MONTANA DEPARTMENT OF TRANSPORTATION
WETLAND MITIGATION MONITORING REPORT: YEAR 2006

Wigeon Reservoir
Alzada, Montana

Prepared for:

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

Prepared by:

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

December 2006

Project No: B43054.00 - 0416

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PBS&J

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Cover Photo: *View is east-southeast at the south end of the impoundment near photograph point E.*

1.0 INTRODUCTION

This report documents the sixth year of monitoring at the Wigeon Reservoir mitigation site. 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 of 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 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** in **Appendix A**.

This wetland was designed by the Bureau of Land Management (BLM) in association with 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 creation of open water and emergent wetland types.

2.0 METHODS

2.1 Monitoring Dates and Activities

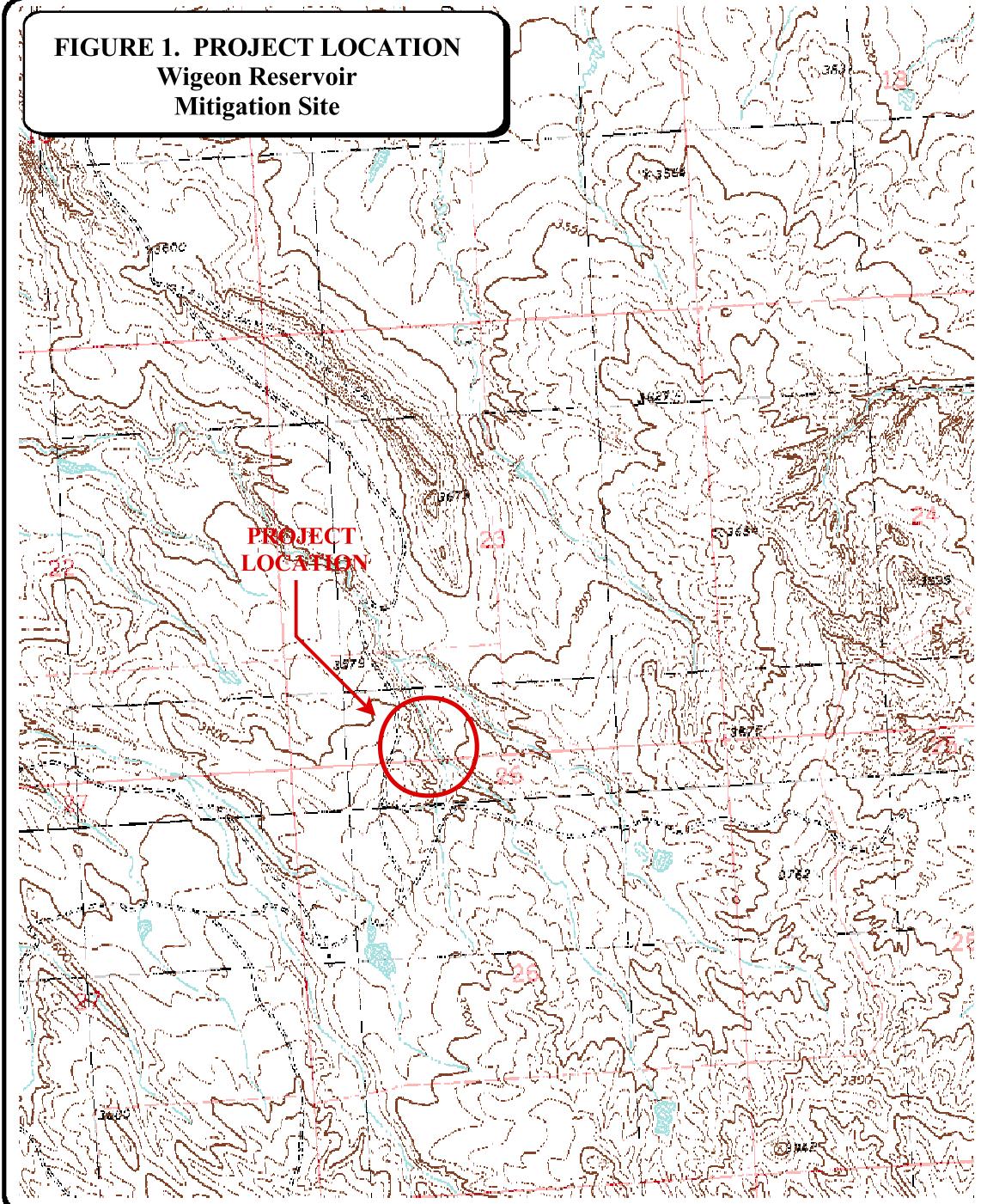
The site was visited once on June 15, 2006. All information on the Wetland Mitigation Site Monitoring Form (**Appendix B**) and macroinvertebrate samples were collected at this time. Activities and information conducted/collected included: wetland delineation; wetland/open water boundary mapping; vegetation 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.

