MONTANA DEPARTMENT OF TRANSPORTATION WETLAND MITIGATION MONITORING REPORT: YEAR 2002

Musgrave Lake
Zurich, Montana

Prepared for:

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

Prepared by:

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

May 2003

Project No: 130091.019

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1.0 INTRODUCTION

The Musgrave Lake wetland mitigation 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 approximately 27 acres of wetland credit within the confines of a 100-acre conservation easement.

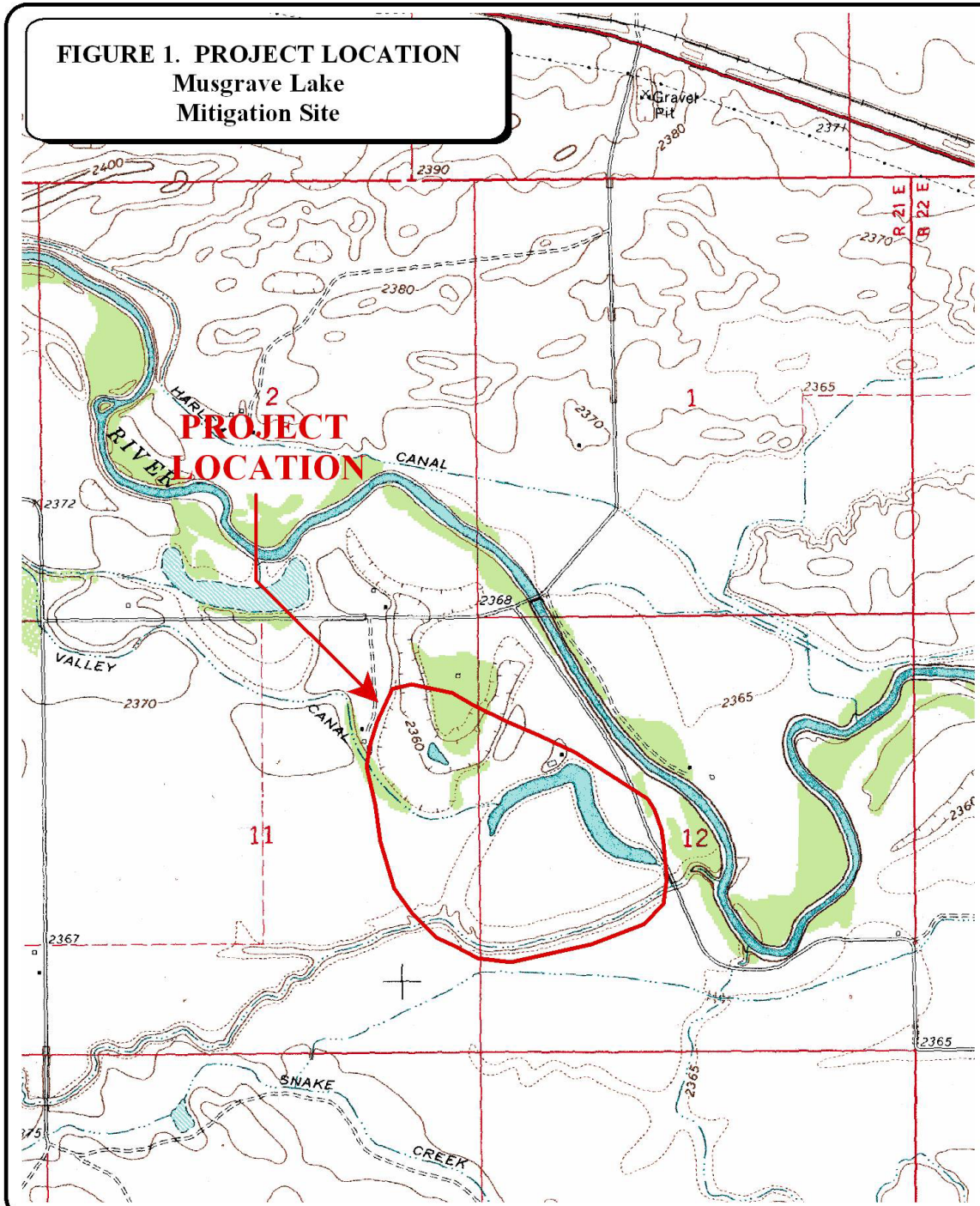
The approximate site boundary is illustrated on **Figure 2** (**Appendix A**), and the original conceptual layout is provided in **Appendix D**. The project is comprised of two "restoration" sites and two "enhancement" sites. Restoration Site 1 (RS1) occurs in a basin in the northwest corner of the mitigation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

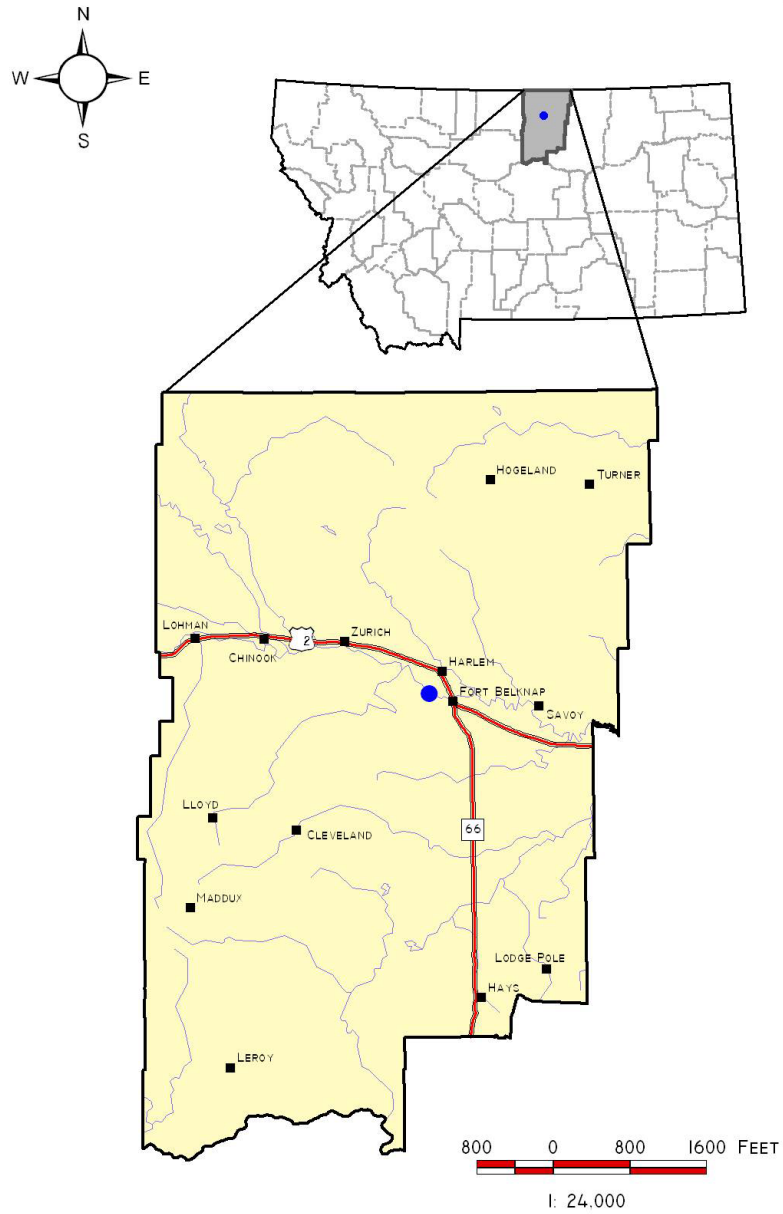
Approximately 4.6 acres of impaired, low-quality wetlands were delineated by MDT at RS1 prior to project implementation. However, given the restoration of hydrology, the Corps of Engineers (COE) has approved allocation of 1:1 credit at the two basins, inclusive of these existing impaired wetlands (1:1 ratio) (Urban pers. comm.). No pre-project wetlands were delineated by MDT at RS2. A target of 24.5 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 11 acres of Musgrave Lake at two areas contained within the 100-acre easement. These areas are referenced as Enhancement Site 1 (ES1) and Enhancement Site 2 (ES2) (**Figure 2, Appendix A**). Although currently wetland, Enhancement Site 1, the "middle" portion of Musgrave Lake, is 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. Enhancement Site 2, the "lower" portion of Musgrave Lake, is also currently wetland and was impacted by grazing.

The project attempts to remedy these problems by relocating the water control structure, installing a larger culvert, and revising the grazing system. Grazing will be prohibited for five years, after which grazing prescriptions will follow a Natural Resources Conservation Service grazing management plan. Assuming that an appropriate increase in wetland functional condition is achieved, a ratio of 3:1 was tentatively approved by the COE, resulting in 3.7 acres of mitigation credit in these areas as proposed by the landowner (MLR 2001).

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

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**; see **Appendix C** for completed pre-project functional assessment forms). 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 first monitored in 2001. This report documents the results of 2002 monitoring efforts. The monitoring area is illustrated in **Figure 2** (**Appendix A**). It should be noted that, per comments made by the Corps of Engineers, Land & Water was instructed by MDT not to monitor area ES2 during 2002; as such, this report primarily addresses areas RS1, RS2, and ES1. ES2 was apparently determined by the Corps to be functioning appropriately in its existing state (Urban pers. comm.)

2.0 METHODS

2.1 Monitoring Dates and Activities

The site was visited on May 14th (spring) and July 29-30 (mid-season) 2002. 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 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 will be used to evaluate changes over time, especially the establishment and increase of hydrophytic vegetation. Transect locations were marked on the air photo and all data 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 within the 100-acre easement (exclusive of the reference wetland area and ES2) during the mid-season visit according the 1987 COE Wetland Delineation Manual. The indicator status of vegetation was derived from the National List of Plant Species that Occur in Wetlands: Northwest Region 9 (Reed 1988). Wetland and upland areas within the monitoring area were investigated for the presence of wetland hydrology, hydrophytic vegetation and hydric soils. The information was recorded on COE Routine Wetland Delineation Data Forms (**Appendix B**). The wetland/upland boundary was modified on the 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 and Herptiles

Mammal and herptile 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 E**. 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 a laboratory 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 2002 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 2002 were documented by hand on a 2001 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

Inundation was present, to some extent, at each of the four sites. Water depths at open water/rooted vegetation interfaces ranged between approximately 20 inches and five feet, with an average of about three feet. Open water areas are shown on **Figure 3** (**Appendix A**). Specific recorded values for 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 50 years total 8.6 inches for the Chinook station. During 2002, 13.7 inches of precipitation were recorded in Chinook between January and July. Thus, this year-two evaluation was apparently conducted during an above-average 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 (see the 2002 aerial photograph of the site in **Appendix C)**. 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 one percent inundated (within the ditch only), with an average depth of two feet 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 not inundated. There was an apparent problem with the outlet control structure, which appeared to be leaking or opened, as virtually no water was backing up at the dike. This was immediately brought to MDT's attention, and apparently was repaired later in the summer, subsequent to the 2002 monitoring effort. Weak hydrological indicators (cracked, moist soils) indicated that saturation may have occurred further to the east earlier in the year. The standpipe had been raised per 2001 recommendations.

ES1 was approximately 10 percent inundated, with an average depth of 24 inches and a range of depths from 0 to 30 inches. Only the ditch section of this site was inundated or showed recent evidence of inundation. ES2 was approximately 60 percent inundated ("lake" only), with an average depth of 12 inches and a range of depths from 0 to over six feet. Deepest areas appeared to be located in open water areas in the west portion of this site.

3.2 Vegetation

Vegetation species identified on the site are presented in **Table 1** and on the attached data form. Seven wetland community types were identified and mapped on the mitigation area (**Figure 3**, **Appendix A**) in 2002, as opposed to six in 2001. These included Type 1: *Typha latifolia*/*Scirpus acutus*, Type 2: *Alopecurus pratensis*/*Polygonum amphibium*, Type 3: *Salix exigua/Elaeagnus angustifolia*, Type 4: *Potamogeton*/*Myriophyllum*, Type 5: *Carex*, Type 6: *Hordeum jubatum*/*Rumex crispus*, and Type 7: *Populus deltoides* . Type 7 was added in 2002 due to increased inundation at RS1. Dominant species within each of these communities are listed on the attached data form (**Appendix B**).

Type 1 occurs commonly at RS1, ES1, and ES3. Type 2 occurs primarily in newly developing wetland areas of RS1, but was reduced to primarily *Polygonum amphibium* communities where inundated beyond approximately one foot depths. This community type may be revised in 2003. Type 3 occurs in patches at RS1, ES1, ES2, and RS2. Type 4 occurs sparingly in flooded areas at all sites; primarily within ditches or deeper areas. Type 5 occurs primarily at ES1 and ES2. Type 6 is regulated to the majority of RS2, east of the main dike area, although much of this area was hayed prior to the 2002 monitoring effort. Type 7 occurs mainly along the south and east fringe of RS1 in newly-inundated areas formerly mapped as uplands. Understory species appeared to respond rapidly to increased inundation in these areas.

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*).

Table 1: *2001, 2002 Musgrave Lake Vegetation Species List*

Species	Region 9 (Northwest) Wetland Indicator	Observed 2001	Observed 2002
Acer negundo	FAC+	x	x
Agropyron repens	FACU	x	x
Agrostis alba	FACW	x	x
Alisma plantago-aquatica	OBL	x	x
Alopecurus pratensis	FACW	x	x
Apocynum androsaemifolium	--	x	x
Arctium minus	--	x	x
Asclepias speciosa	FAC+	x	x
Asparagus officinalis	--	x	x
Beckmannia syzigachne	OBL	x	x
Bromus inermis	--	x	x
Carex lanuginose	OBL	x	x
Carex praegracilis	FACW	x	x
Carex stipata	OBL	x	x
Carex utriculata	OBL	x	x
Carex vesicaria	OBL	x	x
Carex vulpinoidea	OBL	x	x
Chenopodium album	FAC	x	x
Cicuta douglasii	OBL	x	x
Cirsium arvense	FAC-	x	x
Cornus stolonifera	FACW	x	x
Elaeagnus angustifolia	FAC	x	x
Eleocharis acicularis	OBL	x	x
Eleocharis palustris	OBL	x	x
Festuca sp.	--	x	x
Glyceria grandis	OBL	x	x
Glycyrrhiza lepidota	FAC+	x	x
Helianthus annuus	FACU+	x	x
Hordeum jubatum	FAC-	x	x
Iva xanthifolia	FAC		x
Juncus effuses	FACW	x	x
Kochia scoparia	FAC	x	x
Lemna minor	OBL	x	x
Lycopus americanus	OBL	x	x
Medicago sativa	--	x	x
Myriophyllum spicatum	OBL	x	x
Phalaris arundinacea	FACW	x	x
Phleum pretense	FAC-	x	x
Plantago major	FAC+	x	
Poa bulbosa	--		x
Poa pratensis	FAC	x	x
Polygonum amphibium	OBL	x	x
Polygonum erectum	FACW-	x	
Polygonum lapathifolium	FACW	x	x
Polygonum persicaria	FACW	x	
Populus deltoides	FAC	x	x
Potamogeton natans	OBL	x	x
Potentilla anserine	OBL	x	x
Prunus virginiana	FACU	x	x
Ranunculus occidentalis	FAC	x	x
Rosa nutkana	FAC-	x	x
Rumex crispus	FACW	x	x
Sagittaria cuneata	OBL	x	x
Salix exigua	OBL	x	x
Salix lutea	OBL	x	x
Scirpus acutus	OBL	x	x
Scirpus americanus	OBL	x	x
Scirpus maritimus	OBL	x	x
Scirpus validus	OBL	x	x
Sium suave	OBL	x	x
Solidago Canadensis	FACU	x	x
Sparganium eurycarpum	OBL	x	x
Symphoricarpos occidentalis	--	x	x
Taraxacum officinale	FACU	x	x
Typha latifolia	OBL	x	x

Vegetation transect results are detailed in the attached data form, and are summarized graphically below in comparison to 2001 results.

RS1 Start 2001	***Upland (45')***	***Type 2 (35')***	***Type 1 (110')***	***Type 2 (195')***		***Upland (115')***	**Total: 500'**	**RS1 End**
RS1 Start 2002	***T2 15'***	***Up 16'***	***T7 49'***	***T1 80'***	***Open water – transitional 120'***	***T2 20'***	***Open water – transitional 200'***	**Total: 500'**	**RS1 End**

RS2 Start 2001	***Upland (20')***	***Type 6 (80')***	***Upland (70')***	**Total: 170'**	**RS2 End**
RS2 Start 2001	***Upland (20')***	***Type 6 (80')***	***Upland (70')***	**Total: 170'**	**RS2 End**

ES1 Start 2001	***Upland (18')***	***Type 5 (68')***		**Total: 86'**	**ES2 End**
ES1 Start 2001	***Upland (18')***	***Type 5 (68')***		**Total: 86'**	**ES2 End**

ES2 Start 2001	***Upland (7')***	***Type 1 (18')***	***Type 5 (10')***	***Type 1 (53')***	***Type 3 (11')***	***Upland (38')***	**Total: 137'**	**ES2 End**
ES2 Start 2001	***This transect not sampled in 2002***						**Total: 137'**	**ES2 End**

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 clay loam with a matrix color of 10YR 4/1 and mottles at 10YR 4/6. 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 in the eastern, more "marginal" area of the wetland. Soils were comprised of silty clay loams with a matrix color of 2.5Y3/2 and faint mottles of a 10YR5/8 color. Identical to 2001 results, soils were not saturated during the survey, but had been wet earlier in the year as evidenced by a strongly cracked surface. Soils in this area will likely develop stronger hydric characteristics as the hydroperiod is 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. Delineation results are as follows:

RS1: 4.59 wetland acres impaired pre-existing, but currently "restored".
8.73 additional wetland and flooded "open water / transitional" areas.
Total of 13.32 acres of aquatic habitats delineated in 2002; a gain of 6.1 acres over 2001 totals due to dramatically increased inundation throughout this unit.

