MONTANA DEPARTMENT OF TRANSPORTATION
WETLAND MITIGATION MONITORING REPORT: YEAR 2004

Norem Property
Big Timber, Montana

Prepared for:

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

Prepared by:

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

June 2005

Project No: B43054.00 - 0508

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1.0 INTRODUCTION

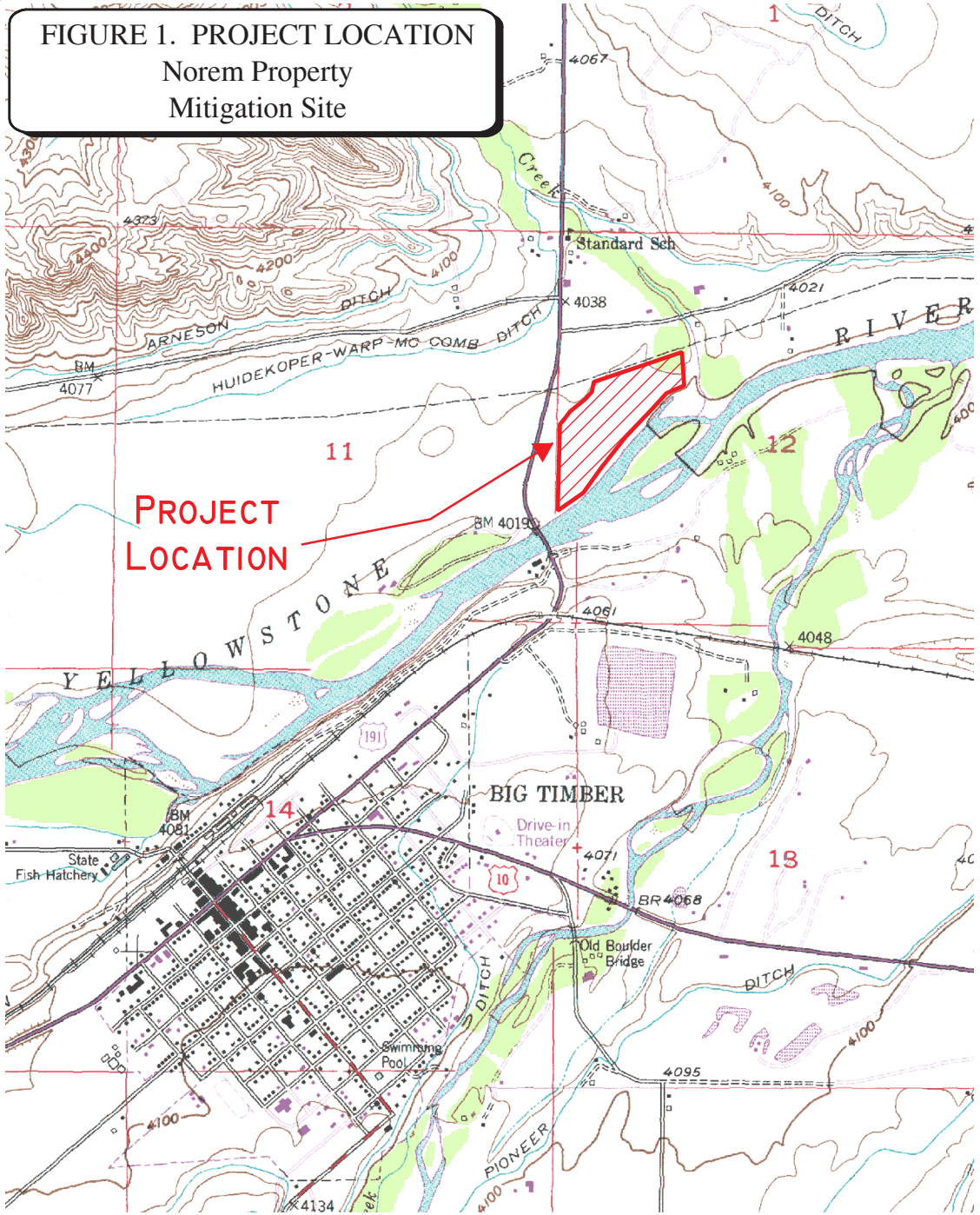
This report summarizes the methods and results of the first year of monitoring at the Norem Wetland project site. This project was constructed in the fall of 2002 by the landowner and Maxim Technologies, Inc. (Maxim) to provide the Montana Department of Transportation (MDT) with wetland mitigation credits 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 Sweetgrass County approximately two miles northeast of Big Timber, MT, in Section 12, Township 1 North, Range 14 East **(Figure 1)**. Elevations within the assessment area range from approximately 4,000 to 4,018 feet above sea level. The Yellowstone River borders the southern project boundary and to the east is it bounded by Big Timber Creek. Fenced pastures delineate the western and northern project boundaries. The surrounding land uses include pastures, hay production and residential areas.

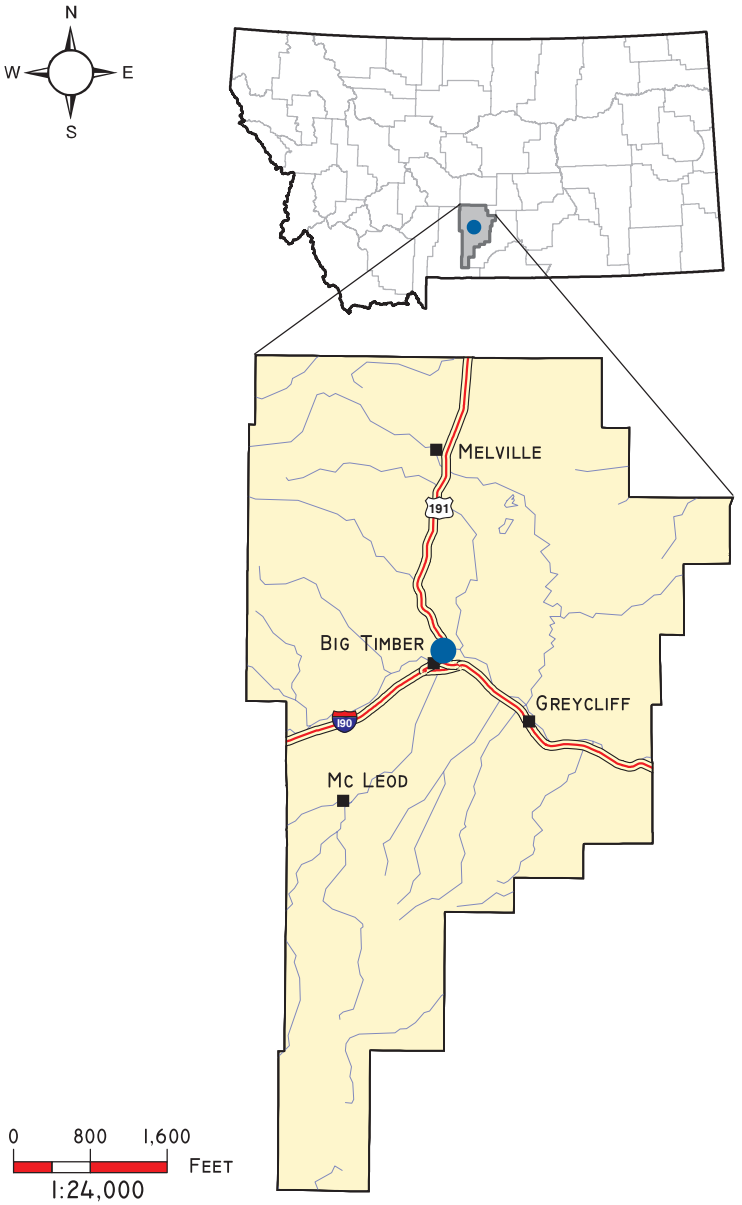
The project was intended to develop approximately 14.71 acres of wetland credit within a 26.88-acre conservation easement on property owned by Mark Norem. The site boundary is illustrated on **Figure 2** (**Appendix A**) and the original conceptual layout is provided in **Appendix D.** The overall wetland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

Approximately 6.98 acres of pre-existing wetlands were delineated on the Norem property by Maxim Technologies, Inc. in 2001. The Corps of Engineers (COE) has approved allocation of 2.32 credit acres (3:1 ratio) for the enhancement of these existing wetlands. Enhancement is being achieved by several methods including: the removal of high impact grazing; the addition and subsequent maturation of herbaceous and woody plants to increase species diversity; and by increasing the depth and period of inundation. An additional 1.50 acres of credit was approved by the COE (2002) for dedication and 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 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 shallow open water ponds have standing water with depths ranging from 12 inches to 3 feet. 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

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2.0 METHODS

2.1 Monitoring Dates and Activities

The site was visited during 2004 on May 27 for spring avian migration use, and on August 13 to collect the primary wetland monitoring form data **(Appendix B)**. The primary monitoring area and monitoring activity locations are shown on **Figure 2**, **Appendix B**. Per MDT instruction (Urban, pers. comm.), monitoring activities were not conducted in minor upland buffer areas east / southeast of the berm / northeast access road, but were restricted to the main body and proposed wetland enhancement and creation areas of the wetland mitigation site. 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).

The site was also visited independently in September 2004 by the design firm, Maxim Technologies, Inc., to obtain initial monitoring data for the wetland project. Maxim's report, entitled *2004 Wetland Monitoring Report – Mark Norem Wetland Reserve,* includes vegetation sample plot, piezometer reading, and pond water level data. A copy of this report is included in **Appendix D.**

2.2 Hydrology

Wetland hydrology indicators were recorded using procedures outlined in the COE 1987 Wetland Delineation Manual (Environmental Laboratory 1987). Hydrology data were recorded on a COE Routine Wetland Delineation Data Form **(Appendix B)** at each wetland determination point. Precipitation data for the year 2004 were compared to the 1894-2003 average (WRCC 2005).

All additional hydrologic data were recorded on the mitigation site monitoring form **(Appendix B)**. The boundary between emergent vegetation and open water was mapped on the aerial photograph **(Figure 3, Appendix A)**. In September 2004, depths to water in 12 piezometers on the site were recorded by Maxim. Future monitoring of groundwater depths will be conducted by the USGS (Urban, pers. comm.), as well as Maxim..

2.3 Vegetation

General vegetation types were delineated on the aerial photograph during the August site visit (**Figure 3, Appendix A)**. Coverage of the dominant species in each community type is listed on the monitoring form **(Appendix B)**. A comprehensive plant species list for the entire site was compiled and 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 location is shown on **Figure 2, Appendix A**. Percent cover for each species was recorded on the vegetation transect form **(Appendix B)**. The transect will be 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 the GPS unit. Photos of each transect end were taken during the August 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, 1993). The wetland/upland and open water boundaries were 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) and is included in **Appendix D**.

2.6 Mammals, Reptiles, and Amphibians

Mammal, reptile, and amphibian species observations were recorded on the wetland monitoring form during each visit **(Appendix B)**. Indirect use indicators were also recorded including tracks, scat and burrows. A comprehensive wildlife species list for the entire site was compiled and will be updated as new species are encountered. Observations from past years will be compared with new data to determine if wildlife use is changing over time.

2.7 Birds

Bird observations were recorded during the site visit according to the established bird survey protocol **(Appendix E).** A general, qualitative bird list has been compiled using these observations. Observations will be compared between years in future studies.

2.8 Macroinvertebrates

One macroinvertebrate composite sample was collected during the site visit following the protocol **(Appendix F)**; a sample was collected from each impoundment and mixed. Samples were preserved as outlined in the sampling procedure and sent to Rhithron Associates for analysis. The approximate sampling locations are indicated on **Figure 2, Appendix A**. Results are included in **Appendix F**.

2.9 Functional Assessment

A functional assessment form was completed for the site using the 1999 MDT Montana Wetland Assessment Method. 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, the results of which are included in **Table 4**.

2.10 Photographs

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

During the 2004 monitoring season, each photograph point was marked on the field map and the location recorded with a resource grade GPS. The approximate locations are shown on **Figure 2, Appendix A**. All photographs were taken using a digital camera.

2.11 GPS Data

During the 2004 monitoring season survey points were collected using a resource grade Trimble Geoexplorer III hand-held GPS unit **(Appendix E)**. Points collected included: the beginning and end locations of the vegetation transects, the jurisdictional wetland boundary, and the sample point (SP) locations. In addition, GPS data were collected for four landmarks recognizable on the air photo for purposes of line fitting to the topography.

2.12 Maintenance Needs

The condition of the outflow structures and potential problematic areas (erosive, barren or weedy areas) were evaluated. Minor maintenance needs and recommendations are presented in **Section 3.9**. 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 August 13, 2004 monitoring visit, approximately 25% of the assessment area was inundated with several inches of standing water. Ponds 3 and 4 were close to full-pond level, while ponds 1 and 2 were approximately 6 to 12 inches below normal pond level as indicated by saturated mud flats and water marks on the islands. Areas without emergent vegetation are included in the open water pond delineation and are depicted on **Figure 3, Appendix A**.

According to the Western Regional Climate Center (WRCC, 2005), the Big Timber station annual mean (1894-2003) precipitation was 16.63 inches; the average precipitation through the month of August was 11.62 inches. For 2004, precipitation through August was 8.47 inches or 51% of the mean. In June 2004, observations from the landowner indicated that the Yellowstone River raised moderately, allowing all ponds to fill, and excess water covered the lower boards of the control structure. Essentially no irrigation return flows have occurred to date, as Big Timber Creek has had very little runoff due to historically low snowpack and an excessive dry period which continued from winter through the balance of spring.

Piezometer data are presented in Maxim's monitoring report in **Appendix D**. Water level depths below ground surface ranged between 1.3 and 6.5 feet.

