MONTANA DEPARTMENT OF TRANSPORTATION
WETLAND MITIGATION MONITORING REPORT: YEAR 2004

Circle Mitigation Site
Circle, Montana

Prepared for:

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

Prepared by:

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

June 2005

Project No: B43054.00 - 0406

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LAND & WATER

TABLE OF CONTENTS

TABLES

FIGURES

CHARTS

APPENDICES

Cover Photo: Shallow open water with *Scirpus* and *Puccinella* around circumference.

1.0 INTRODUCTION

This annual report summarizes methods and results from the fourth year (2004) of monitoring for the Montana Department of Transportation's (MDT) Circle mitigation site. The Circle wetland, located in Watershed #12 of the Glendive District, was constructed to mitigate the impacts for 1.7 acres of wetlands associated with MDT improvements to Highway 200. The site is located in McCone County along the northwest side of Highway 200 between highway markers 276.2 and 276.5, Section 20, Township 19 North, Range 48 East **(Figure 1)**. Elevations are approximately 2,430 feet above sea level.

The Circle wetland was constructed in 1999 in a former oxbow of the Redwater River **(Figure 2, Appendix A)**. The pre-project wetland limits are shown on **Figure 3, Appendix A** and total approximately 2.98 acres. This project was developed in part to compensate for 1.7 acres of wetland impacts resulting from the Southwest-Brockway East project (Harris 1998).

2.0 METHODS

2.1 Monitoring Dates and Activities

The Circle wetland was monitored on July 13, 2004. All information contained within 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; functional assessment; and maintenance assessment of any inflow/outflow structures.

2.2 Hydrology

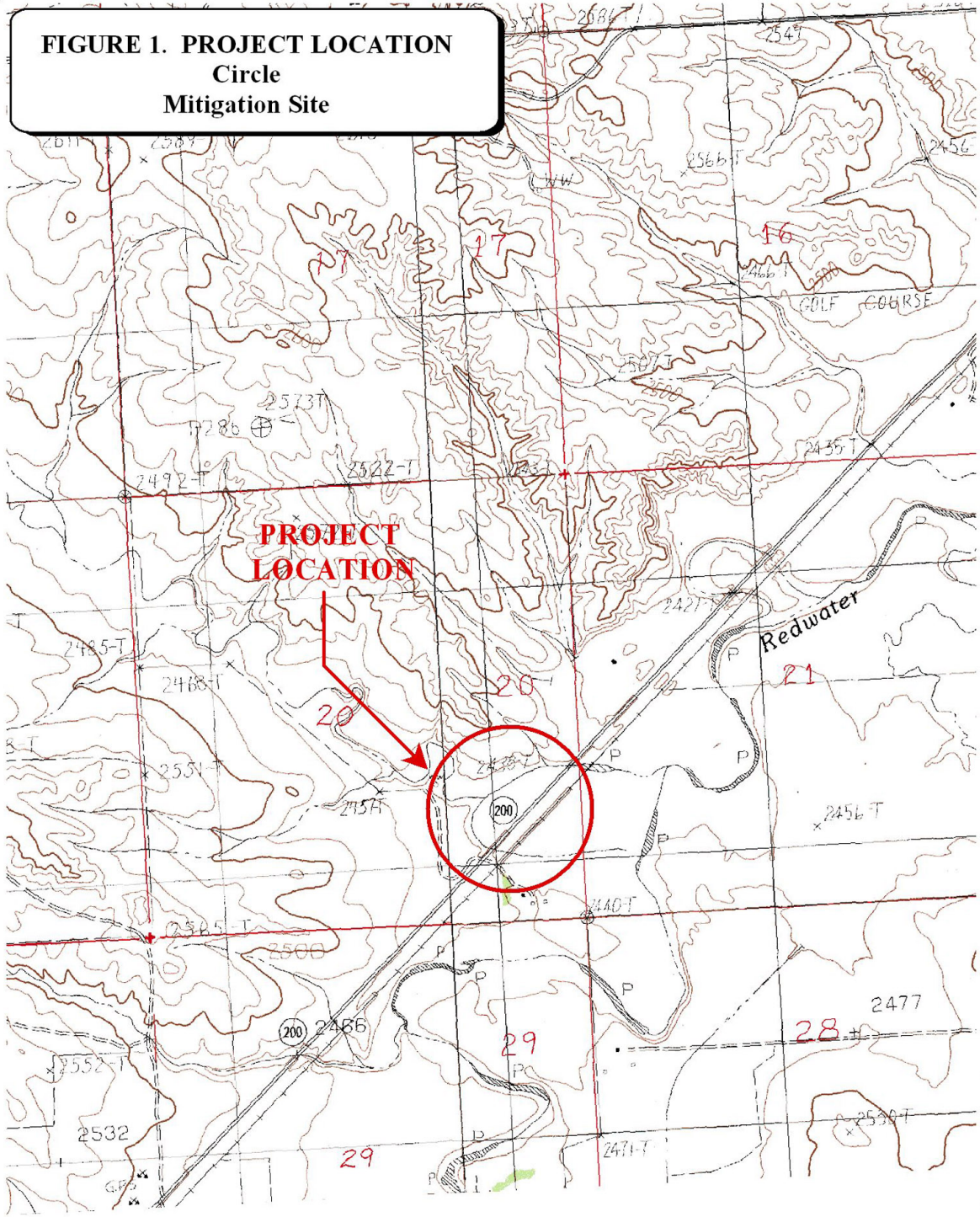
Wetland hydrology indicators were recorded using procedures outlined in the US Army Corps (COE) 1987 Wetland Delineation Manual. Hydrology data were recorded on the Routine Wetland Delineation Data Form **(Appendix B)** at each wetland determination point. Precipitation data for the year 2004 were compared to the 1963-2004 average (WRCC 2005).

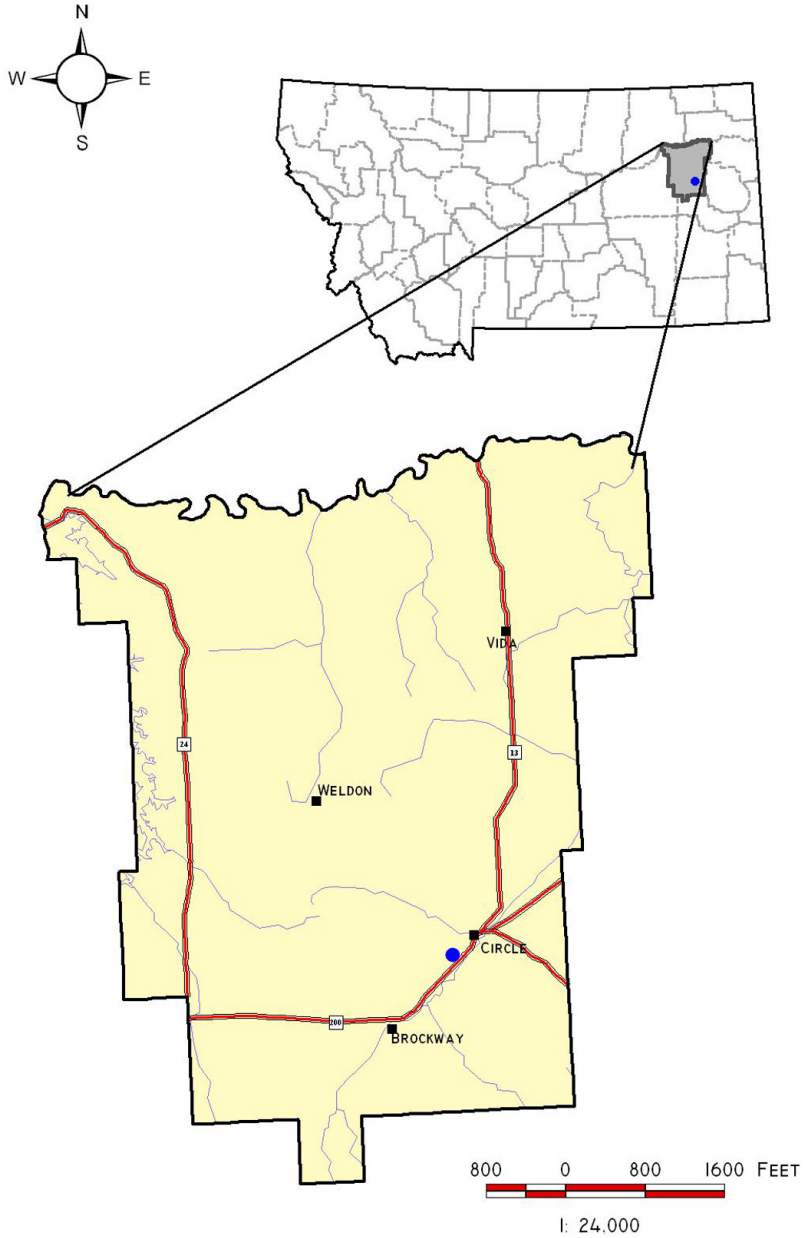
All additional hydrologic data were recorded on the mitigation site monitoring form **(Appendix B)**. The boundary between emergent vegetation and open water was mapped on the aerial photograph **(Figure 3, Appendix A)**. There are no groundwater monitoring wells at the site.

