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# **MONTANA DEPARTMENT OF TRANSPORTATION WETLAND MITIGATION MONITORING REPORT: YEAR 2005**

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*Musgrave Lake  
Zurich, Montana*



Prepared for:

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

Prepared by:

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

December 2005

Project No: B4054.00 - 0304



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## 1.0 INTRODUCTION

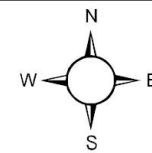
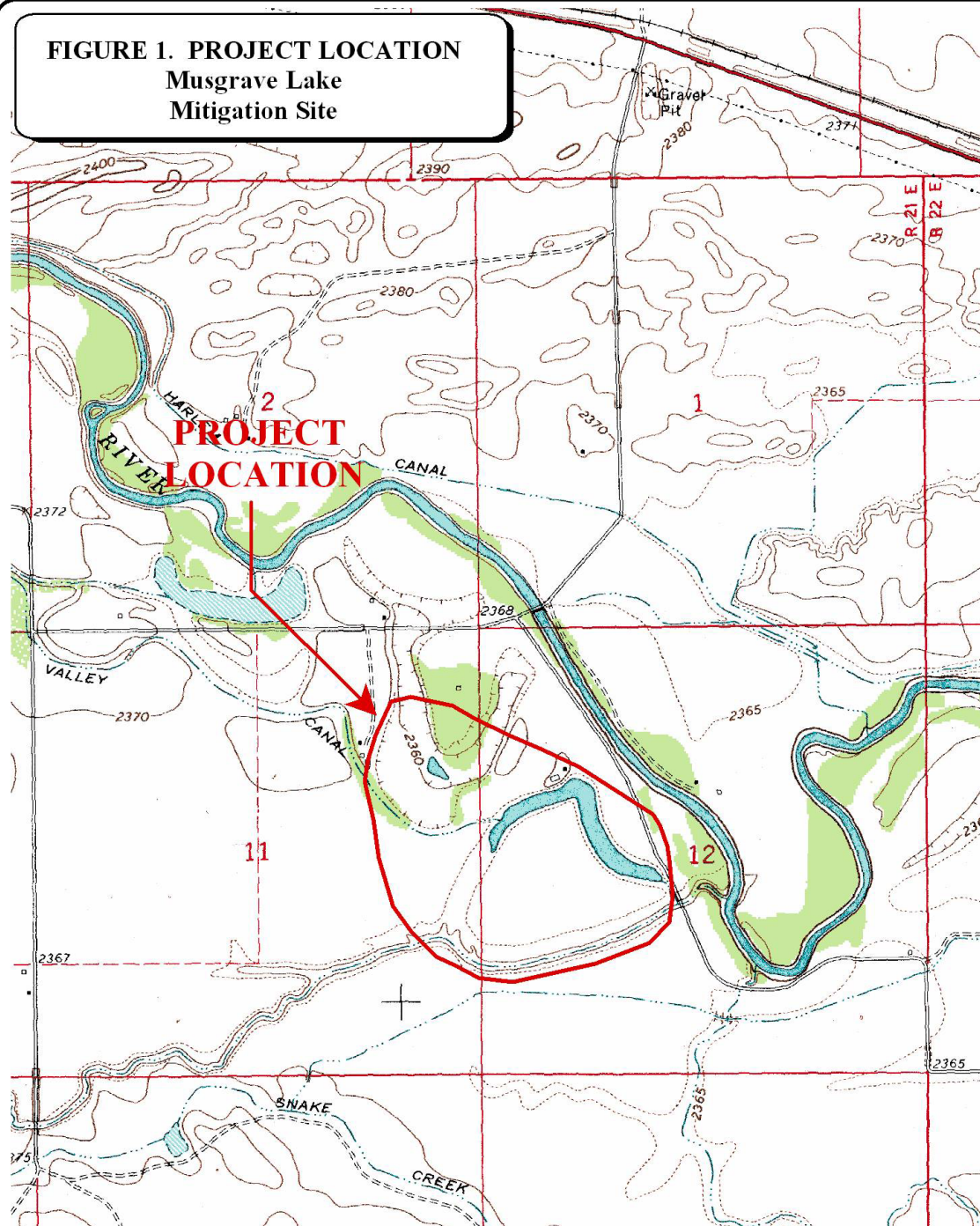
This report documents the fifth year of monitoring at the Musgrave Lake wetland mitigation project. The project was constructed in late 2000/early 2001 in Watershed 11 (Milk River). It is anticipated that this site will compensate for wetland impacts resulting from several proposed Montana Department 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 agreement between the landowner and MDT specifies that approximately 27.2 acres of wetland credit will be developed.

The approximate site boundary is illustrated on **Figure 2 (Appendix A)**, and the original conceptual layout is provided in **Appendix D**. The project is currently comprised of two “restoration” sites and one “enhancement” site. A second enhancement site was initially approved for credit consideration by the Corps of Engineers (COE) and implemented within the easement, but was subsequently dropped from MDT monitoring upon the COE’s recommendation in 2002. 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 intends to enhance approximately four to five acres of Musgrave Lake at an area referenced as Enhancement Site 1 (ES1) (**Figure 2, Appendix A**). Although largely consisting of existing wetland, Enhancement Site 1, 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. 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 an appropriate increase in wetland functional condition is achieved, a ratio of 3:1 was tentatively approved for enhancement by the COE.

**FIGURE 1. PROJECT LOCATION**  
Musgrave Lake  
Mitigation Site



PROJECT #: 130091.019  
DATE: MAY 2001  
LOCATION:  
PROJECT MANAGER: B. DUTTON  
DRAWN BY: B. NOECKER

**LAND & WATER** CONSULTING, INC.

1120 CEDAR PO BOX 8254 MISSOULA, MT 59807

The wetland credit breakdown proposed by the landowner (MLR 2001) and tentatively approved by the COE (2001), once performance standards are met, is as follows:

- Restoration Site 1: 13.6 acres, 1:1 ratio, 13.6 credits
- Restoration Site 2: 10.9 acres, 1:1 ratio, 10.9 credits
- Enhancement Sites 1 and 2: 11.2 acres, 3:1 ratio, 3.7 credits
- Upland Buffer: 3 acres, 4:1 ratio, 0.75 credits

Total Credits: 28.95 acres (*note: 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. Enhancement Site 2 was dropped from monitoring in 2002-2005 per COE / MDT discussions as it was considered to be a reasonably well-functioning system, but may be again monitored in 2006 to ascertain possible enhancement*).

To achieve a 3:1 ratio for wetland enhancement, the COE has required that significant functional improvement be demonstrated (COE 2001). This will occur if the composite functional assessment score improves to within 10 percent of that achieved at the onsite reference wetland (**Figure 2**). The COE (2001) further stated that “*enhancement of an existing wetland must show significant functional increase to qualify for any credit. Simply changing the character or type of an existing good wetland to a different type of equally good wetland may not qualify for credit.*” Other than these improvements to functional attributes, and a five-year monitoring term, no performance standards or success criteria were required by the COE or other agencies.

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

## 2.0 METHODS

### 2.1 Monitoring Dates and Activities

The site was visited on May 17 (spring) and July 18 (mid-season) 2005. 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 jurisdictional 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**).

Three 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 RS 1, RS 2, and ES 1. 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 (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 was 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 according to 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 on the 2004 aerial photo. 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. Observations from past years will ultimately be compared with new data.

## 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 (see field data forms in **Appendix B**). Observations from past years will be compared with new data.

## 2.8 Macroinvertebrates

A total of three macroinvertebrate samples, one each at RS1, RS2, and ES1, 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, 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 using the 1999 MDT Montana Wetland Assessment Method. Field data necessary for this assessment were generally collected during each mid-season site visit. An abbreviated field data sheet for the 1999 MDT

Montana Wetland Assessment Method was compiled to facilitate rapid collection of field information. The remainder of the functional assessment was completed in the office.

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. The approximate location of photo points is shown on **Figure 2, Appendix A**. All photographs were taken using a 50 mm lens. A description and compass direction for each photograph was recorded on the wetland monitoring form.

## **2.11 GPS Data**

During the 2005 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 2005 were documented on a 2004 aerial photograph.

## **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 2005, substantial inundation was again observed at each of the three monitored sites. Water depths ranged between approximately 2 inches and five feet. Open water areas mapped during previous years had largely filled in with aquatic vegetation in 2004, and had filled in further in 2005. 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 over the last 56 years total 8.6 inches for the Chinook station. During 2005, 8.8 inches of precipitation were recorded in Chinook between January and July. Thus, this fifth-year evaluation was apparently conducted during a relatively normal precipitation period.

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 90 percent inundated, with an average depth of 6 inches and a depth range of one to five feet in inundated areas. A deep pool occurs where water enters the site through a culvert at the northwest end. The vast majority of this 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 2005 over past limits.

ES1 was again virtually 100 percent inundated during spring and summer visits, with an average depth of 8 to 10 inches and a range of depths from 0 to 30 inches.

### 3.2 Vegetation

Vegetation species identified on the site are presented in **Table 1** and on the attached data form. As of 2005, nine wetland community types were identified and mapped on the mitigation area (**Figure 3, 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 7: *Populus deltoides*, Type 8: *Rumex crispus* (Type 8 was added in 2003 due to increased inundation at RS1 and RS2, which eliminated Type 6: *Hordeum jubatum/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 RS1, ES1, and RS2. 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 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. Type 5 occurs primarily at ES1. Type 7 occurs mainly along the south and east fringe of RS1 in newly-inundated areas formerly mapped as uplands. Type 8 occurs as a fringe around RS1 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 2, 3 and 4** and in **Charts 1, 2, and 3**.

**Table 1: 2001-2005 Musgrave Lake vegetation species list.**

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

**Table 2: *Transect 1 (RS1) data summary.***

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

**Table 3: *Transect 2 (ES1) data summary.***

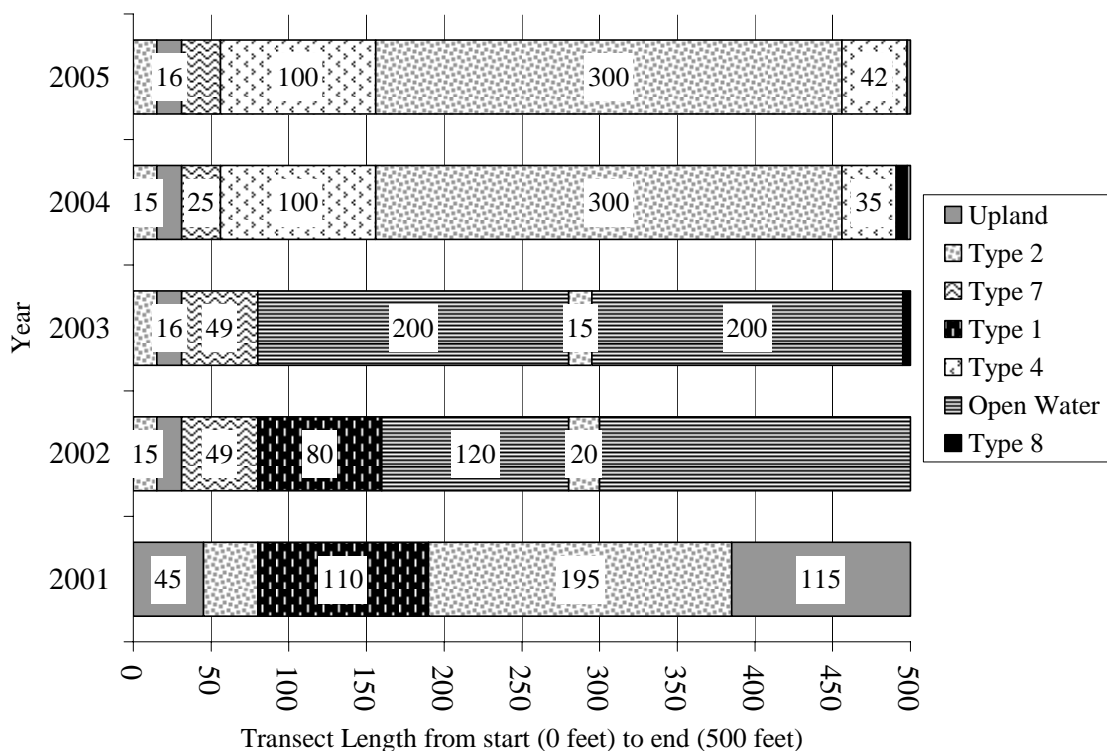
| Monitoring Year   | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|------|------|------|------|------|
| Transect Length (feet)  | 86   | 86   | 86   | 86   | 86   |
| # Vegetation Community Transitions along Transect                 | 1    | 1    | 2    | 2    | 1    |
| # Vegetation Communities along Transect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

**Table 4: *Transect 3 (RS2) data summary.***

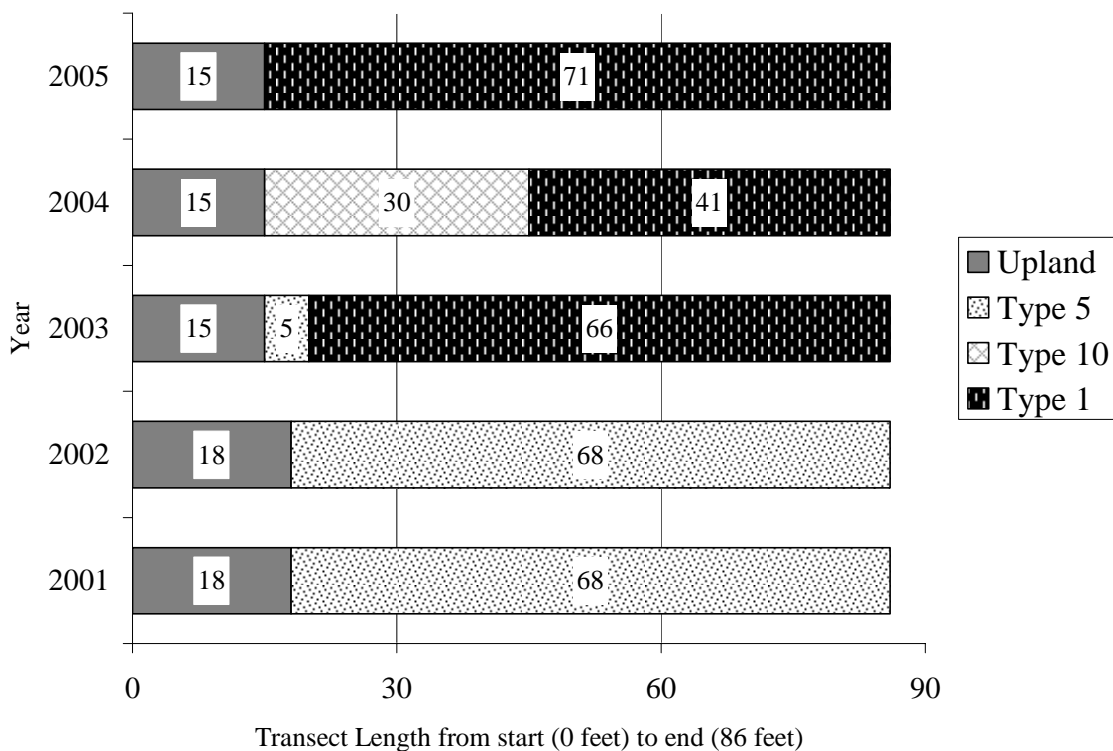
| Monitoring Year   | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|------|------|------|------|------|
| Transect Length (feet)  | 170  | 170  | 170  | 170  | 170  |
| # Vegetation Community Transitions along Transect                 | 2    | 2    | 3    | 3    | 2    |
| # Vegetation Communities along Transect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



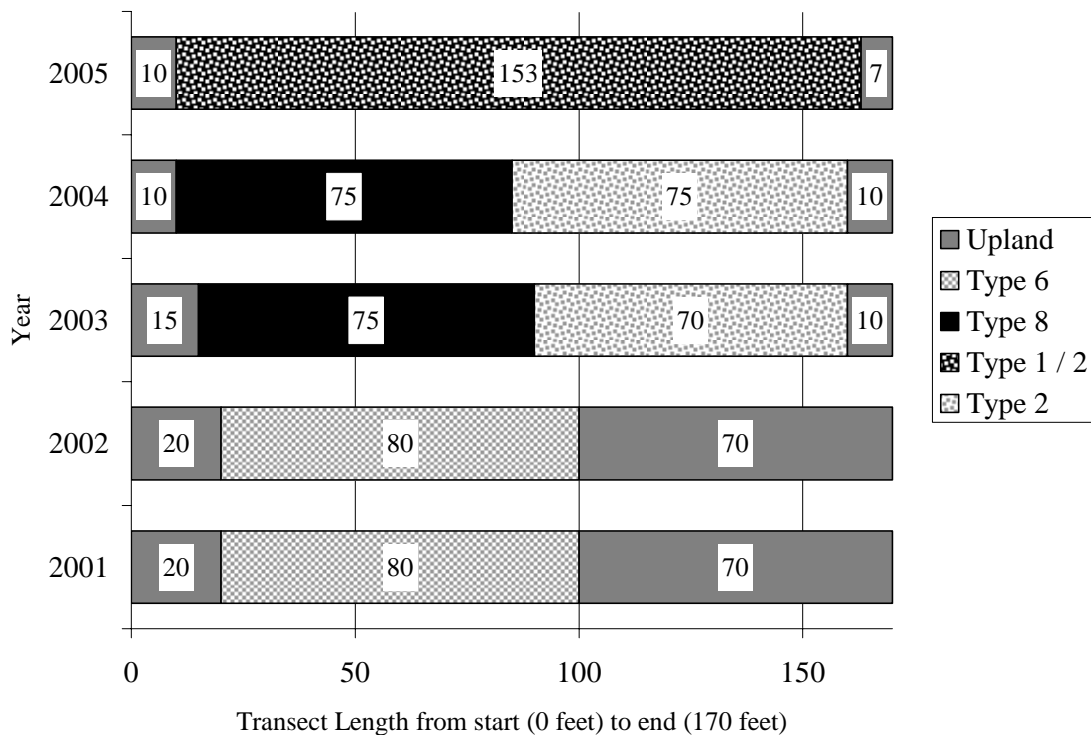
**Chart 1: Transect maps showing vegetation types from start (0 feet) to the end (500 feet) of Transect 1 (RS1) for each year monitored.**