3.2 Vegetation

Vegetation species identified on the site are presented in **Table 1** and in the monitoring form **(Appendix B)**. Wetland vegetation types include: Type 1, *Carex utriculata/C. nebrascensis;* Type 2, *Agrostis alba/Carex sp. /Juncus balticus*; Type 3, *Agropyron smithii*/*Bromus inermis;* Type 4, *Populus trichocarpa/Melitous sp. /Agropyron repens* and, Type 5, *Typha latifolia*. 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) to areas with saturated soils. Other common species include water sedge (*Carex 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 dominant this wetland area. Large, irregular scattered patches of Baltic rush (*Juncus balticus)* occupy portions of this community type. Type 3 occurs in the uplands and consists primarily of western wheatgrass (*Agropyron smithii)* and*/ or smooth brome (Bromus inermis).* Other common species include Kentucky bluegrass (*Poa pratensis)* and meadow fescue (*Festuca pratensis).* Species such as redtop (*Agrostis alba), Juncus balticus* and silverweed (*Potentilla anserine)* were noted along the wetter margins between community types 3 and 2. Type 4 is also an upland community on the upland bench north of the Yellowstone River. Black cottonwood (*Populus trichocarpa)* plants were observed within this community and ranged from 6 inches to 3 feet in height. Sandbar willow seedlings were also observed (volunteers). Yellow and white sweet clover (*Melilotus officinalis* and *Melilotus alba,* respectfully) were common species mixed with *Agrostis alba*. 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 (*Carex utriculata).*

Woody species transplanted around the pond perimeter include primarily sandbar willow (*Salix exigua*), red-osier dogwood (*Cornus stolonifera*), hawthorne (*Crateagus douglasii*) and cottonwood. Other willow species were observed. The willows and dogwoods were transplanted as rooted cuttings in the spring of 2003. Black cottonwood and hawthorne 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 project boundary which will likely develop into riparian corridor. There are approximately 24 known species of wetland plants with a FACW to OBL status within the assessment area.

Overall the planted woody species survival ranged from 60 to 80 percent across the project site. The survival around Ponds 1 and 2 was slightly lower (60 to 69 percent) compared to Ponds 3 and 4 which ranged from 77 to 80 percent survival. Red-osier and willow species were particularly robust and vigorous across the project site. **Appendix B** (page 5) provides details related to the species and quantities planted around each pond.

The vegetation transect results are detailed in the monitoring form **(Appendix B)** and are summarized in **Table 2** and **Chart 1**. The transect is located in the western half of the project site and runs from south to northwest.

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 whitetop (*Cardaria draba*). Leafy spurge, whitetop and spotted knapweed were noted closer to the banks along the Yellowstone River. Canada thistle occurs in random patches scattered throughout the upland and wetland edges. Canada thistle plants were also noted on the island within Pond 1. Locations of the weeds were not mapped or surveyed, as the infestations are minor and do not constitute discreet vegetation communities. Weed control measures have been implemented by the landowner and include herbicide applications as well as mechanical control methods. It is recommended that weed control measures be continued to prevent further spread of these weeds. The Sweetgrass weed supervisor (Stacy Barta) can be contacted for a site specific weed plan with selected herbicides that will not harm woody species, amphibians, etc.

Table 1: ***2004 Norem Property vegetation species list.***

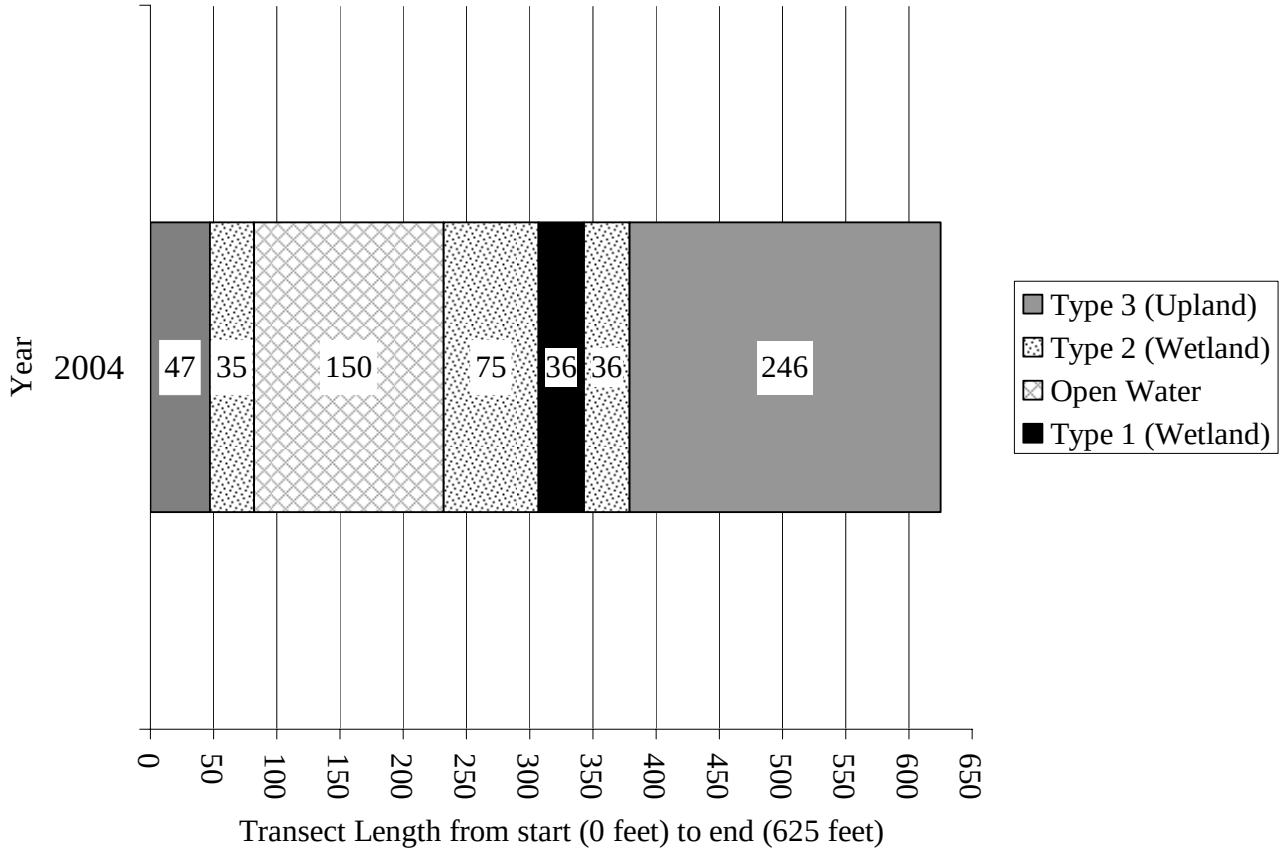
Scientific Name	Region 9 (Northwest) Wetland Indicator Status [1]
Agropyron dasytachyum	UPL
Agropyron smithii	FACU
Agropyron repens	FAC-
Agrostis alba	FAC*
Alopecurus pratensis	FACW
Bromus inermis	**(UPL)**
Bromus tectorum	UPL
Cardaria draba	UPL
Carex aquatilis	OBL
Carex arcta	OBL
Carex lanuginose	OBL
Carex nebrascensis	OBL
Carex utriculuta	OBL
Centaurea maculosa	**(UPL)**
Cirsium arvense	FACU+
Cornus stolonifera	FACW
Crateagus douglasii	FAC
Crepis acuminate	**(FACU)**
Deschampsia cespitosa	FACW
Eleocharis palustris	FACW+
Equisetum arvense	FAC
Euphorbia esula	**(UPL)**
Festuca pratensis	FACU+
Glyceria grandis	OBL
Juncus balticus	FACW+
Juncus longistylis	FACW
Lithosperum arvense	**(FAC)**
Melilotus alba	FACU
Melilotus officinalis	FACU
Mentha arvense	FACW-
Phalaris arundinacea	FACW
Phleum pretense	FAC-
Poa pratensis	FAC
Polygonum punctatum	OBL
Populus trichocarpa	FAC
Potentilla anserine	OBL
Rumex crispus	FACW
Salix alba(lutea)	FACW/OBL
Salix exigua	OBL
Scirpus pungens	OBL
Scirpus acutus	OBL
Spartana pectinata	OBL
Solidago occidentalis	FACW
Thlaspi arvense	**(UPL)**
Tragopogon dubius	UPL
Typha latifolia	OBL

[1] **Bolded** status indicate species either not included or classified as "non-indicator" in the *National List of Plant Species that Occur in Wetlands: Northwest (Region 9)* (Reed 1988); status in parentheses are probable and based on biologist's experience.

Table 2: 2004 *Transect 1 data summary.*

Monitoring Year	2004
Transect Length (feet)	625
# Vegetation Community Transitions along Transect	4
# Vegetation Communities along Transect	6
# Hydrophytic Vegetation Communities along Transect	2
Total Vegetative Species	46
Total Hydrophytic Species	29
Total Upland Species	17
Estimated % Total Vegetative Cover	85
% Transect Length Comprised of Hydrophytic Vegetation Communities	29
% Transect Length Comprised of Upland Vegetation Communities	47
% Transect Length Comprised of Unvegetated Open Water	24
% Transect Length Comprised of Bare Substrate	0

Chart 1: ***Transect map showing vegetation types from start of transect (0 feet) to end of transect (625 feet) for 2004.***



3.3 Soils

The site was mapped as part of the Sweetgrass County Soil Survey (USDA 2001). Three soil mapping units are found 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 is 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. At SP-1, soils were a dark grayish brown (10YR 4/2) from 0-12 inches with yellowish red (10YR 4/6) mottles from 3 to 12 inches. The soil texture in the upper 3 inches was a loam and a silty sand from 3 to 12 inches. Soils were not saturated in the upper 12 inches. Soils within this sampling point are considered a hydric soil; however hydrophytic vegetation and wetland hydrology were not present.

The soils at SP-2 were a dark grayish brown (10YR 3/1) silty clay from 0 to 12 inches with yellowish red (10YR 5/8) mottles. This sampling point meets the hydric soils, hydrophytic and wetland hydrology criteria.

3.4 Wetland Delineation

The delineated wetland boundary is depicted on **Figure 3, Appendix A**. The COE data forms are included in **Appendix B**. Aquatic vegetation is developing around the edge of all four pond margins. The gross wetland boundary encompasses 10.82 acres, including 1.50 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. Pre-existing wetland acreage totaled 6.98 acres, which did include the two wetland lobes outside of the current monitoring area. Therefore, pre-existing wetland within the current monitoring area was approximately 6.98 - 0.05 = 6.93 acres. Wetland / shallow open water acreage has therefore increased by approximately 10.82 – 6.93 = 3.89 acres since construction (2002).

3.5 Wildlife

Wildlife species observed on the site in 2004 are listed in **Table 3.** Activities and densities associated with these observations are included on the monitoring form in **Appendix B**. 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 wildlife species observed within the Norem Property Mitigation Site[1].*

REPTILES and AMPHIBIANS	
Western Chorus Frog (*Pseudacris triseriata*)	
BIRDS	
American Kestrel (*Falco sparerius*)	Red-winged Blackbird (*Agelaius phoeniceus*)
Blue-winged teal (*Anas discors)*	Sandhill Crane (*Grus canadensis*)[1]
Canada Goose (*Branta canadensis*)	Savanah Sparrow (*Passerculus sandwichensis*)
Common Snipe *(Gallinago gallinago*)	Spotted Sandpiper *(Actitis macularia*)
Common Yellowthroat (*Geothlypis trichas*)	Tree Swallow *(Tachycineta bicolor*)
European Starling *(Sturnus vulgaris*)	Turkey Vulture (*Cathartes aura*)[1]
Greater Yellowlegs (*Tringa melanoleuca*)	Unidentified Gull species
Killdeer (*Charadrius vociferous*)	Western Meadowlark (*Sturnella neglecta*)
Mallard (*Anas platyrhynchos*)	Wild Turkey (*Meleagris gallopavo*)[1]
Osprey (*Pandion haliaetus*)	Wilson's Phalarope (*Phalaropus tricolor*)
Red-tailed hawk (*Buteo jamaicensis*)	
MAMMALS	
Red fox (*vulpes vulpes*)	
White-tailed deer *(Odocoileus virginianus)*	

[1]Species observed by Landowner and Maxim Technologies.

3.6 Macroinvertebrates

The bioassessment score indicated sub-optimal conditions at this site (Bollman 2004**) (Appendix F**). Low taxa richness may have reflected monotonous habitats, but representatives from the water column, from macrophyte surfaces, and from the benthos were all present in the sample. The fauna was dominated by ceratopogonid gnats, which are not usually a positive sign relative to water quality. The biotic index value, however, was lower than the median for sites in this study, which suggests that water quality was better than average for these sites. The functional composition exhibited a degree of diversity characteristic of a wetland in good condition. The macroinvertebrate sampling results are included in **Appendix F**.

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) and results of that assessment are included in **Table 4.** The net functional units have increased by 37.81 points since 2001 due to increased ratings for several variables. The overall wetland rating increased from a Category III to a Category II.

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.

The site has four State of Montana Noxious Weeds (Canada thistle, leafy spurge, whitetop and spotted knapweed). Continued weed control measures are recommended.

During the August site visit, a few scattered Russian olive (*Elaeagnus angustifolia*) trees were noted within the assessment area. Russian olive is an introduced small tree that can potentially be a problematic species due to their successful ability to reseed and spread into existing native plant communities. It is likely that this plant may eventually be considered a candidate for the Montana Noxious Weed List. Future monitoring activities should closely note the spread of this tree.

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

Function and Value Parameters From the 1999 MDT Montana Wetland Assessment Method	2001 Pre-construction	2004 Post-construction
Listed/Proposed T&E Species Habitat	Low (0)	Low (0.3)
MNHP Species Habitat	Low (0.1)	Mod (0.6)
General Wildlife Habitat	Mod (0.5)	Mod (0.9)
General Fish/Aquatic Habitat	Low (0.1)	NA
Flood Attenuation	Mod (0.5)	Mod (0.5)
Short and Long Term Surface Water Storage	Mod (0.6)	Mod (0.6)
Sediment, Nutrient, Toxicant Removal	High (1.0)	High (0.9)
Sediment/Shoreline Stabilization	NA	NA
Production Export/Food Chain Support	Mod (0.7)	Mod (0.7)
Groundwater Discharge/Recharge	High (1.0)	High (1.0)
Uniqueness	Low (0.2)	Mod (0.4)
Recreation/Education Potential	Low (0.1)	Mod (0.7)
Actual Points/Possible Points	4.8/11	6.6/10
% of Possible Score Achieved	50	66
Overall Category	III	II
Total Acreage of Assessed Wetlands within Easement	**7.0**	**10.82**
Functional Units (acreage x actual points) (fu)	**33.60**	**71.41**
Net Acreage Gain (ac)	**NA**	**3.89**
Net Functional Unit Gain (fu)	**NA**	**37.81**
Total Functional Unit Gain (fu)	**NA**	**37.81**

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 is provided in **Appendix G** (COE 2002 letter) and 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). 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 2004, the approximate assignable wetland credit at the site is 7.71 acres or 52% of the goal, as outlined in **Table 5**.