2.3 Vegetation

General vegetation types were delineated on an aerial photograph during the site visit (**Figure 3, Appendix A)**. Coverage of the dominant species in each community type is

FIGURE 1. PROJECT LOCATION
Circle
Mitigation Site





PROJECT #: 130091.021
DATE: APRIL 2001
LOCATION:
PROJECT MANAGER: B. DUTTON
DRAWN BY: B. NOECKER

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listed on the monitoring form **(Appendix B)**. A comprehensive plant species list for the entire site was compiled and is updated as new species are encountered. Observations from past years are compared with new data to document vegetation changes over time. Woody species were not planted at this site; consequently, no monitoring of planted woody species survival was conducted.

The vegetation transect established in 2002 and monitored in previous years was again sampled in 2004. The location of the vegetation transect is shown on **Figure 2, Appendix A**. Percent cover for each species was recorded on the vegetation transect form **(Appendix B)**. Transect ends were marked with metal fence posts and their locations recorded on the vegetation map. Photos of the transect were taken from both ends during the site visit.

2.4 Soils

Soils were evaluated during the site visit according to the procedure outlined in the COE 1987 Wetland Delineation Manual. Soil data were recorded for each wetland determination point on the COE Routine Wetland Delineation Data Form **(Appendix B)**.

2.5 Wetland Delineation

A wetland delineation was conducted within the assessment area according to the 1987 COE Wetland Delineation Manual. Wetland and upland areas within the monitoring area were investigated for the presence of wetland hydrology, hydrophytic vegetation and hydric soils. The indicator status of vegetation was derived from the National List of Plant Species that Occur in Wetlands: North Plains Region 4 (Reed 1988). The information was recorded on the COE Routine Wetland Delineation Forms **(Appendix B)**. The wetland/upland and open water boundaries were used to calculate the wetland area.

2.6 Mammals, Reptiles, and Amphibians

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

2.7 Birds

Bird observations were recorded during the site visit according to the established bird survey protocol **(Appendix D).** A general, qualitative bird list has been compiled using these observations. .

2.8 Macroinvertebrates

One macroinvertebrate sample was collected during the 2004 site visit following the sampling protocol **(Appendix E)**. Samples were preserved as outlined in the sampling procedure and sent

to Rhithron Associates for analysis. The approximate sampling location is indicated on **Figure 2, Appendix A**. Results are included in **Appendix F**.

2.9 Functional Assessment

A functional assessment form was completed in 2004 for the Circle mitigation site using the 1999 MDT Montana Wetland Assessment Method. Field data necessary for this assessment were collected on a condensed data sheet. The remainder of the assessment was completed in the office **(Appendix B)**.

2.10 Photographs

Photographs were taken showing the current land use surrounding the site, the wetland buffer, the monitored area, and the vegetation transect. A description and compass direction for each photograph are recorded on the wetland monitoring form.

During the 2001 monitoring season, each photo-point was marked on the ground with a wooden stake and the location recorded with a resource grade GPS **(Appendix C)**. The approximate locations are shown on **Figure 2, Appendix A**. Photographs were taken from the same locations during the 2004 site visit. All photographs were taken using a digital camera. A 2004 aerial photo is included in **Appendix C**.

2.11 GPS Data

During the 2001 monitoring season, survey points were collected using a resource grade Trimble, Geoexplorer III hand-held GPS unit **(Appendix D)**. Points collected included: the vegetation transect beginning and ending locations; photograph locations; and the jurisdictional wetland boundary. In addition, during the August 2001 monitoring season survey points were collected at four (4) landmarks recognizable on the air photo for purposes of line fitting to the topography. No new GPS data were collected during the 2004 field season; changes in the wetland boundary, vegetation communities, location of the vegetation transect, and the sample point locations were mapped on an aerial photograph.

2.12 Maintenance Needs

No bird boxes or inflow structures occur at this site. There is a small containment structure in the lowest elevation of the oxbow that was installed to maintain water in the wetland for longer periods (Sickerson, pers. comm.). This structure is less than 1.5 feet in height and overflows are conveyed through a box culvert under the roadway and into the Redwater River. The structure was examined (non-engineering) for any obvious maintenance needs.

3.0 RESULTS

3.1 Hydrology

The Circle mitigation site was constructed in 1999 to be a 4.3-acre wetland adjacent to an historic oxbow of the Redwater River. The hydrologic source is primarily groundwater and an unnamed intermittent stream that flows from the upper bench between the cliff bands and into the historic and created wetlands. A containment area was excavated at the lowest elevation of the oxbow to retain water in the wetland for longer periods. Excess water simply flows out through a box culvert under the highway and into the Redwater River. During the July 13, 2004 visit, approximately 6% of the assessment area (including historic wetland) was inundated (<12" depth).

Precipitation data for the Circle station indicate that the yearly average (1963-2004) is 13.32 inches (WRCC, 2005); through the month of July the precipitation average is 9.11 inches. During 2004, precipitation through the month of July was 5.35 inches or 59% of the average.

3.2 Vegetation

Vegetation species identified on the site are presented in **Table 1** and in the monitoring form **(Appendix B)**. Five (5) dominant vegetation communities were mapped on the mitigation area (**Figure 3, Appendix A**). The communities include: Type 1, *Agropyron smithii*; Type 2, *Scirpus* species*;* Type 3, *Scirpus* species*/Distichlis stricta; Type 4, Juncus effuses/Carex praegracilis; and Type 5, Distichlis stricta/Hordeum jubatum.* Dominant species within each community are listed on the monitoring form **(Appendix B)**. The 2001 and 2002 transect data are included for comparison, although the transect was moved to a new location in 2002; **Table 2, Chart 1, and Chart 2** illustrate data trends over time. Percent of the transect length dominated by hydrophytic vegetation has increased from 29% in 2002 to 92% in 2004.