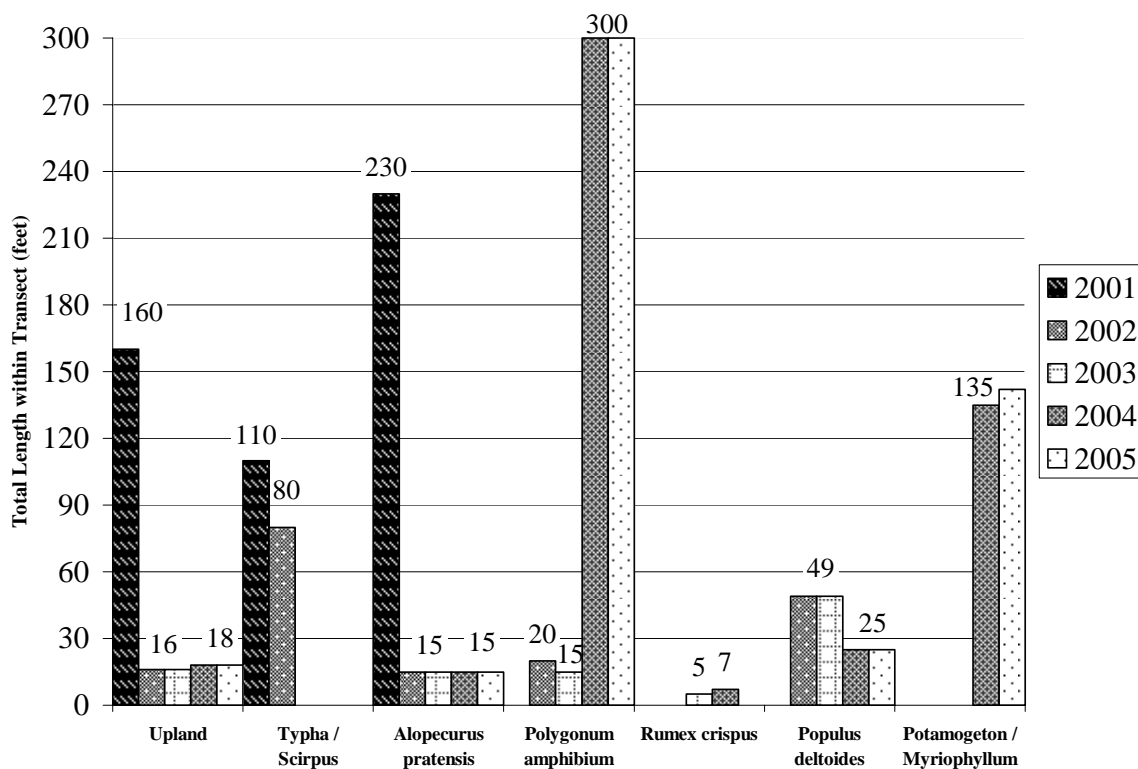
**Chart 2: Transect maps showing vegetation types from start (0 feet) to the end (86 feet) of Transect 2 (ES1) for each year monitored.**



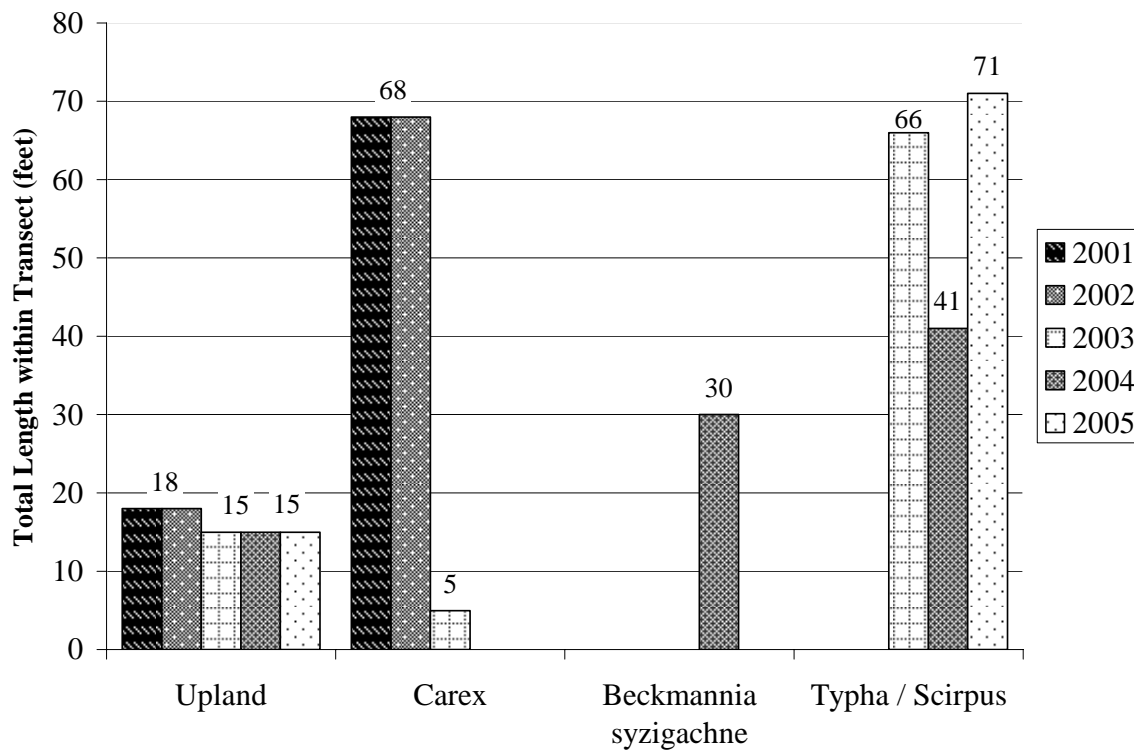
**Chart 3: Transect maps showing vegetation types from start (0 feet) to the end (170 feet) of Transect 3 (RS2) for each year monitored.**



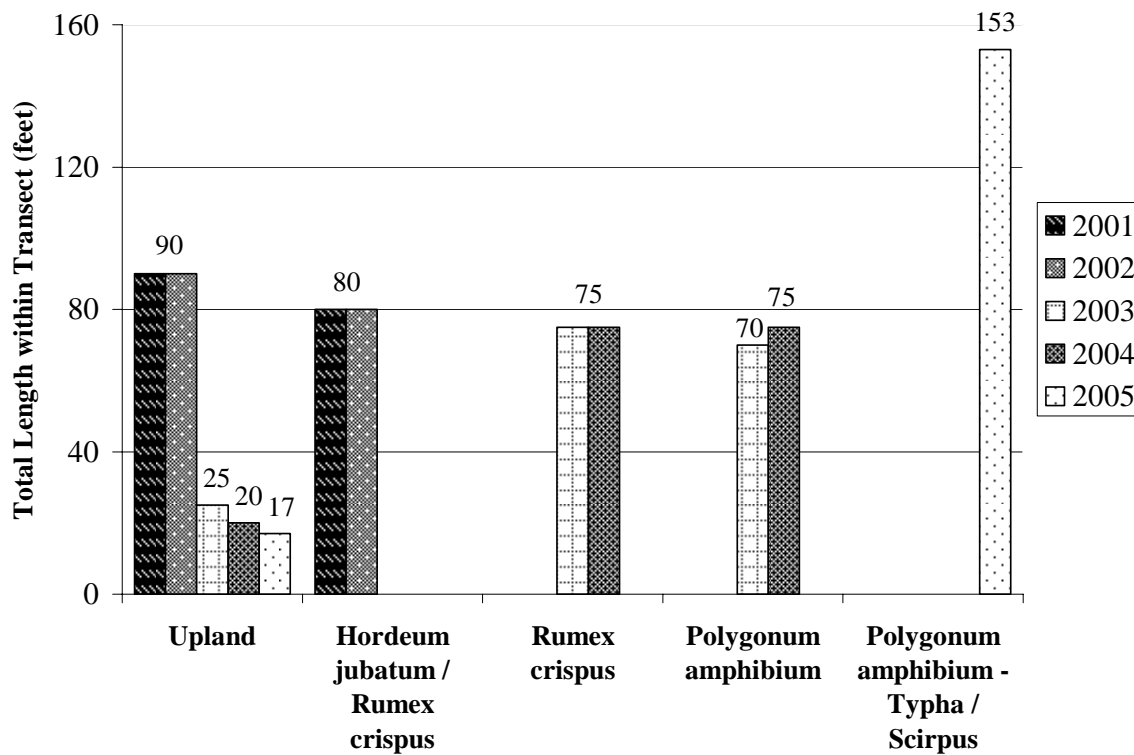
**Chart 4: Length of vegetation communities within Transect 1 (RS1) for each year monitored.**



**Chart 5: Length of vegetation communities within Transect 2 (ES1) for each year monitored.**



**Chart 6: Length of vegetation communities within Transect 3 (RS2) 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 ES 1 transect 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**. Completed wetland delineation forms are included in **Appendix B**. Soils, vegetation, and hydrology are discussed in preceding sections. In 2004, it was discovered that previous gross aquatic area calculations at RS1 included 1.89 acres of the adjacent reference area. These 1.89 acres were not included in 2004 RS1 totals, which is why 2004 totals for RS-1 were lower than 2003 totals. Delineation results for 2005 are as follows:

- RS1: 4.59 wetland acres impaired pre-existing, but currently “restored”.  
7.76 acres of additional emergent, aquatic bed, scrub-shrub and forested wetland interspersed with open water patches.  
Total of 12.35 acres of aquatic habitat delineated in 2005; a gain of 0.16 acre over 2004 totals.
- RS2: 0 wetland acres pre-existing.  
8.43 wetland acres “restored”.  
Total of 8.43 acres of wetlands delineated in 2005; a gain of 1.76 acres over 2004 totals.
- ES1: 4.3 wetland acres pre-existing within delineation area (see below).  
0.5 estimated (planimeter) additional pre-existing wetland acres within easement area north of ditch.  
0.46 acre additional wetlands delineated in 2005.  
Total of 5.26 wetland acres; increase of 0.28 acre from 2004.

Approximately 21.24 wetland/aquatic habitat acres have been “restored” on the mitigation site to date (RS1: 12.35 acres; RS2: 8.43 acres; ES1: 0.46 acre), while approximately 4.8 acres have been enhanced (ES1).

Wetland borders of ES1 were delineated in 2001, although the north border of ES1 was drawn based on the approximate easement borders and is therefore “artificial”. The north border of ES1 was drawn along the path of the ditch flowing into the site from the west, even though the actual wetland is contiguous to the north. Wetland expansion occurred along the south border of ES1 (along the dike) in 2005.

### 3.5 Wildlife

Wildlife species, or evidence of wildlife, observed on the site during 2001-2005 monitoring efforts are listed in **Table 5**. Specific evidence observed, as well as activity codes pertaining to birds, is provided on the completed monitoring form in **Appendix B**. Five mammal, two amphibian, and 37 bird species were noted using portions of the mitigation site during 2005 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 during 2005. 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) west of the Divide and S3 (rare occurrence and/or restricted range and/or vulnerable to extinction) east of the Divide by the MNHP.

### 3.6 Macroinvertebrates

Macroinvertebrate sampling results are provided in **Appendix F** and are summarized below by Rhithron Associates (Bollman 2005). Bioassessment results are summarized in **Chart 7**.

*Restoration Site 1. The bioassessment index indicated that conditions had improved to optimal in 2005. A modest increase in taxa richness and a decrease in the biotic index value were the strongest evidence that conditions had improved at this site over the preceding year. On the other hand, POET taxa remained rare here, and overall abundance was very low, suggesting that the site was not as populated as expected. Index scores are less than reliable when sampling effort produces only 55 organisms. The presence of biting midges suggests that cattle influence the site. Macrophytes and the water column apparently provided the bulk of habitats; water quality measures did not give interpretable results.*

*Restoration Site 2. A slight increase in taxa richness at this site was accompanied by an increase in the number of POET taxa. Chironomid taxa richness also increased between 2004 and 2005. These findings suggest increasing habitat complexity at this site. Substrates were apparently hypoxic, since most of the midges present were hemoglobin-bearers. Macrophyte surfaces provided ample habitat space, and the water column supported a number of taxa as well. The biotic index value was stable over all 5 years of this study, and indicated a moderately tolerant*



**Table 5: Fish and wildlife species observed on the Musgrave Lake Mitigation Site, 2001-2005.**

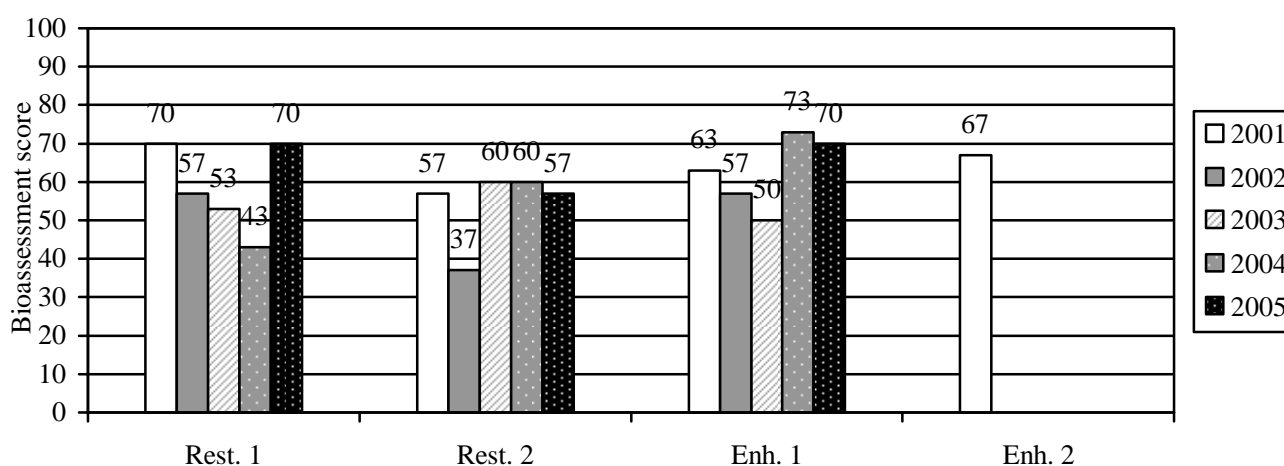
|  |  |
|--|--|
| <b>FISH</b>  |  |
| <b>Unidentified Minnow Species (<i>Hybognathus</i> sp.)</b>  |  |
| <b>AMPHIBIANS</b>  |  |
| <b>Northern Leopard Frog (<i>Rana pipiens</i>)</b>   | <b>Western Chorus Frog (<i>Pseudacris triseriata</i>)</b>  |
| <b>REPTILES</b>  |  |
| Plains Garter Snake ( <i>Thamnophis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

**Bolded** species were observed during 2005 monitoring. All other species were observed during one or more of the previous monitoring years.

*assemblage. Water quality apparently stayed about the same between 2004 and 2005. Scores indicated sub-optimal conditions.*

Enhancement Site 1. Three of the 4 richness measures in the bioassessment index showed decrease in taxa numbers; only the crustacean and mollusks increased in diversity between 2004 and 2005. These findings suggest worsening conditions even though the bioassessment index score increased in that same period, and optimal conditions are implied. Biting midges (*Ceratopogoninae*) were abundant, suggesting that cattle influence the site. Macrophyte surfaces apparently provided considerable habitat; other niches were not common.

**Chart 7: Bioassessment Scores for Musgrave Lake, 2001-2005**



### 3.7 Functional Assessment

Completed functional assessment forms are presented in **Appendix B**. Functional assessment results are summarized in **Table 6**. 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 6**. Ratings and scores in 2005 were similar to those calculated in 2004 (**Table 6**). All three sites remain Category II wetlands in 2005.

Based on the baseline functional assessments conducted by MDT and the landowner, the site has experienced an apparent gain of about 137 functional units (acreage x functional points) at restoration sites RS1 and RS2, and 19 functional units at ES1. No pre-project functional assessment was conducted at RS2 due to the absence of pre-project wetlands.

The composite score at ES1 (7.4 points) again exceeded the composite score for the reference wetland (6.6 points) in 2005. This is partially due to the fact that some variables evaluated and scored for the enhancement site were not evaluated for the reference wetland, resulting in additional points assigned to the enhancement site. Appreciable functional gain, however, occurred at ES1 in 2003-2005.

### 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 2005 aerial photograph.

### 3.9 Maintenance Needs/Recommendations

All dikes were in good condition during the spring and mid-season visits. 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 21.24 wetland/aquatic habitat acres have been “restored” on the mitigation site to date (RS1: 12.35 acres; RS2: 8.43 acres; ES1: 0.46 acre), while approximately 4.8 acres have been enhanced (ES1). Approximately 0.16 acre, 1.76 acres, and 0.28 acre of wetlands were gained respectfully at RS1, RS2, and ES1 between 2004 and 2005.

Appreciable functional enhancement has been achieved across the original 4.8 acres within the easement area at ES1, currently calculated at an approximate 19 functional unit “gain”. An applied 1:3 credit ratio at ES1 would result in approximately 1.6 acres of credit. Also, it should be noted that the total wetland acreage within the easement area at the enhancement site appears to be approximately six acres short of the original 11-acre estimate (original acreage for enhancement was estimated at 11.2 acres for both enhancement sites 1 and 2; Enhancement Site 2 was dropped from monitoring in 2002), reducing the amount of credit available at this site.

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, and upland buffer) as of 2005 is approximately  $21.24 + 1.6 + 0.75 = 23.59$  acres, which is 87% of the 27.2 acre goal.

It is recommended that MDT and the landowner approach the Corps about re-including enhancement credit at Enhancement Site 2, which was dropped from monitoring by MDT and the Corps in 2002-2005. This area was delineated at 3.11 acres in 2001, occurs within the conservation easement, has had cattle excluded, and appears to have been hydrologically enhanced. In 2005, the area was cursorily examined and appeared to have increased inundation and may have expanded in size since 2001. It is recommended that this site be monitored in 2005 in an attempt to quantify any expansion or enhancement. At a 3:1 credit ratio for enhancement, this area could produce at least another acre of credit at the site, in addition to any expansion, which would be credited at 1:1.

It is also recommended that MDT approach the Corps about possibly including the reference wetland (north of RS1) in the mitigation site, and garnering enhancement or preservation credit for this site as it also occurs within the conservation easement.