Table 5: ***2004 wetland mitigation monitoring results.***

Wetland Mitigation Type	2004 Net Acres	Ratio	2004 Credit Acres	Target Credit Acres	Comments
Wetland Enhancement	6.98	3:1	2.32	2.32	Grazing removal, hydrological enhancement, and planting completed, with plants developing.
Wetland Creation	2.39	1:1	2.39	9.46	25% of the wetland creation area has been converted to wetlands
Open Water Creation	1.50	1:1	1.5	1.58	95% of the intended open water has developed.
Buffer Zone Implementation	6.00	4:1	1.5	1.50	2004 net buffer area was assumed within easement.
Berm impact	--	--	--	-0.15	
Total	**16.87**	**--**	**7.71**	**14.71**	**52% of goal**

The gross wetland boundary encompasses 10.82 acres, including 1.50 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. Pre-existing wetland acreage totaled 6.98 acres, which included the two wetland lobes outside of the current monitoring area. Therefore, pre-existing wetland within the current monitoring area was approximately 6.98 - 0.05 = 6.93 acres. Wetland / shallow open water acreage has therefore increased by approximately 10.82 – 6.93 = 3.89 acres since construction (2002).

The net functional units have increased by at least 37.81 points since 2001 due to several improvements in assessed function and value scores. As of 2004, the wetland is ranked as a Category II site, an improvement from its baseline Category III rating.

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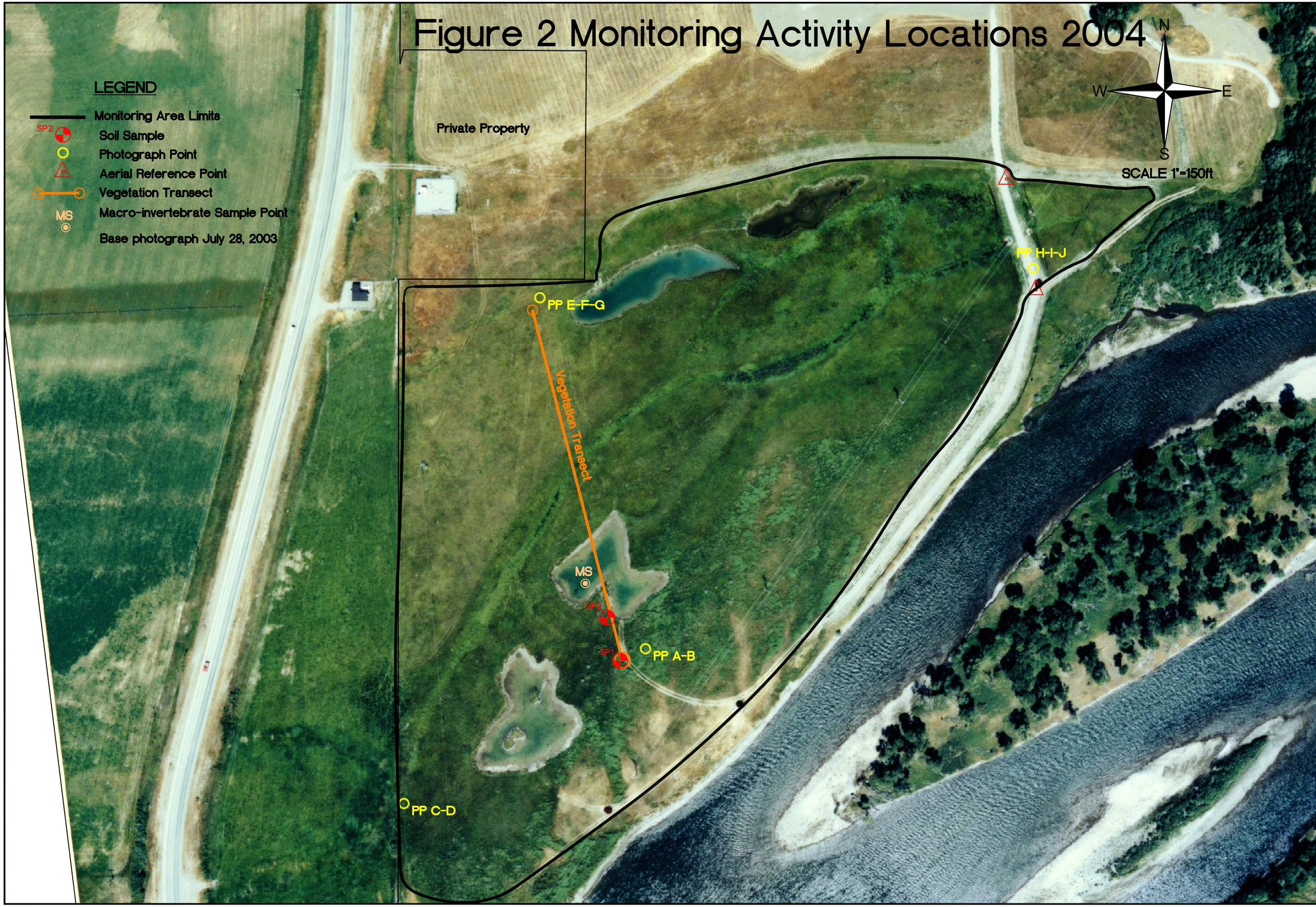
Appendix A

FIGURES 2 & 3

MDT Wetland Mitigation Monitoring
Norem Property
Big Timber, Montana

Figure 2 Monitoring Activity Locations 2004



PROJECT NAME
MDT Norem Wetland Mitigation
DRAWING TITLE
Monitoring Activity Locations 2004

PROJ NO: 330054.508	DRAWN: RAA
LOCATION: Big Timber, MT	PROJ MGR: J.Bergland
SCALE: NOTED	CHECKED: APPVD:
FILE NAME: Task508Base.dwg	

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

FIGURE
2 OF
REV 02
Jun/23/2005

Figure 3 Mapped Site Features 2004

PROJECT NAME
MDT Norem Wetland Mitigation

DRAWING TITLE
Mapped Site Features 2004

PROJ NO:	330054.508
LOCATION:	Big Timber, MT
SCALE:	NOTED
FILE NAME:	Task508Base.dwg
DRAWN:	RAA
PROJ MGR:	J.Bergland
CHECKED:	
APPV'D:	

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

FIGURE
3 OF -

REV 02
Jun/23/2005

Appendix B

2004 WETLAND MITIGATION SITE MONITORING FORM
2004 BIRD SURVEY FORMS
2004 WETLAND DELINEATION FORMS
2004 FUNCTIONAL ASSESSMENT FORMS

MDT Wetland Mitigation Monitoring
Norem Wetland Project
Big Timber, Montana

LWC / MDT WETLAND MITIGATION SITE MONITORING FORM

Project Name: Norem Wetland Project Project Number: 330054-508 Assessment Date: 8/13/04
Location: 2.0 mi NE of Big Timber MDT District: Billings District #13 Milepost:
Legal description: T 1N R 14E Section 12 Time of Day: 9 AM
Weather Conditions: warm/calm Person(s) conducting the assessment: CH/LB/LWC
Initial Evaluation Date: 8/13/04 Visit #: 1 Monitoring Year: 2004
Size of evaluation area: 26.53 acres Land use surrounding wetland: grazing/hay production/residential

HYDROLOGY

Surface Water Source:
Inundation: Present X Absent Average depths: 2 ft **Range of depths:** 1 - 3 ft
Assessment area under inundation: 25 %
Depth at emergent vegetation-open water boundary: 1 ft
If assessment area is not inundated are the soils saturated w/in 12" of surface**:** Yes X No
Other evidence of hydrology on site (drift lines, erosion, stained vegetation etc.): _____

Groundwater
Monitoring wells: Present X Absent
Record depth of water below ground surface

Well #	Depth	Well #	Depth	Well #	Depth

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

COMMENTS/PROBLEMS: Piezometer data collected by Maxim

VEGETATION COMMUNITIES

Community No.: 1 Community Title (main species): *Carex utriculata/Carex nebrascensis*

Dominant Species	% Cover	Dominant Species	% Cover
Carex utriculuta	35	*Scirpus acutus*	<5
Carex nebrascensis	20	*Typha latifolia*	<5
Juncus balticus	10	*Mentha arvensis*	<5
Glyceria grandis	<5	*Salix exigua*	<5
Agrostis alba	<5	*Scirpus pungens*	<5
Carex aquatilis	<5		

COMMENTS/PROBLEMS: no standing water, soil is moist at surface, evidence of standing water (water lines) sediment on thatch layer or litter. *Salix exigua* along the northwest wetland edge.

Community No.: 2 Community Title (main species): *Agrostis alba/Carex sp./Juncus balticus*.

Dominant Species	% Cover	Dominant Species	% Cover
Agrostis alba	40	*Potentilla anserina*	<5
Carex lanuginosa	10	*Spartana pectinata*	5
C. aquatilis	10	*Mentha arvensis*	5
C. nebrascensis	10	*Carex arcta*	<5
Juncus balticus	10		
J. longistylis	5		
Poa pratensis	<5		

COMMENTS/PROBLEMS: Some *Cirsium arvense* noted in this wetland community type but overall less than 1 percent. Very diverse community, other species present in this community type include *Rumex crispus*, *Carex arcta*, *Equiseum arvense*, and *Polygonum punctatum.*

Community No.: 3 Community Title (main species): *Agropyron smithii/Bromus inermis*

Dominant Species	% Cover	Dominant Species	% Cover
Agropyron smithii	25	*Agropyron repens*	5
Bromus inermis	25	*Festuca pratensis*	5
Poa pratensis	10	*Cirsum arvense*	<1
Juncus balticus	10	*Lithosperum arvense*	<1
Agrostis alba	10	*Potentilla anserina*	<1
Equistem arvense	10	*Agropyron dasytachyum*	<5

COMMENTS/PROBLEMS: This community type as a making of a wetland, it just hasn't developed yet.

Community No.: 4 Community Title (main species): *Populus trichocarpa/Melitous sp./Agropyron repens*

Dominant Species	% Cover	Dominant Species	% Cover
Populus angustifolia (6 inches to 3 ft)	35	*Bromus inermis*	5
Melilotus officinalis	15	*Phlaris arundinacea*	5
Melilotus alba	15	*Phleum pratense*	5
Agropyron repens	15	*Alopecurus pratenses*	<5
Poa pratensis	5		

COMMENTS/PROBLEMS: This riparian community type will potentially be a very valuable ecological asset to the Yellowstone River ecosystem. A few scattered annual weeds such as *Bromus tectorum* and *Thalaspi dubius* were noted.

Community No.: 5 Community Title (main species): *Typha latifolia*

Dominant Species	% Cover	Dominant Species	% Cover
Typha latifolia	70	*Spartana pectinata*	5
Scirpus pungens	5		
Scirpus acutus	5		
Eleocharis palustris	5		
Carex utriculuta	10		

COMMENTS/PROBLEMS: This community represents the wettest vegetation type within the project site.

Additional Activities Checklist:

X Record and map vegetative communities on air photo

Comprehensive Vegetation List

Species	Vegetation Community Number(s)	Species	Vegetation Community Number(s)
Agropyron dasytachyum	3	*Salix exigua*	1, 2, 3, 4
Agropyron smithii	3	*Scirpus pungens*	1,2
Agropyron repens	3, 4	*Scirpus* acutus	1,2
Agrostis alba	1, 2, 3	*Spartana pentinata*	2, 5
Alopecurus pratense	2, 4	*Solidago occidentalis*	2
Bromus inermis	3,4	*Thlaspi arvense*	3
Bromus tectorum	4	*Tragopogon dubius*	3
Cardaria draba	4	*Typha latifolia*	1, 5
Carex aquatilis	1, 2		
Carex arcta	2		
Carex lanuginosa	2		
Carex nebrascensis	1, 2, 5		
Carex utriculata	1, 2		
Centaurea maculosa	3, 4		
Cirsium arvense	2, 3, 4		
Cornus stolonifera	1, 2		
Crateagus douglasii	1, 2		
Crepis acuminata	3,4		
Deschamspia cespitosa	2		
Eleocharis palustris	1, 5		
Equisetum arvense	2, 3		
Euphorbia esula	3, 4		
Festuca pratensis	3, 4		
Glyceria grandis	1, 5		
Juncus balticus	1, 2, 3		
Juncus longistylis	2		
Lithosperum arvense	3		
Melilotus alba	4		
Melilotus officinalis	4		
Mentha arvense	1, 2		
Phalaris arundinacea	3, 4		
Phleum pratense	4		
Poa pratensis	2, 3, 4		
Polygonum punstatum	2		
Populus trichocarpa	2, 3, 4		
Potentilla anserina	2, 3		
Rumex crispus	2		
Salix alba	2		

COMMENTS/PROBLEMS: _____

PLANTED WOODY VEGETATION SURVIVAL

Species	Number Originally Planted	Mortality Causes
Pond #1		
Cornus stolonifera	522	
Salix sp. (primarily exigua)	561	
Crateagus douglasii	15	
Populus trichocarpa	46	
A visual assessment of the woody species around the perimeter of this pond estimated a **60 to 65 % survival**. The red-osier dogwood and willows were particularly robust.		Potentially lack of adequate soil moisture following planting (if planted too early in the spring prior to river rise) or lack of adequate soil moisture during mid to late summer, damage due to deer or rodents or transplant shock.
Pond #2		
Cornus stolonifera	200+	
Salix sp. (primarily exigua)	314+	
Crateagus douglasii	100	
Populus trichocarpa	30	
Within the transect line, a total of 10 dead plants were counted out of 35 woody species or a **69 percent survival** of the planted species.		Same as above
Pond #3		
Cornus stolonifera	200	
Salix sp. (primarily exigua)	314	
Crateagus douglasii	100	
Populus trichocarpa	300	
Within the transect line, a total of 12 dead plants were counted out of 52 woody species or a **77 percent survival** of the planted species.		Same as above
Pond #4		
Cornus stolonifera	126+	
Salix sp. (primarily exigua)	275+	
Populus trichocarpa	70	
A visual assessment of the survival of the woody species planted around this pond was estimated at **75 to 80%** survival. Water depth in this pond was estimated between 3 to 4 feet. Island had fewer weeds and excellent survival and vigor of woody species. Red-osier dogwood was especially vigorous.		Same as above

COMMENTS/PROBLEMS: _____

WILDLIFE

BIRDS

(Attach Bird Survey Field Forms)

Were man made nesting structures installed? Yes__X*_ No____Type:_Osprey on tel-pole ____ How many?__1____ Are the nesting structures being utilized? Yes__X__ No____ Do the nesting structures need repairs? Yes____ No_X___

MAMMALS AND HERPTILES

Species	Number Observed	Indirect indication of use			
		Tracks	Scat	Burrows	Other
5/28/04 and 8/13/04					
Adult Red Fox	1	X			
White-tailed deer	4				
Chorus Frogs	Unknown #				Vocal.

