MONTANA DEPARTMENT OF TRANSPORTATION
WETLAND MITIGATION MONITORING REPORT: YEAR 2006

Musgrave Lake
Zurich, Montana

Prepared for:

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

Prepared by:

POST, BUCKLEY, SCHUH, & JERNIGAN
P.O. Box 239
Helena, MT 59624

December 2006

Project No: B43054.00 - 0304

PBSJ

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1.0 INTRODUCTION

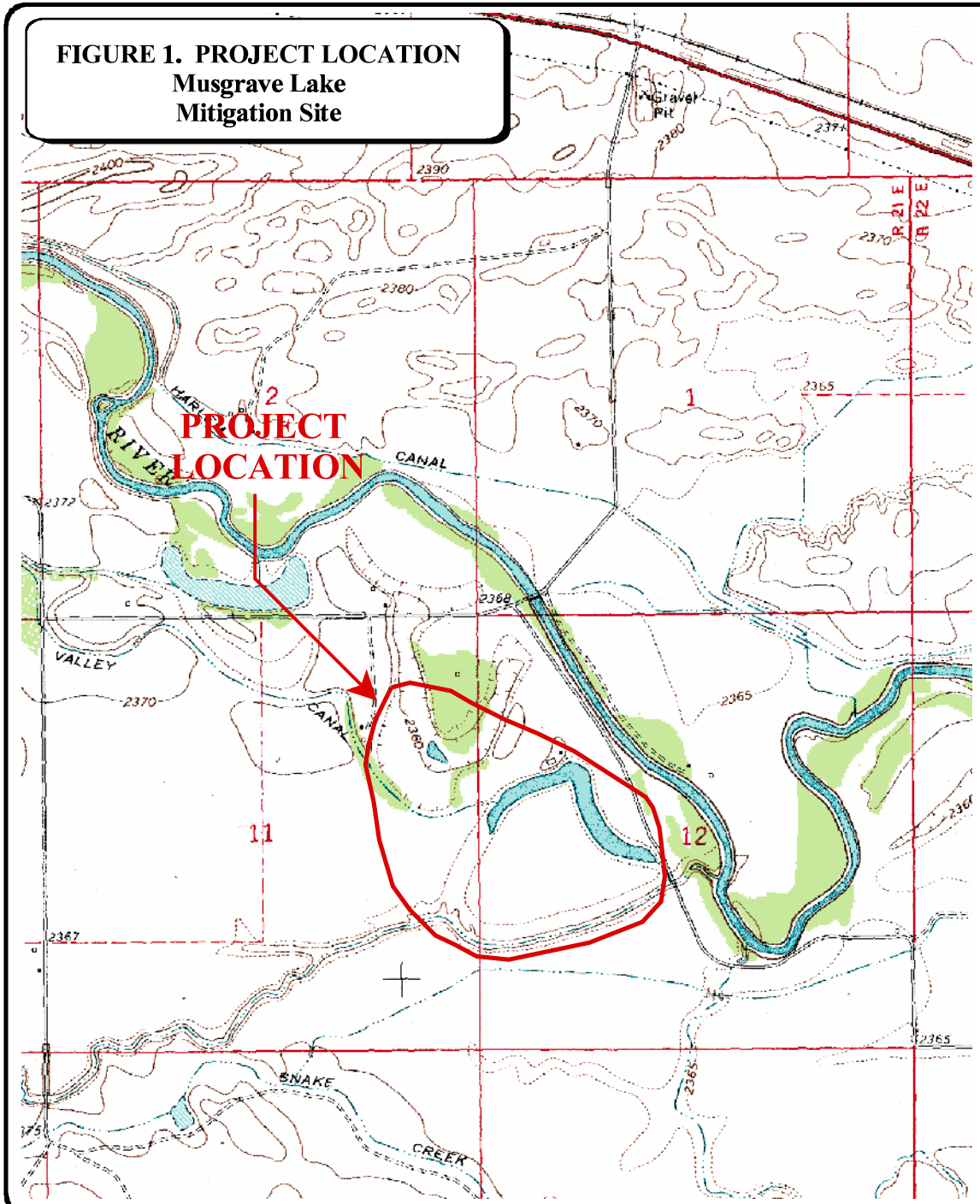
This report documents the sixth year of monitoring at the Musgrave Lake wetland mitigation project. The project was constructed in late 2000/early 2001 in Watershed 11 (Milk River). It is anticipated that this site will compensate for wetland impacts resulting from several proposed Montana Department of Transportation (MDT) highway and bridge reconstruction projects along the U.S. Highway 2 corridor between Havre and Harlem. Constructed on private land in the MDT Great Falls District, the mitigation site is located approximately four miles south of Zurich and the U.S. Highway 2 corridor within 0.25 mile of the Milk River in Blaine County (**Figure 1**). The goal of the project is to restore hydrology via construction of ditch plugs in natural drained wetland basins and historic oxbow sections, providing at least 27.2 acres of wetland credit within the confines of a 100-acre conservation easement. The approximate monitored easement limits are depicted on **Figures 2** and **3** (**Appendix A**) as "monitoring limits", while the actual easement limits are shown on the map in **Appendix D**. The agreement between the landowner and MDT specifies that approximately 27.2 acres of wetland credit will be developed.

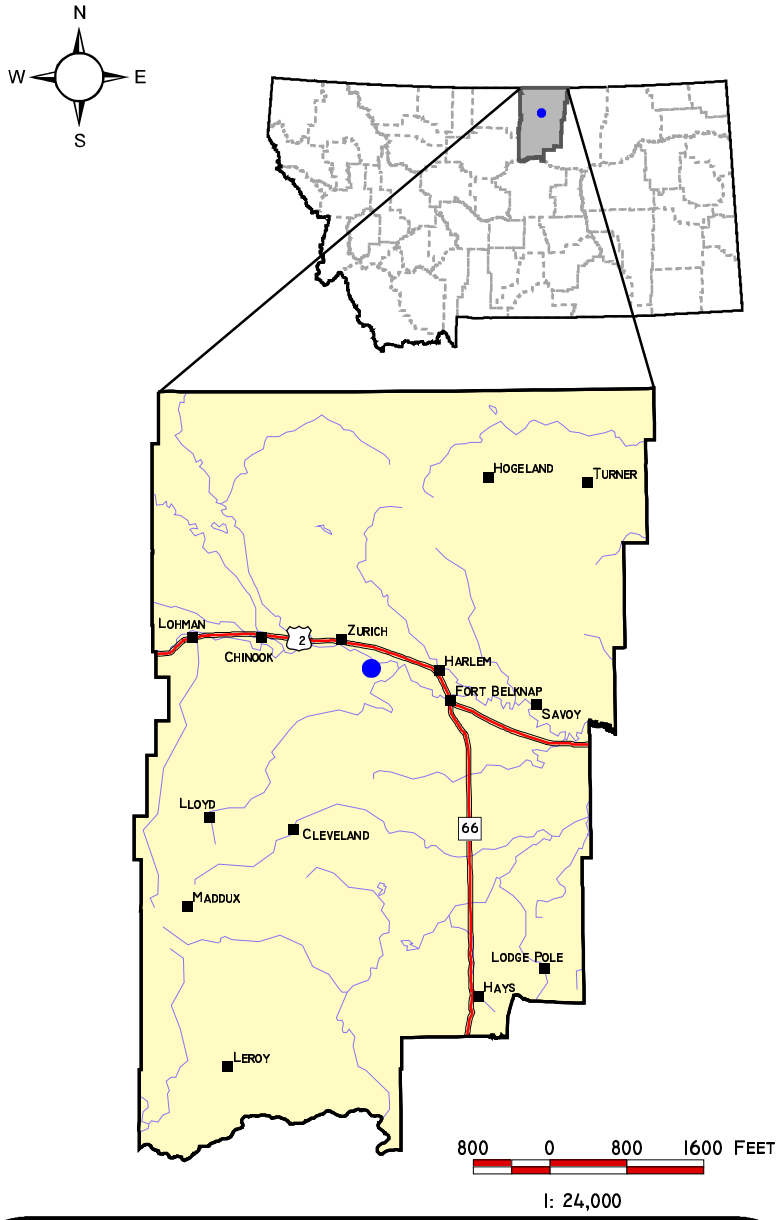
The original conceptual layout is provided in **Appendix D**. The project was originally comprised of two "restoration" sites and two "enhancement" sites. Restoration Site 1 (RS1) occurs in a basin in the northwest corner of the mitigation area. Restoration Site 2 (RS2) occurs within a drained and farmed historic oxbow section of Musgrave Lake located along the south property boundary. Wetland hydrology in these areas is to be supplied by precipitation, surface runoff, and possibly groundwater, and is anticipated to result in maximum depths of 3-3.5 feet and 1-1.5 feet at RS1 and RS2, respectively.

Approximately 4.6 acres of impaired, low-quality wetlands were delineated by MDT at RS1 prior to project implementation. However, given the restoration of hydrology, the COE has approved allocation of 1:1 credit at the two basins, inclusive of these existing impaired wetlands (1:1 ratio) (Urban pers. comm.). No pre-project wetlands were delineated by MDT at RS2. A target of 24.5 "restoration" credit acres was established in these two basins by the landowner (Musgrave Lake Ranch LLC [MLR] 2001). An additional 0.75 acre of credit was proposed by the landowner and tentatively approved by the COE (2001) for maintenance of at least three acres of 75-foot wide upland buffer around all wetland and riparian areas (4:1 ratio).

The project further intended to enhance approximately 11 acres of Musgrave Lake at two areas within the easement. These are referenced as Enhancement Site 1 (ES1) and Enhancement Site 2 (ES2) (**Figure 2** in **Appendix A**). Although largely consisting of existing wetland, ES1, the "middle" portion of Musgrave Lake, was separated from the lake's southern arm by an earthen dike and was impacted by a large drainage ditch, a perched culvert causing headcutting & associated sedimentation, and chronic overgrazing. ES2, the northeast end of Musgrave Lake, was also wetland and was thought to be impaired by grazing. The project attempts to remedy these problems by relocating the water control structure, installing a larger culvert, and revising the grazing system. Grazing will be prohibited for five years, after which grazing prescriptions will follow a Natural Resources Conservation Service grazing management plan. Assuming that appropriate increase in wetland functional condition was achieved, a ratio of 3:1 was tentatively approved for enhancement by the COE.

FIGURE 1. PROJECT LOCATION
Musgrave Lake
Mitigation Site





PROJECT #: 430054.019
DATE: NOVEMBER 2006
LOCATION:
PROJ. MANAGER: J. BERGLUND
DRAWN BY: BN/LL

LAND & WATER CONSULTING, INC.
1120 CEDAR PO BOX 8254 MISSOULA, MT 59807

The original wetland credit breakdown proposed by the landowner (MLR 2001) and tentatively approved by the COE (2001), once performance standards are met, is listed in **Table 1**.

Table 1: ***Original wetland credit breakdown for Musgrave Lake Wetland Mitigation Site.***

Area	Acreage	Ratio	Credit
Restoration Site 1	13.6	1:1	13.60
Restoration Site 2	10.9	1:1	10.90
Enhancement Sites 1 and 2	11.2	3:1	3.70
Upland Buffer	3.0	4:1	0.75
Total [1]	**38.7 acres**		**28.95 Credits [1]**

[1] *The agreement between the landowner and MDT specifies that approximately 27.2 acres of wetland credit will be developed; this is the minimum target for the project.*

ES2 was dropped from monitoring in 2002-2005 per COE / MDT discussions as it was considered to be a reasonably well-functioning system. However, this area was approved for preservation credit at 6:1 in 2006, as was the reference area wetland within the existing easement (**Figure 2** in **Appendix A**; COE 2006). Consequently, ES2 was monitored and the reference wetland was delineated in 2006. Further, the COE approved restoration/rehabilitation credit (1.5:1 ratio), rather than enhancement credit (3:1), for ES1 as this more accurately describes the mitigation activity at this location, given updated Montana COE mitigation definitions (COE 2006).

As a result, the following credit ratios were applied to the project in 2006:

- RS1, RS2, and any additional created or restored wetlands: 1:1
- ES1 (pre-existing wetlands that were rehabilitated): 1.5:1
- ES2 and Reference Wetland (preserved areas): 6:1
- Upland Buffer: 4:1

The site was previously monitored in 2001, 2002, 2003, 2004, and 2005. This report documents the results of 2006 monitoring efforts. The monitoring area is illustrated in **Figure 2** in **Appendix A**.

2.0 METHODS

2.1 Monitoring Dates and Activities

The site was visited on May 24 (spring) and July 18 (mid-season) 2006. The primary purpose of the spring visit was to conduct a bird/general wildlife reconnaissance. The mid-May period was selected for the spring visit because monitoring between mid-May and early June is likely to detect migrant as well as early nesting activities for a variety of avian species (Carlson pers. comm.), as well as maximizing the potential for amphibian detection. In Montana, most amphibian larval stages are present by early June (Werner pers. comm.).

The mid-season visit was conducted to document vegetation, soil, and hydrologic conditions used to map wetlands. All information contained on the Wetland Mitigation Site Monitoring Form (**Appendix B**) was collected at this time. Activities and information conducted/collected included: wetland delineation; wetland/open water boundary mapping; vegetation community mapping; vegetation transects; soils data; hydrology data; bird and general wildlife use; photograph points; macro-invertebrate sampling; functional assessment; and (non-engineering) examination of dike structures.

2.2 Hydrology

Hydrologic indicators were evaluated at the site during the mid-season visit. Approximate designed water depths are shown on the conceptual restoration plan in **Appendix D**. Wetland hydrology indicators were recorded using procedures outlined in the COE 1987 Wetland Delineation Manual (Environmental Laboratory 1987). Hydrology data were recorded on COE Routine Wetland Delineation Data Forms (**Appendix B**).

All additional hydrologic data were recorded on the mitigation site monitoring form (**Appendix B**). Where possible, the boundary between wetlands and open water (no rooted vegetation) aquatic habitats was mapped on the aerial photograph and an estimate of the average water depth at this boundary was recorded.

No groundwater monitoring wells were installed at the site. If located within 18 inches of the ground surface (soil pit depth for purposes of delineation), groundwater depths were documented on the routine wetland delineation data form at each data point.

2.3 Vegetation

General dominant species-based vegetation community types (e.g., *Typha latifolia/Scirpus acutus*) were delineated on an aerial photograph during the mid-season visit. Standardized community mapping was not employed as many of these systems are geared towards climax vegetation and may not reflect yearly changes. Estimated percent cover of the dominant species in each community type was listed on the site monitoring form (**Appendix B**).

Four 10-foot wide belt transects were sampled during the mid-season monitoring event to represent the range of current vegetation conditions. Transects were evaluated at RS1, RS2, ES1, and ES2. Percent cover was estimated for each vegetative species for each successive vegetation community encountered within the "belt" using the following values: + (<1%); 1 (1-5%); 2 (6-10%); 3 (11-20%); 4 (21-50%); and 5 (>50%).

Approximate transect locations are depicted on **Figure 2** in **Appendix A**. The transects are used to evaluate changes over time, especially the establishment and increase of hydrophytic vegetation. Transect data were recorded on the mitigation site monitoring form. Photos along each transect were taken from both ends during the mid-season visit.

A comprehensive plant species list prepared for the site in 2001 was updated as new species were encountered. Woody species were not planted at this mitigation site. Consequently, no monitoring relative to the survival of such species was conducted.

2.4 Soils

Soils were evaluated during the mid-season visit according to hydric soils determination procedures outlined in the COE 1987 Wetland Delineation Manual. Soil data were recorded for each wetland determination point on the COE Routine Wetland Delineation Data Form (**Appendix B**). The most current terminology used by NRCS was used to describe hydric soils (USDA 1998).

2.5 Wetland Delineation

Wetland delineation was conducted during the mid-season visit at RS1, RS2, ES1, ES2, and the Reference Wetland according the 1987 COE Wetland Delineation Manual. The indicator status of vegetation was derived from the National List of Plant Species that Occur in Wetlands: Northwest Region 9 (Reed 1988). 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 Data Forms (**Appendix B**). The wetland/upland boundary was modified using 2005 and 2006 aerial photos. The wetland/upland boundary in combination with the wetland/open water habitat boundary was used to calculate the wetland area developed at each impoundment.

2.6 Mammals, Reptiles, and Amphibians

Mammal, reptile, and amphibian species observations and other positive indicators of use, such as vocalizations, were recorded on the wetland monitoring form during each visit. Indirect use indicators, including tracks; scat; burrows; eggshells; skins; bones; etc., were also recorded. Observations were recorded as the observer traversed the site while conducting other required activities. Direct sampling methods, such as snap traps, live traps, and pitfall traps, were not implemented. A comprehensive list of observed species was compiled.

2.7 Birds

Bird observations were recorded during each visit. No formal census plots, spot mapping, point counts, or strip transects were conducted. During the spring visit, observations were recorded in compliance with the bird survey protocol in **Appendix E**. During the mid-season visit, bird observations were recorded incidental to other monitoring activities. During all visits, observations were categorized by species, activity code, and general habitat association (**Field Data Forms** in **Appendix B**).

2.8 Macroinvertebrates

A total of four macroinvertebrate samples, one each at RS1, RS2, ES1, and ES2, were collected during the mid-season site visit and data recorded on the wetland mitigation monitoring form.

Macroinvertebrate sampling procedures are included in **Appendix F**. The approximate locations of these sample points are shown on **Figure 2** in **Appendix A**. Samples were preserved as outlined in the sampling procedure and sent to Rhithron Associates for analysis.

2.9 Functional Assessment

Functional assessment forms were completed at RS1, RS2, and ES1/ES2 using the 1999 MDT Montana Wetland Assessment Method (Berglund 1999). Field data necessary for this assessment were generally collected during each mid-season site visit. Pre-project functional assessments of the mitigation site and reference area were included in the 2001 monitoring report and are not provided in this document.

2.10 Photographs

Photographs were taken during the mid-season visit showing the current land use surrounding the site, the upland buffer, the monitored area, and the vegetation transects (**Appendix C**). The approximate location of photo points is shown on **Figure 2** in **Appendix A**. A description and compass direction for each photograph was recorded on the wetland monitoring form.

2.11 GPS Data

During the 2006 monitoring season, no survey points were collected with a GPS unit as most site features were recorded during 2001. These included vegetation transect beginning and ending locations, all photograph locations and wetland boundaries. Wetland boundary changes observed in 2006 were found to be most accurately documented by mapping onto 2005 and 2006 aerial photographs Procedures used for GPs mapping and aerial photography referencing are included in **Appendix E**.

2.12 Maintenance Needs

Dike structures were examined during site visits for obvious signs of breaching, damage, or other problems. This did not constitute an engineering-level structural inspection, but rather a cursory examination. Current or future potential problems were documented.

3.0 RESULTS

3.1 Hydrology

In 2006, substantial inundation was again observed at each of the four monitored sites. Water depths ranged between approximately 2 inches and six feet. Open water areas mapped during previous years had largely filled in with aquatic vegetation in 2004, and had filled in further in 2005 and 2006. Specific recorded water depths are provided on the attached data forms. According to the Western Regional Climate Center, mean monthly precipitation totals from January through July between 1948 and 2005 totaled 8.6 inches for the Chinook station. During 2005, 8.8 inches of precipitation were recorded in Chinook between January and July. Data for

2006 were incomplete for June and July, although precipitation for April-May in 2006 was 2.98 inches, as compared to 2.64 inches during the same period in 2005.

RS1 was virtually 100 percent inundated, with an average depth of about two feet and a range of depths from two inches to an estimated four feet. Deepest areas were located in the center of the impoundment. A groundwater component appears to contribute to this site, possibly resulting from upslope irrigation ditch seepage.

RS2 was approximately 100 percent inundated, with an average depth of 6 inches and a depth range of 6inches to five feet in inundated areas. A deep pool occurs where water enters the site through a culvert at the northwest end. The entire site east of the ditch/dike was inundated during the summer visit, and was in the process of filling during the spring visit. Inundation at the east end increased in 2006 over past limits, maximizing inundation potential at this site.

ES1 and ES2 were again virtually 100 percent inundated during spring and summer visits, with an average depth of approximately 2 feet and a range of depths from 6 to 30 inches.

3.2 Vegetation

Vegetation species identified on the site are presented in **Table 2** and on the attached data form. As of 2006, nine wetland community types were identified and mapped on the mitigation area (**Figure 3** in **Appendix A**). These included Type 1: *Typha latifolia*/*Scirpus acutus*, Type 2: *Polygonum amphibium*, Type 3: *Salix exigua/Elaeagnus angustifolia*, Type 4: *Potamogeton*/*Myriophyllum*, Type 5: *Carex*, Type 6: *Hordeum jubatum*/*Rumex crispus*; Type 7: *Populus deltoides*, and Type 8: *Rumex crispus*. Type 9: *Scirpus maritimus / Beckmannia syzigachne* and Type 10: *Beckmannia syzigachne* were added in 2004. Dominant species within each of these communities are listed on the attached data form (**Appendix B**).

Type 1 occurs commonly at all sites. Type 2 occurs primarily in newly developing wetland areas of RS1 and RS2, and in 2003 was reduced to primarily *Polygonum amphibium* communities, with far less *Alopecurus pratensis* than observed in previous years. Consequently, this community type was revised from *Polygonum amphibium* / *Alopecurus pratensis* to simply *Polygonum amphibium* in 2003. Type 3 occurs in patches at RS1, ES1, and RS2. Type 4 occurs in the deeper portions of ES1, ES2, and RS2, and throughout the main impoundment at RS1. Aquatic vegetation in Type 4 increased dramatically in 2004, both in terms of density and diversity, and continued to increase in 2005 and 2006. Types 5 and 6 occur primarily at ES1. Type 7 occurs mainly along the south and east fringe of RS1. Type 8 occurs as a fringe around RS1 and in small patches at RS2. Type 9 developed within the main body of RS1, while Type 10 developed within ES1 and along the north perimeter of RS1.

Upland communities generally range from kochia (*Kochia scoparia*) and smooth brome (*Bromus inermis*)-dominated areas, to hayland dominated by alfalfa (*Medicago sativa*) and/or foxtail barley (*Hordeum jubatum*).

Vegetation transect results are detailed in the attached data form (**Appendix B**), and are summarized in **Tables 3 - 6** and in **Charts 1 - 8**.

