
**MONTANA DEPARTMENT OF TRANSPORTATION
WETLAND MITIGATION MONITORING REPORT: YEAR 2007**

*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 2007

PBS&J Project No: B43088.00 - 0508



MONTANA DEPARTMENT OF TRANSPORTATION

WETLAND MITIGATION MONITORING REPORT:

YEAR 2007

*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 2007

PBS&J Project No: B43088.00 - 0508

“MDT attempts to provide accommodations for any known disability that may interfere with a person participating in any service, program, or activity of the Department of Transportation. Alternative accessible formats of this information will be provided upon request. For further information, call 406-444-7228 or TTY (800-335-7592) or by calling Montana Relay at 711.”



TABLE OF CONTENTS

1.0 INTRODUCTION.....	1
2.0 METHODS	3
2.1 Monitoring Dates and Activities.....	3
2.2 Hydrology	3
2.3 Vegetation.....	3
2.4 Soils.....	4
2.5 Wetland Delineation	4
2.6 Mammals, Reptiles and Amphibians	4
2.7 Birds.....	4
2.8 Macroinvertebrates	4
2.9 Functional Assessment.....	4
2.10 Photographs.....	5
2.11 GPS Data.....	5
2.12 Maintenance Needs.....	5
3.0 RESULTS	5
3.1 Hydrology	5
3.2 Vegetation.....	6
3.3 Soils.....	11
3.4 Wetland Delineation	11
3.5 Wildlife	12
3.6 Macroinvertebrates	13
3.7 Functional Assessment.....	13
3.8 Photographs.....	14
3.9 Maintenance Needs/Recommendations	14
3.10 Current Credit Summary.....	15
4.0 REFERENCES.....	16

TABLES

Table 1	<i>2004 to 2007 vegetation species list for the Norem Property Wetland Mitigation Site.</i>
Table 2	<i>2004 to 2007 Transect 1 data summary.</i>
Table 3	<i>2004 to 2007 wildlife species observed within the Norem Property Wetland Mitigation Site.</i>
Table 4	<i>Summary of the 2001 and 2004 to 2007 wetland function/value ratings and functional points at the Norem Property Wetland Mitigation Project.</i>
Table 5	<i>2007 wetland credits and acreages for the Norem Property Wetland Mitigation Site.</i>

FIGURES

Figure 1	<i>Project Site Location Map</i>
Figure 2	<i>Monitoring Activity Locations 2007</i>
Figure 3	<i>Mapped Site Features 2007</i>

CHART

Chart 1	<i>Transect maps showing vegetation types from start of transect (0 feet) to end of transect (625 feet) for each year monitored.</i>
Chart 2	<i>Length of vegetation communities within Transect 1 for each year monitored.</i>
Chart 3	<i>Bioassessment scores for 2004 to 2007 for the Norem Property Wetland Mitigation Site.</i>

APPENDICES

Appendix A	<i>Figures 2 & 3</i>
Appendix B	<i>2007 Wetland Mitigation Site Monitoring Forms</i> <i>2007 Bird Survey Forms</i> <i>2007 COE Wetland Delineation Forms</i> <i>2007 Functional Assessment Forms</i>
Appendix C	<i>2007 Representative Photographs</i>
Appendix D	<i>Proposed Wetland Mitigation Site Map</i>
Appendix E	<i>Bird Survey Protocol GPS Protocol</i>
Appendix F	<i>2007 Macroinvertebrate Sampling Protocol and Data</i>
Appendix G	<i>Norem Property Wetland Credit Assessment Letter</i>

1.0 INTRODUCTION

This annual report summarizes the methods and results from the 2007 (fourth 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.

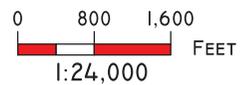
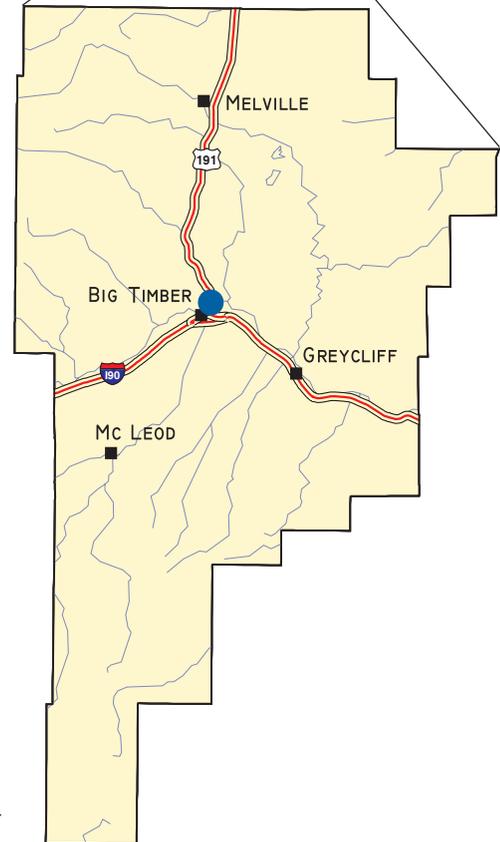
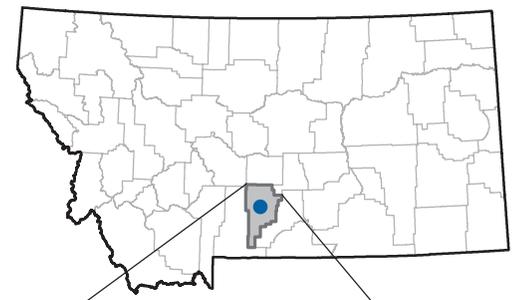
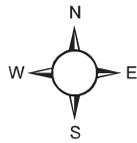
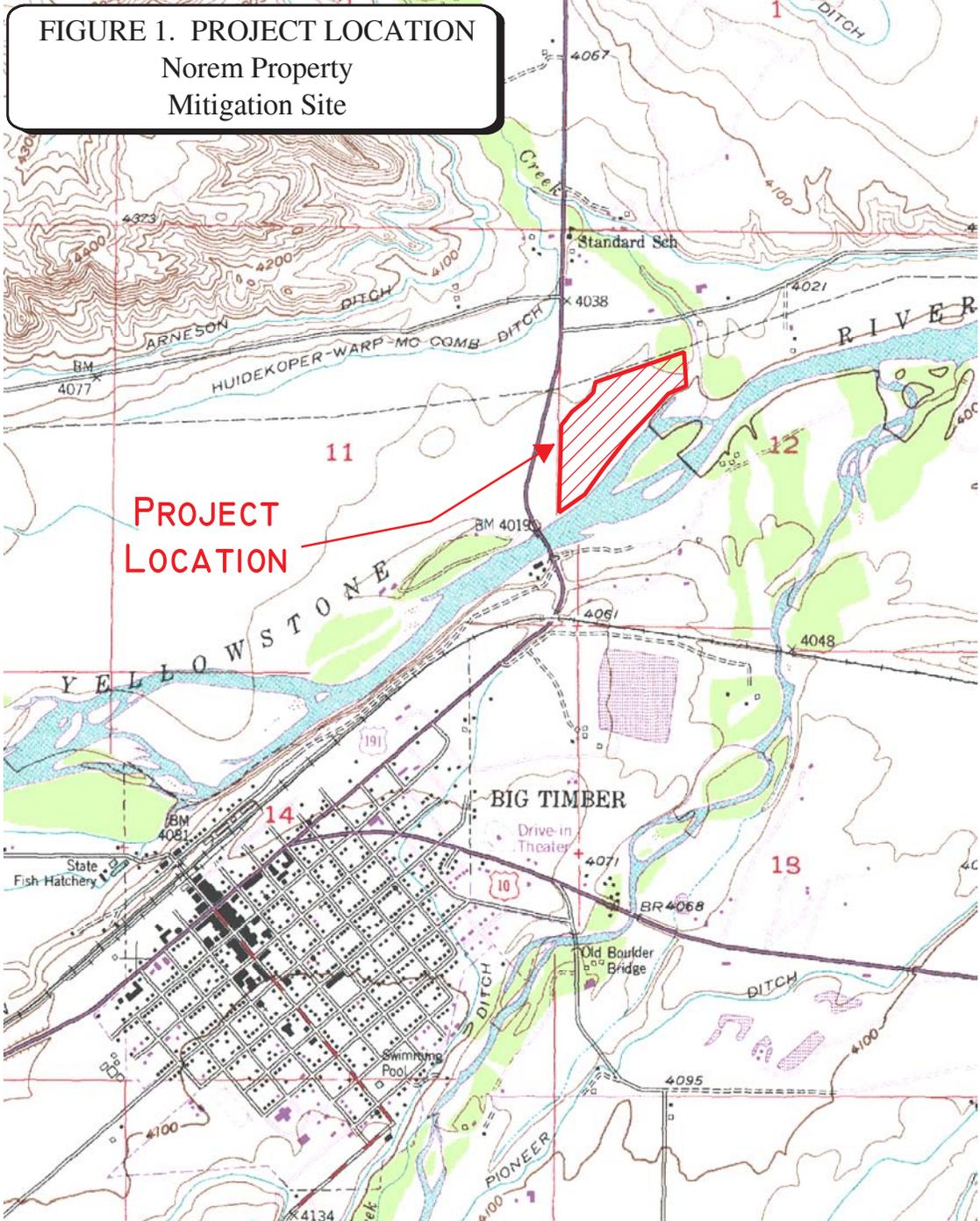
The project was intended to develop approximately 14.71 acres of wetland credit within a 26.88-acre conservation easement on property owned by Mark Norem. The site boundary is illustrated on **Figure 2** in **Appendix A** and the original conceptual layout is provided in **Appendix D**. The overall wetland 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 #: 330054.508
DATE: JAN 2005
LOCATION:
PROJECT MANAGER:
DRAWN BY: B. STEINEBACH



2.0 METHODS

2.1 Monitoring Dates and Activities

The site was visited on July 24 to collect the primary Wetland Mitigation Monitoring Form data (**Appendix B**). The primary monitoring area and monitoring activity locations are shown on **Figure 2** in **Appendix A**. 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 2007 were compared to the 1894-2007 average (Western Regional Climate Center [WRCC] 2007). 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 and will be updated as new species are encountered. Observations will be compared with new data to document vegetation changes over time. 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. This transect was re-evaluated in 2007 to reflect changes in species composition and changing wetland boundaries. The transect location is shown on **Figure 2** in **Appendix A**. Percent cover for each species was recorded on the Vegetation Transect Form (**Appendix B**). 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

A wetland delineation was conducted within the assessment area according to the 1987 COE Wetland Delineation Manual. Wetland and upland areas within the monitoring area were investigated for the presence of wetland hydrology, hydrophytic vegetation and hydric soils. The information was recorded on 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 2007 aerial photograph and used to calculate the wetland area developed at the Norem wetland project. A pre-construction wetland map was completed by the Maxim Technologies, Inc. (2001) (**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 2007 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 approximate location of the macroinvertebrate sample was mapped (**Figure 2** in **Appendix A**).

2.9 Functional Assessment

A Functional Assessment Form was completed for the site using the 1999 MDT Montana Wetland Assessment Method (Berglund 1999) (**Appendix B**). 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 recorded with a resource grade GPS. The approximate locations are shown on **Figure 2** in **Appendix A**. All photographs were taken using a digital camera.

2.11 GPS Data

During the 2004 monitoring season survey points were collected using a resource grade Trimble Geoplotter 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. No additional GPS data were collected in 2007.

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 24, 2007 monitoring visit, approximately 25% of the assessment area was inundated with 1 to 2 inches of shallow surface water; primarily in the eastern portion of the project area. Ponds 1 and 2 were approximately 1 to 2 feet below normal pond level as indicated by saturated mud flats and water marks on the island. Pond 3 was approximately 6 to 8 inches below normal pond level and pond 4 was bank full. Emergent vegetation continues to colonize around the exposed saturated soils of ponds 1 and 2 (**Photograph C, Appendix C**). Exposed

saturated soils were included in the open water pond delineation and are depicted on **Figure 3 in Appendix A**.

According to the Western Regional Climate Center (WRCC), the Big Timber weather station has calculated a mean annual precipitation of 11.33 inches from 1894 through August 2007 (last updated file). The average precipitation through the month of July for that period was 10.06 inches. For the year 2007, precipitation through July was 11.73 inches or 117% of the mean indicating that the spring and summer of 2007 (through July) were wetter compared to 2006 precipitation. However, Montana experienced record breaking hot temperatures in July and August 2007. Even with the increase of precipitation in May and June 2007, unseasonable hot temperatures likely resulted in reduced surface water across the wetlands.