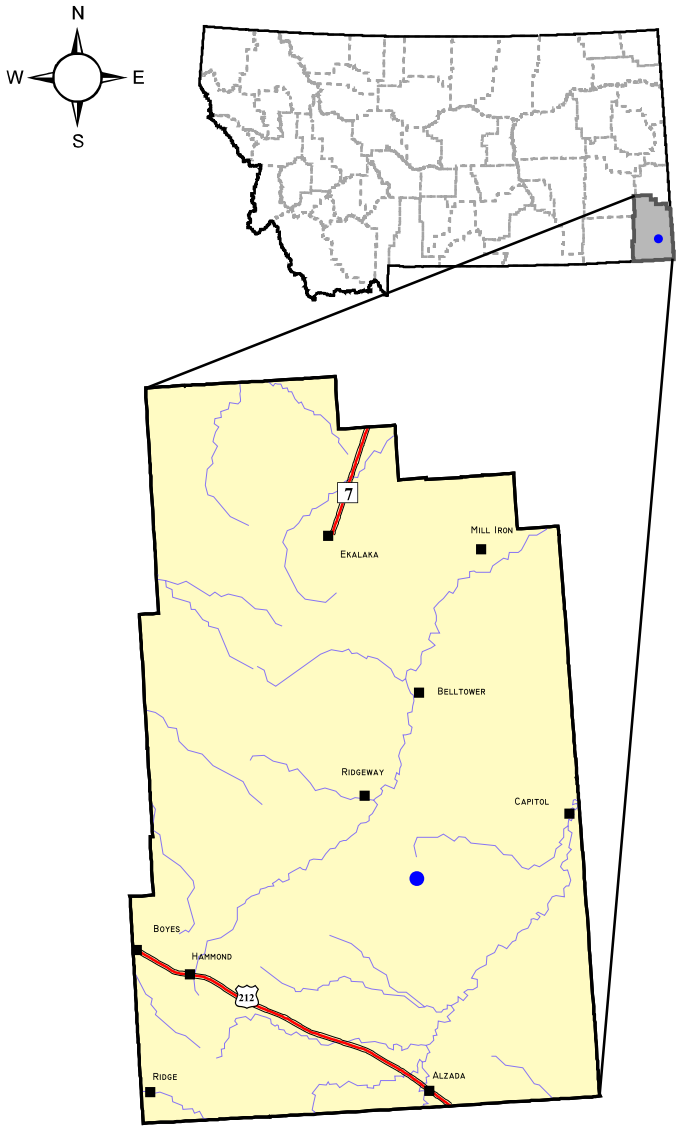
2.2 Hydrology

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 COE Routine Wetland Delineation Data Form **(Appendix B)** at each wetland determination point.

All additional hydrologic data were recorded on the Wetland 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** in **Appendix A**). There are no groundwater monitoring wells at the site. Precipitation data for the year 2006 were compared to the average (1952 – current) (WRCC 2006).

FIGURE 1. PROJECT LOCATION
Wigeon Reservoir
Mitigation Site





800 0 800 1600 Feet

1: 24,000

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 a 2005 aerial photograph during the July site visit (**Figure 3** in **Appendix A**). Coverage of the dominant species in each community type is listed on the Wetland Mitigation Site 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 each subsequent year. 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 transect was again sampled in 2006. The location of this transect is shown on **Figure 2** in **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 2006 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 Mitigation Site 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 updated as new species were encountered.

2.7 Birds

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

2.8 Macroinvertebrates

One macroinvertebrate sample was collected during the 2006 site visit following the **Macroinvertebrate Sampling Protocol** (**Appendix E**). Samples were preserved as outlined in the sampling procedure and sent to Rhithron Associates for analysis (**Appendix E**). The approximate sampling location is indicated on **Figure 2** in **Appendix A**.

2.9 Functional Assessment

A functional assessment form was completed in 2006 for the Wigeon reservoir using the 1999 MDT Montana Wetland Assessment Method (Berglund 1999). 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** in **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 updated in 2006 by mapping on a 2005 color 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 was inspected for problems.