Additional Activities Checklist:
___X__Macroinvertebrate sampling (if required)

COMMENTS/PROBLEMS: __*Osprey nest platform was in place prior to the project.

PHOTOGRAPHS

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

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

Location	Photograph Description	Compass Reading
A	Transect 1: Southern end	NW
B	Transect 1: Southern end	SW
C	Shallow open water pond #2	NE
D	SW wetland corner	North
E	Transect 1: Northern end	South
F	Transect 1: Northern end	SE
G	Shallow open water pond #3	East
H	Wetland/upland transitions	SW
I	Wetland/Upland transitions	NW
J	Buffer between Yellowstone River and wetlands	SW
D-2	Adjacent land use, pasture west of the site	West
G-2	Shallow water pond #4	SW

COMMENTS/PROBLEMS: _____

_____

_____

GPS SURVEYING

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

Checklist:

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

COMMENTS/PROBLEMS:

_____

_____

WETLAND DELINEATION

(Attach Corps of Engineers delineation forms)

At each site conduct the items on the checklist below:
__X__Delineate wetlands according to the 1987 Army Corps manual.
__X__Delineate wetland-upland boundary on the air photo
__X__Survey wetland-upland boundary with a resource grade GPS survey

COMMENTS/PROBLEMS:

FUNCTIONAL ASSESSMENT

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

COMMENTS/PROBLEMS:

MAINTENANCE

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

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

COMMENTS/PROBLEMS:

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: Norem Property Date: 8/13/04 Examiner: CH/LB/LWC Transect # 1

Approx. transect length: 625 Compass Direction from Start (Upland): NW 60

Vegetation type A:	CT 3 UPL	
Length of transect in this type:	0-47	feet
Species:		Cover:
AGRREP		30
MELOFF		10
MELALB		10
FESPRA		5
JUNBAL		5
AGRALB		5
EQUARV		<5
SALEXI		5
PHLARU		<5
CIRARV		<5
POPTRI		5
Litter		10
Total Vegetative Cover:		90%

Vegetation type B:	CT 2 WL	
Length of transect in this type:	47-82	feet
Species:		Cover:
AGRALB		20
CARNEB		15
CARAQU		15
CARLAN		10
JUNBAL		10
SALEXU		5
MENTHA		5
ALOPRA		5
CIRARV		<5
POTARV		<5
Total Vegetative Cover:		100%

Vegetation type C:	OPEN WATER<4 FT	
Length of transect in this type:	82-232	feet
Species:		Cover:
open water		95
TYPLAT		5
GLYGRA		5
SCIPUN		5
Mud flats		10
Total Vegetative Cover:		15%

Vegetation type D:	CT 2 WL	
Length of transect in this type:	232-307	feet
Species:		Cover:
CARLAN		20
CARAQU		20
JUNBAL		20
AGRALB		20
POAPRA		5
CARNEB		5
MENARV		<5
Total Vegetative Cover:		100%

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: Norem Property Date: 8/13/04 Examiner: CH/LB/LWC Transect # 1

Approx. transect length: 625 Compass Direction from Start (Upland):

Vegetation type E:	CT 5 WL
Length of transect in this type:	307-343 feet
Species:	Cover:
TYPLAT	45
CARUTR	30
GLYGRA	5
SCIPUL	5
CARNEB	5
Surface water	10
Total Vegetative Cover:	90%

Vegetation type F:	CT 2 WL
Length of transect in this type:	343-379’ feet
Species:	Cover:
AGRALB	25
CARLAN	20
CARNEB	20
JUNBAL	10
JUNLON	10
POAPRA	5
CARAQU	5
CIRARV	<5
Total Vegetative Cover:	100%

Vegetation type G:	CT 3 UPL
Length of transect in this type:	379-625 feet
Species:	Cover:
BROINE	35
AGRSMI	15
FESPRA	15
EQUARV	10
AGRALB	10
POAPRA	10
CIRARV	5
Total Vegetative Cover:	100%

Vegetation type H:	
Length of transect in this type:	feet
Species:	Cover:

MDT WETLAND MONITORING – VEGETATION TRANSECT (back of form)

Cover Estimate

+ = <1%
1 = 1-5%
2 = 6-10%
3 = 11-20%
4 = 21-50%
5 = >50%

Indicator Class:

+ = Obligate
- = Facultative/Wet
0 = Facultative

Source:

P = Planted
V = Volunteer

Percent of perimeter 75% % developing wetland vegetation – excluding dam/berm structures.

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

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

Notes:

Community Type 3 will likely develop into a wetland with time. A mix of wetland and upland vegetation, currently the upland vegetation is dominant. Woody species such as *Salix exigua* and *Populus trichocarpa* are present.

BIRD SURVEY – FIELD DATA SHEET

Page_1___of_1__
Date: varies
Survey Time: 7-9 AM

SITE: Mark Norem Wetland

Bird Species	#	Behavior	Habitat	Bird Species	#	Behavior	Habitat
May 28, 2004							
American Kestrel	1	FO	MA/OW				
Common Snipe	2	unknown*					
Common Yellowthroat	3	BR	MA				
European Starling	1	FO	MA/OW				
Mallard	2	unknown*	MA				
Osprey	2	N/L	tel-pole				
Red-tailed Hawk	1	FO	OW/MA				
Red-winged Blackbird	10	BR	MA				
Savannah Sparrow	1	BR	UPL edge				
Spotted Sandpiper	2	F	MA				
Tree Swallow	10	F	MA				
Unident. Gull	1	FO	MA/OW				
Western Meadowlark	3	BR/F	MA				
Wilson's Phalarope	5	F	OW/MA				
August 13, 2004							
Blue-winged Teal	1	F	OW				
Eastern Kingbird	2	F	MA/OW				
Greater Yellowlegs	2	F	MA/OW				
Osprey	2	FO	MA/OW				
Red-tailed Hawk	1	FO	MA/OW				
Spotted Sandpiper	1	F	MA/OW				

Notes:
*flushed from tall vegetation within marshy area
Mark Norem, landowner, observed several Canada Geese with broods during the spring 2004.

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

Habitat: AB – aquatic bed; FO – forested; I – island; MA – marsh; MF – mud flat; OW – open water; SS – scrub/shrub; UP – upland buffer; WM – wet meadow, US – unconsolidated shoreline

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

Project/Site: Norem Property	Date: 8/13/04
Applicant/Owner: MDT	County: Sweetgrass
Investigator: CH/LB/LWC	State: MT

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

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	AGRREP	H	FAC-	9			
2	MELOFF	H	FACU	10			
3	MELALB	H	FACU	11			
4	SALEXI (root suckers)	S	OBL	12			
5	CIRARV	H	FACU+	13			
6	EQUARV	H	FAC	14			
7				15			
8				16			

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

HYDROLOGY

Recorded Data (Describe in Remarks):
- ____ Stream, Lake, or Tide Gauge
- X Aerial Photographs
- ____ Other
- ____ No Recorded Data Available

Field Observations:
- Depth of Surface Water: -- (in.)
- Depth to Free Water in Pit: -- (in.)
- Depth to Saturated Soil: >12 (in.)

Wetland Hydrology Indicators:

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

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

Remarks:

Only one secondary indicator was noted during the field investigation. This sampling site does not meet the wetland hydrology parameters.

SOILS

Map Unit Name (Series and Phase): Nesda-McIlwaine loam (107A)
Taxonomy (Subgroup): Fine sandy loam
Drainage Class: Well-drained
Field Observations
Confirm Mapped Type? X Yes ____ No

Profile Description:

Depth inches	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-3	A	10YR 4/2	10YR 4/6	Small, common, prominent	Roots, loam
3-12	A	10YR 4/2	10YR 4/6	Small, common, prominent	Silty sand

Hydric Soil Indicators:

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

Hydric soil

WETLAND DETERMINATION

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

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

Remarks:

This site does not meet all three wetland parameters.

Approved by HQUSACE 2/92

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

Project/Site: Norem Property	Date: 8/13/04
Applicant/Owner: MDT	County: Sweetgrass
Investigator: CH/LB/MDT	State: MT
Do Normal Circumstances exist on the site: X Yes ___ No	Community ID: Wetland
Is the site significantly disturbed (Atypical Situation)? ___ Yes X No	Transect ID: 1
Is the area a potential Problem Area?: ___ Yes X No	Plot ID: SP-2
(If needed, explain on reverse.)	Soil pit located ~74 ft north of stake

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	CARNEB	H	OBL	9			
2	CARAQU	H	FAC	10			
3	AGRALB	H	FAC*	11			
4	SALEXI (root suckers)	S	OBL	12			
5	POTANS	H	OBL	13			
6	JUNBAL	H	FACW+	14			
7	JUNLON	H	FACW	15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-). 7/7 = 100% hydrophytic vegetation

HYDROLOGY

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

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: -- (in.)

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

Depth to Saturated Soil: 10 (in.)

Wetland Hydrology Indicators:

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

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

Remarks:

SOILS

Map Unit Name (Series and Phase): Lallie family (250A)
Taxonomy (Subgroup): Silty clay
Drainage Class: Poorly drained
Field Observations
Confirm Mapped Type? X Yes ____ No

Profile Description:

Depth inches	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-5	A	10YR 3/1			Silt with many fine roots
5-12	A	10YR 3/2	10YR 5/8	Faint, moderate	Silty clay

Hydric Soil Indicators:

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

Hydric soil

WETLAND DETERMINATION

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

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

Remarks:
This sampling site meets all three wetland criteria.

Approved by HQUSACE 2/92

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

1. Project Name: Norem Wetland Project **2. Project #:** 330054.508 **Control #:** _____

3. Evaluation Date: 8/13/2004 **4. Evaluator(s):** CH/LB/LWC **5. Wetland / Site #(s):** _____

6. Wetland Location(s) i. T: 1 N **R:** 14 E **S:** 12 **T:** __ N **R:** __ E **S:** _____

ii. Approx. Stationing / Mileposts: _____

iii. Watershed: 13 **GPS Reference No. (if applies):** _____

Other Location Information: _____

7. A. Evaluating Agency LWC

8. Wetland Size (total acres): 10.82 (visually estimated)
_____ (measured, e.g. GPS)

B. Purpose of Evaluation:
- ☐ Wetlands potentially affected by MDT project
- ☐ Mitigation wetlands; pre-construction
- ☒ Mitigation wetlands; post-construction
- ☐ Other

9. Assessment Area (total acres): _____ (visually estimated)
10.82 (measured, e.g. GPS)

10. CLASSIFICATION OF WETLAND AND AQUATIC HABITATS IN AA

HGM CLASS [1]	SYSTEM [2]	SUBSYSTEM [2]	CLASS [2]	WATER REGIME [2]	MODIFIER [2]	% OF AA
Riverine	Palustrine	None	Emergent Wetland	Seasonally Flooded	Impounded	90
Riverine	Palustrine	None	Unconsolidated Bottom	Permanently Flooded	Excavated	10
---	---	---	---	---	---	
---	---	---	---	---	---	

[1] = Smith et al. 1995. [2] = Cowardin et al. 1979.

11. ESTIMATED RELATIVE ABUNDANCE (of similarly classified sites within the same Major Montana Watershed Basin)
Common **Comments:** _____

12. GENERAL CONDITION OF AA

i. Regarding Disturbance: (Use matrix below to select appropriate response.)

Conditions Within AA	Predominant Conditions Adjacent (within 500 Feet) To AA		
	Land managed in predominantly natural state; is not grazed, hayed, logged, or otherwise converted; does not contain roads or buildings.	Land not cultivated, but moderately grazed or hayed or selectively logged or has been subject to minor clearing; contains few roads or buildings.	Land cultivated or heavily grazed or logged; subject to substantial fill placement, grading, clearing, or hydrological alteration; high road or building density.
AA occurs and is managed in predominantly a natural state; is not grazed, hayed, logged, or otherwise converted; does not contain roads or occupied buildings.	---	low disturbance	---
AA not cultivated, but moderately grazed or hayed or selectively logged or has been subject to relatively minor clearing, or fill placement, or hydrological alteration; contains few roads or buildings.	---	---	---
AA cultivated or heavily grazed or logged; subject to relatively substantial fill placement, grading, clearing, or hydrological alteration; high road or building density.	---	---	---

Comments: (types of disturbance, intensity, season, etc.) low disturbance includes a road/berm.

ii. Prominent weedy, alien, & introduced species: herbaceous species include scattered leafy spurge, whitetop and knapweed patches closer to the river, patches of Canada thistle and young Russian olive plants (1.5 ft to 3 ft tall).

iii. Briefly describe AA and surrounding land use / habitat: grazing agricultural and residential

13. STRUCTURAL DIVERSITY (Based on 'Class' column of #10 above.)

Number of 'Cowardin' Vegetated Classes Present in AA	≥3 Vegetated Classes or ≥ 2 if one class is forested	2 Vegetated Classes or 1 if forested	≤ 1 Vegetated Class
Select Rating	---	---	Low

Comments: this will change in the near future with the establishment and growth of the woody species.