Table 2: ***2001-2006 Musgrave Lake vegetation species list.***

Species[1]	Region 9 Wetland Indicator Status	Species	Region 9 Wetland Indicator Status
Acer negundo	FAC+	*Melilotus alba*	FACU
Agropyron intermedium	--	*Myriophyllum spicatum*	OBL
Agropyron repens	FACU	*Najas flexilis*	
Agropyron smithii	FACU	*Najas guadalupensis*	
Agrostis alba	FACW	*Phalaris arundinacea*	FACW
Alisma gramineum	OBL	*Phleum pretense*	FAC-
Alisma plantago-aquatica	OBL	*Plantago major*	FAC+
Alopecurus pratensis	FACW	*Poa bulbosa*	--
Apocynum androsaemifolium	--	*Poa pratensis*	FAC
Arctium minus	--	*Polygonum amphibium*	OBL
Asclepias speciosa	FAC+	*Polygonum erectum*	FACW-
Asparagus officinalis	--	*Polygonum lapathifolium*	FACW
Beckmannia syzigachne	OBL	*Polygonum persicaria*	FACW
Bromus inermis	--	*Populus deltoides*	FAC
Carex lanuginosa	OBL	*Potamogeton natans*	OBL
Carex praegracilis	FACW	*Potamogeton pectinatus*	OBL
Carex stipata	OBL	*Potentilla anserina*	OBL
Carex utriculata	OBL	*Potentilla gracilis*	FAC
Carex vesicaria	OBL	*Prunus virginiana*	FACU
Carex vulpinoidea	OBL	*Ranunculus occidentalis*	FAC
Chenopodium album	FAC	*Rosa nutkana*	FAC-
Cicuta douglasii	OBL	*Rumex crispus*	FACW
Cirsium arvense	FAC-	*Sagittaria cuneata*	OBL
Cornus stolonifera	FACW	*Salix amygdaloides*	OBL
Elaeagnus angustifolia	FAC	*Salix exigua*	OBL
Eleocharis acicularis	OBL	*Salix lutea*	OBL
Eleocharis palustris	OBL	*Scirpus acutus*	OBL
Elodea canadensis	OBL	*Scirpus americanus*	OBL
Festuca sp.	--	*Scirpus maritimus*	OBL
Glyceria grandis	OBL	*Scirpus validus*	OBL
Glycyrrhiza lepidota	FAC+	*Sium suave*	OBL
Helianthus annuus	FACU+	*Solidago canadensis*	FACU
Hordeum jubatum	FAC-	*Spartina pectinata*	OBL
Iva xanthifolia	FAC	*Sparganium emersum*	OBL
Juncus effuses	FACW	*Sparganium eurycarpum*	OBL
Kochia scoparia	FAC	*Symphoricarpos occidentalis*	--
Lactuca serriola	FAC-	*Taraxacum officinale*	FACU
Lemna minor	OBL	*Tragopogon dubium*	--
Lycopus americanus	OBL	*Typha latifolia*	OBL
Medicago sativa	--	*Utricularia intermedia*	OBL

Table 3: ***Transect 1 (RS1) data summary.***

Monitoring Year	2001	2002	2003	2004	2005	2006
Transect Length (feet)	500	500	500	500	500	500
# Vegetation Community Transitions along Transect	4	6	6	7	6	6
# Vegetation Communities along Transect	3	4	4	6	5	5
# Hydrophytic Vegetation Communities along Transect	2	3	3	5	4	4
Total Vegetative Species	19	16	16	21	20	20
Total Hydrophytic Species	8	9	9	15	13	13
Total Upland Species	11	7	7	6	7	7
Estimated % Total Vegetative Cover	100	25	20	70	70	70
% Transect Length Comprised of Hydrophytic Vegetation Communities	68	33	17	90	96	96
% Transect Length Comprised of Upland Vegetation Communities	32	3	3	<1	4	4
% Transect Length Comprised of Unvegetated Open Water	0	64	80	9	0	0
% Transect Length Comprised of Bare Substrate	0	0	0	0	0	0

Table 4: ***Transect 2 (ES1) data summary.***

Monitoring Year	2001	2002	2003	2004	2005	2006
Transect Length (feet)	86	86	86	86	86	86
# Vegetation Community Transitions along Transect	1	1	2	2	1	1
# Vegetation Communities along Transect	2	2	3	3	2	2
# Hydrophytic Vegetation Communities along Transect	1	1	2	2	1	1
Total Vegetative Species	13	14	9	11	10	9
Total Hydrophytic Species	10	10	6	8	7	6
Total Upland Species	3	4	3	3	3	3
Estimated % Total Vegetative Cover	100	100	70	80	85	85
% Transect Length Comprised of Hydrophytic Vegetation Communities	79	79	83	83	83	83
% Transect Length Comprised of Upland Vegetation Communities	21	21	17	17	17	17
% Transect Length Comprised of Unvegetated Open Water	0	0	0	0	0	0
% Transect Length Comprised of Bare Substrate	0	0	0	0	0	0

Table 5: ***Transect 3 (RS2) data summary.***

Monitoring Year	2001	2002	2003	2004	2005	2006
Transect Length (feet)	170	170	170	170	170	170
# Vegetation Community Transitions along Transect	2	2	3	3	2	2
# Vegetation Communities along Transect	2	2	3	3	2	2
# Hydrophytic Vegetation Communities along Transect	1	1	2	2	1	1
Total Vegetative Species	13	12	9	14	12	13
Total Hydrophytic Species	6	6	4	8	7	8
Total Upland Species	7	6	5	6	5	5
Estimated % Total Vegetative Cover	100	100	80	90	90	90
% Transect Length Comprised of Hydrophytic Vegetation Communities	47	47	85	88	88	88
% Transect Length Comprised of Upland Vegetation Communities	53	53	15	12	12	12
% Transect Length Comprised of Unvegetated Open Water	0	0	0	0	0	0
% Transect Length Comprised of Bare Substrate	0	0	0	0	0	0

Table 6: ***Transect 4 (ES2) data summary.***

Monitoring Year	2001	2002	2003	2004	2005	2006
Transect Length (feet)	137	na	na	na	na	137
# Vegetation Community Transitions along Transect	5	na	na	na	na	3
# Vegetation Communities along Transect	4	na	na	na	na	3
# Hydrophytic Vegetation Communities along Transect	3	na	na	na	na	2
Total Vegetative Species	20	na	na	na	na	12
Total Hydrophytic Species	15	na	na	na	na	7
Total Upland Species	5	na	na	na	na	5
Estimated % Total Vegetative Cover	100	na	na	na	na	100
% Transect Length Comprised of Hydrophytic Vegetation Communities	67	na	na	na	na	78
% Transect Length Comprised of Upland Vegetation Communities	33	na	na	na	na	22
% Transect Length Comprised of Unvegetated Open Water	0	na	na	na	na	0
% Transect Length Comprised of Bare Substrate	0	na	na	na	na	0

Chart 1: ***Transect maps showing vegetation types from start (0 feet) to the end (500 feet) of Transect 1 (RS1) for each year monitored.***

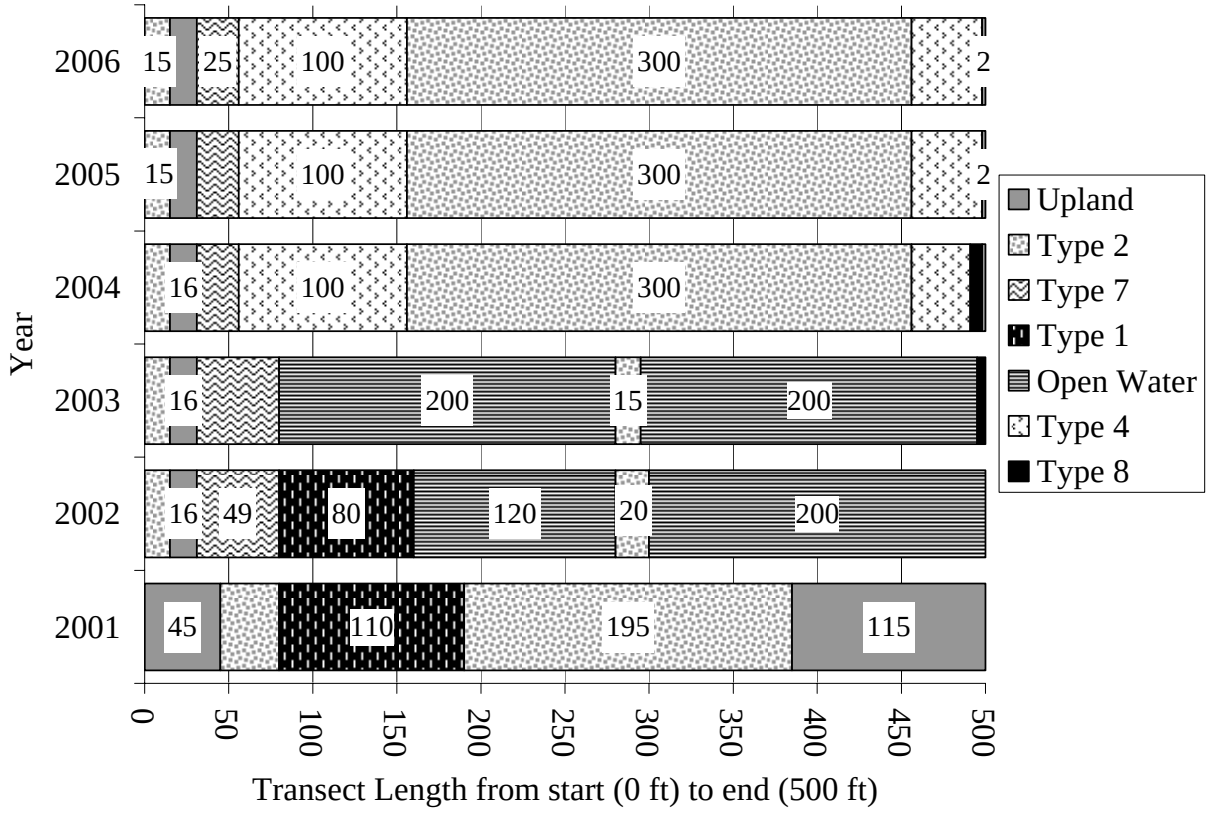


Chart 2: ***Transect maps showing vegetation types from start (0 feet) to the end (86 feet) of Transect 2 (ES1) for each year monitored.***

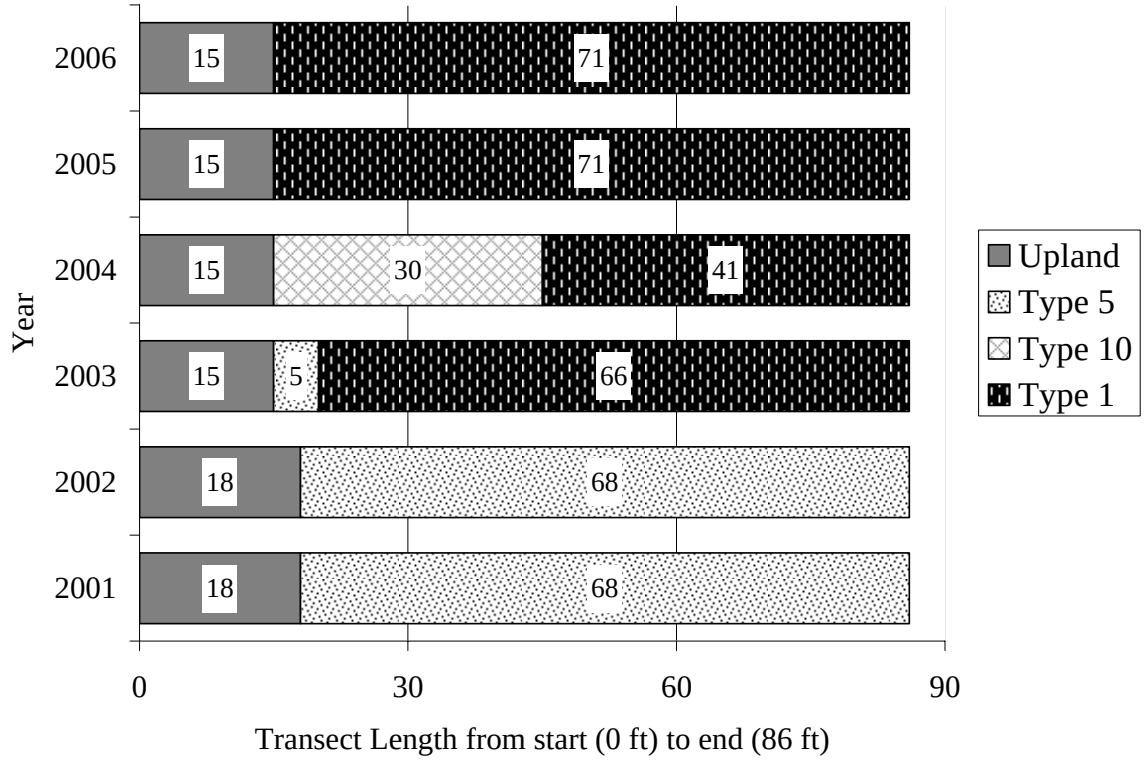


Chart 3: ***Transect maps showing vegetation types from start (0 feet) to the end (170 feet) of Transect 3 (RS2) for each year monitored.***

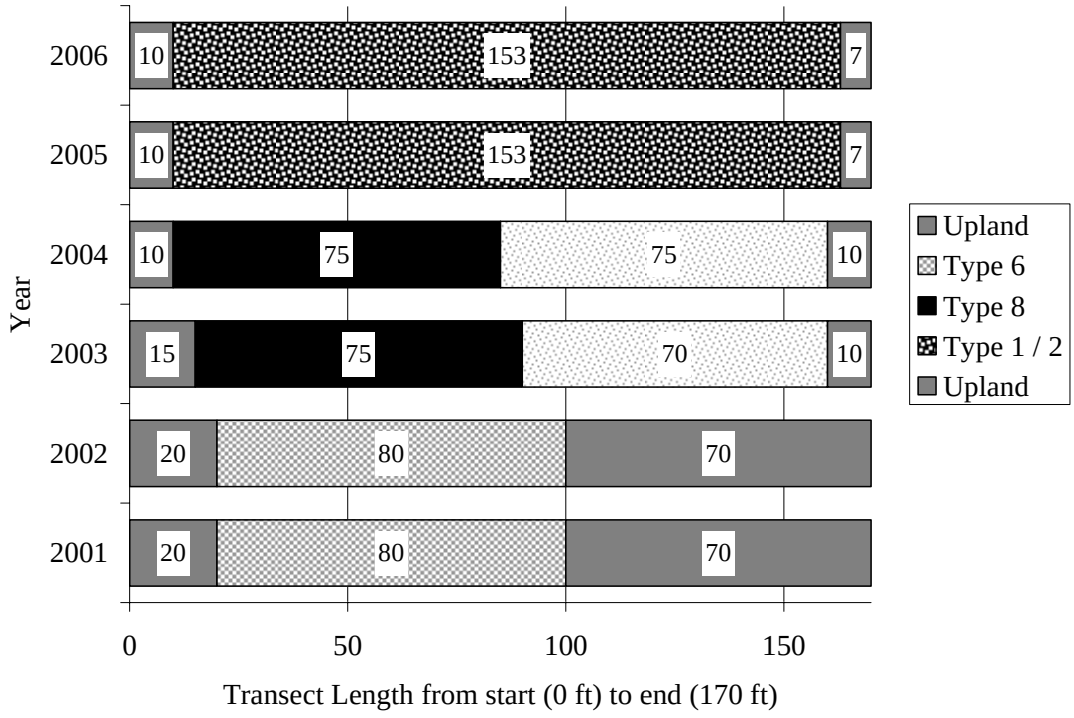


Chart 4: ***Transect maps showing vegetation types from start (0 feet) to the end (137 feet) of Transect 4 (ES2) for each year monitored.***

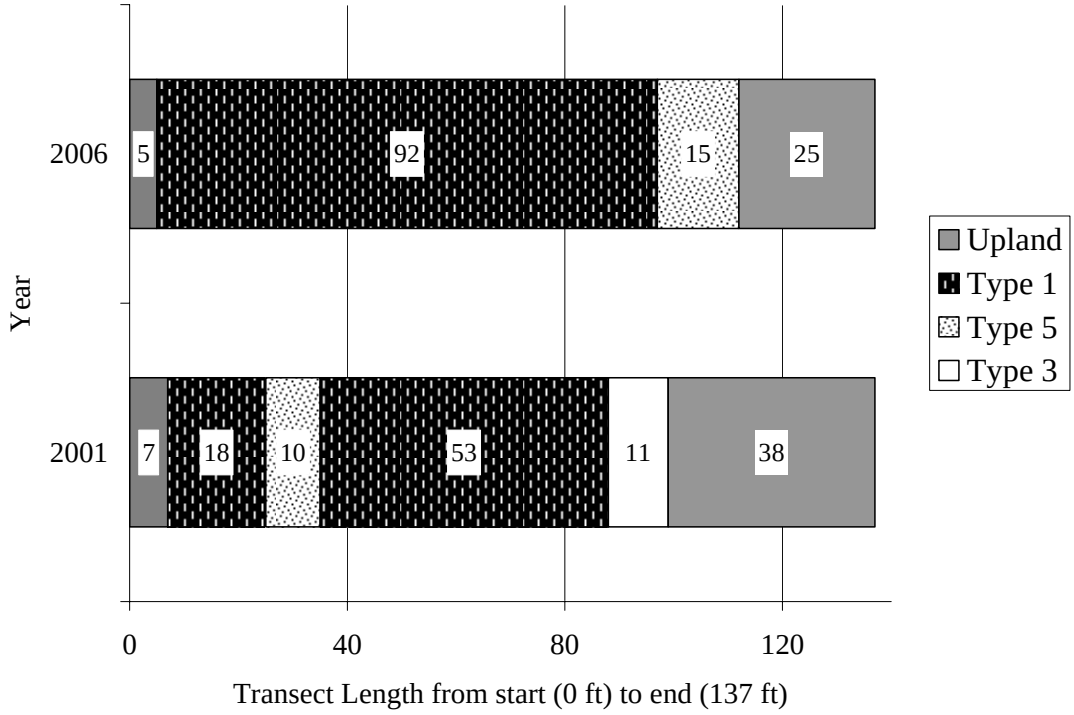


Chart 5: ***Length of vegetation communities within Transect 1 (RS1) for each year monitored.***

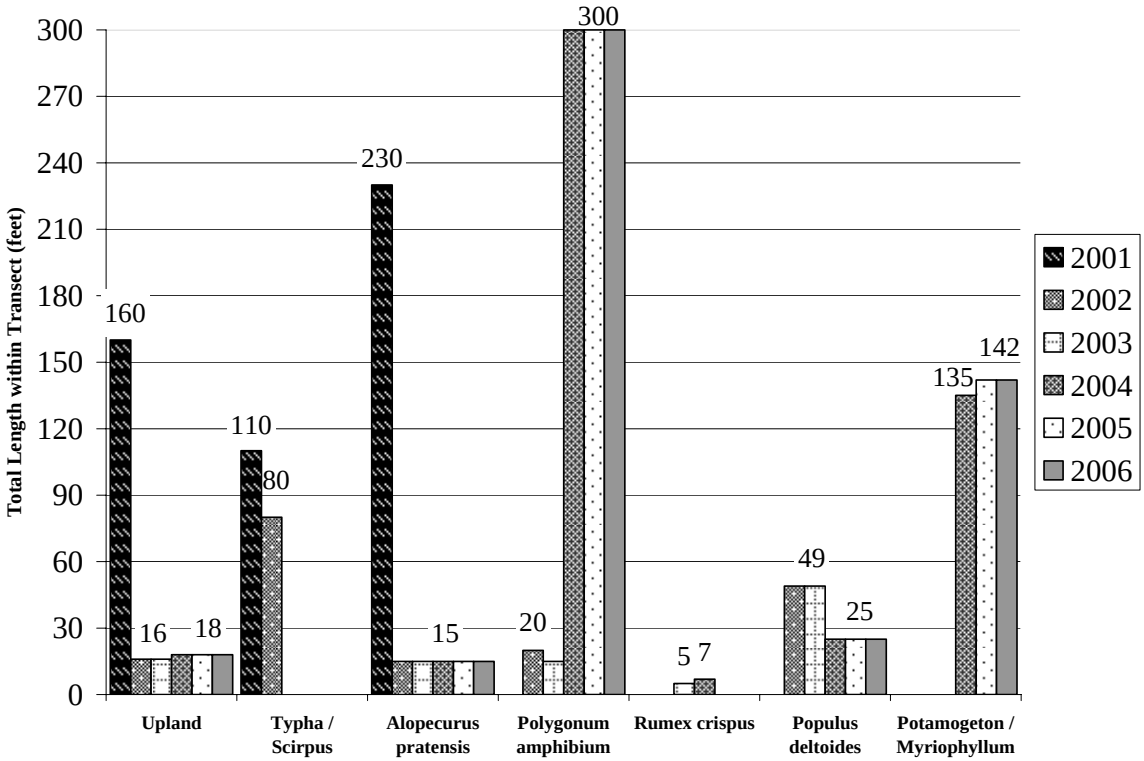


Chart 6: ***Length of vegetation communities within Transect 2 (ES1) for each year monitored.***

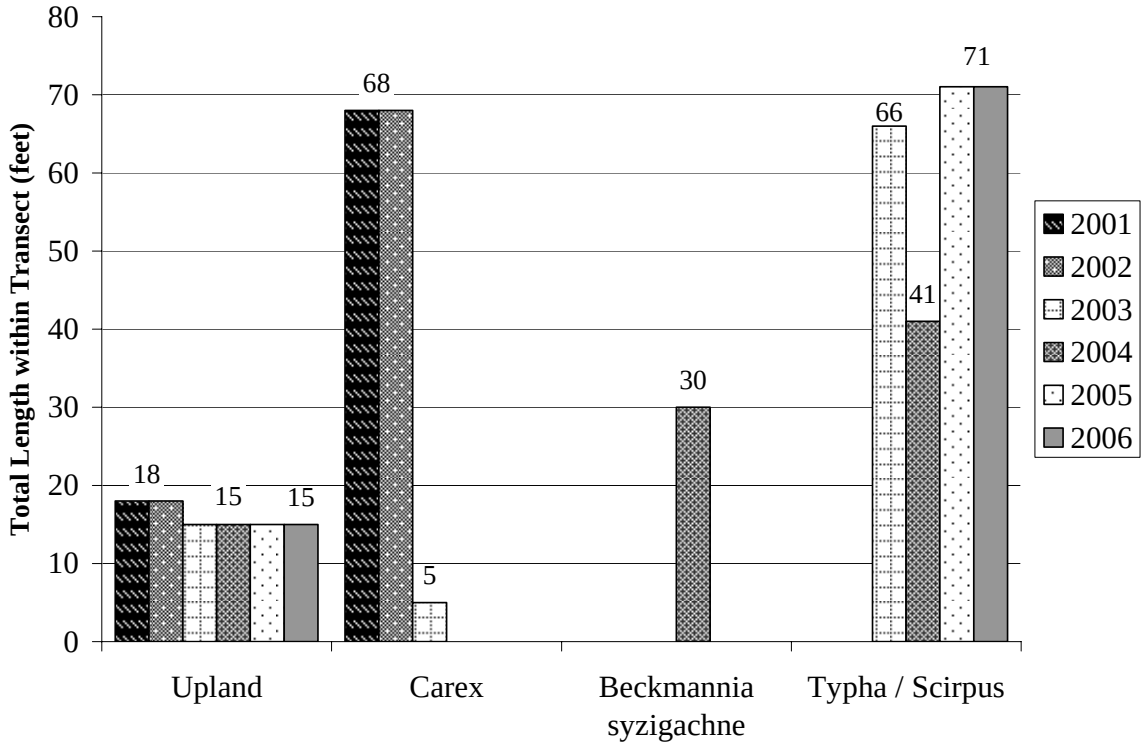


Chart 7: ***Length of vegetation communities within Transect 3 (RS2) for each year monitored.***

