MONTANA DEPARTMENT OF TRANSPORTATION WETLAND MITIGATION MONITORING REPORT: YEAR 2003

Wigeon Reservoir
Alzada, Montana

Prepared for:

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

March 2004

Project No: 130091.028

Prepared by:

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

LAND & WATER

MONTANA DEPARTMENT OF TRANSPORTATION

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1.0 INTRODUCTION

The Wigeon wetland was created to provide mitigation credits for wetland impacts associated with Montana Department of Transportation (MDT) roadway projects that have been constructed in Watershed #16 in MDT District Four (Glendive District) The site is located in Carter County, Montana, approximately 22 miles directly north of Alzada **(Figure 1)** in Sections 23 and 26, Township 5 South, Range 59 East. Elevations range from approximately 3,169 to 3,175 feet above sea level.

Construction was completed on this site in October of 1997 with the goal of creating a reservoir to provide nesting and brood rearing habitat for waterfowl and other wildlife species. An impoundment was constructed to collect surface water runoff from an intermittent tributary of Prairie Dog Creek. The site boundary is illustrated on **Figure 2, Appendix A**.

This wetland was designed by the BLM in association with the MDT to provide specific wetland functions including: nesting and brood rearing habitat for waterfowl; water for wildlife habitat; increased habitat diversity; water storage and retention; and creating open water and emergent wetland types.

2.0 METHODS

2.1 Monitoring Dates and Activities

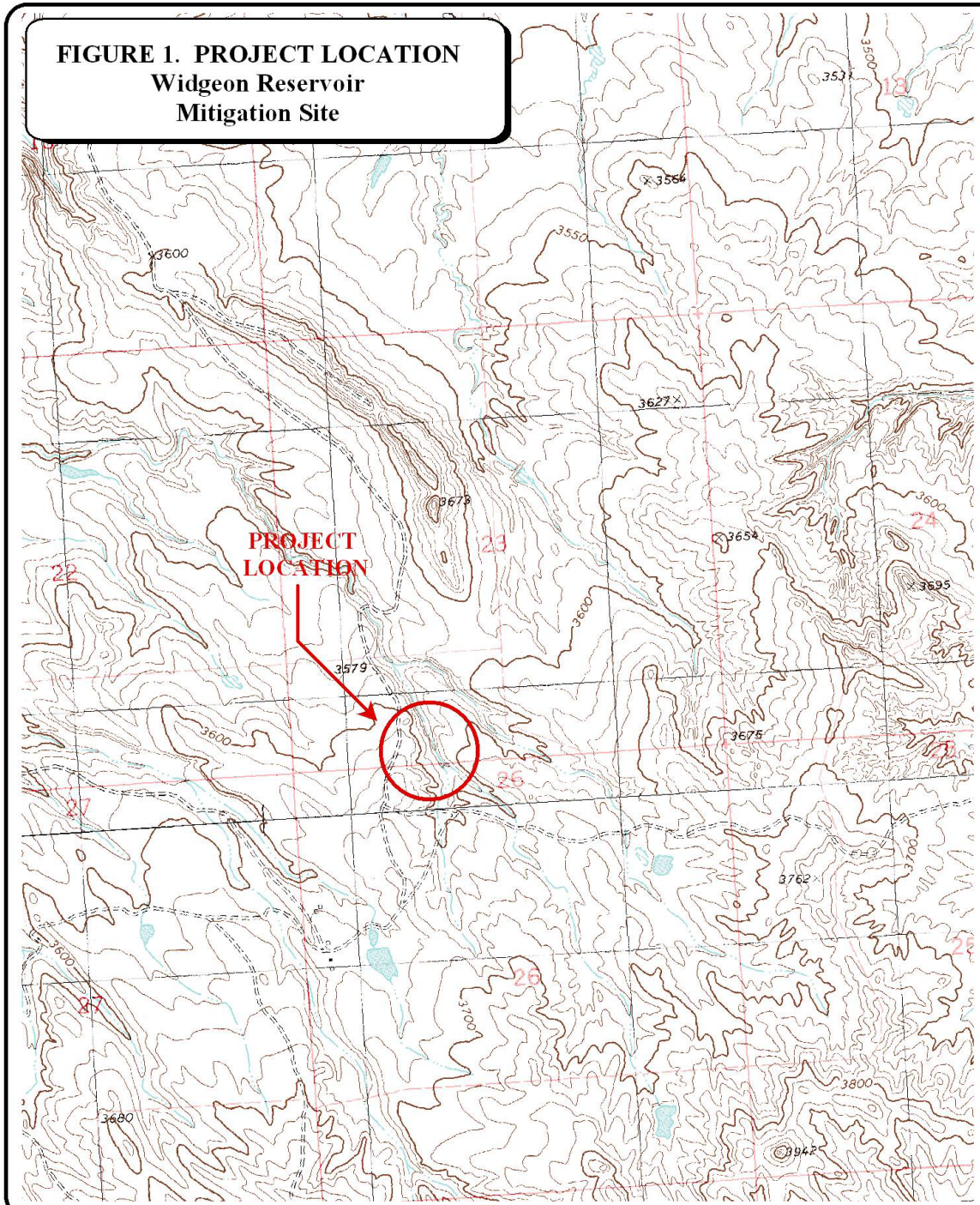
The site was visited once on July 2, 2003. All information within the Wetland Mitigation Site Monitoring Form **(Appendix B)** and macroinvertebrate samples were collected at this time. Activities and information conducted/collected included: wetland delineation; wetland/open water boundary mapping; vegetation community mapping; vegetation transects; soils data; hydrology data; bird and general wildlife use; photograph points; macroinvertebrate sampling; functional assessment; and assessment of the maintenance needs at inflow area and outflow structure.

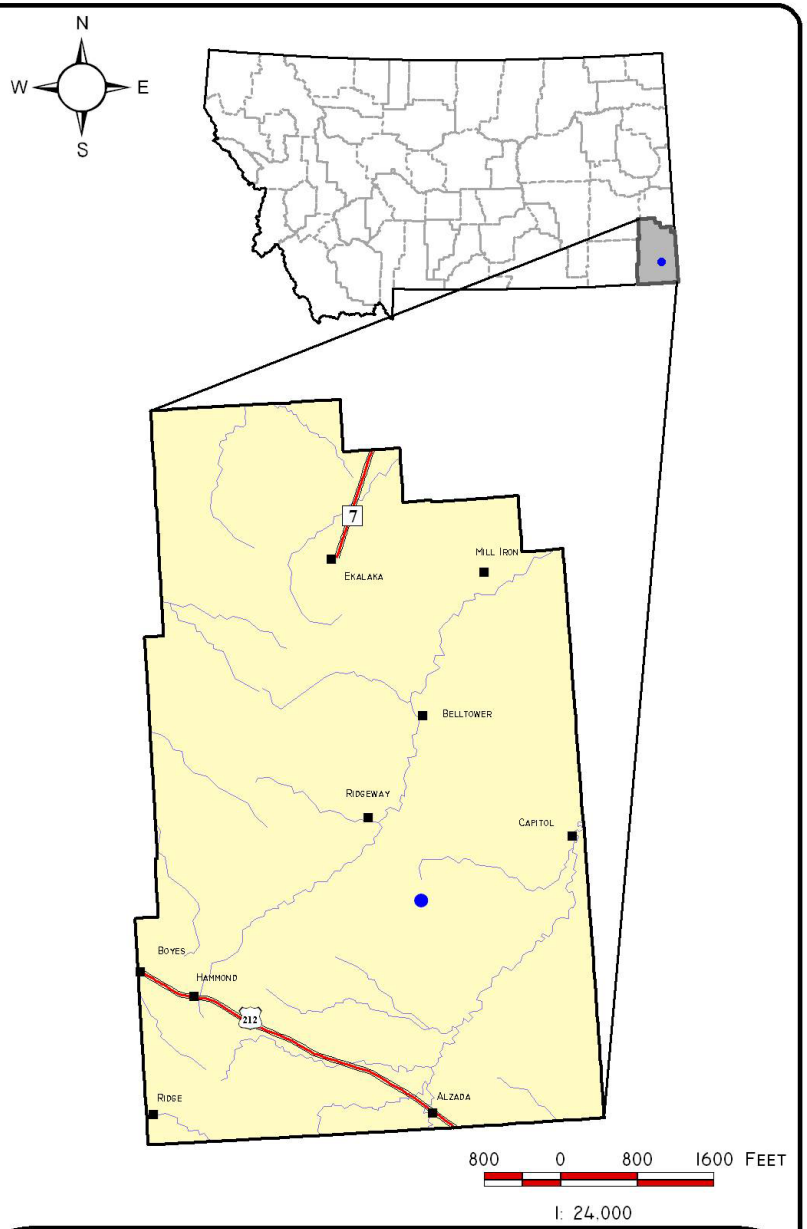
2.2 Hydrology

Wetland hydrology indicators were recorded using procedures outlined in the US Army Corps (COE) 1987 Wetland Delineation Manual (Environmental Laboratory 1987). Hydrology data were recorded on the Routine Wetland Delineation Data Form **(Appendix B)** at each wetland determination point.