3.2 Vegetation

Vegetation species identified on the site are presented in **Table 1** and in the **Monitoring Form (Appendix B)**. Wetland community types include: Type 1, Mixed *Carex species*, Type 2, *Carex sp. /Juncus balticus*; Type 3, *Bromus inermis/Festuca pratensis*; Type 4, *Populus trichocarpa/Agropyron repens*, Type 5, *Typha latifolia*, and Type 6 *Salix exigua*. Dominant species within each community are listed on the **Monitoring Form (Appendix B)**.

Type 1 occurs in the areas with shallow standing water (1 to 2 inches deep) and areas with saturated soils. This type is dominated by sedge species. Common species include beaked sedge (*Carex utriculata*), Nebraska sedge (*C. nebrascensis*), water sedge (*C. aquatilis*) and wooly sedge (*C. lanuginosa*) Type 2 community composition includes a mix of FAC to OBL species and it is likely as the wetland features develop, FACW and OBL species will dominate this wetland area. Large, irregular scattered patches of Baltic rush (*Juncus balticus*) occupy portions of this community type. In 2007, Torrey's rush (*Juncus torreyi*) co-dominants 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. Type 2 is the largest wetland community type within the project area and is expanding into upland areas.

Type 3 occurs in the uplands and consists primarily of smooth brome (*Bromus inermis*) and meadow fescue (*Festuca pratensis*). Western wheatgrass (*Agropyron smithii*) co-dominates portions of this upland community but the cover and abundance of this species appears lower 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 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 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*, respectfully) 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

Table 1: 2004 to 2007 vegetation species list for the Norem Property Wetland Mitigation Site.

Scientific Name	Region 9 (Northwest) Wetland Indicator Status ^{1, 2}
<i>Agropyron dasystachyum</i>	UPL
<i>Agropyron repens</i>	FAC-
<i>Agropyron smithii</i>	FACU
<i>Agropyron trachycaulum</i>	FAC
<i>Agrostis alba</i>	FACW
<i>Alisma sp.</i>	OBL
<i>Alopecurus arundinacea</i>	(FACW)
<i>Alopecurus pratensis</i>	FACW
<i>Asclepias speciosa</i>	FAC+
<i>Beckmannia syzigachne</i>	OBL
<i>Bromus inermis</i>	(UPL)
<i>Bromus tectorum</i>	UPL
<i>Cardaria draba</i>	UPL
<i>Carex aquatilis</i>	OBL
<i>Carex arcta</i>	OBL
<i>Carex lanuginosa</i>	OBL
<i>Carex lasiocarpa</i>	OBL
<i>Carex nebrascensis</i>	OBL
<i>Carex utriculata</i>	OBL
<i>Centaurea maculosa</i>	(UPL)
<i>Cirsium arvense</i>	FACU+
<i>Convolvulus arvensis</i>	(FACU)
<i>Cornus stolonifera</i>	FACW
<i>Crateagus douglasii</i>	FAC
<i>Crepis acuminata</i>	(FACU)
<i>Deschampsia cespitosa</i>	FACW
<i>Distichlis spicata</i>	FAC+
<i>Eleocharis palustris</i>	FACW+
<i>Epilobium ciliatum</i>	FACW-
<i>Equisetum arvense</i>	FAC
<i>Erigeron lanatus</i>	FACU
<i>Euphorbia esula</i>	(UPL)
<i>Festuca arundinacea</i>	FACU-
<i>Festuca pratensis</i>	FACU+
<i>Glyceria grandis</i>	OBL
<i>Glyceria striata</i>	OBL
<i>Glycyrrhiza lepidota</i>	FAC+
<i>Grindelia squarrosa</i>	FACU
<i>Helianthus annuus</i>	FACU+
<i>Hordeum jubatum</i>	FAC+
<i>Juncus balticus</i>	OBL
<i>Juncus longistylis</i>	FACW
<i>Juncus torreyi</i>	FACW
<i>Kochia scoparia</i>	FAC
<i>Lithosperum arvense</i>	(FAC)
<i>Melilotus alba</i>	FACU
<i>Melilotus officinalis</i>	FACU
<i>Mentha arvense</i>	FACW-

¹ **Bolded** species indicate those documented within the analysis area for the first time in 2007.

² Species in parentheses indicate either not included or classified as “non-indicator” in the *National List of Plant Species that Occur in Wetlands: Northwest (Region 9)* (Reed 1988); statuses in parentheses are probable and based on biologist’s experience.

Table 1 (continued): 2004 to 2007 vegetation species list for the Norem Property Wetland Mitigation Site.

Scientific Name	Region 9 (Northwest) Wetland Indicator Status ^{1,2}
<i>Phalaris arundinacea</i>	FACW
<i>Phleum pratense</i>	FAC-
<i>Poa palustris</i>	FAC
<i>Poa pratense</i>	FAC
<i>Polygonum punctatum</i>	OBL
<i>Populus tremuloides</i>	FAC+
<i>Populus trichocarpa</i>	FAC
<i>Potentilla anserina</i>	OBL
<i>Rumex crispus</i>	FACW
<i>Sagittaria cuneata</i>	OBL
<i>Salix alba(lutea)</i>	FACW/OBL
<i>Salix exigua</i>	OBL
<i>Scirpus acutus</i>	OBL
<i>Scirpus pungens</i>	OBL
<i>Sisymbrium altissimum</i>	FACU-
<i>Solidago occidentalis</i>	FACW
<i>Spartana gracilis</i>	FACW
<i>Spartana pectinata</i>	OBL
<i>Taraxacum officinale</i>	FACU
<i>Thlaspi arvense</i>	(UPL)
<i>Tragopogon dubius</i>	UPL
<i>Typha latifolia</i>	OBL
<i>Verbascum thapsus</i>	(UPL)

¹ **Bolded** species indicate those documented within the analysis area for the first time in 2007.

² Species in parentheses indicate either not included or classified as “non-indicator” in the *National List of Plant Species that Occur in Wetlands: Northwest (Region 9)* (Reed 1988); statuses in parentheses are probable and based on biologist’s experience.

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.

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 (see **Figure 3**).

Woody species transplanted around the pond perimeter include primarily 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.

There are approximately 34 known species of wetland plants with a FACW to OBL status within the assessment area. .

Overall, the planted trees and shrubs around the perimeter of the ponds are doing very well. No mortality was observed to any of the planted woody species around the ponds in 2007. As noted in 2005 and 2006, the overall survival of the planted trees and shrubs ranged from 65 to 80 percent across the project site. 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. This year (2007), quaking aspen seedlings were noted growing in the saturated soils around the edge of Pond 1. Hawthorn seedlings appeared more abundant and robust around Pond 3. Red-osier and willow species were particularly robust and vigorous across the project site. Cottonwood seedlings along Pond 4 are an impressive 3 to 4 feet tall (see **photograph G, Appendix C**). 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 between the past three years. **Chart 1** presents the length of each community as it is encountered from the start to the end of the transect. In 2004, wetland communities represented 29 percent of the transect compared to 45 percent in 2007. **Chart 2** shows graphically the total length occupied by each community type within the transect. Overall, upland habitat and open water habitats have shrunk while wetlands have increased since 2004. In 2004, two wetland communities were present. In 2007, three wetland communities are present and a developing shrub wetland (**Chart 2**).

Noxious weeds were noted at the site, including four species on the State of Montana list. These include spotted knapweed (*Centaurea maculosa*), leafy spurge (*Euphorbia esula*), Canada thistle (*Cirsium arvense*) and field bindweed (*Convolvulus arvensis*). Field bindweed and spotted knapweed were noted along the access road in the eastern and southern portions of the project area. Leafy spurge was noted along the margins of Pond 1 and closer to the banks of the Yellowstone River. Canada thistle occurs in random patches scattered throughout the upland and wetland edges with larger infestations in the southwestern portion of the project. Locations of the weeds were not mapped or surveyed and do not constitute discreet vegetation communities. Weed control measures have been implemented by the landowner and include herbicide applications as well as mechanical and biological control methods. Many Canada thistle plants were dead during the July monitoring and effective weed control has significantly lowered the size and frequency of the Canada thistle, spotted knapweed and leafy spurge infestations.

Table 2: 2004 to 2007 Transect 1 data summary.

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

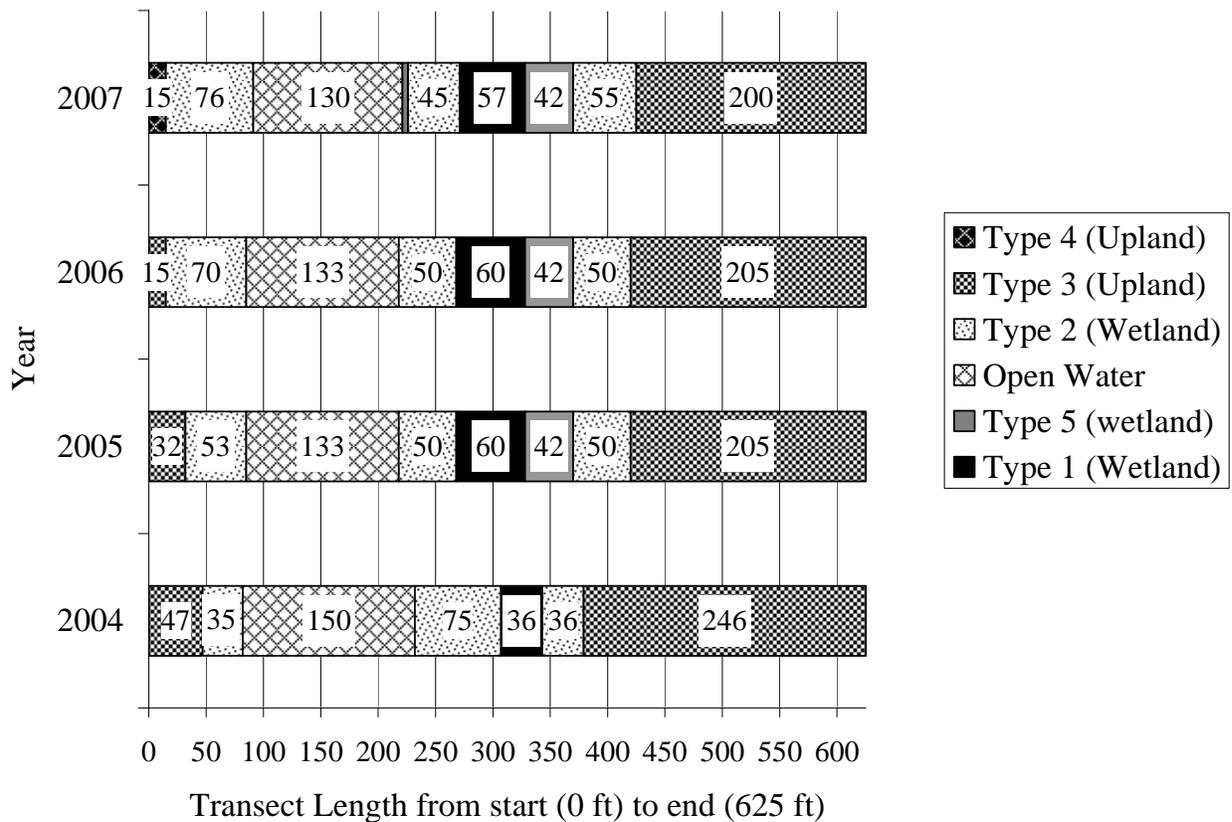
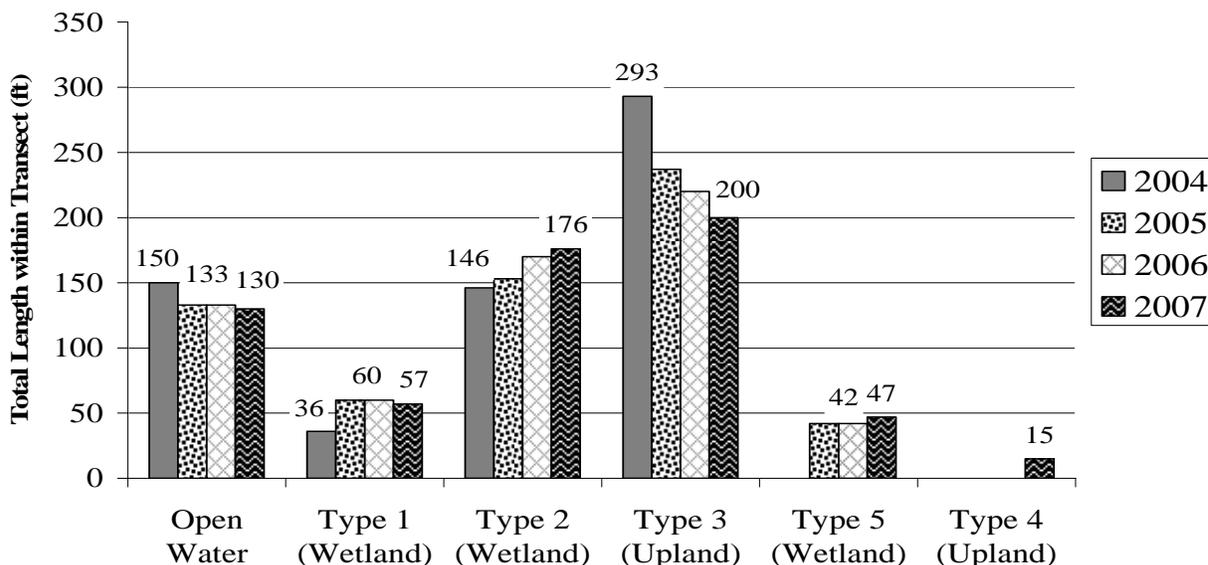


Chart 2: Length of vegetation communities within Transect 1 for each year monitored.