Table 1: ***2001-2004 Circle wetland mitigation vegetation species list.***

Scientific Name[1]	Region 4 (North Plains) Wetland Indicator Status[2]
Agropyron cristatum	-(UPL)
Agropyron smithii	FACU
Artemisia tridentate	-(UPL)
Brassica spp.	FACW+
Bromus japonicus	FACU
Carex praegracilis	FACW
Chenopodium spp.	(FAC-FACW)
Cirsium arvense	FACU
Distichlis stricta	-(FACW)
Elaeagnus angustifolia	FAC
Eleocharis palustris	OBL
Glyceria grandis.	OBL
Grindelia spp.	(likely FACU)
Hordeum jubatum	FACW
Juncus balticus	OBL
Juncus effuses	OBL
Kochia spp.	FAC
Poa fendleriana	FACU
Rumex crispus	FACW
Scirpus acutus	OBL
Scirpus pungens	OBL
Scirpus maritimus	-(OBL)
Stipa spp.	(UPL)
Trifolium spp.	(FACU)
Typha latifolia	OBL

[1] **Bolded** species indicate those documented within the analysis area for the first time in 2004.
[2] Species either not included or classified as "non-indicator" in the *National List of Plant Species that Occur in Wetlands: North Plains (Region 4)* (Reed 1988); status in parentheses are probable and based on biologist's experience.

Table 2: ***2001-2004 transect data summary.***

Monitoring Year	2001[1]	2002	2003	2004
Transect Length (feet)	40	132	132	132
# Vegetation Community Transitions along Transect	1	5	3	3
# Vegetation Communities along Transect	2	3	2	3
# Hydrophytic Vegetation Communities along Transect	1	2	2	2
Total Vegetative Species	8	9	7	6
Total Hydrophytic Species	3	8	6	5
Total Upland Species	5	1	1	1
Estimated % Total Vegetative Cover	75	36	77	77
% Transect Length Comprised of Hydrophytic Vegetation Communities	50	29.5	67	92
% Transect Length Comprised of Upland Vegetation Communities	50	6	9	8
% Transect Length Comprised of Unvegetated Open Water	0	29.5	0	0
% Transect Length Comprised of Bare Substrate	0	34	24	0

[1] Transect moved in 2002.

Chart 1: ***Length of vegetation communities along Transect 1. The 2001 transect was moved and is not shown in the bar graph.***

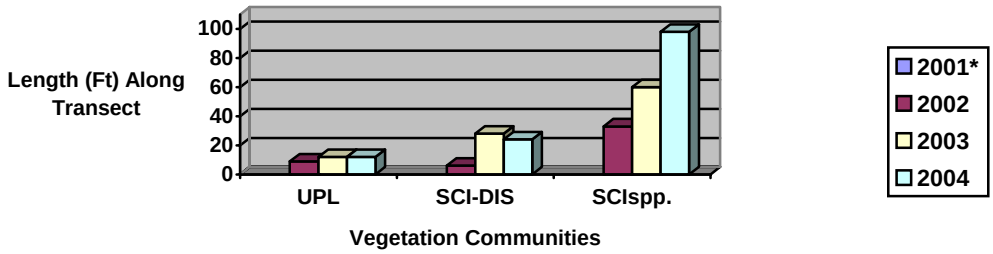
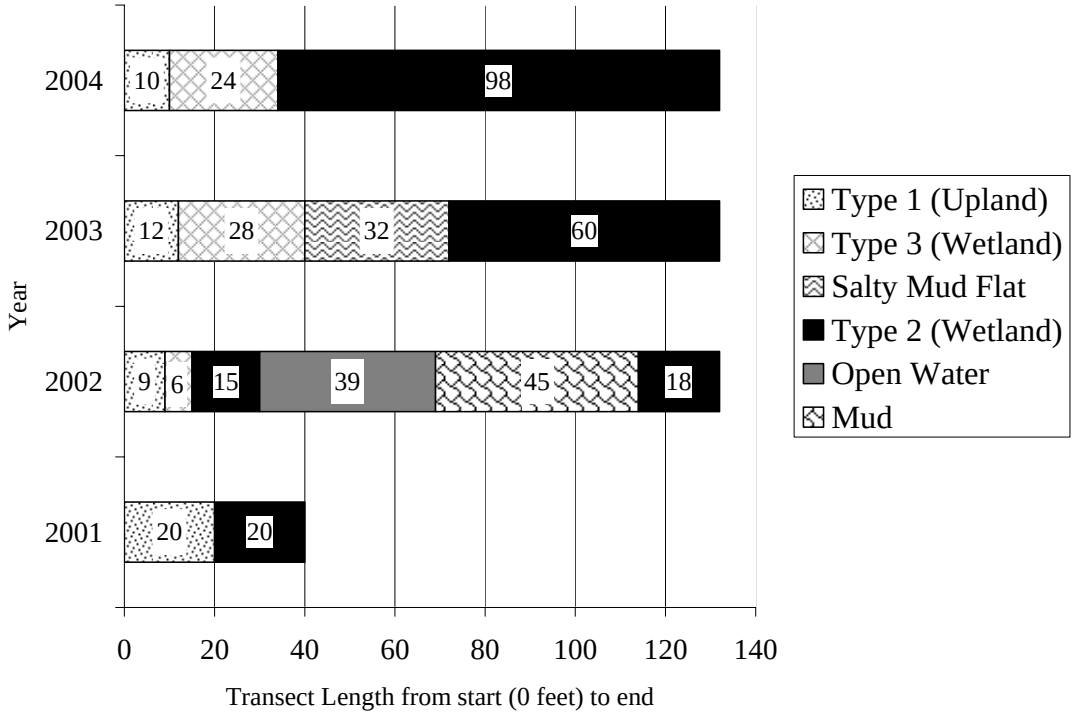


Chart 2: ***Transect maps showing vegetation types from the start (0 feet) to the end of Transect (40 feet in 2001 and 132 feet in 2002-2004).***



3.3 Soils

The site was mapped as part of the McCone County Soil Survey. The dominant soil on the site is the Havrelon loam (Map Unit 86). This deep, well-drained soil is formed in alluvium on low terraces and floodplains of the Missouri and Redwater Rivers and their tributaries. Havrelon soils and the inclusions of Trembles, Cherry, and Ridgelaw soils are not listed on the Montana NRCS Hydric Soil list.

Soils were sampled at one wetland (SP-1) and one upland (SP-2) location. Soils at SP-1 at a depth of 10 inches were a very dark gray (2.5Y 3/1) sandy loam. The soil was saturated to the

surface. Soils at SP-2 were an olive brown (10YR 4/4) sandy loam at 10 inches; no saturation or hydric indicators were noted.

3.4 Wetland Delineation

The delineated wetland boundary is depicted on **Figure 3, Appendix A**. According to the MDT, approximately 2.98 acres of wetlands occurred at the site prior to mitigation construction. The gross wetland area has stabilized at 7.6 acres, and wetland vegetation cover has increased to 94%. The unvegetated shallow (<1 foot) open water area (0.49 acre) is included in the 7.6 gross wetland acreage. Observations in past years indicate that these shallow water areas typically evaporate by late summer and become vegetated over time. The COE data forms are included in **Appendix B**.

3.5 Wildlife

Wildlife species are listed in **Table 3.** Activities and densities associated with these observations area included on the monitoring form in **Appendix B**. Mammal observations were limited to deer tracks. No bird boxes have been installed at this site. A pair of Wilson's Phalaropes were exhibiting defensive behavior in the shallow water pond and this indicates that an active nest may be on site. A spring bird visit would likely result in increased avian observations.