All additional hydrologic data were recorded on the mitigation site monitoring form **(Appendix B)**. Where possible, the boundary between wetlands and open water (no rooted vegetation) aquatic habitats was mapped on the aerial photograph and an estimate of the average water depth at this boundary was recorded **(Figure 3, Appendix A)**. There are no groundwater monitoring wells at the site.

FIGURE 1. PROJECT LOCATION
Widgeon Reservoir
Mitigation Site





PROJECT #: 130091.028
DATE: APRIL 2001
LOCATION:
PROJECT MANAGER: B. DUTTON
DRAWN BY: B. NOECKER

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

2.3 Vegetation

General vegetation types were delineated on an aerial photograph during the July site visit (**Figure 3, Appendix A)**. Coverage of the dominant species in each community type is listed on the monitoring form **(Appendix B)**. A comprehensive plant species list for the entire site was compiled in 2001 and has been updated with the new species encountered during the current season. Observations from past years will be compared with new data to document vegetation changes over time. Wigeon Reservoir is not fenced, and cattle have unrestricted access to the site. Woody species were not planted on this site.

One transect was established during the 2001 monitoring event to represent the range of vegetation conditions over time, especially the establishment and increase of hydrophytic vegetation. The location of this 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 were recorded with the GPS unit during 2001. Photographs of the transect were taken from both ends during the 2003 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 area immediately adjacent to and including the reservoir 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 developed at the reservoir.

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 will be updated as new species are encountered. Observations from past years will be compared with new data to determine if wildlife use is changing over time.

2.7 Birds

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

2.8 Macroinvertebrates

One macroinvertebrate sample was collected during the 2003 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 2003 for the Wigeon reservoir 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 monitoring area, and the vegetation transect. A description and compass direction for each photograph were recorded on the wetland monitoring form. The approximate locations of the photos are shown on **Figure 2, Appendix A**. All photographs were taken using a digital camera; representative photos are 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. The wetland boundary was hand-drawn during the 2003 site visit using an aerial photograph.

2.12 Maintenance Needs

There are no inflow or outflow structures or nest boxes at this site. The only hydrologic control structure at the Wigeon wetland is the dike; no pipes or other outflow structures were installed to convey water through the dike or out of the reservoir. The dike structure was examined for obvious maintenance needs during the July visit.

3.0 RESULTS

3.1 Hydrology

Open water represented 69% of the area within the wetland boundary. The reservoir was not at full pool as a result of the drought. Negligible emergent vegetation was observed within the open water at the time of investigation because of low water level. Water depths were estimated to range between 1 and 6 feet deep throughout the reservoir. The open water boundary is depicted on **Figure 3, Appendix A**. The primary source of hydrology is an intermittent tributary of Prairie Dog Creek and the secondary source is likely groundwater. No problems with the dike were noted.

According to the Western Regional Climate Center (WRCC 2003), the Ridgeway 1S station annual mean (1971 – 2000) precipitation was 14.36 inches; the average precipitation through the month of July was 9.74 inches. For the year 2003, precipitation through July was 9.1 inches or 93% of the mean. Though data is incomplete for 2003, precipitation has been below average since 1999.

3.2 Vegetation

Vegetation species identified on the site are presented in **Table 1** and in the monitoring form **(Appendix B). Table 2**, the transect maps, and **Chart 1** illustrate transect data trends. Three (3) major vegetation communities were mapped on the mitigation area map (**Figure 3, Appendix A)**. The communities include: Type 1, *Artemesia tridentata/ Bouteloua gracilis*; Type 2, *Hordeum jubatum*; and Type 3, *Chenopodium glauca/Eleocharis spp.* (dominant species in this community type have changed since 2002). Dominant species within each community are listed on the monitoring form **(Appendix B)**.

The drainages on the south and east ends of the reservoir and an area on the east end of the dike had developed the *Typha* community as of 2001. However, in 2002 and 2003, mature cattails were not observed because of grazing pressure. Grazed stems of *Eleocharis* and *Scirpus* species were noted in 2002 and 2003 but growth was also minimal because of heavy grazing and trampling by cattle; no *Carex* species were noted, likely for the same reasons. Grazed clumps of *Puccinellia nuttalliana* were also noted in 2003. Most of the wetland plants could only be identified to the genus level because of grazing and trampling affects on vegetation.

Though the drought undoubtedly has a negative affect on the colonization rate of wetland vegetation, the soil is saturated around the edge of the reservoir and could support hydrophytic species. However, the mud and soil around the edge of the reservoir is pedestaled as a result of cattle tracking (see photographs, **Appendix C**) and likely exposes plant roots and causes the soil profile to dehydrate. The pedastaling of the wet soil and grazing of the wetland vegetation likely discourages the rate of colonization by rhizome growth typical of many wetland species. Vegetated mats of *Eleocharis* species, both *E. palustris* and *E. acicularis*, were turning brown as a result of trampling and root exposure to the air.

The transect length was increased in 2003 to include the exposed substrate that is the result of a lower water level caused by drought. These transect data **(Table 2** and bar graph**)** suggest that

the site has almost completely lost the preferred hydrophytic vegetation community, which included *Scirpus, Carex, Juncus* and *Eleocharis*, and has subsequently been replaced by C*henopodium*, a non-preferred weed.

Table 1: ***2001-2003 Wigeon Reservoir Vegetation Species List***

Scientific Name[1]	Region 4 (North Plains) Wetland Indicator Status
Achillea millefolium	FACU
Agropyron cristatum	-(UPL)
Agropyron dasystachyum	FAC
Agropyron smithii	**FACU**
Artemesia cana	FACU
Artemesia tridentate	-(UPL)
Bouteloua gracilis	-(UPL)
Bromus japonicus	**-(UPL)**
Carex spp.	(unknown, FAC-OBL)
Carex utriculata	OBL
Chenopodium glaucum	FACW
Eleocharis acicularis	**OBL**
Eleocharis palustris	OBL
Festuca idahoensis	- (UPL)
Grindelia gracilifolia	FACW
Hordeum jubatum	FACW
Juncus spp.	(unknown, FAC-OBL)
Myosotis scorpioides	OBL
Najas flexilis	OBL
Opuntia spp.	-(UPL)
Phleum pretense	FACU
Puccinelliana nuttalliana	**OBL**
Sagittaria spp.	OBL
Scirpus spp.	OBL
Thlaspi arvense	**-(FACU)**
Typha latifolia	OBL
Xanthium strumarium	FAC

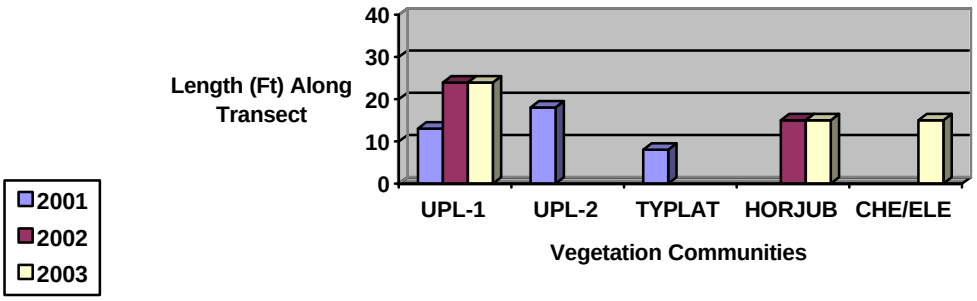
[1]**Bolded** species indicate those documented within the analysis area for the first time in 2003.
- : Species not listed in the National List of Plant Species that Occur in Wetlands (Reed 1988); parenthetical status is assumed.