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 1 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 grayish brown (10YR 5/2) from 0 to 11 inches and dark grayish brown (10YR 4/2) from 12 to 14 inches. Soils were dry to a depth of 11 inches and moist from 12 to 14 inches. This sampling point does not meet the hydric soils or wetland hydrology criteria.

At SP-2, soils were a dark grayish brown (10YR 4/2) silty clay loam. Prominent yellowish brown mottles (10YR 5/6) were noted below eight inches. Soils within this sampling point are considered a hydric soil; hydrophytic vegetation and wetland hydrology were also present.

3.4 Wetland Delineation

The delineated wetland boundary is depicted on **Figure 3** in **Appendix A**. The **COE Forms** are included in **Appendix B**. Aquatic vegetation is developing around the edge of all four pond margins. The gross wetland boundary encompasses 12.54 acres, including 1.35 acres of shallow open water (<4 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 shown on **Figure 3 in Appendix A** was approximately $6.98 - 0.05 = 6.93$ acres. Wetland / shallow open water acreage within the shown monitoring area has therefore increased by approximately $12.54 - 6.93 = 5.61$ 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 (1.35 acres) and wetland creation (4.26 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 in are listed in **Table 3**. Activities and densities associated with these observations are included on the monitoring form in **Appendix B**. Avian species will likely increase as migrating flocks key into this wetland that features open water as well as inundated emergent wetlands along the Yellowstone River flyway.

Table 3: 2004 - 2007 wildlife species observed within the Norem Property Wetland Mitigation Site¹.

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

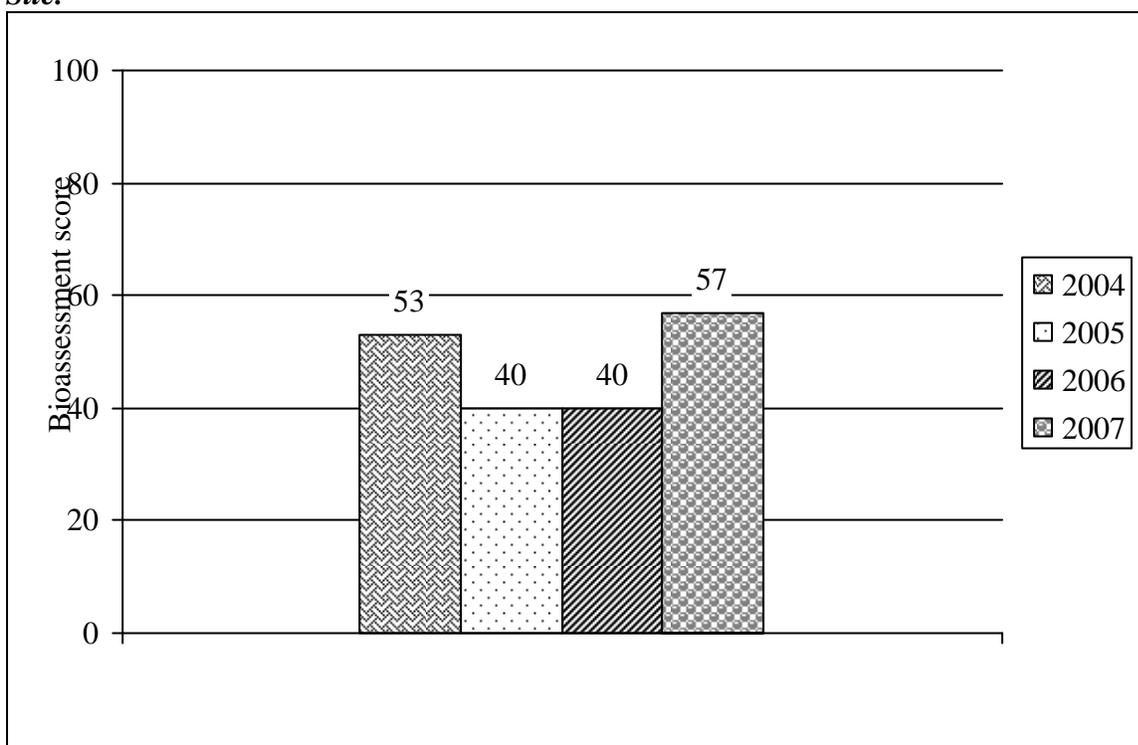
¹ **Bolded** species indicate those documented within the analysis area in 2007.

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 2007).

Pond: *Very low abundance and low taxa richness continue to characterize this site. In spite of this, the bioassessment index returned a score indicating sub-optimal conditions, with the score at the median value for statewide mitigated wetlands sampled in 2007. Macrophyte development appears to be limited at this site, with hypoxic benthic substrates and open-water dominating the available aquatic habitats.*

Chart 3: Bioassessment scores from 2004 to 2007 for the Norem Property Wetland Mitigation Site.



3.7 Functional Assessment

Completed functional assessment forms are included in **Appendix B** and summarized in **Table 4**. Pre-construction functional assessments were completed for the wetlands by Maxim (2001) (**Table 4**). The site rated as an overall Category II wetland and scores 82 functional units. This represents an increase of approximately 48.25 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.

Table 4: Summary of the 2001 and 2004 to 2007 wetland function/value ratings and functional points at the Norem Property Wetland Mitigation Project.

Function and Value Parameters From the 1999 MDT Montana Wetland Assessment Method	Pre-construction	Post-construction			
	2001	2004	2005	2006	2007
Listed/Proposed T&E Species Habitat	Low (0)	Low (0.3)	Low (0.3)	Low (0.3)	Low (0.0)*
MTNHP Species Habitat	Low (0.1)	Mod (0.6)	Mod (0.6)	Mod (0.6)	Mod (0.6)
General Wildlife Habitat	Mod (0.5)	Mod (0.9)	Mod (0.9)	Exc (1.0)	Exc (1.0)
General Fish/Aquatic Habitat	Low (0.1)	NA	NA	NA	NA
Flood Attenuation	Mod (0.5)	Mod (0.5)	Mod (0.5)	Mod (0.5)	Mod (0.5)
Short and Long Term Surface Water Storage	Mod (0.6)	Mod (0.6)	Mod (0.6)	Mod (0.6)	Mod (0.6)
Sediment, Nutrient, Toxicant Removal	High (1.0)	High (0.9)	High (0.9)	High (0.9)	High (0.9)
Sediment/Shoreline Stabilization	NA	NA	NA	NA	NA
Production Export/Food Chain Support	Mod (0.7)	Mod (0.7)	Mod (0.7)	Mod (0.7)	High (0.8)
Groundwater Discharge/Recharge	High (1.0)	High (1.0)	High (1.0)	High (1.0)	High (1.0)
Uniqueness	Low (0.2)	Mod (0.4)	Mod (0.4)	Mod (0.4)	Mod (0.4)
Recreation/Education Potential	Low (0.1)	Mod (0.7)	Mod (0.7)	Mod (0.7)	Mod (0.7)
Actual Points/Possible Points	4.8/11	6.6/10	6.6/10	6.7/10	6.5*/10
% of Possible Score Achieved	50	66	66	67	65*
Overall Category	III	II	II	II	II
Total Acreage of Assessed Wetlands within Easement	6.93	10.82	11.39	12.54	12.54
Functional Units (acreage x actual points) (fu)	33.26	71.41	75.17	84.02	81.51*
Net Acreage Gain (ac)	NA	3.89	4.46	5.61	5.61
Total Functional Unit Gain (fu)	NA	38.15	41.91	50.76	48.25*

* The delisting of the Bald Eagle from the threatened and endangered species list reduced the functional score.

3.8 Photographs

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

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 2006 monitoring trip very few leafy spurge and spotted knapweed plants were noted. These weed species had been sprayed and were not viable at the time of the monitoring. Leafy spurge, field bindweed and spotted knapweed are small infestations located along the access road or around Pond 1. 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 2007, the approximate assignable wetland credit at the site is 9.43 acres or 64% of the goal, as outlined in **Table 5**.

Table 5: 2007 wetland credits and acreages for the Norem Property Wetland Mitigation Site.

Wetland Mitigation Type	2007 Net Acre	Ratio	2007 Credit Acre	Target Credit Acre	Comments
Wetland Enhancement	6.98	3:1	2.32	2.32	Grazing removal, hydrological enhancement, and planting completed, with plants developing.
Wetland Creation	4.26	1:1	4.26	9.46	45% of the wetland creation area has been converted to wetlands.
Open Water Creation	1.35	1:1	1.35	1.58	85% of the intended open water has developed. Approximately 0.15 ac of OW transitioned to wetland between 2006 and 2007.
Buffer Zone Implementation	6.00	4:1	1.50	1.50	2007 net buffer area was assumed within easement.
Berm impact	--	--	---	-0.15	
TOTAL	18.59	--	9.43	14.71	64% of goal

The cottonwood community adjacent to the river is likely to shift from an upland understory to a wetland understory over time. 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 to over 48 points since 2001 due to increase in wetland size. The wetland is ranked as a Category II site.

4.0 REFERENCES

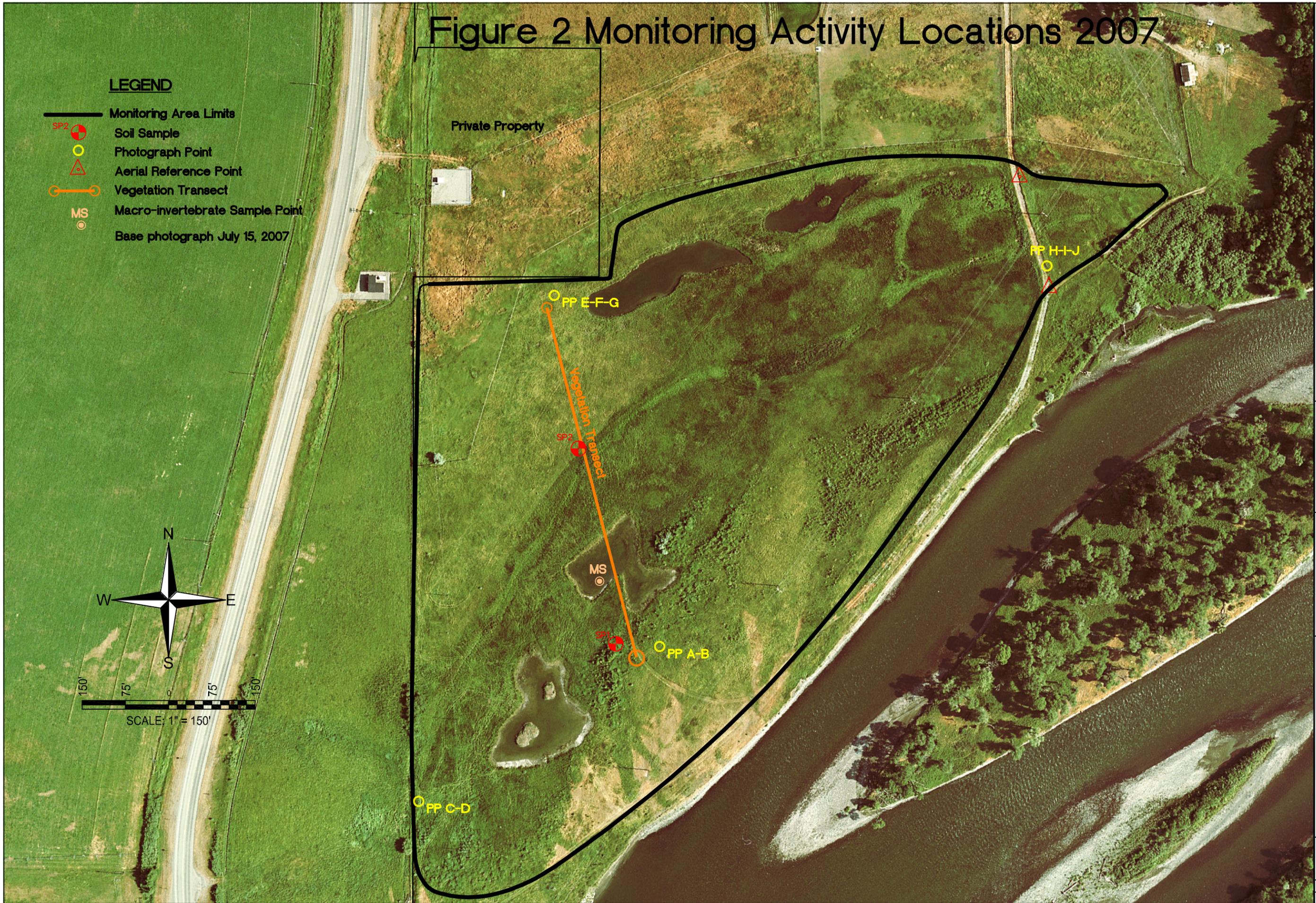
- Berglund, J. 1999. *MDT Montana Wetland Assessment Method*. May. Montana Department of Transportation, Helena, Montana.
- Bollman, W. 2007. MDT Mitigated Wetland Monitoring Project – Aquatic Invertebrate Monitoring Summary 2001-2007. Rhithron Associates, Inc. Missoula, Montana.
- Dorn, D.R. 1984. *Vascular Plants of Montana*. Mountain West Publishing. Cheyenne, Wyoming.
- Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual*. U.S. Army Corps of Engineers, Washington, DC.
- Lackschewitz, K. 1997. *Vascular Plants of West-Central Montana – Identification Guidebook*. United States Department of Agriculture Forest Service, Intermountain Research Station. General Technical Report INT-277. May.
- Reed, P.B. 1988. *National list of plant species that occur in wetlands: North West (Region 9)*. Biological Report 88(26.9), May 1988. U.S. Fish and Wildlife Service, Washington, D.C.
- USDA Natural Resource Conservation Service (NRCS). 2001. *Soil Survey of Sweetgrass County, Montana*.
- Western Regional Climate Center (WRCC). 2007. Big Timber Weather Station. Data obtained on November 5th at: <http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?mtcolu>.