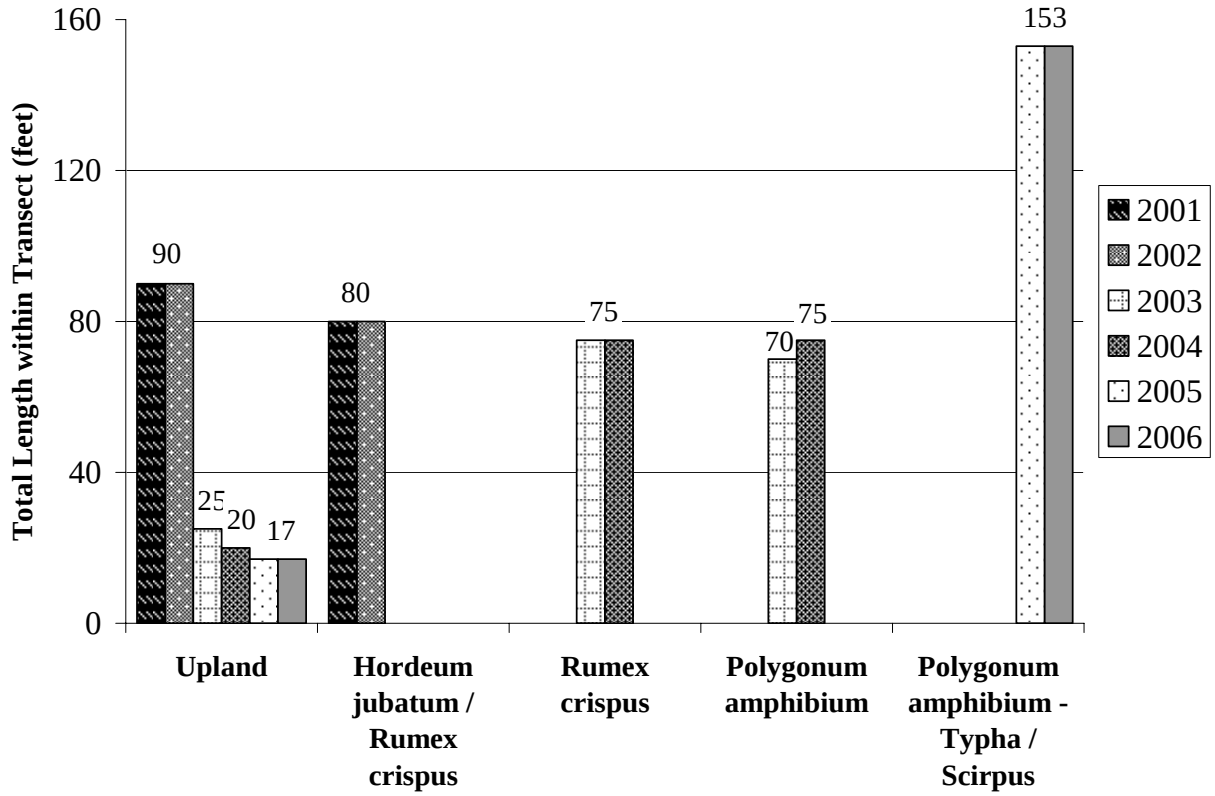
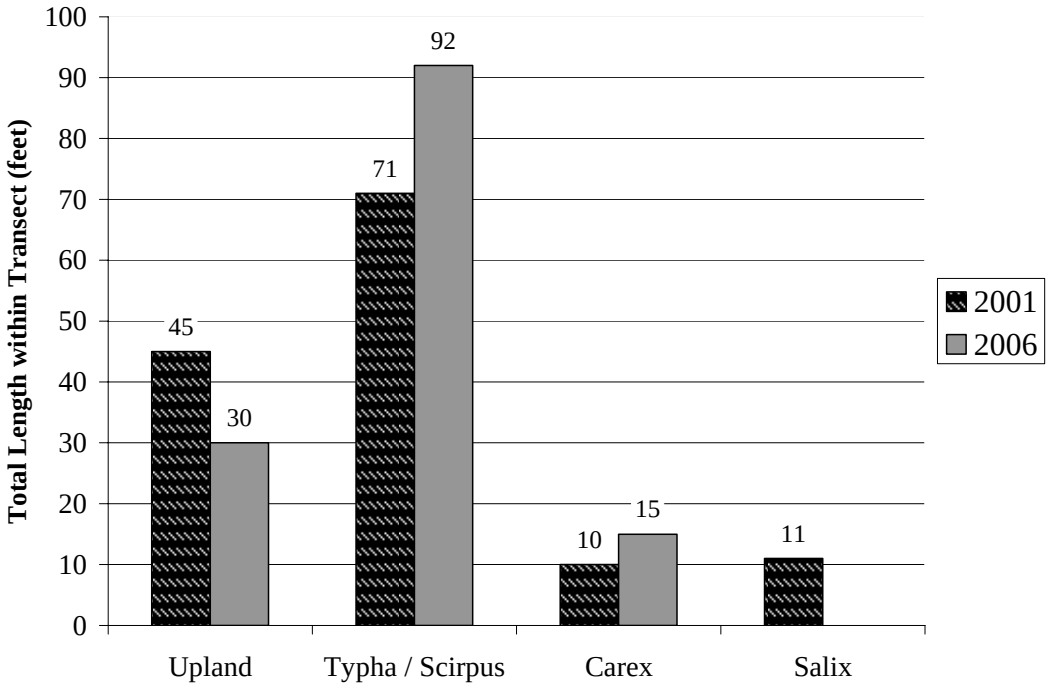


Chart 8: ***Length of vegetation communities within Transect 4 (ES2) for each year monitored.***



3.3 Soils

According to the Blaine County soil survey (Soil Conservation Service 1986), soils at RS1 and the proposed enhancement areas are Typic Fluvaquents. These are somewhat poorly drained or poorly drained silty clays and silty clay loams that formed in alluvium in areas with seasonally high water tables, usually during the irrigation season. Typic Fluvaquents are not suited to cultivated crops, windbreaks, or most urban uses due to flooding and general wetness.

These characteristics were generally confirmed during monitoring. Soils sampled in wetland areas along the RS1 transect consistently were comprised of silty clays / clay loams with a matrix color of 2.5Y4/2 with mottles in the range of 2.5 Y 5/6 or 10YR 5/8, indicating a fluctuating water table. Soils along the ES1 and ES2 transects were comprised of silty clay loam with a matrix color of 10 YR 3/1. Wetland soils were saturated or inundated at the time of the survey.

Soils at RS2 consist of Havre silty clay loam, saline. This is a well-drained soil formed in alluvium on flood plains and stream terraces. Permeability is moderately slow, and the available water capacity is moderate because of the effects of salts and sodium. According to the soil survey, this soil type is often subject to rare flooding. Soils were sampled at RS2 along the transect. Soils were comprised of silty clay loams with a matrix color of 2.5YR 4/2 and distinct mottles of a 2.5YR 4/6 color. Soils were inundated during the survey. Soils in this area have developed stronger hydric characteristics as the hydroperiod has increased.

3.4 Wetland Delineation

Delineated wetland boundaries are illustrated on **Figure 3** in **Appendix A**. Completed wetland delineation forms are included in **Appendix B**. Soils, vegetation, and hydrology are discussed in preceding sections. Delineation results for 2006 are as follows:

RS1: 4.59 wetland acres impaired pre-existing, but currently "restored".
8.7 acres of additional emergent, aquatic bed, scrub-shrub and forested wetland.
Total of 13.29 acres of aquatic habitat delineated in 2006.

RS2: 0 wetland acres pre-existing.
Total of 10.21 acres of wetlands delineated in 2006.

ES1: Approximately 4.8 wetland acres pre-existing within easement area.
0.97 acre additional wetlands delineated as of 2006.
Total of 5.77 wetland acres in 2006.

ES2: Approximately 3.64 acres pre-existing wetland / open water area within easement.
0.16 acre additional wetlands delineated as of 2006.
Total of 3.8 acres in 2006.

Reference Area Wetland: 5.29 wetland acres pre-existing and delineated in 2006

Approximately 24.63 wetland/aquatic habitat acres have been "restored" or created within the mitigation site easement to date (RS1: 13.29 acres; RS2: 10.21 acres; ES1: 0.97 acre; ES2: 0.16 acre), while approximately 4.8 acres have been rehabilitated (ES1) and 8.93 acres have been preserved (ES2: 3.64 acres; Reference wetland: 5.29 acres). Please refer to **Section 3.10** for application of appropriate credit ratios and actual credit totals.

3.5 Wildlife

Wildlife species, or evidence of wildlife, observed on the site during 2001-2006 monitoring efforts are listed in **Table 7**. Specific evidence observed, as well as activity codes pertaining to birds, is provided on the completed monitoring form in **Appendix B**. Four mammal, two amphibian, one reptile, and 38 bird species were noted using portions of the mitigation site during 2006 monitoring efforts. Several Blue-winged Teal (*Anas discors*) broods were again observed at RS1 and RS2 during the July visit.

Of special interest were observations of northern leopard frogs (*Rana pipiens*) at each of the sites again during 2006. Leopard frogs are considered a "species of special concern" by the Montana Natural Heritage Program (MNHP) due largely to their apparent extirpation from the portion of their historic distribution west of the Continental Divide. This species has been assigned the rank of S1 (critically imperiled) in intermountain valleys and S3 (rare occurrence and/or restricted range and/or vulnerable to extinction) in the Great Plains region by the MNHP.

Table 7: *Fish and wildlife species observed on the Musgrave Lake Mitigation Site, 2001-2006.*

FISH	
Unidentified Minnow Species *(Hybognathus* sp.*)*	
AMPHIBIANS	
Northern Leopard Frog (*Rana pipiens*)	**Western Chorus Frog (*Pseudacris triseriata*)**
REPTILES	
Plains Garter Snake (*Thamnophis radix*)	
BIRDS	
American Coot (*Fulica americana*)	**Killdeer (*Charadrius vociferous*)**
American Crow (*Corvus brachyrhynchos*)	Least Flycatcher (*Empidonax minimus*)
American Kestrel (*Falco sparverius*)	Lesser Scaup (*Aythya affinis*)
American Robin (*Turdus migratorius*)	**Long-billed Curlew (*Numenius americanus*)**
American White Pelican (*Pelecanus erythrorhynchos*)	Long-billed Dowitcher (*Limnodromus scolopaceus*)
American Wigeon (*Anas Americana)*	**Mallard (*Anas platyrhynchos*)**
Bank Swallow (*Riparia riparia*)	Marbled Godwit (*Limosa fedoa*)
Barn Swallow (*Hirundo rustica*)	**Marsh Wren (*Cistothorus palustris*)**
Belted Kingfisher (*Ceryle alcyon)*	**Mourning Dove (*Zenaida macroura*)**
Black-billed Magpie (*Pica pica*)	**Northern Flicker (*Colaptes auratus*)**
Black-capped Chickadee (*Poecile atricapillus*)	Northern Harrier (*Circus cyaneus*)
Blue-winged Teal (*Anas discors*)	Northern Pintail (*Anas acuta*)
Bobolink (*Dolichonyx oryzivorus*)	Northern Rough-winged Swallow (*Stelgidopteryx serripennis*)
Brewer's Blackbird (*Euphagus cyanocephalus*)	**Northern Shoveler (*Anas clypeata*)**
Brown-headed Cowbird (*Molothrus ater*)	Orange-crowned Warbler (*Vermivora celata*)
Bufflehead (*Bucephala albeola*)	**Red-tailed Hawk (*Buteo jamaicensis)***
Bullock's Oriole (*Icterus bullockii*)	**Red-winged Blackbird (*Agelaius phoeniceus)***
California Gull (*Larus californicus*)	Ring-billed Gull (*Larus delawarensis*)
Canada Goose (*Branta canadensis*)	**Ring-necked Pheasant (*Phasianus colchicus*)**
Canvasback (*Aythya valisineria*)	**Rock Dove (*Columba livia*)**
Cedar Waxwing (*Bombycilla cedrorum*)	Savannah Sparrow (*Passerculus sandwichensis*)
Chipping Sparrow (*Spizella passerina*)	Sharp-tailed Grouse (*Tympanuchus phasianellus*)
Clay-colored Sparrow (*Spizella pallida*)	Solitary Sandpiper (*Tringa solitaria*)
Cliff Swallow (*Petrochelidon pyrrhonota*)	Song Sparrow (*Melospiza melodia*)
Common Grackle (*Quiscalus quiscula*)	**Sora (*Porzana carolina*)**
Common Merganser (*Mergus merganser*)	Spotted Sandpiper (*Actitis macularia*)
Common Nighthawk (*Chordeiles minor)*	Swainson's Hawk (*Buteo swainsoni*)
Common Snipe (*Gallinago gallinago*)	**Tree Swallow (*Tachycineta bicolor*)**
Common Tern (*Sterna hirundo*)	Upland Sandpiper (*Bartramia longicauda*)
Common Yellowthroat (*Geothlypis trichas)*	Warbling Vireo (*Vireo gilvus*)
Double-crested Cormorant (*Phalacrocorax auritus*)	Western Meadowlark (*Sturnella neglecta*)
Eastern Kingbird (*Tyrannus tyrannus*)	**Western Sandpiper (*Calidris mauri*)**
European Starling (*Sturnus vulgaris*)	Western Wood-pewee (*Contopus sordidulus*)
Franklin's Gull (*Larus pipixcan*)	Willet (*Catoptrophorus semipalmatus*)
Gadwall (*Anas strepera*)	Willow Flycatcher (*Empidonax traillii*)
Gray Catbird (*Dumetella carolinensis*)	**Wilson's Phalarope (*Phalaropus tricolor*)**
Great Horned Owl (*Bubo virginianus*)	**Wilson's Warbler (*Wilsonia pusilla*)**
Great Blue Heron (*Ardea herodias*)	Wood Duck (*Aix sponsa*)
Green-winged Teal (*Anas crecca*)	Yellow-rumped Warbler (*Dendroica coronata*)
House Wren (*Troglodytes aedon*)	**Yellow Warbler (*Dendroica petechia*)**
	Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*)
MAMMALS	
American Badger (*Taxidea taxus*)	Meadow Vole (*Microtus pennsylvanicus*)
American Beaver (*Castor canadensis*)	**Raccoon (*Procyon lotor*)**
Coyote (*Canis latrans*)	**Richardson's Ground Squirrel (*Spermophilus richardsonii*)**
Long-tailed Weasel (*Mustela frenata*)	**White-tailed Deer (*Odocoileus virginianus*)**

Bolded species were observed during 2006 monitoring. All other species were observed during one or more of the previous monitoring years.

3.6 Macroinvertebrates

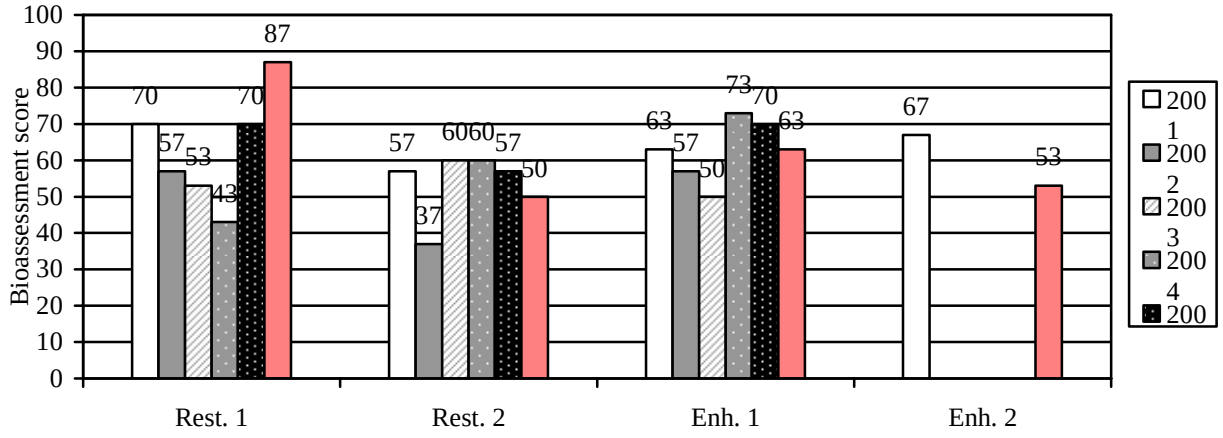
Macroinvertebrate sampling results are provided in **Appendix F** and are summarized below by Rhithron Associates (Bollman 2006). Bioassessment results are summarized in **Chart 9**.

Restoration Site 1. Optimal conditions have persisted at this site since 2005. A richer assemblage was present in 2006 than in the previous year. Overall abundance of invertebrates was within expectations; and POET taxa were common. The biotic index value and the presence of at least 2 mayfly taxa suggest that water quality was good at the site.

Restoration Site 2. Biting gnats (Ceratopogoninae) were very abundant in the sample collected at this site, suggesting that cattle may be present near this wetland. Biotic conditions apparently worsened here since 2005, as evidenced by falling taxa richness and loss of both POET taxa and chironomid taxa. Poor conditions are indicated by the bioassessment score.
Enhancement Site 1. Biotic conditions apparently worsened from optimal to sub-optimal between 2005 and 2006, judging from bioassessment scores. There was an increase in total taxa between the 2 years, which is mostly attributable to additional chironomid taxa. Snails (Physa sp. and Helisoma sp.) dominated the sample, suggesting that macrophyte surfaces were important invertebrate habitats here. There may have been an overall improvement in water quality, since the assemblage was somewhat more sensitive than in the past.

Enhancement Site 2. Prior to 2006, this site had not been sampled since 2001. Poor biological conditions were evident in 2006. Ceratopogonid gnats were very abundant, suggesting the influence of cattle at the site. Aquatic habitats were apparently limited; the site supported only 10 taxa, most of which were represented by single individual specimens.

Chart 9: Bioassessment Scores for Musgrave Lake, 2001-2006



3.7 Functional Assessment

Completed functional assessment forms are presented in **Appendix B**. Functional assessment results are summarized in **Table 8**. For comparative purposes, the functional assessment results for the reference wetland site and baseline conditions prepared by MDT and the landowner are also included in **Table 8**. Ratings and scores in 2006 were similar to those calculated in 2005 (**Table 8**). Scores for enhancement sites increased slightly in 2006 as both ES1 and ES2 are one contiguous wetland and were therefore assessed as one assessment area (ES2 was not functionally assessed in 2002-2005). All four sites remain Category II wetlands in 2006.

Based on the baseline functional assessments conducted by MDT and the landowner, the site has experienced a conservative gain of over 180 functional units (acreage x functional points) at RS1, and RS2, and ES1. This does not include any functional gain that may have occurred at ES2, as no baseline functional assessment was conducted at ES2 with which to compare the 2006 assessment. No pre-project functional assessment was conducted at RS2 due to the absence of pre-project wetlands. The composite score at all sites again exceeded the composite score for the reference wetland (6.6 points) in 2006.

3.8 Photographs

Representative photographs taken from photo-points and transect ends are provided in **Appendix C**. **Figures 2** and **3** (**Appendix A**) are based on the 2006 aerial photograph. Additionally, a comparison of aerial photographs from 2001-2006 is provided in **Appendix C**.

3.9 Maintenance Needs/Recommendations

All constructed dikes were in good condition during the spring and mid-season visits. A few small areas in the RS-2 "berm" (spoil pile) between the wetland and the irrigation ditch to the south were cleaving during the mid-season visit, with several small breach areas (some caused by beaver) spilling water from the site to the ditch. The overall water level in RS2 appeard unaffected by the breaches. MDT and the landowner were notified of this potential maintenance issue. Beaver had downed several cottonwoods along the east side of RS1 in 2006 – options (tree protection, trapping, etc.) should be examined to discourage this in the future. Lowering the water level slightly at RS1 may be necessary in the future to prevent drowning of existing mature cottonwoods.

3.10 Current Credit Summary

Approximately 24.63 wetland/aquatic habitat acres have been “restored” or created within the mitigation site easement to date (RS1: 13.29 acres; RS2: 10.21 acres; ES1: 0.97 acre; ES2: 0.16 acre). At 1:1 credit ratio, this equates to 24.63 credit acres.

Approximately 4.8 pre-existing wetland acres have been rehabilitated at ES1. At a 1.5:1 credit ratio, this amounts to 3.2 credit acres.

Table 8: ***Summary of 2006 wetland function/value ratings and functional points [1] at the Musgrave Lake Mitigation Project.***

Function and Value Parameters From the 1999 MDT Montana Wetland Assessment Method	Wetland Numbers					
	Reference Wetland (Stutzman 1999)	**Pre-Project RS1[2] (Stutzman 1999)**	**Pre-Project ES1 (MDT 1999)**	**2006 RS1**	**2006 RS2**	**2006 ES1/ES2**
Listed/Proposed T&E Species Habitat	Low (0.3)	Low (0.3)	Low (0.3)	Low (0.3)	Low (0.3)	Low (0.3)
MNHP Species Habitat	Mod (0.7)	Low (0.1)	Mod (0.7)	High (1.0)	High (1.0)	High (1.0)
General Wildlife Habitat	High (0.9)	Low (0.1)	Mod (0.7)	Exceptional (1.0)	High (0.9)	High (0.9)
General Fish/Aquatic Habitat	NA	NA	Low (0.3)	NA	NA	NA
Flood Attenuation	Mod (0.5)	Low (0.1)	Mod (0.5)	Mod (0.6)	Mod (0.6)	Mod (0.6)
Short and Long Term Surface Water Storage	High (1)	Low (0.2)	Low (0.3)	High (0.9)	High (0.9)	High (0.9)
Sediment, Nutrient, Toxicant Removal	Mod (0.7)	Mod (0.4)	Low (0.2)	NA	High (1.0)	High (1.0)
Sediment/Shoreline Stabilization	NA	NA	Low (0.2)	Mod (0.6)	NA	Mod (0.6)
Production Export/ Food Chain Support	High (0.9)	Mod (0.5) [Low 0.2]	Mod (0.7)	High (0.9)	High (0.9)	High (0.9)
Groundwater Discharge/Recharge	High (1)	NA	NA	High (1.0)	High (1)	High (1)
Uniqueness	Low (0.3)	Low (0.2)	Low (0.1)	Mod (0.6)	Mod (0.5)	Mod (0.5)
Recreation/Education Potential	Low (0.3)	Low (0.1)	Low (0.1)	Low (0.1)	Low (0.1)	Low (0.1)
Actual Points/Possible Points	6.6 / 10	2.0 / 9	4.1 / 11	7.0 / 10	7.2 / 10	7.8 / 11
% of Possible Score Achieved	66	22	37	70	72	71
Overall Category	II	III	III	II	II	II
Total Acreage of Assessed Aquatic Habitats within Easement (ac)	**6.5 (estimated)**	**4.59**	**4.8**	**13.29**	**10.21**	**5.77[3]**
Functional Units (acreage x actual points) (fu)	**42.90**	**9.18**	**19.68**	**93.03**	**73.51**	**45.01[3]**
Net Acreage Gain (ac)	**NA**	**NA**	**NA**	**8.7**	**10.21**	**0.97[3]**
Net Functional Unit Gain (fu)	**NA**	**NA**	**NA**	**83.85**	**73.51**	**25.33[3]**
Total Functional Unit Gain over baseline	**182.69[3]**					

[1] See completed MDT functional assessment forms in **Appendix B** for further detail.
[2] Production Export rating was corrected based on size of vegetated component in the AA and shown in bold; this resulted in site rating as Category III.
[3] Calculations pertain to acreage associated with ES1 only, as no baseline functional assessment was completed for ES2. Thus, functional unit gains are conservative.