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

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

Primary or Critical habitat **(list species)**	☐ D	☐ S	
Secondary habitat **(list species)**	☐ D	☐ S	
Incidental habitat **(list species)**	☐ D	☒ S	Bald Eagle
No usable habitat	☐ D	☐ S	

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

Highest Habitat Level	doc/primary	sus/primary	doc/secondary	sus/secondary	doc/incidental	sus/incidental	none
Functional Point and Rating	---	---	---	---	---	.3 (L)	---

If documented, list the source (e.g., observations, records, etc.)**:** likely bald eagle

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	Black Tern, Peregrine Falcon
Incidental habitat **(list species)**	☐ D	☐ S	_____
No usable habitat	☐ D	☐ S	_____

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

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

If documented, list the source (e.g., observations, records, etc.)**:** black tem, peregrine falcon

14C. General Wildlife Habitat Rating

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

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

☐ **Low** (based on any of the following)
- ☐ few or no wildlife observations during peak use periods
- ☐ little to no wildlife sign
- ☐ sparse adjacent upland food sources
- ☐ interviews with local biologists with knowledge of AA

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

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

Structural Diversity (from #13)	☐High								☐Moderate								☒Low			
Class Cover Distribution (all vegetated classes)	☐Even				☐Uneven				☐Even				☐Uneven				☒Even			
Duration of Surface Water in ≥ 10% of AA	P/P	S/I	T/E	A	P/P	S/I	T/E	A	P/P	S/I	T/E	A	P/P	S/I	T/E	A	P/P	S/I	T/E	A
Low disturbance at AA (see #12)	--	--	--	--	--	--	--	--	--	H	--	--	--	--	--	--	E	--	--	--
Moderate disturbance at AA (see #12)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
High disturbance at AA (see #12)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

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

Evidence of Wildlife Use from 14C(i)	**Wildlife Habitat Features Rating** from 14C(ii)			
	☒ Exceptional	☐ High	☐ Moderate	☐ Low
Substantial	--	--	--	--
Moderate	.9 (H)	--	--	--
Low	--	--	--	--

Comments: _____

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

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

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

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

ii. **Modified Habitat Quality:** Is fish use of the AA precluded or significantly reduced by a culvert, dike, other man-made structure or activity **or** is the waterbody included on the 'MDEQ list of waterbodies in need of TMDL development' with 'Probable Impaired Uses' listed as cold or warm water fishery or aquatic life support**?**
☐ **Y** ☐ **N** If yes, reduce the rating from 14D(i) by one level and check the modified habitat quality rating: ☐ E ☐ H ☐ M ☐ L

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

Types of Fish Known or Suspected Within AA	**Modified Habitat Quality** from 14D(ii)			
	☐ Exceptional	☐ High	☐ Moderate	☐ Low
Native game fish	--	--	--	--
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	☐ ≥ 10 acres			☐ <10, >2 acres			☐ ≤2 acres		
% of flooded wetland classified as forested, scrub/shrub, or both	75%	25-75%	<25%	75%	25-75%	<25%	75%	25-75%	<25%
AA contains **no outlet or restricted outlet**	--	--	--	--	--	.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.	☐ >5 acre feet			☒ <5, >1 acre feet			☐ ≤1 acre foot		
Duration of surface water at wetlands within the AA	P/P	S/I	T/E	P/P	S/I	T/E	P/P	S/I	T/E
Wetlands in AA flood or pond **≥ 5 out of 10 years**	--	--	--	--	.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.			
% cover of wetland vegetation in AA	☒ ≥ 70%		☐ < 70%		☐ ≥ 70%		☐ < 70%	
Evidence of flooding or ponding in AA	☒ Yes	☐ No	☐ Yes	☐ No	☐ Yes	☐ No	☐ Yes	☐ No
AA contains **no or restricted outlet**	--	--	--	--	--	--	--	--
AA contains **unrestricted outlet**	.9 (H)	--	--	--	--	--	--	--

Comments: _____

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

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

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

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

Comments:

14I. PRODUCTION EXPORT / FOOD CHAIN SUPPORT

i. **Rating** (Working from top to bottom, use the matrix below to arrive at the functional point and rating of high (H), moderate (M), or low (L) for this function.
A = acreage of vegetated component in the AA. **B** = structural diversity rating from #13. **C** = Yes (Y) or No (N) as to whether or not the AA contains a surface or subsurface outlet; **P/P** = permanent/perennial; **S/I** = seasonal/intermittent; **T/E/A**= temporary/ephemeral/absent.

A	☒ Vegetated component >5 acres						☐ Vegetated component 1-5 acres						☐ Vegetated component <1 acre					
B	☐ High		☐ Moderate		☒ Low		☐ High		☐ Moderate		☐ Low		☐ High		☐ Moderate		☐ Low	
C	☐Y	☐N	☐Y	☐N	☒Y	☐N	☐Y	☐N	☐Y	☐N	☐Y	☐N	☐Y	☐N	☐Y	☐N	☐Y	☐N
P/P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
S/I	--	--	--	--	.7M	--	--	--	--	--	--	--	--	--	--	--	--	--
T/E/A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Comments:

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

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

ii. ☐ **Recharge Indicators**
- ☐ Permeable substrate presents without underlying impeding layer.
- ☐ Wetland contains inlet but not outlet.
- ☐ Other

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

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

Comments:

14K. UNIQUENESS

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

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

Comments: .

14L. RECREATION / EDUCATION POTENTIAL

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

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

iii. Based on the location, diversity, size, and other site attributes, is there a strong potential for recreational or educational use?
☒ **Yes** [Proceed to 14L (ii) and then 14L(iv).] ☐ **No** [Rate as low in 14L(iv)]

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

Ownership	Disturbance at AA from #12(i)		
	☒ Low	☐ Moderate	☐ High
Public ownership	--	--	--
Private ownership	.7(M)	--	--

Comments: 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	0.30	1	
B. MT Natural Heritage Program Species Habitat	M	0.60	1	
C. General Wildlife Habitat	M	0.90	1	
D. General Fish/Aquatic Habitat	NA	0.00	--	
E. Flood Attenuation	M	0.5	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	M	0.70	1	
J. Groundwater Discharge/Recharge	H	1.00	1	
K. Uniqueness	M	0.40	1	
L. Recreation/Education Potential	M	0.70	1	
	Totals:	6.60	10.00	71
	Percent of Total Possible Points:		**66%** (Actual / Possible) x 100 [rd to nearest whole #]	

Category I Wetland: (Must satisfy **one** of the following criteria. If not proceed to Category II.)
- ☐ Score of 1 functional point for Listed/Proposed Threatened or Endangered Species; **or**
- ☐ Score of 1 functional point for Uniqueness; **or**
- ☐ Score of 1 functional point for Flood Attenuation **and** answer to Question 14E(ii) is "yes"; **or**
- ☐ Percent of total Possible Points is > 80%.

Category II Wetland: (Criteria for Category I not satisfied **and** meets any **one** of the following Category II criteria. If not satisfied, proceed to Category IV.)
- ☐ Score of 1 functional point for Species Rated S1, S2, or S3 by the MT Natural Heritage Program; **or**
- ☒ Score of .9 or 1 functional point for General Wildlife Habitat; **or**
- ☐ Score of .9 or 1 functional point for General Fish/Aquatic Habitat; **or**
- ☐ "High" to "Exceptional" ratings for **both** General Wildlife Habitat **and** General Fish / Aquatic Habitat; **or**
- ☐ Score of .9 functional point for Uniqueness; **or**
- ☒ Percent of total possible points is > 65%.

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

Category IV Wetland: (Criteria for Categories I or II are not satisfied **and** all of the following criteria are met; If not satisfied, proceed to Category III.)
- ☐ "Low" rating for Uniqueness; **and**
- ☐ "Low" rating for Production Export / Food Chain Support; **and**
- ☐ Percent of total possible points is < 30%.

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

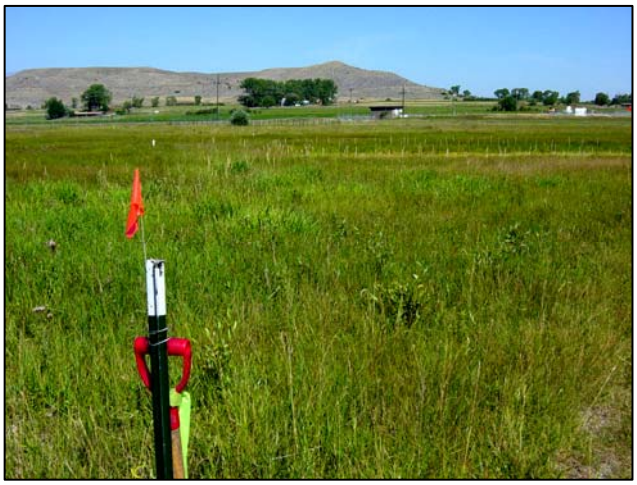
☐ **I** ☒ **II** ☐ **III** ☐ **IV**

Appendix C

REPRESENTATIVE PHOTOGRAPHS
2004 AERIAL PHOTOGRAPH

MDT Wetland Mitigation Monitoring
Norem Property
Big Timber, Montana

2004 NOREM



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

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

Location: C **Description:** Shallow open water pond. **Compass Reading:**

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:** southeast

2004 NOREM

Location: G **Description:** Transect 1 northern end. Pond 4 and willow cuttings. **Compass Reading:** east

Location: H **Description:** Looking across wetland/upland transitions. **Compass Reading:** southwest

Location: I **Description:** WL/UPL interface. **Compass Reading:** northwest

Location: **J** **Description:** Buffer between Yellowstone River and wetlands. **Compass Reading:** southwest

Location: D-2 **Description:** Adjacent land use, pasture west of the site. **Compass Reading**: west

Location: G-2 **Description:** Willow cuttings planted around pond perimeter. **Compass Reading:** southwest

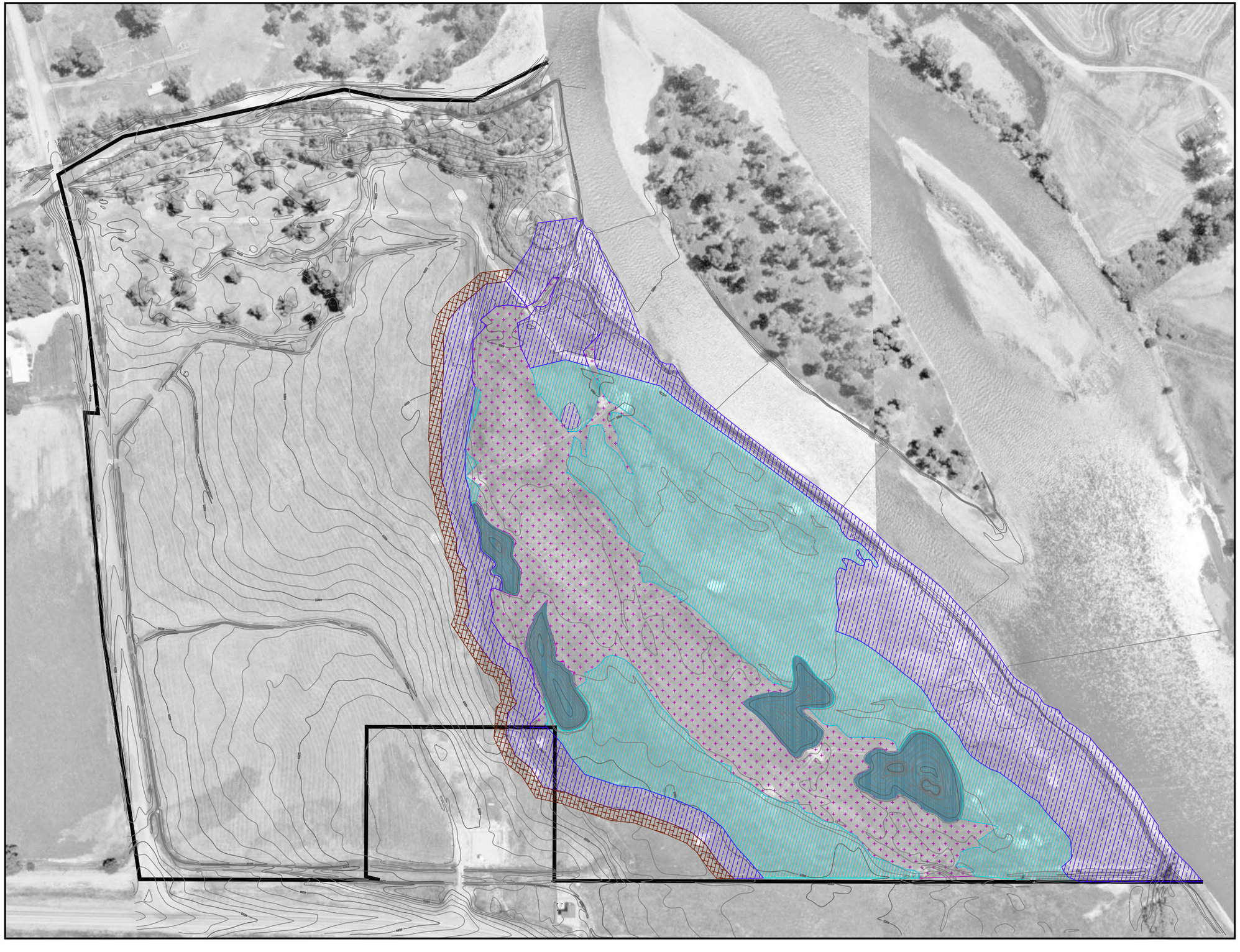

JOB:NOREM WETLAND ROLL:000 SCALE:1:6000 FLT:26 07/25/2004 09:14:02
FS160 1/ 140 f/5.6 FF4.0 EC 0 SIN dt225.0 27.4V -56mb

Norem 2004

Appendix D

PROPOSED WETLAND MITIGATION SITE MAP
2004 WETLAND MONITORING REPORT – MARK NOREM WETLAND RESERVE (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)

N

0 Feet 200

MAXIM 1560117.500

April 2002

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

2004 WETLAND MONITORING REPORT
MARK NOREM WETLAND RESERVE
SWEET GRASS COUNTY, MONTANA

2004 WETLAND MONITORING REPORT
MARK NOREM WETLAND RESERVE
SWEET GRASS COUNTY, MONTANA

Prepared for:

Mr Mark Norem
P.O.Box 1285
116 West 2nd Street
Big Timber, Montana 59011

Prepared by:

Maxim Technologies
P.O. Box 4699
Helena, MT 59604
406-443-5210

November 2004

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INTRODUCTION

The following report summarizes monitoring activities completed by Maxim Technologies at the Mark Norem Wetland Reserve site (**Figure 1**) in September 2004. Monitoring of the site in 2004 was completed to obtain first year baseline data for the wetland reserve. **Table 1** provides general site information.