3.0 RESULTS

3.1 Hydrology

Open water/aquatic bed represented 97% of the area within the wetland boundary. Water depths ranged from 0 to 8 feet deep throughout the reservoir. The open water boundary is depicted on **Figure 3** in **Appendix A**. The primary source of hydrology is an intermittent tributary of Prairie Dog Creek and the secondary source is likely groundwater.

According to the Western Regional Climate Center (WRCC 2006), the Ridgeway 1S station annual mean (1952 – current 2006) precipitation was 13.23 inches; the 2005 total precipitation was 14.8 inches or 111% of the mean. The total mean precipitation from January – April was 2.57 inches and in 2006, 4.26 inches of precipitation was recorded for the same time period. In April, 2006 3.76 inches of precipitation was recorded (11 days of data are missing) as a result of a large snow event. This event and the greater than average yearly precipitation in 2005 likely contributed to the difference in water levels observed during the 2005 and 2006 monitoring events, from very low pool in 2005 to greater than full pool levels in 2006.

3.2 Vegetation

Vegetation species identified on the site are presented in **Table 1** and in the Wetland Mitigation Site Monitoring Form (**Appendix B**). **Table 2** and **Charts 1** and **2** illustrate transect data trends. Three major vegetation communities w ere mapped on the mitigation area map (**Figure 3** in **Appendix A**). The communities include: Type 1, *Artemesia tridentata/ Bouteloua gracilis*; Type 2, *Hordeum jubatum*; Type 3, *Chenopdium glauca/Hordeum jubatum,* Type 4, *Eleocharis palustris,* and Type 5, *Agropyron repens/Eleocharis palustris*. Dominant species within each community are listed on the Monitoring Form (**Appendix B**). The Type 4 and 5 communities are new in 2006 because of full pool conditions; dormant *Eleocharis palustris* was observed growing within 1 foot-deep water, from a circumference band that was covered 100% with *Hordeum* in 2005. It is noteworthy that the spikerush rootstock was preserved in the soil substrate within the *Hordeum* community the last several years. Quack grass comprised community Type 5 around most of the wetland circumference.

The 2006 transect data (**Table 2** and **Chart 1**) indicate that most of the transect was inundated and that the spikerush community is reviving. If water levels remain moderately high for the next growing season, other species may regenerate from rootstock that is likely still present in the substrate. If and when the pond levels decrease, it may be advantageous to wetland sustainability if livestock were fenced from entering the wetland from all but a few controlled locations.

Table 1: ***2001-2006 Wigeon Reservoir vegetation species list.***

Scientific Name[1]	Region 4 (North Plains) Wetland Indicator Status[2]
Achillea millefolium	FACU
Agropyron cristatum	-(UPL)
Agropyron dasystachyum	FAC
Agropyron repens	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
Rumex crispus	FACW
Sagittaria spp.	OBL
Scirpus maritimus	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 2006.

[2] Species either not included or classified as "non-indicator" for the National List of Plant Species that Occur in Wetlands: North Plains (Region 4); status in parentheses are probable and based on biologist's experience.

Table 2: ***2001-2006 transect data summary.***

Monitoring Year	2001	2002	2003	2004	2005	2006
Transect Length (feet)	39	39	54[1]	54	54	54
# Vegetation Community Transitions along Transect	2	2	2	2	1	2
# Vegetation Communities along Transect	3	1	3	3	2	3
# Hydrophytic Vegetation Communities along Transect	1	1	2	2	1	2
Total Vegetative Species	11	7	6	4	3	7
Total Hydrophytic Species	4	3	4	2	4	2
Total Upland Species	7	4	2	2	0	6
Estimated % Total Vegetative Cover	76	78	88	91	85	27
% Transect Length Comprised of Hydrophytic Vegetation Communities	21	38	56	56	25	81
% Transect Length Comprised of Upland Vegetation Communities	79	61	44	44	75	19
% Transect Length Comprised of Unvegetated Open Water	0	0	0	0	0	0
% Transect Length Comprised of Bare Substrate	0	0	0	0	0	0