RS2: 0 wetland acres pre-existing.
2.53 wetland acres "restored".
0.05 acre open water.
Total of 2.58 acres of aquatic habitats delineated in 2002; a gain of 0.06 acre over 2001 totals due to minor increased wetland area southeast of culvert.

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.
Total of 4.8 wetland acres; no change from 2001.

ES2: 2.28 wetland acres pre-existing within delineation area (see below).
0.83 acres open water.
Total of 3.11 acres of aquatic habitats as of 2001; not sampled in 2002, but reconnaissance revealed no obvious changes in this area.

Inclusive of minor open water/transitional areas at RS1, approximately 15.9 wetland/aquatic habitat acres have been "restored" on the mitigation site to date, an increase of 6.1 acres over 2001 totals. Enhancement sites remained virtually unchanged from 2001.

In addition to wetland borders delineated during the 2002 mid-season visit, RS1 also contained approximate borders of pre-existing, impaired wetlands delineated by MDT that were referenced in the introduction to this report. Wetland fringes were noted developing below the RS1 dike in addition to pre-existing wetlands associated with the ditch, as well as along the south border of the impoundment in forested areas. "Open water/transitional" areas at RS1 consisted of recently flooded wetland and previously-mapped upland areas that were under from one to an estimated four feet of water during the mid-season visit. Rooted vegetation in these areas was not observable due to water depth/turbidity.

The amount of open water at RS2 decreased in 2002 due to the leaking control structure at the dike (see previous discussion under *Hydrology*). In addition, much of this area was hayed in 2002, making vegetation identification extremely difficult. For the most part, wetland borders were therefore assumed to be consistent with those delineated in 2001.

Wetland borders of ES1 and ES2 were delineated in 2001, although the north border of ES1 and the west border of ES2 were drawn based on the approximate easement borders in these areas and are 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 and connects to ES2. The west border of ES2 was drawn along the approximate easement border, although the wetland is contiguous to the west and connects to ES1. Any wetland expansion relative to these areas is most likely to occur along the south border of ES1 (along the dike) and/or along the east border of ES2, both of which were carefully delineated in 2001 and will be monitored for future changes. No changes were observed in either area during 2002.

3.5 Wildlife

Wildlife species, or evidence of wildlife, observed on the site during 2001 and 2002 monitoring efforts are listed in **Table 2**. Specific evidence observed, as well as activity codes pertaining to birds, is provided on the completed monitoring form in **Appendix B**. Three mammal, two herptile, and numerous bird species were noted using portions of the mitigation site during 2002 monitoring efforts.

Of special interest were observations of northern leopard frogs (*Rana pipiens*) at each of the four sites in 2001 and at RS1 and RS2 in 2002. 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 B** and summarized below.

RS1: Significantly diminished taxa richness at this site in 2002 resulted in a deterioration of bioassessment score compared to 2001. Optimal conditions apparently regressed to sub-optimal conditions. Midge taxa richness decreased by half in the second year, suggesting that either a different sampling effort was employed or benthic habitats became compromised in the interim. The biotic index value did not change appreciably between the two years, suggesting that water quality had not diminished.

RS2: The depauperate sample taken in 2002 contrasted sharply with that of 2001, which yielded ample numbers of invertebrates and excellent diversity. In 2002, only 3 animals were present in the sample, which suggested an inadequate sampling effort or a gross deterioration of water quality and/or habitat availability in the interim.

ES1: Sub-optimal conditions apparently persisted at this site in 2002. Fewer organisms than expected were present in the 2002 sample; however, and taxa richness was greatly reduced compared to 2001. Whereas water-column inhabitants dominated the fauna in the earlier year, the dominant faunal component of the later year's sample were midges, suggesting a shift to benthic habitats. The apparent increase in the sensitivity of the fauna to warm temperatures and

Table 2: ***Fish and Wildlife Species Observed on the Musgrave Mitigation Site, 2001 and 2002***

FISH
Unidentified Minnow Species *(Hybognathus* sp.*)**

AMPHIBIANS
Northern Leopard Frog (*Rana pipiens*)*

REPTILES
Plains Garter Snake (*Thamnophis radix*)*

BIRDS
American Coot (*Fulica americana*)**
American Kestrel (*Falco sparverius*)*
American Robin (*Turdus migratorius*)*
American White Pelican (*Pelecanus erythrorhynchos*)**
American Wigeon (*Anas Americana)**
Barn Swallow (*Hirundo rustica*)
Belted Kingfisher (*Ceryle alcyon)*
Black-billed Magpie (*Pica pica*)
Black-capped Chickadee (*Poecile atricapillus*)
Blue-winged Teal (*Anas discors*)
Bobolink (*Dolichonyx oryzivorus*)
Brewer's Blackbird (*Euphagus cyanocephalus*)*
Brown-headed Cowbird (*Molothrus ater*)
Bufflehead (*Bucephala albeola*)
Bullock's Oriole (*Icterus bullockii*)
Canada Goose (*Branta Canadensis*)*
Canvasback (*Aythya valisineria*)
Cedar Waxwing (*Bombycilla cedrorum*)*
Chipping Sparrow (*Spizella passerina*)**
Clay-colored Sparrow (*Spizella pallida*)*
Cliff Swallow (*Petrochelidon pyrrhonota*)
Common Grackle (*Quiscalus quiscula*)
Common Nighthawk (*Chordeiles minor)*
Common Snipe (*Gallinago gallinago*)*
Common Tern (*Sterna hirundo*)**
Common Yellowthroat (*Geothlypis trichas)**
Eastern Kingbird (*Tyrannus tyrannus*)*
European Starling (*Sturnus vulgaris*)
Gadwall (*Anas strepera*)*
Gray Catbird (*Dumetella carolinensis*)
Great Blue Heron (*Ardea herodias*)
Green-winged Teal (*Anas crecca*)
House Wren (*Troglodytes aedon*)
Killdeer (*Charadrius vociferous*)*Least Flycatcher (*Empidonax minimus*)
Mallard (*Anas platyrhynchos*)*
Marbled Godwit (*Limosa fedoa*)
Marsh Wren (*Cistothorus palustris*)
Mourning Dove (*Zenaida macroura*)*
Northern Flicker (*Colaptes auratus*)*
Northern Harrier (*Circus cyaneus*)*
Northern Rough-winged Swallow (*Stelgidopteryx serripennis*)
Northern Shoveler (*Anas clypeata*)*
Orange-crowned Warbler (*Vermivora celata*)
Red-tailed Hawk (*Buteo jamaicensis)*
Red-winged Blackbird (*Agelaius phoeniceus)**
Ring-billed Gull (Larus delawarensis)*
Ring-necked Pheasant (*Phasianus colchicus*)*
Rock Dove (*Columba livia*)
Savannah Sparrow (*Passerculus sandwichensis*)
Sharp-tailed Grouse (*Tympanuchus phasianellus*)**
Solitary Sandpiper (*Tringa solitaria*)*
Song Sparrow (*Melospiza melodia*)*
Sora (*Porzana Carolina*)*
Spotted Sandpiper (*Actitis macularia*)
Tree Swallow (*Tachycineta bicolor*)*
Upland Sandpiper (*Bartramia longicauda*)*
Warbling Vireo (*Vireo gilvus*)
Western Meadowlark (*Sturnella neglecta*)*
Western Wood-pewee (*Contopus sordidulus*)*
Willet (*Catoptrophorus semipalmatus*)*
Wilson's Phalarope (*Phalaropus tricolor*)*
Wood Duck (*Aix sponsa*)
Yellow Warbler (*Dendroica petechia*)*
Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*)*

MAMMALS
American Badger (*Taxidea taxus*)**
American Beaver (*Castor Canadensis*)
Coyote (*Canis latrans*)**
Long-tailed Weasel (*Mustela frenata*)
Raccoon (*Procyon lotor*)
Richardson's Ground Squirrel (*Spermophilus richardsonii*)
White-tailed Deer (*Odocoileus virginianus*)*

* denotes observed in 2002 in addition to previous years.
** denotes observed in 2002 for the first time.
No asterisk indicates observed in 2001 only.

nutrient enrichment appeared to be an artifact of the depauperate sample; the low number of snails seemed to be driving this. The taxonomic composition of the sample in 2002 suggested that water quality remained somewhat impaired.

ES2: This area was not sampled in 2002.

3.7 Functional Assessment

Completed functional assessment forms are presented in **Appendix B**. Functional assessment results are summarized in **Table 3**. 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 3**, as are 2001 functional assessment results prepared by Land & Water.

Ratings and scores were identical in 2001 and 2002 at RS2 and ES1; an assessment was not conducted at ES2 in 2002, but this site would likely score the same as it did in 2001 as well. Functional units increased slightly at RS2 in 2002 as wetland size slightly increased.

RS1 rated as a Category II site during both 2001 and 2002, but scored higher over a variety of functions in 2002 due to dramatically increased inundation (**Table 3**). Functional units nearly doubled at this site from 2001 to 2002 due to the increased area and vegetative diversity (see the 2002 aerial photograph of the site in **Appendix C)**.

Based on the baseline functional assessments conducted by MDT and the landowner, the site has experienced an apparent gain of about 63 functional units (acreage x functional points) at restoration sites RS1 and RS2, and 11.5 functional units at ES1. As stated in the 2001 report, some of this lift at ES1 may be due to differing approaches to completing the assessment form. No pre-project functional assessment was conducted at RS2 due to the absence of pre-project wetlands.

No pre-project functional assessment was conducted at ES2, however, ES2 was not assessed during 2002 per MDT instruction. Thus, functional unit "gain" at ES2 could not be calculated.

As in 2001, the composite score at ES1 is currently just under the composite score for the reference wetland. 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. Functional gain at the enhancement site will likely need to be compared to the reference wetland in terms of percentage of possible score achieved, functional units, individual functions, or some combination. This should be worked out with the COE and the landowner so that gains can be accurately tracked over the monitoring period.

3.8 Photographs

Representative photographs taken from photo-points and transect ends are provided in **Appendix C**. A 2002 aerial photograph of the site is also included in **Appendix C**.

3.9 Maintenance Needs/Recommendations

All dikes were in good condition during the spring and mid-season visits.

The vast majority of RS2 east of the ditch/dike was not inundated. There was an apparent problem with the outlet control structure, which appeared to be leaking or opened, as virtually no water was backing up at the dike. This was immediately brought to MDT's attention, and apparently was repaired later in the summer, subsequent to the 2002 monitoring effort. The standpipe at the RS2 dike had been raised per 2001 recommendations.

It is recommended that RS2 not be hayed in order to allow vegetation to establish and provide wildlife habitat. It is also recommended that MDT or the landowner complete a baseline functional assessment for ES2 to provide an accurate basis for future comparison.

3.10 Current Credit Summary

Inclusive of open water/transitional areas at RS1, approximately 15.9 wetland/aquatic habitat acres have been "restored" on the mitigation site to date, an increase of 6.1 acres over 2001 totals. Wetland fringes were noted developing below the RS1 dike in addition to pre-existing wetlands associated with the ditch, as well as along the south border of the impoundment in forested areas. "Open water/transitional" areas at RS1 consist of recently flooded wetland and previously-mapped upland areas that were under from one to an estimated four feet of water during the mid-season visit. Rooted vegetation in these areas was not observable due to water depth/turbidity. Enhancement sites remained virtually unchanged from 2001.

A degree of functional enhancement has been achieved across about 4.8 acres within the easement area at ES1, currently calculated at an approximate 11.5 functional unit "gain". A degree of functional enhancement may have been achieved across about 3.11 acres within the easement area at ES2, however, a baseline functional assessment was not conducted with which to compare 2001 results, and an assessment was not conducted at ES2 in 2002. 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 enhancement sites appears to be approximately 3 acres short of the original 11-acre estimate, reducing the amount of credit available at these sites.

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 2002 is approximately 18.25 acres, not including any enhancement that may have occurred at ES2.

Table 3: ***Summary of 2002 Wetland Function/Value Ratings and Functional Points [1] at the Musgrave Lake Mitigation Project***

Function and Value Parameters From the 1999 MDT Montana Wetland Assessment Method	Wetland Numbers							
	Reference Wetland (Stutzman 1999)	Pre-Project RS1 (Stutzman 1999)[2]	Pre-Project ES1 (MDT 1999)	2001 RS1	2002 RS1	2001 / 2002 RS2	2001 / 2002 ES1	2001 ES2 (not assessed in 2002)
Listed/Proposed T&E Species Habitat	Low (0.3)	Low (0.3)	Low (0.3)	Low (0.3)	Low (0.3)	Low (0.0)	Low (0.3)	Low (0.3)
MNHP Species Habitat	Mod (0.7)	Low (0.1)	Mod (0.7)	Mod (0.7)	Mod (0.7)	Mod (0.7)	Mod (0.7)	Mod (0.7)
General Wildlife Habitat	High (0.9)	Low (0.1)	Mod (0.7)	high (0.9)	excep. (1.0)	Mod (0.5)	High (0.9)	High (0.9)
General Fish/Aquatic Habitat	NA	NA	Low (0.3)	NA	NA	Low (0.3)	Low (0.3)	Mod (0.5)
Flood Attenuation	Mod (0.5)	Low (0.1)	Mod (0.5)	NA	NA	Low (0.2)	Mod (0.4)	Mod (0.5)
Short and Long Term Surface Water Storage	High (1)	Low (0.2)	Low (0.3)	Mod (0.6)	High (0.9)	Low (0.3)	Low (0.6)	High (1)
Sediment, Nutrient, Toxicant Removal	Mod (0.7)	Mod (0.4)	Low (0.2)	NA	NA	High (1)	High (0.9)	High (1)
Sediment/Shoreline Stabilization	NA	NA	Low (0.2)	NA	Low (0.2)	NA	Mod (0.6)	High (1)
Production Export/ Food Chain Support	High (0.9)	Mod (0.5) [Low 0.2]	Mod (0.7)	High (0.8)	High (0.9)	Mod (0.7)	High (0.8)	High (0.9)
Groundwater Discharge/Recharge	High (1)	NA	NA	High (1)	High (1)	High (1)	High (1)	High (1)
Uniqueness	Low (0.3)	Low (0.2)	Low (0.1)	Mod (0.4)	Mod (0.6)	Low (0.3)	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)	Low (0.1)	Low (0.3)
Actual Points/Possible Points	6.6 / 10	2.0 / 9	4.1 / 11	4.8 / 8	5.7 / 9	5.1 / 11	6.5 / 12	8.6 / 12
% of Possible Score Achieved	66%	22%	37%	60%	63%	46%	54%	72%
Overall Category	II	III	III	II*	II*	III	II*	II
Total Acreage of Assessed Wetlands within Easement	6.5 ac (estimated)	4.59 ac	4.8 ac (ES1)	7.22 ac	13.32 ac	2.58 ac	4.8 ac	3.11 ac
Functional Units (acreage x actual points)	42.9 fu	9.18 fu	19.68 fu (ES1)	34.66 fu	75.92 fu	13.16 fu	31.2 fu	26.75 fu
Net Acreage Gain	NA	NA	NA	2.63 ac	8.73 ac	2.58 ac	0	0
Net Functional Unit Gain	NA	NA	NA	25.48 fu	49.76 fu	13.16 fu	11.52 fu	Unknown
Total Functional Unit "Gain" over baseline	74.44 Total Functional Units; 62.92 at restoration wetlands; 11.52 at enhancement wetlands (ES1 only; ES2 could not be calculated)							

[1] See completed MDT functional assessment forms in Appendix B for further detail.
[2] Production Export rating was corrected based on size of vegetated component in the AA and shown in bold; this resulted in site rating as Category III.
* Did not achieve Category II rating based on functional points, but did achieve Category II rating based on score for wildlife habitat.