Table 3: ***Wildlife species observed at the Circle Mitigation Site*[1]**.

Birds	
American coot (*Fulica Americana*)	**Killdeer (*Charadrius vociferous)***
Barn Swallow (*Hirundo rustica*)	Mallard (*Anas platyrhynchos)*
Black Tern (*Chlidonias niger*)	Red-winged Black bird (*Agelaius phoeniceus*)
Eastern Kingbird (*Tyrannus tyrannus*)	Spotted sandpiper (*Actitis macularia*)
Greater Yellow Legs (*Tringa melanoleuca*)	Tree Swallow (*Tachycineta bicolor*)
Blue winged teal (*Anas discors*)	Western Meadowlark (*Sturnella neglecta*)
Cinnamon teal (*Anas cyanoptera*)	Willet (*Catoptrophorus semipalmatus*)
Common Nighthawk (*Chordeiles minor*)	**Wilson's Phalarope (*Phalaropus tricolor*)**
Common snipe (*Gallinago gallinago*)	
MAMMALS	
Deer tracks (*Odocoileus* spp.)	
Coyote tracks (*Canis latrans*)	

[1]**Bolded** species were observed during the 2004 monitoring. All other species were observed during one or more of the previous monitoring years, but not during 2004.

3.6 Macroinvertebrates

Bioassessment scores indicated sub-optimal biotic conditions at this site (Bollman 2004, **Appendix E**), although it should be noted that the site is an alkaline system and was measured against freshwater parameters. The biotic index value for the assemblage, however, was below the median for studied sites, indicating that water quality was better than average here. The dominance by *Cricotopus (Isocladius)* sp., a midge, and *Lestes* sp., a damselfly, suggests that macrophytes were an available source of colonizable space. Water column and benthic animals were also collected, so habitats were complex.

3.7 Functional Assessment

Completed functional assessment forms are included in **Appendix B** and summarized below in **Table 3**. The 1998 baseline functional assessment resulted in a Category III (43%) rating. In 2001, the site was rated as a Category II (66%) wetland. The wetland has rated as a Category II wetland since 2002. An adjustment was made to the short and long term surface water storage value to acknowledge the water-holding capacity of the nearly fully vegetated wetland. The functional units have therefore increased 25% within the new wetland acreage since 2001. It is unlikely that the rating of this wetland will improve further unless structural diversity is increased by planting with shrubs and trees and maintaining the cattle-exclusion conditions. Providing water-access points for cattle would not damage the wetland as a whole and only disturb a few controlled areas.

3.8 Photographs

Representative photos taken from photo points and transect ends are included in **Appendix C.** The 2004 aerial photograph is also included in **Appendix C.**

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

Function and Value Parameters From the 1999 MDT Montana Wetland Assessment Method	2001	2002	2003	2004
Listed/Proposed T&E Species Habitat	Low (.3)	Low (.3)	Low (.3)	Low (.3)
MNHP Species Habitat	Moderate (.6)	High (.8)	High (.8)	High (.8)
General Wildlife Habitat	Exceptional (1)	Exceptional (1)	Exceptional (1)	Exceptional (1)
General Fish/Aquatic Habitat	NA	NA	NA	NA
Flood Attenuation	Moderate (.5)	Moderate (.5)	Moderate (.5)	Moderate (.5)
Short and Long Term Surface Water Storage	Moderate (.7)	High (.8)	High (.8)	High (.9)
Sediment, Nutrient, Toxicant Removal	High (1)	High (1)	High (1)	High (1)
Sediment/Shoreline Stabilization	High (1)	High (1)	High (1)	High (1)
Production Export/Food Chain Support	Moderate (.7)	Moderate (.7)	Moderate (.7)	Moderate (.7)
Groundwater Discharge/Recharge	High (1)	High (1)	High (1)	High (1)
Uniqueness	Moderate (.4)	Moderate (.4)	Moderate (.4)	Moderate (.4)
Recreation/Education Potential	Low (.1)	High (1)	High (1)	High (1)
Actual Points/ Possible Points	7.3/11	8.5/11	8.5/11	8.6/11
% of Possible Score Achieved	66%	77%	77%	78%
Overall Category	II	II	II	II
Total Acreage of Assessed Wetlands within Monitoring Area (ac) [1]	**7.33**	**7.60**	**7.60**	**7.60**
Total Functional Units (acreage x actual points) (fu)	**53.73**	**64.6**	**64.6**	**65.4**
Net Acreage Gain ("new" wetlands) (ac)	**4.35**	**4.62**	**4.62**	**4.62**
Net Functional Unit Gain (new acreage x actual points) (fu)	**31.76**	**39.27**	**39.27**	**39.73**

[1] 2.98 pre-existing wetlands.

3.9 Maintenance Needs/Recommendations

No maintenance is required at this site. The cattle exclusion fence was intact and it is recommended that the fence be maintained in perpetuity while providing watering access points.

3.10 Current Credit Summary

The Circle Wetland has met the 4.3-acre wetland creation goal. The site currently contains 7.11 acres of wetlands and 0.49 acre of open water, for a total of 7.6 acres. Subtracting the pre-existing wetlands (2.98) yields a net gain of 4.62 acres. The shallow open water area provides optimum habitat for shorebirds and is intermittent in nature. Wetlands impacted during the Southwest-Brockway East projects totaled 1.7 acres. Consequently, approximately 2.92 acres of "credit" may remain at this site for application to other projects as of 2004.

The created wetland is 94% vegetated and does include very small saline mud flat areas (see photos D and E) which likely inundate during precipitation events. A wetland mosaic of primarily emergent vegetation with small pools of open water and/or mud flats provides optimal habitat for wildlife.

The wetland has rated as a Category II wetland since 2002. The functional units have increased 25% within the new wetland acreage since 2001. A continuation of the livestock fence around the Circle wetland is highly recommended to protect the sensitive wetland environment. Several watering access points for livestock could be incorporated, which would limit vegetation trampling to a small number of areas.

4.0 REFERENCES

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USDA Natural Resource Conservation Service (NRCS). 1984. *Soil Survey of McCone County, Montana.*

Western Regional Climate Center (WRCC). 2005. Circle, Montana Station: http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?mtcirc

Appendix A

FIGURES 2 & 3

MDT Wetland Mitigation Monitoring
Circle Mitigation Site
Circle, Montana

Figure 2 -Monitoring Activity Locations 2004

N
W E
S

SCALE 1"=150 ft

Legend

- Monitoring Area Limits
- Vegetation Transect
- Photograph Point
- Aerial Reference Point
- Soil Sample Point
- Macro-Invertebrate Sample Point (MS)
- Base photograph July 17, 2001

Monitoring Area Limits

1
2
3
4
E
D
H
End
SP-1
Transect 1
SP-2
Begin
G
F
MS
ABC
Monitoring Area Limits
Monitoring Area Limits

PROJECT NAME: MDT Circle Wetland Mitigation
DRAWING TITLE: Monitoring Activity Locations 2004

PROJ NO: 330054.406
FILE NAME: TASK406BASE2004.dwg
SCALE: 1"= 150 ft
LOCATION: Circle

DRAWN: RA/SH
CHECKED:
APPVD: BD
PROJ MGR: BD

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Missoula, MT 59807

SHEET NUMBER
2 OF

REV 02
DATE: 06/23/05

Figure 3 -Mapped Site Features 2004

N
W E
S

SCALE 1"=150 ft

Legend

- Monitoring Area Limits
- Wetland Boundary
- Vegetation Community Boundary
- Open Water Boundary