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

Chart 1: ***Length of vegetation communities within Transect 1.***

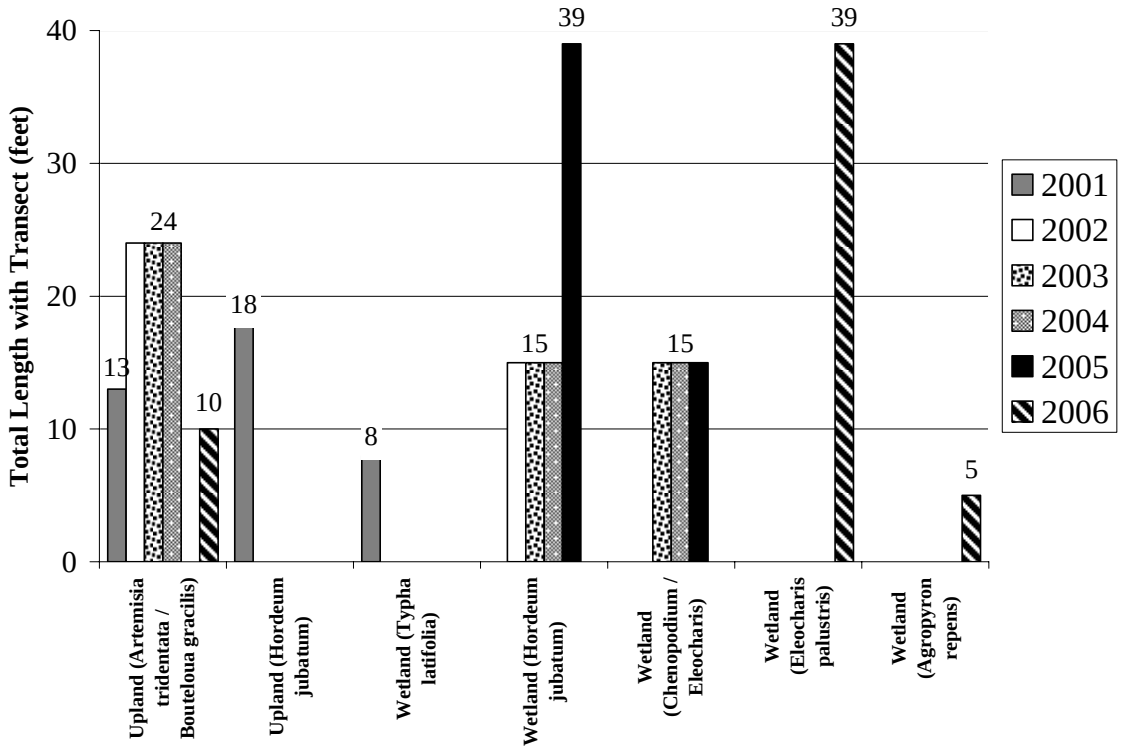
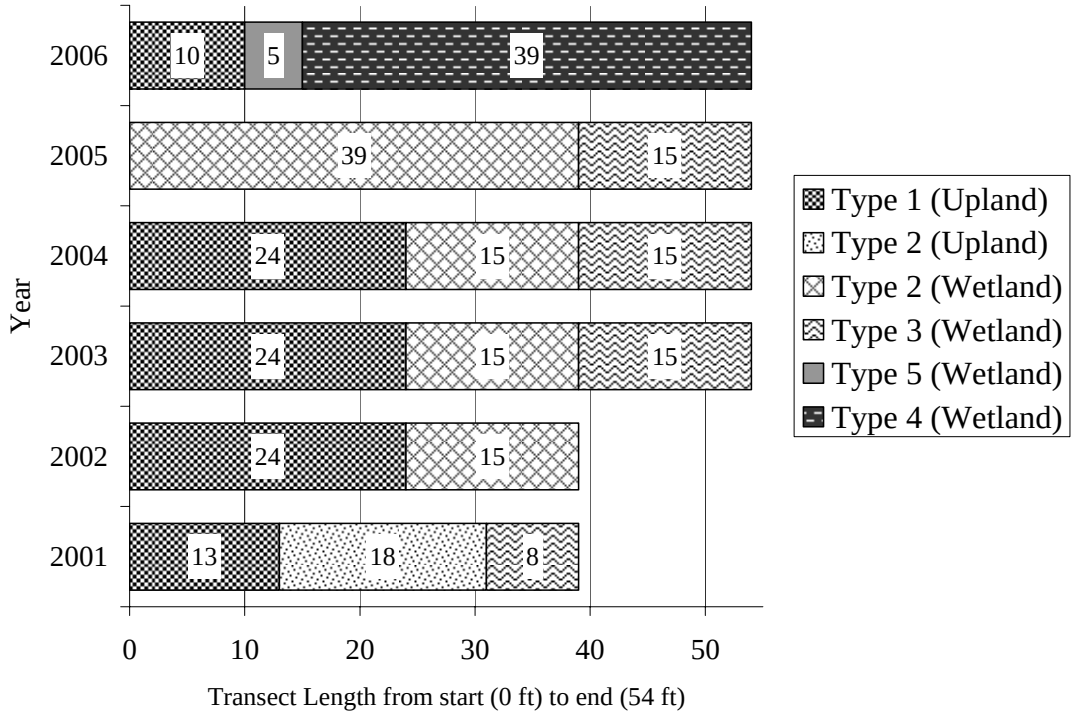