Approximately 8.93 wetland/aquatic habitat acres have been preserved (ES2: 3.64 acres; Reference wetland: 5.29 acres) within the easement. At a 6:1 credit ratio, this equates to 1.49 credit acres.

Approximately 0.75 acre of credit is associated with the upland buffer surrounding wetlands. Consequently, the maximum assignable credit at this site (RS1, RS2, ES1, ES2, Reference wetland, and upland buffer) as of 2006 is approximately 24.63 + 3.2 + 1.49 + 0.75 = 30.07 acres, which exceeds the 27.2 acre goal.

The site has experienced a conservative gain of over 180 functional units (acreage x functional points) at RS1, and RS2, and ES1. The composite score at all sites again exceeded the composite score for the reference wetland (6.6 points) in 2006

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Appendix A

FIGURES 2 & 3

MDT Wetland Mitigation Monitoring
Musgrave Lake
Zurich, Montana

Figure 2 - Monitoring Activity Locations 2006

PROJECT NAME
MDT Musgrave Wetland Mitigation

DRAWING TITLE
Monitoring Activity Locations

PROJ NO: 43054.303	DRAWN: LL
LOCATION: Ft. Belknap, MT	PROJ MGR: J.Berglund
SCALE: 1"=300'	CHECKED: APPVD:
FILE NAME: L:\B43054.303\Musgrave\dwg\Musgrave2006.dwg	

LAND & WATER CONSULTING
P.O. BOX 8754
Missoula, MT 59807
A division of PBS

FIGURE
2 OF -
REV -
Nov/16/2006

Figure 3 - 2006 Mapped Site Features

LEGEND
Monitoring Area Limits
Wetland-Upland Boundary
Vegetation Community Boundary
Base Photograph - July 05, 2006

N
W E
S
SCALE 1"= 300ft

MONITORING AREA LIMITS
Reference Wetland (Pre-existing Wetlands)
Restoration Site #1
Enhancement Site #1
Enhancement Site #2
Restoration Site #2

Vegetation Types:
1. Typha/Scirpus
2. Polygonum
3. Salix
4. Potamogeton/Myriophyllum
5. Carex
6. Hordeum/Rumex
7. Populus
8. Rumex crispus
9. Scirpus/Beckmannia
10. Beckmannia

Wetland Areas:

Enhancement Site #1 - 2006
Net Area 5.77 Acres

Enhancement Site #2 - 2006
Net Area 3.80 Acres

Restoration Site #1 - 2006
Gross Wetland Area 18.58 Acres
Reference Wetland Area -5.29 Acres
Net Wetland Area 13.29 Acres

Restoration Site #2 - 2006
Net Area 10.21 Acres

PROJECT NAME
MDT Musgrave Wetland Mitigation

DRAWING TITLE
2006 Mapped Site Features

DRAWN: LL
PROJ MGR: J.Berglund
CHECKED: APPVD:

PROJ NO: 43054.303
LOCATION: Ft. Belknap, MT
SCALE: 1"=300'
FILE NAME: L:\B43054.303Musgrave\dwg\Musgrave2006.dwg

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FIGURE 3 OF -
REV -
Dec/05/2006

Appendix B

2006 WETLAND MITIGATION SITE MONITORING FORM
2006 BIRD SURVEY FORMS
2006 COE WETLAND DELINEATION FORMS
2006 FUNCTIONAL ASSESSMENT FORMS

MDT Wetland Mitigation Monitoring
Musgrave Lake
Zurich, Montana

LWC / MDT WETLAND MITIGATION SITE MONITORING FORM

Project Name: **Musgrave Lake** Project Number: **NH-STPX 3(33)**
Assessment Date: **July 18, 2006** Person(s) conducting the assessment: **Berglund**
Location: **S. of Zurich** MDT District: **Great Falls** Milepost: **417**
Legal Description: T **32N** R **21E** Section **11/12**
Weather Conditions: **dry, sunny** Time of Day: **10:30-15:30**
Initial Evaluation Date: **May 15, 2001** Monitoring Year: **6** # Visits in Year: **2**
Size of evaluation area: **100 acres** Land use surrounding wetland: **Hayland and pastures**

HYDROLOGY

Surface Water Source: **irrigation water, ground water, runoff / ppt.**
Inundation: **Present** Average Depth: **0-2 feet** Range of Depths: **0-6 feet**
Percent of assessment area under inundation: **99%**
Depth at emergent vegetation-open water boundary: **3 feet**
If assessment area is not inundated then are the soils saturated within 12 inches of surface: **Yes**
Other evidence of hydrology on the site (ex. – drift lines, erosion, stained vegetation, etc.):
RS1, RS2, ES1, and ES2 all inundated

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

Well Number	Depth	Well Number	Depth	Well Number	Depth

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

COMMENTS / PROBLEMS:
RS1 is 100% inundated, ave. depth is 2 feet, range of depths 2" to 4 feet. RS2 is 99% inundated, ave. depth is 1 foot, range of depths is 6" to 5 feet. A few areas in the RS-2 "berm" between the wetland and the irrigation ditch to the south are cleaving, with several small breach areas currently spilling water from the site to the ditch. ES1 is 100% inundated, ave. depth is 24", range of depths is 6" to 30". ES2 is 99% inundated, ave. depth is estimated at 3 feet, range of depths estimated at 6" to 6 feet.

VEGETATION COMMUNITIES

Community Number: **1** Community Title (main spp): **Typha latifolia / Scirpus acutus**

Dominant Species	% Cover	Dominant Species	% Cover
TYP LAT	5 = > 50%	POL AMP	3 = 11-20%
SCI ACU	4 = 21-50%	SAG CUN	1 = 1-5%
CAR LAN	4 = 21-50%	ALO PRA	1 = 1-5%
ELE PAL	2 = 6-10%	SPA EME	1 = 1-5%
CAR VES	4 = 21-50%	GLY ELA	+ = < 1%

Comments / Problems: **Very similar composition to 2001-2005**

Community Number: **2** Community Title (main spp): **Polygonum amphibium**

Dominant Species	% Cover	Dominant Species	% Cover
POL AMP	5 = > 50%	SAG CUN	1 = 1-5%
ALO PRA	1 = 1-5%	POT PEC	2 = 6-10%
RUM CRI	1 = 1-5%	UTR INT	2 = 6-10%
TYP LAT	1 = 1-5%	NAJ GUA	2 = 6-10%
SCI ACU	1 = 1-5%	ALI GRA	2 = 6-10%

Comments / Problems: **ALO PRA was removed from community type title from 2003-2006 due to lack of dominance.**

Community Number: **3** Community Title (main spp): **Salix**

Dominant Species	% Cover	Dominant Species	% Cover
SAL EXI	5 = > 50%	POL AMP	2 = 6-10%
SAL LUT	4 = 21-50%		
SAL AMY	5 = > 50%		
AGR ALB	3 = 11-20%		
BRO INE	2 = 6-10%		
CAR LAN	4 = 21-50%		

Comments / Problems: **Similar composition 2002-2006.**

Community Number: **4** Community Title (main spp): **Potomogeton / Myriophyllum**

Dominant Species	% Cover	Dominant Species	% Cover
POT PEC	5 = > 50%	ALI GRA	1 = 1-5%
MYR SPI	5 = > 50%	ELO CAN	2 = 6-10%
NAJ GUA	5 = > 50%		
UTR INT	5 = > 50%		
SAG CUN	2 = 6-10%		
POT GRA	1 = 1-5%		

Comments / Problems: **Similar composition 2004-2006**

VEGETATION COMMUNITIES (continued)

Community Number: **5** Community Title (main spp): **Carex**

Dominant Species	% Cover	Dominant Species	% Cover
CAR VUL	4 = 21-50%	AGR ALB	3 = 11-20%
CAR UTR	4 = 21-50%	POL AMP	1 = 1-5%
CAR VES	4 = 21-50%		
CAR LAN	4 = 21-50%		
TYP LAT	2 = 6-10%		
ALO PRA	2 = 6-10%		

Comments / Problems: **Similar in composition 2003-2005**

Community Number: **6** Community Title (main spp): **Hordeum jubatum / Rumex crispus**

Dominant Species	% Cover	Dominant Species	% Cover
HOR JUB	5 = > 50%		
RUM CRI	5 = > 50%		
AGR REP	4 = 21-50%		
POT ANS	1 = 1-5%		
CAR VES	2 = 6-10%		
FES ARU	1 = 1-5%		

Comments / Problems: ____

Community Number: **7** Community Title (main spp): **Populus deltoides**

Dominant Species	% Cover	Dominant Species	% Cover
POP DEL	4 = 21-50%		
ELA ANG	3 = 11-20%		
SAL LUT	3 = 11-20%		
SAL EXI	3 = 11-20%		
IVA XAN	3 = 11-20%		
TYP LAT	3 = 11-20%		

Comments / Problems: **New wetland community type in 2002 due to increased inundation. Was upland in 2001. Wetland understory species appeared to germinate in 2002. Stayed consistent 2003 through 2006.**

Community Number: **8** Community Title (main spp): **Rumex crispus**

Dominant Species	% Cover	Dominant Species	% Cover
RUM CRI	5 = > 50%	SCI MAR	2 = 6-10%
AGR REP	4 = 21-50%		
BEC SYZ	3 = 11-20%		
CAR VES	2 = 6-10%		
POL AMP	2 = 6-10%		
TYP LAT	+ = < 1%		

Comments / Problems: **New community type in 2003; replaced community type 6 in some areas. Occurs around perimeter of RS1 and to a much lesser extent in RS2. Same 2004-2006**

VEGETATION COMMUNITIES (continued)

Community Number: **9** Community Title (main spp): **Scirpus maritimus / Beckmannia syzigachne**

Dominant Species	% Cover	Dominant Species	% Cover
SCI MAR	5 = > 50%	ALO PRA	3 = 11-20%
BEC SYZ	4 = 21-50%		
SCI ACU	2 = 6-10%		
RUM CRI	3 = 11-20%		
HOR JUB	1 = 1-5%		
TYP LAT	1 = 1-5%		

Comments / Problems: **New type in 2004. Same in 2005-2006.**

Community Number: **10** Community Title (main spp): **Beckmannia syzigachne**

Dominant Species	% Cover	Dominant Species	% Cover
BEC SYZ	5 = > 50%		
POL LAP	4 = 21-50%		
AGR ALB	4 = 21-50%		
SCI ACU	1 = 1-5%		
POL AMP	2 = 6-10%		
TYP LAT	1 = 1-5%		

Comments / Problems: **New type in 2004. Same in 2005-2006.**

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

Dominant Species	% Cover	Dominant Species	% Cover

Comments / Problems: _____

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

Dominant Species	% Cover	Dominant Species	% Cover

Comments / Problems: _____

Additional Activities Checklist:

☒ Record and map vegetative communities on aerial photograph.

COMPREHENSIVE VEGETATION LIST

Plant Species	Vegetation Community Number (s)	Plant Species	Vegetation Community Number (s)
Acer negundo	3	*Poa bulbosa*	7, upland
Agropyron intermedium	upland	*Poa pratensis*	2, upland
Agropyron repens	2,6, 8, 10	*Polygonum amphibium*	1, 2, 5, 8
Agropyron smithii	Upland	*Polygonum lapathifolium*	1,2
Agrostis alba	1,2,3,7	*Polygonum persicaria*	1,2
Alisma plantago-aquatica	1,4	*Populus deltoides*	7
Alopecurus pratensis	2,5, 10, 9	*Potamogeton natans*	4
Apocynum androsaemifolium	7, upland	*Potentilla anserina*	1,6
Arctium minus	3,7	*Prunus virginiana*	3, upland
Asclepias speciosa	5,7	*Ranunculus occidentalis*	1,4
Asparagus officinalis	Upland	*Rosa nutkana*	3, upland
Beckmannia syzigachne	1,5, 8, 10, 9	*Rumex crispus*	1,5, 6, 8, 10, 9
Bromus inermis	3,7, upland	*Sagittaria cuneata*	1,4
Carex lanuginose	1,3,5	*Salix amygdaloides*	3
Carex praegracilis	5, upland	*Salix exigua*	3
Carex stipata	5	*Salix lutea*	3
Carex utriculata	1,5	*Scirpus acutus*	1, 9
Carex vesicaria	1,5, 8	*Scirpus americanus*	1,6
Carex vulpinoides	5	*Scirpus maritimus*	1, 8, 10, 9
Chenopodium album	6, upland	*Scirpus validus*	1
Cicuta douglasii	1,3	*Sium suave*	1,4
Cirsium arvense	1,3	*Solidago canadensis*	1,3,7, upland
Convolvulus arvensis	Upland	*Spartina pectinata*	5
Cornus stolonifera	3,7	*Sparganium eurycarpum*	1
Elaeagnus angustifolia	3,7	*Symphoricarpos occidentalis*	Upland
Eleocharis acicularis	1,4	*Taraxacum officinale*	Upland
Eleocharis palustris	1,2,4	*Typha latifolia*	1,4,7, 8, 9
Festuca arundinacea	6	*Potentilla gracilis*	4
Glyceria grandis	1,2, 10	*Utricularia intermedia*	4
Glycyrrhiza lepidota	2,7	*Sparganium emersum*	4
Helianthus annuus	Upland	*Alisma gramineum*	4
Hordeum jubatum	6, upland, 10, 9	*Phalaris arundinacea*	1
Iva xanthifolia	7, upland	*Phleum pratense*	2, upland
Juncus effuses	1	Lactuca serriola	upland
Kochia scoparia	upland	Tragopogon dubiu	upland
Lemna minor	4		
Lycopus americanus	1,2,4		
Medicago sativa	upland		
Melilotus alba	upland		
Myriophyllum spicatum	4		
Najas guadalupensis	4		
Najas flexilis	4		

Comments / Problems: <u>Dense growth of Kochia present on the dike at RS1. Also dense Canada thistle on the old ditch spoil pile south of RS2.</u>

PLANTED WOODY VEGETATION SURVIVAL

Plant Species	Number Originally Planted	Number Observed	Mortality Causes

Comments / Problems: **No woody species were planted at this site.**

WILDLIFE

Birds

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

Mammals and Herptiles

Mammal and Herptile Species	Number Observed	Indirect Indication of Use			
		Tracks	Scat	Burrows	Other
white-tailed deer	1	☒	☒	☐	
badger		☐	☐	☒	
raccoon		☒	☐	☐	
beaver		☐	☐	☐	dams, chewings
Richardson's ground squirrel		☐	☐	☐	
northern leopard frog	100+	☐	☐	☐	
western chorus frog	100+	☐	☐	☐	
plains garter snake	1	☐	☐	☐	

Additional Activities Checklist:
Yes Macroinvertebrate Sampling (if required)

Comments / Problems: Substantial frog activity observed at all sites. Dense aquatic bed vegetation is ideal cover. 1000's of minnows also observed at all sites, and numerous crayfish observed at ES1. Extensive beaver damage is occuring to cottonwoods along east shore of RS1.

PHOTOGRAPHS

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

Photograph Checklist:

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

Location	Photograph Frame #	Photograph Description	Compass Reading (°)
		See figures and photo sheets.	

Comments / Problems: _____

GPS SURVEYING

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

GPS Checklist:

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

Comments / Problems: **No GPS data collected in 2006. Modifications were made using high quality aerial photograph during field visits.**

WETLAND DELINEATION

(attach COE delineation forms)

At each site conduct these checklist items:

- ☒ Delineate wetlands according to the 1987 Army COE manual.
- ☒ Delineate wetland – upland boundary onto aerial photograph.
- **NA** 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 any completed abbreviated field forms, if used)

Comments / Problems: _____

MAINTENANCE

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

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

Comments / Problems: **Flow was overtopping the road/dike between ES1 and RS1 during the July 2006 visit. This is resulting in expanding wetlands (not a problem). A few areas in the RS-2 "berm" between the wetland and the irrigation ditch to the south are cleaving, with several small breach areas currently spilling water from the site to the ditch.**

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **Musgrave Lake** Date: **July 18, 2006** Examiner: **Berglund**
Transect Number: **1** Approximate Transect Length: **500 feet** Compass Direction from Start: ___˚ Note: **RS1**

Vegetation Type A: **ALO PRA (wetland community #2)**	
Length of transect in this type: 15 feet	
Plant Species	**Cover**
ALO PRA	5 = > 50%
APO AND	2 = 6-10%
CAR LAN	1 = 1-5%
PHL PRA	1 = 1-5%
SCI ACU	+ = < 1%
2"-4" OF STANDING WATER PRESENT	
Total Vegetative Cover:	100%

Vegetation Type B: **UPLAND**	
Length of transect in this type: 16 feet	
Plant Species	**Cover**
BRO INE	2 = 6-10%
PHL PRA	4 = 21-50%
AGR REP	4 = 21-50%
POA PRA	1 = 1-5%
SYM OCC	+ = < 1%
APO AND	1 = 1-5%
POL AMP	1 = 1-5%
Total Vegetative Cover:	100%

Vegetation Type C: **POP DEL (wetland community #7)**	
Length of transect in this type: 25 feet	
Plant Species	**Cover**
POP DEL (not actually rooted in transect; overhanging)	4 = 21-50%
POL AMP	3 = 11-20%
TYP LAT	+ = < 1%
SAG CUN	1 = 1-5%
SCI ACU	1 = 1-5%
NAJ GUA	2 = 6-10%
UTR VUL	2 = 6-10%
POT PEC	2 = 6-10%
LEM MIN	+ = < 1%
6" TO 12" STANDING WATER PRESENT	
Total Vegetative Cover:	90%

Vegetation Type D: **POT / MYR (wetland community #4)**	
Length of transect in this type: 100 feet	
Plant Species	**Cover**
SAG CUN	2 = 6-10%
SCI ACU	1 = 1-5%
POL AMP	1 = 1-5%
NAJ GUA	5 = > 50%
POT PEC	5 = > 50%
MYR SPI	5 = > 50%
UTR VUL	5 = > 50%
Estimated from photo - inacessible due to flooding.	
Total Vegetative Cover:	20%

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **Musgrave Lake** Date: **July 18, 2006** Examiner: **Berglund**
Transect Number: **1** Approximate Transect Length: **500 feet** Compass Direction from Start: ___˚ Note: **Transect RS1 continued**

Vegetation Type E: **POL AMP (wetland community #2)**	
Length of transect in this type: 300 feet	
Plant Species	**Cover**
POL AMP	5 = > 50%
SAG CUN	2 = 6-10%
Estimated from aerial photo; inaccesible due to flood.	
Total Vegetative Cover:	80%

Vegetation Type F: **POT / MYR (wetland community #4)**	
Length of transect in this type: 42 feet	
Plant Species	**Cover**
MYR SPI	5 = > 50%
NAJ GUA	5 = > 50%
POT PEC	5 = > 50%
UTR INT	5 = > 50%
ALI GRA	1 = 1-5%
Total Vegetative Cover:	80%

Vegetation Type G: **UPLAND**	
Length of transect in this type: 2 feet	
Plant Species	**Cover**
BRO INE	5 = > 50%
AGR REP	1 = 1-5%
SCI ACU	1 = 1-5%
ALO PRA	1 = 1-5%
Total Vegetative Cover:	100%

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

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **Musgrave Lake** Date: **July 18, 2006** Examiner: **Berglund**
Transect Number: **2** Approximate Transect Length: **86 feet** Compass Direction from Start: **106˚** Note: **ES1**

Vegetation Type A: **UPLAND**	
Length of transect in this type: 15 feet	
Plant Species	**Cover**
PRU VIR	1 = 1-5%
ROS WOO	+ = < 1%
BRO INE	4 = 21-50%
POL AMP	3 = 11-20%
CAR LAN	1 = 1-5%
Total Vegetative Cover:	100%

Vegetation Type B: **TYP / SCI (wetland community #1)**	
Length of transect in this type: 71 feet	
Plant Species	**Cover**
TYP LAT	1 = 1-5%
SCI ACU	4 = 21-50%
POL LAP	3 = 11-20%
BEC SYZ	1 = 1-5%
POL AMP	3 = 11-20%
Inundated 6" to 2 feet throughout.	
Total Vegetative Cover:	70%

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

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

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **Musgrave Lake** Date: **July 18, 2006** Examiner: **Berglund**
Transect Number: **3** Approximate Transect Length: **170 feet** Compass Direction from Start: ___˚ Note: **RS2**

Vegetation Type A: **UPLAND**	
Length of transect in this type: 10 feet	
Plant Species	**Cover**
AGR REP	4 = 21-50%
BRO INE	4 = 21-50%
SYM OCC	3 = 11-20%
ROS NUT	1 = 1-5%
CIR ARV	2 = 6-10%
GLY LEP	1 = 1-5%
Total Vegetative Cover:	100%

Vegetation Type B: **POL AMP-TYP/SCI (mix of #1 and #2)**	
Length of transect in this type: 153 feet	
Plant Species	**Cover**
POL AMP	3 = 11-20%
SCI ACU	3 = 11-20%
TYP LAT	4 = 21-50%
ALO PRA	1 = 1-5%
SPA EME	1 = 1-5%
AGR REP	1 = 1-5%
NAJ GUA	4 = 21-50%
LEM MIN	3 = 11-20%
Inundated 6-16" throughout	
Total Vegetative Cover:	80%

Vegetation Type C: **UPLAND**	
Length of transect in this type: 7 feet	
Plant Species	**Cover**
SYM OCC	4 = 21-50%
BRO INE	3 = 11-20%
CIR ARV	3 = 11-20%
POL AMP	1 = 1-5%
Total Vegetative Cover:	100%

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

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **Musgrave Lake** Date: **July 18, 2006** Examiner: **Berglund**
Transect Number: **4** Approximate Transect Length: **137 feet** Compass Direction from Start: **20˚** Note: **ES2**

Vegetation Type A: **UPLAND**	
Length of transect in this type: 5 feet	
Plant Species	**Cover**
PRU VIR	4 = 21-50%
ACE NEG	5 = > 50%
SYM OCC	4 = 21-50%
SOL DUL	2 = 6-10%
AGR REP	+ = < 1%
ARC MIN	+ = < 1%
Total Vegetative Cover:	100%

Vegetation Type B: **TYP LAT**	
Length of transect in this type: 92 feet	
Plant Species	**Cover**
TYP LAT	5 = > 50%
CAR UTR	4 = 21-50%
LEM MIN	5 = > 50%
Inundated 6-16" throughout	
Total Vegetative Cover:	100%

Vegetation Type C: **CAREX**	
Length of transect in this type: 15 feet	
Plant Species	**Cover**
CAR UTR	5 = > 50%
TYP LAT	3 = 11-20%
Total Vegetative Cover:	100%

Vegetation Type D: **UPLAND**	
Length of transect in this type: 25 feet	
Plant Species	**Cover**
AGR REP	5 = > 50%
SYM OCC	4 = 21-50%
PRU VIR	3 = 11-20%
BRO INE	5 = > 50%
GLY LEP	1 = 1-5%
CAR VES	2 = 6-10%
Total Vegetative Cover:	100%