Appendix A

FIGURES 2 & 3

*MDT Wetland Mitigation Monitoring
Norem Property
Big Timber, Montana*

Figure 2 Monitoring Activity Locations 2007



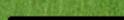
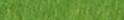
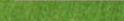
LEGEND

- Monitoring Area Limits
- Soil Sample
- Photograph Point
- Aerial Reference Point
- Vegetation Transect
- Macro-invertebrate Sample Point
- Base photograph July 15, 2007

PROJECT NAME MDT NOREM WETLAND MITIGATION	
DRAWING TITLE MONITORING ACTIVITY LOCATIONS 2007	
PROJ. NO.: B43088.00 0508	DRAWN: SH/JR
LOCATION: BIG TIMBER, MT	PROJ. MGR: J. BERGLUND
SCALE: 1" = 150'	CHECKED: CH / APP'VD: JB
FILE NAME: 2007 Base.dwg	
3810 Valley Commons Drive Suite 4 Bozeman, MT 59718	
FIGURE 2 OF	
REV - Nov/19/2007	

Figure 3 Mapped Site Features 2007

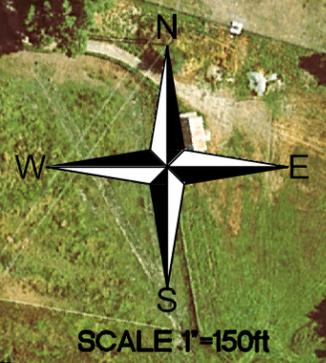
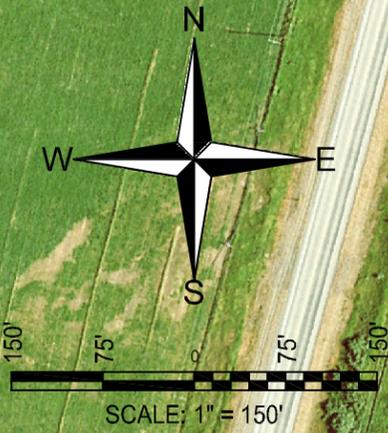
LEGEND

-  Monitoring Area Limits
 -  Wetland Limits
 -  Vegetation Community Boundary
 -  Open Water Boundary
 -  Historic Wetland
- Base photograph July 15, 2007

Gross Wetland Area = 12.54 Acres*
 Open Water = 1.35 Acres*
 Historic Wetland Area = 6.93 Acres*
 Net Wetland Area = 4.26 Acres*
 * within Monitoring Area Limits

VEGETATION COMMUNITIES

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



PROJECT NAME MDT NOREM WETLAND MITIGATION	
DRAWING TITLE MAPPED SITE FEATURES 2007	
PROJ NO: B43088.00 0508	DRAWN: SH/JR
LOCATION: BIG TIMBER, MT	PROJ MGR: J. BERGLUND
SCALE: 1" = 150'	CHECKED: CH / APPVD: JB
FILE NAME: 2007 Base.dwg	
3810 Valley Commons Drive Suite 4 Bozeman, MT 59718	
	
FIGURE 3 OF	
REV - Nov/19/2007	

Appendix B

2007 WETLAND MITIGATION SITE MONITORING FORMS

2007 BIRD SURVEY FORMS

2007 COE WETLAND DELINEATION FORMS

2007 FUNCTIONAL ASSESSMENT FORMS

MDT Wetland Mitigation Monitoring

Norem Wetland Project

Big Timber, Montana

PBS&J / MDT WETLAND MITIGATION SITE MONITORING FORM

Project Name: Norem Wetland Project Project Number: B43054-0508
Assessment Date: July 24 2007 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, Time of Day: 7 AM
Initial Evaluation Date: August 13, 2004 Monitoring Year: fourth # 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: 1-3 inches wet meadows, 1 – 3 feet ponds
Percent of assessment area under inundation: 25%
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

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: **Soils saturated at the surface but less surface water in 2007 compared to 2006. Surface water was generally in the eastern portion of the project.**

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

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

Comments / Problems: **This is a very 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, Hordeum jubatum, Poa palustris, Mentha arvensis and Polygonum punctatum.**

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

Dominant Species	% Cover	Dominant Species	% Cover
Bromus inermis	3 = 11-20%	Poa pratense	2 = 6-10%
Festuca pratensis	3 = 11-20%	Agropyron dasytachyum	1 = 1-5%
Agropyron smithii	2 = 6-10%	Equisetum arvense	1 = 1-5%
Agrostis alba	2 = 6-10%	Juncus balticus	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. Noting an increase in cover by Agrostis alba in this community type. 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 (1-6.5 ft)	4 = 21-50%	Poa pratensis	1 = 1-5%
Agropyron repens	3 = 11-20%	Bromus inermis	1 = 1-5%
Salix exigua	2 = 6-10%	Phalaris arundinacea	1 = 1-5%
Agropyron smithii	2 = 6-10%	Juncus balticus	1 = 1-5%
Festuca pratensis	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.**

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

Dominant Species	% Cover	Dominant Species	% Cover
Typha latifolia	5 = > 50%	Bechmannia syzigachne	1 = 1-5%
Scirpus 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%		
Carex lanuginosa	2=6-10%		
Phalaris arundinacea	2=6-10%		
Agrostis alba	2=6-10%		
Agropyron repens	2=6-10%		
Juncus balticus	1 = 1-5%		

Comments / Problems: **Salix exigua forms a narrow band west of the access road.**

Community Number: _____ Community Title (main spp): _____

Dominant Species	% Cover	Dominant Species	% Cover

Comments / Problems: _____

Additional Activities Checklist:

- Record and map vegetative communities on aerial photograph.

COMPREHENSIVE VEGETATION LIST

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

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
Raccoon		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
White-tailed deer, fawn	2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Additional Activities Checklist:

Yes Macroinvertebrate Sampling (if required)

Comments / Problems: Osprey nest platform just off-site was still in place and adults observed feeding young.

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	Northwest
B		Southern end of transect looking SW	Southwest
C		Species diversity along edges of open water pond	Northwest
D		Southernwestern corner of the property	North
E		Northern end of the transect looking South	South
F		Northern end of transect looking SW (upland)	Southwest
G		Northern end of transect, pond 4 with woody species	East
H		Looking SW across CT 1 and 2 (wetlands)	Southwest
I		Willow establishment along eastern road edge	North
J		Buffer between the river and wetlands	Southwest
C-1		Shrub establishment in saturated soils	
G-1		Aquatic vegetation - Alisma sp. in ponds	

Comments / Problems: _____

GPS SURVEYING

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

GPS Checklist:

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

Comments / Problems: _____

WETLAND DELINEATION

(attach COE delineation forms)

At each site conduct these checklist items:

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

Comments / Problems: **Survey was done in 2004**

FUNCTIONAL ASSESSMENT

(Complete and attach full MDT Montana Wetland Assessment Method field forms.)

(Also attach any completed abbreviated field forms, if used)

Comments / Problems: _____

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 24, 2007** Examiner: **CH/PBSJ**

Transect Number: **1** Approximate Transect Length: **625 feet** Compass Direction from Start: **0°** Note: **_____**

Vegetation Type E: CT 2 (wetland)	
Length of transect in this type: 45 feet	
Plant Species	Cover
CARAQU	3 = 11-20%
CARNEB	2 = 6-10%
CARUTR	2 = 6-10%
JUNBAL	3 = 11-20%
ELEPAL	1 = 1-5%
POAPAL	1 = 1-5%
MENARV	2 = 6-10%
HORJUB	1 = 1-5%
JUNTOR	1 = 1-5%
POTANS	1 = 1-5%
Total Vegetative Cover:	80%

Vegetation Type F: CT 1 (wetland)	
Length of transect in this type: 57 feet	
Plant Species	Cover
CARAQU	3 = 11-20%
CARUTR	3 = 11-20%
CARNEB	2 = 6-10%
CARLAS	1 = 1-5%
SCIACU	2 = 6-10%
SCIPUN	2 = 6-10%
JUNBAL	1 = 1-5%
JUNLON	1 = 1-5%
TYPLAT	1 = 1-5%
GLYGRA	1 = 1-5%
CIRARV	+ = < 1%
Total Vegetative Cover:	80%

Vegetation Type G: CT 5 (wetland)	
Length of transect in this type: 42 feet	
Plant Species	Cover
TYPLAT	5 = >50%
CARUTR	3 = 11-20%
SCIACU	2 = 6-10%
SCIPUL	1 = 1-5%
GLYGRA	1 = 1-5%
CARAQU	1 = 1-5%
POLPUN	+ = < 1%
Total Vegetative Cover:	85%

Vegetation Type H: CT 2 (wetland)	
Length of transect in this type: 55 feet	
Plant Species	Cover
CARUTR	3 = 11-20%
JUNBAL	3 = 11-20%
CARAQU	2 = 6-10%
CARNEB	2 = 6-10%
AGRALB	3 = 11-20%
SCIPUN	1 = 1-5%
CIRARV	1 = 1-5%
Total Vegetative Cover:	75%

MDT WETLAND MONITORING – VEGETATION TRANSECT

Cover Estimate

+ = < 1% 3 = 11-10%
1 = 1-5% 4 = 21-50%
2 = 6-10% 5 = > 50%

Indicator Class

+ = Obligate
- = Facultative/Wet
0 = Facultative

Source

P = Planted
V = Volunteer

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: **7/24/07**

Survey Time: **7AM** to **9AM**

Bird Species	#	Behavior	Habitat	Bird Species	#	Behavior	Habitat
Yellow Warbler	1	BD	MA				
Red-tailed Hawk	3	F	UP				
Osprey	1	N	UP				
Red-winged Blackbird	10	BD	MA				
Tree Swallow	1	FO	MA				
Barn Swallow	30	F	MA				
Brown-headed Cowbird	1	BD	MA				
Mallard	1	Flush	MA				
Common Nighthawk	1	FO	MA				
Spotted Sandpiper	1	FO	MA				
Mourning Dove	1	FO					
Common Nighthawk	1	FO	MA				
Spotted Sandpiper	1	FO	MA				
Mourning Dove	1	FO					

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:

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

Project / Site: <u>Norem Property</u> Applicant / Owner: <u>MDT</u> Investigator: <u>CH/PBSJ</u>	Date: <u>July 24, 2007</u> County: <u>Sweetgrass</u> State: <u>Montana</u>
---	---

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

VEGETATION

Dominant Species	Stratum	Indicator	Dominant Species	Stratum	Indicator
1. <i>POPTRI</i>	Tree	FAC	11.		
2. <i>PHAARU</i>	Herb	FACW	12.		
3. <i>AGRSMI</i>	Herb	FACU	13.		
4. <i>FESPRO</i>	Herb	FACU+	14.		
5. <i>POAPRA</i>	Herb	FACU+	15.		
6. <i>POTANS</i>	Herb	OBL	16.		
7. <i>HORJUB</i>	Herb	FAC+	17.		
8. <i>CIRARV</i>	Herb	FACU+	18.		
9.			19.		
10.			20.		
Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): 4 / 8 = 50%			FAC Neutral: 2 / 5 = 40%		
Remarks: 50% hydrophytic vegetation					

HYDROLOGY

<u>Yes</u> Recorded Data (Describe in Remarks): <u>N/A</u> Stream, Lake, or Tide Gauge <u>Yes</u> Aerial Photographs <u>N/A</u> Other <u>No</u> No Recorded Data	Wetland Hydrology Indicators Primary Indicators: <u>NO</u> Inundated <u>NO</u> Saturated in Upper 12 Inches <u>NO</u> Water Marks <u>NO</u> Drift Lines <u>NO</u> Sediment Deposits <u>NO</u> Drainage Patterns in Wetland Secondary Indicators (2 or more required): <u>NO</u> Oxidized Root Channels in Upper 12 inches <u>NO</u> Water-Stained Leaves <u>NO</u> Local Soil Survey Data <u>NO</u> FAC-Neutral Test <u>NO</u> Other (Explain in Remarks)
Field Observations: Depth of Surface Water None ____ (in.) Depth to Free Water in Pit > 14 (in.) Depth to Saturated Soil > 14 (in.)	
Remarks: Soils were dry from 0 to 11 inches, from 12 to 14 soils moist but not saturated. Primary or secondary hydrologic indicators are not present at this sampling point.	