Table 2: ***2001-2003 Transect Data Summary***

Monitoring Year	2001	2002	2003
Transect Length	39 feet	39 feet	54 feet[1]
# Vegetation Community Transitions along Transect	2	2	2
# Vegetation Communities along Transect	3	1	3
# Hydrophytic Vegetation Communities along Transect	1	1	2
Total Vegetative Species	11	7	6
Total Hydrophytic Species	4	3	4
Total Upland Species	7	4	2
Estimated % Total Vegetative Cover	76%	78%	88%
% Transect Length Comprised of Hydrophytic Vegetation Communities	21%	38%	56%
% Transect Length Comprised of Upland Vegetation Communities	79%	61%	44%
% Transect Length Comprised of Unvegetated Open Water	0%	0%	0%
% Transect Length Comprised of Bare Substrate	0%	0%	0%

[1] Lengthened in 2003 as a result of exposed substrate area.

Chart 1: Length of Vegetation Communities along Transect 1



2001 Transect Map[1]

Transect 1 Start	Upland Type 1 (13')	Upland Type 2 (18')	Wetland Type 3 (8')	Total 39'	End Transect 1

2002 Transect Map

Transect 1 Start	Upland Type 1 (24')	Wetland Type 2 (15')	Total 39'	End Transect 1

2003 Transect Map[2]

Transect 1 Start	Upland Type 1 (24')	Wetland Type 2 (15')	Wetland Type 3 (15')	Total 54'	End Transect 1

[1] Vegetation species within community types are not static across years.
[2] Lengthened in 2003 as a result of exposed substrate area.

3.3 Soils

The site was mapped as part of the Carter County Soil Survey. The dominant soil on the site is the Moyerson-Orinoco complex (277D) a silty clay loam, and the Gerdrum-Absher (165C) complex (Typic Natriboralfs). The taxonomic classification of the 277D series components are Ustic Torriorthent and Ardic Ustorthent, respectively.

The Myerson-Orinoco (277D) is typical of sedimentary plains and hills and the Gerdrum-Absher complex (165C) is found in alluvial fans and stream terraces. Neither of these soil series are hydric or have hydric inclusions. Both soils types are poor for wetland plant establishment and have a high saline content.

Soil pit (SP) 1 was excavated within the wetland vegetation community. From 0-5 inches the soil was a dark reddish gray (2.5YR 4/1, 3/1) silt loam with yellowish red (5YR 5/8) mottles (50%, fine). The soil profile from 5-8 inches was a greenish black (Gley 1 2.5/10GY) and 8-18 inches dark greenish grey (Gley 1 4/10Y) silt and silt clay loam. The soil was not saturated; however, drift lines and water marks were evident and the profile was moist but heavily tracked by cattle hooves. SP-2 was excavated in the upland community; from 0-4 inches the soil was a dark reddish gray (2.5 YR 4/1, 3/1) silt loam and a silt clay loam from 4-18 inches. Fine

yellowish red (5YR 5/8) mottles were observed throughout, suggesting this area may have been historically inundated and would support hydrophytic vegetation if water levels increased.

3.4 Wetland Delineation

The delineated wetland boundary is depicted on **Figure 3, Appendix A**. The COE data forms are included in **Appendix B**.

The 8.09 acre gross "aquatic area" boundary encompasses 2.5 acres of emergent wetland (which is comprised of an estimated 50% bare mud substrate) and 5.6 acres of open water of 1-6 feet depth. Credit should be considered for the shallow water habitat which is admittedly difficult to quantify in terms of "wetland" credit, but which does provide a valuable aquatic resource in this arid region of the state.

3.5 Wildlife

Wildlife species are listed in **Table 3.** Activities and densities associated with these observations are included on the monitoring form in **Appendix B**. Leopard frogs, a "species of special concern" (S3) by the Montana Natural Heritage Program (MNHP) were observed in 2001 and 2003 (MDT sighting); none were seen in 2002. Painted turtles (MDT) were observed in June 2003.

Table 3. ***Fish and Wildlife Species Observed on the Wigeon Reservoir Mitigation Site[1] 2001-2003***

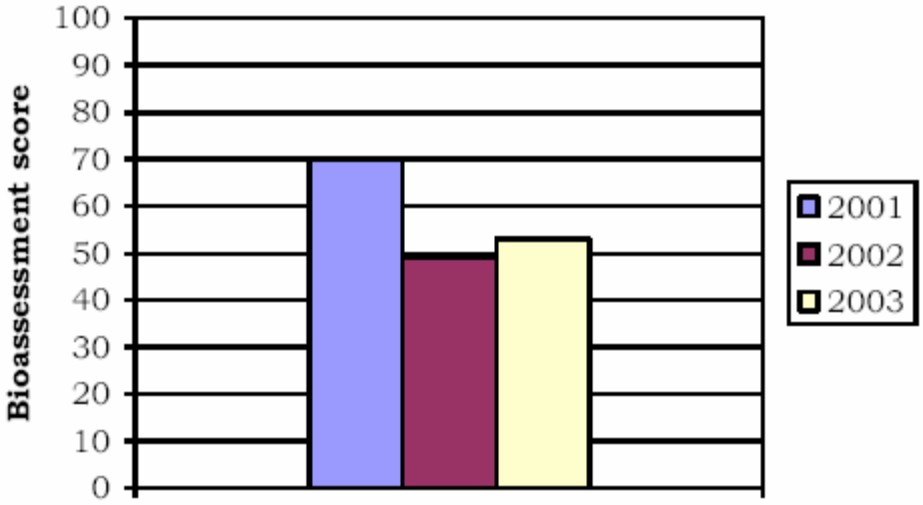
AMPHIBIANS AND REPTILES	
Plains garter snake (*Thamnophis radix*) Painted turtle (*Chrysemys picta*) **Leopard frogs (*Rana pipiens)***	
BIRDS	
American Avocet (*Recurvirostra americana*)[2]	**Northern Pintail (*Anas acuta*)**[2]
American Wigeon *(Anas americanus)*	**Red-winged Blackbird (*Agelaius phoeniceus*)**
Blue-winged teal (*Anas discors)*	Redhead *(Aythya Americana)*
Bobolink (*Dolichonyx oryzivorus*)	**Ring-necked Duck (*Aythya collaris*)**[2]
Canada Goose (*Branta canadensis*)[2]	Ruddy Duck (*Oxyura jamaicensis)*
Earred grebes *(Podiceps nigricollis)*	**Greater Sage Grouse (*Centrocercus urophasianus*)**
Horned Lark (Eremophila alpestris)	**Savannah Sparrow (*Passerculus sandwichensis)***
Gadwall (*Anas strepera*)[1]	Spotted sandpiper *(Actitis macularia)*
Grasshopper Sparrow *(Ammodramus savannarum)*	Swallow (*Hirundo* spp.)
Green-winged Teal (*Anas crecca*)[2]	**Upland Sandpiper** (*Bartramia longicauda*)
Killdeer *(Charadrius vociferous)*	**Wilson's Phalarope** (*Phalaropus tricolor*)[2]
Mallards *(Anas platyrhynchos)* Meadow Lark (*Sturnella neglecta)*	**Willet** (*Catoptrophorus semipalmatus)*[2]
MAMMALS	
Deer (*Odocoileus spp.)* Raccoon (*Procyon lotor)*	

[1] **Bolded** species indicate those documented within the analysis area for the first time in 2003.
[2] June 2003 MDT sightings.

3.6 Macroinvertebrates

The optimal conditions noted in 2001 have yet to be restored at this site on Wigeon Reservoir, but scores indicate a slight improvement since 2002 **(Bollman, Appendix E)**. In 2002 biotic condition was rated "poor"; scores for 2003 indicate suboptimal conditions. Taxa richness remains low; however, assemblage sensitivity has increased dramatically, judging by the biotic index value. Water quality or thermal conditions may have changed for the better. Habitats appear to be confined to macrophytes and the water column; substrates were likely monotonous.

Chart 2: *Bioassessment Scores 2001-2003*



3.7 Functional Assessment

Completed functional assessment forms are included in **Appendix B** and summarized below in **Table 4**. The wetland ranks as a Category II wetland due to the presence of the MNHP species of special concern, the leopard frog, during 2001 and 2003. The diversity of wildlife that use the reservoir is high as evidenced by the diversity of waterfowl, amphibians and reptiles. However, because the disturbance is high due to grazing, ratings are still suppressed in several categories. Functional units decreased 3 points in 2003 because of a lower rating in sediment stabilization as a result of the lack of deep-rooted vegetation along the shoreline.