4.0 REFERENCES

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Appendix A

FIGURES 2 - 3

MDT Wetland Mitigation Monitoring
Musgrave Lake
Zurich, Montana

LAND & WATER

Figure 2 – Monitoring Activity Locations 2002

MDT Musgrave Lake Wetland Mitigation

Monitoring Activity Locations 2002

SHEET NUMBER 2

REV -

DATE 12-2-02

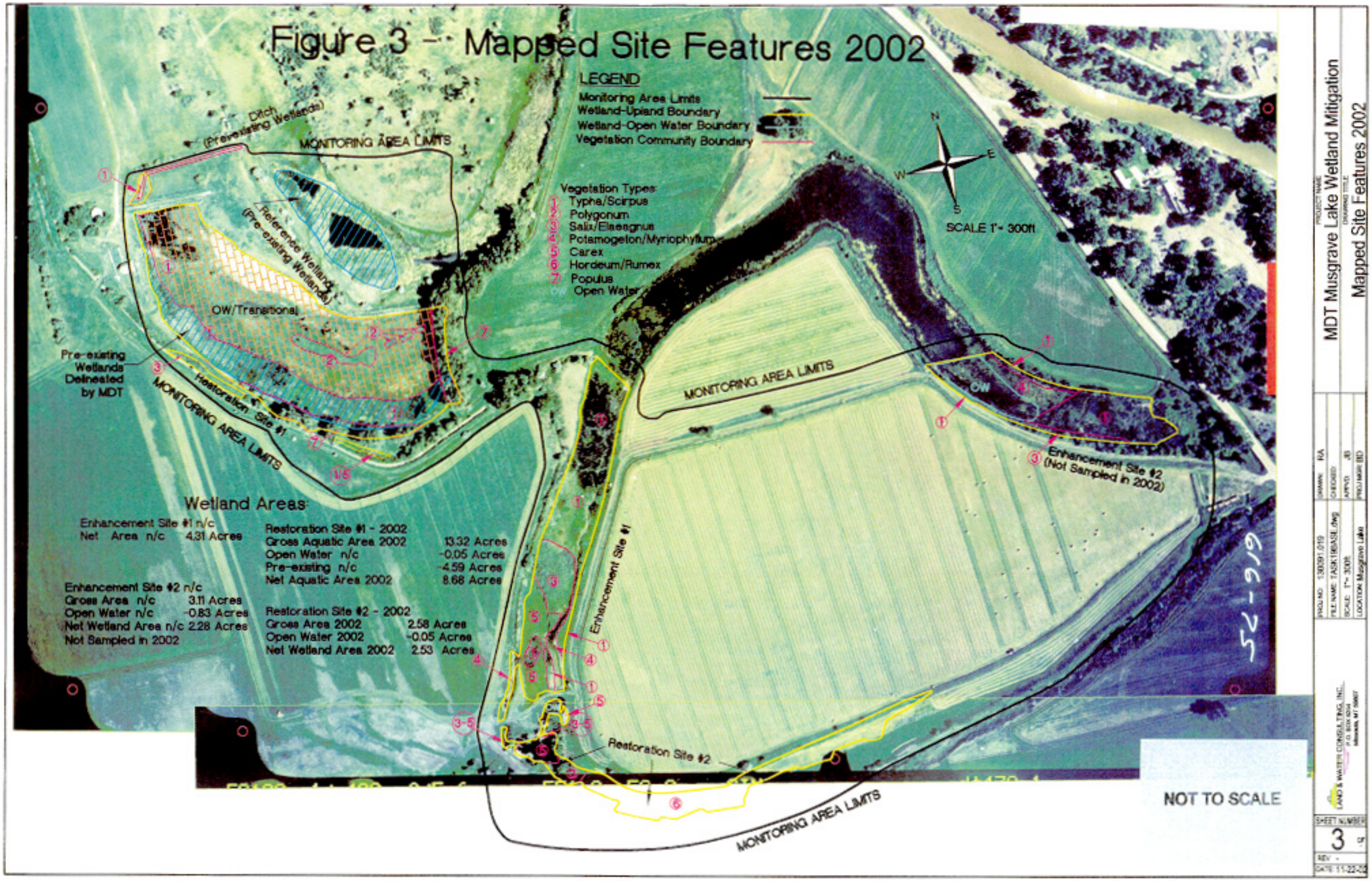


Figure 3 - Mapped Site Features 2002
LEGEND
Monitoring Area Limits
Wetland-Upland Boundary
Wetland-Open Water Boundary
Vegetation Community Boundary
Vegetation Types:
1 Typha/Scirpus
2 Polygonum
3 Salix/Elaeagnus
4 Potamogeton/Myriophyllum
5 Carex
6 Hordeum/Rumex
7 Populus
OW Open Water
SCALE 1"= 300ft
Ditch (Pre-existing Wetlands)
MONITORING AREA LIMITS
Reference Wetland (Pre-existing Wetlands)
OW/Transitional
Pre-existing Wetlands Delineated by MDT
Restoration Site #1
Enhancement Site #1
Enhancement Site #2 (Not Sampled in 2002)
Restoration Site #2
Wetland Areas:
Enhancement Site #1 n/c
Net Area n/c 4.31 Acres
Restoration Site #1 - 2002
Gross Aquatic Area 2002 13.32 Acres
Open Water n/c -0.05 Acres
Pre-existing n/c -4.59 Acres
Net Aquatic Area 2002 8.68 Acres
Enhancement Site #2 n/c
Gross Area n/c 3.11 Acres
Open Water n/c -0.83 Acres
Net Wetland Area n/c 2.28 Acres
Not Sampled in 2002
Restoration Site #2 - 2002
Gross Area 2002 2.58 Acres
Open Water 2002 -0.05 Acres
Net Wetland Area 2002 2.53 Acres
NOT TO SCALE
MDT Musgrave Lake Wetland Mitigation
Mapped Site Features 2002
PROJ NO: 130091.019
FILE NAME: TASK19BASE.dwg
SCALE: 1"= 300ft
LOCATION: Musgrave Lake
DRAWN: RA
APPVD: JB
LAND & WATER CONSULTING, INC.
SHEET NUMBER 3
DATE 11-22-02

Appendix B

COMPLETED 2002 WETLAND MITIGATION SITE MONITORING FORM
COMPLETED 2002 BIRD SURVEY FORMS
COMPLETED 2002 WETLAND DELINEATION FORMS
2002 MACROINVERTEBRATE SAMPLING RESULTS
COMPLETED 2002 FUNCTIONAL ASSESSMENT FORMS

MDT Wetland Mitigation Monitoring
Musgrave Lake
Zurich, Montana

LAND & WATER

LWC / MDT WETLAND MITIGATION SITE MONITORING FORM

Project Name:__Musgrave Lake____ Project Number:_NH-STPX 3(33)_ Assessment Date:__7_/_30_/_02_
Location:S. of Zurich_____ MDT District:____Great Falls Milepost:_417_____
Legal description: T_32N R21E_ Section_11/12 Time of Day:0700-1200
Weather Conditions:__dry, sunny_____ Person(s) conducting the assessment: Berglund
Initial Evaluation Date:__5_/_15_/_01_ Visit #:__4___ Monitoring Year:_2_____
Size of evaluation area:_100___acres Land use surrounding wetland:____Hayland and pasture_

HYDROLOGY

Surface Water Source:_Irrigation water, ground water, surf. runoff / ppt._____
Inundation: Present__X_ Absent____ Average depths:_0-2ft Range of depths:_0_-__6_ft
Assessment area under inundation:__45%
Depth at emergent vegetation-open water boundary:_3__ft
If assessment area is not inundated are the soils saturated w/in 12" of surface: Yes_X__No_____
Other evidence of hydrology on site (drift lines, erosion, stained vegetation etc.): ___RS1 = inundated, RS2 = drift lines, sediment deposits, ES1 = sediment deposits, ES1 – sediment deposits

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

Well #	Depth	Well #	Depth	Well #	Depth

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

COMMENTS/PROBLEMS: RS1: 100% inundated, ave. depth = 2 feet, range = 2" to 4'_____ RS2:1% inundated (ditch only), ave. depth = 2 ft, range = 1' to 5' ES1: 10% inundated, ave. depth = 24", range = 0-30" (ditch only) ES2: 60 % inundated (lake only), ave. depth = 1 ', range = 0-6 ft._____

At RS2, there appears to be something jamming the outlet structure as plenty of water is entering the site, but none is backing up. Larry Urban was notified immediately via cell phone.

VEGETATION COMMUNITIES

Community No.:_1__ Community Title (main species):_TYP LAT / SCI ACU_____

Dominant Species	% Cover	Dominant Species	% Cover
TYP LAT	>50		
SCI ACU	21-50		
CAR LAN	21-50		
ELE PAL	6-10		
CAR VES	21-50		

COMMENTS/PROBLEMS: __similar to 2001_____

Community No.:__2_ Community Title (main species):_ALO PRA / POL AMP_____

Dominant Species	% Cover	Dominant Species	% Cover
ALO PRA	21-50		
POL AMP	21-50		
AGR REP	21-50		
ELE PAL	6-10		
AGR ALB	1-5		

COMMENTS/PROBLEMS: ___"POL LAP" REFERENCED IN 2001 IS POL AMP._At RS1, this community occurs as POL AMP monotype where other species have been flooded out (or apparently flooded out – they were not visible due to water depth). _____

Community No.:__3_ Community Title (main species):_SALIX / ELA ANG_____

Dominant Species	% Cover	Dominant Species	% Cover
SAL EXI	>50	BRO INE	6-10
SAL LUT	21-50		
ELA ANG	>50		
CAR LAN	21-50		
AGR ALB	11-20		

COMMENTS/PROBLEMS: ___SAL LUT AND ELA ANG not "new" in 2001, but added to general community type description._____

Additional Activities Checklist:

_X__Record and map vegetative communities on air photo

VEGETATION COMMUNITIES (continued)

LAND & WATER B-3

Community No.:_4__ Community Title (main species):_POT / MYR_____

Dominant Species	% Cover	Dominant Species	% Cover
POT NAT	1-5		
MYR SPI	>50		
ELE ACI	6-10		
SAG CUN	6-10		
POTAMOGETON sp.	>50		

COMMENTS/PROBLEMS: __Similar to 2001._____

Community No.:_5__ Community Title (main species):_CAREX_____

Dominant Species	% Cover	Dominant Species	% Cover
CAL VUL	21-50	**ALO PRA**	6-10
CAR UTR	21-50	**AGR ALB**	11-20
CAR VES	21-50		
TYP LAT	6-10		
CAR LAN	21-50		

COMMENTS/PROBLEMS: ____Similar to 2001_____

Community No.:__6_ Community Title (main species):_HOR JUB / RUM CRI_____

Dominant Species	% Cover	Dominant Species	% Cover
HOR JUB (>50)	21-50	CAR VES	6-10
RUM CRI (>50)	21-50	**FES ARU**	1-5
AGR REP	21-50		
POT ANS	1-5		
POL ERE (6-10)	absent		

COMMENTS/PROBLEMS: __Appears "drier" than 2001, and much of this community was hayed in 2002.

VEGETATION COMMUNITIES (continued)

Community No.:_7__ Community Title (main species):_POP DEL_____

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

COMMENTS/PROBLEMS: _New wetland community type in 2002 due to increased site inundation. Was upland in 2001. Wetland understory species appeared to germinate in 2002.

Community No.:____ Community Title (main species):_____

Dominant Species	% Cover	Dominant Species	% Cover

COMMENTS/PROBLEMS: _____

Community No.:____ Community Title (main species):_____

Dominant Species	% Cover	Dominant Species	% Cover

COMMENTS/PROBLEMS: _____

COMPREHENSIVE VEGETATION LIST

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

COMMENTS/PROBLEMS: ____Iva and Poa bulbosa "new" in 2002, PLA MAJ and POL ERE not observed in 2002. Much of RS2 hayed.

PLANTED WOODY VEGETATION SURVIVAL

Species	Number Originally Planted	Number Observed	Mortality Causes
NO WOODY SPECIES PLANTED			

COMMENTS/PROBLEMS: _____

WILDLIFE

BIRDS

(Attach Bird Survey Field Forms)

Were man made nesting structures installed? Yes____ No_X_Type:_____ How many?_____ Are the nesting structures being utilized? Yes____ No____ Do the nesting structures need repairs? Yes____ No____

MAMMALS AND HERPTILES

Species	Number Observed	Indirect indication of use			
		Tracks	Scat	Burrows	Other
White-tailed deer	4	yes	yes		
Badger	0			yes	
Coyotes	sev. heard				vocal
Northern leopard frog (RS1, RS2)	3-5				
Garter snake	1				

Additional Activities Checklist:
_X___Macroinvertebrate sampling (if required)

COMMENTS/PROBLEMS: ___Adult deer and fawns observed at RS1 and ES1; badger holes in uplands

PHOTOGRAPHS

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

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

Location	Photo Frame #	Photograph Description	Compass Reading
A		SEE FIGURES AND PHOTO SHEETS	
B			
C			
D			
E			
F			
G			
H			

COMMENTS/PROBLEMS: _____

GPS SURVEYING

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

Checklist:

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

COMMENTS/PROBLEMS: ___No GPS data collected in 2002; modifications made using high-quality aerial photograph during field visits.

WETLAND DELINEATION

(Attach Corps of Engineers delineation forms)

At each site conduct the items on the checklist below:
_X___Delineate wetlands according to the 1987 Army Corps manual.
_X___ Delineate wetland-upland boundary on the air photo
_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 abbreviated field forms, if used)

COMMENTS/PROBLEMS: __RS2, ES1 SAME AS 2001. ES2 NOT SAMPLED (PER MDT INSTRUCTION). ONLY CHANGE WAS AT RS1

MAINTENANCE

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

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

COMMENTS/PROBLEMS: _Outlet control structure at RS2 was jammed open, and no water was being retained in the site despite excellent water availability. Larry Urban was contacted immediately via cell phone and informed of the problem.

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: Musgrave Lake Date: 7/30/02 Examiner: Berglund Transect # RS1

Approx. transect length: 500 feet Compass Direction from Start (Upland): _____

Vegetation type A:	ALO PRA (Wetland comm. #2)	
Length of transect in this type:	15	feet
Species:		Cover:
ALO PRA		21-50
APO AND		6-10
ELE PAL		1-5
PHL PRA		6-10
EQU ARV		1-5
Upland in 2001		
Total Vegetative Cover:		100

Vegetation type B:	UPLAND	
Length of transect in this type:	16	feet
Species:		Cover:
BRO INE		21-50
PHL PRA		6-10
AGR REP		6-10
POA BUL		6-10
TAR OFF		1-5
SYM OCC		1-5
Similar to 2001		
Total Vegetative Cover:		100

Vegetation type C:	POP DEL (Wetland comm. #7)	
Length of transect in this type:	49	feet
Species:		Cover:
POP DEL (not rooted in transect)		21-50
ALO PRA		21-50
GLY GRA		11-20
TYP LAT		<1
Mapped as ALO PRA / POL LAP in 2001 – wet		
community extended to POP DEL in 2002 due to		
increased inundation – mapped as POP DEL		
Total Vegetative Cover:		100

Vegetation type D:	TYP LAT / SCI ACU (#1)	
Length of transect in this type:	approx. 80	feet
Species:		Cover:
TYP LAT		11-20
SCI ACU		11-20
POL AMP		11-20
Estimated from photo – inaccessible due to flooding		
Total Vegetative Cover:		50

MDT WETLAND MONITORING – VEGETATION TRANSECT (continued)

Site: Musgrave Lake Date: 7/30/02 Examiner: Berglund Transect # RS1 – cont.