Base photograph July 17, 2001

Wetland Area 2004

Estimated Historic Wetland	2.98 Acres
Gross Wetland 2004	4.62 Acres
(Outside of Est. Historic Wetland)	
Open Water (included in Gross Wetland Area)	0.49 Acre

Vegetation Community Type

1. Agropyron smithii
2. Scirpus spp.
3. Scirpus pungens/Carex praegracilis
4. Carex praegracilis
5. Distichlis stricta/ Hordeum jubatum
6. Puccinellia nuttalliana

Monitoring Area Limits

Est. Historic Wetland

Open Water

Monitoring Area Limits

Monitoring Area Limits

PROJECT NAME: MDT Circle Wetland Mitigation

DRAWING TITLE: Mapped Site Features 2004

PROJ NO: 330054.406	DRAWN: RA/SH		
FILE NAME: TASK406BASE2004.dwg	CHECKED: LB		
SCALE: 1"= 150 ft	APPVD: JB		
LOCATION: Circle	PROJ MGR: JB		

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REV 02

DATE: 06/23/05

Appendix B

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

MDT Wetland Mitigation Monitoring
Circle Mitigation Site
Circle, Montana

LWC / MDT WETLAND MITIGATION SITE MONITORING FORM

Project Name:__Circle_____ Project Number:_130091-406___ Assessment Date:_7/13/04_
Location:____Circle, MT_____ MDT District:___5____ Milepost:__276_____
Legal description: T 19N__ R__48E__ Section __20__ Time of Day:__1-3 PM_
Weather Conditions:_clear_(clouds of mosquitos!)_ Person(s) conducting the assessment:__LBacon____
Initial Evaluation Date:__8_/_29_/03_ Visit #:__4___ Monitoring Year:___2004_____
Size of evaluation area:___~8 acres Land use surrounding wetland:_____range_____

HYDROLOGY

Surface Water Source:____ unnamed tributary of Redwater River_____
Inundation**:** Present__X__ Absent____ Average depths:__0.5__ft Range of depths:_0-1__ft
Assessment area under inundation:__6%
Depth at emergent vegetation-open water boundary:__0.5 __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.): __ **saturated salt flats; water/sediment stains__**

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-recent open water boundary on air photo
__X__Observe extent of (recent) surface water during each site visit and look for evidence of past surface water elevations (drift lines, erosion, vegetation staining etc.)
_hand-drawn-2004____GPS survey groundwater monitoring wells locations if present

COMMENTS/PROBLEMS: _____

VEGETATION COMMUNITIES

Community No.:_1_ Community Title (main species):____*Agropyon smithii*_____

Dominant Species	% Cover	Dominant Species	% Cover
Agropyon smithii	50		
Cirsium arvense	<10		
Stipa spp.	<10		
Kochia spp.	30		

COMMENTS/PROBLEMS: _____

Community No.:_2___ Community Title (main species):_____ *Scirpus species*_____

Dominant Species	% Cover	Dominant Species	% Cover
Scirpus pungens	80	*Distichlis stricta*	2
Scirpus maritimus	10	*Juncus balticus (or effuses)*	<1
Scirpus acutus	<1		
Puccinella nutaliana	<5		
Hordeum jubatum	<5		

COMMENTS/PROBLEMS: ____Recollect Juncus 2005; investigate whether all is *J. effuses* or *balticus*.

Community No.:__3__ Community Title (main species):__ *Scirpus species / Distichlis stricta*

Dominant Species	% Cover	Dominant Species	% Cover
Scirpus pungens	25	*Puccinellia nuttalliana*	10
Scirpus maritimus	5	*Eleocharis palustris*	10
Poa fendlerana	5	*Distichlis stricta*	15
Chenopodium spp.	5	*Carex praegracilis*	20
Hordeum jubatum	5		

COMMENTS/PROBLEMS: _____*Glyceria* not present; actually *Puccinellia* sp._____

Additional Activities Checklist:
__X__Record and map vegetative communities on air photo

VEGETATION COMMUNITIES (continued)

Community No.:__4__ Community Title (main species):____ *Juncus effuses/Carex praegracilis* _____

Dominant Species	% Cover	Dominant Species	% Cover
Carex praegracilis	45	*Disticlis stricta*	<5
Chenopdium spp.	<5	*Poa fendlerana*	<1
Hordeum jubatum	<5	*Juncus effuses (see note)*	40
Scirpus pungens	5		

COMMENTS/PROBLEMS: __ recollect Juncus 2005; investigate whether all is *J. effuses* or *balticus*. __

Community No.:_5___ Community Title (main species):__*Disticlis stricta/Hordeum jubatum*_____

Dominant Species	% Cover	Dominant Species	% Cover
Disticlis stricta	50		
Hordeum jubatum	40		
Scirpus pungens/Scirpus spp.	<5		
Juncus effuses	<5		

COMMENTS/PROBLEMS: ___This area not investigated in 2004; beyond boundary fence of wetland creation._____

Community No.:__6__ Community Title (main species):____*Puccinellia nuttalliana*_____

Dominant Species	% Cover	Dominant Species	% Cover
Puccinellia nuttalliana	60		
Disticlis stricta	15		
Scirpus pungens	25		

COMMENTS/PROBLEMS: _____

COMPREHENSIVE VEGETATION LIST

Species	Vegetation Community Number(s)	Species	Vegetation Community Number(s)
Agropyron cristatum	1		
Agropyron smithii	1		
Artemisia tridentate	1		
Brassica spp.	1		
Bromus japonicus	1		
Carex praegracilis	3, 4		
Chenopodium spp.	3		
Cirsium arvense	1		
Distichlis stricta	1, 2, 3, 4, 6		
Elaeagnus angustifolia	1		
Eleocharis palustris	3		
Grindelia spp.	1		
Hordeum jubatum	1, 2, 3		
Juncus effuses	2,4		
Kochia spp.	1		
Poa fendlerana	3,4		
Puccinellia nuttaliana	2, 3, 6		
Rumex crispus	1		
Scirpus acutus	2		
Scirpus maritimus	2		
Scirpus pungens	2,3, 4, 6		
Stipa spp.	1		
Trifolium spp.	1		
Typha latifolia	2		
Bold denotes seen for first time in 2004.			

COMMENTS/PROBLEMS: _____

_____

_____

_____

PLANTED WOODY VEGETATION SURVIVAL

Species	Number Originally Planted	Number Observed	Mortality Causes
NONE			

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
Deer		X			
raccoon		X			

Additional Activities Checklist:
__X___Macroinvertebrate sampling (if required)

COMMENTS/PROBLEMS: _____

PHOTOGRAPHS

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

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

Location	Photograph Description	(2001) Compass Readings
A	wetland view	N
B	upland use (across WL)	320
C	WL buffer (across WL)	W
D	wetland view	W
E	wetland view	S
F	wetland view	E
G	Beginning transect (new 2002)	NW
H	End transect (new 2002)	SE

COMMENTS/PROBLEMS: _____

*GPS SURVEYING

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

Checklist:

__X___ Jurisdictional wetland boundary
__no-2004___4-6 landmarks recognizable on the air photo
__X__ Start and end points of vegetation transect(s)
__X__ Photo reference points
_none__ Groundwater monitoring well locations

COMMENTS/PROBLEMS: *Data in checklist was hand-drawn for the 2004 investigation.