3.8 Photographs

Representative photos taken from photo points and transect ends are included in **Appendix C.** Photos of the vegetation fringe are also included to illustrate the effects of grazing. A 2003 aerial photograph is provided in **Appendix C**.

3.9 Maintenance Needs/Recommendations

No observable problems were noted concerning the dike structure. Fencing the wetland while providing several watering access points for cattle is recommended to preserve the integrity of the wetland.

Table 4: ***Summary of 2001-2003 Wetland Function/Value Ratings and Functional Points at the Wigeon Reservoir Mitigation Project***

Function and Value Parameters From the 1999 MDT Montana Wetland Assessment Method	2001	2002	2003
Listed/Proposed T&E Species Habitat	Low (0)	Low (0)	Low (0)
MNHP Species Habitat	High (1)	High (1)	High (1)
General Wildlife Habitat	Moderate (.5)	Moderate (.7)	Moderate (.7)
General Fish/Aquatic Habitat	Moderate (.6)	Moderate (.6)	Moderate (.6)
Flood Attenuation	Moderate (.5)	Moderate (.5)	Moderate (.5)
Short and Long Term Surface Water Storage	High (1)	High (1)	High (1)
Sediment, Nutrient, Toxicant Removal	Moderate (.7)	Moderate (.7)	Moderate (.7)
Sediment/Shoreline Stabilization	Moderate (.7)	Moderate (.7)	Moderate (.3)
Production Export/Food Chain Support	Moderate (.6)	Moderate (.6)	Moderate (.6)
Groundwater Discharge/Recharge	High (1)	High (1)	High (1)
Uniqueness	Low (.3)	Low (.2)	Low (.2)
Recreation/Education Potential	Low (.1)	Low (.2)	Low (.2)
Actual Points/Possible Points	7/12	7.2/12	6.8/12
% of Possible Score Achieved	58%	60%	56%
Overall Category	II	II	II
Total Acreage of Assessed Wetlands within Easement	8.2 ac	8.09 ac	8.09 ac
Functional Units (acreage x actual points)	57.4 fu	58.24 fu	55 fu
Net Acreage Gain	8.2 ac	8.09 ac	8.09 ac
Net Functional Unit Gain	57.4 fu	58.24 fu	55 fu
Total Functional Unit "Gain"	57.4 fu	58.24 fu	55 fu

3.10 Current Credit Summary

The 8.09 acre gross "aquatic area" boundary encompasses 2.5 acres of emergent wetland (which is comprised of an estimated 50% bare mud substrate) and 5.6 acres of open water of 1-6 feet depth. Credit should be considered for the shallow water habitat which is admittedly difficult to quantify in terms of "wetland" credit, but which does provide a valuable aquatic resource in this arid region of the state. The wetland remains a Category II function because of the presence of the northern leopard frog but the site has lost functional points since 2002 as a result of drought and large ungulate pressure (cattle) in the fragile saturated zones. Grazing and tramping pressure around the entire circumference of the reservoir has decreased the viability of the hydrophytic plant community. Fencing the reservoir from cattle access while providing 3-4 watering access points is recommended.

4.0 REFERENCES

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Appendix A

FIGURES 2 - 3

MDT Wetland Mitigation Monitoring
Wigeon Reservoir
Alzada, Montana

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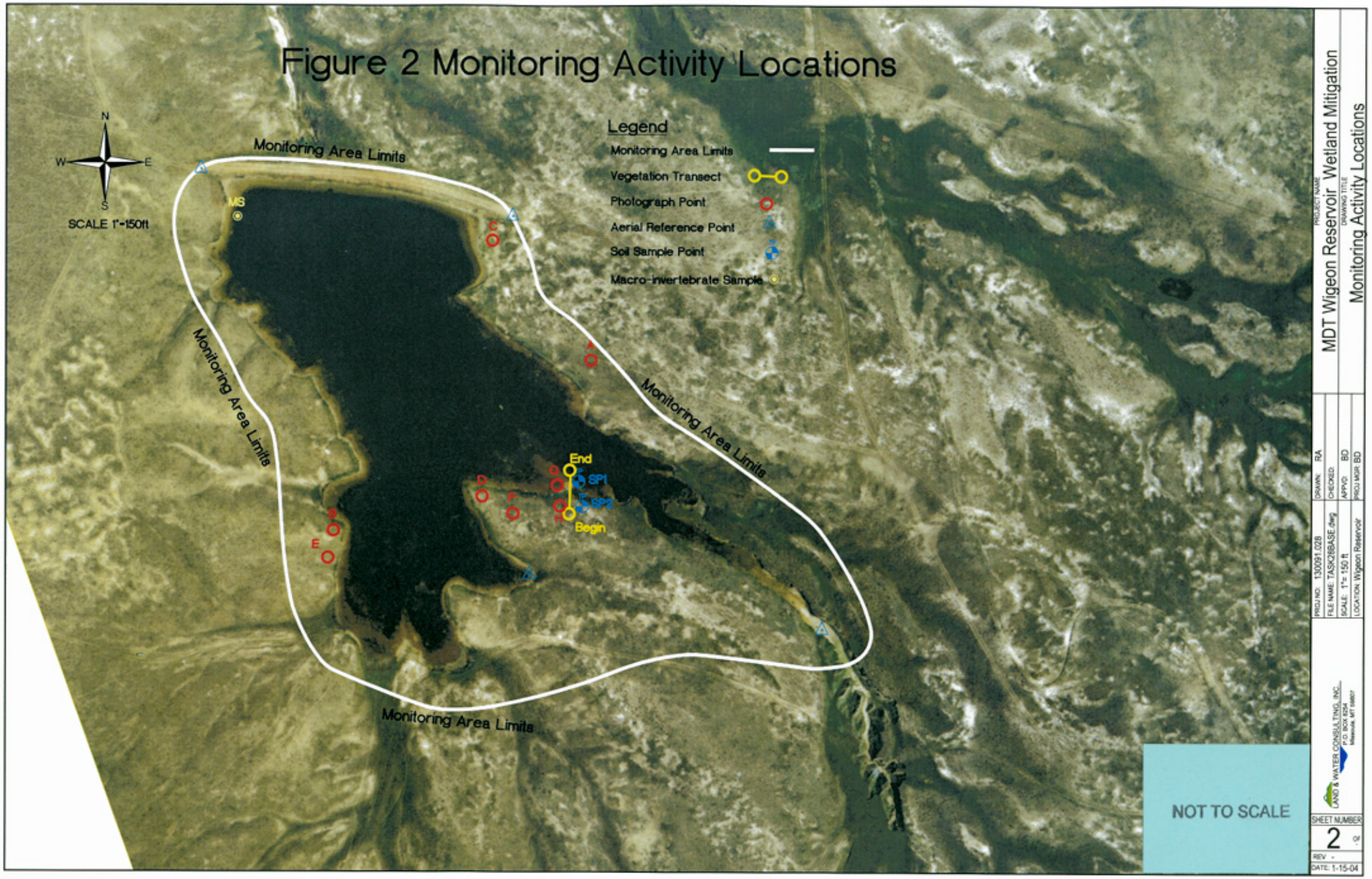
Figure 2 Monitoring Activity Locations



PROJECT NAME: MDT Wigeon Reservoir Wetland Mitigation
DRAWING TITLE: Monitoring Activity Locations

PROJ NO: 130091.028 | DRAWN: RA
FILE NAME: TASK2/BASE.dwg | CHECKED:
SCALE: 1"= 150 ft | APPVD: BD
LOCATION: Wigeon Reservoir | PROJ MGR: BD