MDT WETLAND MONITORING – VEGETATION TRANSECT

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

Percent of perimeter developing wetland vegetation (excluding dam/berm structures): **100%**

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

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

Comments: **All sites are inundated and developing substantive wetland vegetation.**

BIRD SURVEY – FIELD DATA SHEET

Site: **Musgrave Lake** Date: **5/24/06**
Survey Time: **18:30** to **20:30**

Bird Species	#	Behavior	Habitat	Bird Species	#	Behavior	Habitat
Canada goose	6	N	OW MA				
Ring-necked pheasant	5	L	UP MA	Common snipe	2	F	MA
Bank swallow	300	FO	MA				
Red-winged blackbird	100	N	MA	Yellow warbler	2	F	UP
American white pelican	2	F	OW	Long-billed curlew	1	F L	MA UP
Mourning dove	10	L	UP				
American robin	12	F L	UP MA				
Barn swallow	20	F	MA OW				
Brewer's blackbird	2	F	UP				
Yellow-headed blackbird	50	N	MA				
Wilson's warbler	1	F	UP				
Canvasback	1	L	OW				
Wilson's phalarope	12	F	MA OW				
Gadwall	2	F	OW				
Brown-headed cowbird	6	F	UP				
Mallard	2	F	MA OW				
Northern flicker	1	F	UP				
Bobolink	6	F	UP				
Blue-winged teal	12	F	MA OW				
Common yellowthroat	2	L	MA				
Great blue heron	2	F	MA				
Northern shoveler	8	F	MA				

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

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

Weather: **Calm, sunny, dry**

Notes: **RS1 - 99% full, fresh beaver chewings along east border, few cottonwoods are down, 4 deer plus tracks, raccoon tracks, 1000's western chours frogs, buck rubs on willows. ES1 - 99% inundated, numerous chorus frogs, beaver observed. RS2 - 90% inundated, numerous chorus frogs. ES2 - 100% inundated, numerous chorus frogs and deer.**

BIRD SURVEY – FIELD DATA SHEET

Site: **Musgrave Lake** Date: **7/18/06**
Survey Time: **10:30** to **15:30**

Bird Species	#	Behavior	Habitat	Bird Species	#	Behavior	Habitat
Belted kingfisher	2	F	OW MA				
Ring-necked pheasant	1	F	UP				
Eastern Kingbird	4	F	UP MA	Tree swallow	6	F	MA OW
Red-winged blackbird	50	N	MA	Yellow warbler	1	F	MA
Cedar waxwing	2	L	MA				
Mourning dove	2	F	UP				
Yellow-headed blackbird	20	N L	MA				
Blue-winged teal	50	N	MA OW				
Western sandpiper	2	F	MF				
Wilson's phalarope	2	F	MA				
Red-tailed hawk	1	FO	MA				
Rock dove	6	F	UP				
Barn swallow	20	F	MA				
Gadwall	20	N	OW MA				
Brewer's blackbird	20	F	UP MA				
Cliff swallow	20	F	MA OW				
Killdeer	10	F	MA				
Marsh wren	2	L	MA				
American coot	25	F	MA				
Double-crested cormorant	2	L	MA				
Sora	1	F	MA				

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

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

Weather: **Sunny, calm**

Notes: **Numerous chorus frogs. leopard frogs, minnows at all sites. Deer and ground squirrels observed, beaver sign. Plains garter snake at RS1, crayfish at ES1**

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

Project / Site: **Musgrave Lake**	Date: **July 18, 2006**
Applicant / Owner: **MDT**	County: **Blaine**
Investigator: **Berglund**	State: **MT**

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

VEGETATION

Dominant Species	Stratum	Indicator	Dominant Species	Stratum	Indicator
1. *ALO PRA*	Herb	FACW	11.		
2. *APO AND*	Herb	NI	12.		
3. *PHL PRA*	Herb	FACU	13.		
4. *CAR LAN*	Herb	OBL	14.		
5. *SCI ACU*	Herb	OBL	15.		
6.			16.		
7.			17.		
8.			18.		
9.			19.		
10.			20.		

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

HYDROLOGY

Yes Recorded Data (Describe in Remarks): **N/A** Stream, Lake, or Tide Gauge **Yes** Aerial Photographs **N/A** Other **No** No Recorded Data	Wetland Hydrology Indicators Primary Indicators: **YES** Inundated **YES** Saturated in Upper 12 Inches **YES** Water Marks **YES** Drift Lines **YES** Sediment Deposits **NO** Drainage Patterns in Wetland
Field Observations: Depth of Surface Water = **2-4** (in.) Depth to Free Water in Pit **N/A** ____ (in.) Depth to Saturated Soil **N/A** ____ (in.)	Secondary Indicators (2 or more required): **NO** Oxidized Root Channels in Upper 12 inches **NO** Water-Stained Leaves **NO** Local Soil Survey Data **YES** FAC-Neutral Test **NO** Other (Explain in Remarks)
Remarks: **Virtually all of the site is inundated.**	

PBS&J

SOILS

Map Unit Name (Series and Phase): **Typic Fluvaquents, 0-2%**
Map Symbol: **129** Drainage Class: **PD** Mapped Hydric Inclusion? **No**
Taxonomy (Subgroup): **Typic Fluvaquents** Field Observations confirm Mapped Type? **Yes**

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color(s) (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
10	B	2.5 Y 4/2	2.5 Y 4/6	Common	Silty Clay Loam
			/	Distinct	
		/	/	N/A	
			/	N/A	
		/	/	N/A	
			/	N/A	
		/	/	N/A	
			/	N/A	
		/	/	N/A	
			/	N/A	

Hydric Soil Indicators:

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

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? **YES** Wetland Hydrology Present? **YES** Hydric Soils Present? **YES**	Is this Sampling Point within a Wetland? **YES**

Remarks: **Restoration Site 1 at beginning of transect, along site edge.**

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

Project / Site: **Musgrave Lake**	Date: **July 18, 2006**
Applicant / Owner: **MDT**	County: **Blaine**
Investigator: **Berglund**	State: **MT**

Do Normal Circumstances exist on the site? **Yes**	Community ID: **Emergent**
Is the site significantly disturbed (Atypical Situation)? **No**	Transect ID: **3**
Is the area a potential Problem Area? **No**	Plot ID: **RS2 along transect**
(If needed, explain on reverse side)	

VEGETATION

Dominant Species	Stratum	Indicator	Dominant Species	Stratum	Indicator
1. *AGR REP*	Herb	FACU	11.		
2. *POL AMP*	Herb	OBL	12.		
3. *TYP LAT*	Herb	OBL	13.		
4. *SCI ACU*	Herb	OBL	14.		
5. *ALO PRA*	Herb	FACW	15.		
6. *SPA EME*	Herb	OBL	16.		
7. *NAJ GUA*	Herb	OBL	17.		
8. *LEM MIN*	Herb	OBL	18.		
9.			19.		
10.			20.		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): **7** / **8** = **88**%	FAC Neutral: **7** / **8** = **88**%
Remarks:	

HYDROLOGY

Yes Recorded Data (Describe in Remarks): **N/A** Stream, Lake, or Tide Gauge **Yes** Aerial Photographs **N/A** Other **No** No Recorded Data	Wetland Hydrology Indicators Primary Indicators: **YES** Inundated **YES** Saturated in Upper 12 Inches **YES** Water Marks **YES** Drift Lines **NO** Sediment Deposits **NO** Drainage Patterns in Wetland
Field Observations: Depth of Surface Water = **16** (in.) Depth to Free Water in Pit **N/A** ____ (in.) Depth to Saturated Soil **N/A** ____ (in.)	Secondary Indicators (2 or more required): **NO** Oxidized Root Channels in Upper 12 inches **NO** Water-Stained Leaves **NO** Local Soil Survey Data **YES** FAC-Neutral Test **NO** Other (Explain in Remarks)
Remarks: **Inundated to 16"**	

PBSJ

SOILS

Map Unit Name (Series and Phase): **Havre silty clay loam, saline**
Map Symbol: **58** Drainage Class: **WD** Mapped Hydric Inclusion? **No**
Taxonomy (Subgroup): **Ustic Torrifluvents** Field Observations confirm Mapped Type? **Yes**

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color(s) (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
10	B	2.5 YR 4/2	2.5 YR 4/6 /	Common Distinct	Silty Clay Loam
		/ 	/ /	N/A N/A	
		/ 	/ /	N/A N/A	
		/ 	/ /	N/A N/A	
		/ 	/ /	N/A N/A	

Hydric Soil Indicators:

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

Remarks:

WETLAND DETERMINATION

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

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

Remarks: **Plot at RS-1 along transect.**

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

Project / Site: **Musgrave Lake**	Date: **July 18, 2006**
Applicant / Owner: **MDT**	County: **Blaine**
Investigator: **Berglund**	State: **MT**

Do Normal Circumstances exist on the site? **Yes**	Community ID: **Emergent**
Is the site significantly disturbed (Atypical Situation)? **No**	Transect ID: **2**
Is the area a potential Problem Area? **No**	Plot ID: **ES1 - center of transect**
(If needed, explain on reverse side)	

VEGETATION

Dominant Species	Stratum	Indicator	Dominant Species	Stratum	Indicator
1. *SCI ACU*	Herb	OBL	11.		
2. *POL AMP*	Herb	OBL	12.		
3. *BEC SYZ*	Herb	OBL	13.		
4. *POL LAP*	Herb	FACW+	14.		
5. *TYP LAT*	Herb	OBL	15.		
6.			16.		
7.			17.		
8.			18.		
9.			19.		
10.			20.		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): **5** / **5** = **100**%	FAC Neutral: **5** / **5** = **100**%
Remarks:	

HYDROLOGY

Yes Recorded Data (Describe in Remarks): **N/A** Stream, Lake, or Tide Gauge **Yes** Aerial Photographs **N/A** Other **No** No Recorded Data	Wetland Hydrology Indicators Primary Indicators: **YES** Inundated **YES** Saturated in Upper 12 Inches **YES** Water Marks **YES** Drift Lines **YES** Sediment Deposits **YES** Drainage Patterns in Wetland
Field Observations: Depth of Surface Water = **24** (in.) Depth to Free Water in Pit **N/A** ____ (in.) Depth to Saturated Soil **N/A** ____ (in.)	Secondary Indicators (2 or more required): **NO** Oxidized Root Channels in Upper 12 inches **NO** Water-Stained Leaves **NO** Local Soil Survey Data **YES** FAC-Neutral Test **NO** Other (Explain in Remarks)
Remarks: **Site inundated to 2 feet.**	

SOILS

Map Unit Name (Series and Phase): **Typic Fluvaquents, 0-2%**
Map Symbol: **129** Drainage Class: **PD** Mapped Hydric Inclusion? **No**
Taxonomy (Subgroup): **Typic Fluvaquents** Field Observations confirm Mapped Type? **Yes**

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color(s) (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
10	B	10 YR 3/1	/ /	N/A N/A	Silty Clay Loam
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	

Hydric Soil Indicators:

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

Remarks:

WETLAND DETERMINATION

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

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

Remarks: **Plot at ES1 along center of transect.**

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

Project / Site: **Musgrave Lake**	Date: **July 18, 2006**
Applicant / Owner: **MDT**	County: **Blaine**
Investigator: **Berglund**	State: **MT**

Do Normal Circumstances exist on the site? **Yes**	Community ID: **Emergent**
Is the site significantly disturbed (Atypical Situation)? **No**	Transect ID: **4**
Is the area a potential Problem Area? **No**	Plot ID: **ES2 - near end of transect**
(If needed, explain on reverse side)	

VEGETATION

Dominant Species	Stratum	Indicator	Dominant Species	Stratum	Indicator
1. *CAR UTR*	Herb	OBL	11.		
2. *CAR VES*	Herb	OBL	12.		
3. *TYP LAT*	Herb	OBL	13.		
4.			14.		
5.			15.		
6.			16.		
7.			17.		
8.			18.		
9.			19.		
10.			20.		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): **3** / **3** = **100**%	FAC Neutral: **3** / **3** = **100**%

Remarks: **BRO INE and AGR REP also present, but not dominant (<3% cover).**

HYDROLOGY

Yes Recorded Data (Describe in Remarks): **N/A** Stream, Lake, or Tide Gauge **Yes** Aerial Photographs **N/A** Other **No** No Recorded Data	Wetland Hydrology Indicators Primary Indicators: **YES** Inundated **YES** Saturated in Upper 12 Inches **YES** Water Marks **YES** Drift Lines **YES** Sediment Deposits **YES** Drainage Patterns in Wetland
Field Observations: Depth of Surface Water = **4** (in.) Depth to Free Water in Pit **N/A** ____ (in.) Depth to Saturated Soil **N/A** ____ (in.)	Secondary Indicators (2 or more required): **NO** Oxidized Root Channels in Upper 12 inches **NO** Water-Stained Leaves **NO** Local Soil Survey Data **YES** FAC-Neutral Test **NO** Other (Explain in Remarks)

Remarks: **Site inundated to 4 inches at plot.**

PBS&J

SOILS

Map Unit Name (Series and Phase): **Typic Fluvaquents, 0-2%**
Map Symbol: **129** Drainage Class: **PD** Mapped Hydric Inclusion? **No**
Taxonomy (Subgroup): **Typic Fluvaquents** Field Observations confirm Mapped Type? **Yes**

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color(s) (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
10	B	10 YR 3/2	10 YR 3/6 /	Common Faint	Silty Clay Loam
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	

Hydric Soil Indicators:

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

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? **YES** Wetland Hydrology Present? **YES** Hydric Soils Present? **YES**	Is this Sampling Point within a Wetland? **YES**

Remarks: **Plot at ES2 near end of transect (Carex community).**

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

1. Project Name: Musgrave Lake Mitigation Project **2. Project #:** NH-STPX 3(33) **Control #:** 4421

3. Evaluation Date: 7/18/2006 **4. Evaluator(s):** Berglund **5. Wetland / Site #(s):** Restoration Site 1

6. Wetland Location(s) i. T: 32 N **R:** 21 E **S:** 11 **T:** __ N **R:** __ E **S:** _____

ii. Approx. Stationing / Mileposts: NA

iii. Watershed: 11 - Milk **GPS Reference No. (if applies):** _____

Other Location Information: South of US Highway 2, south of Zurich, south of Milk River, Blaine County

7. A. Evaluating Agency MDT

8. Wetland Size (total acres): _____ (visually estimated)
13.29 (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)
13.29 (measured, e.g. GPS)

Comments: Restoration Site 1 (RS1)

10. CLASSIFICATION OF WETLAND AND AQUATIC HABITATS IN AA

HGM CLASS [1]	SYSTEM [2]	SUBSYSTEM [2]	CLASS [2]	WATER REGIME [2]	MODIFIER [2]	% OF AA
Depression	Palustrine	None	Aquatic Bed	Semipermanently Flooded	Impounded	75
Depression	Palustrine	None	Emergent Wetland	Seasonally Flooded	Impounded	15
Depression	Palustrine	None	Forested Wetland	Seasonally Flooded	Impounded	5
Depression	Palustrine	None	Scrub-Shrub Wetland	Semipermanently Flooded	Impounded	5

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

Comments: Substantial aquatic species abundance in 2005 and 2006.

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.) Grazing and hayland occur adjacent to the site.

ii. Prominent weedy, alien, & introduced species: CIR ARV, KOC SCO, PHA ARU, PHL PRA

iii. Briefly describe AA and surrounding land use / habitat: Restoration Site 1 in NW corner of site. Large, impounded marsh / transitional open water area with partial SS and FO fringe. Surrounding land use is pasture and hayland.

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	High	---	---

Comments: _____

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

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

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

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

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

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

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

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

Primary or Critical habitat **(list species)**	☒ D	☐ S	Northern leopard frog
Secondary habitat **(list species)**	☐ D	☐ S	_____
Incidental habitat **(list species)**	☐ D	☐ S	_____
No usable habitat	☐ D	☐ S	_____

ii. Rating: Based on the strongest habitat chosen in 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 & Rating	1 (H)	---	---	---	---	---	---

If documented, list the source (e.g., observations, records, etc.)**:** Numerous leopard frogs observed on site in 2001, 2002, 2004, 2005. 2006

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

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

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

Evidence of Wildlife Use from 14C(i)	**Wildlife Habitat Features Rating** from 14C(ii)			
	☒ **Exceptional**	☐ **High**	☐ **Moderate**	☐ **Low**
Substantial	1 (E)	--	--	--
Moderate	--	--	--	--
Low	--	--	--	--

Comments: Numerous waterfowl and shorebirds, chorus frogs, leopard frogs, beaver, raccoons, deer, minnows observed.

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 or 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 determine the quality rating of exceptional (E), high (H), moderate (M), or low (L).

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 arrive at 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: Site contains minnows, but is considered incidental (minnows enter system strictly through irrigation canal) and is not managed as a fishery.

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

Applies only to wetlands subject to flooding via in-channel or overbank flow. If wetlands in AA do not flood from in-channel or overbank flow, then check NA.

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**	--	--	.6 (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:** This function is somewhat artificial in that water is conveyed from an irrigation ditch. However, the ditch could be used to convey flood waters from the Milk River.

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

Applies to wetlands that flood or pond from overbank or in-channel flow, precipitation, upland surface flow, or groundwater flow.
If no wetlands in the AA are subject to flooding or ponding, then check 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.
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**	--	.9 (H)	--	--	--	--	--	--	--
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 the 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**	--	--	--	--	--	--	--	--

Comments: _____

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

Applies only if AA occurs on or within the banks of a river, stream, or other natural or man-made drainage, or on the shoreline of a standing water body that is subject to wave action. If this does not apply, then 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 %	--	.6 (M)	--
< 35 %	--	--	--

Comments: Wave action. Dikes are stabilizing.

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

Comments: _____

14J. GROUNDWATER DISCHARGE / RECHARGE (DR) (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 slope.
- ☒ 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 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)	--	--	--	--	.6M	--	--	--	--
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	--	--	.1(L)

Comments: Private land with no access.

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	low	0.30	1	
B. MT Natural Heritage Program Species Habitat	high	1.00	1	
C. General Wildlife Habitat	exceptional	1.00	1	
D. General Fish/Aquatic Habitat	N/A		--	
E. Flood Attenuation	moderate	0.60	1	
F. Short and Long Term Surface Water Storage	high	0.90	1	
G. Sediment/Nutrient/Toxicant Removal	N/A		--	
H. Sediment/Shoreline Stabilization	moderate	.6	1	
I. Production Export/Food Chain Support	high	0.90	1	
J. Groundwater Discharge/Recharge	high	1.00	1	
K. Uniqueness	moderate	0.60	1	
L. Recreation/Education Potential	low	.1	1	
	Total:	**7.00**	**10.00**	____
	Percent of Total Possible Points:		**70%** (Actual / Possible) x 100 [rd to nearest whole #]	

Category I Wetland: (Must satisfy **one** of the following criteria. If not satisfied, 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, return 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**

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

1. Project Name: Musgrave Lake Mitigation Project **2. Project #:** NH-STPX 3(33) **Control #:** 4421

3. Evaluation Date: 7/18/2006 **4. Evaluator(s):** Berglund **5. Wetland / Site #(s):** Restoration Site 2

6. Wetland Location(s) i. T: 32 N **R:** 21 E **S:** 11, 12 **T:** __ N **R:** __ E **S:** _____

ii. Approx. Stationing / Mileposts: NA

iii. Watershed: 11 - Milk **GPS Reference No. (if applies):** _____

Other Location Information: South of US Highway 2, south of Zurich, south of Milk River, Blaine County

7. A. Evaluating Agency MDT

8. Wetland Size (total acres): _____ (visually estimated)
10.21 (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)
10.21 (measured, e.g. GPS)

Comments: Restoration Site 2 (RS2)

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	75
Riverine	Palustrine	None	Scrub-Shrub Wetland	Seasonally Flooded	Impounded	10
Riverine	Palustrine	None	Aquatic Bed	Seasonally Flooded	Impounded	15
---	---	---	---	---	---	

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

Comments: AB first appeared in 2004.

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.	---	---	moderate 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.) Grazing and hayland occur immediately adjacent to the site.

ii. Prominent weedy, alien, & introduced species: CIR ARV, PHL PRA, KOC SCO

iii. Briefly describe AA and surrounding land use / habitat: Restoration Site #2, in SE corner of the mitigation site. Large, impounded marsh / oxbow area with partial SS component. Surrounding land use is agricultural.

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	High	---	---

Comments: _____

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

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

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

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

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

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

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

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

Primary or Critical habitat **(list species)**	☒ D	☐ S	Northern leopard frog
Secondary habitat **(list species)**	☐ D	☐ S	_____
Incidental habitat **(list species)**	☐ D	☐ S	_____
No usable habitat	☐ D	☐ S	_____

ii. Rating: Based on the strongest habitat chosen in 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 & Rating	1 (H)	---	---	---	---	---	---

If documented, list the source (e.g., observations, records, etc.)**:** Leopard frogs observed in RS2 every year from 2001-2006 in increasingly high numbers.

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 the AA attribute 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)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Moderate disturbance at AA (see 12)	--	--	--	--	--	H	--	--	--	--	--	--	--	--	--	--	--	--	--	--
High disturbance at AA (see 12)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

iii. Rating: Use 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	--	.9 (H)	--	--
Moderate	--	--	--	--
Low	--	--	--	--

Comments: Numerous waterfowl (several blue-winged teal broods in 2005 and 2006), shorebirds, chorus and leopard frogs observed.

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 or 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 determine the quality rating of exceptional (E), high (H), moderate (M), or low (L).

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 arrive at 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: Minnows occur here, but ther occurrence is considered incidental as a result of their origination in the irrrigation system. The site is not intended to be managed as a fishery.

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

Applies only to wetlands subject to flooding via in-channel or overbank flow. If wetlands in AA do not flood from in-channel or overbank flow, then check NA.

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**	--	--	.6 (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:** Fed by irrigation canals, but those canals could convey flood waters from the Milk River.

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

Applies to wetlands that flood or pond from overbank or in-channel flow, precipitation, upland surface flow, or groundwater flow.
If no wetlands in the AA are subject to flooding or ponding, then check 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.
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**	--	.9 (H)	--	--	--	--	--	--	--
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 the 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**	1 (H)	--	--	--	--	--	--	--
AA contains **unrestricted outlet**	--	--	--	--	--	--	--	--

Comments: Treats adjacent agricultural runoff.

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

Applies only if AA occurs on or within the banks of a river, stream, or other natural or man-made drainage, or on the shoreline of a standing water body that is subject to wave action. If this does not apply, then 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	.9H	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
T/E/A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Comments: _____

14J. GROUNDWATER DISCHARGE / RECHARGE (DR) (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 slope.
- ☒ 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 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)	--	--	--	--	--	--	--	--	--
Moderate disturbance at AA (12i)	--	--	--	--	.5M	--	--	--	--
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	--	--	.1(L)

Comments: Private land with no access.