**Table 6: Summary of 2005 wetland function/value ratings and functional points<sup>1</sup> 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 <sup>2</sup> (Stutzman 1999) | Pre-Project ES1 (MDT 1999) | 2005 RS1          | 2005 RS2     | 2005 ES1     |
| 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 (0.5)    | Mod (0.5)    |
| Short and Long Term Surface Water Storage   | High (1)  | Low (0.2)                                    | Low (0.3)                  | High (0.9)        | High (0.9)   | Mod (0.6)    |
| 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)<br>[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          | 7.1 / 10     | 7.4 / 11     |
| % of Possible Score Achieved  | 66  | 22   | 37                         | 70                | 71           | 67           |
| Overall Category  | II  | III  | III                        | II                | II           | II           |
| <b>Total Acreage of Assessed Wetlands within Easement (ac)</b>                    | <b>6.5 (estimated)</b>  | <b>4.59</b>                                  | <b>4.8</b>                 | <b>12.35</b>      | <b>8.43</b>  | <b>5.26</b>  |
| <b>Functional Units (acreage x actual points) (fu)</b>                            | <b>42.90</b>  | <b>9.18</b>                                  | <b>19.68</b>               | <b>86.45</b>      | <b>59.85</b> | <b>38.92</b> |
| <b>Net Acreage Gain (ac)</b>  | <b>NA</b>   | <b>NA</b>                                    | <b>NA</b>                  | <b>7.76</b>       | <b>8.43</b>  | <b>0.46</b>  |
| <b>Net Functional Unit Gain (fu)</b>  | <b>NA</b>   | <b>NA</b>                                    | <b>NA</b>                  | <b>77.27</b>      | <b>59.85</b> | <b>19.24</b> |
| <b>Total Functional Unit Gain over baseline</b>                                   | <b>156.36</b> Total Functional Units; <b>137.12</b> at restoration wetlands; <b>19.24</b> at enhancement wetlands |  |                            |                   |              |              |

<sup>1</sup> See completed MDT functional assessment forms in **Appendix B** for further detail.<sup>2</sup> 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.

#### 4.0 REFERENCES

- Bollman, W. 2005. MDT Mitigated Wetland Monitoring Project – Aquatic Invertebrate Monitoring Summary 2001-2005. Rhithron Associates Inc. Missoula, MT.
- Carlson, J. 2001. Program Zoologist, Montana Natural Heritage Program, Helena, Montana. April conversation.
- Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual*. U.S. Army Corps of Engineers, Washington, DC.
- Musgrave Lake Ranch LLC. 2001. June 26<sup>th</sup> letter from Jeff Stutzman to Todd Tillinger (Army Corps of Engineers) regarding Milk River Basin Wetland Mitigation Project. Missoula, Montana.
- Ralph, C.J., Geupel, G.R., Pyle, P., Martin, T.E., and D.F. DeSante. 1993. *Handbook of field methods for monitoring landbirds*. Gen. Tech. Rep. PSW-GTR-144. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Dept. of Agriculture. 41 p.
- Reed, P.B. 1988. *National list of plant species that occur in wetlands: North West (Region 9)*. Biological Report 88(26.9), May 1988. U.S. Fish and Wildlife Service. Washington, D.C.
- Soil Conservation Service (SCS). 1986. Soil survey of Blaine County and part of Phillips County, Montana. Bozeman, Montana.
- Urban, L. 2001. Wetland Mitigation Specialist, Montana Department of Transportation, Helena, Montana. March 2001 meeting.
- Urban, L. 2002. Wetland Mitigation Specialist, Montana Department of Transportation, Helena, Montana. January 2002 meeting and August 2002 telephone conversation.
- U.S. Army Corps of Engineers (COE). 2001. December 6<sup>th</sup> letter from Allan Steinle to Jeff Stutzman (Musgrave Lake Ranch LLC) regarding Milk River Wetland Mitigation Project – Corps File # 2000-90-331. Helena, Montana.
- USDA Natural Resources Conservation Service (NRCS). 1998. *Field Indicators of Hydric Soils in the United States*, Version 4. G. Hurt, P. Whited and R. Pringle (eds.). USDA, NRCS Fort Worth, TX.
- Werner, K. 1998. Herpetologist, Salish-Kootenai Community College, Pablo, Montana. May instructional presentation.



## **Appendix A**

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### **FIGURES 2 & 3**

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*MDT Wetland Mitigation Monitoring*  
*Musgrave Lake*  
*Zurich, Montana*



# Figure 2 – Monitoring Activity Locations 2005



PROJECT NAME  
**MDT Musgrave Wetland Mitigation**

DRAWING TITLE  
**Monitoring Activity Locations**

PROJ NO: 43054.303

LOCATION: FL Belknap, MT

SCALE: 1"=300'

FILE NAME: L:\B43054.303\Musgrave\dwg\Musgrave2005.dwg

DRAWN: LL

PROJ MGR: J.Berglund

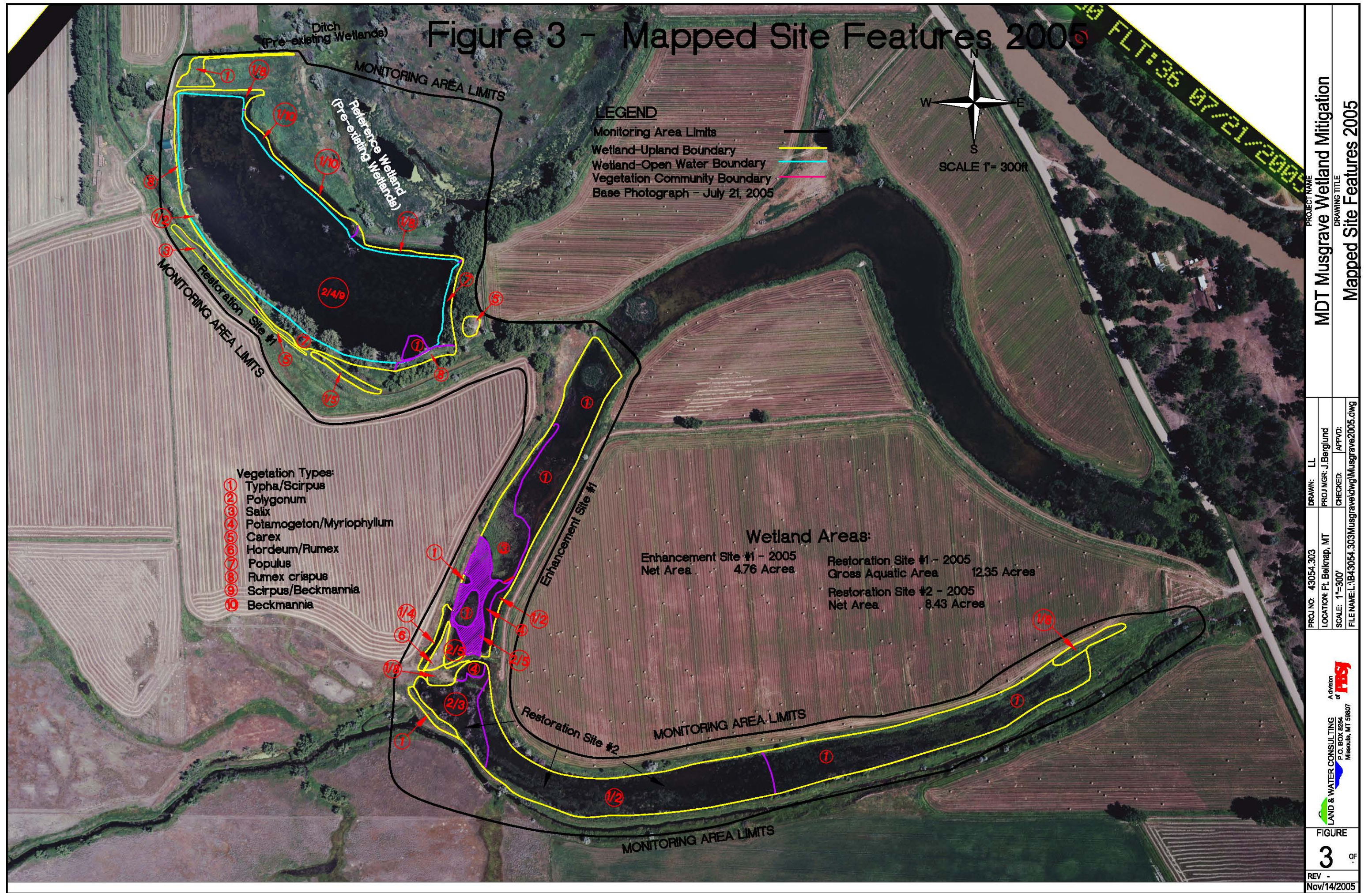
CHECKED: APPVD:

**LAND & WATER CONSULTING**  
A Division of **PLS**  
P.O. BOX 8254  
Missoula, MT 59807

FIGURE  
**2** OF  
REV -  
Dec/06/2005



Figure 3 - Mapped Site Features 2005





## **Appendix B**

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**2005 WETLAND MITIGATION SITE MONITORING FORM**

**2005 BIRD SURVEY FORMS**

**2005 WETLAND DELINEATION FORMS**

**2005 FUNCTIONAL ASSESSMENT FORMS**

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*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, 2005 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: 10:00-14:30  
Initial Evaluation Date: May 15, 2001 Monitoring Year: 5 # 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: 90%  
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, and ES1 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 90% inundated, ave. depth is 1 foot, range of depths is 2" to 5 feet. ES1 is 100% inundated, ave. depth is 24", range of depths is 6" to 30".

## 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 2001-2004**

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 2003-2005 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 2002-2005.**

Community Number: **4** Community Title (main spp): **Potamogeton / 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 2004-2005**



## 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: **This community no longer exists at the site. It was replaced by Type 8 in 2003, and subsequently by Type 1.**

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 2005.**

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. Occurs around perimeter of RS1 and to a much lesser extent in RS2. Same 2004-2005**

## 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.**

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.**

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

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

## PLANTED WOODY VEGETATION SURVIVAL

[illegible]

**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               | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |                |
| badger                       |                 | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |                |
| raccoon                      |                 | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |                |
| beaver                       | 2               | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | dams, chewings |
| Richardson's ground squirrel | 1               | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |                |
| northern leopard frog        | 20              | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |                |
| western chorus frog          | 20              | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |                |
|                              |                 | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |                |

### Additional Activities Checklist:

Yes Macroinvertebrate Sampling (if required)

**Comments / Problems: Substantial frog activity observed at all sites. Dense aquatic bed vegetation is ideal cover. 1000's of minnows also observed at all sites. Extensive beaver damage is occurring 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.

[illegible]

**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 2005. 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 2005 visit. This is resulting in expanding wetlands (not a problem).**

## MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **Musgrave Lake** Date: **July 18, 2005** Examiner: **Berglund**

Transect Number: **1** Approximate Transect Length: **500 feet** Compass Direction from Start: **\_\_\_°** Note: **RS1**

| Vegetation Type A: <b>ALO PRA (wetland community #2)</b> |           |
|--|-----------|
| 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: <b>UPLAND</b>         |            |
|--|------------|
| 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%   |
|  |            |
|  |            |
|  |            |
|  |            |
|  |            |
| Total Vegetative Cover:                  | 100%       |

| Vegetation Type C: <b>POP DEL (wetland community #7)</b> |            |
|--|------------|
| 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  | 1 = 1-5%   |
| UTR VUL  | 1 = 1-5%   |
| POT PEC  | 1 = 1-5%   |
| LEM MIN  | + = < 1%   |
|  |            |
|  |            |
| 6" TO 12" STANDING WATER PRESENT                         |            |
| Total Vegetative Cover:                                  | 90%        |

| Vegetation Type D: <b>POT / MYR (wetland community #4)</b> |           |
|--|-----------|
| 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 - inaccessible due to flooding.       |           |
| Total Vegetative Cover:                                    | 20%       |

## MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: Musgrave Lake Date: July 18, 2005 Examiner: Berglund

Transect Number: 1 Approximate Transect Length: 500 feet Compass Direction from Start:     ° Note: Transect RS1 continued

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

| Vegetation Type F: <b>POT / MYR (wetland community #4)</b> |           |
|--|-----------|
| 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: <b>UPLAND</b>        |           |
|---|-----------|
| Length of transect in this type: 2 feet |           |
| Plant Species                           | Cover     |
| BRO INE                                 | 5 = > 50% |
| AGR REP                                 | 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, 2005** 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% |
| ALO PRA   | 1 = 1-5%   |
|   |            |
|   |            |
|   |            |
|   |            |
| Inundated 6" to 2 feet throughout.                  |            |
| Total Vegetative Cover:                             | 70%        |

|                                  |              |
|----------------------------------|--------------|
| Vegetation Type C:               |              |
| Length of transect in this type: | feet         |
| <b>Plant Species</b>             | <b>Cover</b> |
|                                  |              |
|                                  |              |
|                                  |              |
|                                  |              |
|                                  |              |
|                                  |              |
|                                  |              |
|                                  |              |
|                                  |              |
|                                  |              |
|                                  |              |
| Total Vegetative Cover:          | %            |

|                                  |              |
|----------------------------------|--------------|
| Vegetation Type D:               |              |
| Length of transect in this type: | feet         |
| <b>Plant Species</b>             | <b>Cover</b> |
|                                  |              |
|                                  |              |
|                                  |              |
|                                  |              |
|                                  |              |
|                                  |              |
|                                  |              |
|                                  |              |
|                                  |              |
|                                  |              |
|                                  |              |
| Total Vegetative Cover:          | %            |

## MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **Musgrave Lake** Date: **July 18, 2005** Examiner: **Berglund**

Transect Number: **3** Approximate Transect Length: **170 feet** Compass Direction from Start: **\_\_\_°** Note: **RS2**

| Vegetation Type A: <b>UPLAND</b>         |            |
|--|------------|
| 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: <b>POL AMP-TYP/SCI (mix of #1 and #2)</b> |            |
|--|------------|
| 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% |
|  |            |
|  |            |
|  |            |
|  |            |
| Inundated 6-12" throughout                                   |            |
| Total Vegetative Cover:                                      | 80%        |

| Vegetation Type C: <b>UPLAND</b>        |            |
|---|------------|
| 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

### Cover Estimate

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

### Indicator Class

+ = Obligate  
- = Facultative/Wet  
0 = Facultative

### Source

P = Planted  
V = Volunteer

Percent of perimeter developing wetland vegetation (excluding dam/berm structures): **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: **5/17/05**

Survey Time: **16:45** to **18:45**

| Bird Species            | #  | Behavior | Habitat | Bird Species       | #  | Behavior | Habitat |
|-------------------------|----|----------|---------|--------------------|----|----------|---------|
| Canada goose            | 16 | F        | OW MA   | Cliff swallow      | 20 | F        | MA      |
| Ring-necked pheasant    | 6  | L        | UP MA   | Common snipe       | 4  | F        | MA      |
| Western meadowlark      | 5  | L        | UP      | Tree swallow       | 12 | F        | MA OW   |
| Red-winged blackbird    | 30 | N        | MA      | Yellow warbler     | 1  | F        | UP      |
| European starling       | 20 | L        | UP      | Long-billed curlew | 6  | F L      | MA UP   |
| Willet                  | 6  | F        | MA      | California gull    | 2  | FO       | UP      |
| American robin          | 20 | F L      | UP MA   |                    |    |          |         |
| Barn swallow            | 30 | F        | MA OW   |                    |    |          |         |
| Killdeer                | 50 | F        | MF      |                    |    |          |         |
| Yellow-headed blackbird | 2  | F        | MA      |                    |    |          |         |
| Red-tailed hawk         | 1  | F        | UP      |                    |    |          |         |
| Clay-colored sparrow    | 2  | F        | UP      |                    |    |          |         |
| Wilson's phalarope      | 20 | F        | MA OW   |                    |    |          |         |
| Gadwall                 | 2  | F        | OW      |                    |    |          |         |
| Common merganser        | 1  | L        | OW      |                    |    |          |         |
| Mallard                 | 6  | F        | MA OW   |                    |    |          |         |
| American wigeon         | 6  | F        | OW      |                    |    |          |         |
| Willow flycatcher       | 1  | L        | UP      |                    |    |          |         |
| Blue-winged teal        | 30 | F        | MA OW   |                    |    |          |         |
| American crow           | 2  | FO       | UP      |                    |    |          |         |
| N. rough-winged swallow | 30 | F        | MA OW   |                    |    |          |         |
| Great blue heron        | 1  | F        | MA      |                    |    |          |         |
| Northern shoveler       | 4  | 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: **Light rain, overcast**

Notes: **RS1 - 80% full, fresh beaver chewings along east border, few cottonwoods are down, deer tracks, raccoon tracks, numerous western chorus frogs, buck rubs on willows. ES1 - 60% inundated, numerous chorus frogs, beaver observed. RS2 - 85% inundated, numerous chorus frogs.**

## BIRD SURVEY – FIELD DATA SHEET

Site: Musgrave Lake Date: 7/18/05

Survey Time: 10:00 to 14:30

| Bird Species            | #  | Behavior | Habitat | Bird Species   | #  | Behavior | Habitat |
|-------------------------|----|----------|---------|----------------|----|----------|---------|
| Belted kingfisher       | 4  | F        | OW MA   |                |    |          |         |
| Ring-necked pheasant    | 1  | F        | UP      | Common snipe   | 10 | F N      | MA      |
| Eastern Kingbird        | 10 | F        | UP      | Tree swallow   | 12 | F        | MA OW   |
| Red-winged blackbird    | 12 | N        | MA      | Yellow warbler | 2  | F        | UP      |
| Cedar waxwing           | 10 | F        | MA      |                |    |          |         |
| Mourning dove           | 3  | F        | UP      |                |    |          |         |
| American robin          | 2  | F L      | UP      |                |    |          |         |
| Blue-winged teal        | 30 | F        | MA OW   |                |    |          |         |
| Lesser scaup            | 2  | F        | MA      |                |    |          |         |
| Western wood pewee      | 1  | F        | UP      |                |    |          |         |
| Red-tailed hawk         | 2  | F        | MA      |                |    |          |         |
| Clay-colored sparrow    | 2  | F        | UP      |                |    |          |         |
| Common yellowthroat     | 1  | F        | UP      |                |    |          |         |
| Gadwall                 | 10 | F        | OW      |                |    |          |         |
| Brewer's blackbird      | 8  | F        | UP      |                |    |          |         |
| Mallard                 | 2  | F        | MA OW   |                |    |          |         |
|                         |    |          |         |                |    |          |         |
|                         |    |          |         |                |    |          |         |
|                         |    |          |         |                |    |          |         |
|                         |    |          |         |                |    |          |         |
| N. rough-winged swallow | 10 | F        | MA OW   |                |    |          |         |
| Great blue heron        | 2  | F        | MA      |                |    |          |         |
| Northern shoveler       | 10 | 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

Notes: Numerous chorus frogs. leopard frogs, minnows at all sites. Deer and ground squirrel observed, beaver sign.