Chart 2: ***Transect maps showing vegetation types from the start (0 feet) to the end of transect.***
(Transect 1 was lengthened from 39 (2001-2002) to 54 (2003-2006) feet as a result of exposed substrate area. Vegetation species within community types are not static across years.)



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) occurs 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 in the re-emerging spikerush community. At a depth of 10 inches the soil was a dark gray and brown (10YR 4/1, 4/3) silt clay with dark yellowish brown mottles (10YR 4/6). Saturation was at the surface at SP-1. SP-2 was excavated in what is likely the original upland zone (prior to ultra-low pond levels); at a depth of 10 inches the soil was a very dark gray (2.5Y 4/2) with no mottles or hydrologic indicators and did not qualify as hydric soil.

3.4 Wetland Delineation

The delineated wetland boundary is depicted on **Figure 3** in **Appendix A**. The pond was at full-pool levels, perhaps higher. The *Hordeum* community that had colonized the circumference of the pond over the last several years was completely inundated. In 2006, spikerush was observed growing within one foot of water around most of the pond circumference. No other wetland species were noted, however, as the pond level decreases during the summer, other rootstock is likely to revive. The COE Forms are included in **Appendix B**.

The gross wetland area in 2006 was 8.71 acres, of which 6.64 acres was open water and 2.07 acres were comprised of inundated emergent vegetation. In 2001, the gross wetland acreage was 8.2 acres and as a result of severe drought, had decreased to 3.73 acres by 2005. The net wetland acreage in 2006 (2.07 acres) is 144% of the 2005 net wetland acreage (0.85 acre). The wetland vegetation in 2005 was primarily comprised of weedy, facultative species (*Chenopodium*) and in 2006 spikerush was the dominant hydrophytic species. Wigeon Reservoir has a high potential to support a diverse and thriving wetland vegetation community, if the area is protected from grazing pressure.

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**. Northern leopard frogs, a “species of special concern” (S3) by the Montana Natural Heritage Program (MNHP), were observed in 2003, however very few have been observed since that time and therefore this wetland site may not be a primary habitat for the species. Several broods of American Wigeon were observed during the 2006 site visit. To date, 26 avian and 3 amphibian species have been recorded at the Wigeon Reservoir during the mitigation monitoring site visit.

Table 3. ***Fish and wildlife species observed on the Wigeon Reservoir Wetland Mitigation Site from 2001-2006.***

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

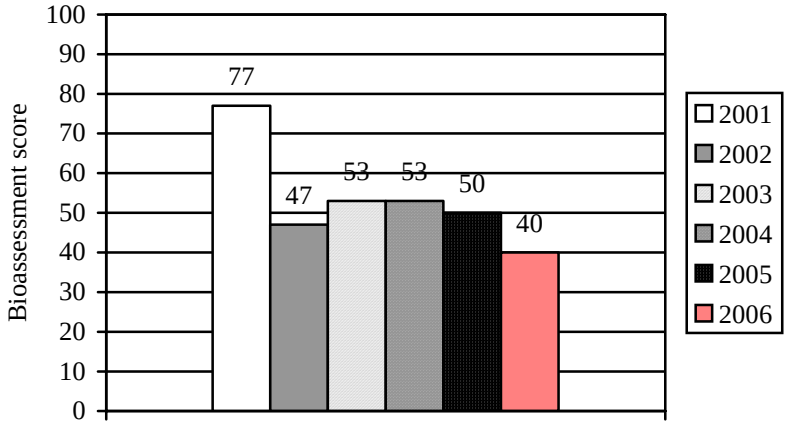
Bolded species were observed during 2006.