WETLAND DELINEATION

(Attach Corps of Engineers delineation forms)

At each site conduct the items on the checklist below:
__X____Delineate wetlands according to the 1987 Army Corps manual.
__X___ Delineate wetland-upland boundary on the air photo
__X*___ Survey wetland-upland boundary with a resource grade GPS survey

COMMENTS/PROBLEMS: _ *boundary hand-drawn 2004_____

FUNCTIONAL ASSESSMENT

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

COMMENTS/PROBLEMS: _____

MAINTENANCE

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

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

COMMENTS/PROBLEMS: Outflow area constructed to slow passage of water out of the wetland and to allow ponding; outlet stream not impeded and culvert clear.

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: Circle Date: 7/13/04 Examiner: LB Transect # 1

Approx. transect length: 132' Compass Direction from Start (Upland): 315 deg.

Vegetation type A:	CT 1	
Length of transect in this type:	10'	feet
Species:		Cover:
HORJUB		45
DISSTR		35
AGRSMI		15
PUCNUT		5
(soils did not qualify as wetland)		
Total Vegetative Cover:		100%

Vegetation type B:	CT 3	
Length of transect in this type:	24'	feet
Species:		Cover:
SCIPUN		99
SCIMAR		1
Total Vegetative Cover:		100%

Vegetation type C:	CT2	
Length of transect in this type:	98'	feet
Species:		Cover:
Saturated mud flat w/ salt deposits		20
SCIMAR/SCIPUN		65
DISSTR		15
Total Vegetative Cover:		80%

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 100% % 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:

Vegetation coverage is increasing.

3/01 rev

BIRD SURVEY – FIELD DATA SHEET

Page__1_of__1_
Date: 7/13/04
Survey Time: 2 PM

SITE: Circle, MT

Bird Species	#	Behavior	Habitat	Bird Species	#	Behavior	Habitat
Wilson's Phalarope	2	defensive	MA/OW				
Killdeer	2	defensive	MA				

Notes:

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

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

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

Project/Site: Circle Wetland	Date: 7-13-04
Applicant/Owner: MDT	County: McCone
Investigator: Lynn Bacon, Land & Water Consulting	State: MT
Do Normal Circumstances exist on the site: x Yes ___ No	Community ID: Emergent
Is the site significantly disturbed (Atypical Situation)? ___ Yes x No	Transect ID:
Is the area a potential Problem Area?: ___ Yes x No	Plot ID: SP-1
(If needed, explain on reverse.)	

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	*Scirpus pungens*	H	OBL	9			
2	.			10			
3				11			
4				12			
5				13			
6				14			
7				15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-). 1/ = 100%

Remarks: SP on the wetland end of the transect. Vegetation thriving except where normally inundated.

HYDROLOGY

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

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: ___ (in.)

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

Depth to Saturated Soil: surface (in.)

Wetland Hydrology Indicators:

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

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

Remarks:

Soil saturated in all wetland.

SOILS

Map Unit Name (Series and Phase): 86 Havrelon loam
Drainage Class: well
Taxonomy (Subgroup): NA
Field Observations
Confirm Mapped Type? - Yes - No

Profile Description:

Depth inches	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
10”	A	2.5Y 3/1			sandy loam

Hydric Soil Indicators:

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

Chroma is slightly high even w/ mottled soils to technically qualify as hydric soil, however there is organic streaking, and likely reducing and aquic moisture regime.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	X	Yes		No	
Wetland Hydrology Present?	X	Yes		No	
Hydric Soils Present?	X	Yes		No	Is this Sampling Point Within a Wetland? X Yes No

Remarks:

Wetland vegetation continues to expand within the WL boundary and the SE boundary has expanded approx. 10 feet.

Approved by HQUSACE 2/92

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

Project/Site: Circle Wetland	Date: 7-13-04
Applicant/Owner: MDT	County: McCone
Investigator: Lynn Bacon, Land & Water Consulting	State: MT
Do Normal Circumstances exist on the site: x Yes ___ No	Community ID: UPL
Is the site significantly disturbed (Atypical Situation)? ___ Yes x No	Transect ID:
Is the area a potential Problem Area?: ___ Yes x No	Plot ID: SP-2
(If needed, explain on reverse.)	

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	*Poa fendlerana*	H	FACU-	9			
2	*Grindelia sp.*	H	UPL	10			
3	*Agropyron smithii*	H	FACU	11			
4	*Hordeum jubatum*	H	FACW	12			
5				13			
6				14			
7				15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-). 1/4 = 25%

SP not within the wetland boundary. SCIPUN continues to grow into what was the upland edge; saturation zone may be expanding.

HYDROLOGY

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

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: NA (in.)

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

Depth to Saturated Soil: NA (in.)

Wetland Hydrology Indicators:

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

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

Remarks:

Soil profile dry this year.

SOILS

Map Unit Name (Series and Phase): 86 Havrelon loam
Drainage Class: well
Taxonomy (Subgroup): NA
Field Observations
Confirm Mapped Type? ____ Yes X No

Profile Description:

Depth inches	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
10”	A	2.5Y 4/4			sandy loam

Hydric Soil Indicators:

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

No hydric indicators.

WETLAND DETERMINATION

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

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

Remarks:

Wetland has expanded on this edge about 10 feet, but not as high as post where pit was excavated.

Approved by HQUSACE 2/92

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

1. Project Name: Circle **2. Project #:** 43054406 **Control #:** _____

3. Evaluation Date: 7/13/2004 **4. Evaluator(s):** LB/LWC **5. Wetland / Site #(s):** _____

6. Wetland Location(s) i. T: 19 N **R:** 48 E **S:** 20 **T:** __ N **R:** __ E **S:** _____

ii. Approx. Stationing / Mileposts: _____

iii. Watershed: 10060002 **GPS Reference No. (if applies):** _____

Other Location Information: _____

7. A. Evaluating Agency LWC

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

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

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

10. CLASSIFICATION OF WETLAND AND AQUATIC HABITATS IN AA

HGM CLASS [1]	SYSTEM [2]	SUBSYSTEM [2]	CLASS [2]	WATER REGIME [2]	MODIFIER [2]	% OF AA
Depression	Palustrine	None	Emergent Wetland	Intermittently Exposed	Excavated	90
Riverine	Riverine	Lower Perennial	Unconsolidated Bottom	Intermittently Flooded	---	10
---	---	---	---	---	---	
---	---	---	---	---	---	

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

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

12. GENERAL CONDITION OF AA

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

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

Comments: (types of disturbance, intensity, season, etc.) none

ii. Prominent weedy, alien, & introduced species: kochia

iii. Briefly describe AA and surrounding land use / habitat: cattle grazing outside of fenced WL, hwy to south

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

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

Comments: _____

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

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

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

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

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

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

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

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

Primary or Critical habitat **(list species)**	☐ D	☒ S	N.Leopard frog
Secondary habitat **(list species)**	☐ D	☒ S	Peregrin Falcon
Incidental habitat **(list species)**	☐ D	☒ S	Black Tern
No usable habitat	☐ D	☐ S	_____

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

Highest Habitat Level:	doc/primary	sus/primary	doc/secondary	sus/secondary	doc/incidental	sus/incidental	none
Functional Point and Rating	---	.8 (H)	---	---	---	---	---

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

14C. General Wildlife Habitat Rating

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

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

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

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

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

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

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

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

Comments: Surface water present, 2 Wilson's Phalarope exibiting defensive behavior. WIllow sprigs may survivie in location of original stream course location at base of upland bank.