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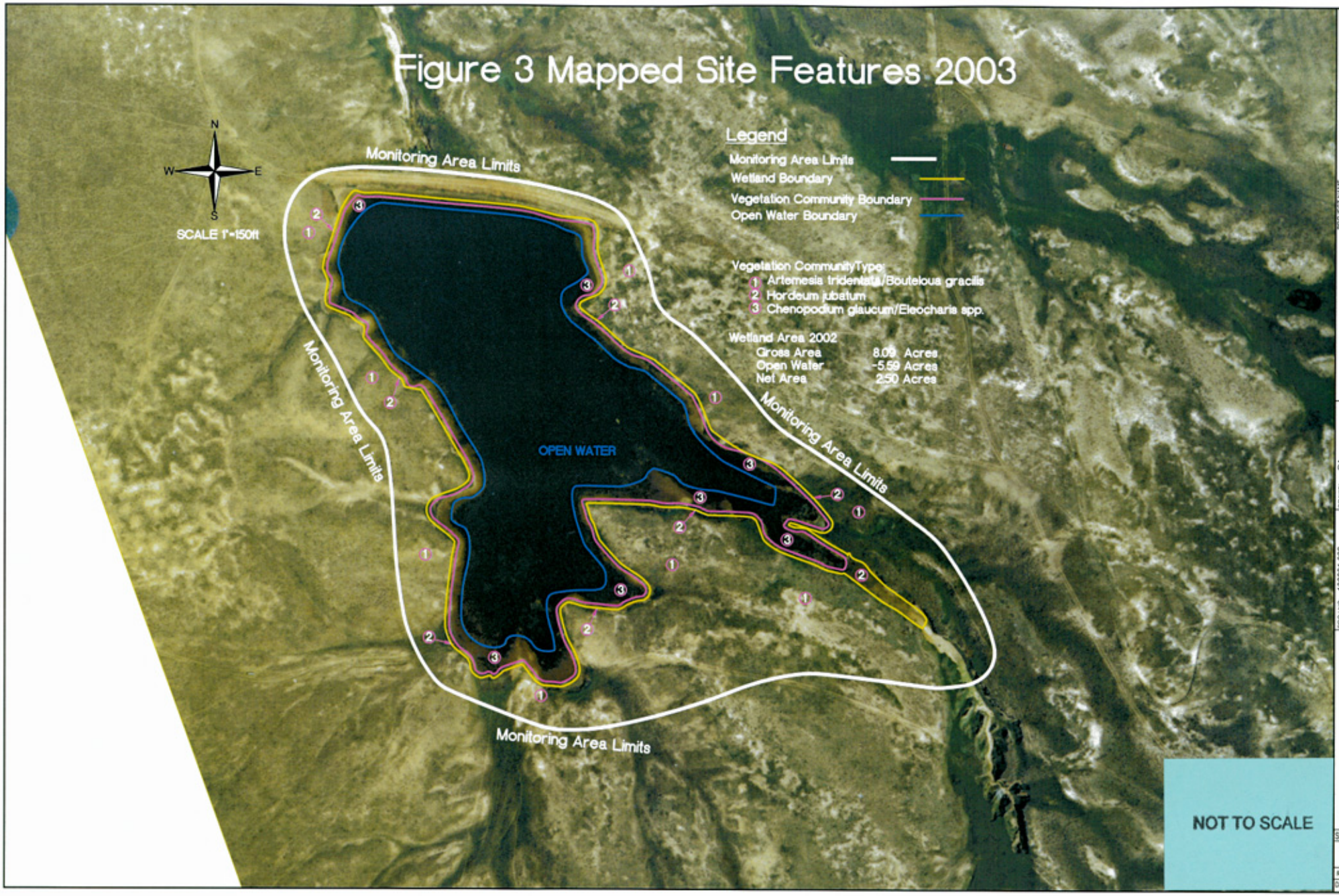
Missoula, MT 59807

SHEET NUMBER: 2
REV: -
DATE: 1-15-04

Figure 3 Mapped Site Features 2003



PROJECT NAME: MDT Wigeon Reservoir Wetland Mitigation
DRAWING TITLE: Mapped Site Features 2003

PROJ NO: 130091.028
FILE NAME: TASK28BASE.dwg
SCALE: 1"= 150 ft
LOCATION: Wigeon Reservoir

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

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SHEET NUMBER: 3 of

REV: -
DATE: 1-15-04

Appendix B

2003 WETLAND MITIGATION SITE MONITORING FORM
2003 BIRD SURVEY FORMS
2003 WETLAND DELINEATION FORMS
2003 FUNCTIONAL ASSESSMENT FORMS

MDT Wetland Mitigation Monitoring
Wigeon Reservoir
Alzada, Montana

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LWC / MDT WETLAND MITIGATION SITE MONITORING FORM

Project *Name:* *Wigeon* Project Number: 130091-028 Assessment Date: 7 / 2 / 03
Location: Alzada MDT District: 5 Milepost: -
Legal description: T 5 S, R 59 E Section 23, 26 Time of Day: 11 AM
Weather Conditions: few cloudy, slight breeze, mostly sunny Person(s) conducting the assessment: LB/LWC
Initial Evaluation Date: 8 / 22 / 01 Visit #: 3 Monitoring Year: 2003
Size of evaluation area: 8.09 acres Land use surrounding wetland: grazing land

HYDROLOGY

Surface Water Source: intermittent drainage
Inundation**:** Present X Absent Average depths: 3 ft Range of depths: 1 - 6 ft
Assessment area under inundation: 69%
Depth at emergent vegetation-open water boundary: 0-6" ft (water elevation very low and most emergent veg is exposed; aquatic vegetation noted
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.): yes, drift lines, stained soil and veg, erosion

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

Well #	Depth	Well #	Depth	Well #	Depth

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

COMMENTS/PROBLEMS:

VEGETATION COMMUNITIES

Community No.:_1___ Community Title (main species):__*Artemesia spp./Bouteloua gracilis*

Dominant Species	% Cover	Dominant Species	% Cover
Artemesia cana	10	*Agropyron cristatum*	10
Opuntia spp.	10	*Grindelia gracifolia*	10
Achillea millefolium	10	*Agropyron dasystachyum*	5
Bouteloua gracilis	25	*Artemesia tridentata*	5
Festuca idahoensis	15	*Melolotis officinale*	<1

COMMENTS/PROBLEMS: _____

_____

_____

_____

Community No.:__2__ Community Title (main species):____*Hordeum jubatum*

Dominant Species	% Cover	Dominant Species	% Cover
Hordeum jubatum	10		
Phleum pratense	<1		
Grindelia gracifolia	<1		
Xanthium strumarium	<1		
Chenopodium glaucum	90		

COMMENTS/PROBLEMS: _____

_____

_____

_____

Community No.:__3__ Community Title (main species):___ *Chenopodium glaucum/Eleocharis spp.*_____

Dominant Species	% Cover	Dominant Species	% Cover
Typha latifolia	2 sprigs	*Chenopodium glaucum*	20
Eleocharis palustris	?	*Puccinellia nuttalliana*	<1
Scirpus spp.	?		
Sagittaria spp.	?		
Eleocharis acicularis	15		

COMMENTS/PROBLEMS: ____This CT was severely grazed and dewatered from drought conditions; % cover estimated if possible. Most plants were without flowering parts and barely recognizable.

_____

_____

Additional Activities Checklist:

__X__Record and map vegetative communities on air photo

COMPREHENSIVE VEGETATION LIST

Species	Vegetation Community Number(s)	Species	Vegetation Community Number(s)
Achillea millefolium	1		
Agropyron cristatum	1		
Agropyron dasystachyum	1		
Artemesia cana	1		
Artemesia tridentate	1		
Bouteloua gracilis	1		
Bromus japonicus	**1**		
Carex spp.	3		
Carex utriculata	3		
Chenopodium glaucum	2, 3		
Eleocharis acicularis	**3**		
Eleocharis palustris	3		
Festuca idahoensis	1		
Grindelia gracifolia	1		
Hordeum jubatum	1, 2		
Juncus spp.	2, 3		
Myosotis scorpioides	open water		
Najas flexilis	open water		
Opuntia spp.	1		
Phleum pretense	1, 2		
Puccinelliana nuttalliana	**1**		
Sagittaria spp.	3		
Scirpus spp.	3		
Thlaspi arvense	**1**		
Typha latifolia	3		
Xanthium strumarium	2		
Bold denotes observed in 2003 for the first time.			

COMMENTS/PROBLEMS: _____

_____

PLANTED WOODY VEGETATION SURVIVAL

Species	Number Originally Planted	Number Observed	Mortality Causes
none			

COMMENTS/PROBLEMS: ____None, but would add diversity if grazing could be controlled in the planted areas.