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.
0-11	A	10 YR 5/2	/	N/A	Silty loam
			/	N/A	
12-14	B	10 YR 4/2	/	N/A	Silty clay loam
			/	N/A	
		/	/	N/A	
		/	/	N/A	
		/	/	N/A	
		/	/	N/A	

Hydric Soil Indicators:

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

Remarks: **Hydric soil indicators were not present.**

WETLAND DETERMINATION

Hydrophytic Vegetation Present? <u>YES</u>	Is this Sampling Point within a Wetland? <u>NO</u>
Wetland Hydrology Present? <u>NO</u>	
Hydric Soils Present? <u>NO</u>	

Remarks: **Cottonwoods are increasing 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 wetland hydrology or hydric soils parameters -area needs more time and hydrology to develop.**

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

Project / Site: <u>Norem Property</u> Applicant / Owner: <u>MDT</u> Investigator: <u>CH/PBSJ</u>	Date: <u>July 24, 2007</u> County: <u>Sweetgrass</u> State: <u>Montana</u>
---	---

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

VEGETATION

Dominant Species	Stratum	Indicator	Dominant Species	Stratum	Indicator
1. <i>CARLAN</i>	Herb	OBL	11.		
2. <i>CARNEB</i>	Herb	OBL	12.		
3. <i>ASCSP</i>	Herb	FAC+	13.		
4. <i>JUNBAL</i>	Herb	OBL	14.		
5. <i>FESARU</i>	Herb	FACU-	15.		
6. <i>AGRALB</i>	Herb	FACW	16.		
7. <i>MENARV</i>	Herb	FACW	17.		
8. <i>CIRARV</i>	Herb	FACU+	18.		
9.			19.		
10.			20.		
Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): 6 / 8 = 75%			FAC Neutral: 5 / 7 = 71%		
Remarks: 75% hydrophytic vegetation - improved species diversity along this portion of community type 2.					

HYDROLOGY

<u>Yes</u> Recorded Data (Describe in Remarks): <u>N/A</u> Stream, Lake, or Tide Gauge <u>Yes</u> Aerial Photographs <u>N/A</u> Other <u>No</u> No Recorded Data	Wetland Hydrology Indicators Primary Indicators: <u>NO</u> Inundated <u>NO</u> Saturated in Upper 12 Inches <u>NO</u> Water Marks <u>NO</u> Drift Lines <u>NO</u> Sediment Deposits <u>NO</u> Drainage Patterns in Wetland Secondary Indicators (2 or more required): <u>YES</u> Oxidized Root Channels in Upper 12 inches <u>NO</u> Water-Stained Leaves <u>NO</u> Local Soil Survey Data <u>YES</u> FAC-Neutral Test <u>NO</u> Other (Explain in Remarks)
Field Observations: Depth of Surface Water None ____ (in.) Depth to Free Water in Pit > 14 (in.) Depth to Saturated Soil > 14 (in.)	
Remarks: Soils moist at 8 inches but not saturated. Secondary hydrologic indicators include the FAC neutral test and oxidized root channels within the upper 12 inches.	

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.
0-14	A	10 YR 4/2	10 YR 5/6	Few Prominent	Silty Clay Loam
		/	/	N/A	
		/	/	N/A	
		/	/	N/A	
		/	/	N/A	
		/	/	N/A	

Hydric Soil Indicators:

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

Remarks: **Hydric soil indicators include mottles (noted at 8 inches) and low chroma values. Oxidized root channels were noted below 6 inches.**

WETLAND DETERMINATION

Hydrophytic Vegetation Present? <u>YES</u>	Is this Sampling Point within a Wetland? <u>YES</u>
Wetland Hydrology Present? <u>YES</u>	
Hydric Soils Present? <u>YES</u>	

Remarks: **Noticed an increase in cover by Agrostis alba in community type 2.**

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

i. AA is Documented (D) or Suspected (S) to contain (check box):

- Primary or Critical habitat (list species) D S
- Secondary habitat (list species) D S
- Incidental habitat (list species) D S
- No usable habitat D S

ii. **Rating** (Based on the strongest habitat chosen in 14A(i) above, find the corresponding rating of High (H), Moderate (M), or Low (L) for this function.

Highest Habitat Level	doc/primary	sus/primary	doc/secondary	sus/secondary	doc/incidental	sus/incidental	none
Functional Point and Rating	---	---	---	---	---	---	0 (L)

If documented, list the source (e.g., observations, records, etc.): 1

14B. HABITAT FOR PLANTS AND ANIMALS RATED AS S1, S2, OR S3 BY THE MONTANA NATURAL HERITAGE PROGRAM.

Do not include species listed in 14A(i).

i. AA is Documented (D) or Suspected (S) to contain (check box):

- Primary or Critical habitat (list species) D S _____
- Secondary habitat (list species) D S Peregrine Falcon
- Incidental habitat (list species) D S Bald eagle
- No usable habitat D S _____

iii. **Rating** (Based on the strongest habitat chosen in 14B(i) above, find the corresponding rating of High (H), Moderate (M), or Low (L) for this function.

Highest Habitat Level:	doc/primary	sus/primary	doc/secondary	sus/secondary	doc/incidental	sus/incidental	none
Functional Point and Rating	---	---	---	.6 (M)	---	---	---

If documented, list the source (e.g., observations, records, etc.): _____

14C. General Wildlife Habitat Rating

i. **Evidence of overall wildlife use in the AA:** (Check either substantial, moderate, or low)

Substantial (based on any of the following)

- observations of abundant wildlife #s or high species diversity (during any period)
- abundant wildlife sign such as scat, tracks, nest structures, game trails, etc.
- presence of extremely limiting habitat features not available in the surrounding area
- interviews with local biologists with knowledge of the AA

Low (based on any of the following)

- few or no wildlife observations during peak use periods
- little to no wildlife sign
- sparse adjacent upland food sources
- interviews with local biologists with knowledge of AA

Moderate (based on any of the following)

- observations of scattered wildlife groups or individuals or relatively few species during peak periods
- common occurrence of wildlife sign such as scat, tracks, nest structures, game trails, etc.
- adequate adjacent upland food sources
- interviews with local biologists with knowledge of the AA

ii. **Wildlife Habitat Features** (Working from top to bottom, select appropriate AA attributes to determine the exceptional (E), high (H), moderate (M), or low (L) rating. Structural diversity is from #13. For class cover to be considered evenly distributed, vegetated classes must be within 20% of each other in terms of their percent composition in the AA (see #10). Duration of Surface Water: P/P = permanent/perennial; S/I = seasonal/intermittent; T/E = temporary/ephemeral; A = absent.

Structural Diversity (from #13)	<input type="checkbox"/> High								<input checked="" type="checkbox"/> Moderate								<input type="checkbox"/> Low			
Class Cover Distribution (all vegetated classes)	<input type="checkbox"/> Even				<input type="checkbox"/> Uneven				<input type="checkbox"/> Even				<input checked="" type="checkbox"/> Uneven				<input type="checkbox"/> Even			
Duration of Surface Water in ≥ 10% of AA	P/P	S/I	T/E	A	P/P	S/I	T/E	A	P/P	S/I	T/E	A	P/P	S/I	T/E	A	P/P	S/I	T/E	A
Low disturbance at AA (see #12)	--	--	--	--	--	--	--	--	--	--	--	--	E	--	--	--	--	--	--	--
Moderate disturbance at AA (see #12)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
High disturbance at AA (see #12)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

iii. **Rating** (Using 14C(i) and 14C(ii) above and the matrix below to arrive at the functional point and rating of exceptional (E), high (H), moderate (M), or low (L) for this function.)

Evidence of Wildlife Use from 14C(i)	Wildlife Habitat Features Rating from 14C(ii)			
	<input checked="" type="checkbox"/> Exceptional	<input type="checkbox"/> High	<input type="checkbox"/> Moderate	<input type="checkbox"/> Low
Substantial	1 (E)	--	--	--
Moderate	--	--	--	--
Low	--	--	--	--

Comments: _____

14D. GENERAL FISH/AQUATIC HABITAT RATING NA (proceed to 14E)

If the AA is not or was not historically used by fish due to lack of habitat, excessive gradient, then check the NA box above.

Assess if the AA is used by fish or the existing situation is "correctable" such that the AA could be used by fish [e.g. fish use is precluded by perched culvert or other barrier, etc.]. If fish use occurs in the AA but is not desired from a resource management perspective (e.g. fish use within an irrigation canal), then Habitat Quality [14D(i)] below should be marked as "Low", applied accordingly in 14D(ii) below, and noted in the comments.

i. **Habitat Quality** (Pick the appropriate AA attributes in matrix to pick the exceptional (E), high (H), moderate (M), or low (L) quality rating.)

Duration of Surface Water in AA	<input type="checkbox"/> Permanent/Perennial			<input type="checkbox"/> Seasonal / Intermittent			<input type="checkbox"/> Temporary / Ephemeral		
Cover - % of waterbody in AA containing cover objects (e.g. submerged logs, large rocks & boulders, overhanging banks, floating-leaved vegetation)	>25%	10-25%	<10%	>25%	10-25%	<10%	>25%	10-25%	<10%
Shading - >75% of streambank or shoreline of AA contains riparian or wetland scrub-shrub or forested communities	--	--	--	--	--	--	--	--	--
Shading - 50 to 75% of streambank or shoreline of AA contains riparian or wetland scrub-shrub or forested communities.	--	--	--	--	--	--	--	--	--
Shading - < 50% of streambank or shoreline of AA contains riparian or wetland scrub-shrub or forested communities.	--	--	--	--	--	--	--	--	--

ii. **Modified Habitat Quality:** Is fish use of the AA precluded or significantly reduced by a culvert, dike, other man-made structure or activity or is the waterbody included on the 'MDEQ list of waterbodies in need of TMDL development' with 'Probable Impaired Uses' listed as cold or warm water fishery or aquatic life support?

Y N If yes, reduce the rating from 14D(i) by one level and check the modified habitat quality rating: E H M L

iii. **Rating** (Use the conclusions from 14D(i) and 14D(ii) above and the matrix below to pick the functional point and rating of exceptional (E), high (H), moderate (M), or low (L).)

Types of Fish Known or Suspected Within AA	Modified Habitat Quality from 14D(ii)			
	<input type="checkbox"/> Exceptional	<input type="checkbox"/> High	<input type="checkbox"/> Moderate	<input type="checkbox"/> Low
Native game fish	--	--	--	--
Introduced game fish	--	--	--	--
Non-game fish	--	--	--	--
No fish	--	--	--	--

Comments: _____

14E. FLOOD ATTENUATION NA (proceed to 14G)

Applies only to wetlands subject to flooding via in-channel or overbank flow.

If wetlands in AA do not flooded from in-channel or overbank flow, check NA above.

i. **Rating** (Working from top to bottom, mark the appropriate attributes to arrive at the functional point and rating of high (H), moderate (M), or low (L) for this function.)

Estimated wetland area in AA subject to periodic flooding	<input type="checkbox"/> ≥ 10 acres			<input checked="" type="checkbox"/> <10, >2 acres			<input type="checkbox"/> ≤2 acres		
% of flooded wetland classified as forested, scrub/shrub, or both	75%	25-75%	<25%	75%	25-75%	<25%	75%	25-75%	<25%
AA contains no outlet or restricted outlet	--	--	--	--	--	.5 (M)	--	--	--
AA contains unrestricted outlet	--	--	--	--	--	--	--	--	--

ii. **Are residences, businesses, or other features which may be significantly damaged by floods located within 0.5 miles downstream of the AA?** (check)

Y N Comments: homes, ranches

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

Applies to wetlands that flood or pond from overbank or in-channel flow, precipitation, upland surface flow, or groundwater flow.