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

|   |  |
|---|--|
| Project / Site: <b><u>Musgrave Lake</u></b><br>Applicant / Owner: <b><u>MDT</u></b><br>Investigator: <b><u>Berglund</u></b> | Date: <b><u>July 18, 2005</u></b><br>County: <b><u>Blaine</u></b><br>State: <b><u>MT</u></b> |
|---|--|

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

**VEGETATION**

| Dominant Species   | Stratum | Indicator | Dominant Species                 | Stratum | Indicator |
|--|---------|-----------|----------------------------------|---------|-----------|
| 1. <i>SCI ACU</i>  | Herb    | OBL       | 11.                              |         |           |
| 2. <i>POL AMP</i>  | Herb    | OBL       | 12.                              |         |           |
| 3. <i>BEC SYZ</i>  | Herb    | OBL       | 13.                              |         |           |
| 4. <i>POL LAP</i>  | Herb    | FACW+     | 14.                              |         |           |
| 5. <i>TYP LAT</i>  | 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-): <b>5 / 5 = 100%</b> |         |           | FAC Neutral: <b>5 / 5 = 100%</b> |         |           |
| Remarks:   |         |           |                                  |         |           |

**HYDROLOGY**

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

## 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                       | Silty Clay Loam                       |
|                |         | /                            | /                               | 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: <u>Musgrave Lake</u><br>Applicant / Owner: <u>MDT</u><br>Investigator: <u>Berglund</u> | Date: <u>July 18, 2005</u><br>County: <u>Blaine</u><br>State: <u>MT</u> |
|--|---|

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

**VEGETATION**

| Dominant Species  | Stratum | Indicator | Dominant Species                | Stratum | Indicator |
|---|---------|-----------|---------------------------------|---------|-----------|
| 1. <i>ALO PRA</i>   | Herb    | FACW      | 11.                             |         |           |
| 2. <i>APO AND</i>   | Herb    | NI        | 12.                             |         |           |
| 3. <i>PHL PRA</i>   | Herb    | FACU      | 13.                             |         |           |
| 4. <i>CAR LAN</i>   | Herb    | OBL       | 14.                             |         |           |
| 5. <i>SCI ACU</i>   | 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-): <b>3 / 5 = 60%</b> |         |           | FAC Neutral: <b>3 / 5 = 60%</b> |         |           |
| Remarks:  |         |           |                                 |         |           |

**HYDROLOGY**

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

## 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<br>Distinct        | Silty Clay Loam                       |
|                |         | /                            | /                               | 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? <b><u>YES</u></b>                             | Is this Sampling Point within a Wetland? <b><u>YES</u></b> |
| Wetland Hydrology Present? <b><u>YES</u></b>                                  |  |
| Hydric Soils Present? <b><u>NO</u></b>  |  |
| Remarks: <b>Restoration Site 1 at beginning of transect, along site edge.</b> |  |



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

|   |  |
|---|--|
| Project / Site: <b><u>Musgrave Lake</u></b><br>Applicant / Owner: <b><u>MDT</u></b><br>Investigator: <b><u>Berglund</u></b> | Date: <b><u>July 18, 2005</u></b><br>County: <b><u>Blaine</u></b><br>State: <b><u>MT</u></b> |
|---|--|

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

**VEGETATION**

| Dominant Species  | Stratum | Indicator | Dominant Species                | Stratum | Indicator |
|---|---------|-----------|---------------------------------|---------|-----------|
| 1. <i>AGR REP</i>   | Herb    | FACU      | 11.                             |         |           |
| 2. <i>POL AMP</i>   | Herb    | OBL       | 12.                             |         |           |
| 3. <i>TYP LAT</i>   | Herb    | OBL       | 13.                             |         |           |
| 4. <i>SCI ACU</i>   | Herb    | OBL       | 14.                             |         |           |
| 5. <i>ALO PRA</i>   | Herb    | FACW      | 15.                             |         |           |
| 6. <i>SPA EME</i>   | Herb    | OBL       | 16.                             |         |           |
| 7. <i>NAJ GUA</i>   | Herb    | OBL       | 17.                             |         |           |
| 8.  |         |           | 18.                             |         |           |
| 9.  |         |           | 19.                             |         |           |
| 10.   |         |           | 20.                             |         |           |
| Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): <b>6 / 7 = 86%</b> |         |           | FAC Neutral: <b>6 / 7 = 86%</b> |         |           |
| Remarks:  |         |           |                                 |         |           |

**HYDROLOGY**

|   |  |
|---|--|
| <b><u>Yes</u></b> Recorded Data (Describe in Remarks):<br><b><u>N/A</u></b> Stream, Lake, or Tide Gauge<br><b><u>Yes</u></b> Aerial Photographs<br><b><u>N/A</u></b> Other<br><br><b><u>No</u></b> No Recorded Data | Wetland Hydrology Indicators<br>Primary Indicators:<br><b><u>YES</u></b> Inundated<br><b><u>YES</u></b> Saturated in Upper 12 Inches<br><b><u>YES</u></b> Water Marks<br><b><u>YES</u></b> Drift Lines<br><b><u>NO</u></b> Sediment Deposits<br><b><u>NO</u></b> Drainage Patterns in Wetland<br>Secondary Indicators (2 or more required):<br><b><u>NO</u></b> Oxidized Root Channels in Upper 12 inches<br><b><u>NO</u></b> Water-Stained Leaves<br><b><u>NO</u></b> Local Soil Survey Data<br><b><u>YES</u></b> FAC-Neutral Test<br><b><u>NO</u></b> Other (Explain in Remarks) |
| Field Observations:<br><br>Depth of Surface Water = <b><u>10</u></b> (in.)<br><br>Depth to Free Water in Pit <b><u>N/A</u></b> ____ (in.)<br><br>Depth to Saturated Soil <b><u>N/A</u></b> ____ (in.)               |  |
| Remarks: <b>Inundated to 10"</b>  |  |

## SOILS

| Map Unit Name (Series and Phase): <b>Havre silty clay loam, saline</b>                            |         |   |                                    |                              |   |
|---|---------|---|------------------------------------|------------------------------|---|
| Map Symbol: <b>58</b> Drainage Class: <b>WD</b> Mapped Hydric Inclusion? <b>No</b>                |         |   |                                    |                              |   |
| Taxonomy (Subgroup): <b>Ustic Torrifuvents</b> Field Observations confirm Mapped Type? <b>Yes</b> |         |   |                                    |                              |   |
| <b>Profile Description</b>  |         |   |                                    |                              |   |
| Depth<br>(inches)   | Horizon | Matrix Color<br>(Munsell Moist)                                       | Mottle Color(s)<br>(Munsell Moist) | Mottle<br>Abundance/Contrast | Texture,<br>Concretions,<br>Structure, etc. |
| 10  | B       | 2.5 YR 4/2  | 2.5 YR 4/6<br>/                    | Common<br>Distinct           | Silty Clay Loam                             |
|   |         | /   | /<br>/                             | N/A<br>N/A                   |   |
|   |         | /   | /<br>/                             | N/A<br>N/A                   |   |
|   |         | /   | /<br>/                             | N/A<br>N/A                   |   |
|   |         | /   | /<br>/                             | N/A<br>N/A                   |   |
|   |         | /   | /<br>/                             | N/A<br>N/A                   |   |
| Hydric Soil Indicators:   |         |   |                                    |                              |   |
| <b><u>NO</u></b> Histosol   |         | <b><u>NO</u></b> Concretions  |                                    |                              |   |
| <b><u>NO</u></b> Histic Epipedon  |         | <b><u>NO</u></b> High Organic Content in Surface Layer in Sandy Soils |                                    |                              |   |
| <b><u>NO</u></b> Sulfidic Odor  |         | <b><u>NO</u></b> Organic Streaking in Sandy Soils                     |                                    |                              |   |
| <b><u>NO</u></b> Aquic Moisture Regime  |         | <b><u>NO</u></b> Listed on Local Hydric Soils List                    |                                    |                              |   |
| <b><u>NO</u></b> Reducing Conditions  |         | <b><u>NO</u></b> Listed on National Hydric Soils List                 |                                    |                              |   |
| <b><u>YES</u></b> Gleyed or Low-Chroma Colors   |         | <b><u>NO</u></b> Other (Explain in Remarks)                           |                                    |                              |   |
| Remarks:  |         |   |                                    |                              |   |

## WETLAND DETERMINATION

|   |  |
|---|--|
| Hydrophytic Vegetation Present? <b><u>YES</u></b> | Is this Sampling Point within a Wetland? <b><u>YES</u></b> |
| Wetland Hydrology Present? <b><u>YES</u></b>      |  |
| Hydric Soils Present? <b><u>NO</u></b>            |  |
| Remarks: <b>Plot at RS-1 along transect.</b>      |  |

1. Project Name: Musgrave Lake Mitigation Project

2. Project #: NH-STPX 3(33) Control #: Unknown

3. Evaluation Date: 7/18/2005

4. Evaluator(s): Berglund

5. Wetland / Site #(s): Enhancement 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)  
5.26 (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)  
5.26 (measured, e.g. GPS)

Comments: Enhancement Site 1 (ES1)

| HGM CLASS <sup>1</sup> | SYSTEM <sup>2</sup> | SUBSYSTEM <sup>2</sup> | CLASS <sup>2</sup>  | WATER REGIME <sup>2</sup> | MODIFIER <sup>2</sup> | % OF AA |
|------------------------|---------------------|------------------------|---------------------|---------------------------|-----------------------|---------|
| Riverine               | Palustrine          | None                   | Aquatic Bed         | Semipermanently Flooded   | Impounded             | 20      |
| Riverine               | Palustrine          | None                   | Emergent Wetland    | Seasonally Flooded        | Impounded             | 10      |
| Mineral Soil Flats     | Palustrine          | Limnetic               | Scrub-Shrub Wetland | Seasonally Flooded        | Impounded             | 70      |
| ---                    | ---                 | ---                    | ---                 | ---                       | ---                   |         |

<sup>1</sup> = Smith et al. 1995. <sup>2</sup> = Cowardin et al. 1979.

**Comments:**

## 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. 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 \_\_\_\_\_  
 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 and 2005.

#### 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)                   | <input checked="" type="checkbox"/> High |     |     |    |  |     |     |    | <input type="checkbox"/> Moderate |     |     |    |                                 |     |     |    | <input type="checkbox"/> Low  |     |     |    |
|--|--|-----|-----|----|--|-----|-----|----|-----------------------------------|-----|-----|----|---------------------------------|-----|-----|----|-------------------------------|-----|-----|----|
|  | <input type="checkbox"/> Even            |     |     |    | <input checked="" type="checkbox"/> Uneven |     |     |    | <input type="checkbox"/> Even     |     |     |    | <input type="checkbox"/> Uneven |     |     |    | <input type="checkbox"/> Even |     |     |    |
| Class Cover Distribution (all vegetated classes) | 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  |
| Duration of Surface Water in ≥ 10% of AA         |  |     |     |    |  |     |     |    |                                   |     |     |    |                                 |     |     |    |                               |     |     |    |
| 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) |  |                                   |                              |
|--------------------------------------|---|--|-----------------------------------|------------------------------|
|                                      | <input type="checkbox"/> Exceptional          | <input checked="" type="checkbox"/> High | <input type="checkbox"/> Moderate | <input type="checkbox"/> 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  | <input type="checkbox"/> Permanent/Perennial |        |      | <input type="checkbox"/> Seasonal / Intermittent |        |      | <input type="checkbox"/> Temporary / Ephemeral |        |      |
|--|--|--------|------|--|--------|------|--|--------|------|
|  | >25%   | 10-25% | <10% | >25%   | 10-25% | <10% | >25%   | 10-25% | <10% |
| Cover - % of waterbody in AA containing cover objects (e.g. submerged logs, large rocks & boulders, overhanging banks, floating-leaved vegetation) |  |        |      |  |        |      |  |        |      |
| 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) |                               |                                   |                              |
|--|---------------------------------------|-------------------------------|-----------------------------------|------------------------------|
|  | <input type="checkbox"/> Exceptional  | <input type="checkbox"/> High | <input type="checkbox"/> Moderate | <input type="checkbox"/> Low |
| Native game fish                           | --                                    | --                            | --                                | --                           |
| Introduced game fish                       | --                                    | --                            | --                                | --                           |
| Non-game fish                              | --                                    | --                            | --                                | --                           |
| No fish                                    | --                                    | --                            | --                                | --                           |

**Comments:** 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         | <input type="checkbox"/> ≥ 10 acres |        |      | <input checked="" type="checkbox"/> <10, >2 acres |        |        | <input type="checkbox"/> ≤2 acres |        |      |
|---|-------------------------------------|--------|------|---|--------|--------|-----------------------------------|--------|------|
|   | 75%                                 | 25-75% | <25% | 75%   | 25-75% | <25%   | 75%                               | 25-75% | <25% |
| % of flooded wetland classified as forested, scrub/shrub, or both |                                     |        |      |   |        |        |                                   |        |      |
| AA contains no outlet or restricted outlet                        | --                                  | --     | --   | --  | --     | .5 (M) | --                                | --     | --   |
| AA contains unrestricted outlet                                   | --                                  | --     | --   | --  | --     | --     | --                                | --     | --   |

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

☐ Y ☒ N **Comments:** 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. | <input type="checkbox"/> >5 acre feet |     |     | <input checked="" type="checkbox"/> <5, >1 acre feet |        |     | <input type="checkbox"/> ≤1 acre foot |     |     |
|--|---------------------------------------|-----|-----|--|--------|-----|---------------------------------------|-----|-----|
|  | P/P                                   | S/I | T/E | P/P  | S/I    | T/E | P/P                                   | S/I | T/E |
| Duration of surface water at wetlands within the AA  |                                       |     |     |  |        |     |                                       |     |     |
| Wetlands in AA flood or pond ≥ 5 out of 10 years   | --                                    | --  | --  | --   | .6 (M) | --  | --                                    | --  | --  |
| Wetlands in AA flood or pond < 5 out of 10 years   | --                                    | --  | --  | --   | --     | --  | --                                    | --  | --  |

**Comments:** \_\_\_\_\_

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

Applies to wetlands with 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. |                             |                                |                             |
|---|---|-----------------------------|--------------------------------|-----------------------------|--|-----------------------------|--------------------------------|-----------------------------|
|   | <input checked="" type="checkbox"/> ≥ 70%   |                             | <input type="checkbox"/> < 70% |                             | <input type="checkbox"/> ≥ 70%   |                             | <input type="checkbox"/> < 70% |                             |
| % cover of wetland vegetation in AA                     | <input checked="" type="checkbox"/> Yes   | <input type="checkbox"/> No | <input type="checkbox"/> Yes   | <input type="checkbox"/> No | <input type="checkbox"/> Yes   | <input type="checkbox"/> No | <input type="checkbox"/> Yes   | <input type="checkbox"/> No |
| Evidence of flooding or ponding in AA                   | <input checked="" type="checkbox"/> Yes   | <input type="checkbox"/> No | <input type="checkbox"/> Yes   | <input type="checkbox"/> No | <input type="checkbox"/> Yes   | <input type="checkbox"/> No | <input type="checkbox"/> Yes   | <input type="checkbox"/> No |
| AA contains no or restricted outlet                     | 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 |   |  |
|--|---|---|--|
|  | <input type="checkbox"/> Permanent / Perennial          | <input checked="" type="checkbox"/> Seasonal / Intermittent | <input type="checkbox"/> 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     | <input checked="" type="checkbox"/> Vegetated component >5 acres |                            |                                   |                            |                              |                            | <input type="checkbox"/> Vegetated component 1-5 acres |                            |                                   |                            |                              |                            | <input type="checkbox"/> Vegetated component <1 acre |                            |                                   |                            |                              |                            |
|-------|--|----------------------------|-----------------------------------|----------------------------|------------------------------|----------------------------|--|----------------------------|-----------------------------------|----------------------------|------------------------------|----------------------------|--|----------------------------|-----------------------------------|----------------------------|------------------------------|----------------------------|
| B     | <input checked="" type="checkbox"/> High                         |                            | <input type="checkbox"/> Moderate |                            | <input type="checkbox"/> Low |                            | <input type="checkbox"/> High                          |                            | <input type="checkbox"/> Moderate |                            | <input type="checkbox"/> Low |                            | <input type="checkbox"/> High                        |                            | <input type="checkbox"/> Moderate |                            | <input type="checkbox"/> Low |                            |
| C     | <input checked="" type="checkbox"/> Y                            | <input type="checkbox"/> N | <input type="checkbox"/> Y        | <input type="checkbox"/> N | <input type="checkbox"/> Y   | <input type="checkbox"/> N | <input type="checkbox"/> Y                             | <input type="checkbox"/> N | <input type="checkbox"/> Y        | <input type="checkbox"/> N | <input type="checkbox"/> Y   | <input type="checkbox"/> N | <input type="checkbox"/> Y                           | <input type="checkbox"/> N | <input type="checkbox"/> Y        | <input type="checkbox"/> N | <input type="checkbox"/> Y   | <input type="checkbox"/> N |
| P/P   | --   | --                         | --                                | --                         | --                           | --                         | --   | --                         | --                                | --                         | --                           | --                         | --   | --                         | --                                | --                         | --                           | --                         |
| S/I   | .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 | <input type="checkbox"/> rare  | <input type="checkbox"/> common | <input type="checkbox"/> abundant | <input type="checkbox"/> rare   | <input checked="" type="checkbox"/> common | <input type="checkbox"/> abundant | <input type="checkbox"/> rare   | <input type="checkbox"/> common | <input type="checkbox"/> 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) |                                   |                               |
|-------------------|------------------------------|-----------------------------------|-------------------------------|
|                   | <input type="checkbox"/> Low | <input type="checkbox"/> Moderate | <input type="checkbox"/> 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<br>(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 | 0.50  | 1                          |  |
| F. Short and Long Term Surface Water Storage   | moderate | 0.60  | 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                          |  |
| <b>Total:</b>                                  |          | <b><u>7.40</u></b>  | <b><u>11.00</u></b>        |  |
| <b>Percent of Total Possible Points:</b>       |          | <b><u>67%</u> (Actual / Possible) x 100 [rd to nearest whole #]</b> |                            |  |

**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 #: Unknown

3. Evaluation Date: 7/18/2005

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)  
12.35 (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)  
12.35 (measured, e.g. GPS)

Comments: Restoration Site 1 (RS1)

## 10. CLASSIFICATION OF WETLAND AND AQUATIC HABITATS IN AA

| HGM CLASS <sup>1</sup> | SYSTEM <sup>2</sup> | SUBSYSTEM <sup>2</sup> | CLASS <sup>2</sup>  | WATER REGIME <sup>2</sup> | MODIFIER <sup>2</sup> | % 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       |

<sup>1</sup> = Smith et al. 1995. <sup>2</sup> = Cowardin et al. 1979.

Comments: Substantial aquatic species abundance in 2005.

## 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 \_\_\_\_\_  
 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.