TABLE 1
General Site Information
Norem Wetland Reserve Site

Project Name	Norem Wetland Reserve
U.S. Army Corps File Number	2002-90-260
General Location	Junction of Hwy 191 and Yellowstone River, Big Timber, MT
Monitoring Period	2004-2008
Year of Monitoring	2004 (1st)
Wetland Creation (Acres)	~ 7 acres

The monitoring plan was designed to evaluate the trend and successful establishment of hydrophytic vegetation and wetland hydrology. Monitoring activities included quantitative sampling of herbaceous and woody vegetation, groundwater measurements, observations of wetland hydrology indicators, and general observations of as-built conditions.

SUCCESS STANDARDS AND MONITORING OBJECTIVES

Vegetation and hydrology data collected during site monitoring were compared with specific success standards to determine if the project area has developed the desired conditions identified in the original design plan. The following includes a description of the six success standards used to evaluate success of the wetland design. A companion monitoring objective follows each success standard description.

Success Standard 1: Greater than 50% of dominant plant species in both existing and newly created wetland areas will be hydrophytes (wetland species with an indicator status of either Facultative, Facultative Wetland, or Obligate. A description of wetland indicator status is found in the attached Glossary).

Monitoring Objective: To visually observe that >50% of dominant plant species occurring in both the new and existing wetland areas (including vegetation sample plots) are wetland plants.

Success Standard 2: Both existing and new wetland areas will exhibit indicators of wetland hydrology sufficient to meet standard wetland criteria.

Monitoring Objective: To visually observe and/or measure indicators of wetland hydrology sufficient to meet wetland criteria.

Success Standard 3: The Yellowstone River bank will be sufficiently colonized by native vegetation.

Monitoring Objective: To visually observe that the Yellowstone River bank is sufficiently stable with portions of the bank containing 25%-75% cover of native herbaceous plants and woody shrubs.

***Success Standard 4*:** There will be less than 10% cover of noxious weeds throughout the project area.

Monitoring Objective: To visually observe <10% cover of noxious weeds.

***Success Standard 5*:** There will be an increase in Cowardin habitat types to include open water, emergent marsh, and shrub habitat.

Monitoring Objective: To visually observe the successful establishment of open water, emergent marsh, and shrub habitat.

***Success Standard 6*:** To formally delineate additional wetland acreage at the site.

Monitoring Objective: To delineate additional wetland acreage following the 5th year of monitoring.

METHODS

Success Standard and Monitoring Objective 1

To evaluate dominant vegetation in the existing wetland, percent cover by species was visually estimated within 10 meter^2 plots centered at each piezometer location (**Figure 2**). To evaluate dominant vegetation in the new wetland area, percent cover by species was visually estimated in 1 meter^2 sample plots along a single (76.8 meters long) transect (TR-1) bisecting the new wetland area (plots were placed at 9.6 meter intervals centered over the transect line). Dominant vegetation was also visually observed throughout the new and existing wetland at representative observation points.

Success Standard and Monitoring Objective 2

To evaluate hydrology, depth to water in all piezometers was measured and recorded (**Figure 2**). Also, other indicators of wetland hydrology were visually observed throughout the project area. In addition, the water level in each pond was noted by measuring distance from the top of bank to the waters edge. A labeled wooden stake was positioned at the top of each pond bank to permanently mark this location.

Success Standard and Monitoring Objective 3

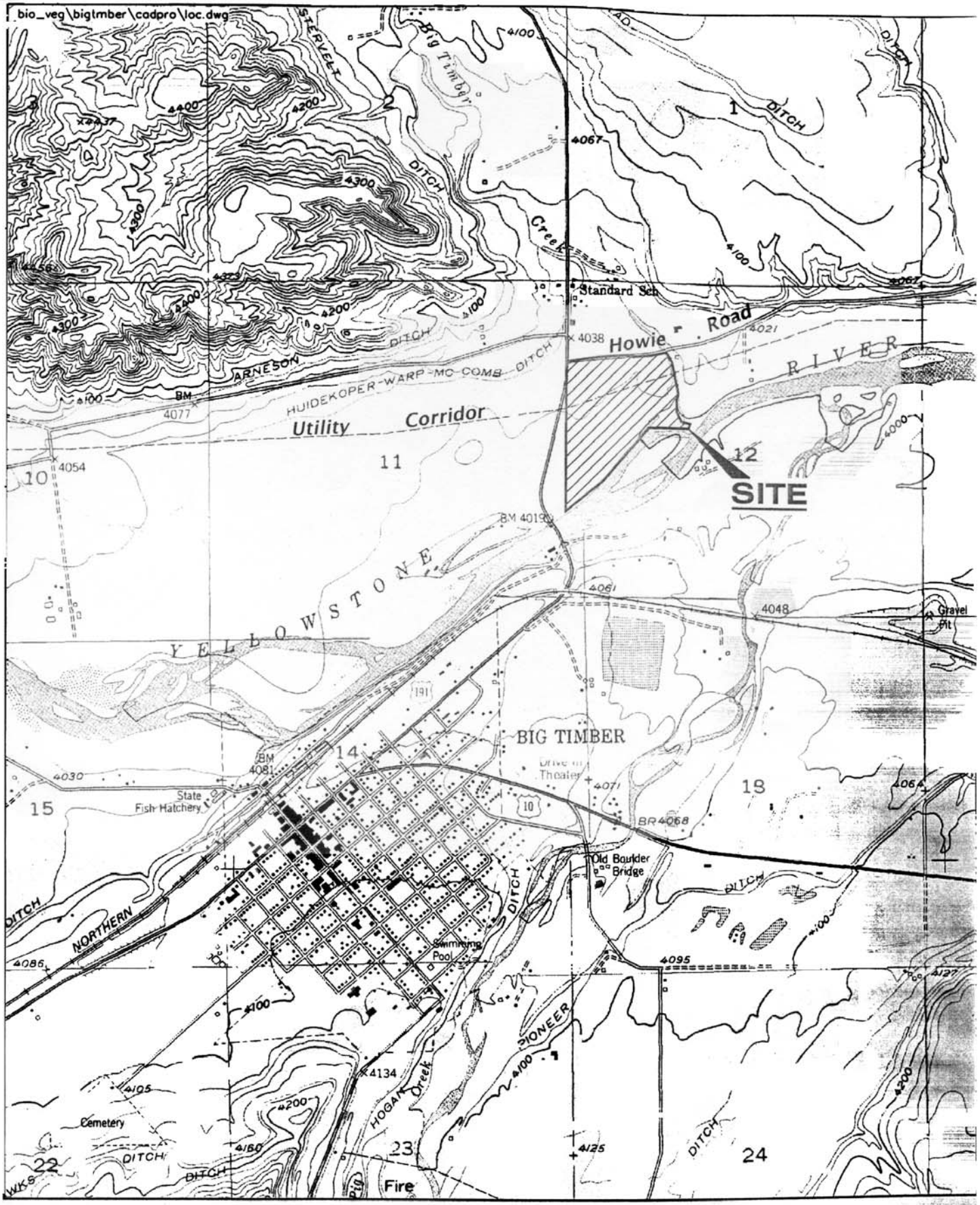
To evaluate stabilization of the Yellowstone River bank, a visual estimate of the percent cover of woody species was conducted along the entire length of the bank.

Success Standard and Monitoring Objective 4

To evaluate noxious weeds, a visual estimate of the percent cover of noxious weeds was conducted throughout the project area.

Success Standard and Monitoring Objective 5

To evaluate the newly created open water, emergent marsh, and shrub habitat, these areas were visually inspected to determine their establishment.



From USGS 7.5' Big Timber Quad

N

0 Feet 2000

MAXIM TECHNOLOGIES INC. 1560117.300

Location Map
Norem Property
Wetland Enhancement
Big Timber, Montana
FIGURE 1

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

Easement Area (26.88 acres)

Existing Wetlands (6.98 acres)

New Wetland Acreas Resulting from Berm Placement (9.46 acres)

Newly Created Open Water Wetland Areas (1.58 acres)

Buffer Zone (6.02 acres)

Stranded Acres (2.84 acres)

P-4 Piezometer with Vegetation Plot (10 meter^2)

P-1 Regular Piezometer Without Vegetation Plot

Pond Water Level Stake

TR-1 Transect (1 meter^2) Plots

N

0 Feet 200

MAXIM 1560117.500

2004 Wetland Monitoring
Mark Norem
Wetland Reserve
Big Timber, Montana

Success Standard and Monitoring Objective 6

No formal wetland delineation was conducted; this will be accomplished following the 5th year of monitoring.

RESULTS AND DISCUSSION

Table 2 provides a summary of 2004 monitoring results. A detailed description of the monitoring results is found below. Data forms for vegetation sample plots, piezometer readings, and pond water levels are found in **Appendix A.**

TABLE 2
2004 Monitoring Results Summary for the Norem Wetland Reserve

Success Standard	2004 Results	Recommendation
1. Greater than (>) 50% of dominant plant species in both existing and new wetland areas will be hydrophytes (wetland species).	Existing wetlands have maintained >50% dominance of wetland plant species. Portions of new wetland areas currently have <50% dominance of wetland plant species.	Continue monitoring to evaluate trend.
2. Both existing and new wetland areas will exhibit indicators of wetland hydrology sufficient to meet standard criteria.	Impoundment structure successfully inundated the site to the projected level for a period of at least 3 weeks during the growing season. Therefore, this criterion for wetland hydrology is currently being satisfied. Depth to water measured in piezometers was <1 foot	Monitor hydrology (depth to water in piezometers and pond water levels) in mid June, July, and August. Evaluate need to regrade high ground area in northwest corner. Establish a target elevation for inundation level.
3. The Yellowstone River bank will be sufficiently colonized by native vegetation. Preferred target of 25-75% cover.	Seedlings of both black cottonwood and sandbar willow were observed on portions of the bank. Percent cover is currently <25%.	Continue to monitor establishment of native vegetation. Monitor river bank for changes in stabilization.
4. There will be <10% cover of noxious weeds in the project area.	Most of the project site has <10% cover of noxious weeds and therefore meets this performance criterion. However, small areas appear to have >10% cover of Canada thistle	Continue to treat Canada thistle on the site.
5. There will be an increase in Cowardin habitat types to include open water, emergent marsh, and shrub habitat.	Open water has been established successfully. All four ponds contained standing water at end of growing season. Emergent marsh was developing along pond perimeters. Shrub seedlings were observed throughout the project site and appear to be developing the shrub habitat component.	Continue monitoring to evaluate trend.
6. Additional new wetland areas will be delineated following the 5th year of monitoring.	To be completed following the 5th year of monitoring. It is assumed that the current wetland boundary follows the existing wetland boundary delineated by Maxim prior to wetland construction.	No recommendations at this time.

Success Standard 1

Results of vegetation sampling at piezometer plots, as well as visual observations of vegetation in the existing wetland areas, indicate that the existing wetland is currently dominated by hydrophytic vegetation. Therefore, it appears that, the wetland construction project has not led to a decline in wetland vegetation in the existing wetland area.

Results of vegetation sampling along transect TR-1 located in a portion of the new wetland area (**Figure 2**) indicate that about half of the sample plots, particularly those closest to the existing wetland, are dominated by wetland vegetation. Plots located near the outer margin of the new wetland area remain dominated by upland vegetation. Visual observations of vegetation in other portions of the new wetland area indicate that the new wetland area appears to be increasing in wetland vegetation, particularly Baltic rush.

Success Standard 2

Water levels observed in site piezometers (**Figure 2**) indicate water levels greater than 1 foot below ground surface. In addition, no primary indicators of wetland hydrology were observed in new wetland areas at the time of the survey. However, the impoundment structure successfully inundated the site to the projected level for at least 3 weeks during the growing season. Therefore, the wetland hydrology criterion of saturation at ground surface for 12.5% of the growing season has been met, and wetland hydrology has been successfully established.

Maxim recommends that the water level in each piezometer be recorded in June, July, and August each year to adequately evaluate water fluctuations. In addition, Maxim recommends that a target water level elevation and target inundation duration be established. Also, pond water levels should be recorded when piezometer readings are recorded in June, July, and August.

Success Standard 3

Small willow and cottonwood seedlings are colonizing many areas along the Yellowstone River bank. However, cover remains less than 25%. Percent cover will likely increase over the next 1-2 years. Undercutting of the river bank may be occurring at the east end of the project area (**Figure 2**). This area should be closely monitored for future bank destabilization.

Success Standard 4

Noxious weeds in most of the area are below 10% cover. However, small areas, particularly in the newly created wetland area near the river contains Canada thistle with slightly above 10% cover. These areas should continue to be treated.

Success Standard 5

The four open water ponds (Figure 1) appear to be functioning well with standing water remaining late in the growing season. Small areas of emergent marsh occur along the perimeter of each pond with vegetation consisting primarily of cattail (*Typha latifolia*). Shrub growth is found throughout the project site with many willow and cottonwood seedlings observed. Therefore, these additional Cowardin wetland habitat types appear to have been successfully established.