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	low	0.30	1	
B. MT Natural Heritage Program Species Habitat	high	1.00	1	
C. General Wildlife Habitat	high	0.90	1	
D. General Fish/Aquatic Habitat	N/A		--	
E. Flood Attenuation	moderate	0.60	1	
F. Short and Long Term Surface Water Storage	high	0.90	1	
G. Sediment/Nutrient/Toxicant Removal	high	1.00	1	
H. Sediment/Shoreline Stabilization	N/A		--	
I. Production Export/Food Chain Support	high	0.90	1	
J. Groundwater Discharge/Recharge	high	1.0	1	
K. Uniqueness	moderate	0.50	1	
L. Recreation/Education Potential	low	.1	1	
	Total:	**7.20**	**10.00**	____
	Percent of Total Possible Points:		**72%** (Actual / Possible) x 100 [rd to nearest whole #]	

Category I Wetland: (Must satisfy **one** of the following criteria. If not satisfied, 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, return 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**

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

1. Project Name: Musgrave Lake Mitigation Project **2. Project #:** NH-STPX 3(33) **Control #:** 4421

3. Evaluation Date: 7/18/2006 **4. Evaluator(s):** Berglund **5. Wetland / Site #(s):** Enhancement Sites 1 & 2

6. Wetland Location(s) i. T: 32 N **R:** 21 E **S:** 11 **T:** 32 N **R:** 21 E **S:** 12

ii. Approx. Stationing / Mileposts: NA

iii. Watershed: 11 - Milk **GPS Reference No. (if applies):** _____

Other Location Information: South of US Highway 2, south of Zurich, south of Milk River, Blaine County

7. A. Evaluating Agency MDT

8. Wetland Size (total acres): 13.0 (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): 13.0 (visually estimated)
_____ (measured, e.g. GPS)

Comments: Enhancement Sites 1&2 (ES 1 and ES2)

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	Aquatic Bed	Semipermanently Flooded	Impounded	30
Riverine	Palustrine	None	Emergent Wetland	Seasonally Flooded	Impounded	60
Riverine	Palustrine	None	Scrub-Shrub Wetland	Seasonally Flooded	Impounded	10
---	---	---	---	---	---	

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

Comments: ES1 and ES2 are technically two portions of the same wetland, so are evaluated together.

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.	---	---	moderate 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.) Grazing and hayland occur immediately adjacent to the site.

ii. Prominent weedy, alien, & introduced species: CIR ARV, KOC SCO, PHL PRA

iii. Briefly describe AA and surrounding land use / habitat: Enhancement Site #1 in approximate center of mitigation site and Ehnacement Site 2, at east edge of site. Both occur in the same large, impounded marsh / oxbow area with partial SS component. Surrounding land use is primarily hayland.

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	High	---	---

Comments: _____

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

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

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

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

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

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

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

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

Primary or Critical habitat **(list species)**	☒ D	☐ S	Northern leopard frog
Secondary habitat **(list species)**	☐ D	☐ S	_____
Incidental habitat **(list species)**	☐ D	☐ S	_____
No usable habitat	☐ D	☐ S	_____

ii. Rating: Based on the strongest habitat chosen in 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 & Rating	1 (H)	---	---	---	---	---	---

If documented, list the source (e.g., observations, records, etc.)**:** Numerous leopard frogs observed in 2004, 2005, and 2006 at ES1 and in 2001 and 2006 at ES2.

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 the AA attribute 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)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Moderate disturbance at AA (see 12)	--	--	--	--	--	H	--	--	--	--	--	--	--	--	--	--	--	--	--	--
High disturbance at AA (see 12)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

iii. Rating: Use 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	--	.9 (H)	--	--
Moderate	--	--	--	--
Low	--	--	--	--

Comments: Numerous waterfowl, shorebirds, chorus frogs, leopard frogs observed.

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 or 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 determine the quality rating of exceptional (E), high (H), moderate (M), or low (L).

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 arrive at 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: Site contains minnows, but they enter the system through the irrigation canal - fish use considered incidental. Site not managed as fishery.

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

Applies only to wetlands subject to flooding via in-channel or overbank flow. If wetlands in AA do not flood from in-channel or overbank flow, then check NA.

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**	--	--	.6 (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:** This function is somewhat artificial in that flooding occurs via an irrigation ditch. However, the ditch could convey flood flows from the Milk River.

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

Applies to wetlands that flood or pond from overbank or in-channel flow, precipitation, upland surface flow, or groundwater flow.
If no wetlands in the AA are subject to flooding or ponding, then check 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.
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**	--	.9 (H)	--	--	--	--	--	--	--
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 the 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**	1 (H)	--	--	--	--	--	--	--
AA contains **unrestricted outlet**	--	--	--	--	--	--	--	--

Comments: Treats adjacent agricultural runoff.

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

Applies only if AA occurs on or within the banks of a river, stream, or other natural or man-made drainage, or on the shoreline of a standing water body that is subject to wave action. If this does not apply, then 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 %	--	.6 (M)	--
< 35 %	--	--	--

Comments: _____

14I. PRODUCTION EXPORT / FOOD CHAIN SUPPORT

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

A	☒ Vegetated component >5 acres						☐ Vegetated component 1-5 acres						☐ Vegetated component <1 acre					
B	☒ High		☐ Moderate		☐ Low		☐ High		☐ Moderate		☐ Low		☐ High		☐ Moderate		☐ Low	
C	☒Y	☐N	☐Y	☐N	☐Y	☐N	☐Y	☐N	☐Y	☐N	☐Y	☐N	☐Y	☐N	☐Y	☐N	☐Y	☐N
P/P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
S/I	.9H	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
T/E/A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Comments: _____

14J. GROUNDWATER DISCHARGE / RECHARGE (DR) (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 slope.
- ☒ 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 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)	--	--	--	--	--	--	--	--	--
Moderate disturbance at AA (12i)	--	--	--	--	.5M	--	--	--	--
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	--	--	.1(L)

Comments: Private land with no access.

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	low	0.30	1	
B. MT Natural Heritage Program Species Habitat	high	1.00	1	
C. General Wildlife Habitat	high	0.90	1	
D. General Fish/Aquatic Habitat	N/A		--	
E. Flood Attenuation	moderate	0.60	1	
F. Short and Long Term Surface Water Storage	high	0.90	1	
G. Sediment/Nutrient/Toxicant Removal	high	1.00	1	
H. Sediment/Shoreline Stabilization	moderate	0.60	1	
I. Production Export/Food Chain Support	high	0.90	1	
J. Groundwater Discharge/Recharge	high	1.00	1	
K. Uniqueness	moderate	0.50	1	
L. Recreation/Education Potential	low	.1	1	
	Total:	**7.80**	**11.00**	____
		Percent of Total Possible Points:	**71%** (Actual / Possible) x 100 [rd to nearest whole #]	

Category I Wetland: (Must satisfy **one** of the following criteria. If not satisfied, 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, return 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
2001-2006 AERIAL PHOTOGRAPH COMPARISON

MDT Wetland Mitigation Monitoring
Musgrave Lake
Zurich, Montana

MUSGRAVE LAKE WETLAND MITIGATION SITE 2006

RS1, Transect 1 from Start, 10 degrees N/NE

RS1, Transect 1 from End, 192 degrees S/SW

ES1, Transect 2 from Start, 106 degrees E/SE

ES1, Transect 2 from End, 299 degrees W/NW

RS2, Transect 3 from Start, 167 degrees S/SE

RS2, Transect 3 from End, 354 degrees N/NW

MUSGRAVE LAKE WETLAND MITIGATION SITE 2006

ES2, Transect 4 from Start, 20 degrees N/NE

ES2, Transect 4 from End, 194 degrees S/SW

RS2, Photo Point 1, 260 degrees W

RS2, Photo Point 2, 100 degrees E

RS2, Photo Point 3, 54 degrees NE

RS2, Photo Point 4, 19 degrees S

MUSGRAVE LAKE WETLAND MITIGATION SITE 2006

ES1, Photo Point 4, 15 degrees N

ES1, Photo Point 5, 123 degrees SE

ES1, Photo Point 5, 290 degrees W/NW (adjacent upland)

RS1, Photo Point 6, 310 degrees NW

RS1, Photo Point 7, 143 degrees SE

ES2, Photo Point 8, 105 degrees N/NE

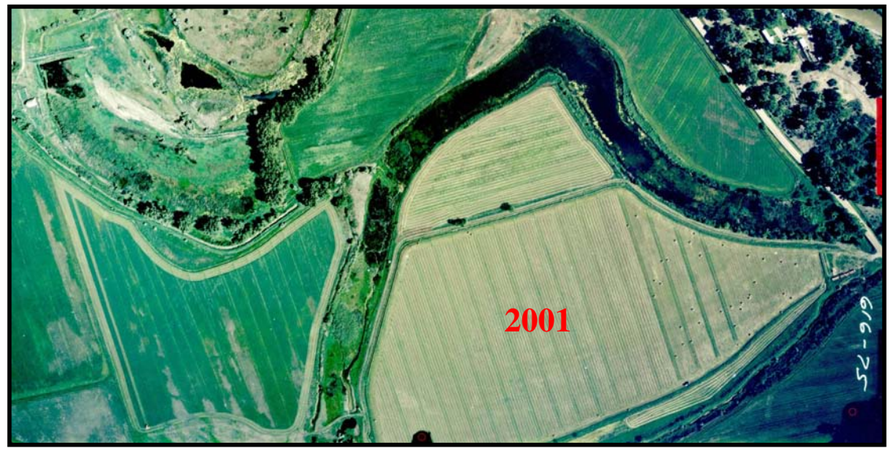
MUSGRAVE LAKE WETLAND MITIGATION SITE 2006

RS1, New wetland east of impoundment that developed in 2005 and expanded in 2006. Facing north.

Reference wetland, facing north.

Reference wetland, facing northwest.

Musgrave Lake Photo Comparison
2001 - 2006



Appendix D

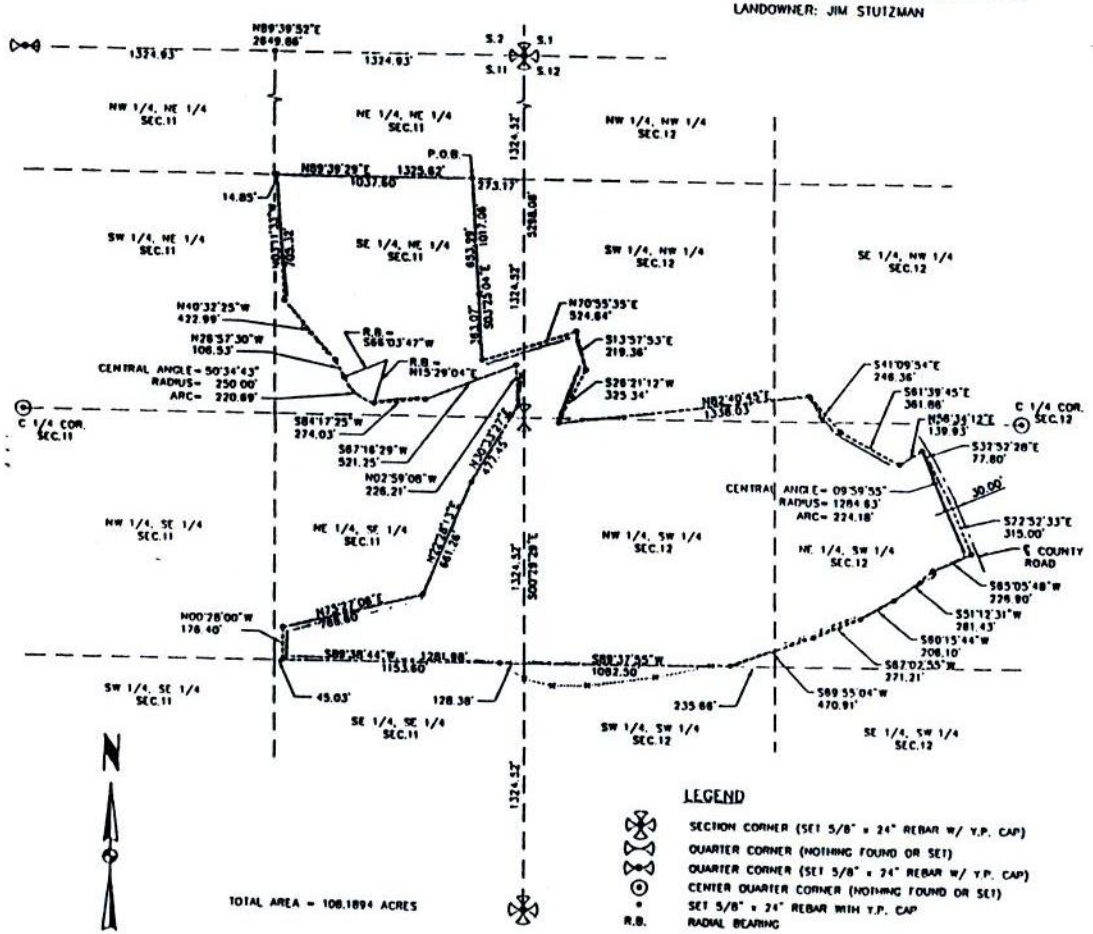
EASEMENT LIMITS AND CONCEPTUAL SITE LAYOUT

MDT Wetland Mitigation Monitoring
Musgrave Lake
Zurich, Montana

CERTIFICATE OF SURVEY

A WETLANDS EASEMENT DESCRIPTION LOCATED IN THE NE 1/4 AND SE 1/4 SECTION 11; NW 1/4 AND SW 1/4 SECTION 12, T32N, R21E, P.M.M., BLAINE COUNTY, MONTANA

LANDOWNER: JIM STUTZMAN



LEGEND

- SECTION CORNER (SET 5/8" x 24" REBAR W/ Y.P. CAP)
- QUARTER CORNER (NOTHING FOUND OR SET)
- QUARTER CORNER (SET 5/8" x 24" REBAR W/ Y.P. CAP)
- CENTER QUARTER CORNER (NOTHING FOUND OR SET)
- SET 5/8" x 24" REBAR WITH Y.P. CAP
- R.B. RADIAL BEARING

BASIS OF BEARING: GLOBAL POSITIONING SYSTEM FROM THE MONTANA DEPT. OF TRANSPORTATION

PURPOSE OF SURVEY: TO CREATE A WETLANDS EASEMENT.

DESCRIPTION

A wetlands easement description located in the Northeast quarter and the Southeast quarter of Section 11, the Northwest quarter and the Southwest quarter of Section 12, T32N, R21E, PMM, Blaine County, Montana being more particularly described as follows:

Beginning at the Northeast corner of Section 11; thence S00°29'29"E along the east line of said Section 11, a distance of 1324.53' to the North 1/16 corner of Sections 11 and 12; thence S89°39'29"W along south line of the NE 1/4 of the NE 1/4 of Section 11, a distance of 273.17' to the true point of beginning; thence S03°25'04"E, a distance of 1017.06'; thence N70°55'35"E, a distance of 524.84'; thence S13°57'53"E, a distance of219.36'; thence S28°21'12"W, a distance of 325.34'; thence N82°40'45"E, a distance of 1338.03'; thence S41°09'54"E, a distance of 248.36'; thence S61°39'45"E, a distance of 361.86'; thence N26°34'12"E, a distance of 139.93' to a point 30.00' from centerline of a county road; thence staying 30.00' westerly and parallel to said county road the next three courses: S32°52'28"E, a distance of 77.80'; through a tangent curve to the right having a central angle of 09°59'55", a radius of 1284.63', and an arc distance of 224.18'; S22°32'33"E, a distance of 315.00'; thence S85°05'48"W, a distance of 229.90'; thence S51°12'31"W, a distance of 281.43'; thence S80°15'44"W, a distance of 208.10'; thence S87°02'55"W, a distance of 271.21'; thence S89°55'04"W, a distance of 470.91' to a point on the north line of the SW 1/4 of Section 12; thence S89°37'55"W along said north line a distance of 1082.50' to the South 1/16 corner of Sections 11 and 12; thence S89°38'45"W along the north line of the SE 1/4 of the SE 1/2 of Section 11, a distance of 1281.88'; thence N00°28'00"W, a distance of 178.40'; thence N72°27'06"E, a distance of 708.00'; thence N22°28'13"E, a distance of 661.26'; thence N30°33'27"E, a distance of 477.45'; thence N02°59'08"W, a distance of 226.21'; thence S87°16'29"W, a distance of 521.25'; thence S84°17'25"W, a distance of 274.03'; thence through a non-tangent curve to the right having a central angle of 50°34'43", a radius of 250.00', and an arc distance of 220.89'; thence N26°37'30"W, a distance of 106.53'; thence N40°32'25"W, a distance of 422.99'; thence N03°11'33"W, a distance of 705.32' to a point on the south line of the NE 1/4 of the NE 1/4 of Section 11; thence N89°39'29"E along the said south line a distance of 1037.80' to the true point of beginning and containing 108.1894 acres.

CERTIFICATE OF SURVEYOR

I, the undersigned, Robert F. Stangler, Professional Land Surveyor, Montana registration No. 90945, do hereby certify that I supervised this survey and plotted same as shown on the accompanying Certificate of Survey, and as described in accordance with the provisions of the Montana Subdivision and Platting Act, Sections 76-3-101 through 76-3-614, M.C.A., and Blaine County.

Dated this _____ day of _____, A.D., 2000

_____

Robert F. Stangler, Montana Reg. No. 90945

CERTIFICATE OF FILING BY CLERK AND RECORDER

State of Montana)
: ss
County of Blaine)

Filed on this _____ day of _____, A.D., 2000, at _____ o'clock, County Clerk and Recorder, Blaine County, Montana.

_____

Blaine County Clerk and Recorder

CERTIFICATE OF TREASURER

I, _____, County Treasurer of Blaine County, Montana, do hereby certify that I have examined the records covering the said tracts of land and find that taxes on the same have been paid for the last five years.

Dated this _____ day of _____, A.D., 2000

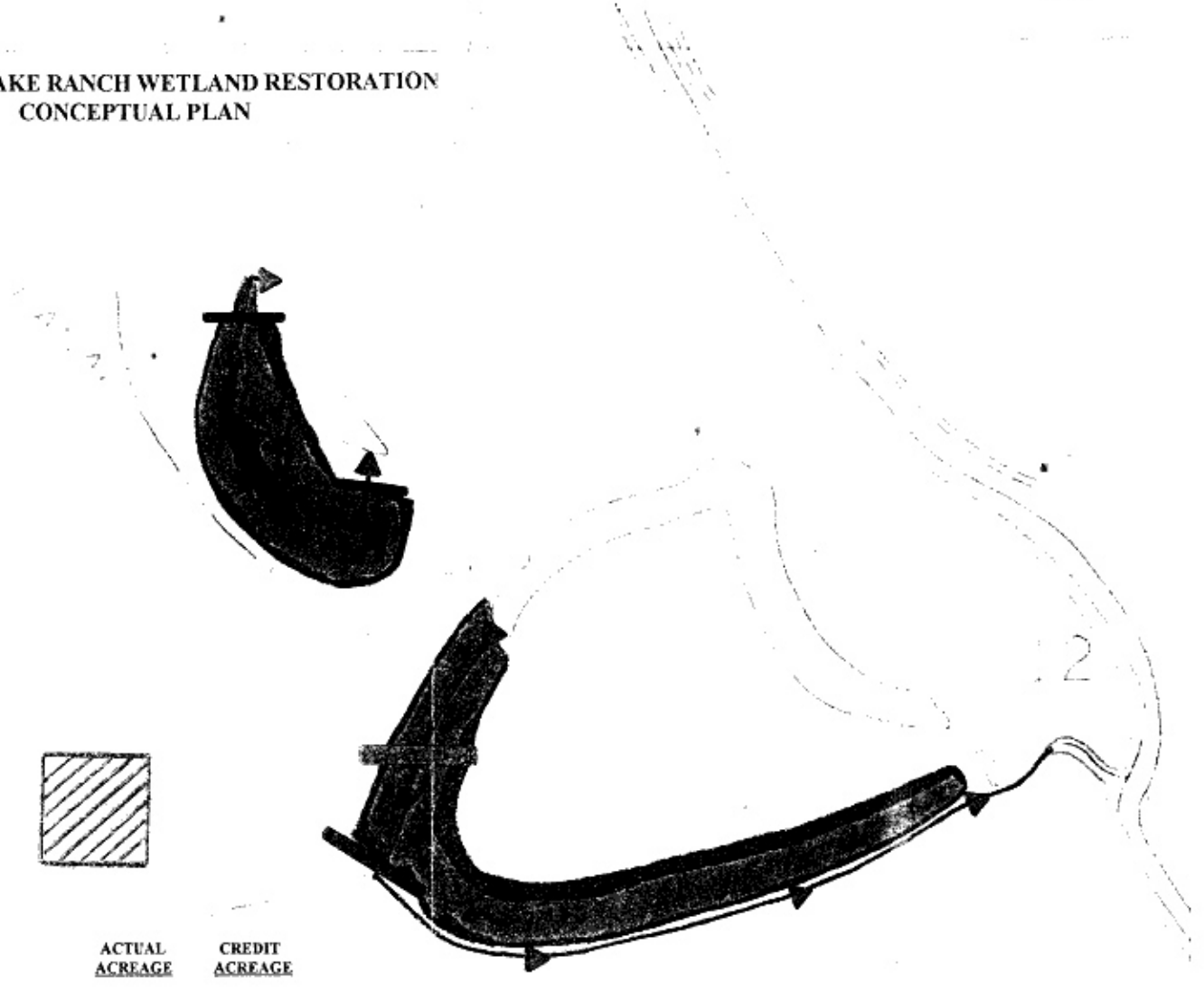
_____

Blaine County Treasurer

00131-1.DWG

TD&H THOMAS, DEAN & HOSKINS INC. ENGINEERING CONSULTANTS

MUSGRAVE LAKE RANCH WETLAND RESTORATION
CONCEPTUAL PLAN



SYMBOL	DESCRIPTION	ACTUAL ACREAGE	CREDIT ACREAGE
	Standing Water Depth from 0" to 24"	16.6 acres	15.2 acres
	Standing Water Depth from 24" to 42"	3.6 acres	3.6 acres
	Riparian and Upland Buffer	8.4 acres	8.4 acres
	Ditch Plug/Dike		27.2 acres
	Borrow Area and Road Fill (existing)		
	Existing Ditches		

Appendix E

BIRD SURVEY PROTOCOL
GPS PROTOCOL

MDT Wetland Mitigation Monitoring
Musgrave Lake
Zurich, 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

2006 MACROINVERTEBRATE SAMPLING PROTOCOL AND DATA

MDT Wetland Mitigation Monitoring
Musgrave Lake
Zurich, 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 <u>see</u> 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 Mitigated Wetland Monitoring Project: Aquatic Invertebrate Monitoring Summary 2001 – 2006

Prepared for PBS&J, Inc.
Prepared by W.Bollman, Rhithron Associates, Inc.

INTRODUCTION

Among other monitoring activities, aquatic invertebrate assemblages were collected at a number of mitigated wetlands throughout Montana. This report summarizes data generated from six years of collection. Over all years of sampling, a total of 182 invertebrate samples were collected. Table 2 summarizes sites and sampling years.