If no wetlands in the AA are subject to flooding or ponding, check NA above.

i. **Rating** (Working from top to bottom, use the matrix below to arrive at the functional point and rating of high (H), moderate (M), or low (L) for this function.)

Abbreviations: P/P = permanent/perennial; S/I = seasonal/intermittent; T/E = temporary/ephemeral.

Estimated maximum acre feet of water contained in wetlands within the AA that are subject to periodic flooding or ponding.	<input type="checkbox"/> >5 acre feet			<input checked="" type="checkbox"/> <5, >1 acre feet			<input type="checkbox"/> ≤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	--	--	--	--	.6 (M)	--	--	--	--
Wetlands in AA flood or pond < 5 out of 10 years	--	--	--	--	--	--	--	--	--

Comments: _____

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

Applies to wetlands with potential to receive excess sediments, nutrients, or toxicants through influx of surface or ground water or direct input.

If no wetlands in the AA are subject to such input, check NA above.

i. **Rating** (Working from top to bottom, use the matrix below to arrive at the functional point and rating of high (H), moderate (M), or low (L) for this function.)

Sediment, Nutrient, and Toxicant Input Levels Within AA	AA receives or surrounding land use has potential to deliver low to moderate levels of sediments, nutrients, or compounds such that other functions are not substantially impaired. Minor sedimentation, sources of nutrients or toxicants, or signs of eutrophication present.				Waterbody on MDEQ list of waterbodies in need of TMDL development for "probable causes" related to sediment, nutrients, or toxicants or AA receives or surrounding land use has potential to deliver high levels of sediments, nutrients, or compounds such that other functions are substantially impaired. Major sedimentation, sources of nutrients or toxicants, or signs of eutrophication present.			
	<input checked="" type="checkbox"/> ≥ 70%		<input type="checkbox"/> < 70%		<input type="checkbox"/> ≥ 70%		<input type="checkbox"/> < 70%	
% cover of wetland vegetation in AA	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> Yes <input type="checkbox"/> No	
Evidence of flooding or ponding in AA	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> Yes <input type="checkbox"/> No	
AA contains no or restricted outlet	--	--	--	--	--	--	--	--
AA contains unrestricted outlet	.9 (H)	--	--	--	--	--	--	--

Comments: _____

14H. SEDIMENT/ShORELINE STABILIZATION

NA (proceed to 14I)

Applies only if AA occurs on or within the banks of a river, stream, or other natural or man-made drainage, or on the shoreline of a standing water body that is subject to wave action. If this does not apply, check NA above.

i. **Rating** (Working from top to bottom, use the matrix below to arrive at the functional point and rating exceptional (E), high (H), moderate (M), or low (L) for this function.

% Cover of wetland streambank or shoreline by species with deep, binding rootmasses.	Duration of Surface Water Adjacent to Rooted Vegetation		
	<input type="checkbox"/> Permanent / Perennial	<input type="checkbox"/> Seasonal / Intermittent	<input type="checkbox"/> Temporary / Ephemeral
≥ 65 %	--	--	--
35-64 %	--	--	--
< 35 %	--	--	--

Comments:

14I. PRODUCTION EXPORT / FOOD CHAIN SUPPORT

i. **Rating** (Working from top to bottom, use the matrix below to arrive at the functional point and rating of high (H), moderate (M), or low (L) for this function.

A = acreage of vegetated component in the AA. B = structural diversity rating from #13. C = Yes (Y) or No (N) as to whether or not the AA contains a surface or subsurface outlet; P/P = permanent/perennial; S/I = seasonal/intermittent; T/E/A = temporary/ephemeral/absent.

A	<input checked="" type="checkbox"/> Vegetated component >5 acres				<input type="checkbox"/> Vegetated component 1-5 acres				<input type="checkbox"/> Vegetated component <1 acre			
B	<input type="checkbox"/> High		<input checked="" type="checkbox"/> Moderate		<input type="checkbox"/> Low		<input type="checkbox"/> High		<input type="checkbox"/> Moderate		<input type="checkbox"/> Low	
C	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> Y	<input type="checkbox"/> N
P/P	--	--	--	--	--	--	--	--	--	--	--	--
S/I	--	--	.8H	--	--	--	--	--	--	--	--	--
T/E/A	--	--	--	--	--	--	--	--	--	--	--	--

Comments:

14J. GROUNDWATER DISCHARGE/RECHARGE (D/R) (Check the indicators in i & ii below that apply to the AA)

i. **Discharge Indicators**

- Springs are known or observed.
- Vegetation growing during dormant season/drought.
- Wetland occurs at the toe of a natural slopes.
- Seeps are present at the wetland edge.
- AA permanently flooded during drought periods.
- Wetland contains an outlet, but no inlet.
- Other

ii. **Recharge Indicators**

- Permeable substrate presents without underlying impeding layer.
- Wetland contains inlet but not outlet.
- Other

iii. **Rating:** Use the information from 14J(i) and 14J(ii) above and the table below to arrive at the functional point and rating of high (H) or low (L) for this function.

Criteria	Functional Point and Rating
AA has known Discharge/Recharge area or one or more indicators of D/R present	1 (H)
No Discharge/Recharge indicators present	--
Available Discharge/Recharge information inadequate to rate AA D/R potential	--

Comments:

14K. UNIQUENESS

i. **Rating** (Working from top to bottom, use the matrix below to arrive at the functional point and rating of high (H), moderate (M), or low (L) for this function.

Replacement Potential	AA contains fen, bog, warm springs or mature (>80 yr-old) forested wetland or plant association listed as "S1" by the MTNHP.			AA does not contain previously cited rare types and structural diversity (#13) is high or contains plant association listed as "S2" by the MTNHP.			AA does not contain previously cited rare types or associations and structural diversity (#13) is low-moderate.		
Estimated Relative Abundance from #11	<input type="checkbox"/> rare	<input type="checkbox"/> common	<input type="checkbox"/> abundant	<input type="checkbox"/> rare	<input type="checkbox"/> common	<input type="checkbox"/> abundant	<input type="checkbox"/> rare	<input checked="" type="checkbox"/> common	<input type="checkbox"/> abundant
Low disturbance at AA (#12i)	--	--	--	--	--	--	--	.4M	--
Moderate disturbance at AA (#12i)	--	--	--	--	--	--	--	--	--
High disturbance at AA (#12i)	--	--	--	--	--	--	--	--	--

Comments:

14L. RECREATION / EDUCATION POTENTIAL

i. Is the AA a known recreational or educational site? Yes (Rate High (1.0), then proceed to 14L(ii) only] No [Proceed to 14L(iii)]

ii. Check categories that apply to the AA: Educational / scientific study Consumptive rec. Non-consumptive rec. Other

iii. Based on the location, diversity, size, and other site attributes, is there a strong potential for recreational or educational use?

- Yes [Proceed to 14L (ii) and then 14L(iv).]
- No [Rate as low in 14L(iv)]

iv. **Rating** (Use the matrix below to arrive at the functional point and rating of high (H), moderate (M), or low (L) for this function.

Ownership	Disturbance at AA from #12(i)	
	<input checked="" type="checkbox"/> Low	<input type="checkbox"/> Moderate <input type="checkbox"/> High
Public ownership	--	--
Private ownership	.7(M)	--

Comments: As the wetland features expand and develop, this area will provide excellent recreation and education opportunities. .

FUNCTION, VALUE SUMMARY, AND OVERALL RATING

Function and Value Variables	Rating	Actual Functional Points	Possible Functional Points	Functional Units (Actual Points x Estimated AA Acreage)
A. Listed/Proposed T&E Species Habitat	L	0.00	1	
B. MT Natural Heritage Program Species Habitat	M	0.60	1	
C. General Wildlife Habitat	E	1.00	1	
D. General Fish/Aquatic Habitat	NA	0.00	--	
E. Flood Attenuation	M	0.50	1	
F. Short and Long Term Surface Water Storage	M	0.60	1	
G. Sediment/Nutrient/Toxicant Removal	H	0.90	1	
H. Sediment/Shoreline Stabilization	NA	0.00	--	
I. Production Export/Food Chain Support	H	0.80	1	
J. Groundwater Discharge/Recharge	H	1.00	1	
K. Uniqueness	M	0.40	1	
L. Recreation/Education Potential	M	0.70	1	
Totals:		6.5	10.00	
Percent of Total Possible Points:			65% (Actual / Possible) x 100 [rd to nearest whole #]	

<p>Category I Wetland: (Must satisfy one of the following criteria. If not proceed to Category II.)</p> <p><input type="checkbox"/> Score of 1 functional point for Listed/Proposed Threatened or Endangered Species; or</p> <p><input type="checkbox"/> Score of 1 functional point for Uniqueness; or</p> <p><input type="checkbox"/> Score of 1 functional point for Flood Attenuation and answer to Question 14E(ii) is "yes"; or</p> <p><input type="checkbox"/> Percent of total Possible Points is > 80%.</p>
<p>Category II Wetland: (Criteria for Category I not satisfied and meets any one of the following Category II criteria. If not satisfied, proceed to Category IV.)</p> <p><input type="checkbox"/> Score of 1 functional point for Species Rated S1, S2, or S3 by the MT Natural Heritage Program; or</p> <p><input checked="" type="checkbox"/> Score of .9 or 1 functional point for General Wildlife Habitat; or</p> <p><input type="checkbox"/> Score of .9 or 1 functional point for General Fish/Aquatic Habitat; or</p> <p><input type="checkbox"/> "High" to "Exceptional" ratings for both General Wildlife Habitat and General Fish / Aquatic Habitat; or</p> <p><input type="checkbox"/> Score of .9 functional point for Uniqueness; or</p> <p><input type="checkbox"/> Percent of total possible points is > 65%.</p>
<p><input type="checkbox"/> Category III Wetland: (Criteria for Categories I, II, or IV not satisfied.)</p>
<p>Category IV Wetland: (Criteria for Categories I or II are not satisfied and <u>all</u> of the following criteria are met; If not satisfied, proceed to Category III.)</p> <p><input type="checkbox"/> "Low" rating for Uniqueness; and</p> <p><input type="checkbox"/> "Low" rating for Production Export / Food Chain Support; and</p> <p><input type="checkbox"/> Percent of total possible points is < 30%.</p>

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

I **II** **III** **IV**

Appendix C

2007 REPRESENTATIVE PHOTOGRAPHS

*MDT Wetland Mitigation Monitoring
Norem Property
Big Timber, Montana*

Norem Property Wetland Mitigation Site 2007



Location: A **Description:** Transect 1 South end.
Compass Reading: NW



Location: B **Description:** Transect 1 South end.
Compass Reading: SW



Location: C **Description:** Species diversity along
edges of the pond. **Compass Reading:** NW



Location: D **Description:** SW wetland corner
Compass Reading: North



Location: E **Description:** Transect 1 northern end.
Reading: South



Location: F **Description:** Transect 1 northern end.
Upland community type. **Compass Reading:** SW

Norem Property Wetland Mitigation Site 2007



Location: G **Description:** Transect 1 northern end. Pond 4 with woody species. **Compass Reading:** East



Location: H **Description:** Looking across communities 1 and 2 wetlands. **Compass Reading:** SW



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



Location: J **Description:** Buffers between Yellowstone River and wetlands. **Compass Reading:** SW



Location: C -1 **Description:** Willow seedling establishment in saturated soils. **Compass Reading:**