Success Standard 6

This standard will be addressed following the 5th year of monitoring. It is assumed that the current wetland boundary follows the wetland boundary originally delineated by Maxim prior to wetland construction.

WILDLIFE OBSERVATIONS

Wildlife usage of the area includes numerous species of wetland and upland birds, small mammals, deer, and fish. Wetland and water dependent birds observed using both the ponds and river bank area include Canada goose, osprey, and several duck species. Other birds observed using the project area include killdeer, sandhill crane, western meadowlark, and an unidentified gull. Numerous mammal tracks were observed surrounding the ponds with a well-established game trail, presumably used by deer, bisecting the wetland project site. An unidentified fish species was observed in Ponds 1 and 2. Per the landowner, other species noted include wild turkey, turkey vulture, and red fox. Ducklings were also raised on one of the ponds in the project area in 2004.

CONCLUSION

Overall the Norem Wetland Reserve has established in accordance with the original design plan and will likely continue to develop wetland conditions as specified therein. Future monitoring results can be compared with data presented in this report to evaluate the trend and establishment of additional wetland conditions.

APPENDIX A

Field Data Forms

2004 Pond Water Level Readings	
Pond Number	**Distance from waters edge to Bank-full Stake (feet)**
Pond 1	14.0
Pond 2	12.0
Pond 3	9.0
Pond 4	6.0

2004 Piezometer Readings	
Piezometer Number	**Water level depth below ground surface (feet)**
P-1	5.3
P-2	Dry to base (> 2 feet)
P-3	2.4
P-4	Dry to base (> 2 feet)
P-5	Not recorded – outside of project site.
P-6	Not recorded – outside of project site.
P-7	2.0
P-8	2.4
P-9	1.3
P-10	3.1
P-11	3.8
P-12	6.5
P-13	Dry to base (8.3 feet)
P-14	6.0

2004 10 M^2 Vegetation Sample Plots Located at Piezometers P-3, P-4, P-7, P-8, P-9, and P-10		
Plot P-3		
Species Name	**Cover Class***	**Wetland Indicator Status****
Mel alb	2	Facu
Spa pec	4	Facw-obl
Men spp.	1	Fac
Fes spp.	2	Facu+
Abr smi	1	Facu

* Cover classes: 1 = 1-5%, 2 = 5-25%, 3 = 25-50%, 4 = 50-75%, 5 = 75-95%, and 6 = 95-100%

** Definition of Indicator Status

NO = No indicator category exists for given species.

OBL = Occur almost always (estimated probability >99%) under natural conditions in wetlands.

FACW = Usually occur in wetlands (estimated probability 67% - 99%) but occasionally found in non-wetlands.

FAC = Equally likely to occur in wetlands or nonwetlands (estimated probability 34% - 66%).

FACU = Usually occur in nonwetlands (estimated probability 67% - 99%) but occasionally found in wetlands (estimated probability 1% - 33%).

Plot P-4		
Species Name	**Cover Class***	**Wetland Indicator Status**
Jun bal	3	Obl
Car neb	3	Obl
Car Aav	3	Obl
Car utr	1	Obl
Men arv	1	Facw

Plot P-7		
Species Name	**Cover Class**	**Wetland Indicator Status**
Sal exi	1	Obl
Car lan	4	Obl
Pop tri	1	Fac
Poa pra	2	Facu+
Agr sto	1	Fac+
Sal spp.	1	Obl
Cir arv	2	Facu+
Pot ans	2	Obl
Sci Ame	2	Obl
Bro spp.	1	
Epi gla	1	Obl
Jun bal	1	Obl

Plot P-8		
Species Name	**Cover Class**	**Wetland Indicator Status**
Cir arv	2	Facu
Pot ans	2	Obl
Poa pra	1	Facu
Agr sto	1	Fac+
Car lan	2	Obl
Jun bal	1	Obl
Men arv	1	Facu
Fes spp	3	N/A

Plot P-9		
Species Name	**Cover Class**	**Wetland Indicator Status**
Car aqu	1	Obl
Jun bal	2	Obl
Car neb	4	Obl
Agr sto	1	Fac+
Sal exi	1	Obl
Jun lon	2	Obl
Car lan	1	Obl

Plot P-10		
Species Name	**Cover Class**	**Wetland Indicator Status**
Car lan	4	Obl
Poa pra	1	Facu
Cir arv	1	Facu
Pot ans	2	Obl
Agr smi	2	Facu

2004 Transect Data Transect TR-1		
Plot 1		
Species Name	**Cover Class/Est. % Cover**	**Wetland Indicator Status**
Agr smi	5 (80)	Facu
Jun bal	2 (20)	Obl
Cir arv	1 (1-3)	Facu
Plot 2		
Agr smi	4 (50)	Facu
Jun bal	3 (30)	Obl
Equ arv	2 (10)	Obl
Cir arv	1 (trace)	Facu
Plot 3		
Agr smi	2 (20)	Facu
Cir can	2 (15)	Facu
Pot ars	1 (3)	Obl
Agr sto	2 (10)	Fac+
Equ arv	1 (trace)	Fac
Jun bal	3 (60)	Obl
Plot 4		
Agr smi	3 (40)	Facu
Jun bal	3 (40)	Obl
Cir arv	2 (10)	Facu
Plot 5		
Jun bal	5 (80)	Obl
Agr smi	2 (15)	Facu
Agr sto	1 (5)	Fac+
Equ arv	1 (trace)	Fac
Plot 6		
Jun bal	4 (60)	Obl
Cir arv	2 (10)	Facu
Agr smi	3 (30)	Facu
Plot 7		
Agr smi	3 (30)	Facu
Jun lon	2 (10)	Obl
Jun bal	3 (50)	Obl
Agr sto	2 (10)	Fac+
Plot 8		
Bro spp	4 (70)	N/A
Cir arv	2 (10)	Facu
Jun bal	3 (30)	Obl
Plot 9		
Cir arv	2 (20)	Facu
Men spp.	2 (10)	Facw
Agr sto	3 (25)	Fac+
Car lan	2 (20)	Obl
Car aba	2 (20)	Obl

Appendix E

BIRD SURVEY PROTOCOL
GPS PROTOCOL

MDT Wetland Mitigation Monitoring
Norem Property
Big Timber, Montana

BIRD SURVEY PROTOCOL

The following is an outline of the MDT Wetland Mitigation Site Monitoring Bird Survey Protocol. Though each site is vastly different, the bird survey data collection methods must be standardized to a certain degree to increase repeatability. An Area Search within a restricted time frame will be used to collect the following data: a bird species list, density, behavior, and habitat-type use. There will be some decisions that team members must make to fit the protocol to their particular site. Each of the following sections and the desired result describes the protocol established to reflect bird species use over time.

Species Use within the Mitigation Wetland: Survey Method

Result: To conduct a bird survey of the wetland mitigation site within a restricted period of time and the budget allotment.

Sites that can be circumambulated or walked throughout.

These types of sites will include ponds, enhanced historic river channels, wet meadows, and any area that can be surveyed from the entirety of its perimeter or walked throughout. If the wetland is not uncomfortably inundated, conduct several "meandering" transects through the site in an orderly fashion (record the number and approximate location/direction of the transects in the field notebook; they do not have to be formalized or staked). If a very small portion of the site cannot be crossed due to inundation, this method will also apply. Though the sizes of the site vary, each site will require surveying to the fullest extent possible within a set time limit. The optimum times to conduct the survey are in the morning hours. Conduct the survey from sunrise to no later than 11:00 AM. (Note: some sites may have to be surveyed in the late afternoon or evening due to time constraints or weather; if this is the case, record the time of day and include this information in your report discussion.) If the survey is completed before 11:00 AM and no additions are being made to the list, then the task is complete. The overall limiting factor regarding the number of hours that are spent conducting this survey is the number of budgeted hours; this determination must be made by site by each individual.

In many cases, binoculars will be the only instrument that is needed to identify and count the birds using the wetland. If the wetland includes deep water habitat that can not be assessed with binoculars, then a scope and tripod are necessary. If this is the case, establish as many lookout posts as necessary from key vantage points to collect the data. Depending on the size of the open water, more time may be spent viewing the mitigation area from these vantage points than is spent walking the peripheries of more shallow-water wetlands.

Sites that cannot be circumambulated.

These types of sites will include large-bodied waters, such as reservoirs, particularly those with deep water habitat (>6 ft) close to the shore and no wetland development in that area of the shoreline. If one area of the reservoir was graded in such a way to create or enhance the development of a wetland, then that will be the area in which the ambulatory bird survey is conducted. The team member must then determine the length of the shoreline that will be surveyed during each visit.

As stated above in the ambulatory site section, these large sites most likely will have to be surveyed from established vantage points.

Species Use within the Mitigation Wetland: Data Recording

Result: A complete list of bird species using the site, an estimate of bird densities and associated behaviors, and identification of habitat use.

1. Bird Species List

Record the bird species on the Bird Survey - Field Data Sheet using the appropriate 4-letter code of the common name. The coding uses the first two letters of the first two words of the birds' common name or if one name, the first four (4) letters. For example, mourning dove is coded MODO and mallard is MALL. If an unknown individual is observed, use the following protocol and define your abbreviation at the bottom of the field data sheet: unknown shorebird: UNSB; unknown brown bird (UNBR); unknown warbler (UNWA); unknown waterfowl (UNWF). For a flyover of a flock of unknown species, use a term that describes the birds' general characteristics and include the approximate flock size in parentheses; do not fill in the habitat column. For example, a flock of black, medium-sized birds could be coded: UNBB / FO (25). You may also note on the data sheet if that particular individual is using a constructed nest box.

2. Bird Density

In the office, sum the Bird Survey – Field Data Sheet data by species and by behavior. Record this data in the Bird Summary Table.

3. Bird Behavior

Bird behavior must be identified by what is known. When a species is simply observed, the behavior that it is immediately exhibiting is what is recorded. Only behaviors that have discreet descriptive terms should be used. The following terms are recommended: breeding pair individual (BP); foraging (F); flyover (FO); loafing (L; e.g. sleeping, roosting, floating with head tucked under wing are loafing behaviors); and, nesting (N). If more behaviors are observed that do have a specific descriptive word, use them and we will add it to the protocol; descriptive words or phrases such as "migrating" or "living on site" are unknown behaviors.

4. Bird Species Habitat Use

We are interested in what bird species are using which particular habitat within the mitigation wetlands. This data is easily collected by simply recording what habitat the species was initially observed. Use the following broad category habitat classifications: aquatic bed (AB - rooted floating, floating-leaved, or submergent vegetation); forested (FO); marsh (MA – cattail, bulrush, emergent vegetation, etc. with surface water); open water (OW – primarily unvegetated); scrub-shrub (SS); and upland buffer (UP); wet meadow (WM – sedges, rushes, grasses with little to no surface water). If other categories are observed onsite that are not suggested here, we will make a new category next year.

GPS Mapping and Aerial Photo Referencing Procedure

The wetland boundaries, photograph location points and sampling locations were field located with mapping grade Trimble Geo III GPS units. The data was collected with a minimum of three positions per feature using Course/Acquisition code. The collected data was then transferred to a PC and differentially corrected to the nearest operating Community Base Station. The corrected data was then exported to ACAD drawings in Montana State Plain Coordinates NAD 83 international feet.

The GPS positions collected and processed had a 68% accuracy of 7 feet except in isolated areas of Tasks .008 and .011, where it went to 12 feet. This is within the 1 to 5 meter range listed as the expected accuracy of the mapping grade Trimble GPS.

Aerial reference points were used to position the aerial photographs. This positioning did not remove the distortion inherent in all photos; this imagery is to be used as a visual aide only. The located wetland boundaries were given a final review by the wetland biologist and adjustments were made if necessary.

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

Appendix F

2004 MACROINVERTEBRATE SAMPLING PROTOCOL AND DATA

MDT Wetland Mitigation Monitoring
Norem Property
Big Timber, Montana

AQUATIC INVERTEBRATE SAMPLING PROTOCOL

Equipment List

- D-frame sampling net with 1 mm mesh. Wildco is a good source of these.
- Spare net.
- 1-liter plastic sample jars, wide-mouth. VWR has these: catalog #36319-707.
- 95% ethanol: Northwest Scientific in Billings carries this.

All these other things are generally available at hardware or sporting goods stores. Make the labels on an ink jet printer preferably.

- hip waders.
- pre-printed sample labels (printed on Rite-in-the-Rain or other coated paper, two labels per sample).
- pencil.
- plastic pail (3 or 5 gallon).
- large tea strainer or framed screen.
- towel.
- tape for affixing label to jar.
- cooler with ice for sample storage.

Site Selection

Select the sampling site with these considerations in mind:

- Select a site accessible with hip waders. If substrates are too soft, lay a wide board down to walk on.
- Determine a location that is representative of the overall condition of the wetland.

Sampling

Wetland invertebrates inhabit the substrate, the water column, the stems and leaves of aquatic vegetation, and the water surface. Your goal is to sweep the collecting net through each of these habitat types, and then to combine the resulting samples into the 1-liter sample jar.

Dip out about a gallon of water into the pail. Pour about a cup of ethanol into the sample jar. Fill out the top half of the sample labels, using pencil, since ink will dissolve in the ethanol.

Ideally, you can sample a swath of water column from near-shore outward to a depth of approximately 3 feet with a long sweep of the net, keeping the net at about half the depth of the water throughout the sweep. Sweep the water surface as well. Pull the net through a vegetated area, beneath the water surface, for at least a meter of distance.

Sample the substrate by pulling the net along the bottom, bumping it against the substrate several times as you pull.

This step is optional, but it gives you a chance to see that you've collected some invertebrates. Rinse the net out into the bucket, and look for insects, crustaceans, etc. If necessary, repeat the sampling process in a nearby location, and add the net contents to the bucket. Remember to sample all four environments.

Sieve the contents of the bucket through the straining device and pour or carefully scrape the contents of the strainer into the sample jar.