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

##### iii. Rating: 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)   |                               |                                   |                              |
|--------------------------------------|---|-------------------------------|-----------------------------------|------------------------------|
|                                      | <input checked="" type="checkbox"/> Exceptional | <input type="checkbox"/> High | <input type="checkbox"/> Moderate | <input type="checkbox"/> 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  | <input type="checkbox"/> Permanent/Perennial |        |      | <input type="checkbox"/> Seasonal / Intermittent |        |      | <input type="checkbox"/> Temporary / Ephemeral |        |      |
|--|--|--------|------|--|--------|------|--|--------|------|
|  | >25%   | 10-25% | <10% | >25%   | 10-25% | <10% | >25%   | 10-25% | <10% |
| Cover - % of waterbody in AA containing cover objects (e.g. submerged logs, large rocks & boulders, overhanging banks, floating-leaved vegetation) |  |        |      |  |        |      |  |        |      |
| 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) |                               |                                   |                              |
|--|---------------------------------------|-------------------------------|-----------------------------------|------------------------------|
|  | <input type="checkbox"/> Exceptional  | <input type="checkbox"/> High | <input type="checkbox"/> Moderate | <input type="checkbox"/> Low |
| Native game fish                           | --                                    | --                            | --                                | --                           |
| Introduced game fish                       | --                                    | --                            | --                                | --                           |
| Non-game fish                              | --                                    | --                            | --                                | --                           |
| No fish                                    | --                                    | --                            | --                                | --                           |

**Comments:** 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         | <input checked="" type="checkbox"/> ≥ 10 acres |        |        | <input type="checkbox"/> <10, >2 acres |        |      | <input type="checkbox"/> ≤2 acres |        |      |
|---|--|--------|--------|--|--------|------|-----------------------------------|--------|------|
|   | 75%  | 25-75% | <25%   | 75%                                    | 25-75% | <25% | 75%                               | 25-75% | <25% |
| % of flooded wetland classified as forested, scrub/shrub, or both |  |        |        |  |        |      |                                   |        |      |
| 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. | <input checked="" type="checkbox"/> >5 acre feet |        |     | <input type="checkbox"/> <5, >1 acre feet |     |     | <input type="checkbox"/> ≤1 acre foot |     |     |
|--|--|--------|-----|---|-----|-----|---------------------------------------|-----|-----|
|  | P/P  | S/I    | T/E | P/P                                       | S/I | T/E | P/P                                   | S/I | T/E |
| Duration of surface water at wetlands within the AA  |  |        |     |   |     |     |                                       |     |     |
| 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. |                             |                                |                             |
|---|---|-----------------------------|--------------------------------|-----------------------------|--|-----------------------------|--------------------------------|-----------------------------|
|   | <input type="checkbox"/> ≥ 70%  |                             | <input type="checkbox"/> < 70% |                             | <input type="checkbox"/> ≥ 70%   |                             | <input type="checkbox"/> < 70% |                             |
| % cover of wetland vegetation in AA                     | <input type="checkbox"/> Yes  | <input type="checkbox"/> No | <input type="checkbox"/> Yes   | <input type="checkbox"/> No | <input type="checkbox"/> Yes   | <input type="checkbox"/> No | <input type="checkbox"/> Yes   | <input type="checkbox"/> No |
| Evidence of flooding or ponding in AA                   |   |                             |                                |                             |  |                             |                                |                             |
| 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 |   |  |
|--|---|---|--|
|  | <input type="checkbox"/> Permanent / Perennial          | <input checked="" type="checkbox"/> Seasonal / Intermittent | <input type="checkbox"/> 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     | <input checked="" type="checkbox"/> Vegetated component >5 acres |                            |                                   |                            |                              |                            | <input type="checkbox"/> Vegetated component 1-5 acres |                            |                                   |                            |                              |                            | <input type="checkbox"/> Vegetated component <1 acre |                            |                                   |                            |                              |                            |
|-------|--|----------------------------|-----------------------------------|----------------------------|------------------------------|----------------------------|--|----------------------------|-----------------------------------|----------------------------|------------------------------|----------------------------|--|----------------------------|-----------------------------------|----------------------------|------------------------------|----------------------------|
| B     | <input checked="" type="checkbox"/> High                         |                            | <input type="checkbox"/> Moderate |                            | <input type="checkbox"/> Low |                            | <input type="checkbox"/> High                          |                            | <input type="checkbox"/> Moderate |                            | <input type="checkbox"/> Low |                            | <input type="checkbox"/> High                        |                            | <input type="checkbox"/> Moderate |                            | <input type="checkbox"/> Low |                            |
| C     | <input checked="" type="checkbox"/> Y                            | <input type="checkbox"/> N | <input type="checkbox"/> Y        | <input type="checkbox"/> N | <input type="checkbox"/> Y   | <input type="checkbox"/> N | <input type="checkbox"/> Y                             | <input type="checkbox"/> N | <input type="checkbox"/> Y        | <input type="checkbox"/> N | <input type="checkbox"/> Y   | <input type="checkbox"/> N | <input type="checkbox"/> Y                           | <input type="checkbox"/> N | <input type="checkbox"/> Y        | <input type="checkbox"/> N | <input type="checkbox"/> Y   | <input type="checkbox"/> N |
| P/P   | --   | --                         | --                                | --                         | --                           | --                         | --   | --                         | --                                | --                         | --                           | --                         | --   | --                         | --                                | --                         | --                           | --                         |
| S/I   | .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. |                                 |                                   |
|--------------------------------------|--|---------------------------------|-----------------------------------|---|--|-----------------------------------|---|---------------------------------|-----------------------------------|
|                                      | <input type="checkbox"/> rare  | <input type="checkbox"/> common | <input type="checkbox"/> abundant | <input type="checkbox"/> rare   | <input checked="" type="checkbox"/> common | <input type="checkbox"/> abundant | <input type="checkbox"/> rare   | <input type="checkbox"/> common | <input type="checkbox"/> abundant |
| Estimated Relative Abundance from 11 |  |                                 |                                   |   |  |                                   |   |                                 |                                   |
| 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) |                                   |                               |
|-------------------|------------------------------|-----------------------------------|-------------------------------|
|                   | <input type="checkbox"/> Low | <input type="checkbox"/> Moderate | <input type="checkbox"/> 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<br>(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   |  |
| <b>Total:</b>                                  |             | <b><u>7.00</u></b>       | <b><u>10.00</u></b>   | <b>_____</b>   |
| <b>Percent of Total Possible Points:</b>       |             |                          | <b><u>70%</u> (Actual / Possible) x 100 [rd to nearest whole #]</b> |  |

**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 #: Unknown

3. Evaluation Date: 7/18/2005

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)  
8.43 (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)  
8.43 (measured, e.g. GPS)

Comments: Restoration Site 2 (RS2)

## 10. CLASSIFICATION OF WETLAND AND AQUATIC HABITATS IN AA

| HGM CLASS <sup>1</sup> | SYSTEM <sup>2</sup> | SUBSYSTEM <sup>2</sup> | CLASS <sup>2</sup>  | WATER REGIME <sup>2</sup> | MODIFIER <sup>2</sup> | % OF AA |
|------------------------|---------------------|------------------------|---------------------|---------------------------|-----------------------|---------|
| Depression             | Palustrine          | None                   | Emergent Wetland    | Seasonally Flooded        | Impounded             | 75      |
| Depression             | Palustrine          | None                   | Scrub-Shrub Wetland | Seasonally Flooded        | Impounded             | 10      |
| Depression             | Palustrine          | None                   | Aquatic Bed         | Seasonally Flooded        | Impounded             | 15      |
| ---                    | ---                 | ---                    | ---                 | ---                       | ---                   |         |

<sup>1</sup> = Smith et al. 1995. <sup>2</sup> = 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 \_\_\_\_\_  
 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 2001-2005 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)                   | <input checked="" type="checkbox"/> High |     |     |    |  |     |     |    | <input type="checkbox"/> Moderate |     |     |    |                                 |     |     |    | <input type="checkbox"/> Low  |     |     |    |
|--|--|-----|-----|----|--|-----|-----|----|-----------------------------------|-----|-----|----|---------------------------------|-----|-----|----|-------------------------------|-----|-----|----|
| Class Cover Distribution (all vegetated classes) | <input type="checkbox"/> Even            |     |     |    | <input checked="" type="checkbox"/> Uneven |     |     |    | <input type="checkbox"/> Even     |     |     |    | <input type="checkbox"/> Uneven |     |     |    | <input type="checkbox"/> Even |     |     |    |
| Duration of Surface Water in ≥ 10% of AA         | P/P                                      | S/I | T/E | A  | P/P  | S/I | T/E | A  | P/P                               | S/I | T/E | A  | P/P                             | S/I | T/E | A  | P/P                           | S/I | T/E | A  |
| Low disturbance at AA (see 12)                   | --                                       | --  | --  | -- | --   | --  | --  | -- | --                                | --  | --  | -- | --                              | --  | --  | -- | --                            | --  | --  | -- |
| 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) |  |                                   |                              |
|--------------------------------------|---|--|-----------------------------------|------------------------------|
|                                      | <input type="checkbox"/> Exceptional          | <input checked="" type="checkbox"/> High | <input type="checkbox"/> Moderate | <input type="checkbox"/> Low |
| Substantial                          | --  | .9 (H)                                   | --                                | --                           |
| Moderate                             | --  | --                                       | --                                | --                           |
| Low                                  | --  | --                                       | --                                | --                           |

Comments: Numerous waterfowl (several blue-winged teal broods in 2005), 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  | <input type="checkbox"/> Permanent/Perennial |        |      | <input type="checkbox"/> Seasonal / Intermittent |        |      | <input type="checkbox"/> Temporary / Ephemeral |        |      |
|--|--|--------|------|--|--------|------|--|--------|------|
|  | >25%   | 10-25% | <10% | >25%   | 10-25% | <10% | >25%   | 10-25% | <10% |
| Cover - % of waterbody in AA containing cover objects (e.g. submerged logs, large rocks & boulders, overhanging banks, floating-leaved vegetation) |  |        |      |  |        |      |  |        |      |
| 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) |                               |                                   |                              |
|--|---------------------------------------|-------------------------------|-----------------------------------|------------------------------|
|  | <input type="checkbox"/> Exceptional  | <input type="checkbox"/> High | <input type="checkbox"/> Moderate | <input type="checkbox"/> Low |
| Native game fish                           | --                                    | --                            | --                                | --                           |
| Introduced game fish                       | --                                    | --                            | --                                | --                           |
| Non-game fish                              | --                                    | --                            | --                                | --                           |
| No fish                                    | --                                    | --                            | --                                | --                           |

**Comments:** Minnows occur here, but their occurrence is considered incidental as a result of their origination in the irrigation 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         | <input type="checkbox"/> ≥ 10 acres |        |      | <input checked="" type="checkbox"/> <10, >2 acres |        |        | <input type="checkbox"/> ≤2 acres |        |      |
|---|-------------------------------------|--------|------|---|--------|--------|-----------------------------------|--------|------|
|   | 75%                                 | 25-75% | <25% | 75%   | 25-75% | <25%   | 75%                               | 25-75% | <25% |
| % of flooded wetland classified as forested, scrub/shrub, or both |                                     |        |      |   |        |        |                                   |        |      |
| AA contains no outlet or restricted outlet                        | --                                  | --     | --   | --  | --     | .5 (M) | --                                | --     | --   |
| AA contains unrestricted outlet                                   | --                                  | --     | --   | --  | --     | --     | --                                | --     | --   |

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

☐ Y ☒ N **Comments:** 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. | <input checked="" type="checkbox"/> >5 acre feet |        |     | <input type="checkbox"/> <5, >1 acre feet |     |     | <input type="checkbox"/> ≤1 acre foot |     |     |
|--|--|--------|-----|---|-----|-----|---------------------------------------|-----|-----|
|  | P/P  | S/I    | T/E | P/P                                       | S/I | T/E | P/P                                   | S/I | T/E |
| Duration of surface water at wetlands within the AA  |  |        |     |   |     |     |                                       |     |     |
| 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. |                             |                                |                             |
|---|---|-----------------------------|--------------------------------|-----------------------------|--|-----------------------------|--------------------------------|-----------------------------|
|   | <input checked="" type="checkbox"/> ≥ 70%   |                             | <input type="checkbox"/> < 70% |                             | <input type="checkbox"/> ≥ 70%   |                             | <input type="checkbox"/> < 70% |                             |
| % cover of wetland vegetation in AA                     | <input checked="" type="checkbox"/> Yes   | <input type="checkbox"/> No | <input type="checkbox"/> Yes   | <input type="checkbox"/> No | <input type="checkbox"/> Yes   | <input type="checkbox"/> No | <input type="checkbox"/> Yes   | <input type="checkbox"/> No |
| Evidence of flooding or ponding in AA                   | <input checked="" type="checkbox"/> Yes   | <input type="checkbox"/> No | <input type="checkbox"/> Yes   | <input type="checkbox"/> No | <input type="checkbox"/> Yes   | <input type="checkbox"/> No | <input type="checkbox"/> Yes   | <input type="checkbox"/> No |
| AA contains no or restricted outlet                     | 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 |  |  |
|--|---|--|--|
|  | <input type="checkbox"/> Permanent / Perennial          | <input type="checkbox"/> Seasonal / Intermittent | <input type="checkbox"/> Temporary / Ephemeral |
| ≥ 65 %   | --  | --   | --   |
| 35-64 %  | --  | --   | --   |
| < 35 %   | --  | --   | --   |

Comments: \_\_\_\_\_

**14I. PRODUCTION EXPORT / FOOD CHAIN SUPPORT**

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

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

| A     | <input checked="" type="checkbox"/> Vegetated component >5 acres |                            |                                   |                            |                              |                            | <input type="checkbox"/> Vegetated component 1-5 acres |                            |                                   |                            |                              |                            | <input type="checkbox"/> Vegetated component <1 acre |                            |                                   |                            |                              |                            |
|-------|--|----------------------------|-----------------------------------|----------------------------|------------------------------|----------------------------|--|----------------------------|-----------------------------------|----------------------------|------------------------------|----------------------------|--|----------------------------|-----------------------------------|----------------------------|------------------------------|----------------------------|
| B     | <input checked="" type="checkbox"/> High                         |                            | <input type="checkbox"/> Moderate |                            | <input type="checkbox"/> Low |                            | <input type="checkbox"/> High                          |                            | <input type="checkbox"/> Moderate |                            | <input type="checkbox"/> Low |                            | <input type="checkbox"/> High                        |                            | <input type="checkbox"/> Moderate |                            | <input type="checkbox"/> Low |                            |
| C     | <input checked="" type="checkbox"/> Y                            | <input type="checkbox"/> N | <input type="checkbox"/> Y        | <input type="checkbox"/> N | <input type="checkbox"/> Y   | <input type="checkbox"/> N | <input type="checkbox"/> Y                             | <input type="checkbox"/> N | <input type="checkbox"/> Y        | <input type="checkbox"/> N | <input type="checkbox"/> Y   | <input type="checkbox"/> N | <input type="checkbox"/> Y                           | <input type="checkbox"/> N | <input type="checkbox"/> Y        | <input type="checkbox"/> N | <input type="checkbox"/> Y   | <input type="checkbox"/> N |
| P/P   | --   | --                         | --                                | --                         | --                           | --                         | --   | --                         | --                                | --                         | --                           | --                         | --   | --                         | --                                | --                         | --                           | --                         |
| S/I   | .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 | <input type="checkbox"/> rare  | <input type="checkbox"/> common | <input type="checkbox"/> abundant | <input type="checkbox"/> rare   | <input checked="" type="checkbox"/> common | <input type="checkbox"/> abundant | <input type="checkbox"/> rare   | <input type="checkbox"/> common | <input type="checkbox"/> 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) |                                   |                               |
|-------------------|------------------------------|-----------------------------------|-------------------------------|
|                   | <input type="checkbox"/> Low | <input type="checkbox"/> Moderate | <input type="checkbox"/> 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<br>(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 | 0.50                     | 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     | 0.10                     | 1   |  |
| K. Uniqueness                                  | moderate | 0.50                     | 1   |  |
| L. Recreation/Education Potential              | low      | .1                       | 1   |  |
| <b>Total:</b>                                  |          | <b><u>7.10</u></b>       | <b><u>10.00</u></b>   | <b>_____</b>   |
| <b>Percent of Total Possible Points:</b>       |          |                          | <b><u>71</u>% (Actual / Possible) x 100 [rd to nearest whole #]</b> |  |

**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**

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### **REPRESENTATIVE PHOTOGRAPHS**

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*MDT Wetland Mitigation Monitoring*  
*Musgrave Lake*  
*Zurich, Montana*

## MUSGRAVE LAKE WETLAND MITIGATION SITE 2005



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 2005

**No 2005 Photo;  
Per MDT instruction, ES2 transect  
not sampled in 2005**

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

**No 2005 Photo;  
Per MDT instruction, ES2 transect  
not sampled in 2005**

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 2005



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

**No 2005 Photo;  
Per MDT instruction, ES2  
not sampled in 2005**

ES2, Photo Point 8, 105 degrees N/NE

## **Appendix D**

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### **CONCEPTUAL SITE LAYOUT**

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*MDT Wetland Mitigation Monitoring  
Musgrave Lake  
Zurich, Montana*

# MUSGRAVE LAKE RANCH WETLAND RESTORATION CONCEPTUAL PLAN



| <u>SYMBOL</u>   | <u>DESCRIPTION</u>                   | <u>ACTUAL<br/>ACREAGE</u> | <u>CREDIT<br/>ACREAGE</u> |
|---|--------------------------------------|---------------------------|---------------------------|
|  | 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                 | <u>8.4 acres</u>          |
|  | Ditch Plug/Dike                      |                           | 27.2 acres                |
|  | Borrow Area and Road Fill (existing) |                           |                           |
|  | Existing Ditches                     |                           |                           |

## **Appendix E**

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### **BIRD SURVEY PROTOCOL GPS PROTOCOL**

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*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 Plane 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**

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### **2005 MACROINVERTEBRATE SAMPLING PROTOCOL AND DATA**

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

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

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

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

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

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

Photograph the sampled site.

### **Sample Handling/Shipping**

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

## **MDT Mitigated Wetland Monitoring Project**

### **Aquatic Invertebrate Monitoring Summary 2001 - 2005**

#### **METHODS**

Among other monitoring activities, aquatic invertebrate assemblages were collected at a number of mitigated wetlands throughout Montana. This report summarizes data generated from five years of collection. In 2001, 29 sites were sampled statewide. Nineteen of these sites were revisited in 2002, and 13 new sites were sampled. In 2003, 17 sites that had been visited in both 2001 and 2002 were re-sampled, and 11 sites sampled for the first time in 2001 were re-visited. In addition, 2 new sites were sampled. In 2004, 25 sites were re-visited, and 6 new sites were sampled. In 2005, an additional 2 sites were added. Over all years of sampling, a total of 151 sites were sampled for invertebrates. Table 2 summarizes sites and sampling years.