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

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

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

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

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

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

Types of Fish Known or Suspected Within AA	**Modified Habitat Quality** from 14D(ii)			
	☐ Exceptional	☐ High	☐ Moderate	☐ Low
Native game fish	--	--	--	--
Introduced game fish	--	--	--	--
Non-game fish	--	--	--	--
No fish	--	--	--	--

Comments: _____

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

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

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

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

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

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

Applies to wetlands that flood or pond from overbank or in-channel flow, precipitation, upland surface flow, or groundwater flow.
If no wetlands in the AA are subject to flooding or ponding, check NA above.

i. Rating (Working from top to bottom, use the matrix below to arrive at the functional point and rating of high (H), moderate (M), or low (L) for this function.)
Abbreviations: P/P = permanent/perennial; S/I = seasonal/intermittent; T/E = temporary/ephemeral.

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

Comments: _____

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

Applies to wetlands with potential to receive excess sediments, nutrients, or toxicants through influx of surface or ground water or direct input.
If no wetlands in the AA are subject to such input, check NA above.

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

Sediment, Nutrient, and Toxicant Input Levels Within AA	AA receives or surrounding land use has potential to deliver low to moderate levels of sediments, nutrients, or compounds such that other functions are not substantially impaired. Minor sedimentation, sources of nutrients or toxicants, or signs of eutrophication present.				Waterbody on MDEQ list of waterbodies in need of TMDL development for "probable causes" related to sediment, nutrients, or toxicants **or** AA receives or surrounding land use has potential to deliver high levels of sediments, nutrients, or compounds such that other functions are substantially impaired. Major sedimentation, sources of nutrients or toxicants, or signs of eutrophication present.			
% cover of wetland vegetation in AA	☒ ≥ 70%		☐ < 70%		☐ ≥ 70%		☐ < 70%	
Evidence of flooding or ponding in AA	☒ Yes	☐ No	☐ Yes	☐ No	☐ Yes	☐ No	☐ Yes	☐ No
AA contains **no or restricted outlet**	1 (H)	--	--	--	--	--	--	--
AA contains **unrestricted outlet**	--	--	--	--	--	--	--	--

Comments: _____

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

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

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

% Cover of wetland streambank or shoreline by species with deep, binding rootmasses.	Duration of Surface Water Adjacent to Rooted Vegetation		
	☒Permanent / Perennial	☐Seasonal / Intermittent	☐Temporary / Ephemeral
≥ 65 %	1 (H)	--	--
35-64 %	--	--	--
< 35 %	--	--	--

Comments:

14I. PRODUCTION EXPORT / FOOD CHAIN SUPPORT

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

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

Comments:

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

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

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

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

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

Comments:

14K. UNIQUENESS

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

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

Comments:

14L. RECREATION / EDUCATION POTENTIAL

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

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

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

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

Ownership	Disturbance at AA from #12(i)		
	☒ Low	☐ Moderate	☐ High
Public ownership	1(H)	--	--
Private ownership	--	--	--

Comments: bird watching;plant ID

FUNCTION, VALUE SUMMARY, AND OVERALL RATING

Function and Value Variables	Rating	Actual Functional Points	Possible Functional Points	Functional Units (Actual Points x Estimated AA Acreage)
A. Listed/Proposed T&E Species Habitat	L	0.30	1	
B. MT Natural Heritage Program Species Habitat	H	0.80	1	
C. General Wildlife Habitat	E	1.00	1	
D. General Fish/Aquatic Habitat	NA		--	
E. Flood Attenuation	M	0.50	1	
F. Short and Long Term Surface Water Storage	H	0.90	1	
G. Sediment/Nutrient/Toxicant Removal	H	1.00	1	
H. Sediment/Shoreline Stabilization	H	1.00	1	
I. Production Export/Food Chain Support	M	0.70	1	
J. Groundwater Discharge/Recharge	H	1.00	1	
K. Uniqueness	M	0.40	1	
L. Recreation/Education Potential	H	1.00	1	
	Totals:	8.60	11.00	65
	Percent of Total Possible Points:		**78%** (Actual / Possible) x 100 [rd to nearest whole #]	

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

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

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

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

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

☐ **I** ☒ **II** ☐ **III** ☐ **IV**

Appendix C

REPRESENTATIVE PHOTOGRAPHS
2004 AERIAL PHOTOGRAPH

MDT Wetland Mitigation Monitoring
Circle Mitigation Site
Circle, Montana

2004 CIRCLE

Location: A **Description:** Wetland view **Compass Reading:** N

Location: B **Description:** Upland us (across WL) **Compass Reading:** 320°

Location: C **Description:** WL buffer (across WL) **Compass Reading:** W

Location: D **Description:** Wetland view **Compass Reading:** W

Location: E **Description:** Wetland view **Compass Reading:** S

Location: F **Description:** Wetland view **Compass Reading:** E

LAND & WATER

2004 CIRCLE

Location: G **Description:** Beginning transect **Compass Reading:** NW

Location: H **Description:** End transect **Compass Reading:** SE

LAND & WATER


JOB:CIRCLE SW WETLANDS ROLL:000 SCALE:1:6000 FLT:40 07/25/2004 13:27:11
FS160 1/ 240 f/5.6 FF4.0 EC 0 SIN dt734.4 27.3V -55mb

Circle 2004

Appendix D

BIRD SURVEY PROTOCOL
GPS PROTOCOL

MDT Wetland Mitigation Monitoring
Circle Mitigation Site
Circle, Montana

BIRD SURVEY PROTOCOL

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

Species Use within the Mitigation Wetland: Survey Method

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

Sites that can be circumambulated or walked throughout.

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

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

Sites that cannot be circumambulated.

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

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

Species Use within the Mitigation Wetland: Data Recording

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

1. Bird Species List

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

2. Bird Density

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

3. Bird Behavior

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

4. Bird Species Habitat Use

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

GPS Mapping and Aerial Photo Referencing Procedure

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

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

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

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

Appendix E

2004 MACROINVERTEBRATE SAMPLING PROTOCOL AND DATA

MDT Wetland Mitigation Monitoring
Roundup Wetland
Roundup, Montana

AQUATIC INVERTEBRATE SAMPLING PROTOCOL

Equipment List

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

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

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

Site Selection

Select the sampling site with these considerations in mind:

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

Sampling

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

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

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

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

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

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

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

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

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

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

Photograph the sampled site.

Sample Handling/Shipping

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

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

METHODS

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

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

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

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

Sample processing

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

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

Bioassessment metrics

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

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

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

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

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

RESULTS

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

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

Literature cited

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

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

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

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

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

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

Table 3a.

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

Table 3b.

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

Table 3d.

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

Aquatic Invertebrate Taxonomic Data

Site Name CIRCLE **Date Collected**

Order	Family	Taxon	Count	Percent	Unique	BI	FFG
Coleoptera							
	Curculionidae						
		Curculionidae	1	0.90%	Yes	5	SH
	Dytiscidae						
		Hygrotus	4	3.60%	Yes	5	PR
	Hydrophilidae						
		Berosus	6	5.41%	Yes	5	PR
		Enochrus	1	0.90%	Yes	5	CG
		Laccobius	1	0.90%	Yes	5	PR
Diplostraca							
		Cladocera	4	3.60%	Yes	8	CF
Diptera							
	Ceratopogonidae						
		Ceratopogoninae	5	4.50%	Yes	6	PR
	Chironomidae						
		Chironomus	3	2.70%	Yes	10	CG
		Cladotanytarsus	2	1.80%	Yes	7	CG
		Cricotopus (Isocladius)	43	38.74%	Yes	7	SH
		Psectrotanypus	1	0.90%	Yes	10	PR
		Tanytarsus	13	11.71%	Yes	6	CF
	Tabanidae						
		Tabanidae	1	0.90%	Yes	6	PR
Heteroptera							
	Corixidae						
		Corisella	1	0.90%	Yes	11	PR
Odonata							
	Lestidae						
		Lestes	23	20.72%	Yes	9	PR
	Libellulidae						
		Libellulidae	2	1.80%	Yes	9	PR
Grand Total			**111**				