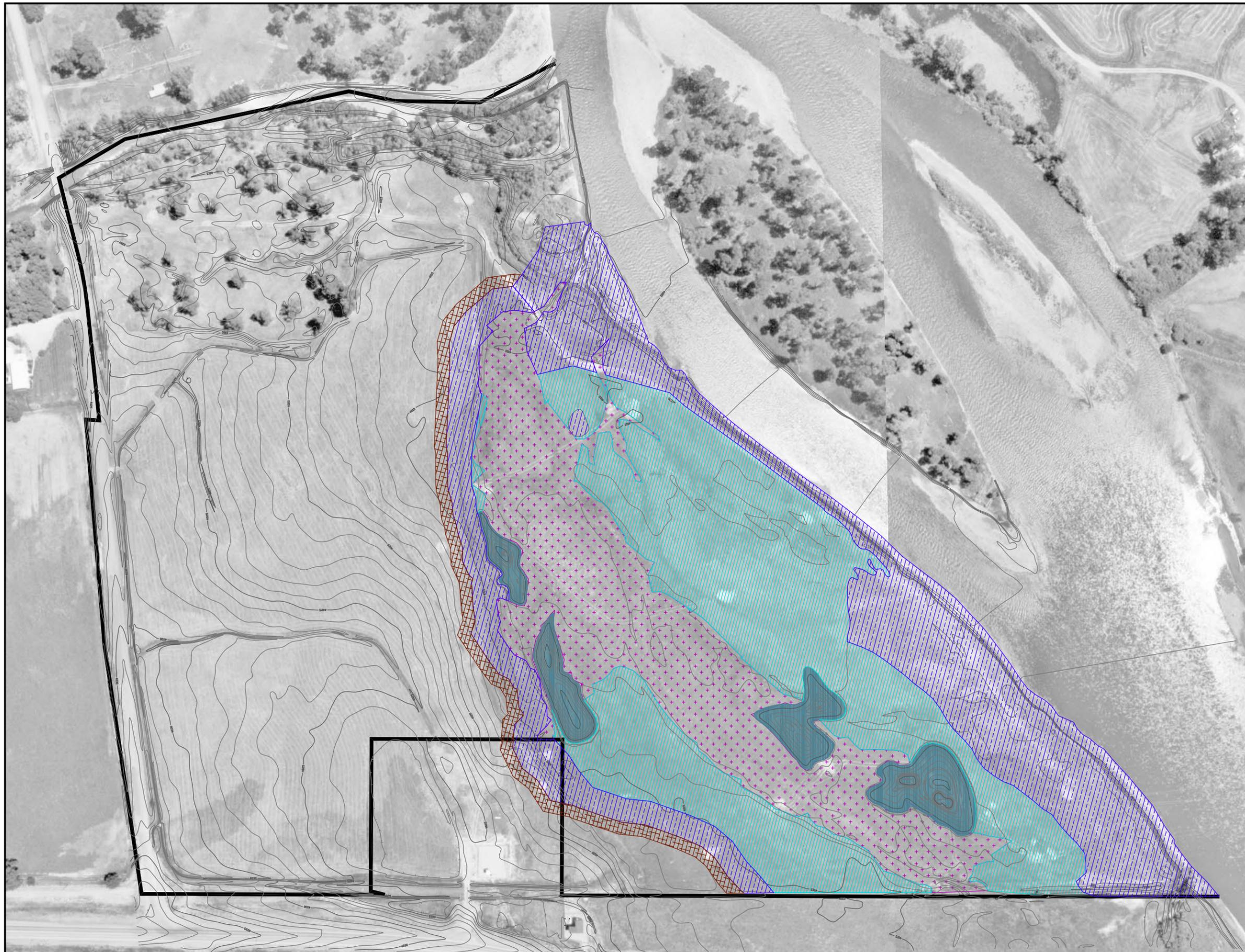


Location: G-1 **Description:** Aquatic vegetation – Alisma sp. colonizing in ponds. **Compass Reading:**

Appendix D

PROPOSED WETLAND MITIGATION SITE MAP (MAXIM TECHNOLOGIES INC.)

*MDT Wetland Mitigation Monitoring
Norem Property
Big Timber, Montana*



-  Existing Wetlands (6.98 acres)
-  Wetland Acres Resulting from Berm Placement (9.46 acres)
-  Created Open Water Wetland Areas (1.58 acres)
-  Buffer Zone (7.99 acres)
-  Low Impact Buffer (0.99 acres)



0 Feet 200

MAXIM 1560117.500

April 2002
Wetland/Buffer Areas
Norem Property
Wetland Reserves Development
Big Timber, Montana
FIGURE 7

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

BIRD SURVEY PROTOCOL (continued)

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 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, some sites continued to be mapped using the Trimble GEO III GPS unit while most 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

2007 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 – 2007**

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

INTRODUCTION

Aquatic invertebrate assemblages were collected at a number of mitigated wetlands throughout Montana. This report summarizes data generated from seven years of collection. Over all years of sampling, a total of 182 invertebrate samples were collected. Table 1 lists the currently monitored sites at which aquatic invertebrates were collected in 2007, 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 and 2007 by personnel of PBS&J. Sampling procedures utilized were based on the protocols developed by the Montana Department of Environmental Quality (MT DEQ) 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.

Quality assurance systems

Quality control procedures for initial sample processing and subsampling involved checking sorting efficiency. These checks were conducted on 96% of the samples by independent observers who microscopically re-examined 20% of sorted substrate from each sample. All organisms that were missed were counted and this number was added to the total number obtained in the original sort. Sorting efficiency was evaluated by applying the following calculation:

$$SE = \frac{n_1}{n_{1+2}} \times 100$$

where: SE is the sorting efficiency, expressed as a percentage, n_1 is the total number of specimens in the first sort, and n_{1+2} is the total number of specimens in the first and second sorts combined.

Quality control procedures for taxonomic determinations of invertebrates involved checking accuracy, precision and enumeration. At least 10% of samples are targeted for quality assurance procedures. For this project, three samples were randomly selected and all organisms re-identified and counted by an independent taxonomist. Taxa lists and enumerations were compared by calculating a Bray-Curtis similarity statistic (Bray and Curtis 1957) for each

selected sample. Routinely, discrepancies between the original identifications and the QC identifications are discussed among the taxonomists, and necessary rectifications to the data are made. Discrepancies that cannot be rectified by discussions are routinely sent out to taxonomic specialists for identification. However, taxonomic certainty for identifications in this project was high, and no external verifications were necessary.

Assessment

The method employed to assess these wetlands is based on an index incorporating a battery of 12 bioassessment metrics or attributes (Table 1) tested and recommended by Stribling et al. (1995) in a report to the Montana Department of Health and Environmental Science. In that study, it was determined that some of the metrics were of limited use in some geographic regions, and for some wetland types. Despite that finding, all 12 metrics are used in this evaluation of mitigated wetlands, since detailed geographic information and wetland classifications were unavailable. Scoring criteria for 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, “optimal” scores were generally those that fell above the 75th percentile (for those metrics that decrease in value in response to stress) or below the 25th percentile (for metrics that respond to stress by an increase in value) of all scores. Additional scoring ranges were established by bisecting the range below the 75th percentile for decreasing scores (or above the 25th percentile for increasing scores) into “sub-optimal” and “poor” assessment categories. A score of 5, 3, or 1 was assigned to optimal, sub-optimal, and poor metric performance, respectively. In this way, metric values were translated into normalized metric scores, and scores for all metrics were summed to produce a total bioassessment score, 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.

Several 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 2007, the lotic sites were Camp Creek (2 sites), Cloud Ranch stream, Kleinschmidt stream, Jack Creek, and Woodson Creek-Ringling stream. 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 (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 (the Hilsenhoff Biotic Index and %Dominant taxon) were included in the bioassessment battery. The HBI indicates the overall invertebrate assemblage tolerance to nutrient enrichment, warm water, and/or low dissolved oxygen conditions. The percent abundance of the dominant taxon has been demonstrated to be strongly associated with pH, conductance, salinity, total organic carbon, and total dissolved solids.

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

Summary metric values and scores for the 2007 samples are given in Tables 4a-4c and 5.

In 2007, thermal preference of the invertebrate assemblages was calculated when possible, using the tool developed by 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 Arctopsyche 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 monitored in 2007 are included. An asterisk (*) indicates lotic sites.

Site Identifier	2001	2002	2003	2004	2005	2006	2007
Roundup	+	+	+	+	+	+	+
Ridgeway	+	+	+	+	+	+	+
Hoskins Landing MS-1		+	+	+	+		+
Hoskins Landing MS-2							+
Peterson Ranch pond 1		+	+	+	+	+	+
Peterson Ranch pond 2		+		+	+	+	+
Peterson Ranch pond 4		+	+	+	+	+	+
Peterson Ranch pond 5		+	+	+	+	+	+
Camp Creek MS-1*		+	+	+	+	+	+
Camp Creek MS-2*						+	+
Kleinschmidt		+	+	+	+	+	+
Kleinschmidt – stream*			+	+	+	+	+
Cloud Ranch Pond				+	+		+
Cloud Ranch Stream*				+			+
Jack Creek – pond				+	+		+
Jack Creek – McKee*							+
Norem				+	+	+	+
Rock Creek Ranch					+	+	+
Wagner Marsh					+	+	+
Alkali Lake 1						+	+
Charley Creek							+
Woodson pond MI 1							+
Woodson stream MI 2*							+
Little Muddy Creek							+
Selkirk Ranch							+
DH Ranch							+

Table 2. Aquatic invertebrate metrics employed for wetland (lentic) invertebrate assemblages in the MDT mitigated wetlands study, 2001 – 2007.

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
Orthoclaadiinae / Chironomidae	Number of individual midges in the sub-family Orthoclaadiinae / 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 section of individual project monitoring reports. Summary tables for lentic (4a – 4c) and lotic (5) sites and project specific taxa listings and metrics reports are provided on the following pages.)

Quality Assurance

Table 3 gives the results of quality assurance procedures for sample sorting efficiency (SE) and Bray-Curtis similarity statistics for comparisons of taxonomic determinations and enumeration. Sorting efficiency averaged 97.54% for the project, and taxonomic similarity averaged 97.44%.

Table 3. Results of quality control procedures for subsampling and taxonomic and enumeration similarity.

Site name	SE	Bray-Curtis similarity
Roundup	100.00%	
Ridgeway	100.00%	
Hoskins Landing MS-1	100.00%	
Hoskins Landing MS-2	93.40%	
Peterson Ranch pond 1	100.0%	95.38%
Peterson Ranch pond 2	96.64%	
Peterson Ranch pond 4	91.66%	
Peterson Ranch pond 5	96.64%	
Camp Creek MS-1	100.00%	
Camp Creek MS-2	100.00%	96.94%
Kleinschmidt – pond	100.00%	
Kleinschmidt – stream	99.10%	
Cloud Ranch Pond	95.65%	
Cloud Ranch Stream	91.61%	
Jack Creek – pond	n.a.	
Jack Creek - McKee	96.49%	
Norem	100.00%	100.00%
Rock Creek Ranch	100.00%	
Wagner Marsh	100.00%	
Alkali Lake 1	98.04%	
Charley Creek	100.00%	
Woodson pond	91.37%	
Woodson stream	100.00%	
Little Muddy Creek	92.31%	
Selkirk Ranch	95.56%	
DH Ranch	100.00%	

Table 4a. Metric values and scores for wetland (lentic) sites in the MDT mitigated wetland study – 2007 sampling.

	ROUNDUP	RIDGEWAY	HOSKINS LANDING MS-1	HOSKINS LANDING MS-2	PETERSON RANCH 1	PETERSON RANCH 2	PETERSON RANCH 4	PETERSON RANCH 5
Total taxa	7	13	18	21	17	18	26	18
POET	0	2	3	5	2	0	6	4
Chironomidae taxa	5	5	2	8	8	12	12	6
Crustacea + Mollusca	1	2	5	4	4	5	4	4
% Chironomidae	7.62%	30.00%	18.75%	52.68%	36.45%	51.79%	42.59%	14.78%
Orthoclaadiinae/Chir	0.38	0.17	0.00	0.03	0.08	0.16	0.09	0.12
% Amphipoda	0.00%	10.00%	0.00%	0.00%	0.93%	0.00%	21.30%	1.74%
% Crustacea + % Mollusca	89.52%	15.00%	26.79%	8.04%	10.28%	43.75%	28.70%	37.39%
HBI	8.02	7.11	7.23	6.55	7.42	7.76	6.53	7.23
% Dominant taxon	89.52%	30.00%	17.86%	35.71%	39.25%	23.21%	17.59%	30.43%
% Collector-Gatherers	92.38%	70.00%	78.57%	82.14%	49.53%	71.43%	38.89%	26.96%
% Filterers	0.00%	0.00%	0.89%	6.25%	9.35%	3.57%	1.85%	5.22%
Total taxa	1	1	3	5	3	3	5	3
POET	1	1	3	5	1	1	5	5
Chironomidae taxa	3	3	1	5	5	5	3	3
Crustacea + Mollusca	1	1	3	3	3	3	1	3
% Chironomidae	5	3	3	1	3	1	1	5
Orthoclaadiinae/Chir	3	1	1	1	1	1	3	1
% Amphipoda	5	3	5	5	5	5	5	5
% Crustacea + % Mollusca	1	5	5	5	5	3	5	3
HBI	1	3	3	5	3	1	5	3
% Dominant taxon	1	5	5	3	3	5	1	5
% Collector-Gatherers	5	3	3	5	3	3	3	1
% Filterers	3	3	3	1	1	3	5	3
Total score	30	32	38	44	36	34	42	40
Percent of maximum score	50.00%	53.33%	63.33%	73.33%	60.00%	56.67%	70.00%	66.67%
Impairment classification	poor	sub-optimal	optimal	optimal	sub-optimal	sub-optimal	optimal	optimal

Table 4b. Metric values and scores for wetland (lentic) sites in the MDT mitigated wetland study – 2007 sampling.