Approx. transect length: 500 Compass Direction from Start (Upland): _____

Vegetation type E:	OPEN WATER – transitional	
Length of transect in this type:	approx. 120	feet
Species:		Cover:
TYP LAT		<1
POL AMP		<1
length estimated from photo		
Total Vegetative Cover:		<1

Vegetation type F:	POL AMP (COMM. #2, w/ALO PRA flooded out)	
Length of transect in this type:	approx. 20	feet
Species:		Cover:
POL AMP		>50
estimated from aerial photo		
Total Vegetative Cover:		80

Vegetation type G:	OPEN WATER – transitional	
Length of transect in this type:	approx. 200	feet
Species:		Cover:
POL AMP		1-5
Length estimated from photo due to flooding.		
Flooded to end of transect at fencepost.		
Total Vegetative Cover:		1-5

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

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: Musgrave Lake Date: 7/30/02 Examiner: Berglund Transect # RS2

Approx. transect length: 170 ft Compass Direction from Start (Upland): _____

Vegetation type A:	UPLAND	
Length of transect in this type:	20	feet
Species:		Cover:
AGR REP		21-50
BRO INE (11-20)		21-50
SYM OCC		11-20
ROS NUT		1-5
CIR ARV		6-10
GLY LEP		1-5
CHE ALB (1-5)		0
Total Vegetative Cover:		100

Vegetation type B:	HOR JUB / RUM CRI (type 6)	
Length of transect in this type:	80	feet
Species:		Cover:
HOR JUB (>50)		21-50
RUM CRI (>50)		21-50
AGR REP		21-50
FES ARU		1-5
CIR ARV		1-5
PLA MAJ (6-10)		0
CHE ALB (6-10)		0
POL ERE (1-5)		0
POA PRA (1-5)		0
Much of this section is hayed in 2002 – drying out??		
Total Vegetative Cover:		100

Vegetation type C:	UPLAND	
Length of transect in this type:	70	feet
Species:		Cover:
BRO INE		11-20
AGR REP		21-50
POL LAP		11-20
SYM OCC		21-50
RUM CRI		1-5
ROS NUT		1-5
POA PRA		1-5
CAR LAN		<1
Veg. assumed same as 2001– most of this section		
hayed in 2002		
Total Vegetative Cover:		100

Vegetation type D:		
Length of transect in this type:		feet
Species:		Cover:
Total Vegetative Cover:		

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: Musgrave Lake Date: 7/30/02 Examiner: Berglund Transect # ES1

Approx. transect length: 86 ft Compass Direction from Start (Upland): 106 degrees

Vegetation type A:	UPLAND	
Length of transect in this type:	18	feet
Species:		Cover:
PRU VIR		1-5
MED SAT		11-20
BRO INE		11-20
POL LAP		11-20
Total Vegetative Cover:		100

Vegetation type B:	CAREX (type 5)	
Length of transect in this type:	68	feet
Species:		Cover:
CAR LAN (>50)		21-50
AGR ALB		>50
ALO PRA		11-20
RUM CRI		6-10
BEC SYZ		1-5
SCI ACU		1-5
RAN OFF		<1
POL LAP		<1
CAR VES (21-50)		>50
PHA ARU		1-5
AGR REP		<1
Total Vegetative Cover:		100

Vegetation type C:		
Length of transect in this type:		feet
Species:		Cover:
Total Vegetative Cover:		

Vegetation type D:		
Length of transect in this type:		feet
Species:		Cover:
Total Vegetative Cover:		

MDT WETLAND MONITORING – VEGETATION TRANSECT (back of form)

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

Indicator Class:
+ = Obligate
- = Facultative/Wet
0 = Facultative

Source:
P = Planted
V = Volunteer

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

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

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

Notes:

Bolded species are new additions in 2002. Changes in species cover percentages are indicated by *italics*, with the 2001 percentages included in parentheses.
% perimeter developing wetland vegetation: RS1 – 100; ES1 – 90; RS2 – 50; ES2 unsampled in 2002.

3/01 rev

MDT Montana Wetland Assessment Form (revised 5/25/1999)

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

3. Evaluation Date: Mo. 7 Day 30 Yr. 02 **4. Evaluator(s):** Berglund **5. Wetlands/Site #(s)** RS1

6. Wetland Location(s): i. Legal: T 32 N or S; R 21 E or W; S 11 ; T ____ N or S; R ____ E or W; S ____ ;
ii. Approx. Stationing or Mileposts: NA

iii. Watershed: 1 005004 **GPS Reference No. (if applies):** NA

Other Location Information: South of Zurich, Blaine County, S. of Milk River

7. a. Evaluating Agency: MDT ;
b. Purpose of Evaluation:
1. ____ Wetlands potentially affected by MDT project
2. ____ Mitigation wetlands; pre-construction
3. X Mitigation wetlands; post-construction
4. ____ Other

8. Wetland size: (total acres) _____ (visually estimated)
_____ (measured, e.g. by GPS [if applies])

9. Assessment area: (AA, tot., ac., see instructions on determining AA) _____ (visually estimated)
_____ (measured, e.g. by GPS [if applies])

10. Classification of Wetland and Aquatic Habitats in AA (HGM according to Brinson, first col.; USFWS according to Cowardin [1979], remaining cols.)

HGM Class	System	Subsystem	Class	Water Regime	Modifier	% of AA
Depressional	Palustrine	--	EM	C	D	40
"	"	--	SS	C	D	5
"	"	--	FO	C	D	15
"	"	--	AB	C	D	5
"	"	--	OW	C	D	35

(Abbreviations: **System**: Palustrine(P)/ **Subsyst.**: none/ **Classes**: Rock Bottom (RB), Unconsolidated bottom (UB), Aquatic Bed (AB), Unconsolidated Shore (US), Moss-lichen Wetland (ML), Emergent Wetland (EM), Scrub-Shrub Wetland (SS), Forested Wetland (FO)/ **System:** Lacustrine (L)/, **Subsyst.**: Limnetic (2)/ **Classes:** RB, UB, AB/ **Subsystem:** Littoral (4)/ **Classes:** RB, UB, AB, US, EM/ **System:** Riverine (R)/ **Subsyst.**: Lower Perennial (2)/ **Classes**: RB, UB, AB, US, EM/ **Subsystem:** Upper Perennial (3)/ **Classes**: RB, UB, AB, US/ **Water Regimes:** Permanently Flooded (H), Intermittently Exposed (G), Semipermanently Flooded (F), Seasonally Flooded (C), Saturated (B), Temporarily Flooded (A), Intermittently Flooded (J) **Modifiers:** Excavated (E), Impounded (I), Diked (D), Partly Drained (PD), Farmed (F), Artificial (A) **HGM Classes:** Riverine, Depressional, Slope, Mineral Soil Flats, Organic Soil Flats, Lacustrine Fringe

11. Estimated relative abundance: (of similarly classified sites within the same Major Montana Watershed Basin, see definitions)
(Circle one) Unknown Rare Common Abundant
Comments:

12. General condition of AA:
i. Regarding disturbance: (use matrix below to determine [circle] appropriate response)

Conditions within AA	*Predominant conditions adjacent to (within 500 feet of) 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 natural state; is not grazed, hayed, logged, or otherwise converted; does not contain roads or occupied buildings.	low disturbance	low disturbance	moderate disturbance
AA not cultivated, but moderately grazed or hayed or selectively logged; or has been subject to relatively minor clearing, fill placement, or hydrological alteration; contains few roads or buildings.	moderate disturbance	moderate disturbance	high disturbance
AA cultivated or heavily grazed or logged; subject to relatively substantial fill placement, grading, clearing, or hydrological alteration; high road or building density.	high disturbance	high disturbance	high disturbance

Comments: (types of disturbance, intensity, season, etc.): grazing & hayland in adjacent areas
ii. Prominent weedy, alien, & introduced species (including those not domesticated, feral): (list)
Canada thistle, timothy, reed canarygrass
iii. Provide brief descriptive summary of AA and surrounding land use/habitat: Restoration Site #1 in NW corner of site; large marsh / open water area with partial forested fringe. Surrounding land use is agricultural.

13. Structural Diversity: (based on number of "Cowardin" *vegetated* classes present [do not include unvegetated classes], see #10 above)

# of "Cowardin" vegetated classes present in AA (see #10)	≥ 3 vegetated classes (or ≥ 2 if one is forested)	2 vegetated classes (or 1 if forested)	≤ 1 vegetated class
Rating (circle)	High	Moderate	Low

Comments:

RS 1

SECTION PERTAINING to FUNCTIONS & VALUES ASSESSMENT

14A. Habitat for Federally Listed or Proposed Threatened or Endangered Plants or Animals:

I. AA is Documented (D) or Suspected (S) to contain (circle one based on definitions contained in instructions):

Primary or critical habitat (list species)	D S	
Secondary habitat (list species)	D S	
Incidental habitat (list species)	D (S)	Bald eagle
No usable habitat	D S	

II. Rating (use the conclusions from I above and the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function)

Highest Habitat Level	doc./primary	sus/primary	doc./secondary	sus./secondary	doc./incidental	sus./incidental	None
Functional Points and Rating	1 (H)	.9 (H)	.8 (M)	.7 (M)	.5 (L)	(.3 (L))	0 (L)

Sources for documented use (e.g. observations, records, etc):

14B. Habitat for plant or animals rated S1, S2, or S3 by the Montana Natural Heritage Program: (not including species listed in14A above)

i. AA is Documented (D) or Suspected (S) to contain (circle one based on definitions contained in instructions):

Primary or critical habitat (list species)	D S	
Secondary habitat (list species)	(D) S	Northern leopard frog
Incidental habitat (list species)	D S	
No usable habitat	D S	

II. Rating (use the conclusions from i above and the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function)

Highest Habitat Level	doc./primary	sus/primary	doc./secondary	sus./secondary	doc./incidental	sus./incidental	None
Functional Points and Rating	1 (H)	.8 (H)	(.7 (M))	.6 (M)	.2 (L)	.1 (L)	0 (L)

Sources for documented use (e.g. observations, records, etc.): Status for n. leopard frog not S3 east of divide - only a few observed.

14C. General Wildlife Habitat Rating:

i. Evidence of overall wildlife use in the AA (circle substantial, moderate, or low based on supporting evidence):

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

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

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

ii. Wildlife habitat features (working from top to bottom, circle appropriate AA attributes in matrix to arrive at 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 of the AA (see #10). Abbreviations for surface water durations are as follows: P/P = permanent/perennial; S/I = seasonal/intermittent; T/E = temporary/ephemeral; and A = absent [see instructions for further definitions of these terms].)

Structural diversity (see #13)	High								Moderate								Low			
Class cover distribution (all vegetated classes)	Even				Uneven				Even				Uneven				Even			
Duration of surface water in ≥ 10% of AA	P/P	S/I	T/E	/	P/P	(S/I)	T/E	/	P/P	S/I	T/E	A	P/P	S/I	T/E	A	P/P	S/I	T/E	/
Low disturbance at AA (see #12i)	E	E	E	H	E	(E)	H	H	E	H	H	M	E	H	M	M	E	H	M	M
Moderate disturbance at AA (see #12i)	H	H	H	H	H	H	H	H	H	H	M	M	H	M	M	L	H	M	L	L
High disturbance at AA (see #12i)	M	M	M	L	M	M	L	L	M	M	L	L	M	L	L	L	L	L	L	L

iii. Rating (use the conclusions from i and ii above and the matrix below to arrive at [circle] the functional points and rating [E = exceptional, H = high, M = moderate, or L = low] for this function)

Evidence of wildlife use (i)	*Wildlife habitat features rating (ii)*			
	Exceptional	High	Moderate	Low
Substantial	(1 (E))	.9 (H)	.8 (H)	.7 (M)
Moderate	.9 (H)	.7 (M)	.5 (M)	.3 (L)
Minimal	.6 (M)	.4 (M)	.2 (L)	.1 (L)

Comments:

RS1

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

i. Habitat Quality (circle appropriate AA attributes in matrix to arrive at exceptional (E), high (H), moderate (M), or low (L) quality rating.

Duration of surface water in AA	Permanent / Perennial			Seasonal / Intermittent			Temporary / Ephemeral		
Cover - % of waterbody in AA containing cover objects such as submerged logs, large rocks & boulders, overhanging banks, floating-leaved vegetation, etc.	>25%	10–25%	<10%	>25%	10–25%	<10%	>25%	10–25%	<10%
Shading - **>75%** of streambank or shoreline within AA contains riparian or wetland scrub-shrub or forested communities	E	E	H	H	H	M	M	M	M
Shading – **50 to 75%** of streambank or shoreline within AA contains rip. or wetland scrub-shrub or forested communities	H	H	M	M	M	M	M	L	L
Shading - **< 50%** of streambank or shoreline within AA contains rip. or wetland scrub-shrub or forested communities	H	M	M	M	L	L	L	L	L

ii. Modified Habitat Quality (Circle the appropriate response to the following question. If answer is Y, then reduce rating in i above by one level [E = H, H = M, M = L, L = L]). *Is fish use of the AA precluded or significantly reduced by a culvert, dike, or other man-made structure or activity or is the waterbody included on the MDEQ list of waterbodies in need of TMDL development with listed "Probable Impaired Uses" including cold or warm water fishery or aquatic life support?* Y N Modified habitat quality rating = (circle) E H M L

iii. Rating (use the conclusions from I and ii above and the matrix below to arrive at [circle] the functional points and rating [E = exceptional, H = high, M = moderate, or L = low] for this function)

Types of fish known or suspected within AA	*Modified Habitat Quality (ii)*			
	Exceptional	High	Moderate	Low
Native game fish	1 (E)	.9 (H)	.7 (M)	.5 (M)
Introduced game fish	.9 (H)	.8 (H)	.6 (M)	.4 (M)
Non-game fish	.7 (M)	.6 (M)	.5 (M)	.3 (L)
No fish	.5 (M)	.3 (L)	.2 (L)	.1 (L)

Comments: NA

14E. Flood Attenuation: (applies only to wetlands subject to flooding via in-channel or overbank flow. If wetlands in AA are not flooded from in-channel or overbank flow, circle **NA** here and proceed to next function.)

i. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function)

Estimated wetland area in AA subject to periodic flooding	> 10 acres			<10, >2 acres			≤2 acres		
% of flooded wetland classified as forested, scrub/shrub, or both	75%	25-75%	<25%	75%	25-75%	<25%	75%	25-75%	<25%
AA contains **no outlet or restricted outlet**	1(H)	.9(H)	.6(M)	.8(H)	.7(H)	.5(M)	.4(M)	.3(L)	.2(L)
AA contains **unrestricted outlet**	.9(H)	.8(H)	.5(M)	.7(H)	.6(M)	.4(M)	.3(L)	.2(L)	.1(L)

ii. Are residences, businesses, or other features which may be significantly damaged by floods located within 0.5 miles downstream of the AA (circle)? Y N
Comments: NA

14F. Short and Long Term Surface Water Storage: (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, circle **NA** here and proceed with the evaluation.)

i. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function. Abbreviations for surface water durations are as follows: P/P = permanent/perennial; S/I = seasonal/intermittent; and T/E = temporary/ephemeral [see instructions for further definitions of these terms].)

Estimated maximum acre feet of water contained in wetlands within the AA that are subject to periodic flooding or ponding	>5 acre feet			<5, >1 acre feet			≤1 acre foot		
Duration of surface water at wetlands within the AA	P/P	S/I	T/E	P/P	S/I	T/E	P/P	S/I	T/E
Wetlands in AA flood or pond **≥ 5 out of 10 years**	1(H)	.9(H)	.8(H)	.8(H)	.6(M)	.5(M)	.4(M)	.3(L)	.2(L)
Wetlands in AA flood or pond **< 5 out of 10 years**	.9(H)	.8(H)	.7(M)	.7(M)	.5(M)	.4(M)	.3(L)	.2(L)	.1(L)

Comments: Water storage increased over 2001.

14G. Sediment/Nutrient/Toxicant Retention and Removal: (Applies to wetlands with potential to receive excess sediments, nutrients, or toxicants through influx of surface or ground water or direct input. If no wetlands in the AA are subject to such input, circle **NA** here and proceed with the evaluation.)

i. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function.

Sediment, nutrient, and toxicant input levels within AA	AA receives or surrounding land use with 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 with potential to deliver high levels of sediments, nutrients, or compounds such that other functions are substantially impaired. Major sedimentation, sources of nutrients or toxicants, or signs of eutrophication present.			
% cover of wetland vegetation in AA	≥ 70%		< 70%		≥ 70%		< 70%	
Evidence of flooding or ponding in AA	Yes	No	Yes	No	Yes	No	Yes	No
AA contains **no or restricted outlet**	1 (H)	.8 (H)	.7 (M)	.5 (M)	.5 (M)	.4 (M)	.3 (L)	.2 (L)
AA contains **unrestricted outlet**	.9 (H)	.7 (M)	.6 (M)	.4 (M)	.4 (M)	.3 (L)	.2 (L)	.1 (L)

Comments: NA

RS1

14H Sediment/Shoreline Stabilization: (applies only if AA occurs on or within the banks or a river, stream, or other natural or man-made drainage, or on the shoreline of a standing water body which is subject to wave action. If does not apply, circle NA here and proceed to next function)

i. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating [E = exceptional, H = high, M = moderate, or L = low] for this function.

% Cover of wetland streambank or shoreline by species with deep, binding rootmasses	*Duration of surface water adjacent to rooted vegetation*		
	permanent / perennial	seasonal / intermittent	Temporary / ephemeral
> 65%	1 (H)	.9 (H)	.7 (M)
35-64%	.7 (M)	.6 (M)	.5 (M)
< 35%	.3 (L)	.2 (L)	.1 (L)

Comments: Veg. is developing along dike

14I. Production Export/Food Chain Support:

i. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function. Factor A = acreage of vegetated component in the AA; Factor B = structural diversity rating from #13; Factor C = whether or not the AA contains a surface or subsurface outlet; the final three rows pertain to duration of surface water in the AA, where P/P = permanent/perennial; S/I = seasonal/intermittent; T/E /A= temporary/ephemeral-or-absent [see instructions for further definitions of these terms].)

A	Vegetated component >5 acres						Vegetated component 1-5 acres						Vegetated component <1 acre					
B	High		Moderate		Low		High		Moderate		Low		High		Moderate		Low	
C	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
P/P	1H	.9H	.9H	.8H	.8H	.7M	.9H	.8H	.8H	.7M	.7M	.6M	.7M	.6M	.6M	.4M	.4M	.3L
S/I	.9H	.8H	.8H	.7M	.7M	.6M	.8H	.7M	.7M	.6M	.6M	.5M	.6M	.5M	.5M	.3L	.3L	.2L
T/E/A	.8H	.7M	.7M	.6M	.6M	.5M	.7M	.6M	.6M	.5M	.5M	.4M	.5M	.4M	.4M	.2L	.2L	.1L

Comments:

14J. Groundwater Discharge/Recharge: (Check the indicators in i & ii below that apply to the AA)

i. Discharge Indicators

___Springs are known or observed
XX Vegetation growing during dormant season/drought
___Wetland occurs at the toe of a natural slope
XX 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 present without underlying impeding layer
___Wetland contains inlet but no outlet
___Other

iii. Rating: Use the information from i and ii above and the table below to arrive at [circle] the functional points and rating [H = high, L = low] for this function.