3.6 Macroinvertebrates

Macroinvertebrate sampling results are provided in **Appendix E** and **Chart 3** and were summarized by Rhithron Associates in the italicized sections below (Bollman 2006).

A POET taxon (*Enallagma* sp.) *reappeared in 2006, but remained rare, suggesting poor water quality conditions at the Wigeon site. Overall taxa richness fell this year, suggesting limited aquatic habitats. Macrophyte surfaces appear to have supported a rather large population of physid snails* (*Physa* sp.). *Poor conditions are indicated by index scores.*

Chart 3: ***Bioassessment scores for 2001-2006.***



3.7 Functional Assessment

Completed Functional Assessment Forms are included in **Appendix B** and are summarized below in **Table 4**. Functional units have increased to 61.84 in 2006 because of full-pool conditions and the re-emergence of desirable hydrophytic vegetation. The wetland continues to rank as a Category II wetland as it provides primary habitat for an MNHP species of special concern, the northern leopard frog. The diversity of water-loving wildlife that use the reservoir is high as evidenced by the diversity of waterfowl, amphibians and reptiles observed.

Table 4: ***Summary of 2001-2006 wetland function/value ratings and functional points at the Wigeon Reservoir Wetland Mitigation Project.***

Function and Value Parameters From the 1999 MDT Montana Wetland Assessment Method	2001	2002	2003	2004	2005	2006
Listed/Proposed T&E Species Habitat	Low (0)	Low (0)	Low (0)	Low (0)	Low (0)	Low (0)
MNHP Species Habitat	High (1)	High (1)	High (1)	High (1)	High (1)	Mod (.7)
General Wildlife Habitat	Mod (.5)	Mod (.7)	Mod (.7)	High (.9)	High (.9)	High (.9)
General Fish/Aquatic Habitat	Mod (.6)	Mod (.6)	Mod (.6)	Mod (.5)	Mod (.5)	Mod (.5)
Flood Attenuation	Mod (.5)	Mod (.5)	Mod (.5)	Mod (.5)	Mod (.5)	Mod (.5)
Short and Long Term Surface Water Storage	High (1)	High (1)	High (1)	High (1)	High (1)	High (1)
Sediment, Nutrient, Toxicant Removal	Mod (.7)	Mod (.7)	Mod (.7)	Mod (.7)	Mod (.7)	Mod (.7)
Sediment/Shoreline Stabilization	Mod (.7)	Mod (.7)	Low (.3)	Low (.3)	Low (.3)	Low (.3)
Production Export/Food Chain Support	Mod (.6)	Mod (.6)	Mod (.6)	High (.8)	High (.8)	Mod (.7)
Groundwater Discharge/Recharge	High (1)	High (1)	High (1)	High (1)	High (1)	High (1)
Uniqueness	Low (.3)	Low (.2)	Low (.2)	Low (.3)	Low (.3)	Low (.3)
Recreation/Education Potential	Low (.1)	Low (.2)	Low (.2)	Mod (.5)	Mod (.5)	Mod (.5)
Actual Points/Possible Points	7/12	7.2/12	6.8/12	7.5/12	7.5/12	7.1/12
% of Possible Score Achieved	58%	60%	56%	63%	63%	59%
Overall Category	II	II	II	II	II	II
Total Acreage of Assessed Aquatic Habitat Wetlands within Easement	**8.20**	**8.09**	**8.09**	**5.50[1]**	**3.73[1]**	**8.71**
Functional Units (acreage x actual points)	**57.40**	**58.24**	**55.00**	**41.25**	**27.98**	**61.84**
Net Acreage Gain	**8.20**	**8.09**	**8.09**	**5.50**	**3.73**	**8.71**
Net Functional Unit Gain	**57.40**	**58.24**	**55.00**	**41.25**	**27.98**	**61.84**

[1] Years of extreme drought.

3.8 Photographs

Representative photos taken from photo points and transect ends are included in **Appendix C.** Several of the photos depict the extent of the full pool and the reviving community of spikerush around the inundated circumference. A six-year aerial photograph comparison is also provided in **Appendix C**.

3.9 Maintenance Needs/Recommendations

No observable problems were noted concerning the dike structure.