Aquatic Invertebrate Data Summary

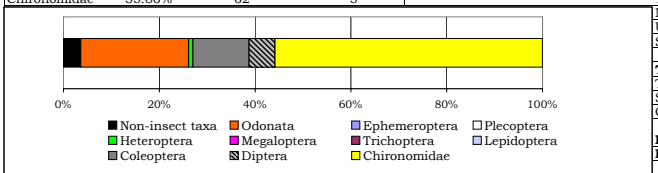
Project ID: MDT04LW
STORET Station ID:
Station Name: CIRCLE

Activity ID:
Sample Date:

Sample type	
SUBSAMPLE TOTAL ORGANISMS	111
Portion of sample used	66.67%
Estimated number in total sample	167
Conversion factor	2.018
Estimated number in 1 square meter	224
Sampling effort	
Habitat type	
EPT abundance	0
Taxa richness	16
Number EPT taxa	0
Percent EPT	0.00%

TAXONOMIC COMPOSITION

GROUP	PERCENT	ABUNDANCE	#TAXA
Non-insect taxa	3.60%	4	1
Odonata	22.52%	25	2
Ephemeroptera	0.00%	0	0
Plecoptera	0.00%	0	0
Heteroptera	0.90%	1	1
Megaloptera	0.00%	0	0
Trichoptera	0.00%	0	0
Lepidoptera	0.00%	0	0
Coleoptera	11.71%	13	5
Diptera	5.41%	6	2
Chironomidae	55.86%	62	5



TAXONOMIC RATIOS

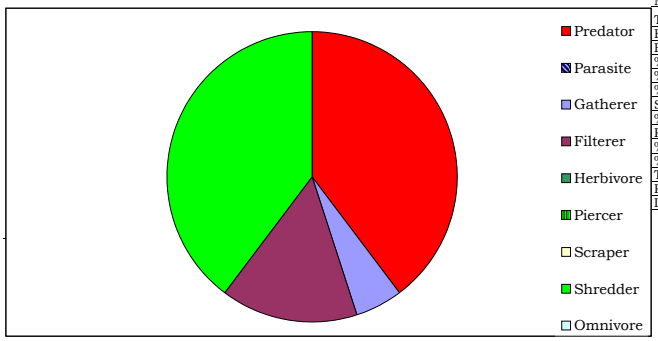
METRIC	VALUE
EPT/Chironomidae	0.00
Baetidae/Ephemeroptera	#DIV/0!
Hydropsychidae/Trichopt	#DIV/0!

FUNCTIONAL COMPOSITION

GROUP	PERCENT	ABUNDANCE	#TAXA
Predator	39.64%	44	9
Parasite	0.00%	0	0
Gatherer	5.41%	6	3
Filterer	15.32%	17	2
Herbivore	0.00%	0	0
Piercer	0.00%	0	0
Scraper	0.00%	0	0
Shredder	39.64%	44	2
Omnivore	0.00%	0	0
Unknown	0.00%	0	0

FUNCTIONAL RATIOS

METRIC	VALUE
Scraper/Filterer	0.00
Scraper/Scraper + Filtere	0.00



COMMUNITY TOLERANCES

Sediment tolerant taxa	0
Percent sediment tolerant	0.00%
Sediment sensitive taxa	0
Percent sediment sensitive	0.00%
Metals tolerance index (McGuire)	3.33
Cold stenotherm taxa	0
Percent cold stenotherms	0.00%

HABITUS MEASURES

Hemoglobin bearer richness	2
Percent hemoglobin bearers	3.60%
Air-breather richness	5
Percent air-breathers	11.71%
Burrower richness	3
Percent burrowers	8.11%
Swimmer richness	4
Percent swimmers	30.63%

DOMINANCE

TAXON	ABUNDANCE	PERCENT
Cricotopus (Isocladius)	43	38.74%
Lestes	23	20.72%
Tanytarsus	13	11.71%
Berosus	6	5.41%
Ceratopogoninae	5	4.50%
SUBTOTAL 5 DOMINANTS	90	81.08%
Cladocera	4	3.60%
Hygrotus	4	3.60%
Chironomus	3	2.70%
Libellulidae	2	1.80%
Cladotanytarsus	2	1.80%
TOTAL DOMINANTS	105	94.59%

TOLERANCE/CONDITION INDICES

Community Tolerance Quotient (CTQa)	102.86
Hilsenhoff Biotic Index	7.19

DIVERSITY

Shannon H (loge)	2.58
Shannon H (log2)	1.79
Margalef D	3.18
Simpson D	0.21
Evenness	0.11

VOLTINISM

TYPE	ABUNDANCE	# TAXA	PERCENT
Multivoltine	66	6	59.46%
Univoltine	30	4	27.03%
Semivoltine	14	5	12.61%

TAXA CHARACTERS	#TAXA	PERCENT
Tolerant	6	13.51%
Sensitive	0	0.00%
Clinger	2	50.45%

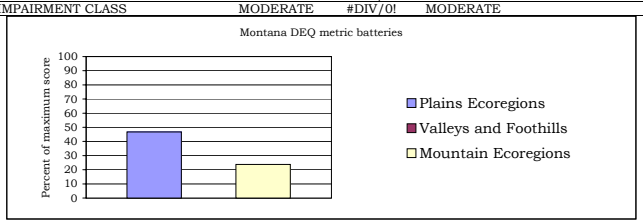
BIOASSESSMENT INDICES

B-IBI (Karr et al.)

METRIC	VALUE	SCORE
Taxa richness	16	1
E richness	0	1
P richness	0	1
T richness	0	1
Long-lived	5	5
Sensitive richness	0	1
%tolerant	13.51%	5
%predators	39.64%	5
Clinger richness	2	1
%dominance (3)	71.17%	3
TOTAL SCORE	24	48%

MONTANA DEQ INDICES (Bukantis 1998)

METRIC	VALUE	Plains Ecoregions	Valleys and Foothills	Mountain Ecoregions
Taxa richness	16	1	1	0
EPT richness	0	0	0	0
Biotic Index	7.19	0	0	0
%Dominant taxon	38.74%	2	2	1
%Collectors	20.72%	3	3	3
%EPT	0.00%	0	0	0
Shannon Diversity	1.79	0		
%Scrapers +Shredder	39.64%	3	3	1
Predator taxa	9	3		
%Multivoltine	59.46%	2		
%H of T	#DIV/0!		#DIV/0!	
TOTAL SCORES		14	#DIV/0!	5
PERCENT OF MAXIMUM		46.67	#DIV/0!	23.81
IMPAIRMENT CLASS		MODERATE	#DIV/0!	MODERATE



Montana Valleys and Foothills revised index (Bollman 1998)

Percent max.	11.11%	Impairment class	SEVERE

Montana Plains ecoregions metrics (Bramblett and Johnson 2002)

Riffle		*Pool*	
EPT richness	0	E richness	0
Percent EPT	0.00%	T richness	0
Percent Oligochaetes and Leeches	0.00%	Percent EPT	0.00%
Percent 2 dominants	59.46%	Percent non-insect	3.60%
Filterer richness	2	Filterer richness	2
Percent intolerant	0.00%	Univoltine richness	4
Univoltine richness	4	Percent supertolerant	30.63%
Percent clingers	50.45%		
Swimmer richness	4		