Criteria	*Functional Points and Rating*
AA is known Discharge/Recharge area or one or more indicators of D/R present	1 (H)
No Discharge/Recharge indicators present	.1 (L)
Available Discharge/Recharge information inadequate to rate AA D/R potential	N/A (Unknown)

Comments:

14K. Uniqueness:

i. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] 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 MNHP			AA does not contain previously cited rare types and structural diversity (#13) is high or contains plant association listed as "S2" by the MNHP			AA does not contain previously cited rare types or associations and structural diversity (#13) is low-moderate		
Estimated relative abundance (#11)	rare	common	abundant	rare	common	abundant	rare	common	abundant
Low disturbance at AA (#12i)	1 (H)	.9 (H)	.8 (H)	.8 (H)	.6 (M)	.5 (M)	.5 (M)	.4 (M)	.3 (L)
Moderate disturbance at AA (#12i)	.9 (H)	.8 (H)	.7 (M)	.7 (M)	.5 (M)	.4 (M)	.4 (M)	.3 (L)	.2 (L)
High disturbance at AA (#12i)	.8 (H)	.7 (M)	.6 (M)	.6 (M)	.4 (M)	.3 (L)	.3 (L)	.2 (L)	.1 (L)

Comments:

14L. Recreation/Education Potential: i. Is the AA a known rec./ed. site: (circle) Y (N) (If yes, rate as [circle] High [1] and go to ii; if no go to 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 strong potential for rec./ed. use? Y (N)

(If yes, go to ii, then proceed to iv; if no, then rate as [circle] Low [0.1])

iv. Rating (use the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function.

Ownership	*Disturbance at AA (#12i)*		
	low	moderate	high
public ownership	1 (H)	.5 (M)	.2 (L)
private ownership	.7 (M)	.3 (L)	.1 (L)

Comments: Private land w/no access.

 RS1

FUNCTION & VALUE SUMMARY & OVERALL RATING

Function & Value Variables	Rating	Actual Functional Points	Possible Functional Points	Functional Units; (Actual Points x Estimated AA Acreage)
A. Listed/Proposed T&E Species Habitat	LOW	0.3	1	
B. MT Natural Heritage Program Species Habitat	MOD	0.7	1	
C. General Wildlife Habitat	Excep.	1.0	1	
D. General Fish/Aquatic Habitat	NA	–	–	
E. Flood Attenuation	NA	–	–	
F. Short and Long Term Surface Water Storage	HIGH	0.9	1	
G. Sediment/Nutrient/Toxicant Removal	NA	–	–	
H. Sediment/Shoreline Stabilization	LOW	0.2	1	
I. Production Export/Food Chain Support	HIGH	0.9	1	
J. Groundwater Discharge/Recharge	HIGH	1.0	1	
K. Uniqueness	MOD	0.6	1	
L. Recreation/Education Potential	LOW	0.1	1	
Totals:		5.7	9	

63%

OVERALL ANALYSIS AREA (AA) RATING: (Circle appropriate category based on the criteria outlined below) I (II) III IV

Category I Wetland: (Must satisfy **one** of the following criteria; if does not meet criteria, go to Category II)
- ___ Score of 1 functional point for Listed/Proposed Threatened or Endangered Species; **or**
- ___ Score of 1 functional point for Uniqueness; **or**
- ___ Score of 1 functional point for Flood Attenuation **and** answer to Question 14E.ii is "yes"; **or**
- ___ Total actual functional points > 80% (round to nearest whole #) of total possible functional points.

√

Category II Wetland: (Criteria for Category I not satisfied **and** meets any **one** of the following criteria; if not satisfied, go to Category IV)
- ___ Score of 1 functional point for Species Rated S1, S2, or S3 by the MT Natural Heritage Program; **or**
- XX 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**
- ___ Total Actual Functional Points > 65% (round to nearest whole #) of total possible functional points.

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 does not satisfy criteria go to Category III)
- ___ "Low" rating for Uniqueness; **and**
- ___ "Low" rating for Production Export/Food Chain Support; **and**
- ___ Total actual functional points < 30% (round to nearest whole #) of total possible functional points

MDT Montana Wetland Assessment Form (revised 5/25/1999)

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

3. Evaluation Date: Mo. 7 Day 16 Yr 01 4. Evaluator(s): JB/RH
7 30 02 JB

5. Wetlands/Site #(s) Restoration #2 "South" Oxbow

6. Wetland Location(s): i. Legal: T 32 (N) or S; R 21 (E) or W; S 11, 12 ; T ___ N or S; R ___ E or W; S ___ ;
ii. Approx. Stationing or Mileposts: NA

iii. Watershed: 10050004 GPS Reference No. (if applies): —
Other Location Information:
SE of Zurich, S of Milk River, Blaine County

7. a. Evaluating Agency: MDT ;
b. Purpose of Evaluation:
1. ___ Wetlands potentially affected by MDT project
2. ___ Mitigation wetlands; pre-construction
3. X Mitigation wetlands; post-construction
4. ___ Other

8. Wetland size: (total acres) ~20 (visually estimated)
___ (measured, e.g. by GPS [if applies])

9. Assessment area: (AA, tot., ac., see instructions on determining AA) 3 (visually estimated)
3 (measured, e.g. by GPS [if applies])

10. Classification of Wetland and Aquatic Habitats in AA (HGM according to Brinson, first col.; USFWS according to Cowardin [1979], remaining cols.)

HGM Class	System	Subsystem	Class	Water Regime	Modifier	% of AA
Riverine (Ironper.)	Palustrine	—	EM	SF	D	90
	"	—	SS	SF	D	5
	"	—	UB	SPF	D	5

(Abbreviations: **System:** Palustrine(P)/ **Subsyst.:** none/ **Classes:** Rock Bottom (RB), Unconsolidated bottom (UB), Aquatic Bed (AB), Unconsolidated Shore (US), Moss-lichen Wetland (ML), Emergent Wetland (EM), Scrub-Shrub Wetland (SS), Forested Wetland (FO)/ **System:** Lacustrine (L)/ **Subsyst.:** Limnetic (2)/ **Classes:** RB, UB, AB/ **Subsystem:** Littoral (4)/ **Classes:** RB, UB, AB, US, EM/ **System:** Riverine (R)/ **Subsyst.:** Lower Perennial (2)/ Classes: RB, UB, AB, US, EM/ **Subsystem:** Upper Perennial (3)/ Classes: RB, UB, AB, US/ **Water Regimes:** Permanently Flooded (H), Intermittently Exposed (G), Semipermanently Flooded (F), Seasonally Flooded (C), Saturated (B), Temporarily Flooded (A), Intermittently Flooded (J) **Modifiers:** Excavated (E), Impounded (I), Diked (D), Partly Drained (PD), Farmed (F), Artificial (A) **HGM Classes:** Riverine, Depressional, Slope, Mineral Soil Flats, Organic Soil Flats, Lacustrine Fringe

11. Estimated relative abundance: (of similarly classified sites within the same Major Montana Watershed Basin, see definitions)
(Circle one) Unknown Rare (Common) Abundant
Comments:

12. General condition of AA:
i. Regarding disturbance: (use matrix below to determine [circle] appropriate response)

Conditions within AA	Predominant conditions adjacent to (within 500 feet of) 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 natural state; is not grazed, hayed, logged, or otherwise converted; does not contain roads or occupied buildings.	low disturbance	low disturbance	(moderate disturbance)
AA not cultivated, but moderately grazed or hayed or selectively logged; or has been subject to relatively minor clearing, fill placement, or hydrological alteration; contains few roads or buildings.	moderate disturbance	moderate disturbance	high disturbance
AA cultivated or heavily grazed or logged; subject to relatively substantial fill placement, grading, clearing, or hydrological alteration; high road or building density.	high disturbance	high disturbance	high disturbance

Comments: (types of disturbance, intensity, season, etc.): Hayland
ii. Prominent weedy, alien, & introduced species (including those not domesticated, feral): (list) CIR ARV

iii. Provide brief descriptive summary of AA and surrounding land use/habitat: "South" oxbow section, the east end of which was hayed in 2001, surrounded by hayland. Site is largely developing wet meadow/marsh.

13. Structural Diversity: (based on number of "Cowardin" *vegetated* classes present [do not include unvegetated classes], see #10 above)

# of "Cowardin" vegetated classes present in AA (see #10)	≥ 3 vegetated classes (or ≥ 2 if one is forested)	2 vegetated classes (or 1 if forested)	≤ 1 vegetated class
Rating (circle)	High	(Moderate)	Low

Comments:

SECTION PERTAINING to FUNCTIONS & VALUES ASSESSMENT Rest. #2

14A. Habitat for Federally Listed or Proposed Threatened or Endangered Plants or Animals:

I. AA is Documented (D) or Suspected (S) to contain (circle one based on definitions contained in instructions):

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)	None

II. **Rating** (use the conclusions from i above and the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function)

Highest Habitat Level	doc./primary	sus/primary	doc./secondary	sus./secondary	doc./incidental	sus./incidental	None
Functional Points and Rating	1 (H)	.9 (H)	.8 (M)	.7 (M)	.5 (L)	.3 (L)	0 (L)

Sources for documented use (e.g. observations, records, etc):

14B. Habitat for plant or animals rated S1, S2, or S3 by the Montana Natural Heritage Program: (not including species listed in14A above)

I. AA is Documented (D) or Suspected (S) to contain (circle one based on definitions contained in instructions):

Primary or critical habitat (**list species**)	D S	_____
Secondary habitat (**list species**)	(D) S	Northern leopard frog
Incidental habitat (**list species**)	D (S)	black-necked stilt, yellow rail
No usable habitat	D S	_____

II. **Rating** (use the conclusions from i above and the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function)

Highest Habitat Level	doc./primary	sus/primary	doc./secondary	sus./secondary	doc./incidental	sus./incidental	None
Functional Points and Rating	1 (H)	.8 (H)	.7 (M)	.6 (M)	.2 (L)	.1 (L)	0 (L)

Sources for documented use (e.g. observations, records, etc.): Leopard frogs present, but only 2 observed.

14C. General Wildlife Habitat Rating:

I. Evidence of overall wildlife use in the AA (circle substantial, moderate, or low based on supporting evidence):

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

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

Moderate (based on any of the following [check]):
- XX observations of scattered wildlife groups or individuals or relatively few species during peak periods
- XX 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, circle appropriate AA attributes in matrix to arrive at 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 of the AA (see #10). Abbreviations for surface water durations are as follows: P/P = permanent/perennial; S/I = seasonal/intermittent; T/E = temporary/ephemeral; and A = absent [see instructions for further definitions of these terms].)

Structural diversity (see #13)	High								Moderate								Low			
Class cover distribution (all vegetated classes)	Even				Uneven				Even				Uneven				Even			
Duration of surface water in ≥ 10% of AA	P/P	S/I	T/E	A	P/P	S/I	T/E	A	P/P	S/I	T/E	A	P/P	(S/I)	T/E	A	P/P	S/I	T/E	A
Low disturbance at AA (see #12i)	E	E	E	H	E	E	H	H	E	H	H	M	E	H	M	M	E	H	M	M
Moderate disturbance at AA (see #12i)	H	H	H	H	H	H	H	M	H	H	M	M	H	(M)	M	L	H	M	L	L
High disturbance at AA (see #12i)	M	M	M	L	M	M	L	L	M	M	L	L	M	L	L	L	L	L	L	L

iii. Rating (use the conclusions from i and ii above and the matrix below to arrive at [circle] the functional points and rating [E = exceptional, H = high, M = moderate, or L = low] for this function)

Evidence of wildlife use (i)	*Wildlife habitat features rating (ii)*			
	Exceptional	High	(Moderate)	Low
Substantial	1 (E)	.9 (H)	.8 (H)	.7 (M)
(**Moderate**)	.9 (H)	.7 (M)	(.5 (M))	.3 (L)
Minimal	.6 (M)	.4 (M)	.2 (L)	.1 (L)

Comments:

 Rest. #2

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

i. Habitat Quality (circle appropriate AA attributes in matrix to arrive at exceptional (E), high (H), moderate (M), or low (L) quality rating.

Duration of surface water in AA	Permanent / Perennial			Seasonal / Intermittent			Temporary / Ephemeral		
Cover - % of waterbody in AA containing cover objects such as submerged logs, large rocks & boulders, overhanging banks, floating-leaved vegetation, etc.	>25%	10–25%	<10%	>25%	10–25%	<10%	>25%	10–25%	<10%
Shading - >75% of streambank or shoreline within AA contains riparian or wetland scrub-shrub or forested communities	E	E	H	H	H	M	M	M	M
Shading – 50 to 75% of streambank or shoreline within AA contains rip. or wetland scrub-shrub or forested communities	H	H	M	M	M	M	M	L	L
Shading - < 50% of streambank or shoreline within AA contains rip. or wetland scrub-shrub or forested communities	H	M	M	M	L	L	L	L	L

ii. Modified Habitat Quality (Circle the appropriate response to the following question. If answer is Y, then reduce rating in i above by one level [E = H, H = M, M = L, L = L]). *Is fish use of the AA precluded or significantly reduced by a culvert, dike, or other man-made structure or activity or is the waterbody included on the MDEQ list of waterbodies in need of TMDL development with listed "Probable Impaired Uses" including cold or warm water fishery or aquatic life support?* (Y) N Modified habitat quality rating = (circle) E H M (L)

– limited by water depth and extent regulated by Standpipe –

iii. Rating (use the conclusions from i and ii above and the matrix below to arrive at [circle] the functional points and rating [E = exceptional, H = high, M = moderate, or L = low] for this function)

Types of fish known or suspected within AA	*Modified Habitat Quality (ii)*			
	Exceptional	High	Moderate	Low
Native game fish	1 (E)	.9 (H)	.7 (M)	.5 (M)
Introduced game fish	.9 (H)	.8 (H)	.6 (M)	.4 (M)
Non-game fish	.7 (M)	.6 (M)	.5 (M)	.3 (L)
No fish	.5 (M)	.3 (L)	.2 (L)	.1 (L)

Comments: Minnows observed

14E. Flood Attenuation: (applies only to wetlands subject to flooding via in-channel or overbank flow. If wetlands in AA are not flooded from in-channel or overbank flow, circle **NA** here and proceed to next function.)

i. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function)

Estimated wetland area in AA subject to periodic flooding	≥ 10 acres			<10, >2 acres			≤2 acres		
% of flooded wetland classified as forested, scrub/shrub, or both	75%	25-75%	<25%	75%	25-75%	<25%	75%	25-75%	<25%
AA contains **no outlet or restricted outlet**	1(H)	.9(H)	.6(M)	.8(H)	.7(H)	.5(M)	.4(M)	.3(L)	.2(L)
AA contains **unrestricted outlet**	.9(H)	.8(H)	.5(M)	.7(H)	.6(M)	.4(M)	.3(L)	.2(L)	.1(L)

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

Comments: Homes

14F. Short and Long Term Surface Water Storage: (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, circle **NA** here and proceed with the evaluation.)

i. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function. Abbreviations for surface water durations are as follows: P/P = permanent/perennial; S/I = seasonal/intermittent; and T/E = temporary/ephemeral [see instructions for further definitions of these terms].)

Estimated maximum acre feet of water contained in wetlands within the AA that are subject to periodic flooding or ponding	>5 acre feet			<5, >1 acre feet			≤1 acre foot		
Duration of surface water at wetlands within the AA	P/P	S/I	T/E	P/P	S/I	T/E	P/P	S/I	T/E
Wetlands in AA flood or pond ≥ **5 out of 10 years**	1(H)	.9(H)	.8(H)	.8(H)	.6(M)	.5(M)	.4(M)	.3(L)	.2(L)
Wetlands in AA flood or pond < **5 out of 10 years**	.9(H)	.8(H)	.7(M)	.7(M)	.5(M)	.4(M)	.3(L)	.2(L)	.1(L)

Comments:

14G. Sediment/Nutrient/Toxicant Retention and Removal: (Applies to wetlands with potential to receive excess sediments, nutrients, or toxicants through influx of surface or ground water or direct input. If no wetlands in the AA are subject to such input, circle **NA** here and proceed with the evaluation.)

i. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function.