METHODS

Sample processing

Aquatic invertebrate samples were collected at mitigated wetland sites in the summer months of 2001, 2002, 2003, 2004, 2005 and 2006 by personnel of PBS&J, 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, and over the water surface, and included disturbing and scraping substrates at each sampled site. These sample components were composited and preserved in ethanol at each wetland site. Samples were delivered to Rhithron Associates, Inc. for processing, taxonomic determinations, and data analysis.

At Rhithron's laboratory, Caton subsamplers and stereomicroscopes with 10X magnification were used to randomly select a minimum of 100 organisms from each sample. In some instances, the entire sample contained fewer than 100 organisms; in these cases, all organisms from the sample were taken. Animals were identified to lowest practical taxonomic levels using relevant published resources. Quality control (QC) procedures were applied to sample sorting, taxonomic determinations and enumeration, and data entry. QC statistics are presented in Table 3. The identified samples have been archived at Rhithron's laboratory.

Assessment

The method employed to assess these wetlands is based on an index incorporating a battery of 12 bioassessment metrics or attributes (Table 1) tested and recommended by Stribling et al. (1995) in a report to the Montana Department of Health and Environmental Science. In that study, it was determined that some of the metrics were of limited use in some geographic regions, and for some wetland types. Despite that finding, all 12 metrics are used in this evaluation of mitigated wetlands, since detailed geographic information and wetland classifications were unavailable.

Scoring criteria for metrics were developed by generally following the tactic used by Stribling et al. Boxplots were generated using a statistical software package (Statistica™), 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, 2004, 2005 and 2006, and Kleinschmidt Creek, sampled in 2003, 2004, 2005 and 2006, were assessed using the tested metric battery developed for montane streams of Western Montana (Bollman 1998).Invertebrate assemblages at these sites differed from those of the other sites, and suggested montane or foothill stream conditions rather than wetland conditions. For the wetland sites, "optimal" scores were generally those that fell above the 75th percentile (for those metrics that decrease in value in response to stress) or below the 25th percentile (for metrics that respond to stress by an increase in value) of all scores. Additional scoring ranges were established by bisecting the range below the 75th percentile for decreasing scores (or above the 25th percentile for increasing scores) into "sub-optimal" and "poor" assessment categories. A score of 5, 3, or 1 was assigned to optimal, sub-optimal, and poor metric performance, respectively. In this way, metric values were translated into normalized metric scores, and scores for all metrics were summed to produce a total bioassessment score. 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 since our understanding of the interrelationships of natural environmental factors and anthropogenic disturbances is tentative. Thus, the further interpretive remarks accompanying the raw taxonomic and metric data in this summary are offered cautiously. Year-to-year comparisons depend on an assumption that specific sites were revisited in each year, and that equivalent sampling methods were utilized at each site revisit.

Bioassessment metrics

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

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

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

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

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

Metric scoring criteria were re-examined each year as new data was added. For 2005, all 151 records were utilized. Ranges of individual metrics, as well as median metric values remained remarkably consistent over all 5 years of analysis. Since metric value distributions changed insignificantly with the addition of the 2006 data, no changes were made to scoring criteria this year. Summary metric values and scores for the 2006 samples are given in Tables 3a-3d.

Quality control

Quality control procedures for initial sample processing and subsampling involved checking sorting efficiency. These checks were conducted on 100% of the samples by independent technicians who microscopically re-examined 20% of sorted substrate from each sample. All organisms that were missed were counted and this number was added to the total number obtained in the original sort. Sorting efficiency was evaluated by applying the following calculation:

$$SE = \frac{n_1}{n_2} \times 100$$

Where: SE is the sorting efficiency, expressed as a percentage, n_1 is the total number of specimens in the first sort, and n_2 is the total number of specimens in the first and second sorts combined.

Quality control procedures for taxonomic determinations involved checking accuracy, precision and enumeration. Four samples were randomly selected and all organisms re-identified by independent taxonomists. A Bray-Curtis similarity statistic (Bray and Curtis 1957) was generated to evaluate identifications.

Table 1. Montana Department of Transportation Mitigated Wetlands Monitoring Project sites. 2001 – 2006.

Site identifier	2001	2002	2003	2004	2005	2006
Beaverhead 1	+	+	+	+	+	+
Beaverhead 2	+	+				
Beaverhead 3	+	+		+	+	+
Beaverhead 4	+	+	+			
Beaverhead 5	+	+	+	+	+	+
Beaverhead 6	+	+	+	+	+	+
Big Sandy 1	+					
Big Sandy 2	+					
Big Sandy 3	+					
Big Sandy 4	+					
Johnson-Valier	+					
VIDA	+					
Cow Coulee	+	+	+			
Fourchette – Puffin	+	+	+	+		
Fourchette – Flashlight	+	+	+	+		
Fourchette – Penguin	+	+	+	+		
Fourchette – Albatross	+	+	+	+		
Big Spring	+	+	+	+	+	
Vince Ames	+					
Ryegate	+					
Lavinia	+					
Stillwater	+	+	+	+	+	
Roundup	+	+	+	+	+	+
Wigeon	+	+	+	+	+	+
Ridgeway	+	+	+	+	+	+
Musgrave – Rest. 1	+	+	+	+	+	+
Musgrave – Rest. 2	+	+	+	+	+	+
Musgrave – Enh. 1	+	+	+	+	+	+
Musgrave – Enh. 2	+					+
Hoskins Landing		+	+	+	+	
Hoskins Landing						
Peterson - 1		+	+	+	+	+
Peterson – 2		+		+	+	+
Peterson – 4		+	+	+	+	+
Peterson – 5		+	+	+	+	+
Jack Johnson - main		+	+			
Jack Johnson - SW		+	+			
Creston		+	+	+	+	
Lawrence Park		+				
Perry Ranch		+			+	
SF Smith River		+	+	+	+	+
Camp Creek		+	+	+	+	+
Camp Creek						+
Kleinschmidt		+	+	+	+	+
Kleinschmidt – stream			+	+	+	+
Ringling - Galt			+			
Circle				+		
Cloud Ranch Pond				+	+	
Cloud Ranch Stream				+		
American Colloid				+	+	+
Jack Creek				+	+	
Jack Creek						
Norem				+	+	+
Rock Creek Ranch					+	+
Wagner Marsh					+	+
Alkali Lake 1						+
Alkali Lake 2						+

Table 2. Aquatic invertebrate metrics employed in the MTDT mitigated wetland monitoring study, 2001-2005.

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

RESULTS

(Note: Individual site discussions were removed from this report by PBS&J and are included in the macroinvertebrate sections of individual monitoring reports. Summary tables (4a – 4d) are provided on the following pages.)

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Quality Assurance

Table 3 gives the results of quality assurance procedures for sample sorting and taxonomic determinations and enumeration.

Table 3. *Results of quality control procedures for subsampling and taxonomy.*

Sample ID	Site name	SE	Bray-Curtis similarity
MDT06PBSJ001	MUSGRAVE LAKE ES-1	91.67%	
MDT06PBSJ002	MUSGRAVE LAKE ES-2	94.44%	
MDT06PBSJ003	MUSGRAVE LAKE RS-1	87.30%	
MDT06PBSJ004	MUSGRAVE LAKE RS-2	100.00%	
MDT06PBSJ005	ROCK CREEK RANCH	96.49%	95.25%
MDT06PBSJ006	Alkali Lake Sample 1	100.00%	
MDT06PBSJ007	Alkali Lake Sample 2	100.00%	
MDT06PBSJ008	Peterson Ranch Pond # 4	100.00%	
MDT06PBSJ009	Peterson Ranch Pond # 1	97.35%	
MDT06PBSJ010	Peterson Ranch Pond # 5	91.67%	
MDT06PBSJ011	South Fork Smith River	100.00%	
MDT06PBSJ012	Beaverhead 1	100.00%	
MDT06PBSJ013	Beaverhead 3	95.65%	
MDT06PBSJ014	Beaverhead 5	100.00%	
MDT06PBSJ015	Beaverhead 6	94.12%	98.38%
MDT06PBSJ016	Peterson Ranch Pond # 2	91.67%	99.66%
MDT06PBSJ017	American Colloid	100.00%	
MDT06PBSJ018	Norem	100.00%	
MDT06PBSJ019	Cloud Ranch	85.56%	98.89%
MDT06PBSJ020	Jack Creek Pond	100.00%	
MDT06PBSJ021	Jack Creek Stream	100.00%	
MDT06PBSJ022	Camp Creek 1	99.10%	
MDT06PBSJ023	Camp Creek 2	100.00%	
MDT06PBSJ024	Kleinschmidt Pond	100.00%	
MDT06PBSJ025	Kleinschmidt Stream	96.49%	
MDT06PBSJ026	Hoskins Landing 1	97.35%	
MDT06PBSJ027	Hoskins Landing 2	96.49%	
MDT06PBSJ028	Wagner Marsh	100.00%	
MDT06PBSJ029	Wigeon Reservoir	100.00%	
MDT06PBSJ030	Ridgeway	98.21%	
MDT06PBSJ031	Roundup	100.00%	

Table 4a. Metric values and scores for Montana Department of Transportation mitigated wetland sites. 2006.

	BEAVERHEAD #1	BEAVERHEAD #3	BEAVERHEAD #5	BEAVERHEAD #6	ROUNDUP	WIDGEON	RIDGEWAY	MUSGRAVE RS-1
Total taxa	12	11	4	15	11	11	21	23
POET	1	0	1	3	2	1	3	4
Chironomidae taxa	5	3	1	7	4	3	10	7
Crustacea + Mollusca	1	4	2	3	2	2	5	7
% Chironomidae	52.38%	25.22%	0.69%	63.06%	18.87%	6.42%	37.25%	9.62%
Orthocladiinae/Chir	0.181818	0.965517	0	0.142857	0.2	0.285714	0.289474	0.7
%Amphipoda	0.00%	0.00%	0.00%	0.90%	0.00%	6.42%	11.76%	1.92%
%Crustacea + %Mollusca	9.52%	69.57%	98.62%	3.60%	73.58%	79.82%	45.10%	51.92%
HBI	7.857143	7.773913	7.97931	7.243243	8.09434	8.100917	7.127451	7.403846
%Dominant taxon	33.33%	39.13%	97.93%	27.93%	72.64%	73.39%	28.43%	23.08%
%Collector-Gatherers	61.90%	68.70%	100.00%	84.68%	87.74%	6.42%	49.02%	47.12%
%Filterers	0.00%	2.61%	0.00%	1.80%	0.00%	0.00%	0.00%	4.81%
Total taxa	1	1	1	3	1	1	5	5
POET	1	1	1	3	1	1	3	5
Chironomidae taxa	3	3	1	5	3	3	5	5
Crustacea + Mollusca	1	3	1	1	1	1	3	5
% Chironomidae	1	3	5	1	3	5	3	5
Orthocladiinae/Chir	1	5	1	1	3	3	3	5
%Amphipoda	5	5	5	5	5	3	3	5
%Crustacea + %Mollusca	5	1	1	5	1	1	3	3
HBI	1	1	1	3	1	1	3	3
%Dominant taxon	5	3	1	5	1	1	5	5
%Collector-Gatherers	3	3	5	5	5	1	3	3
%Filterers	3	3	3	3	3	3	3	3
Total score	30	32	26	40	28	24	42	52
Percent of maximum score	0.5	0.533333	0.433333	0.666667	0.466667	0.4	0.7	0.866667
Impairment classification	**poor**	**poor**	**poor**	**sub-optimal**	**poor**	**poor**	**optimal**	**optimal**

Table 4b. Metric values and scores for Montana Department of Transportation mitigated wetland sites. 2006.

	MUSGRAVE RS- 2	MUSGRAVE ES- 1	MUSGRAVE ES- 2	HOSKINS LANDING 1	HOSKINS LANDING 2	PETERSON RANCH 1	PETERSON RANCH 2	PETERSON RANCH 4	PETERSON RANCH 5
Total taxa	10	21	10	22	29	19	17	28	26
POET	1	2	1	5	4	2	2	3	4
Chironomidae taxa	2	7	4	6	6	7	4	13	9
Crustacea + Mollusca	3	6	0	5	9	5	6	5	6
% Chironomidae	3.96%	10.89%	10.00%	18.18%	11.71%	64.08%	7.48%	27.52%	14.29%
Orthocladiinae/Chir	0	0.181818	0.125	0.055556	0.307692	0.757576	0.75	0.6	0.75
%Amphipoda	0.00%	2.97%	0.00%	5.05%	1.80%	1.94%	22.43%	2.75%	15.18%
%Crustacea + %Mollusca	8.91%	75.25%	0.00%	20.20%	23.42%	8.74%	42.06%	19.27%	40.18%
HBI	6.326733	6.940594	6	7.111111	7.585586	6.631068	6.719626	7.293578	7.321429
%Dominant taxon	70.30%	38.61%	83.75%	25.25%	42.34%	47.57%	28.04%	20.18%	16.07%
%Collector-Gatherers	15.84%	8.91%	3.75%	64.65%	62.16%	72.82%	31.78%	34.86%	50.89%
%Filterers	0.00%	0.00%	0.00%	6.06%	5.41%	3.88%	3.74%	8.26%	0.89%
Total taxa	1	5	1	5	5	3	3	5	5
POET	1	1	1	5	5	1	1	3	5
Chironomidae taxa	1	5	3	3	3	5	3	5	5
Crustacea + Mollusca	1	5	1	3	5	3	5	3	5
% Chironomidae	5	5	5	3	5	1	5	3	5
Orthocladiinae/Chir	1	1	1	1	3	5	5	5	5
%Amphipoda	5	5	5	3	5	5	3	5	3
%Crustacea + %Mollusca	5	1	5	5	5	5	3	5	3
HBI	5	3	5	3	3	5	5	3	3
%Dominant taxon	1	3	1	5	3	3	5	5	5
%Collector-Gatherers	1	1	1	3	3	3	1	1	3
%Filterers	3	3	3	1	3	3	3	1	3
Total score	30	38	32	40	48	42	42	44	50
Percent of maximum score	0.5	0.633333	0.533333	0.666667	0.8	0.7	0.7	0.733333	0.833333
Impairment classification	**poor**	**sub-optimal**	**poor**	**sub-optimal**	**optimal**	**optimal**	**optimal**	**optimal**	**optimal**

Table 4c. Metric values and scores for Montana Department of Transportation mitigated wetland sites. 2006

	SOUTH FORK SMITH RIVER	CAMP CREEK 1*	CAMP CREEK 2*	KLEINSCH MIDT POND	KLEINSCH MIDT STREAM*	CLOUD RANCH	COLLOID	JACK CREEK POND	JACK CREEK STREAM
Total taxa	14	31	29	20	22	13	7	7	5
POET	4	8	8	5	1	1	2	0	0
Chironomidae taxa	3	10	8	6	8	6	4	4	0
Crustacea + Mollusca	4	1	3	2	5	3	0	2	2
% Chironomidae	18.02%	45.87%	16.07%	8.04%	77.68%	23.81%	84.21%	75.00%	0.00%
Orthocladiinae/Chir	0.05	0.26	0.277778	0.222222	0.448276	0.65	0.25	0.555556	0
%Amphipoda	18.02%	0.00%	0.00%	25.00%	0.00%	4.76%	0.00%	0.00%	5.00%
%Crustacea + %Mollusca	58.56%	0.92%	3.57%	25.89%	5.36%	11.90%	0.00%	16.67%	7.50%
HBI	7.540541	4.504587	4.294643	7.241071	5.928571	7.535714	6.315789	8.833333	7.325
%Dominant taxon	25.23%	24.77%	37.50%	25.00%	33.93%	36.90%	52.63%	33.33%	60.00%
%Collector-Gatherers	41.44%	48.62%	31.25%	62.50%	46.43%	64.29%	21.05%	58.33%	67.50%
%Filterers	15.32%	6.42%	7.14%	3.57%	38.39%	2.38%	0.00%	0.00%	0.00%
Total taxa	1	5	5	3	5	1	1	1	1
POET	5	5	5	5	1	1	1	1	1
Chironomidae taxa	3	5	5	3	5	3	3	3	1
Crustacea + Mollusca	3	1	1	1	3	1	1	1	1
% Chironomidae	3	1	5	5	1	3	1	1	5
Orthocladiinae/Chir	1	3	3	3	3	5	3	5	1
%Amphipoda	3	5	5	1	5	3	5	5	3
%Crustacea + %Mollusca	3	5	5	5	5	5	5	5	5
HBI	3	5	5	3	5	3	5	1	3
%Dominant taxon	5	5	3	5	5	3	1	5	1
%Collector-Gatherers	1	3	1	3	3	3	1	3	3
%Filterers	1	1	1	3	1	3	3	3	3
Total score	32	44	44	40	42	34	30	34	28
Percent of maximum score	0.533333	*0.733333*	*0.733333*	0.666667	*0.7*	0.566667	0.5	0.566667	0.466667
Impairment classification	**poor**	***optimal***	***optimal***	**sub-optimal**	***optimal***	**sub-optimal**	**poor**	**sub-optimal**	**poor**

*Sites indicated by asterisks were dominated by lotic fauna, and were evaluated with the MDEQ index for streams in the text and charts. Scores and impairment classifications in this table (italicized) are included only for completeness and are not reliable indications of conditions at these sites. See text.

Table 4d. Metric values and scores for Montana Department of Transportation mitigated wetland sites. 2006.

	NOREM	ROCK CREEK RANCH	WAGNER MARSH	ALKALI LAKE 1	ALKALI LAKE 2
Total taxa	6	15	11	6	5
POET	1	0	0	0	0
Chironomidae taxa	2	4	4	3	0
Crustacea + Mollusca	1	4	3	1	1
% Chironomidae	82.93%	8.40%	13.51%	42.86%	0.00%
Orthocladiinae/Chir	0	0.2	0.6	0.666667	0
%Amphipoda	0.00%	0.00%	0.00%	0.00%	0.00%
%Crustacea + %Mollusca	7.32%	65.55%	23.42%	7.14%	9.52%
HBI	7.317073	7.638655	7.036036	7.785714	7.904762
%Dominant taxon	65.85%	47.06%	45.95%	42.86%	52.38%
%Collector-Gatherers	68.29%	56.30%	47.75%	28.57%	9.52%
%Filterers	17.07%	0.00%	0.90%	0.00%	0.00%
Total taxa	1	3	1	1	1
POET	1	1	1	1	1
Chironomidae taxa	1	3	3	3	1
Crustacea + Mollusca	1	3	1	1	1
% Chironomidae	1	5	5	1	5
Orthocladiinae/Chir	1	3	5	5	1
%Amphipoda	5	5	5	5	5
%Crustacea + %Mollusca	5	1	5	5	5
HBI	3	1	3	1	1
%Dominant taxon	1	3	3	3	1
%Collector-Gatherers	3	3	3	1	1
%Filterers	1	3	3	3	3
Total score	24	34	38	30	26
Percent of maximum score	0.4	0.566667	0.633333	0.5	0.433333
Impairment classification	**poor**	**sub-optimal**	**sub-optimal**	**poor**	**poor**

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Taxa Listing

Project ID: MDT06PBSJ
RAI No.: MDT06PBSJ003

RAI No.: MDT06PBSJ003 **Sta. Name:** MUSGRAVE LAKE
Client ID: RS-1
Date Coll.: 7/18/2006 **No. Jars:** 1 **STORET ID:**

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Non-Insect							
Acari	8	7.69%	Yes	Unknown		5	PR
Cladocera	5	4.81%	Yes	Unknown		8	CF
Copepoda	2	1.92%	Yes	Unknown		8	CG
Ostracoda	24	23.08%	Yes	Unknown		8	CG
Lymnaeidae							
Stagnicola sp.	4	3.85%	Yes	Unknown		6	SC
Physidae							
Physidae	4	3.85%	Yes	Unknown		8	SC
Planorbidae							
Gyraulus sp.	13	12.50%	Yes	Unknown		8	SC
Talitridae							
Hyalella sp.	2	1.92%	Yes	Unknown		8	CG
Odonata							
Lestidae							
Lestes sp.	1	0.96%	Yes	Larva		9	PR
Ephemeroptera							
Baetidae							
Callibaetis sp.	13	12.50%	Yes	Larva		9	CG
Caenidae							
Caenis sp.	1	0.96%	Yes	Larva		7	CG
Heteroptera							
Notonectidae							
Notonectidae	2	1.92%	Yes	Larva		10	PR
Trichoptera							
Leptoceridae							
Triaenodes sp.	8	7.69%	Yes	Larva		6	SH
Coleoptera							
Dytiscidae							
Laccophilus sp.	4	3.85%	Yes	Adult		5	PR
Haliplidae							
Haliplus sp.	1	0.96%	Yes	Adult		5	PH
Haliplus sp.	1	0.96%	No	Larva		5	PH
Diptera							
Ceratopogonidae							
Ceratopogoninae	1	0.96%	Yes	Larva		6	PR
Chironomidae							
Chironomidae							
Corynoneura sp.	2	1.92%	Yes	Larva		7	CG
Cricotopus (Isocladius) sp.	2	1.92%	Yes	Larva		7	SH
Dicrotendipes sp.	2	1.92%	Yes	Larva		8	CG
Micropsectra sp.	1	0.96%	Yes	Larva		4	CG
Orthocladius sp.	1	0.96%	Yes	Larva		6	CG
Phaenopsectra sp.	1	0.96%	Yes	Larva		7	SC
Psectrocladius sp.	1	0.96%	Yes	Larva		8	CG

Taxa Listing

Project ID: MDT06PBSJ
RAI No.: MDT06PBSJ003

RAI No.: MDT06PBSJ003 **Sta. Name:** MUSGRAVE LAKE
Client ID: RS-1
Date Coll.: 7/18/2006 **No. Jars:** 1 **STORET ID:**

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Sample Count	104						

Metrics Report

Project ID: MDT06PBSJ
RAI No.: MDT06PBSJ003
Sta. Name: MUSGRAVE LAKE
Client ID: RS-1
STORET ID:
Coll. Date: 7/18/2006

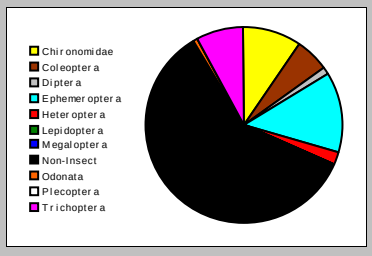
Abundance Measures

Sample Count: 104
Sample Abundance: 385.19 27.00% of sample used

Coll. Procedure:
Sample Notes:

Taxonomic Composition

Category	R	A	PRA
Non-Insect	8	62	59.62%
Odonata	1	1	0.96%
Ephemeroptera	2	14	13.46%
Plecoptera			
Heteroptera	1	2	1.92%
Megaloptera			
Trichoptera	1	8	7.69%
Lepidoptera			
Coleoptera	2	6	5.77%
Diptera	1	1	0.96%
Chironomidae	7	10	9.62%

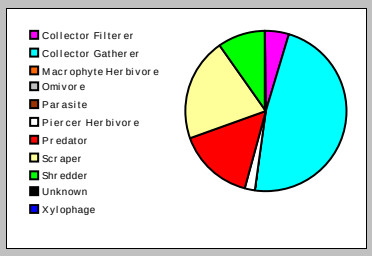


Dominant Taxa

Category	A	PRA
Ostracoda	24	23.08%
Gyraulus	13	12.50%
Callibaetis	13	12.50%
Triaenodes	8	7.69%
Acari	8	7.69%
Cladocera	5	4.81%
Stagnicola	4	3.85%
Physidae	4	3.85%
Laccophilus	4	3.85%
Notonectidae	2	1.92%
Haliplus	2	1.92%
Dicrotendipes	2	1.92%
Cricotopus (Isocladius)	2	1.92%
Corynoneura	2	1.92%
Copepoda	2	1.92%