	KLEIN-SCHMIDT POND	CLOUD RANCH POND	JACK CREEK POND	NOREM	ROCK CREEK RANCH	WAGNER MARSH	ALKALI LAKE 1	CHARLEY CREEK
Total taxa	25	13	9	6	18	11	9	13
POET	5	2	0	1	2	2	0	0
Chironomidae taxa	8	11	5	2	4	4	2	3
Crustacea + Mollusca	8	1	4	1	4	0	2	3
% Chironomidae	18.63%	81.54%	92.79%	31.58%	4.76%	11.39%	1.96%	27.17%
Orthoclaadiinae/Chir	0.53	0.38	0.03	0.00	0.60	0.44	0.50	0.68
% Amphipoda	10.78%	3.08%	0.00%	0.00%	17.14%	0.00%	0.00%	22.83%
% Crustacea + % Mollusca	36.27%	3.08%	7.21%	21.05%	23.81%	0.00%	61.76%	53.26%
HBI	7.35	7.22	9.73	6.63	6.33	7.28	8.07	6.88
% Dominant taxon	13.73%	18.46%	62.16%	26.32%	29.52%	45.57%	60.78%	29.35%
% Collector-Gatherers	53.92%	84.62%	70.27%	57.89%	29.52%	15.19%	70.59%	32.61%
% Filterers	11.76%	9.23%	0.90%	0.00%	0.95%	0.00%	0.00%	0.00%
Total taxa	5	1	1	1	3	1	1	1
POET	5	1	1	1	1	1	1	1
Chironomidae taxa	5	5	3	1	3	3	1	3
Crustacea + Mollusca	5	1	3	1	3	1	1	1
% Chironomidae	3	1	1	3	5	5	5	3
Orthoclaadiinae/Chir	5	3	1	1	5	3	5	5
% Amphipoda	3	5	5	5	3	5	5	3
% Crustacea + % Mollusca	3	5	5	5	5	5	3	3
HBI	3	3	1	5	5	3	1	5
% Dominant taxon	5	5	1	5	5	3	1	5
% Collector-Gatherers	3	5	3	3	1	1	3	1
% Filterers	1	1	3	3	3	3	3	3
Total score	46	36	28	34	42	34	30	34
Percent of maximum score	76.67%	60.00%	46.67%	56.67%	70.00%	56.67%	50.00%	56.67%
Impairment classification	optimal	sub-optimal	poor	sub-optimal	poor	sub-optimal	poor	sub-optimal

Table 4c. Metric values and scores for wetland (lentic) sites in the MDT mitigated wetland study – 2007 sampling.

	WOODSON POND	LITTLE MUDDY CREEK	SELKIRK RANCH	DH RANCH
Total taxa	12	2	16	8
POET	0	0	2	1
Chironomidae taxa	9	0	8	4
Crustacea + Mollusca	1	1	2	2
% Chironomidae	85.71%	0.00%	77.27%	27.50%
Orthoclaadiinae/Chir	0.32	0.00	0.61	0.00
% Amphipoda	0.00%	0.00%	0.00%	0.00%
%Crustacea + %Mollusca	2.86%	75.00%	8.18%	64.17%
HBI	9.34	8.50	7.82	7.38
%Dominant taxon	33.33%	75.00%	46.36%	39.17%
%Collector-Gatherers	55.24%	75.00%	32.73%	27.50%
%Filterers	0.00%	0.00%	8.18%	17.50%
Total taxa	1	1	3	1
POET	1	1	1	1
Chironomidae taxa	5	1	5	3
Crustacea + Mollusca	1	1	1	1
% Chironomidae	1	5	1	3
Orthoclaadiinae/Chir	3	1	5	1
% Amphipoda	5	5	5	5
%Crustacea + %Mollusca	5	1	5	1
HBI	1	1	1	3
%Dominant taxon	5	1	3	3
%Collector-Gatherers	3	3	1	1
%Filterers	3	3	1	1
Total score	34	24	32	24
Percent of maximum score	56.67%	40.00%	53.33%	40.00%
Impairment classification	sub-optimal	poor	sub-optimal	poor

Table 5. Metric values and scores for stream (lotic) sites in the MDT mitigated wetland study – 2007 sampling.

	CAMP CREEK MS-1	CAMP CREEK MS-2	KLEIN- SCHMIDT STREAM	CLOUD RANCH STREAM	JACK CREEK - MCKEE	WOODSON STREAM
E Richness	6	6	0	2	1	1
P Richness	0	0	0	2	0	0
T Richness	4	6	2	4	4	0
Pollution Sensitive Richness	3	4	0	1	0	0
Filterer Percent	4.85%	5.56%	7.14%	3.57%	2.83%	16.67%
Pollution Tolerant Percent	32.04%	34.26%	9.82%	14.29%	58.49%	8.33%
E Richness	3	3	0	1	0	0
P Richness	0	0	0	2	0	0
T Richness	2	3	1	2	2	0
Pollution Sensitive Richness	2	3	0	1	0	0
Filterer Percent	3	2	2	3	3	1
Pollution Tolerant Percent	1	1	2	1	0	2
Total score	11	12	5	10	5	3
Percent of maximum score	61.11%	66.67%	27.78%	55.56%	27.78%	16.67%
Impairment classification	slight	slight	moderate	slight	moderate	severe

LITERATURE CITED

- Bollman, W. 1998. Montana Valleys and Foothill Prairies Ecoregion. Master's Thesis. (M.S.) University of Montana. Missoula, Montana.
- Brandt, D. 2001. Temperature Preferences and Tolerances for 137 Common Idaho Macroinvertebrate Taxa. Report to the Idaho Department of Environmental Quality, Coeur d' Alene, Idaho.
- Bray, J. R. and J. T. Curtis. 1957. An ordination of upland forest communities of southern Wisconsin. Ecological Monographs 27: 325-349.
- Caton, L. W. 1991. Improving subsampling methods for the EPA's "Rapid Bioassessment" benthic protocols. Bulletin of the North American Benthological Society. 8(3): 317-319.
- Stribling, J.B., J. Lathrop-Davis, M.T. Barbour, J.S. White, and E.W. Leppo. 1995. Evaluation of environmental indicators for the wetlands of Montana: the multimetric approach using benthic macroinvertebrates. Report to the Montana Department of Health and Environmental Science. Helena, Montana.

Taxa Listing

Project ID: MDT07PBSJ
RAI No.: MDT07PBSJ010

RAI No.: MDT07PBSJ010

Sta. Name: Norem Ranch

Client ID:

Date Coll.: 7/24/2007

No. Jars: 1

STORET ID:

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Non-Insect							
Lymnaeidae							
Lymnaeidae	4	21.05%	Yes	Immature		6	SC
Ephemeroptera							
Caenidae							
<i>Caenis</i> sp.	5	26.32%	Yes	Larva		7	CG
Coleoptera							
Halplidae							
<i>Halplus</i> sp.	3	15.79%	Yes	Larva		5	PH
Diptera							
Ceratopogonidae							
Ceratopogoninae	1	5.26%	Yes	Larva		6	PR
Chironomidae							
Chironomidae							
<i>Dicrotendipes</i> sp.	5	26.32%	Yes	Larva		8	CG
<i>Paratanytarsus</i> sp.	1	5.26%	Yes	Larva		6	CG
Sample Count	19						

Metrics Report

Project ID: MDT07PBSJ
 RAI No.: MDT07PBSJ010
 Sta. Name: Norem Ranch
 Client ID:
 STORET ID:
 Coll. Date: 7/24/2007

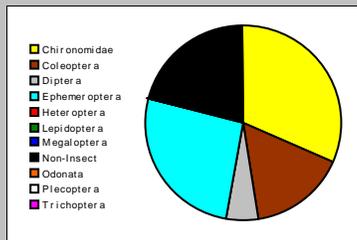
Abundance Measures

Sample Count: 19
 Sample Abundance: 19.00 100.00% of sample used

Coll. Procedure:
 Sample Notes:

Taxonomic Composition

Category	R	A	PRA
Non-Insect	1	4	21.05%
Odonata			
Ephemeroptera	1	5	26.32%
Plecoptera			
Heteroptera			
Megaloptera			
Trichoptera			
Lepidoptera			
Coleoptera	1	3	15.79%
Diptera	1	1	5.26%
Chironomidae	2	6	31.58%

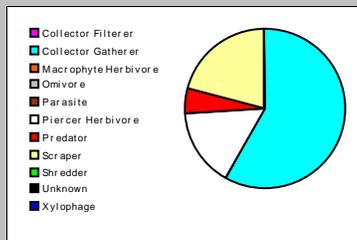


Dominant Taxa

Category	A	PRA
Dicrentidipes	5	26.32%
Caenis	5	26.32%
Lymnaeidae	4	21.05%
Haliphus	3	15.79%
Paratanytarsus	1	5.26%
Ceratopogoninae	1	5.26%

Functional Composition

Category	R	A	PRA
Predator	1	1	5.26%
Parasite			
Collector Gatherer	3	11	57.89%
Collector Filterer			
Macrophyte Herbivore			
Piercer Herbivore	1	3	15.79%
Xylophage			
Scraper	1	4	21.05%
Shredder			
Omnivore			
Unknown			

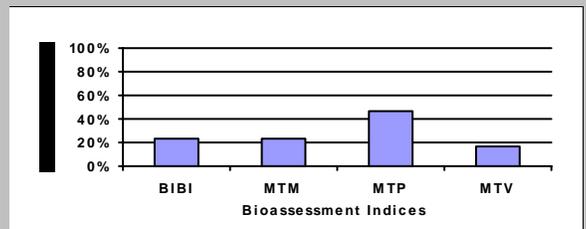


Metric Values and Scores

Metric	Value	BIBI	MTP	MTV	MTM
<i>Composition</i>					
Taxa Richness	6	1	0		0
Non-Insect Percent	21.05%				
E Richness	1	1		0	
P Richness	0	1		0	
T Richness	0	1		0	
EPT Richness	1		0		0
EPT Percent	26.32%		1		0
Oligochaeta+Hirudinea Percent					
Baetidae/Ephemeroptera	0.000				
Hydropsychidae/Trichoptera	0.000				
<i>Dominance</i>					
Dominant Taxon Percent	26.32%		3		2
Dominant Taxa (2) Percent	52.63%				
Dominant Taxa (3) Percent	73.68%	3			
Dominant Taxa (10) Percent	100.00%				
<i>Diversity</i>					
Shannon H (log _e)	1.632				
Shannon H (log ₂)	2.355		1		
Margalef D	1.698				
Simpson D	0.170				
Evenness	0.177				
<i>Function</i>					
Predator Richness	1		0		
Predator Percent	5.26%	1			
Filterer Richness	0				
Filterer Percent	0.00%			3	
Collector Percent	57.89%		3		3
Scraper+Shredder Percent	21.05%		2		0
Scraper/Filterer	0.000				
Scraper/Scraper+Filterer	0.000				
<i>Habit</i>					
Burrower Richness	2				
Burrower Percent	31.58%				
Swimmer Richness	1				
Swimmer Percent	15.79%				
Clinger Richness	0	1			
Clinger Percent	0.00%				
<i>Characteristics</i>					
Cold Stenotherm Richness	0				
Cold Stenotherm Percent	0.00%				
Hemoglobin Bearer Richness	1				
Hemoglobin Bearer Percent	26.32%				
Air Breather Richness	0				
Air Breather Percent	0.00%				
<i>Voltinism</i>					
Univoltine Richness	3				
Semivoltine Richness	1	1			
Multivoltine Percent	31.58%		3		
<i>Tolerance</i>					
Sediment Tolerant Richness	1				
Sediment Tolerant Percent	21.05%				
Sediment Sensitive Richness	0				
Sediment Sensitive Percent	0.00%				
Metals Tolerance Index	3.625				
Pollution Sensitive Richness	0	1			0
Pollution Tolerant Percent	89.47%	1			0
Hilsenhoff Biotic Index	6.632		1		0
Intolerant Percent	0.00%				
Supertolerant Percent	26.32%				
CTQa	93.000				

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	12	24.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	14	46.67%	Moderate
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	3	16.67%	Severe
MTM	Montana DEQ Mountains (Bukantis 1998)	5	23.81%	Moderate



Appendix G

NOREM PROPERTY WETLAND CREDIT ASSESSMENT LETTER (COE 2002)

*MDT Wetland Mitigation Monitoring
Norem Property
Big Timber, Montana*

RECEIVED

AUG 06 2002

U.S. ARMY CORPS OF ENGINEERS

HELENA REGULATORY OFFICE

10 WEST 15TH STREET, SUITE 2200

HELENA, MONTANA 59626

MASTER FILE
COPY



ENVIRONMENTAL

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

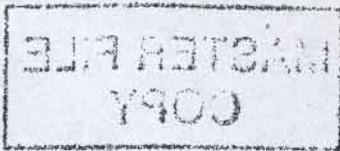
Dear Mr. Norem:

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



-2-

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
Montana Program Manager

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