Sediment, nutrient, and toxicant input levels within AA	AA receives or surrounding land use with 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 with potential to deliver high levels of sediments, nutrients, or compounds such that other functions are substantially impaired. Major sedimentation, sources of nutrients or toxicants, or signs of eutrophication present.			
% cover of wetland vegetation in AA	≥ 70%		< 70%		≥ 70%		< 70%	
Evidence of flooding or ponding in AA	Yes	No	Yes	No	Yes	No	Yes	No
AA contains **no or restricted outlet**	1 (H)	.8 (H)	.7 (M)	.5 (M)	.5 (M)	.4 (M)	.3 (L)	.2 (L)
AA contains **unrestricted outlet**	.9 (H)	.7 (M)	.6 (M)	.4 (M)	.4 (M)	.3 (L)	.2 (L)	.1 (L)

Comments:

14H Sediment/Shoreline Stabilization: (applies only if AA occurs on or within the banks of a river, stream, or other natural or man-made drainage, or on the shoreline of a standing water body which is subject to wave action. If does not apply, circle NA here and proceed to next function)

I. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating [E = exceptional, H = high, M = moderate, or L = low] for this function.

% Cover of wetland streambank or shoreline by species with deep, binding rootmasses	*Duration of surface water adjacent to rooted vegetation*		
	permanent / perennial	seasonal / intermittent	Temporary / ephemeral
≥ 65%	1 (H)	.9 (H)	.7 (M)
35-64%	.7 (M)	.6 (M)	.5 (M)
< 35%	.3 (L)	.2 (L)	.1 (L)

Comments: Nominal "Flow" Component,

14I. Production Export/Food Chain Support:

I. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function. Factor A = acreage of vegetated component in the AA; Factor B = structural diversity rating from #13; Factor C = whether or not the AA contains a surface or subsurface outlet; the final three rows pertain to duration of surface water in the AA, where P/P = permanent/perennial; S/I = seasonal/intermittent; T/E /A= temporary/ephemeral or absent [see instructions for further definitions of these terms].)

A	Vegetated component >5 acres						Vegetated component 1-5 acres						Vegetated component <1 acre					
B	High		Moderate		Low		High		Moderate		Low		High		Moderate		Low	
C	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
P/P	1H	.9H	.9H	.8H	.8H	.7M	.9H	.8H	.8H	.7M	.7M	.6M	.7M	.6M	.6M	.4M	.4M	.3L
S/I	.9H	.8H	.8H	.7M	.7M	.6M	.8H	.7M	.7M	.6M	.6M	.5M	.6M	.5M	.5M	.3L	.3L	.2L
T/E/A	.8H	.7M	.7M	.6M	.6M	.5M	.7M	.6M	.6M	.5M	.5M	.4M	.5M	.4M	.4M	.2L	.2L	.1L

Comments:

14J. Groundwater Discharge/Recharge: (Check the indicators in i & ii below that apply to the AA)

I. Discharge Indicators

- X Springs are known or observed
- ___ Vegetation growing during dormant season/drought
- ___ Wetland occurs at the toe of a natural slope
- X 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 present without underlying impeding layer
- ___ Wetland contains inlet but no outlet
- ___ Other

III. Rating: Use the information from i and ii above and the table below to arrive at [circle] the functional points and rating [H = high, L = low] for this function.

Criteria	*Functional Points and Rating*
AA is known Discharge/Recharge area or one or more indicators of D/R present	1 (H)
No Discharge/Recharge indicators present	.1 (L)
Available Discharge/Recharge information inadequate to rate AA D/R potential	N/A (Unknown)

Comments:

14K. Uniqueness:

I. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] 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 MNHP			AA does not contain previously cited rare types and structural diversity (#13) is high or contains plant association listed as "S2" by the MNHP			AA does not contain previously cited rare types or associations and structural diversity (#13) is low-moderate		
Estimated relative abundance (#11)	rare	common	abundant	rare	common	abundant	rare	common	abundant
Low disturbance at AA (#12i)	1 (H)	.9 (H)	.8 (H)	.8 (H)	.6 (M)	.5 (M)	.5 (M)	.4 (M)	.3 (L)
Moderate disturbance at AA (#12i)	.9 (H)	.8 (H)	.7 (M)	.7 (M)	.5 (M)	.4 (M)	.4 (M)	.3 (L)	.2 (L)
High disturbance at AA (#12i)	.8 (H)	.7 (M)	.6 (M)	.6 (M)	.4 (M)	.3 (L)	.3 (L)	.2 (L)	.1 (L)

Comments:

14L. Recreation/Education Potential: i. Is the AA a known rec./ed. site: (circle) Y N (If yes, rate as [circle] High [1] and go to ii; if no go to 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 strong potential for rec./ed. use? Y N

(If yes, go to ii, then proceed to iv; if no, then rate as [circle] Low [0.1])

iv. Rating (use the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function.

Ownership	*Disturbance at AA (#12i)*		
	low	moderate	high
public ownership	1 (H)	.5 (M)	.2 (L)
private ownership	.7 (M)	.3 (L)	.1 (L)

Comments:

 Rest. #2

FUNCTION & VALUE SUMMARY & OVERALL RATING

Function & Value Variables	Rating	Actual Functional Points	Possible Functional Points	Functional Units; (Actual Points x Estimated AA Acreage)
A. Listed/Proposed T&E Species Habitat	LOW	0	1	
B. MT Natural Heritage Program Species Habitat	MOD	0.7	1	
C. General Wildlife Habitat	MOD	0.5	1	
D. General Fish/Aquatic Habitat	LOW	0.3	1	
E. Flood Attenuation	LOW	0.2	1	
F. Short and Long Term Surface Water Storage	LOW	0.3	1	
G. Sediment/Nutrient/Toxicant Removal	HIGH	1	1	
H. Sediment/Shoreline Stabilization	NA	—	—	
I. Production Export/Food Chain Support	MOD	0.7	1	
J. Groundwater Discharge/Recharge	HIGH	1	1	
K. Uniqueness	LOW	0.3	1	
L. Recreation/Education Potential	LOW	0.1	1	
Totals:		5.1	11	

46%

OVERALL ANALYSIS AREA (AA) RATING: (Circle appropriate category based on the criteria outlined below) I II (III) IV

Category I Wetland: (Must satisfy **one** of the following criteria; if does not meet criteria, go to Category II)
- ___ Score of 1 functional point for Listed/Proposed Threatened or Endangered Species; **or**
- ___ Score of 1 functional point for Uniqueness; **or**
- ___ Score of 1 functional point for Flood Attenuation **and** answer to Question 14E.ii is "yes"; **or**
- ___ Total actual functional points > 80% (round to nearest whole #) of total possible functional points.

Category II Wetland: (Criteria for Category I not satisfied **and** meets any **one** of the following criteria; if not satisfied, go 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**
- ___ Total Actual Functional Points > 65% (round to nearest whole #) of total possible functional points.

√ **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 does not satisfy criteria go to Category III)
- ___ "Low" rating for Uniqueness; **and**
- ___ "Low" rating for Production Export/Food Chain Support; **and**
- ___ Total actual functional points < 30% (round to nearest whole #) of total possible functional points

MDT Montana Wetland Assessment Form (revised 5/25/1999)

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

3. Evaluation Date: Mo. 7 Day 16 Yr. 01 (7 30 02) 4. Evaluator(s): JB/RH (JB) 5. Wetlands/Site #(s) Enhancement #1 "Middle" oxbow

6. Wetland Location(s): i. Legal: T 32 (N) or S; R 21 (E) or W; S 11, 12 ; T ___ N or S; R ___ E or W; S ___ ;
ii. Approx. Stationing or Mileposts: NA

iii. Watershed: 10050004 GPS Reference No. (if applies): —
Other Location Information:
SE of Zurich, S of Milk River, Blaine County

7. a. Evaluating Agency: MDT ;
b. Purpose of Evaluation:
1. ___ Wetlands potentially affected by MDT project
2. ___ Mitigation wetlands; pre-construction
3. X Mitigation wetlands; post-construction
4. ___ Other

8. Wetland size: (total acres) 20 AC. (visually estimated)
___ (measured, e.g. by GPS [if applies])

9. Assessment area: (AA, tot., ac., see instructions on determining AA) 4-5 (visually estimated)
4-5 (measured, e.g. by GPS [if applies])

10. Classification of Wetland and Aquatic Habitats in AA (HGM according to Brinson, first col.; USFWS according to Cowardin [1979], remaining cols.)

HGM Class	System	Subsystem	Class	Water Regime	Modifier	% of AA
Riverine (non-per)	Palustrine	—	EM	SF	D	75%
"	"		AB	SPF	D	10%
"	"		SS	Sat	D	10%
"	Riverine	Intermittent	S.B	SPF	D	5%

(Abbreviations: **System:** Palustrine(P)/ **Subsyst.:** none/ **Classes:** Rock Bottom (RB), Unconsolidated bottom (UB), Aquatic Bed (AB), Unconsolidated Shore (US), Moss-lichen Wetland (ML), Emergent Wetland (EM), Scrub-Shrub Wetland (SS), Forested Wetland (FO)/ **System:** Lacustrine (L)/ **Subsyst.:** Limnetic (2)/ **Classes:** RB, UB, AB/ **Subsystem:** Littoral (4)/ **Classes:** RB, UB, AB, US, EM/ **System:** Riverine (R)/ **Subsyst.:** Lower Perennial (2)/ Classes: RB, UB, AB, US, EM/ **Subsystem:** Upper Perennial (3)/ Classes: RB, UB, AB, US/ **Water Regimes:** Permanently Flooded (H), Intermittently Exposed (G), Semipermanently Flooded (F), Seasonally Flooded (C), Saturated (B), Temporarily Flooded (A), Intermittently Flooded (J) **Modifiers:** Excavated (E), Impounded (I), Diked (D), Partly Drained (PD), Farmed (F), Artificial (A) **HGM Classes:** Riverine, Depressional, Slope, Mineral Soil Flats, Organic Soil Flats, Lacustrine Fringe

11. Estimated relative abundance: (of similarly classified sites within the same Major Montana Watershed Basin, see definitions)
(Circle one) Unknown Rare (Common) Abundant
Comments:

12. General condition of AA:
i. Regarding disturbance: (use matrix below to determine [circle] appropriate response)

Conditions within AA	Predominant conditions adjacent to (within 500 feet of) 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 natural state; is not grazed, hayed, logged, or otherwise converted; does not contain roads or occupied buildings.	low disturbance	low disturbance	(moderate disturbance)
AA not cultivated, but moderately grazed or hayed or selectively logged; or has been subject to relatively minor clearing, fill placement, or hydrological alteration; contains few roads or buildings.	moderate disturbance	moderate disturbance	high disturbance
AA cultivated or heavily grazed or logged; subject to relatively substantial fill placement, grading, clearing, or hydrological alteration; high road or building density.	high disturbance	high disturbance	high disturbance

Comments: (types of disturbance, intensity, season, etc.): Hayland
ii. Prominent weedy, alien, & introduced species (including those not domesticated, feral): (list) CIR ARV

iii. Provide brief descriptive summary of AA and surrounding land use/habitat: "Middle" section of oxbow that drains to Musgrave Lake - bordered to E+W by hayland. AA is bordered on upper end by dike + road, and on lower end by ditch crossing.

13. Structural Diversity: (based on number of "Cowardin" *vegetated* classes present [do not include unvegetated classes], see #10 above)

# of "Cowardin" vegetated classes present in AA (see #10)	≥ 3 vegetated classes (or ≥ 2 if one is forested)	2 vegetated classes (or 1 if forested)	≤ 1 vegetated class
Rating (circle)	(High)	Moderate	Low

Comments:

Enh. # 1

SECTION PERTAINING to FUNCTIONS & VALUES ASSESSMENT

14A. Habitat for Federally Listed or Proposed Threatened or Endangered Plants or Animals:

I. AA is Documented (D) or Suspected (S) to contain (circle one based on definitions contained in instructions):

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

II. **Rating** (use the conclusions from i above and the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function)

Highest Habitat Level	doc./primary	sus/primary	doc./secondary	sus./secondary	doc./incidental	sus./incidental	None
Functional Points and Rating	1 (H)	.9 (H)	.8 (M)	.7 (M)	.5 (L)	(.3 (L))	0 (L)

Sources for documented use (e.g. observations, records, etc):

14B. Habitat for plant or animals rated S1, S2, or S3 by the Montana Natural Heritage Program: (not including species listed in14A above)

I. AA is Documented (D) or Suspected (S) to contain (circle one based on definitions contained in instructions):

Primary or critical habitat (**list species**)	D S	
Secondary habitat (**list species**)	(D) S	Great plains toad
Incidental habitat (**list species**)	D S	
No usable habitat	D S	

II. **Rating** (use the conclusions from i above and the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function)

Highest Habitat Level	doc./primary	sus/primary	doc./secondary	sus./secondary	doc./incidental	sus./incidental	None
Functional Points and Rating	1 (H)	.8 (H)	(.7 (M))	.6 (M)	.2 (L)	.1 (L)	0 (L)

Sources for documented use (e.g. observations, records, etc.):
Northern leopard frogs, but only 2. ; Great Plains toad obs. by MDT in 1999

14C. General Wildlife Habitat Rating:

I. **Evidence of overall wildlife use in the AA** (circle substantial, moderate, or low based on supporting evidence):

Substantial (based on any of the following [check]):
- XX observations of abundant wildlife #'s or high species diversity (during any period)
- XX 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 [check]):
- __ 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 the AA

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

ii. **Wildlife habitat features** (working from top to bottom, circle appropriate AA attributes in matrix to arrive at 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 of the AA (see #10). Abbreviations for surface water durations are as follows: P/P = permanent/perennial; S/I = seasonal/intermittent; T/E = temporary/ephemeral; and A = absent [see instructions for further definitions of these terms].)

Structural diversity (see #13)	(High)								Moderate								Low			
Class cover distribution (all vegetated classes)	Even				(Uneven)				Even				Uneven				Even			
Duration of surface water in ≥ 10% of AA	P/P	S/I	T/E	A	P/P	(S/I)	T/E	A	P/P	S/I	T/E	A	P/P	S/I	T/E	A	P/P	S/I	T/E	A
Low disturbance at AA (see #12i)	E	E	E	H	E	E	H	H	E	H	H	M	E	H	M	M	E	H	M	M
Moderate disturbance at AA (see #12i)	H	H	H	H	H	(H)	H	M	H	H	M	M	H	M	M	L	H	M	L	L
High disturbance at AA (see #12i)	M	M	M	L	M	M	L	L	M	M	L	L	M	L	L	L	L	L	L	L

iii. **Rating** (use the conclusions from i and ii above and the matrix below to arrive at [circle] the functional points and rating [E = exceptional, H = high, M = moderate, or L = low] for this function)

Evidence of wildlife use (i)	*Wildlife habitat features rating (ii)*			
	Exceptional	(High)	Moderate	Low
(**Substantial**)	1 (E)	(.9 (H))	.8 (H)	.7 (M)
Moderate	.9 (H)	.7 (M)	.5 (M)	.3 (L)
Minimal	.6 (M)	.4 (M)	.2 (L)	.1 (L)

Comments:

 Enh. #1

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

i. Habitat Quality (circle appropriate AA attributes in matrix to arrive at exceptional (E), high (H), moderate (M), or low (L) quality rating.

Duration of surface water in AA	Permanent / Perennial			Seasonal / Intermittent			Temporary / Ephemeral		
Cover - % of waterbody in AA containing cover objects such as submerged logs, large rocks & boulders, overhanging banks, floating-leaved vegetation, etc.	>25%	10–25%	<10%	>25%	10–25%	<10%	>25%	10–25%	<10%
Shading - >75% of streambank or shoreline within AA contains riparian or wetland scrub-shrub or forested communities	E	E	H	H	H	M	M	M	M
Shading – 50 to 75% of streambank or shoreline within AA contains rip. or wetland scrub-shrub or forested communities	H	H	M	M	M	M	M	L	L
Shading - < 50% of streambank or shoreline within AA contains rip. or wetland scrub-shrub or forested communities	H	M	M	(M)	L	L	L	L	L

ii. Modified Habitat Quality (Circle the appropriate response to the following question. If answer is Y, then reduce rating in i above by one level [E = H, H = M, M = L, L = L]). *Is fish use of the AA precluded or significantly reduced by a culvert, dike, or other man-made structure or activity or is the waterbody included on the MDEQ list of waterbodies in need of TMDL development with listed "Probable Impaired Uses" including cold or warm water fishery or aquatic life support?* (Y) N Modified habitat quality rating = (circle) E H M (L)

fish regulated to "ditch" portion of site.

iii. Rating (use the conclusions from i and ii above and the matrix below to arrive at [circle] the functional points and rating [E = exceptional, H = high, M = moderate, or L = low] for this function)

Types of fish known or suspected within AA	*Modified Habitat Quality (ii)*			
	Exceptional	High	Moderate	(Low)
Native game fish	1 (E)	.9 (H)	.7 (M)	.5 (M)
Introduced game fish	.9 (H)	.8 (H)	.6 (M)	.4 (M)
Non-game fish	.7 (M)	.6 (M)	.5 (M)	.3 (L)
No fish	.5 (M)	.3 (L)	.2 (L)	.1 (L)

Comments: Minnows observed.