Functional Composition

Category	R	A	PRA
Predator	5	16	15.38%
Parasite			
Collector Gatherer	10	49	47.12%
Collector Filterer	1	5	4.81%
Macrophyte Herbivore			
Piercer Herbivore	1	2	1.92%
Xylophage			
Scraper	4	22	21.15%
Shredder	2	10	9.62%
Omivore			
Unknown			

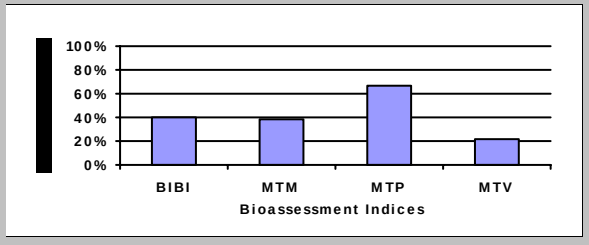


Metric Values and Scores

Metric	Value	BIBI	MTP	MTV	MTM
Composition					
Taxa Richness	23	3	2		1
Non-Insect Percent	59.62%				
E Richness	2	1		1	
P Richness	0	1		0	
T Richness	1	1		0	
EPT Richness	3		1		0
EPT Percent	21.15%		1		0
Oligochaeta+Hirudinea Percent					
Baetidae/Ephemeroptera	0.929				
Hydropsychidae/Trichoptera	0.000				
Dominance					
Dominant Taxon Percent	23.08%		3		3
Dominant Taxa (2) Percent	35.58%				
Dominant Taxa (3) Percent	48.08%	5			
Dominant Taxa (10) Percent	81.73%				
Diversity					
Shannon H (loge)	2.603				
Shannon H (log2)	3.756		3		
Margalef D	4.747				
Simpson D	0.099				
Evenness	0.067				
Function					
Predator Richness	5		2		
Predator Percent	15.38%	3			
Filterer Richness	1				
Filterer Percent	4.81%			3	
Collector Percent	51.92%		3		3
Scraper+Shredder Percent	30.77%		3		1
Scraper/Filterer	4.400				
Scraper/Scraper+Filterer	0.815				
Habit					
Burrower Richness	2				
Burrower Percent	2.88%				
Swimmer Richness	5				
Swimmer Percent	26.92%				
Clinger Richness	2	1			
Clinger Percent	2.88%				
Characteristics					
Cold Stenotherm Richness	0				
Cold Stenotherm Percent	0.00%				
Hemoglobin Bearer Richness	4				
Hemoglobin Bearer Percent	17.31%				
Air Breather Richness	1				
Air Breather Percent	3.85%				
Voltinism					
Univoltine Richness	9				
Semivoltine Richness	2	1			
Multivoltine Percent	59.62%		2		
Tolerance					
Sediment Tolerant Richness	2				
Sediment Tolerant Percent	16.35%				
Sediment Sensitive Richness	0				
Sediment Sensitive Percent	0.00%				
Metals Tolerance Index	2.705				
Pollution Sensitive Richness	0	1		0	
Pollution Tolerant Percent	46.15%	3		0	
Hilsenhoff Biotic Index	7.404		0		0
Intolerant Percent	0.00%				
Supertolerant Percent	66.35%				
CTQa	95.143				

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	20	40.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	20	66.67%	Slight
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	4	22.22%	Moderate
MTM	Montana DEQ Mountains (Bukantis 1998)	8	38.10%	Moderate



Taxa Listing

Project ID: MDT06PBSJ
RAI No.: MDT06PBSJ004

RAI No.: MDT06PBSJ004 **Sta. Name:** MUSGRAVE LAKE
Client ID: RS-2
Date Coll.: 7/18/2006 **No. Jars:** 1 **STORET ID:**

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Non-Insect							
Acari	2	1.98%	Yes	Unknown		5	PR
Copepoda	1	0.99%	Yes	Unknown		8	CG
Ostracoda	6	5.94%	Yes	Unknown		8	CG
Physidae							
Physidae	2	1.98%	Yes	Unknown		8	SC
Ephemeroptera							
Caenidae							
Caenis sp.	6	5.94%	Yes	Larva		7	CG
Heteroptera							
Corixidae							
Corixidae	2	1.98%	Yes	Larva		10	PH
Coleoptera							
Haliplidae							
Haliplus sp.	5	4.95%	No	Larva		5	PH
Haliplus sp.	2	1.98%	Yes	Adult		5	PH
Diptera							
Ceratopogonidae							
Ceratopogoninae	69	68.32%	Yes	Larva		6	PR
Ceratopogoninae	2	1.98%	No	Pupa		6	PR
Chironomidae							
Chironomidae							
Dicrotendipes sp.	3	2.97%	Yes	Larva		8	CG
Zavreliella sp.	1	0.99%	Yes	Larva			UN
Sample Count	**101**						

Metrics Report

Project ID: MDT06PBSJ
RAI No.: MDT06PBSJ004
Sta. Name: MUSGRAVE LAKE
Client ID: RS-2
STORET ID:
Coll. Date: 7/18/2006

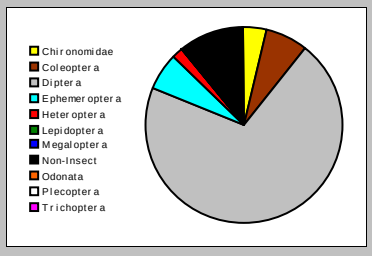
Abundance Measures

Sample Count: 101
Sample Abundance: 606.00 16.67% of sample used

Coll. Procedure:
Sample Notes:

Taxonomic Composition

Category	R	A	PRA
Non-Insect	4	11	10.89%
Odonata			
Ephemeroptera	1	6	5.94%
Plecoptera			
Heteroptera	1	2	1.98%
Megaloptera			
Trichoptera			
Lepidoptera			
Coleoptera	1	7	6.93%
Diptera	1	71	70.30%
Chironomidae	2	4	3.96%

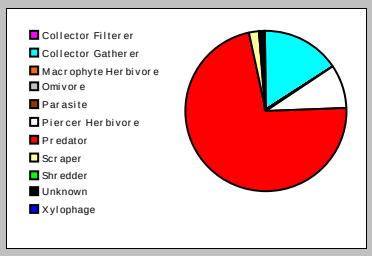


Dominant Taxa

Category	A	PRA
Ceratopogoninae	71	70.30%
Haliplus	7	6.93%
Ostracoda	6	5.94%
Caenis	6	5.94%
Dicrotendipes	3	2.97%
Physidae	2	1.98%
Corixidae	2	1.98%
Acari	2	1.98%
Zavreliella	1	0.99%
Copepoda	1	0.99%

Functional Composition

Category	R	A	PRA
Predator	2	73	72.28%
Parasite			
Collector Gatherer	4	16	15.84%
Collector Filterer			
Macrophyte Herbivore			
Piercer Herbivore	2	9	8.91%
Xylophage			
Scraper	1	2	1.98%
Shredder			
Omivore			
Unknown	1	1	0.99%

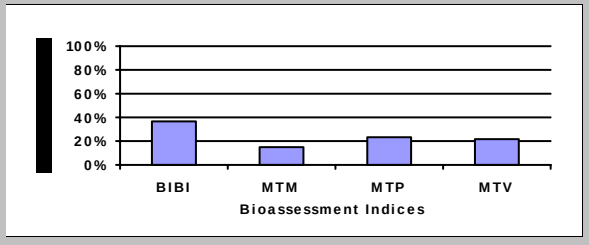


Metric Values and Scores

Metric	Value	BIBI	MTP	MTV	MTM
Composition					
Taxa Richness	10	1	0		0
Non-Insect Percent	10.89%				
E Richness	1	1		0	
P Richness	0	1		0	
T Richness	0	1		0	
EPT Richness	1		0		0
EPT Percent	5.94%		0		0
Oligochaeta+Hirudinea Percent					
Baetidae/Ephemeroptera	0.000				
Hydropsychidae/Trichoptera	0.000				
Dominance					
Dominant Taxon Percent	70.30%		0		0
Dominant Taxa (2) Percent	77.23%				
Dominant Taxa (3) Percent	83.17%	1			
Dominant Taxa (10) Percent	100.00%				
Diversity					
Shannon H (loge)	1.112				
Shannon H (log2)	1.605		0		
Margalef D	1.981				
Simpson D	0.545				
Evenness	0.087				
Function					
Predator Richness	2		0		
Predator Percent	72.28%	5			
Filterer Richness	0				
Filterer Percent	0.00%			3	
Collector Percent	15.84%		3		3
Scraper+Shredder Percent	1.98%		0		0
Scraper/Filterer	0.000				
Scraper/Scraper+Filterer	0.000				
Habit					
Burrower Richness	2				
Burrower Percent	73.27%				
Swimmer Richness	2				
Swimmer Percent	8.91%				
Clinger Richness	0	1			
Clinger Percent	0.00%				
Characteristics					
Cold Stenotherm Richness	0				
Cold Stenotherm Percent	0.00%				
Hemoglobin Bearer Richness	2				
Hemoglobin Bearer Percent	3.96%				
Air Breather Richness	0				
Air Breather Percent	0.00%				
Voltinism					
Univoltine Richness	4				
Semivoltine Richness	1	1			
Multivoltine Percent	11.88%		3		
Tolerance					
Sediment Tolerant Richness	0				
Sediment Tolerant Percent	0.00%				
Sediment Sensitive Richness	0				
Sediment Sensitive Percent	0.00%				
Metals Tolerance Index	3.988				
Pollution Sensitive Richness	0	1		0	
Pollution Tolerant Percent	17.82%	5		1	
Hilsenhoff Biotic Index	6.290		1		0
Intolerant Percent	0.00%				
Supertolerant Percent	13.86%				
CTQa	93.000				

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	18	36.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	7	23.33%	Moderate
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	4	22.22%	Moderate
MTM	Montana DEQ Mountains (Bukantis 1998)	3	14.29%	Severe



Taxa Listing

Project ID: MDT06PBSJ
RAI No.: MDT06PBSJ001

RAI No.: MDT06PBSJ001 **Sta. Name:** MUSGRAVE LAKE
Client ID: ES-1
Date Coll.: 7/18/2006 **No. Jars:** 1 **STORET ID:**

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Non-Insect							
Acari	3	2.97%	Yes	Unknown		5	PR
Copepoda	2	1.98%	Yes	Unknown		8	CG
Lymnaeidae							
Stagnicola sp.	2	1.98%	Yes	Unknown		6	SC
Physidae							
Physidae	27	26.73%	Yes	Unknown		8	SC
Planorbidae							
Helisoma sp.	3	2.97%	Yes	Unknown		6	SC
Planorbidae	39	38.61%	No	Immature		6	SC
Talitridae							
Hyalella sp.	3	2.97%	Yes	Unknown		8	CG
Odonata							
Libellulidae							
Sympetrum sp.	1	0.99%	Yes	Larva		9	PR
Ephemeroptera							
Baetidae							
Callibaetis sp.	1	0.99%	Yes	Larva	Damaged	9	CG
Heteroptera							
Corixidae							
Corixidae	1	0.99%	No	Larva		10	PH
Sigara sp.	1	0.99%	Yes	Adult		5	PH
Coleoptera							
Haliplidae							
Haliplus sp.	1	0.99%	Yes	Larva		5	PH
Hydrophilidae							
Hydrophilidae	1	0.99%	Yes	Larva		5	PR
Diptera							
Ceratopogonidae							
Ceratopogoninae	5	4.95%	Yes	Larva		6	PR
Chironomidae							
Chironomidae							
Chironomidae	1	0.99%	No	Pupa		10	CG
Chironomini	1	0.99%	No	Larva	Early Instar	6	CG
Cricotopus (Isocladius) sp.	1	0.99%	Yes	Larva		7	SH
Labrundinia sp.	1	0.99%	Yes	Larva		7	PR
Orthocladius sp.	1	0.99%	Yes	Larva		6	CG
Parachironomus sp.	5	4.95%	Yes	Larva		10	PR
Polypedilum sp.	1	0.99%	Yes	Larva		6	SH
Sample Count	**101**						

Metrics Report

Project ID: MDT06PBSJ
RAI No.: MDT06PBSJ001
Sta. Name: MUSGRAVE LAKE
Client ID: ES-1
STORET ID:
Coll. Date: 7/18/2006

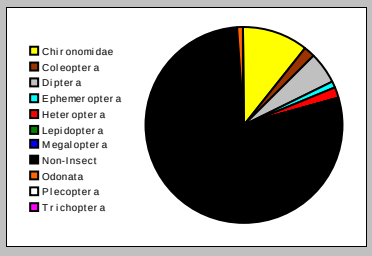
Abundance Measures

Sample Count: 101
Sample Abundance: 168.33 60.00% of sample used

Coll. Procedure:
Sample Notes:

Taxonomic Composition

Category	R	A	PRA
Non-Insect	6	79	78.22%
Odonata	1	1	0.99%
Ephemeroptera	1	1	0.99%
Plecoptera			
Heteroptera	1	2	1.98%
Megaloptera			
Trichoptera			
Lepidoptera			
Coleoptera	2	2	1.98%
Diptera	1	5	4.95%
Chironomidae	5	11	10.89%

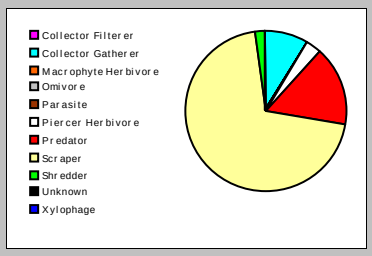


Dominant Taxa

Category	A	PRA
Planorbidae	39	38.61%
Physidae	27	26.73%
Parachironomus	5	4.95%
Ceratopogoninae	5	4.95%
Hyalella	3	2.97%
Helisoma	3	2.97%
Acari	3	2.97%
Stagnicola	2	1.98%
Copepoda	2	1.98%
Sympetrum	1	0.99%
Sigara	1	0.99%
Polypedilum	1	0.99%
Orthocladius	1	0.99%
Labrundinia	1	0.99%
Hydrophilidae	1	0.99%

Functional Composition

Category	R	A	PRA
Predator	6	16	15.84%
Parasite			
Collector Gatherer	4	9	8.91%
Collector Filterer			
Macrophyte Herbivore			
Piercer Herbivore	2	3	2.97%
Xylophage			
Scraper	3	71	70.30%
Shredder	2	2	1.98%
Omivore			
Unknown			

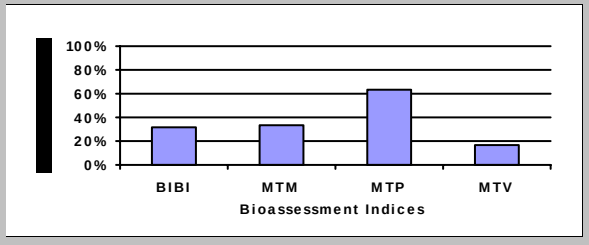


Metric Values and Scores

Metric	Value	BIBI	MTP	MTV	MTM
Composition					
Taxa Richness	17	1	1		0
Non-Insect Percent	78.22%				
E Richness	1	1		0	
P Richness	0	1		0	
T Richness	0	1		0	
EPT Richness	1		0		0
EPT Percent	0.99%		0		0
Oligochaeta+Hirudinea Percent					
Baetidae/Ephemeroptera	1.000				
Hydropsychidae/Trichoptera	0.000				
Dominance					
Dominant Taxon Percent	38.61%		2		1
Dominant Taxa (2) Percent	65.35%				
Dominant Taxa (3) Percent	70.30%	3			
Dominant Taxa (10) Percent	89.11%				
Diversity					
Shannon H (loge)	2.082				
Shannon H (log2)	3.004		3		
Margalef D	3.924				
Simpson D	0.223				
Evenness	0.085				
Function					
Predator Richness	6		3		
Predator Percent	15.84%	3			
Filterer Richness	0				
Filterer Percent	0.00%			3	
Collector Percent	8.91%		3		3
Scraper+Shredder Percent	72.28%		3		3
Scraper/Filterer	0.000				
Scraper/Scraper+Filterer	0.000				
Habit					
Burrower Richness	1				
Burrower Percent	5.94%				
Swimmer Richness	3				
Swimmer Percent	3.96%				
Clinger Richness	2	1			
Clinger Percent	1.98%				
Characteristics					
Cold Stenotherm Richness	0				
Cold Stenotherm Percent	0.00%				
Hemoglobin Bearer Richness	4				
Hemoglobin Bearer Percent	48.51%				
Air Breather Richness	1				
Air Breather Percent	0.99%				
Voltinism					
Univoltine Richness	6				
Semivoltine Richness	3	3			
Multivoltine Percent	16.83%		3		
Tolerance					
Sediment Tolerant Richness	1				
Sediment Tolerant Percent	40.59%				
Sediment Sensitive Richness	0				
Sediment Sensitive Percent	0.00%				
Metals Tolerance Index	3.256				
Pollution Sensitive Richness	0	1		0	
Pollution Tolerant Percent	75.25%	1		0	
Hilsenhoff Biotic Index	6.931		1		0
Intolerant Percent	0.00%				
Supertolerant Percent	40.59%				
CTQa	94.000				

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	16	32.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	19	63.33%	Slight
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	3	16.67%	Severe
MTM	Montana DEQ Mountains (Bukantis 1998)	7	33.33%	Moderate



Taxa Listing

Project ID: MDT06PBSJ
RAI No.: MDT06PBSJ002

RAI No.: MDT06PBSJ002 **Sta. Name:** MUSGRAVE LAKE
Client ID: ES-2
Date Coll.: 7/18/2006 **No. Jars:** 1 **STORET ID:**

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Non-Insect							
Nematoda	1	1.25%	Yes	Unknown		5	PA
Odonata							
Aeshnidae							
Aeshnidae	1	1.25%	Yes	Larva	Damaged	5	PR
Coleoptera							
Haliplidae							
Haliplus sp.	1	1.25%	Yes	Larva		5	PH
Hydrophilidae							
Enochrus sp.	1	1.25%	Yes	Adult		5	CG
Diptera							
Ceratopogonidae							
Ceratopogoninae	9	11.25%	No	Pupa		6	PR
Ceratopogoninae	58	72.50%	Yes	Larva		6	PR
Tabanidae							
Tabanidae	1	1.25%	Yes	Larva		6	PR
Chironomidae							
Chironomidae							
Dicrotendipes sp.	1	1.25%	Yes	Larva		8	CG
Endochironomus sp.	1	1.25%	Yes	Larva		10	SH
Polypedilum sp.	5	6.25%	Yes	Larva		6	SH
Rheocricotopus sp.	1	1.25%	Yes	Larva		4	CG
Sample Count	**80**						

Metrics Report

Project ID: MDT06PBSJ
RAI No.: MDT06PBSJ002
Sta. Name: MUSGRAVE LAKE
Client ID: ES-2
STORET ID:
Coll. Date: 7/18/2006

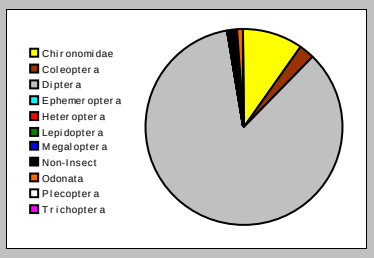
Abundance Measures

Sample Count: 80
Sample Abundance: 80.00 100.00% of sample used

Coll. Procedure:
Sample Notes:

Taxonomic Composition

Category	R	A	PRA
Non-Insect	1	1	1.25%
Odonata	1	1	1.25%
Ephemeroptera			
Plecoptera			
Heteroptera			
Megaloptera			
Trichoptera			
Lepidoptera			
Coleoptera	2	2	2.50%
Diptera	2	68	85.00%
Chironomidae	4	8	10.00%



Dominant Taxa

Category	A	PRA
Ceratopogoninae	67	83.75%
Polypedilum	5	6.25%
Tabanidae	1	1.25%
Rheocricotopus	1	1.25%
Nematoda	1	1.25%
Haliplus	1	1.25%
Enochrus	1	1.25%
Endochironomus	1	1.25%
Dicrotendipes	1	1.25%
Aeshnidae	1	1.25%

Functional Composition

Category	R	A	PRA
Predator	3	69	86.25%
Parasite	1	1	1.25%
Collector Gatherer	3	3	3.75%
Collector Filterer			
Macrophyte Herbivore			
Piercer Herbivore	1	1	1.25%
Xylophage			
Scraper			
Shredder	2	6	7.50%
Omivore			
Unknown			

Metric Values and Scores

Metric	Value	BIBI	MTP	MTV	MTM
Composition					
Taxa Richness	10	1	0		0
Non-Insect Percent	1.25%				
E Richness	0	1		0	
P Richness	0	1		0	
T Richness	0	1		0	
EPT Richness	0		0		0
EPT Percent	0.00%		0		0
Oligochaeta+Hirudinea Percent					
Baetidae/Ephemeroptera	0.000				
Hydropsychidae/Trichoptera	0.000				
Dominance					
Dominant Taxon Percent	83.75%		0		0
Dominant Taxa (2) Percent	90.00%				
Dominant Taxa (3) Percent	91.25%	1			
Dominant Taxa (10) Percent	100.00%				
Diversity					
Shannon H (loge)	0.832				
Shannon H (log2)	1.201		0		
Margalef D	2.111				
Simpson D	0.669				
Evenness	0.067				
Function					
Predator Richness	3		1		
Predator Percent	86.25%	5			
Filterer Richness	0				
Filterer Percent	0.00%			3	
Collector Percent	3.75%		3		3
Scraper+Shredder Percent	7.50%		1		0
Scraper/Filterer	0.000				
Scraper/Scraper+Filterer	0.000				
Habit					
Burrower Richness	3				
Burrower Percent	86.25%				
Swimmer Richness	1				
Swimmer Percent	1.25%				
Clinger Richness	1	1			
Clinger Percent	6.25%				
Characteristics					
Cold Stenotherm Richness	0				
Cold Stenotherm Percent	0.00%				
Hemoglobin Bearer Richness	3				
Hemoglobin Bearer Percent	8.75%				
Air Breather Richness	2				
Air Breather Percent	2.50%				
Voltinism					
Univoltine Richness	2				
Semivoltine Richness	3	3			
Multivoltine Percent	11.25%		3		
Tolerance					
Sediment Tolerant Richness	0				
Sediment Tolerant Percent	0.00%				
Sediment Sensitive Richness	0				
Sediment Sensitive Percent	0.00%				
Metals Tolerance Index	4.052				
Pollution Sensitive Richness	0	1		0	
Pollution Tolerant Percent	6.25%	5		2	
Hilsenhoff Biotic Index					
Intolerant Percent	0.00%				
Supertolerant Percent	2.50%				
CTQa	98.000				

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	20	40.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	8	26.67%	Moderate
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	5	27.78%	Moderate
MTM	Montana DEQ Mountains (Bukantis 1998)	3	14.29%	Severe