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
Frogs (likely *Rana pipiens*)	1				
MDT June 2003:					
Northern Leopard frogs					
painted turtles					

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	Compass Reading
A	wetland view	194
B	Edge of open water between photo points D and E.	22
C	wetland buffer	280
D	wetland view	46
E	wetland view	0
F	Extra photo, of vegetation on edge of open water.	-
G	wetland transect end	10
H	UPL transect beginning	190

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
_-___ 4-6 landmarks recognizable on the air photo
_-___ Start and end points of vegetation transect(s)
_(X)__ Photo reference points
_NA__ Groundwater monitoring well locations

COMMENTS/PROBLEMS: ____Boundary hand-drawn 2002; photos reshot at same locations.

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
__*___ Survey wetland-upland boundary with a resource grade GPS survey

COMMENTS/PROBLEMS: _*hand-drawn 2003_____

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: Water levels were low in the reservoir as a result of drought. Grazing pressure around the edge of open water may have negative affects on wetland vegetation; most wetland plants were severely grazed and without flowering heads. Cattle tracking in the muddy fringe may also increase the drying affect of drought because the ground is essentially pedestaled by hoof tracks; the result is an increase in soil surface area and exposure of wetland vegetation roots to the air and lack of moisture. Wetland vegetation will not be able to colonize the mud flats with a continuance of grazing pressure (all plants were grazed: *Scirpus, Puccinellia, Carex, Eleocharis, Typha*) and heavy tracking. I recommend constructing 3-4 areas for water access in areas not associated with extensive mudflats or areas with the potential for wetland vegetation colonization. Ideal areas would be on both sides of the dam and 1-2 sites on the south end (headwaters area) if locations can be placed away from mud flats. These suggestions are given while realizing that at full pond the locations of the water access fencing will have to be adjusted.

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: Wigeon Date: 8/10/02 Examiner: LB/LWC Transect # 1

Approx. transect length: 54 feet Compass Direction from Start (Upland): 10 deg

Vegetation type A:	CT 1	
Length of transect in this type:	24	feet
Species:		Cover:
AGRSMI		10
HORJUB		40
MELOFF		40
CHENGLA		10
		100%

Vegetation type B:	CT 2	
Length of transect in this type:	15	feet
Species:		Cover:
HORJUB		<1
CHEGLA.		99
	Total Vegetative Cover:	100%

Vegetation type C:	CT 3	
Length of transect in this type:	15	feet
Species:		Cover:
CHEGLA		45
mud		45
ELEPAL/ELEACI		10
	Total Vegetative Cover:	55%

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

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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 **<10%** % 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:

* difficult to assess - because of the heavy grazing much of the vegetation has been removed, mud is being pedestaled by tracking.
Transect length increased because of more mud flat exposure.

BIRD SURVEY – FIELD DATA SHEET

Page__1__of_1_
Date:7/2/03

SITE: Wigeon

Survey Time: afternoon

Bird Species	#	Behavior	Habitat	Bird Species	#	Behavior	Habitat
Upland Sandpiper	1	BR	UPL				
Hen ducks	(several)	LO/BR	OW				
MDT Sightings June 2003:							
American Avocet							
American Wigeon							
Blue-winged Teal							
Bobolink							
Canada Goose							
Gadwall							
Grasshopper Sparrow							
Greater Sage Grouse							
Green-winged Teal							
Horned Lark							
Mallard							
Pintail							
Red-winged Blackbird							
Ring-neck Ducks							
Savanannah Sparrow							
Spotted Sandpiper							
Wilson's Phalarope							
Willet							

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: Wigeon	Date: 8/10/02
Applicant/Owner: MDT	County: Carter
Investigator: LB/LWC	State: MT

Do Normal Circumstances exist on the site:	X	Yes		No	Community ID: Wetland (CT-3)
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	*ELEPAL*	H	OBL	9			
2	*ELEACI*	H	OBL	10			
3	*CHEGLA*	H	FACW	11			
4	*(mud)*			12			
5				13			
6				14			
7				15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-). 3/3

Plants severely grazed in area of SP and all around reservoir; cover <30% in this very spot but upslope CHEGLA is 100% and qualifies.

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: - (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- Inundated
- Saturated in Upper 12 Inches
- X Water Marks
- X 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:

Area of SP has no water or saturation because water levels have decreased since 2001 and subsequently since 2002 because of drought. The pedastaling of the soil by cattle hooves may decrease the moisture levels further.

LAND & WATER

SOILS

Map Unit Name (Series and Phase):	Moyerson-Orinoco (277D)-non-hydric	Drainage Class:	mod. well
Taxonomy (Subgroup):	NA	Field Observations Confirm Mapped Type?	X Yes ____ No

Profile Description:

Depth inches	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-5	A	2.5YR 4/1,3/1	5YR 5/8	50%, fine	silt loam
5-8	B	Gley 1 2.5/10GY			silt loam
8-18	C	Gley 1 4/10Y			silt 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)

hydric soil, though area has been dewatered because of drought.

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? ____ Yes X No

Remarks:

Wetland vegetation inadequate % cover within 20 feet of open water, but CHENGLA fills in at that point so veg % overall >30%. Poor wetland quality.

Approved by HQUSACE 2/92

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

Project/Site: Wigeon	Date: 8/10/02
Applicant/Owner: MDT	County: Carter
Investigator: LB/LWC	State: MT

Do Normal Circumstances exist on the site:	X	Yes		No	Community ID: UPL-1
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	*AGRSMI*	H	FACU	9			
2	*HORJUB (dom.)*	H	FACW	10			
3	*MELOFF*	H	(no listing)	11			
4				12			
5				13			
6				14			
7				15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-). 1/3

clearly an upland site, heavily grazed

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: - (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:

no evidence of hydrology

LAND & WATER

SOILS

Map Unit Name (Series and Phase): Moyerson-Orinoco (277D)-non-hydric
Drainage Class: mod. well
Field Observations
Taxonomy (Subgroup): NA
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.
0-18	A	2.5YR 4/1,4/2	5YR 5/8	20%, fine	0-4 silt loam
					4-18 silt clay 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)

interesting hydric soil lens in this SP location

WETLAND DETERMINATION

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

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

Remarks:

This area may convert to WL if water level increases.

Approved by HQUSACE 2/92

LAND & WATER

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

1. Project Name: Wigeon Reservoir **2. Project #:** -130091028 **Control #:** _____

3. Evaluation Date: 7/2/2003 **4. Evaluator(s):** LB/LWC **5. Wetland / Site #(s):** _____

6. Wetland Location(s) i. T: 5 S **R:** 59 E **S:** 22 **T:** 4 N **R:** 59 E **S:** 23

ii. Approx. Stationing / Mileposts: _____

iii. Watershed: 10110202 **GPS Reference No. (if applies):** _____

Other Location Information: _____

7. A. Evaluating Agency LWC

B. Purpose of Evaluation:

- ☐ Wetlands potentially affected by MDT project
- ☐ Mitigation wetlands; pre-construction
- ☒ Mitigation wetlands; post-construction
- ☐ Other

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

9. Assessment Area (total acres): _____ (visually estimated)
8.09 (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	Aquatic Bed	Permanently Flooded	---	69
Depression	Palustrine	---	Emergent Wetland	Intermittently Exposed	---	30
Riverine	Riverine	Intermittent	Emergent Wetland	Intermittently Flooded	---	1
---	---	---	---	---	---	

[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.	---	---	---
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.	---	---	high disturbance

Comments: (types of disturbance, intensity, season, etc.) grazing pressure appears intense because animals are tracking muddy areas, exposing soil profile to drying by pedestaling soil and grazing wetland vegetation.

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

iii. Briefly describe AA and surrounding land use / habitat: BLM rangeland

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: _____

LAND & WATER

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

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

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

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

Highest Habitat Level	doc/primary	sus/primary	doc/secondary	sus/secondary	doc/incidental	sus/incidental	none
Functional Point and Rating	---	---	---	---	---	---	---

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	Rana pipiens
Secondary habitat **(list species)**	☐ D	☐ S	_____
Incidental habitat **(list species)**	☐ D	☐ S	_____
No usable habitat	☐ D	☐ S	_____

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

Highest Habitat Level:	doc/primary	sus/primary	doc/secondary	sus/secondary	doc/incidental	sus/incidental	none
Functional Point and Rating	1 (H)	---	---	---	---	---	---

If documented, list the source (e.g., observations, records, etc.)**:** MDT observation 2003

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)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Moderate disturbance at AA (see #12)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
High disturbance at AA (see #12)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	L	--	--	--

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	--	--	--	.7 (M)
Moderate	--	--	--	--
Low	--	--	--	--

Comments: Avian species composition likely high but are not observed. As we spend more time there it is apparent recording diversity is limited by observation periods.