14E. Flood Attenuation: (applies only to wetlands subject to flooding via in-channel or overbank flow. If wetlands in AA are not flooded from in-channel or overbank flow, circle **NA** here and proceed to next function.)

i. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function)

Estimated wetland area in AA subject to periodic flooding	≥ 10 acres			<10, >2 acres			≤2 acres		
% of flooded wetland classified as forested, scrub/shrub, or both	75%	25-75%	<25%	75%	25-75%	<25%	75%	25-75%	<25%
AA contains **no outlet or restricted outlet**	1(H)	.9(H)	.6(M)	.8(H)	.7(H)	.5(M)	.4(M)	.3(L)	.2(L)
AA contains **unrestricted outlet**	.9(H)	.8(H)	.5(M)	.7(H)	.6(M)	.4(M)	.3(L)	.2(L)	.1(L)

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

Comments: Homes

14F. Short and Long Term Surface Water Storage: (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, circle **NA** here and proceed with the evaluation.)

i. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function. Abbreviations for surface water durations are as follows: P/P = permanent/perennial; S/I = seasonal/intermittent; and T/E = temporary/ephemeral [see instructions for further definitions of these terms].)

Estimated maximum acre feet of water contained in wetlands within the AA that are subject to periodic flooding or ponding	>5 acre feet			<5, >1 acre feet			(≤1 acre foot)		
Duration of surface water at wetlands within the AA	P/P	S/I	T/E	P/P	S/I	T/E	P/P	(S/I)	T/E
Wetlands in AA flood or pond **≥ 5 out of 10 years**	1(H)	.9(H)	.8(H)	.8(H)	.6(M)	.5(M)	.4(M)	(.3(L))	.2(L)
Wetlands in AA flood or pond **< 5 out of 10 years**	.9(H)	.8(H)	.7(M)	.7(M)	.5(M)	.4(M)	.3(L)	.2(L)	.1(L)

Comments:

14G. Sediment/Nutrient/Toxicant Retention and Removal: (Applies to wetlands with potential to receive excess sediments, nutrients, or toxicants through influx of surface or ground water or direct input. If no wetlands in the AA are subject to such input, circle **NA** here and proceed with the evaluation.)

i. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function.

Sediment, nutrient, and toxicant input levels within AA	AA receives or surrounding land use with 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 with potential to deliver high levels of sediments, nutrients, or compounds such that other functions are substantially impaired. Major sedimentation, sources of nutrients or toxicants, or signs of eutrophication present.			
% cover of wetland vegetation in AA	≥ 70%		< 70%		≥ 70%		< 70%	
Evidence of flooding or ponding in AA	Yes	No	Yes	No	Yes	No	Yes	No
AA contains **no or restricted outlet**	1 (H)	.8 (H)	.7 (M)	.5 (M)	.5 (M)	.4 (M)	.3 (L)	.2 (L)
AA contains **unrestricted outlet**	(.9 (H))	.7 (M)	.6 (M)	.4 (M)	.4 (M)	.3 (L)	.2 (L)	.1 (L)

Comments: Sediments filtered by "upstream" impoundment.

14H Sediment/Shoreline Stabilization: (applies only if AA occurs on or within the banks or a river, stream, or other natural or man-made drainage, or on the shoreline of a standing water body which is subject to wave action. If does not apply, circle NA here and proceed to next function)

I. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating [E = exceptional, H = high, M = moderate, or L = low] for this function.

% Cover of wetland streambank or shoreline by species with deep, binding rootmasses	*Duration of surface water adjacent to rooted vegetation*		
	permanent / perennial	seasonal / intermittent	Temporary / ephemeral
≥ 65%	1 (H)	.9 (H)	.7 (M)
35-64%	.7 (M)	.6 (M)	.5 (M)
< 35%	.3 (L)	.2 (L)	.1 (L)

Comments: Few shrubs along actual water course.

14I. Production Export/Food Chain Support:

I. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function. Factor A = acreage of vegetated component in the AA; Factor B = structural diversity rating from #13; Factor C = whether or not the AA contains a surface or subsurface outlet; the final three rows pertain to duration of surface water in the AA, where P/P = permanent/perennial; S/I = seasonal/intermittent; T/E /A= temporary/ephemeral or absent [see instructions for further definitions of these terms].)

A	Vegetated component >5 acres						Vegetated component 1-5 acres						Vegetated component <1 acre					
B	High		Moderate		Low		High		Moderate		Low		High		Moderate		Low	
C	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
P/P	1H	.9H	.9H	.8H	.8H	.7M	.9H	.8H	.8H	.7M	.7M	.6M	.7M	.6M	.6M	.4M	.4M	.3L
S/I	.9H	.8H	.8H	.7M	.7M	.6M	.8H	.7M	.7M	.6M	.6M	.5M	.6M	.5M	.5M	.3L	.3L	.2L
T/E/A	.8H	.7M	.7M	.6M	.6M	.5M	.7M	.6M	.6M	.5M	.5M	.4M	.5M	.4M	.4M	.2L	.2L	.1L

Comments:

14J. Groundwater Discharge/Recharge: (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
XX 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 present without underlying impeding layer
___Wetland contains inlet but no outlet
___Other

III. Rating: Use the information from i and ii above and the table below to arrive at [circle] the functional points and rating [H = high, L = low] for this function.

Criteria	*Functional Points and Rating*
AA is known Discharge/Recharge area or one or more indicators of D/R present	1 (H)
No Discharge/Recharge indicators present	.1 (L)
Available Discharge/Recharge information inadequate to rate AA D/R potential	N/A (Unknown)

Comments:

14K. Uniqueness:

I. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] 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 MNHP			AA does not contain previously cited rare types and structural diversity (#13) is high or contains plant association listed as "S2" by the MNHP			AA does not contain previously cited rare types or associations and structural diversity (#13) is low-moderate		
Estimated relative abundance (#11)	rare	common	abundant	rare	common	abundant	rare	common	abundant
Low disturbance at AA (#12i)	1 (H)	.9 (H)	.8 (H)	.8 (H)	.6 (M)	.5 (M)	.5 (M)	.4 (M)	.3 (L)
Moderate disturbance at AA (#12i)	.9 (H)	.8 (H)	.7 (M)	.7 (M)	.5 (M)	.4 (M)	.4 (M)	.3 (L)	.2 (L)
High disturbance at AA (#12i)	.8 (H)	.7 (M)	.6 (M)	.6 (M)	.4 (M)	.3 (L)	.3 (L)	.2 (L)	.1 (L)

Comments:

14L. Recreation/Education Potential: i. Is the AA a known rec./ed. site: (circle) Y (N) (If yes, rate as [circle] High [1] and go to ii; if no go to 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 strong potential for rec./ed. use? Y (N)
(If yes, go to ii, then proceed to iv; if no, then rate as [circle] Low [0.1])

Iv. Rating (use the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function.

Ownership	*Disturbance at AA (#12i)*		
	low	moderate	high
public ownership	1 (H)	.5 (M)	.2 (L)
private ownership	.7 (M)	.3 (L)	.1 (L)

Comments:

 Enh. #1

FUNCTION & VALUE SUMMARY & OVERALL RATING

Function & Value Variables	Rating	Actual Functional Points	Possible Functional Points	Functional Units; (Actual Points x Estimated AA Acreage)
A. Listed/Proposed T&E Species Habitat	LOW	0.3	1	
B. MT Natural Heritage Program Species Habitat	MOD	0.7	1	
C. General Wildlife Habitat	HIGH	0.9	1	
D. General Fish/Aquatic Habitat	LOW	0.3	1	
E. Flood Attenuation	MOD	0.4	1	
F. Short and Long Term Surface Water Storage	LOW	0.3	1	
G. Sediment/Nutrient/Toxicant Removal	HIGH	0.9	1	
H. Sediment/Shoreline Stabilization	MOD	0.6	1	
I. Production Export/Food Chain Support	HIGH	0.8	1	
J. Groundwater Discharge/Recharge	HIGH	1	1	
K. Uniqueness	MOD	0.5	1	
L. Recreation/Education Potential	LOW	0.1	1	
Totals:		6.5	12	

54 %

OVERALL ANALYSIS AREA (AA) RATING: (Circle appropriate category based on the criteria outlined below) I (II) III IV

Category I Wetland: (Must satisfy **one** of the following criteria; if does not meet criteria, go to Category II)
- ___ Score of 1 functional point for Listed/Proposed Threatened or Endangered Species; **or**
- ___ Score of 1 functional point for Uniqueness; **or**
- ___ Score of 1 functional point for Flood Attenuation **and** answer to Question 14E.ii is "yes"; **or**
- ___ Total actual functional points > 80% (round to nearest whole #) of total possible functional points.

√ **Category II Wetland:** (Criteria for Category I not satisfied **and** meets any **one** of the following criteria; if not satisfied, go to Category IV)
- ___ Score of 1 functional point for Species Rated S1, S2, or S3 by the MT Natural Heritage Program; **or**
- XX 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**
- ___ Total Actual Functional Points > 65% (round to nearest whole #) of total possible functional points.

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 does not satisfy criteria go to Category III)
- ___ "Low" rating for Uniqueness; **and**
- ___ "Low" rating for Production Export/Food Chain Support; **and**
- ___ Total actual functional points < 30% (round to nearest whole #) of total possible functional points

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

Project/Site: Musgrave Lake Mitigation Site	Project No: #4421	Date: 30-Jul-2002
Applicant/Owner: Montana Department of Transportation		County: Blaine
Investigators: Berglund		State: Montana
		Plot ID: 1

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

VEGETATION (USFWS Region No. 9)

Dominant Plant Species(Latin/Common)	Stratum	Indicator	Plant Species(Latin/Common)	Stratum	Indicator
Alopecurus pratensis	Herb	FACW	*Phleum pratense*	Herb	FACU
Foxtail,Meadow			Timothy		
Eleocharis palustris	Herb	OBL	*Equisetum arvense*	Herb	FAC
Spikerush,Creeping			Horsetail,Field		
Apocynum androsaemifolium	Herb	NI			
dogbane					

Percent of Dominant Species that are OBL, FACW or FAC: (excluding FAC-) 3/4 = 75.00%

FAC Neutral: 2/3 = 66.67%
Numeric Index: 10/4 = 2.50

Remarks:
Dominants

HYDROLOGY

NO Recorded Data(Describe in Remarks):
- N/A Stream, Lake or Tide Gauge
- N/A Aerial Photographs
- N/A Other

YES No Recorded Data

Field Observations

Depth of Surface Water:	= 3 (in.)
Depth to Free Water in Pit:	N/A (in.)
Depth to Saturated Soil:	N/A (in.)

Wetland Hydrology Indicators
- Primary Indicators
  - YES Inundated
  - YES Saturated in Upper 12 Inches
  - NO Water Marks
  - NO Drift Lines
  - NO Sediment Deposits
  - NO Drainage Patterns in Wetlands
- Secondary Indicators
  - NO Oxidized Root Channels in Upper 12 Inches
  - NO Water-Stained Leaves
  - NO Local Soil Survey Data
  - YES FAC-Neutral Test
  - NO Other(Explain in Remarks)

Remarks:
Much of site is inundated. Free water at top of pit.

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

Project/Site: Musgrave Lake Mitigation Site	Project No: #4421	Date: 30-Jul-2002
Applicant/Owner: Montana Department of Transportation		County: Blaine
Investigators: Berglund		State: Montana
		Plot ID: 1

SOILS

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

Profile Description

Depth (Inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc
10	B	2.5Y4/2	2.5Y5/6	Common Distinct	Clay loam
10	B	2.5Y4/2	10YR5/8	Common Distinct	Silty clay

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:
Pit excavated at beginning of transect.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	(Yes) No	Is the Sampling Point within the Wetland? (Yes) No
Wetland Hydrology Present?	(Yes) No	
Hydric Soils Present?	(Yes) No	

Remarks:
Restoration Site 1; large developing marsh area. This plot taken at beginning of transect. Center of transect not accessible due to inundation.

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

Project/Site: Musgrave Lake Mitigation Site	**Project No:** #4421	**Date:** 30-Jul-2002	
Applicant/Owner: Montana Department of Transportation		**County:** Blaine	
Investigators: Berglund		**State:** Montana	
		Plot ID: 2	

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

VEGETATION (USFWS Region No. 9)

Dominant Plant Species(Latin/Common)	Stratum	Indicator	Plant Species(Latin/Common)	Stratum	Indicator
Agropyron repens	Herb	FACU	*Carex lanuginosa*	Herb	OBL
Quackgrass			Sedge,Wooly		
Scirpus acutus	Herb	OBL	*Carex vesicaria*	Herb	OBL
Bulrush,Hard-Stem			Sedge,Inflated		
Rumex crispus	Herb	FACW	*Phalaris arundinacea*	Herb	FACW
Dock,Curly			Grass,Reed Canary		
Beckmannia syzigachne	Herb	OBL	*Ranunculus occidentalis*	Herb	FACW
Sloughgrass,American			Butter-Cup,Western		
Agrostis alba	Herb	FACW	*Polygonum amphibium*	Herb	OBL
Redtop			Smartweed,Water		
Alopecurus pratensis	Herb	FACW			
Foxtail,Meadow					

Percent of Dominant Species that are OBL, FACW or FAC: (excluding FAC-) 10/11 = 90.91%	**FAC Neutral:** 10/11 = 90.91% **Numeric Index:** 19/11 = 1.73

Remarks:

HYDROLOGY

YES **Recorded Data(Describe in Remarks):**
- NO **Stream, Lake or Tide Gauge**
- YES **Aerial Photographs**
- NO **Other**

NO **No Recorded Data**

Field Observations

Depth of Surface Water:	None *(in.)*
Depth to Free Water in Pit:	> 14 *(in.)*
Depth to Saturated Soil:	= 12 *(in.)*

Wetland Hydrology Indicators

Primary Indicators
- NO **Inundated**
- YES **Saturated in Upper 12 Inches**
- NO **Water Marks**
- NO **Drift Lines**
- NO **Sediment Deposits**
- YES **Drainage Patterns in Wetlands**

Secondary Indicators
- NO **Oxidized Root Channels in Upper 12 Inches**
- NO **Water-Stained Leaves**
- NO **Local Soil Survey Data**
- YES **FAC-Neutral Test**
- NO **Other(Explain in Remarks)**

Remarks:
Likely sub-irrigating from adjacent ditch. Wetland signature on aerial photo.

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

Project/Site: Musgrave Lake Mitigation Site	**Project No:** #4421	**Date:** 30-Jul-2002	
Applicant/Owner: Montana Department of Transportation		**County:** Blaine	
Investigators: Berglund		**State:** Montana	
		Plot ID: 2	

SOILS

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

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc
10	B	10YR4/1	10YR4/6	Common Distinct	Clay loam

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) No	Is the Sampling Point within the Wetland? (Yes) No
Wetland Hydrology Present?	(Yes) No	
Hydric Soils Present?	(Yes) No	

Remarks:
Enhancement Site 1; plot in center of transect. Site likely saturates to surface when water is up.

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

Project/Site: Musgrave Lake Mitigation Site	Project No: #4421	Date: 30-Jul-2002
Applicant/Owner: Montana Department of Transportation		County: Blaine
Investigators: Berglund		State: Montana
		Plot ID: 3

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

VEGETATION (USFWS Region No. 9)

Dominant Plant Species(Latin/Common)	Stratum	Indicator	Plant Species(Latin/Common)	Stratum	Indicator
Hordeum jubatum	Herb	FAC+	*Agropyron repens*	Herb	FACU
Barley,Fox-Tail			Quackgrass		
Rumex crispus	Herb	FACW			
Dock,Curly					

Percent of Dominant Species that are OBL, FACW or FAC: (excluding FAC-) 2/3 = 66.67%

FAC Neutral: 1/2 = 50.00%

Numeric Index: 9/3 = 3.00

Remarks:
These three species are dominants. Much of this area has been hayed, making veg. ID difficult.

HYDROLOGY

NO Recorded Data(Describe in Remarks):
- N/A Stream, Lake or Tide Gauge
- N/A Aerial Photographs
- N/A Other

YES No Recorded Data

Field Observations

Depth of Surface Water:	N/A (in.)
Depth to Free Water in Pit:	N/A (in.)
Depth to Saturated Soil:	N/A (in.)

Wetland Hydrology Indicators

Primary Indicators:
- NO Inundated
- NO Saturated in Upper 12 Inches
- NO Water Marks
- NO Drift Lines
- NO Sediment Deposits
- YES Drainage Patterns in Wetlands

Secondary Indicators:
- NO Oxidized Root Channels in Upper 12 Inches
- NO Water-Stained Leaves
- NO Local Soil Survey Data
- NO FAC-Neutral Test
- YES Other(Explain in Remarks)

Remarks:
Soil moist at 10", but not currently saturated. Soil surface has been saturated and cracked. Indicators are week, but may be developing. Site seems to have dried out further since 2001.

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

Project/Site: Musgrave Lake Mitigation Site	Project No: #4421	Date: 30-Jul-2002
Applicant/Owner: Montana Department of Transportation		County: Blaine
Investigators: Berglund		State: Montana
		Plot ID: 3

SOILS

Map Unit Name (Series and Phase): Havre silty clay loam, saline

Map Symbol: 58 Drainage Class: WD

Mapped Hydric Inclusion?