If you skip the bucket-and-sieve steps, simply lift handfuls of material out of the sampling net into the jars. In either case, please include some muck or mud and some vegetation in the jar. Often, you will have collected a large amount of vegetable material. If this is the case, lift out handfuls of material from the sieve into the jar, until the jar is about half full. Please limit material you include in the sample, so that there is only a single jar for each sample.

Top off the sample jar with enough ethanol to cover all the material in the jar. Leave as little headroom as possible.

It is not necessary to sample habitats in any specified order. Keep in mind that disturbing the habitats prior to sampling will chase off the animals you are trying to capture.

Complete the sample labels. Place one label inside the sample jar and tape the other label securely to the outside of the jar. Dry the jar before attaching the outer label if necessary. In some situations, it may be necessary to collect more than one sample at a site. If you take multiple samples from the same site, clearly indicate this by using individual sample numbers, along with the total number of samples collected at the site (e.g. Sample #3 of 5 total samples).

Photograph the sampled site.

Sample Handling/Shipping

- In the field, keep collected samples cool by storing them in a cooler. Only a small amount of ice is necessary.
- Inventory all samples, preparing a list of all sites and enumerating all samples, before shipping or delivering to the laboratory.
- Deliver samples to Rhithron.

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

METHODS

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

The method employed to assess these wetlands is based on constructing an index using a battery of 12 bioassessment metrics or attributes (Table1) tested and recommended by Stribling et al. (1995) in a report to the Montana Department of Health and Environmental Science. In that study, it was determined that some of the metrics were of limited use in some geographic regions, and for some wetland types. Despite that finding, all 12 metrics are used in this evaluation of mitigated wetlands, since detailed geographic information and wetland classifications were unavailable.

Scoring criteria for metrics were developed by generally following the tactic used by Stribling et al. Boxplots were generated using a statistical software package, and distributions, median values, ranges, and quartiles for each metric were examined. All sites in all years of sampling were used. Camp Creek, which was sampled in 2002, 2003, and 2004, was assessed using the tested metric battery developed for montane streams of Western Montana (Bollman 1998).The fauna at the Camp Creek site was different from that of the other sites, and suggested montane stream conditions rather than wetland conditions. For the wetlands, “optimal” scores were generally those that fell above the 75th percentile (for those metrics that decrease in value in response to stress) or below the 25th percentile (for metrics that respond to stress by an increase in value) of all scores. Additional scoring ranges were established by bisecting the range below the 75th percentile for decreasing scores (or above the 25th percentile for increasing scores) into “sub-optimal” and “poor” assessment categories. A score of 5, 3, or 1 was assigned to optimal, sub-optimal, and poor metric performance, respectively. In this way, metric values were translated into normalized metric scores, and scores for all metrics were summed to produce a total bioassessment score. Total bioassessment scores were classified according to a similar process, using the ranges and distributions of total scores for all sites studied in all years.

The purpose of constructing an index from biological attributes or metrics is to provide a means of integrating information to facilitate the determination of whether management action is needed. The nature of the action needed is not determined solely by the index score, however, but by consideration of an analysis of the component metrics, the taxonomic composition of the assemblages, and other issues. The diagnostic functions of the metrics and taxonomic data need more study; our understanding of the interrelationships of natural environmental factors and anthropogenic disturbances are tentative. Thus, the further interpretive remarks accompanying the raw taxonomic and metric data are offered cautiously.

Sample processing

Aquatic invertebrate samples were collected at mitigation wetland sites in the summer months of 2001, 2002, 2003, and 2004 by personnel of Land and Water Consulting, Inc. Sampling procedures utilized were based on the protocols developed by the Montana Department of Environmental Quality (MT DEQ). Sampling consisted of D-frame net sweeps through emergent vegetation (when present), the water column, over the water surface, and included disturbing and scraping substrates at each sampled sites. Samples were preserved in ethanol at each wetland site and subsequently delivered to Rhithron Associates, Inc. for processing, taxonomic determinations, and data analysis.

At Rhithron's laboratory, Caton subsamplers and stereomicroscopes with 10X magnification were used to randomly select a minimum of 100 organisms, when possible, from each sample. In some cases, the entire sample contained fewer than 100 organisms; in these cases, all organisms from the sample were taken. Taxa were identified in general accordance with the taxonomic resolution standards set out in the MT DEQ Standard Operating Procedures for Sampling and Sample Analysis (Bukantis 1998). All samples were re-identified by a second taxonomist for quality assurance purposes. The identified samples have been archived at Rhithron's laboratory. Taxonomic data and organism counts were entered into an Excel 2000 spreadsheet, and metrics were calculated and scored using spreadsheet formulae.

Bioassessment metrics

An index based on the performance of 12 metrics was constructed, as described above. Table 1 lists those metrics, describes their calculation and the expected response of each to increased degradation or impairment of the wetland.

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

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

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

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

RESULTS

In 2001, 29 sites were sampled statewide. Nineteen of these sites were revisited in 2002, and 13 new sites were sampled. In 2003, 17 sites that had been visited in both 2001 and 2002 were re-sampled, and 11 sites sampled for the first time in 2001 were re-visited. In addition, 2 new sites were sampled. In 2004, 25 sites were re-visited, and 6 new sites were sampled. Thus, the 2004 database contains data for 122 sampling events at 50 unique sites. Table 2 summarizes sites and sampling years.

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

Literature cited

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

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

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

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

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

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

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

Table 3a.

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

Table 3b.

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

Table 3d.

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

Aquatic Invertebrate Taxonomic Data

Site Name NOREM **Date Collected**

Order	Family	Taxon	Count	Percent	Unique	BI	FFG
Basommatophora							
	Lymnaeidae						
		Stagnicola	2	12.50%	Yes	6	SC
Coleoptera							
	Haliplidae						
		Peltodytes	1	6.25%	Yes	5	SH
Diptera							
	Ceratopogonidae						
		Ceratopogoninae	3	18.75%	Yes	6	PR
	Chironomidae						
		Dicrotendipes	1	6.25%	Yes	8	CG
		Endochironomus	1	6.25%	Yes	10	SH
		Micropsectra	1	6.25%	Yes	4	CG
		Pseudochironomus	2	12.50%	Yes	5	CG
		Tanytarsus	1	6.25%	Yes	6	CF
Ephemeroptera							
	Caenidae						
		Caenis	1	6.25%	Yes	7	CG
Odonata							
	Coenagrionidae						
		Coenagrionidae	1	6.25%	Yes	7	PR
Trombidiformes							
		Acari	2	12.50%	Yes	5	PR
Grand Total			**16**				

Aquatic Invertebrate Data Summary

Project ID: MDT04LW
STORET Station ID:
Station Name: NOREM

Activity ID:
Sample Date:

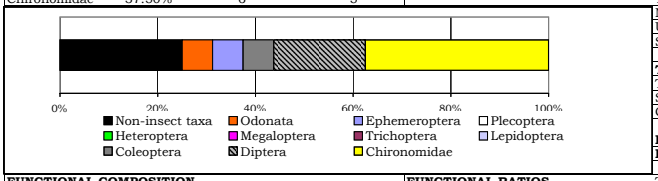
Sample type	
SUBSAMPLE TOTAL ORGANISMS	16
Portion of sample used	100.00%
Estimated number in total sample	16
Conversion factor	1.345
Estimated number in 1 square meter	22
Sampling effort	
Habitat type	
EPT abundance	1
Taxa richness	11
Number EPT taxa	1
Percent EPT	6.25%

TAXONOMIC COMPOSITION

GROUP	PERCENT	ABUNDANCE	#TAXA
Non-insect taxa	25.00%	4	2
Odonata	6.25%	1	1
Ephemeroptera	6.25%	1	1
Plecoptera	0.00%	0	0
Heteroptera	0.00%	0	0
Megaloptera	0.00%	0	0
Trichoptera	0.00%	0	0
Lepidoptera	0.00%	0	0
Coleoptera	6.25%	1	1
Diptera	18.75%	3	1
Chironomidae	37.50%	6	5

TAXONOMIC RATIOS

METRIC	VALUE
EPT/Chironomidae	0.17
Baetidae/Ephemeroptera	0.00
Hydropsychidae/Trichopt	#DIV/0!

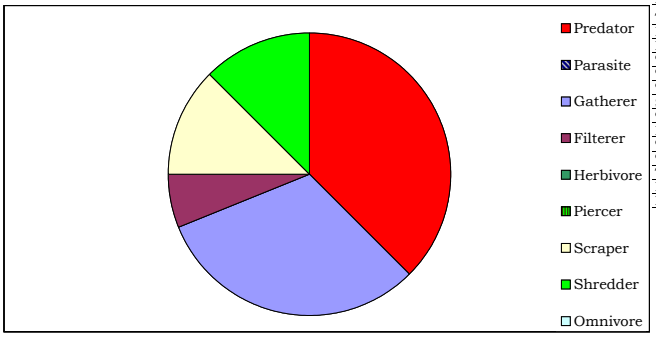


FUNCTIONAL COMPOSITION

GROUP	PERCENT	ABUNDANCE	#TAXA
Predator	37.50%	6	3
Parasite	0.00%	0	0
Gatherer	31.25%	5	4
Filterer	6.25%	1	1
Herbivore	0.00%	0	0
Piercer	0.00%	0	0
Scraper	12.50%	2	1
Shredder	12.50%	2	2
Omnivore	0.00%	0	0
Unknown	0.00%	0	0

FUNCTIONAL RATIOS

METRIC	VALUE
Scraper/Filterer	2.00
Scraper/Scraper + Filtere	0.67



COMMUNITY TOLERANCES

Sediment tolerant taxa	1
Percent sediment tolerant	12.50%
Sediment sensitive taxa	0
Percent sediment sensitive	0.00%
Metals tolerance index (McGuire)	3.80
Cold stenotherm taxa	0
Percent cold stenotherms	0.00%

HABITUS MEASURES

Hemoglobin bearer richness	3
Percent hemoglobin bearers	25.00%
Air-breather richness	0
Percent air-breathers	0.00%
Burrower richness	3
Percent burrowers	37.50%
Swimmer richness	1
Percent swimmers	6.25%

DOMINANCE

TAXON	ABUNDANCE	PERCENT
Ceratopogoninae	3	18.75%
Stagnicola	2	12.50%
Acari	2	12.50%
Pseudochironomus	2	12.50%
Coenagrionidae	1	6.25%
SUBTOTAL 5 DOMINANTS	10	62.50%
Caenis	1	6.25%
Peltodytes	1	6.25%
Dicrotendipes	1	6.25%
Endochironomus	1	6.25%
Micropsectra	1	6.25%
TOTAL DOMINANTS	15	93.75%

TOLERANCE/CONDITION INDICES

Community Tolerance Quotient (CTQa)	104.00
Hilsenhoff Biotic Index	6.06

DIVERSITY

Shannon H (loge)	3.53
Shannon H (log2)	2.45
Margalef D	3.60
Simpson D	0.05
Evenness	0.22

VOLTINISM

TYPE	ABUNDANCE	# TAXA	PERCENT
Multivoltine	8	6	50.00%
Univoltine	7	4	43.75%
Semivoltine	1	1	6.25%

TAXA CHARACTERS	#TAXA	PERCENT
Tolerant	6	43.75%
Sensitive	0	0.00%
Clinger	1	6.25%

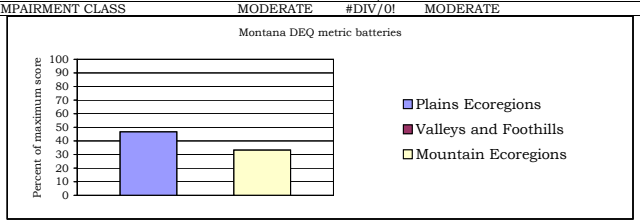
BIOASSESSMENT INDICES

B-IBI (Karr et al.)

METRIC	VALUE	SCORE
Taxa richness	11	1
E richness	1	1
P richness	0	1
T richness	0	1
Long-lived	1	1
Sensitive richness	0	1
%tolerant	43.75%	3
%predators	37.50%	5
Clinger richness	1	1
%dominance (3)	43.75%	5
	TOTAL SCORE	20 40%

MONTANA DEQ INDICES (Bukantis 1998)

METRIC	VALUE	Plains Ecoregions	Valleys and Foothills	Mountain Ecoregions
Taxa richness	11	0	0	0
EPT richness	1	0	0	0
Biotic Index	6.06	1	0	0
%Dominant taxon	18.75%	3	3	3
%Collectors	37.50%	3	3	3
%EPT	6.25%	0	0	0
Shannon Diversity	2.45	2		
%Scrapers +Shredde	25.00%	2	2	1
Predator taxa	3	1		
%Multivoltine	50.00%	2		
%H of T	#DIV/0!		#DIV/0!	
TOTAL SCORES		14	#DIV/0!	7
PERCENT OF MAXIMUM		46.67	#DIV/0!	33.33
IMPAIRMENT CLASS		MODERATE	#DIV/0!	MODERATE



Montana Valleys and Foothills revised index (Bollman 1998)

Percent max.	11.11%	Impairment class	SEVERE

Montana Plains ecoregions metrics (Bramblett and Johnson 2002)

Riffle		*Pool*	
EPT richness	1	E richness	1
Percent EPT	6.25%	T richness	0
Percent Oligochaetes and Leeches	0.00%	Percent EPT	6.25%
Percent 2 dominants	31.25%	Percent non-insect	25.00%
Filterer richness	1	Filterer richness	1
Percent intolerant	0.00%	Univoltine richness	4
Univoltine richness	4	Percent supertolerant	12.50%
Percent clingers	6.25%		
Swimmer richness	1		

Appendix G

NOREM PRELIMINARY WETLAND CREDIT ASSESSMENT LETTER (COE 2002)

MDT Wetland Mitigation Monitoring
Norem Property
Big Timber, Montana

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

REPLY TO ATTENTION OF:

August 2, 2002

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

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

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

Dear Mr. Norem:

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

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

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

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

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

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

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

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

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

Sincerely,

Allan Steinle

Allan Steinle
Montana Program Manager

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