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, and 2005, and Kleinschmidt Creek, sampled in 2003, 2004, and 2005, were assessed using the tested metric battery developed for montane streams of Western Montana (Bollman 1998). Invertebrate assemblages at these sites were different from that 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 75<sup>th</sup> percentile (for those metrics that decrease in value in response to stress) or below the 25<sup>th</sup> 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 75<sup>th</sup> percentile for decreasing scores (or above the 25<sup>th</sup> percentile for increasing scores) into "sub-optimal" and "poor" assessment categories. A score of 5, 3, or 1 was assigned to optimal, sub-optimal, and poor metric performance, respectively. In this way, metric values were translated into normalized metric scores, and scores for all metrics were summed to produce a total bioassessment score. Total bioassessment scores were classified according to a similar process, using the ranges and distributions of total scores for all sites studied in all years.

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

**Table 1.** Montana Department of Transportation Mitigated Wetlands Monitoring Project sites, 2001 – 2005.

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



## **Sample Processing**

Aquatic invertebrate samples were collected at mitigation wetland sites in the summer months of 2001, 2002, 2003, 2004, and 2005 by personnel of Land and Water Consulting, Inc. Sampling procedures utilized were based on the protocols developed by the Montana Department of Environmental Quality (MT DEQ). Sampling consisted of D-frame net sweeps through emergent vegetation (when present), the water column, over the water surface, and included disturbing and scraping substrates at each sampled sites. Samples were preserved in ethanol at each wetland site and subsequently delivered to Rhithron Associates, Inc. for processing, taxonomic determinations, and data analysis.

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

## **Bioassessment Metrics**

An index based on the performance of 12 metrics was constructed, as described above. Table 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 2005 data, no changes were made to scoring criteria this year. Summary metric values and scores for the 2005 samples are given in Tables 3a-3d.

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

| <b>Metric</b>                  | <b>Metric calculation</b>   | <b>Expected response to degradation or impairment</b> |
|--------------------------------|---|---|
| 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 times that taxon's modified Hilsenhoff Biotic Index value. These numbers are summed over all taxa in the subsample. | Increase  |
| % Dominant taxon               | Percent abundance of the most abundant taxon in the subsample   | Increase  |
| % Collector-Gatherers          | Percent abundance of organisms in the collector-gatherer functional group   | Decrease  |
| % Filterers                    | Percent abundance of organisms in the filterer functional group   | Increase  |

## RESULTS

*(Note: Individual site discussions were removed from this report by Land & Water Consulting / PBS&J and are included in the Macro-Invertebrate sections of individual reports. Summary tables are provided on the following pages.)*

**Table 3a.** Metric values and scores for Montana Department of Transportation mitigated wetland sites in 2005.

|                                  | BEAVERHEAD<br>#1   | BEAVERHEAD<br>#3 | BEAVERHEAD<br>#5 | BEAVERHEAD<br>#6   | BIG SPRING<br>CREEK | STILLWATER      | ROUNDUP         | WIDGEON     |
|----------------------------------|--------------------|------------------|------------------|--------------------|---------------------|-----------------|-----------------|-------------|
| Total taxa                       | 22                 | 9                | 14               | 18                 | 28                  | 17              | 7               | 19          |
| POET                             | 2                  | 0                | 0                | 2                  | 4                   | 4               | 0               | 0           |
| Chironomidae taxa                | 7                  | 4                | 4                | 4                  | 9                   | 5               | 3               | 11          |
| Crustacea + Mollusca             | 4                  | 3                | 1                | 4                  | 7                   | 5               | 2               | 4           |
| % Chironomidae                   | 59.80%             | 7.55%            | 50.00%           | 16.67%             | 33.65%              | 9.43%           | 22.22%          | 76.47%      |
| Orthoclaadiinae/Chir             | 0.197              | 0.625            | 0.059            | 0.067              | 0.457               | 0.500           | 0.000           | 0.205       |
| % Amphipoda                      | 1.96%              | 0.94%            | 0.00%            | 1.11%              | 18.27%              | 7.55%           | 0.00%           | 10.78%      |
| % Crustacea + % Mollusca         | 10.78%             | 90.57%           | 2.94%            | 55.56%             | 33.65%              | 53.77%          | 72.65%          | 15.69%      |
| HBI                              | 7.71               | 7.88             | 7.88             | 7.98               | 7.55                | 7.28            | 8.33            | 8.25        |
| % Dominant taxon                 | 34.31%             | 76.42%           | 35.29%           | 25.56%             | 18.27%              | 33.02%          | 71.79%          | 44.12%      |
| % Collector-Gatherers            | 56.86%             | 93.40%           | 47.06%           | 21.11%             | 70.19%              | 64.15%          | 82.05%          | 26.47%      |
| % Filterers                      | 0.00%              | 0.00%            | 0.00%            | 0.00%              | 0.96%               | 3.77%           | 0.00%           | 6.86%       |
|                                  |                    |                  |                  |                    |                     |                 |                 |             |
| Total taxa                       | 5                  | 1                | 1                | 3                  | 5                   | 3               | 1               | 3           |
| POET                             | 1                  | 1                | 1                | 1                  | 5                   | 5               | 1               | 1           |
| Chironomidae taxa                | 5                  | 3                | 3                | 3                  | 5                   | 3               | 3               | 5           |
| Crustacea + Mollusca             | 3                  | 1                | 1                | 3                  | 5                   | 3               | 1               | 3           |
| % Chironomidae                   | 1                  | 5                | 1                | 5                  | 3                   | 5               | 3               | 1           |
| Orthoclaadiinae/Chir             | 3                  | 5                | 1                | 1                  | 5                   | 5               | 1               | 3           |
| % Amphipoda                      | 5                  | 5                | 5                | 5                  | 3                   | 3               | 5               | 3           |
| % Crustacea + % Mollusca         | 5                  | 1                | 5                | 3                  | 3                   | 3               | 1               | 5           |
| HBI                              | 1                  | 1                | 1                | 1                  | 3                   | 3               | 1               | 1           |
| % Dominant taxon                 | 3                  | 1                | 3                | 5                  | 5                   | 5               | 1               | 3           |
| % Collector-Gatherers            | 3                  | 5                | 3                | 1                  | 3                   | 3               | 5               | 1           |
| % Filterers                      | 3                  | 3                | 3                | 3                  | 3                   | 3               | 3               | 1           |
|                                  |                    |                  |                  |                    |                     |                 |                 |             |
| <b>Total score</b>               | <b>38</b>          | <b>32</b>        | <b>28</b>        | <b>34</b>          | <b>48</b>           | <b>44</b>       | <b>26</b>       | <b>30</b>   |
| <b>Percent of maximum score</b>  | <b>0.633333</b>    | <b>0.533333</b>  | <b>0.466667</b>  | <b>0.566667</b>    | <b>0.8</b>          | <b>0.733333</b> | <b>0.433333</b> | <b>0.5</b>  |
| <b>Impairment classification</b> | <b>sub-optimal</b> | <b>poor</b>      | <b>poor</b>      | <b>sub-optimal</b> | <b>optimal</b>      | <b>optimal</b>  | <b>poor</b>     | <b>poor</b> |

**Table 3b.** Metric values and scores for Montana Department of Transportation mitigated wetland sites in 2005.

|                                  | RIDGEWAY           | MUSGRAVE<br>REST. 1 | MUSGRAVE<br>REST. 2 | MUSGRAVE<br>ENH. 1 | HOSKINS<br>LANDING | PETERSON<br>RANCH 1 | PETERSON<br>RANCH 2 | PETERSON<br>RANCH 4 | PETERSON<br>RANCH 5 |
|----------------------------------|--------------------|---------------------|---------------------|--------------------|--------------------|---------------------|---------------------|---------------------|---------------------|
| <b>Total taxa</b>                | 19                 | 19                  | 23                  | 19                 | 27                 | 29                  | 16                  | 25                  | 16                  |
| POET                             | 3                  | 1                   | 3                   | 1                  | 5                  | 4                   | 2                   | 4                   | 4                   |
| Chironomidae taxa                | 6                  | 6                   | 8                   | 3                  | 6                  | 11                  | 6                   | 8                   | 7                   |
| Crustacea + Mollusca             | 5                  | 5                   | 3                   | 7                  | 6                  | 6                   | 5                   | 6                   | 2                   |
| % Chironomidae                   | 9.26%              | 14.55%              | 22.00%              | 2.80%              | 17.58%             | 17.48%              | 13.91%              | 24.55%              | 16.96%              |
| Orthoclaadiinae/Chir             | 0.600              | 0.750               | 0.136               | 0.667              | 0.188              | 0.556               | 0.563               | 0.630               | 0.632               |
| % Amphipoda                      | 6.48%              | 3.64%               | 0.00%               | 0.93%              | 0.00%              | 0.97%               | 7.83%               | 1.82%               | 8.04%               |
| % Crustacea + % Mollusca         | 22.22%             | 30.91%              | 38.00%              | 58.88%             | 27.47%             | 31.07%              | 72.17%              | 20.00%              | 8.93%               |
| HBI                              | 7.71               | 7.22                | 7.77                | 7.16               | 6.81               | 7.16                | 7.43                | 7.65                | 8.08                |
| % Dominant taxon                 | 53.70%             | 21.82%              | 35.00%              | 28.04%             | 14.29%             | 26.21%              | 33.04%              | 18.18%              | 31.25%              |
| % Collector-Gatherers            | 68.52%             | 40.00%              | 15.00%              | 11.21%             | 31.87%             | 59.22%              | 28.70%              | 43.64%              | 68.75%              |
| % Filterers                      | 0.00%              | 0.00%               | 0.00%               | 2.80%              | 0.00%              | 4.85%               | 33.91%              | 5.45%               | 1.79%               |
|                                  |                    |                     |                     |                    |                    |                     |                     |                     |                     |
| <b>Total taxa</b>                | 3                  | 3                   | 5                   | 3                  | 5                  | 5                   | 3                   | 5                   | 3                   |
| POET                             | 3                  | 1                   | 3                   | 1                  | 5                  | 5                   | 1                   | 5                   | 5                   |
| Chironomidae taxa                | 3                  | 3                   | 5                   | 3                  | 3                  | 5                   | 3                   | 5                   | 5                   |
| Crustacea + Mollusca             | 3                  | 3                   | 1                   | 5                  | 5                  | 5                   | 3                   | 5                   | 1                   |
| % Chironomidae                   | 5                  | 5                   | 3                   | 5                  | 5                  | 5                   | 5                   | 3                   | 5                   |
| Orthoclaadiinae/Chir             | 5                  | 5                   | 1                   | 5                  | 3                  | 5                   | 5                   | 5                   | 5                   |
| % Amphipoda                      | 3                  | 5                   | 5                   | 5                  | 5                  | 5                   | 3                   | 5                   | 3                   |
| % Crustacea + % Mollusca         | 5                  | 5                   | 3                   | 3                  | 5                  | 5                   | 1                   | 5                   | 5                   |
| HBI                              | 1                  | 3                   | 1                   | 3                  | 5                  | 3                   | 3                   | 1                   | 1                   |
| % Dominant taxon                 | 1                  | 5                   | 3                   | 5                  | 5                  | 5                   | 5                   | 5                   | 5                   |
| % Collector-Gatherers            | 3                  | 1                   | 1                   | 1                  | 1                  | 3                   | 1                   | 1                   | 3                   |
| % Filterers                      | 3                  | 3                   | 3                   | 3                  | 3                  | 3                   | 1                   | 3                   | 3                   |
|                                  |                    |                     |                     |                    |                    |                     |                     |                     |                     |
| <b>Total score</b>               | <b>38</b>          | <b>42</b>           | <b>34</b>           | <b>42</b>          | <b>50</b>          | <b>54</b>           | <b>34</b>           | <b>48</b>           | <b>44</b>           |
| <b>Percent of maximum score</b>  | <b>0.633333</b>    | <b>0.7</b>          | <b>0.566667</b>     | <b>0.7</b>         | <b>0.833333</b>    | <b>0.9</b>          | <b>0.566667</b>     | <b>0.8</b>          | <b>0.733333</b>     |
| <b>Impairment classification</b> | <b>sub-optimal</b> | <b>optimal</b>      | <b>sub-optimal</b>  | <b>optimal</b>     | <b>optimal</b>     | <b>optimal</b>      | <b>sub-optimal</b>  | <b>optimal</b>      | <b>optimal</b>      |

**Table 3c.** Metric values and scores for Montana Department of Transportation mitigated wetland sites in 2005.

|                                  | CRESTON            | PERRY RANCH        | SOUTH FORK SMITH RIVER | CAMP CREEK     | KLEINSCH MIDT POND | KLEINSCH MIDT STREAM | CLOUD RANCH POND   | COLLOID         | JACK CREEK         |
|----------------------------------|--------------------|--------------------|------------------------|----------------|--------------------|----------------------|--------------------|-----------------|--------------------|
| Total taxa                       | 16                 | 18                 | 19                     | 36             | 27                 | 23                   | 22                 | 9               | 16                 |
| POET                             | 0                  | 0                  | 4                      | 14             | 6                  | 5                    | 2                  | 1               | 1                  |
| Chironomidae taxa                | 4                  | 8                  | 6                      | 13             | 6                  | 9                    | 11                 | 4               | 9                  |
| Crustacea + Mollusca             | 6                  | 4                  | 5                      | 0              | 2                  | 3                    | 3                  | 1               | 4                  |
| % Chironomidae                   | 27.62%             | 43.69%             | 21.67%                 | 45.54%         | 8.85%              | 45.08%               | 37.50%             | 25.83%          | 29.41%             |
| Orthoclaadiinae/Chir             | 0.931              | 0.622              | 0.192                  | 0.804          | 0.200              | 0.473                | 0.256              | 0.000           | 0.467              |
| % Amphipoda                      | 0.00%              | 0.00%              | 29.17%                 | 0.00%          | 5.31%              | 0.82%                | 0.00%              | 0.00%           | 0.98%              |
| % Crustacea + % Mollusca         | 52.38%             | 38.83%             | 62.50%                 | 0.00%          | 7.96%              | 3.28%                | 7.69%              | 67.50%          | 41.18%             |
| HBI                              | 7.52               | 7.31               | 7.54                   | 5.06           | 7.40               | 5.83                 | 6.96               | 8.53            | 7.39               |
| % Dominant taxon                 | 25.71%             | 25.24%             | 29.17%                 | 18.81%         | 30.09%             | 32.79%               | 41.35%             | 67.50%          | 35.29%             |
| % Collector-Gatherers            | 64.76%             | 47.57%             | 65.00%                 | 47.52%         | 37.17%             | 50.82%               | 75.96%             | 88.33%          | 91.18%             |
| % Filterers                      | 6.67%              | 27.18%             | 8.33%                  | 5.94%          | 0.88%              | 2.46%                | 2.88%              | 0.00%           | 2.94%              |
|                                  |                    |                    |                        |                |                    |                      |                    |                 |                    |
| Total taxa                       | 3                  | 3                  | 3                      | 5              | 5                  | 5                    | 5                  | 1               | 3                  |
| POET                             | 1                  | 1                  | 5                      | 5              | 5                  | 5                    | 1                  | 1               | 1                  |
| Chironomidae taxa                | 3                  | 5                  | 3                      | 5              | 3                  | 5                    | 5                  | 3               | 5                  |
| Crustacea + Mollusca             | 5                  | 3                  | 3                      | 1              | 1                  | 1                    | 1                  | 1               | 3                  |
| % Chironomidae                   | 3                  | 1                  | 3                      | 1              | 5                  | 1                    | 3                  | 3               | 3                  |
| Orthoclaadiinae/Chir             | 5                  | 5                  | 3                      | 5              | 3                  | 5                    | 3                  | 1               | 1                  |
| % Amphipoda                      | 5                  | 5                  | 1                      | 5              | 3                  | 5                    | 5                  | 5               | 5                  |
| % Crustacea + % Mollusca         | 3                  | 3                  | 3                      | 5              | 5                  | 5                    | 5                  | 1               | 3                  |
| HBI                              | 3                  | 3                  | 3                      | 5              | 3                  | 5                    | 3                  | 1               | 3                  |
| % Dominant taxon                 | 5                  | 5                  | 5                      | 5              | 5                  | 5                    | 3                  | 1               | 3                  |
| % Collector-Gatherers            | 3                  | 3                  | 3                      | 3              | 1                  | 3                    | 3                  | 5               | 5                  |
| % Filterers                      | 1                  | 1                  | 1                      | 3              | 3                  | 3                    | 3                  | 3               | 3                  |
|                                  |                    |                    |                        |                |                    |                      |                    |                 |                    |
| <b>Total score</b>               | <b>40</b>          | <b>38</b>          | <b>36</b>              | <b>48</b>      | <b>42</b>          | <b>48</b>            | <b>40</b>          | <b>26</b>       | <b>38</b>          |
| <b>Percent of maximum score</b>  | <b>0.666667</b>    | <b>0.633333</b>    | <b>0.6</b>             | <b>0.8</b>     | <b>0.7</b>         | <b>0.8</b>           | <b>0.666667</b>    | <b>0.433333</b> | <b>0.633333</b>    |
| <b>Impairment classification</b> | <b>sub-optimal</b> | <b>sub-optimal</b> | <b>sub-optimal</b>     | <b>optimal</b> | <b>optimal</b>     | <b>optimal</b>       | <b>sub-optimal</b> | <b>poor</b>     | <b>sub-optimal</b> |

**Table 3d.** Metric values and scores for Montana Department of Transportation mitigated wetland sites in 2005.

|                                  | NOREM       | ROCK CREEK<br>RANCH | WAGNER MARSH       |
|----------------------------------|-------------|---------------------|--------------------|
| Total taxa                       | 4           | 24                  | 23                 |
| POET                             | 0           | 2                   | 5                  |
| Chironomidae taxa                | 2           | 8                   | 8                  |
| Crustacea + Mollusca             | 2           | 4                   | 5                  |
| % Chironomidae                   | 37.50%      | 22.00%              | 24.00%             |
| Orthocladiinae/Chir              | 0.000       | 0.318               | 0.167              |
| % Amphipoda                      | 0.00%       | 3.00%               | 7.00%              |
| % Crustacea + % Mollusca         | 62.50%      | 40.00%              | 19.00%             |
| HBI                              | 7.50        | 7.61                | 8.58               |
| % Dominant taxon                 | 56.25%      | 18.00%              | 38.00%             |
| % Collector-Gatherers            | 6.25%       | 57.00%              | 40.00%             |
| % Filterers                      | 0.00%       | 0.00%               | 3.00%              |
|                                  |             |                     |                    |
| Total taxa                       | 1           | 5                   | 5                  |
| POET                             | 1           | 1                   | 5                  |
| Chironomidae taxa                | 1           | 5                   | 5                  |
| Crustacea + Mollusca             | 1           | 3                   | 3                  |
| % Chironomidae                   | 3           | 3                   | 3                  |
| Orthocladiinae/Chir              | 1           | 3                   | 1                  |
| % Amphipoda                      | 5           | 5                   | 3                  |
| % Crustacea + % Mollusca         | 3           | 3                   | 5                  |
| HBI                              | 3           | 1                   | 1                  |
| % Dominant taxon                 | 1           | 5                   | 3                  |
| % Collector-Gatherers            | 1           | 3                   | 1                  |
| % Filterers                      | 3           | 3                   | 3                  |
|                                  |             |                     |                    |
| <b>Total score</b>               | <b>24</b>   | <b>40</b>           | <b>38</b>          |
| <b>Percent of maximum score</b>  | <b>0.4</b>  | <b>0.666667</b>     | <b>0.633333</b>    |
| <b>Impairment classification</b> | <b>poor</b> | <b>sub-optimal</b>  | <b>sub-optimal</b> |

### **Literature Cited**

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

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

McCune, B. and J.B. Grace. 2002. Analysis of Ecological Communities. MjM Software Design, Gleneden Beach, Oregon, USA.