Taxonomy (Subgroup): Ustic Torrifluvents

Field Observations Confirm Mapped Type? (Yes) No

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc
10	B	2.5Y4/2	10YR5/8	Few Faint	Silty clay loam

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:
Weak hydric soil indicators.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	(Yes) No	Is the Sampling Point within the Wetland? (Yes) No
Wetland Hydrology Present?	(Yes) No	
Hydric Soils Present?	(Yes) No	

Remarks:
Restoration site 2, along transect. Site appears to have dried out further since 2002. Wetland characteristics are marginal, but present. Site could use more water.

BIRD SURVEY – FIELD DATA SHEET

Page__1_of__1_
Date: 5/14/02
Survey Time: 1000-1200

SITE: Musgrave Lake

Bird Species	#	Behavior	Habitat	Bird Species	#	Behavior	Habitat
American kestrel	1	N	UP				
American robin	6	F	ALL				
American white pelican	3	FO	MA				
Brewer's blackbird	4	F	ALL				
Canada goose	4	F	MA				
chipping sparrow	1	F	UP				
clay-colored sparrow	1	F	UP				
gadwall	2	L	OW				
killdeer	10	F	UP				
mallard	4	F	AB				
mourning dove	1	L	FO				
northern flicker	2	L	FO				
northern harrier	2	BP	MA				
northern shoveler	2	F	OW				
phalarope	4	F	OW				
red-winged blackbird	10	F	MA				
ring-billed gull	1	FO	MA				
ring-necked pheasant	1	F	UP				
sharptail grouse	1	F	UP				
solitary sandpiper	2	F	MF				
upland sandpiper	1	L	UP				
western meadowlark	3	BD	UP				
willet	4	F	MA				
yellow warbler	1	L	FO				

Notes:

RS1 – dry, no surface water; RS2 – wet in ditch only; ES1 – dry, no surface water, ES2 – mostly dry, some surface water

Dry, sunny, and windy conditions

White-tailed deer rousted from willows in ES1 (2-3)

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

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

Montana Department of Transportation									
Wetland Mitigation Monitoring Project									
Rhithron Associates, Inc.									
for Land and Water Consulting		Project Name	Musgrave Lake R1	Musgrave Lake R2	Musgrave Lake E1	Musgrave Lake E2	Musgrave Lake-ESI	Musgrave Lake RSI	Musgrave Lake RS2
2001 and 2002									
		Date	2001	2001	2001	2001	Jul-02	7/29/2002	Jul-02
Coelenterata		*Hydra*		1	1				
Turbellaria		*Dugesia*							
Oligochaeta	Enchytraeidae	Enchytraeidae	11						
	Lumbriculidae	Lumbriculidae							
	Naididae	*Chaetogaster*				6			
		Nais elinguis	13						
		Nais variabilis		8					
		Ophidonais serpentina							
	Tubificidae	Tubificidae - immature			1		2		
		Limnodrilus hoffmeisteri	1						
Hirudinea		*Mooreobdella microstoma*							
		Nephelopsis							
		Helobdella stagnalis							
		Helobdella							
		Glossiphonia							
		Theromyzon							
Bivalvia	Sphaeriidae	*Sphaerium*							
Gastropoda	Lymnaeidae	*Fossaria*	1						
	Physidae	*Physa*		34	13	19	1		
	Planorbidae	*Gyraulus*	1	15	26	5	3		2
		Helisoma							
		Planorbella						18	
Crustacea	Cladocera	Cladocera		52	57	9			
	Copepoda	Calanoida							
		Cyclopoida	17	23	2			7	
	Ostracoda	Ostracoda	34	5	4		1	44	
	Amphipoda	*Gammarus*							
		Hyalella azteca	4	75	52	16			
	Isopoda	*Caecidotea*							
	Decapoda	*Orconectes*							
Acarina		Acari	18	5	3	7			
Odonata	Aeshnidae	*Anax junius*			1				
	Libellulidae	Libellulidae-early instar							
		Sympetrum	1				1		
	Coenagrionidae	Coenagrionidae-early instar		1	7	9		2	
		Enallagma							
	Lestidae	*Lestes*			1	1			
Ephemeroptera	Baetidae	*Baetis tricaudatus*							
		Callibaetis						7	
		Centroptilum							
	Caenidae	*Caenis*	1	1					
	Ephemerellidae	*Ephemerella*							
	Heptageniidae	*Cinygma*							
		Nixe							
	Leptophlebiidae	*Paraleptophlebia*							
	Ameletidae	*Ameletus*							
Homoptera	Corixidae	Corixidae - immature	2	7	4	1	1	22	
		Corisella tarsalis							
		Hesperocorixa							
		Palmacorixa buenoi							
		Sigara	7		5		2		
		Trichocorixa		3	1		2		
	Nepidae	*Ranatra*		1					
	Notonectidae	*Notonecta*		1	1				
Plecoptera	Chloroperlidae	*Sweltsa*							
	Perlodidae	*Skwala*							
Trichoptera	Brachycentridae	*Brachycentrus* - early instar							
	Hydroptilidae	Hydroptilidae - pupa							
		Hydroptila							
	Lepidostomatidae	*Lepidostoma*							
	Leptoceridae	Leptoceridae - early instar							
		Ceraclea							
		Mystacides							
		Nectopsyche							
		Ylodes							
	Limnephilidae	*Psychoglypha subborealis*							
Coleoptera	Chrysomelidae	Chrysomelidae							
	Curculionidae	*Bagous*	1						
	Dytiscidae	*Acilius*			1				
		Dytiscidae - early instar larvae						5	
		Hydroporinae - early instar larvae		2					
		Hygrotus		1	1	3			
		Liodessus	2						
		Laccophilus	1	3	12		1		
		Neoporus		1					
		Oreodytes							
		Rhantus							
		Stichtotarsus							
	Elmidae	*Dubiraphia*							
		Heterlimnius							
		Lara avara							
		Optioservus							
		Zaitzevia							
	Haliplidae	*Haliplus*	9	6	7	1	1		
		Peltodytes		1					
	Hydrophilidae	Hydrophilidae - early instar larvae							
		Berosus	3	2				1	
		Helophorus							
		Hydrobius	8						
		Hydrochara			1				
		Laccobius							
		Tropisternus	5			1			
Diptera	Athericidae	*Atherix*							
	Ceratopogonidae	*Bezzia/Palpomyia*	4				3		
		Dasyhelea	5						
	Chaoboridae	*Chaoborus*							
	Culicidae	*Anopheles*							
		Culex	5						
	Dixidae	*Dixella*							
	Dolichopodidae	Dolichopodidae							
	Empididae	*Clinocera*							

BIRD SURVEY – FIELD DATA SHEET

Date: 7/30/02
Survey Time: 0700-1200

SITE: Musgrave Lake

Bird Species	#	Behavior	Habitat	Bird Species	#	Behavior	Habitat
American coot	4	F	OW				
American robin	6	F	ALL				
American widgeon	10	F, N	MA,OW				
Brewer's blackbird	5	F	UP				
cedar waxwing	6	F	FO				
common snipe	3	F,N	MA				
common tern	1	F	MA				
common yellowthroat	1	F	SS				
eastern kingbird	3	L	UP				
gadwall	10	N,F	MA,OW				
killdeer	5	F	MA				
mallard	8	N, F	OW,MA				
mourning dove	2	L	FO				
northern flicker	3	F	FO				
red-winged blackbird	10	F, N	MA				
song sparrow	2	F	UP				
sora	3	N	MA				
tree swallow	2	F	MA				
western wood pewee	1	L	FO				
willet	2	F	MA				
yellow warbler	1	F	FO				
yellow-headed blackbird	7	F, N	MA				

Notes:

RS1 –completely inundated; RS2 – wet in ditch only; ES1 – wet in ditch only, ES2 – not sampled

Dry, sunny, and windy conditions

White-tailed deer and fawns at RS1; leopard frogs at RS1, RS2; minnows at ES1, RS2; coyotes howling

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

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

	Ephydridae	Ephydridae							
	Muscidae	Muscidae							
	Pelecorhynchidae	*Glutops*							
	Psychodidae	*Pericoma*							
	Simuliidae	*Simulium*					1		1
	Sciomyzidae	Sciomyzidae							
	Stratiomyidae	*Odontomyia*	3						
	Tabanidae	Tabanidae							
	Tipulidae	*Hexatoma*							
		Tipula							
	Chironomidae	*Ablabesmyia*							
		Acricotopus							
		Camptocladius							
		Chironomus	29	2	3			16	
		Cladotanytarsus							
		Corynoneura			1	1			
		Cricotopus Bicinctus Gr.					1		
		Cricotopus (Cricotopus) Gr.							
		Cricotopus nostococladius							
		Cryptotendipes							
		Diamesa							
		Dicrotendipes	4	3	2	1	14		
		Einfeldia	5					11	
		Endochironomus		1	1				
		Labrundinia							
		Micropsectra							
		Microtendipes							
		Odontomesa							
		Orthocladius annectens	1	9	3	3	13	39	
		Pagastia							
		Parachironomus		8	1		1		
		Paracladopelma							
		Paramerina		3	1				
		Parametriocnemus							
		Paratanytarsus				2	84		
		Paratendipes							
		Phaenopsectra							
		Polypedilum					1		
		Procladius	2						
		Psectrocladius elatus	1		1				
		Psectrocladius vernalis							
		Psectrotanypus	1						
		Pseudochironomus							
		Stichtochironomus							
		Tanypus							
		Tanytarsus	1					20	
		Thienemanniella							
		Tvetenia							
		Total	201	274	214	85	135	192	3
		Total taxa	32	28	29	16	18	12	2
		POET	2	2	3	2	1	2	0
		Chironomidae taxa	8	6	8	4	6	4	0
		Crustacea taxa + Mollusca taxa	5	6	6	4	3	3	1
		% Chironomidae	21.89%	9.49%	6.07%	8.24%	85.93%	44.79%	0.00%
		Orthocladiinae/Chironomidae	0.05	0.35	0.38	0.57	0.14	0.45	#DIV/0!
		%Amphipoda	1.99%	27.37%	24.30%	18.82%	0.00%	0.00%	0.00%
		%Crustacea + %Mollusca	28.36%	74.45%	71.96%	57.65%	3.70%	35.94%	66.67%
		HBI	7.17	7.68	7.55	7.22	6.30	7.24	7.33
		%Dominant taxon	16.92%	27.37%	26.64%	22.35%	62.22%	22.92%	66.67%
		%Collector-Gatherers	67.66%	61.31%	38.79%	49.41%	88.15%	75.00%	0.00%
		%Filterers	0.00%	18.98%	26.64%	10.59%	0.74%	0.00%	33.33%
		Scores (2002 criteria)							
		Total taxa	5	5	5	3	3	3	1
		POET	1	1	3	1	1	1	1
		Chironomidae taxa	5	3	5	3	3	3	1
		Crustacea taxa + Mollusca taxa	5	5	5	5	1	1	1
		% Chironomidae	3	5	5	5	1	1	5
		Orthocladiinae/Chironomidae	1	3	3	5	1	3	1
		%Amphipoda	5	1	1	3	5	5	5
		%Crustacea + %Mollusca	5	1	1	3	5	3	3
		HBI	3	3	3	3	5	3	3
		%Dominant taxon	5	3	3	5	1	5	1
		%Collector-Gatherers	3	3	1	3	5	3	1
		%Filterers	1	5	5	5	1	1	5
		Total score	42	38	40	44	32	32	28

Appendix C

REPRESENTATIVE PHOTOGRAPHS
2002 AERIAL PHOTOGRAPH

MDT Wetland Mitigation Monitoring
Musgrave Lake
Zurich, Montana

LAND & WATER

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 2 from Start, 167 degrees S/SE

RS2, Transect 2 fro m End, 354 degrees N/NW

2002 Musgrave Lake Sheet 1

No 2002 Photo; Per MDT instruction, ES2 transect not sampled in 2002	**No 2002 Photo; Per MDT instruction, ES2 transect not sampled in 2002**
ES2, Transect 4 from Start, 20 degrees N/NE	ES2, Transect 4 from End, 194 degrees S/SW
	
RS2, Photo Point 1, 260 degrees W	RS2, Photo Point 2, 100 degrees E
	
RS2, Photo Point 3, 54 degrees NE	RS2, Photo Point 4, 19 degrees S

2002 Musgrave Lake Sheet 2

	
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
	**No 2002 Photo; Per MDT instruction, ES2 not sampled in 2002**
RS1, Photo Point 7, 143 degrees SE	ES2, Photo Point 8, 105 degrees N/NE

2002 Musgrave Lake Sheet 3

Musgrave Lake 2002

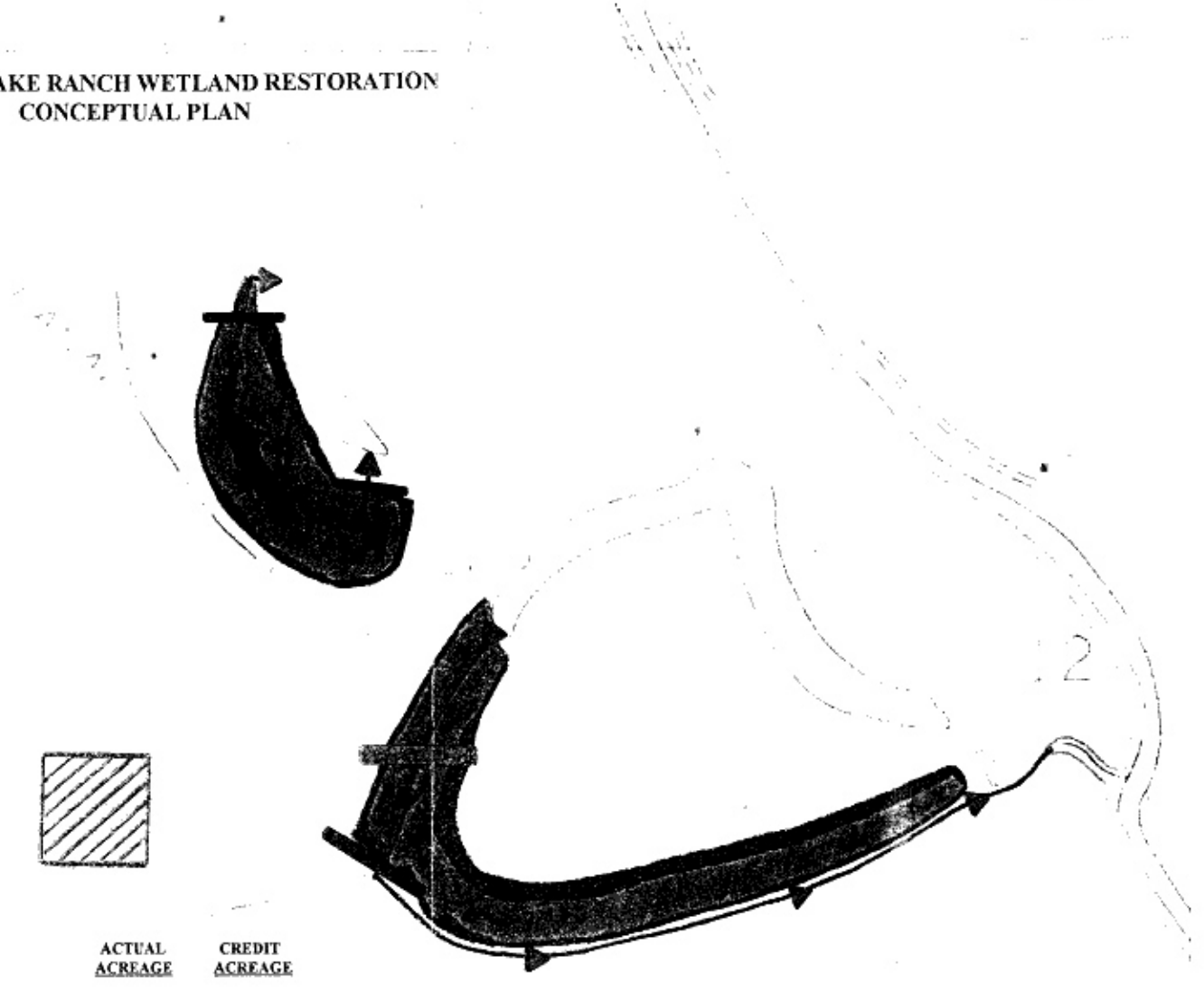
Appendix D

CONCEPTUAL SITE LAYOUT

MDT Wetland Mitigation Monitoring
Musgrave Lake
Zurich, Montana

LAND & WATER

MUSGRAVE LAKE RANCH WETLAND RESTORATION
CONCEPTUAL PLAN



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

Appendix E

BIRD SURVEY PROTOCOL
MACROINVERTEBRATE SAMPLING PROTOCOL
GPS PROTOCOL

MDT Wetland Mitigation Monitoring
Musgrave Lake
Zurich, Montana

LAND & WATER

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.

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.

GPS Mapping and Aerial Photo Referencing Procedure

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

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

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

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