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.	--	--	M	--	--	--	--	--	--

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	--	.6 (M)	--	--
No fish	--	--	--	--

Comments: Fish fry observed by MDT June 2003.

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 [3] **5 out of 10 years**	1 (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**	--	--	.7 (M)	--	--	--	--	--
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
[3] **65 %**	--	--	--
35-64 %	--	--	--
< 35 %	.3 (L)	--	--

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	--	--	--	--	--	--	--	--	--	--	.7M	--	--	--	--	--	--	--
S/I	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
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: intermittent stream flowing into reservoir likely provides groundwater inflows; no surface outlet

14K. UNIQUENESS

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

Replacement Potential	AA contains fen, bog, warm springs or mature (>80 yr-old) forested wetland or plant association listed as "S1" by the MTNHP.			AA does not contain previously cited rare types and structural diversity (#13) is high or contains plant association listed as "S2" by the MTNHP.			AA does not contain previously cited rare types or associations and structural diversity (#13) is low-moderate.		
Estimated Relative Abundance from #11	☐rare	☐common	☐abundant	☐rare	☐common	☐abundant	☐rare	☐common	☐abundant
Low disturbance at AA (#12i)	--	--	--	--	--	--	--	--	--
Moderate disturbance at AA (#12i)	--	--	--	--	--	--	--	--	--
High disturbance at AA (#12i)	--	--	--	--	--	--	--	.2L	--

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	--	--	.2(L)
Private ownership	--	--	--

Comments: _____

LAND & WATER

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	0.00	1	
B. MT Natural Heritage Program Species Habitat	H	1.00	1	
C. General Wildlife Habitat	M	0.70	1	
D. General Fish/Aquatic Habitat	M	0.60	1	
E. Flood Attenuation	M	0.50	1	
F. Short and Long Term Surface Water Storage	H	1.00	1	
G. Sediment/Nutrient/Toxicant Removal	M	0.70	1	
H. Sediment/Shoreline Stabilization	L	0.30	1	
I. Production Export/Food Chain Support	M	0.60	1	
J. Groundwater Discharge/Recharge	H	1.00	1	
K. Uniqueness	L	0.20	1	
L. Recreation/Education Potential	L	0.20	1	
	Totals:	6.80	12.00	55
	Percent of Total Possible Points:		**56%** (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
2003 AERIAL PHOTOGRAPH

MDT Wetland Mitigation Monitoring
Wigeon Reservoir
Alzada, Montana

LAND & WATER

Location: A **Description:** Wetland view **Compass Reading:** 194°

Location: B **Description:** Wetland buffer **Compass Reading:** 22°

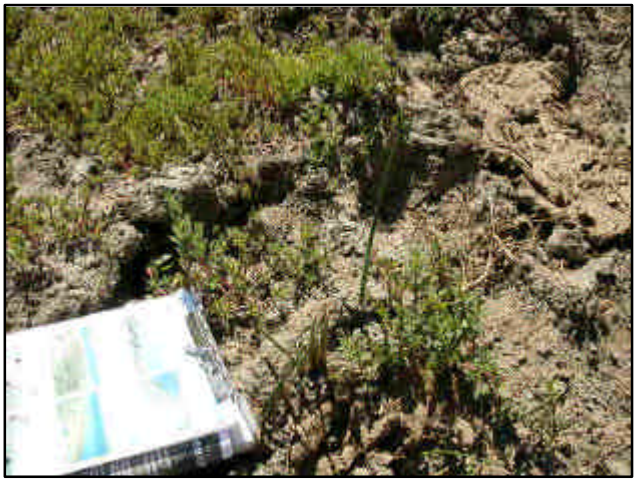
Location: C **Description:** Wetland buffer **Compass Reading:** 280°

Location: D vicinity **Description:** Wetland view **Compass Reading:** 46°

Location: E **Description:** Wetland view **Compass Reading:** 0°

Location: G **Description:** Upland transect end **Compass Reading:** 10°

Location: H **Description:** Wetland transect end
Compass Reading: 190°



Location: WL veg **Description:** **Compass Reading:** °


9-17-03 WIGEON RESERVOIR WETLAND
1:6000 Horizons, Inc. 2
C13-171
Wigeon 2003

Appendix D

BIRD SURVEY PROTOCOL
GPS PROTOCOL

MDT Wetland Mitigation Monitoring
Wigeon Reservoir
Alzada, Montana

LAND & WATER

BIRD SURVEY PROTOCOL

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

Species Use within the Mitigation Wetland: Survey Method

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

Sites that can be circumambulated or walked throughout.

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

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

Sites that cannot be circumambulated.

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

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

Species Use within the Mitigation Wetland: Data Recording

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

1. Bird Species List

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

2. Bird Density

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

3. Bird Behavior

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

4. Bird Species Habitat Use

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

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

MACROINVERTEBRATE SAMPLING PROTOCOL AND DATA

MDT Wetland Mitigation Monitoring
Wigeon Reservoir
Alzada, Montana

LAND & WATER

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, 2002, 2003

METHODS

Among other monitoring activities, aquatic invertebrate assemblages were collected at a number of mitigation wetlands throughout Montana. This report summarizes data generated from three 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 (**Table 1**) tested and recommended by Stribling et al. (1995) in a report to the Montana Department of Health and Environmental Science. In that study, it was determined that some of the metrics were of limited use in some geographic regions, and for some wetland types. Despite that finding, all 12 metrics are used in this evaluation of mitigated wetlands, since detailed geographic information and wetland classifications were unavailable.

Scoring criteria for metrics were developed by generally following the tactic used by Stribling et al. Boxplots were generated and distributions, ranges, and quartiles for each metric were examined. All sites were used except Camp Creek, which was sampled in 2002 and 2003. The fauna at that site was different from that of the other sites, and suggested montane stream conditions rather than wetland conditions. The Camp Creek site was assessed using the tested metric battery developed for montane streams of Western Montana (Bollman 1998). 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.

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, and 2003 by personnel of Wetlands West, Inc. and/or Land & Water Consulting, Inc. Sampling procedures utilized were based on the protocols developed by the Montana Department of Environmental Quality (MDEQ).

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 200 organisms, when possible, from each sample. In some cases, the entire sample contained fewer than 200 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 MDEQ Standard Operating Procedures for Sampling and Sample Analysis (Bukantis 1998). Ten percent of 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; any 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. Thus, the 2003 database contains records for 90 sampling events at 44 unique sites. **Table 2** summarizes sites and sampling dates.

Metric scoring criteria were re-developed each year as new data was added. For 2003, 88 records were utilized. Because of the addition of data, scoring criteria changed for several metrics in 2003; thus, biotic condition classifications assigned in 2002 for some sites also changed. However, ranges of individual metrics, as well as median metric values remained remarkably consistent in each of the three years.

Table 1. Aquatic invertebrate metrics employed in the MTDT mitigation wetland monitoring study, 2001- 2003.