McCune, B. and M.J. Mefford. 2002. PC-ORD. Multivariate Analysis of Ecological Data, Version 4. MjM Software Design, Gleneden Beach, Oregon, USA.

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

# Taxa Listing

Project ID: MDT05LW  
RAI No.: MDT05LW004

RAI No.: MDT05LW004

Sta. Name: MUSGRAVE LAKE RS-1

Client ID:

Date Coll.: 7/18/2005

No. Jars: 1

STORET ID:

| Taxonomic Name                     | Count | PRA    | Unique | Stage   | Qualifier    | BI | Function |
|------------------------------------|-------|--------|--------|---------|--------------|----|----------|
| <b>Non-Insect</b>                  |       |        |        |         |              |    |          |
| Acari                              | 3     | 5.45%  | Yes    | Unknown |              | 5  | PR       |
| Ostracoda                          | 12    | 21.82% | Yes    | Unknown |              | 8  | CG       |
| Lymnaeidae                         |       |        |        |         |              |    |          |
| <i>Stagnicola</i> sp.              | 1     | 1.82%  | Yes    | Unknown |              | 6  | SC       |
| Physidae                           |       |        |        |         |              |    |          |
| Physidae                           | 1     | 1.82%  | Yes    | Unknown |              | 8  | SC       |
| Planorbidae                        |       |        |        |         |              |    |          |
| <i>Gyraulus</i> sp.                | 1     | 1.82%  | Yes    | Unknown |              | 8  | SC       |
| Talitridae                         |       |        |        |         |              |    |          |
| <i>Hyalella</i> sp.                | 2     | 3.64%  | Yes    | Unknown |              | 8  | CG       |
| <b>Ephemeroptera</b>               |       |        |        |         |              |    |          |
| Baetidae                           |       |        |        |         |              |    |          |
| <i>Callibaetis</i> sp.             | 3     | 5.45%  | Yes    | Larva   |              | 9  | CG       |
| <b>Heteroptera</b>                 |       |        |        |         |              |    |          |
| Notonectidae                       |       |        |        |         |              |    |          |
| <i>Notonecta</i> sp.               | 2     | 3.64%  | Yes    | Adult   |              | 5  | PR       |
| Notonectidae                       | 6     | 10.91% | No     | Larva   | Larva        | 10 | PR       |
| <b>Coleoptera</b>                  |       |        |        |         |              |    |          |
| Dytiscidae                         |       |        |        |         |              |    |          |
| Dytiscidae                         | 1     | 1.82%  | Yes    | Larva   | Larva        | 5  | PR       |
| Haliplidae                         |       |        |        |         |              |    |          |
| <i>Halipus</i> sp.                 | 1     | 1.82%  | Yes    | Adult   |              | 5  | PH       |
| <i>Halipus</i> sp.                 | 2     | 3.64%  | No     | Larva   | Larva        | 5  | PH       |
| Hydrophilidae                      |       |        |        |         |              |    |          |
| <i>Berosus</i> sp.                 | 1     | 1.82%  | Yes    | Larva   |              | 5  | PR       |
| <b>Diptera</b>                     |       |        |        |         |              |    |          |
| Ceratopogonidae                    |       |        |        |         |              |    |          |
| Ceratopogoninae                    | 11    | 20.00% | Yes    | Larva   | Larva        | 6  | PR       |
| <b>Chironomidae</b>                |       |        |        |         |              |    |          |
| Chironomidae                       |       |        |        |         |              |    |          |
| <i>Acricotopus</i> sp.             | 1     | 1.82%  | Yes    | Larva   |              | 10 | CG       |
| <i>Corynoneura</i> sp.             | 2     | 3.64%  | Yes    | Larva   |              | 7  | CG       |
| <i>Cricotopus (Isocladius)</i> sp. | 2     | 3.64%  | Yes    | Larva   |              | 7  | SH       |
| Orthocladiinae                     | 1     | 1.82%  | No     | Larva   | Early Instar | 6  | CG       |
| <i>Parachironomus</i> sp.          | 1     | 1.82%  | Yes    | Larva   |              | 10 | PR       |
| <i>Paratanytarsus</i> sp.          | 1     | 1.82%  | Yes    | Larva   |              | 6  | CG       |
| Sample Count                       | 55    |        |        |         |              |    |          |



# Metrics Report

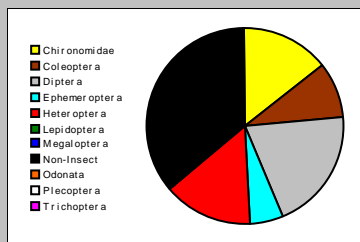
Project ID: MDT05LW  
RAI No.: MDT05LW004  
Sta. Name: MUSGRAVE LAKE RS-1  
Client ID:  
STORET ID  
Coll. Date: 7/18/2005

## Abundance Measures

Sample Count: 55  
Sample Abundance: 55.00 100.00% of sample used  
Total Abundance: 73.98  
Coll. Procedure:  
Sample Notes:

## Taxonomic Composition

| Category      | R | A  | PRA    |
|---------------|---|----|--------|
| Non-Insect    | 6 | 20 | 36.36% |
| Odonata       |   |    |        |
| Ephemeroptera | 1 | 3  | 5.45%  |
| Plecoptera    |   |    |        |
| Heteroptera   | 1 | 8  | 14.55% |
| Megaloptera   |   |    |        |
| Trichoptera   |   |    |        |
| Lepidoptera   |   |    |        |
| Coleoptera    | 3 | 5  | 9.09%  |
| Diptera       | 1 | 11 | 20.00% |
| Chironomidae  | 5 | 8  | 14.55% |

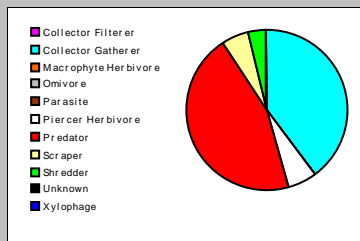


## Dominant Taxa

| Category                | A  | PRA    |
|-------------------------|----|--------|
| Ostracoda               | 12 | 21.82% |
| Ceratopogoninae         | 11 | 20.00% |
| Notonectidae            | 6  | 10.91% |
| Haliphus                | 3  | 5.45%  |
| Callibaetis             | 3  | 5.45%  |
| Acari                   | 3  | 5.45%  |
| Notonecta               | 2  | 3.64%  |
| Hyaella                 | 2  | 3.64%  |
| Cricotopus (Isocladius) | 2  | 3.64%  |
| Corynoneura             | 2  | 3.64%  |
| Stannicola              | 1  | 1.82%  |
| Physidae                | 1  | 1.82%  |
| Paratanytarsus          | 1  | 1.82%  |
| Orthocladinae           | 1  | 1.82%  |
| Gyraulid                | 1  | 1.82%  |

## Functional Composition

| Category             | R | A  | PRA    |
|----------------------|---|----|--------|
| Predator             | 6 | 25 | 45.45% |
| Parasite             |   |    |        |
| Collector Gatherer   | 6 | 22 | 40.00% |
| Collector Filterer   |   |    |        |
| Macrophyte Herbivore |   |    |        |
| Piercer Herbivore    | 1 | 3  | 5.45%  |
| Xylophage            |   |    |        |
| Scraper              | 3 | 3  | 5.45%  |
| Shredder             | 1 | 2  | 3.64%  |
| Omnivore             |   |    |        |
| Unknown              |   |    |        |

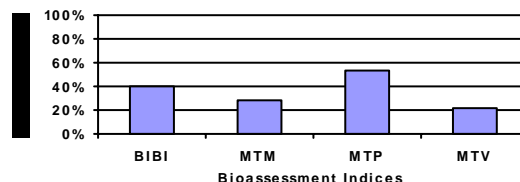


## Metric Values and Scores

| Metric                        | Value  | BIBI | MTP | MTV | MTM |
|-------------------------------|--------|------|-----|-----|-----|
| <i>Composition</i>            |        |      |     |     |     |
| Taxa Richness                 | 17     | 1    | 1   |     | 0   |
| Non-Insect Percent            | 36.36% |      |     |     |     |
| E Richness                    | 1      | 1    |     | 0   |     |
| P Richness                    | 0      | 1    |     | 0   |     |
| T Richness                    | 0      | 1    |     | 0   |     |
| EPT Richness                  | 1      |      | 0   |     | 0   |
| EPT Percent                   | 5.45%  |      | 0   |     | 0   |
| Oligochaeta+Hirudinea Percent |        |      |     |     |     |
| Baetidae/Ephemeroptera        | 1.000  |      |     |     |     |
| Hydropsychidae/Trichoptera    | 0.000  |      |     |     |     |
| <i>Dominance</i>              |        |      |     |     |     |
| Dominant Taxon Percent        | 21.82% |      | 3   |     | 3   |
| Dominant Taxa (2) Percent     | 41.82% |      |     |     |     |
| Dominant Taxa (3) Percent     | 52.73% | 3    |     |     |     |
| Dominant Taxa (10) Percent    | 83.64% |      |     |     |     |
| <i>Diversity</i>              |        |      |     |     |     |
| Shannon H (loge)              | 2.343  |      |     |     |     |
| Shannon H (log2)              | 3.380  |      | 3   |     |     |
| Margalef D                    | 4.179  |      |     |     |     |
| Simpson D                     | 0.127  |      |     |     |     |
| Evenness                      | 0.083  |      |     |     |     |
| <i>Function</i>               |        |      |     |     |     |
| Predator Richness             | 6      |      | 3   |     |     |
| Predator Percent              | 45.45% | 5    |     |     |     |
| Filterer Richness             | 0      |      |     |     |     |
| Filterer Percent              | 0.00%  |      |     | 3   |     |
| Collector Percent             | 40.00% |      | 3   |     | 3   |
| Scraper+Shredder Percent      | 9.09%  |      | 1   |     | 0   |
| Scraper/Filterer              | 0.000  |      |     |     |     |
| Scraper/Scraper+Filterer      | 0.000  |      |     |     |     |
| <i>Habit</i>                  |        |      |     |     |     |
| Burrower Richness             | 1      |      |     |     |     |
| Burrower Percent              | 20.00% |      |     |     |     |
| Swimmer Richness              | 4      |      |     |     |     |
| Swimmer Percent               | 16.36% |      |     |     |     |
| Clinger Richness              | 1      | 1    |     |     |     |
| Clinger Percent               | 3.64%  |      |     |     |     |
| <i>Characteristics</i>        |        |      |     |     |     |
| Cold Stenotherm Richness      | 0      |      |     |     |     |
| Cold Stenotherm Percent       | 0.00%  |      |     |     |     |
| Hemoglobin Bearer Richness    | 3      |      |     |     |     |
| Hemoglobin Bearer Percent     | 18.18% |      |     |     |     |
| Air Breather Richness         | 2      |      |     |     |     |
| Air Breather Percent          | 3.64%  |      |     |     |     |
| <i>Volturnism</i>             |        |      |     |     |     |
| Univoltine Richness           | 6      |      |     |     |     |
| Semivoltine Richness          | 3      | 3    |     |     |     |
| Multivoltine Percent          | 47.27% |      | 2   |     |     |
| <i>Tolerance</i>              |        |      |     |     |     |
| Sediment Tolerant Richness    | 2      |      |     |     |     |
| Sediment Tolerant Percent     | 3.64%  |      |     |     |     |
| Sediment Sensitive Richness   | 0      |      |     |     |     |
| Sediment Sensitive Percent    | 0.00%  |      |     |     |     |
| Metals Tolerance Index        | 3.586  |      |     |     |     |
| Pollution Sensitive Richness  | 0      |      |     |     |     |
| Pollution Tolerant Percent    | 21.82% | 1    |     | 0   |     |
| Hilsenhoff Biotic Index       | 7.218  | 3    |     | 1   |     |
| Intolerant Percent            | 0.00%  |      | 0   |     | 0   |
| Supertolerant Percent         | 49.09% |      |     |     |     |
| CTQa                          | 94.500 |      |     |     |     |

## Bioassessment Indices

| BioIndex | Description                                      | Score | Pct    | Rating   |
|----------|--|-------|--------|----------|
| BIBI     | B-IBI (Karr et al.)                              | 20    | 40.00% |          |
| MTP      | Montana DEQ Plains (Bukantis 1998)               | 16    | 53.33% | Moderate |
| MTV      | Montana Revised Valleys/Foothills (Bollman 1998) | 4     | 22.22% | Moderate |
| MTM      | Montana DEQ Mountains (Bukantis 1998)            | 6     | 28.57% | Moderate |



# Taxa Listing

Project ID: MDT05LW  
RAI No.: MDT05LW005

RAI No.: MDT05LW005

Sta. Name: MUSGRAVE LAKE RS-2

Client ID:

Date Coll.: 7/18/2005

No. Jars: 1

STORET ID:

| Taxonomic Name                     | Count | PRA    | Unique | Stage   | Qualifier | BI | Function |
|------------------------------------|-------|--------|--------|---------|-----------|----|----------|
| <b>Non-Insect</b>                  |       |        |        |         |           |    |          |
| Acari                              | 7     | 7.00%  | Yes    | Unknown |           | 5  | PR       |
| Naididae                           |       |        |        |         |           |    |          |
| Naididae                           | 2     | 2.00%  | Yes    | Unknown |           | 8  | CG       |
| Physidae                           |       |        |        |         |           |    |          |
| Physidae                           | 35    | 35.00% | Yes    | Unknown |           | 8  | SC       |
| Pisidiidae                         |       |        |        |         |           |    |          |
| Pisidiidae                         | 2     | 2.00%  | Yes    | Unknown |           | 8  | CG       |
| Planorbidae                        |       |        |        |         |           |    |          |
| <i>Gyraulus</i> sp.                | 1     | 1.00%  | Yes    | Unknown |           | 8  | SC       |
| <b>Odonata</b>                     |       |        |        |         |           |    |          |
| Aeshnidae                          |       |        |        |         |           |    |          |
| Aeshnidae                          | 1     | 1.00%  | Yes    | Larva   | Damaged   | 5  | PR       |
| Libellulidae                       |       |        |        |         |           |    |          |
| Libellulidae                       | 1     | 1.00%  | Yes    | Larva   | Damaged   | 9  | PR       |
| <b>Ephemeroptera</b>               |       |        |        |         |           |    |          |
| Caenidae                           |       |        |        |         |           |    |          |
| <i>Caenis</i> sp.                  | 2     | 2.00%  | Yes    | Larva   |           | 7  | CG       |
| <b>Heteroptera</b>                 |       |        |        |         |           |    |          |
| Corixidae                          |       |        |        |         |           |    |          |
| Corixidae                          | 13    | 13.00% | Yes    | Larva   | Larva     | 10 | PH       |
| <i>Sigara</i> sp.                  | 1     | 1.00%  | Yes    | Adult   |           | 5  | PH       |
| <i>Trichocorixa</i> sp.            | 1     | 1.00%  | Yes    | Adult   |           | 11 | PR       |
| <b>Coleoptera</b>                  |       |        |        |         |           |    |          |
| Elmidae                            |       |        |        |         |           |    |          |
| <i>Dubiraphia</i> sp.              | 2     | 2.00%  | Yes    | Larva   |           | 6  | CG       |
| Haliplidae                         |       |        |        |         |           |    |          |
| <i>Halipus</i> sp.                 | 6     | 6.00%  | Yes    | Adult   |           | 5  | PH       |
| <i>Peltodytes</i> sp.              | 3     | 3.00%  | Yes    | Adult   |           | 5  | SH       |
| Hydrophilidae                      |       |        |        |         |           |    |          |
| <i>Helophorus</i> sp.              | 1     | 1.00%  | Yes    | Adult   |           | 11 | SH       |
| <b>Chironomidae</b>                |       |        |        |         |           |    |          |
| Chironomidae                       |       |        |        |         |           |    |          |
| <i>Cricotopus (Isocladius)</i> sp. | 2     | 2.00%  | Yes    | Larva   |           | 7  | SH       |
| <i>Cryptochironomus</i> sp.        | 3     | 3.00%  | Yes    | Larva   |           | 8  | PR       |
| <i>Dicrotendipes</i> sp.           | 4     | 4.00%  | Yes    | Larva   |           | 8  | CG       |
| <i>Endochironomus</i> sp.          | 6     | 6.00%  | Yes    | Larva   |           | 10 | SH       |
| <i>Parachironomus</i> sp.          | 2     | 2.00%  | Yes    | Larva   |           | 10 | PR       |
| <i>Paratanytarsus</i> sp.          | 2     | 2.00%  | Yes    | Larva   |           | 6  | CG       |
| <i>Polypedilum</i> sp.             | 2     | 2.00%  | Yes    | Larva   |           | 6  | SH       |
| <i>Psectrocladius</i> sp.          | 1     | 1.00%  | Yes    | Larva   |           | 8  | CG       |
| Sample Count                       | 100   |        |        |         |           |    |          |

Monday, November 07, 2005

# Metrics Report

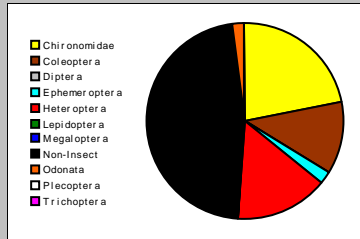
Project ID: MDT05LW  
RAI No.: MDT05LW005  
Sta. Name: MUSGRAVE LAKE RS-2  
Client ID:  
STORET ID  
Coll. Date: 7/18/2005

## Abundance Measures

Sample Count: 100  
Sample Abundance: 127.66 78.33% of sample used  
Total Abundance: 171.70  
Coll. Procedure:  
Sample Notes:

## Taxonomic Composition

| Category      | R | A  | PRA    |
|---------------|---|----|--------|
| Non-Insect    | 5 | 47 | 47.00% |
| Odonata       | 2 | 2  | 2.00%  |
| Ephemeroptera | 1 | 2  | 2.00%  |
| Plecoptera    |   |    |        |
| Heteroptera   | 3 | 15 | 15.00% |
| Megaloptera   |   |    |        |
| Trichoptera   |   |    |        |
| Lepidoptera   |   |    |        |
| Coleoptera    | 4 | 12 | 12.00% |
| Diptera       |   |    |        |
| Chironomidae  | 8 | 22 | 22.00% |

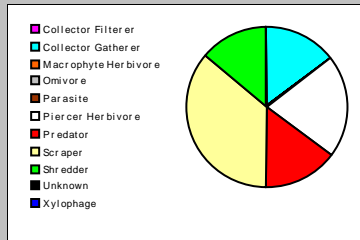


## Dominant Taxa

| Category                | A  | PRA    |
|-------------------------|----|--------|
| Physidae                | 35 | 35.00% |
| Corixidae               | 13 | 13.00% |
| Acari                   | 7  | 7.00%  |
| Haliphus                | 6  | 6.00%  |
| Endochironomus          | 6  | 6.00%  |
| Dicrotendipes           | 4  | 4.00%  |
| Peltodytes              | 3  | 3.00%  |
| Cryptochironomus        | 3  | 3.00%  |
| Polypedilum             | 2  | 2.00%  |
| Pisidiidae              | 2  | 2.00%  |
| Paratanytarsus          | 2  | 2.00%  |
| Parachironomus          | 2  | 2.00%  |
| Naididae                | 2  | 2.00%  |
| Cricotopus (Isocladius) | 2  | 2.00%  |
| Caenis                  | 2  | 2.00%  |

## Functional Composition

| Category             | R | A  | PRA    |
|----------------------|---|----|--------|
| Predator             | 6 | 15 | 15.00% |
| Parasite             |   |    |        |
| Collector Gatherer   | 7 | 15 | 15.00% |
| Collector Filterer   |   |    |        |
| Macrophyte Herbivore |   |    |        |
| Piercer Herbivore    | 3 | 20 | 20.00% |
| Xylophage            |   |    |        |
| Scraper              | 2 | 36 | 36.00% |
| Shredder             | 5 | 14 | 14.00% |
| Omnivore             |   |    |        |
| Unknown              |   |    |        |

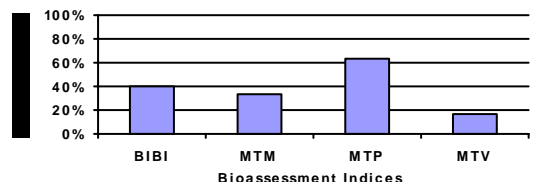


## Metric Values and Scores

| Metric                        | Value  | BIBI | MTP | MTV | MTM |
|-------------------------------|--------|------|-----|-----|-----|
| <i>Composition</i>            |        |      |     |     |     |
| Taxa Richness                 | 23     | 3    | 2   |     | 1   |
| Non-Insect Percent            | 47.00% |      |     |     |     |
| E Richness                    | 1      | 1    |     | 0   |     |
| P Richness                    | 0      | 1    |     | 0   |     |
| T Richness                    | 0      | 1    |     | 0   |     |
| EPT Richness                  | 1      |      | 0   |     | 0   |
| EPT Percent                   | 2.00%  |      | 0   |     | 0   |
| Oligochaeta+Hirudinea Percent | 2.00%  |      |     |     |     |
| Baetidae/Ephemeroptera        | 0.00%  |      |     |     |     |
| Hydropsychidae/Trichoptera    | 0.00%  |      |     |     |     |
| <i>Dominance</i>              |        |      |     |     |     |
| Dominant Taxon Percent        | 35.00% |      | 2   |     | 1   |
| Dominant Taxa (2) Percent     | 48.00% |      |     |     |     |
| Dominant Taxa (3) Percent     | 55.00% | 3    |     |     |     |
| Dominant Taxa (10) Percent    | 81.00% |      |     |     |     |
| <i>Diversity</i>              |        |      |     |     |     |
| Shannon H (loge)              | 2.444  |      |     |     |     |
| Shannon H (log2)              | 3.526  |      | 3   |     |     |
| Margalef D                    | 4.777  |      |     |     |     |
| Simpson D                     | 0.150  |      |     |     |     |
| Evenness                      | 0.071  |      |     |     |     |
| <i>Function</i>               |        |      |     |     |     |
| Predator Richness             | 6      |      | 3   |     |     |
| Predator Percent              | 15.00% | 3    |     |     |     |
| Filterer Richness             | 0      |      |     |     |     |
| Filterer Percent              | 0.00%  |      |     | 3   |     |
| Collector Percent             | 15.00% |      | 3   |     | 3   |
| Scraper+Shredder Percent      | 50.00% |      | 3   |     | 2   |
| Scraper/Filterer              | 0.00%  |      |     |     |     |
| Scraper/Scraper+Filterer      | 0.00%  |      |     |     |     |
| <i>Habit</i>                  |        |      |     |     |     |
| Burrower Richness             | 1      |      |     |     |     |
| Burrower Percent              | 4.00%  |      |     |     |     |
| Swimmer Richness              | 5      |      |     |     |     |
| Swimmer Percent               | 24.00% |      |     |     |     |
| Clinger Richness              | 3      | 1    |     |     |     |
| Clinger Percent               | 6.00%  |      |     |     |     |
| <i>Characteristics</i>        |        |      |     |     |     |
| Cold Stenotherm Richness      | 0      |      |     |     |     |
| Cold Stenotherm Percent       | 0.00%  |      |     |     |     |
| Hemoglobin Bearer Richness    | 6      |      |     |     |     |
| Hemoglobin Bearer Percent     | 18.00% |      |     |     |     |
| Air Breather Richness         | 0      |      |     |     |     |
| Air Breather Percent          | 0.00%  |      |     |     |     |
| <i>Voltinism</i>              |        |      |     |     |     |
| Univoltine Richness           | 8      |      |     |     |     |
| Semivoltine Richness          | 6      | 5    |     |     |     |
| Multivoltine Percent          | 29.00% |      | 3   |     |     |
| <i>Tolerance</i>              |        |      |     |     |     |
| Sediment Tolerant Richness    | 1      |      |     |     |     |
| Sediment Tolerant Percent     | 1.00%  |      |     |     |     |
| Sediment Sensitive Richness   | 0      |      |     |     |     |
| Sediment Sensitive Percent    | 0.00%  |      |     |     |     |
| Metals Tolerance Index        | 3.952  |      |     |     |     |
| Pollution Sensitive Richness  | 0      |      |     |     |     |
| Pollution Tolerant Percent    | 67.00% | 1    |     |     | 0   |
| Hilsenhoff Biotic Index       | 7.724  |      | 0   |     | 0   |
| Intolerant Percent            | 0.00%  |      |     |     |     |
| Supertolerant Percent         | 70.00% |      |     |     |     |
| CTQa                          | 99.625 |      |     |     |     |

## Bioassessment Indices

| BioIndex | Description                                      | Score | Pct    | Rating   |
|----------|--|-------|--------|----------|
| BIBI     | B-IBI (Karr et al.)                              | 20    | 40.00% |          |
| 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: MDT05LW  
RAI No.: MDT05LW006

RAI No.: MDT05LW006

Sta. Name: MUSGRAVE LAKE ES-1

Client ID:

Date Coll.: 7/18/2005

No. Jars: 1

STORET ID:

| Taxonomic Name            | Count | PRA    | Unique | Stage    | Qualifier    | BI | Function |
|---------------------------|-------|--------|--------|----------|--------------|----|----------|
| <b>Non-Insect</b>         |       |        |        |          |              |    |          |
| Acari                     | 2     | 1.87%  | Yes    | Unknown  |              | 5  | PR       |
| Cladocera                 | 3     | 2.80%  | Yes    | Unknown  |              | 8  | CF       |
| Ostracoda                 | 4     | 3.74%  | Yes    | Unknown  |              | 8  | CG       |
| Lymnaeidae                |       |        |        |          |              |    |          |
| Lymnaeidae                | 4     | 3.74%  | No     | Immature | Immature     | 6  | SC       |
| <i>Stagnicola</i> sp.     | 6     | 5.61%  | Yes    | Unknown  |              | 6  | SC       |
| Naididae                  |       |        |        |          |              |    |          |
| Naididae                  | 4     | 3.74%  | Yes    | Unknown  |              | 8  | CG       |
| Physidae                  |       |        |        |          |              |    |          |
| Physidae                  | 15    | 14.02% | Yes    | Unknown  |              | 8  | SC       |
| Planorbidae               |       |        |        |          |              |    |          |
| <i>Gyraulus</i> sp.       | 30    | 28.04% | Yes    | Unknown  |              | 8  | SC       |
| Talitridae                |       |        |        |          |              |    |          |
| <i>Hyalella</i> sp.       | 1     | 0.93%  | Yes    | Unknown  |              | 8  | CG       |
| <b>Odonata</b>            |       |        |        |          |              |    |          |
| Lestidae                  |       |        |        |          |              |    |          |
| <i>Lestes</i> sp.         | 1     | 0.93%  | Yes    | Larva    |              | 9  | PR       |
| <b>Heteroptera</b>        |       |        |        |          |              |    |          |
| Corixidae                 |       |        |        |          |              |    |          |
| Corixidae                 | 1     | 0.93%  | Yes    | Larva    | Larva        | 10 | PH       |
| <b>Coleoptera</b>         |       |        |        |          |              |    |          |
| Haliplidae                |       |        |        |          |              |    |          |
| <i>Halipus</i> sp.        | 1     | 0.93%  | Yes    | Adult    |              | 5  | PH       |
| Hydrophilidae             |       |        |        |          |              |    |          |
| <i>Berosus</i> sp.        | 1     | 0.93%  | Yes    | Larva    |              | 5  | PR       |
| <i>Helophorus</i> sp.     | 1     | 0.93%  | Yes    | Adult    |              | 11 | SH       |
| Hydrophilidae             | 1     | 0.93%  | Yes    | Larva    | Larva        | 5  | PR       |
| <b>Diptera</b>            |       |        |        |          |              |    |          |
| Ceratopogonidae           |       |        |        |          |              |    |          |
| Ceratopogoninae           | 29    | 27.10% | Yes    | Larva    | Larva        | 6  | PR       |
| <b>Chironomidae</b>       |       |        |        |          |              |    |          |
| Chironomidae              |       |        |        |          |              |    |          |
| <i>Ablabesmyia</i> sp.    | 1     | 0.93%  | Yes    | Larva    |              | 8  | CG       |
| Orthocladiinae            | 1     | 0.93%  | Yes    | Larva    | Early Instar | 6  | CG       |
| <i>Psectrocladius</i> sp. | 1     | 0.93%  | Yes    | Larva    |              | 8  | CG       |
| Sample Count              | 107   |        |        |          |              |    |          |

# Metrics Report

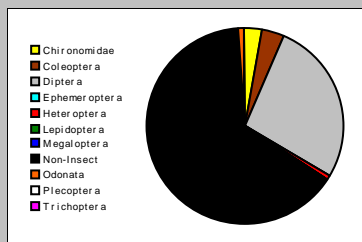
Project ID: MDT05LW  
RAI No.: MDT05LW006  
Sta. Name: MUSGRAVE LAKE ES-1  
Client ID:  
STORET ID  
Coll. Date: 7/18/2005

## Abundance Measures

Sample Count: 107  
Sample Abundance: 1,070.00 10.00% of sample used  
Total Abundance: 1,439.15  
Coll. Procedure:  
Sample Notes:

## Taxonomic Composition

| Category      | R | A  | PRA    |
|---------------|---|----|--------|
| Non-Insect    | 8 | 69 | 64.49% |
| Odonata       | 1 | 1  | 0.93%  |
| Ephemeroptera |   |    |        |
| Plecoptera    |   |    |        |
| Heteroptera   | 1 | 1  | 0.93%  |
| Megaloptera   |   |    |        |
| Trichoptera   |   |    |        |
| Lepidoptera   |   |    |        |
| Coleoptera    | 4 | 4  | 3.74%  |
| Diptera       | 1 | 29 | 27.10% |
| Chironomidae  | 3 | 3  | 2.80%  |

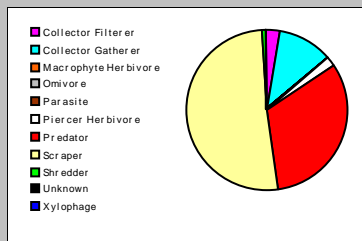


## Dominant Taxa

| Category        | A  | PRA    |
|-----------------|----|--------|
| Gyraulid        | 30 | 28.04% |
| Ceratopogoninae | 29 | 27.10% |
| Physidae        | 15 | 14.02% |
| Stannicula      | 6  | 5.61%  |
| Ostracoda       | 4  | 3.74%  |
| Naididae        | 4  | 3.74%  |
| Lymnaeidae      | 4  | 3.74%  |
| Cladocera       | 3  | 2.80%  |
| Acari           | 2  | 1.87%  |
| Hyalella        | 1  | 0.93%  |
| Helophorus      | 1  | 0.93%  |
| Halipus         | 1  | 0.93%  |
| Corixidae       | 1  | 0.93%  |
| Berosus         | 1  | 0.93%  |
| Ablabesmyia     | 1  | 0.93%  |

## Functional Composition

| Category             | R | A  | PRA    |
|----------------------|---|----|--------|
| Predator             | 5 | 34 | 31.78% |
| Parasite             |   |    |        |
| Collector Gatherer   | 6 | 12 | 11.21% |
| Collector Filterer   | 1 | 3  | 2.80%  |
| Macrophyte Herbivore |   |    |        |
| Piercer Herbivore    | 2 | 2  | 1.87%  |
| Xylophage            |   |    |        |
| Scraper              | 3 | 55 | 51.40% |
| Shredder             | 1 | 1  | 0.93%  |
| Omnivore             |   |    |        |
| Unknown              |   |    |        |



## Metric Values and Scores

| Metric                        | Value  | BIBI | MTP | MTV | MTM |
|-------------------------------|--------|------|-----|-----|-----|
| <b>Composition</b>            |        |      |     |     |     |
| Taxa Richness                 | 18     | 1    | 2   |     | 0   |
| Non-Insect Percent            | 64.49% |      |     |     |     |
| E Richness                    | 0      | 1    |     | 0   |     |
| P Richness                    | 0      | 1    |     | 0   |     |
| T Richness                    | 0      | 1    |     | 0   |     |
| EPT Richness                  | 0      |      | 0   |     | 0   |
| EPT Percent                   | 0.00%  |      | 0   |     | 0   |
| Oligochaeta+Hirudinea Percent | 3.74%  |      |     |     |     |
| Baetidae/Ephemeroptera        | 0.00%  |      |     |     |     |
| Hydropsychidae/Trichoptera    | 0.00%  |      |     |     |     |
| <b>Dominance</b>              |        |      |     |     |     |
| Dominant Taxon Percent        | 28.04% |      | 3   |     | 2   |
| Dominant Taxa (2) Percent     | 55.14% |      |     |     |     |
| Dominant Taxa (3) Percent     | 69.16% | 3    |     |     |     |
| Dominant Taxa (10) Percent    | 91.59% |      |     |     |     |
| <b>Diversity</b>              |        |      |     |     |     |
| Shannon H (loge)              | 2.044  |      |     |     |     |
| Shannon H (log2)              | 2.949  |      | 2   |     |     |
| Margalef D                    | 3.668  |      |     |     |     |
| Simpson D                     | 0.186  |      |     |     |     |
| Evenness                      | 0.095  |      |     |     |     |
| <b>Function</b>               |        |      |     |     |     |
| Predator Richness             | 5      |      | 2   |     |     |
| Predator Percent              | 31.78% | 5    |     |     |     |
| Filterer Richness             | 1      |      |     |     |     |
| Filterer Percent              | 2.80%  |      |     | 3   |     |
| Collector Percent             | 14.02% |      | 3   |     | 3   |
| Scraper+Shredder Percent      | 52.34% |      | 3   |     | 2   |
| Scraper/Filterer              | 18.333 |      |     |     |     |
| Scraper/Scraper+Filterer      | 0.948  |      |     |     |     |
| <b>Habit</b>                  |        |      |     |     |     |
| Burrower Richness             | 1      |      |     |     |     |
| Burrower Percent              | 27.10% |      |     |     |     |
| Swimmer Richness              | 4      |      |     |     |     |
| Swimmer Percent               | 3.74%  |      |     |     |     |
| Clinger Richness              | 0      | 1    |     |     |     |
| Clinger Percent               | 0.00%  |      |     |     |     |
| <b>Characteristics</b>        |        |      |     |     |     |
| Cold Stenotherm Richness      | 0      |      |     |     |     |
| Cold Stenotherm Percent       | 0.00%  |      |     |     |     |
| Hemoglobin Bearer Richness    | 2      |      |     |     |     |
| Hemoglobin Bearer Percent     | 28.97% |      |     |     |     |
| Air Breather Richness         | 2      |      |     |     |     |
| Air Breather Percent          | 1.87%  |      |     |     |     |
| <b>Voltinism</b>              |        |      |     |     |     |
| Univoltine Richness           | 8      |      |     |     |     |
| Semivoltine Richness          | 4      | 3    |     |     |     |
| Multivoltine Percent          | 11.21% |      | 3   |     |     |
| <b>Tolerance</b>              |        |      |     |     |     |
| Sediment Tolerant Richness    | 2      |      |     |     |     |
| Sediment Tolerant Percent     | 37.38% |      |     |     |     |
| Sediment Sensitive Richness   | 0      |      |     |     |     |
| Sediment Sensitive Percent    | 0.00%  |      |     |     |     |
| Metals Tolerance Index        | 3.500  |      |     |     |     |
| Pollution Sensitive Richness  | 0      | 1    |     | 0   |     |
| Pollution Tolerant Percent    | 55.14% | 1    |     | 0   |     |
| Hilsenhoff Biotic Index       | 7.132  |      | 0   |     | 0   |
| Intolerant Percent            | 0.00%  |      |     |     |     |
| Supertolerant Percent         | 57.01% |      |     |     |     |
| CTQa                          | 97.167 |      |     |     |     |

## Bioassessment Indices

| BioIndex | Description                                      | Score | Pct    | Rating   |
|----------|--|-------|--------|----------|
| BIBI     | B-IBI (Karr et al.)                              | 18    | 36.00% |          |
| MTP      | Montana DEQ Plains (Bukantis 1998)               | 18    | 60.00% | Slight   |
| MTV      | Montana Revised Valleys/Foothills (Bollman 1998) | 3     | 16.67% | Severe   |
| MTM      | Montana DEQ Mountains (Bukantis 1998)            | 7     | 33.33% | Moderate |