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

LITERATURE CITED

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

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

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

Table 2. Sampled MDT Mitigation Sites by Year

2001	2002	2003
Beaverhead 1	Beaverhead 1	Beaverhead 1
Beaverhead 2	Beaverhead 2	
Beaverhead 3	Beaverhead 3	
Beaverhead 4	Beaverhead 4	Beaverhead 4
Beaverhead 5	Beaverhead 5	Beaverhead 5
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 – Flashlight	Fourchette – Flashlight	Fourchette – Flashlight
Fourchette – Penguin	Fourchette – Penguin	Fourchette – Penguin
Fourchette – Albatross	Fourchette – Albatross	Fourchette – Albatross
Big Spring	Big Spring	Big Spring
Vince Ames		
Ryegate		
Lavinia		
Stillwater	Stillwater	Stillwater
Roundup	Roundup	Roundup
Wigeon	Wigeon	Wigeon
Ridgeway	Ridgeway	Ridgeway
Musgrave – Rest. 1	Musgrave – Rest. 1	Musgrave – Rest. 1
Musgrave – Rest. 2	Musgrave – Rest. 2	Musgrave – Rest. 2
Musgrave – Enh. 1	Musgrave – Enh. 1	Musgrave – Enh. 1
Musgrave – Enh. 2		
	Hoskins Landing	Hoskins Landing
	Peterson - 1	Peterson – 1
	Peterson – 2	
	Peterson – 4	Peterson – 4
	Peterson – 5	Peterson – 5
	Jack Johnson - main	Jack Johnson - main
	Jack Johnson - SW	Jack Johnson - SW
	Creston	Creston
	Lawrence Park	
	Perry Ranch	
	SF Smith River	SF Smith River
	Camp Creek	Camp Creek
	Kleinschmidt	Kleinschmidt – pond
		Kleinschmidt – stream
		Ringling - Galt

Aquatic Invertebrate Taxonomic Data

Site Name WIGEON **Date Collected**

Order	Family	Taxon	Count	Percent	Unique	BI	FFG
Amphipoda							
	Talitridae						
		Hyalella	35	50.00%	Yes	8	CG
Basommatophora							
	Planorbidae						
		Gyraulus	2	2.86%	Yes	8	SC
Coleoptera							
	Haliplidae						
		Haliplus	1	1.43%	Yes	5	PH
Diptera							
	Chironomidae						
		Orthocladius annectens	1	1.43%	Yes	6	CG
Ephemeroptera							
	Baetidae						
		Callibaetis	4	5.71%	Yes	9	CG
Heteroptera							
	Corixidae						
		Corixidae	4	5.71%	No	10	PH
		Sigara	7	10.00%	Yes	5	PH
	Notonectidae						
		Notonecta	3	4.29%	Yes	5	PR
Odonata							
	Coenagrionidae						
		Enallagma	11	15.71%	Yes	7	PR
Trichoptera							
	Leptoceridae						
		Triaenodes	2	2.86%	Yes	6	SH
Grand Total			**70**				

Aquatic Invertebrate Data Summary

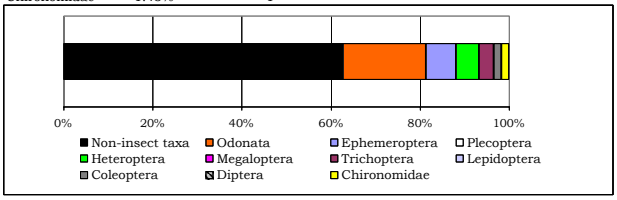
Project ID: MDT03LW
STORET Station ID:
Station Name: WIGEON

Activity ID:
Sample Date:

Sample type	
SUBSAMPLE TOTAL ORGANISMS	70
Portion of sample used	100.00%
Estimated number in total sample	70
Sampling effort	
Time	
Distance	
Jabs	
Habitat type	
EPT abundance	6
Taxa richness	9
Number EPT taxa	2
Percent EPT	8.57%

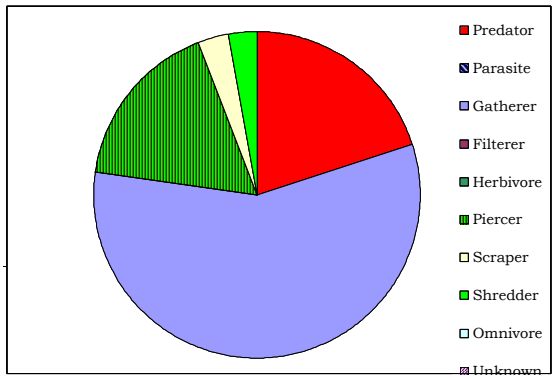
TAXONOMIC COMPOSITION

GROUP	PERCENT	#TAXA
Non-insect taxa	52.86%	2
Odonata	15.71%	1
Ephemeroptera	5.71%	1
Plecoptera	0.00%	0
Heteroptera	4.29%	3
Megaloptera	0.00%	0
Trichoptera	2.86%	1
Lepidoptera	0.00%	0
Coleoptera	1.43%	1
Diptera	0.00%	0
Chironomidae	1.43%	1



FUNCTIONAL COMPOSITION

GROUP	PERCENT	#TAXA
Predator	20.00%	2
Parasite	0.00%	0
Gatherer	57.14%	3
Filterer	0.00%	0
Herbivore	0.00%	0
Piercer	17.14%	3
Scraper	2.86%	1
Shredder	2.86%	1
Omnivore	0.00%	0
Unknown	0.00%	0



COMMUNITY TOLERANCES

Sediment tolerant taxa	1
Percent sediment tolerant	2.86%
Sediment sensitive taxa	0
Metals tolerance index (McGuire)	1.51
Cold stenotherm taxa	0
Percent cold stenotherms	0.00%

HABITUS MEASURES

Hemoglobin bearer richness	2
Percent hemoglobin bearers	7.14%
Air-breather richness	0
Percent air-breathers	0.00%
Burrower richness	0
Percent burrowers	0.00%
Swimmer richness	2
Percent swimmers	2.86%

DOMINANCE

TAXON	ABUNDANCE	PERCENT
Hyalella	35	50.00%
Enallagma	11	15.71%
Sigara	7	10.00%
Callibaetis	4	5.71%
Corixidae	4	5.71%
SUBTOTAL 5 DOMINANTS	61	87.14%
Notonecta	3	4.29%
Gyraulus	2	2.86%
Triaenodes	2	2.86%
Haliplus	1	1.43%
Orthocladius annectens	1	1.43%
TOTAL DOMINANTS	70	100.00%

SAPROBITY

Hilsenhoff Biotic Index	6.56

DIVERSITY

Shannon H (loge)	2.09
Shannon H (log2)	1.45
Margalef D	2.11
Simpson D	0.28
Evenness	0.14

VOLTINISM

TYPE	# TAXA	PERCENT
Multivoltine	2	7.14%
Univoltine	6	91.43%
Semivoltine	1	1.43%

TAXA CHARACTERS

	#TAXA	PERCENT
Tolerant	4	12.86%
Intolerant	0	0.00%
Clinger	0	0.00%

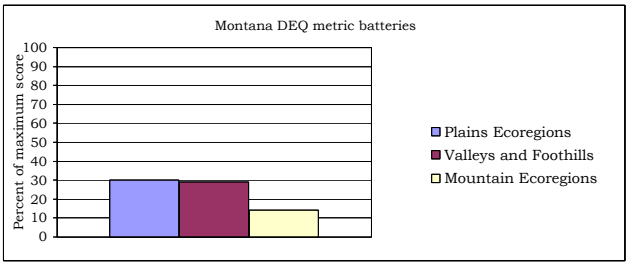
BIOASSESSMENT INDICES

B-IBI (Karr et al.)

METRIC	VALUE	SCORE	
Taxa richness	9	1	
E richness	1	1	
P richness	0	1	
T richness	1	1	
Long-lived	1	1	
Sensitive richness	0	1	
%tolerant	12.86%	5	
%predators	20.00%	5	
Clinger richness	0	1	
%dominance (3)	75.71%	1	
	TOTAL SCORE	18	36%

MONTANA DEQ METRICS (Bukantis 1998)

METRIC	VALUE	Plains Ecoregions	Valleys and Foothills	Mountain Ecoregions
Taxa richness	9	0	0	0
EPT richness	2	0	0	0
Biotic Index	6.56	1	0	0
%Dominant taxon	50.00%	1	1	0
%Collectors	57.14%	3	3	3
%EPT	8.57%	0	0	0
Shannon Diversity	1.45	0		
%Scrapers +Shredders	5.71%	1	0	0
Predator taxa	2	0		
%Multivoltine	7.14%	3		
%H of T	0.00%		3	
TOTAL SCORES		9	7	3
PERCENT OF MAXIMUM		30.00	29.17	14.29
IMPAIRMENT CLASS		MODERATE	MODERATE	SEVERE



Montana Plains ecoregions metrics (Bramblett and Johnson)

Riffle		*Pool*	
EPT richness	2	E richness	1
Percent EPT	8.57%	T richness	1
Percent Oligochaetes and Leeches	0.00%	Percent EPT	8.57%
Percent 2 dominants	65.71%	Percent non-insect	52.86%
Filterer richness	0	Filterer richness	0
Percent intolerant	0.00%	Univoltine richness	6
Univoltine richness	6	Percent supertolerant	64.29%
Percent clingers	0.00%		
Swimmer richness	2		