Fencing the monitoring boundary prior to the decrease of water levels is recommended to protect the reestablishing wetland community from cattle grazing. Given the drought-prone location of

Wigeon Reservoir, the wetland community is particularly sensitive to extirpation from grazing pressure when water levels decrease as a result of yearly precipitation variability. When grazing pressure is high, as it was during the drought, the wetland community was dramatically reduced and consequently may require several years to rebound from rootstock, where not damaged. In the absence of grazing pressure, the community would remain intact during drought cycles and therefore simply oscillate through stages of robustness rather than having to regenerate. Several water access points could be incorporated for cattle if the stream below the dam did not provide enough water to support the herd.

3.10 Current Credit Summary

The gross aquatic habitat area in 2006 was 8.71 acres, of which 6.64 acres was open water and 2.07 acres were comprised of inundated emergent vegetation. Wigeon Reservoir has a tremendous potential to support a diverse and thriving wetland vegetation community, if the area is protected from grazing pressure. Functional units have increased to 61.84 in 2006 because of full-pool conditions and the re-emergence of desirable hydrophytic vegetation. The site size fluctuates naturally with precipitation conditions, similar to a natural pothole system.

The target credit amount at this site was 2.2 acres. No specific performance criteria were required to document project success. However, construction was completed in October of 1997 with the goal of providing specific wetland functions including: nesting and brood rearing habitat for waterfowl; water for wildlife habitat; increased habitat diversity; water storage and retention; and creation of open water and emergent wetland types. These functions have clearly been provided by the project. The maximum assignable credit to this site as of 2006 is 8.71 acres of wetlands and shallow open water, all of which constitute valuable habitat in this arid section of Montana; however, the Corps and MDT will need to determine whether credits for all or part of this total acreage are allocated.

4.0 REFERENCES

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Appendix A

FIGURES 2 & 3

MDT Wetland Mitigation Monitoring
Wigeon Reservoir
Alzada, Montana

Figure 2 Monitoring Activity Locations 2006

N
W E
S

SCALE 1"=150ft

Legend

- Monitoring Area Limits
- Vegetation Transect
- Photograph Point
- Aerial Reference Point
- Soil Sample Point
- Macro-invertebrate Sample
- Base Photograph July 5, 2006

Monitoring Area Limits

Monitoring Area Limits

Monitoring Area Limits

Monitoring Area Limits

MS

A

B

C

D

E

F

G

H

End

SP1

SP2

Begin

PROJECT NAME
MDT WIGEON RESERVOIR WETLAND MITIGATION

DRAWING TITLE
MONITORING ACTIVITY LOCATIONS 2006

DRAWN: SH/JR
PROJ MGR: J. BERGLUND
CHECKED: LB
APPVD: JB

PROJ NO: B43054.00.0416
LOCATION: WIGEON RESERVOIR
SCALE: 1" = 150'
FILE NAME:BASE2006.dwg

PBSJ
3810 Valley Commons Drive
Suite 4
Bozeman, MT 59718

FIGURE
2 OF -

REV -
Oct/30/2006

Figure 3 Mapped Site Features 2006

N
W E
S

SCALE 1"=150ft

Monitoring Area Limits

Open Water

Legend

- Monitoring Area Limits
- Wetland Boundary
- Vegetation Community Boundary
- Open Water Boundary
- Base Photograph July 5, 2006

Vegetation CommunityType:

① Artemesia tridentata/Bouteloua gracilis
② Hordeum jubatum
③ Chenopodium glaucum/Hordeum jubatum
④ Eleocharis palustris
⑤ Agropyron repens/Eleocharis palustris

Wetland Areas

Gross Wetland Area	8.71 Acres
Open Water Area	6.64 Acres
Net Wetland Area	2.07 Acres

PROJECT NAME
MDT WIGEON RESERVOIR WETLAND MITIGATION

DRAWING TITLE
MAPPED SITE FEATURES 2006

PROJ NO: B430354.00 0416	DRAWN: SH/JR
LOCATION: WIGEON RESERVOIR	PROJ MGR: J. BERGLUND
SCALE: 1" = 150'	CHECKED: LB APPVD: JB
FILE NAME:BASE2006.dwg	

PBSJ
3810 Valley Commons Drive
Suite 4
Bozeman, MT 59718

FIGURE
3 OF

REV -
Nov/16/2006

Appendix B

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

MDT Wetland Mitigation Monitoring
Wigeon Reservoir
Alzada, Montana

LWC / MDT WETLAND MITIGATION SITE MONITORING FORM

Project Name:_Wigeon_____ Project Number: __B43054.00 0416__ Assessment Date:_6 _/_15___/_06___
Location:____Alzada_____ MDT District:_____5____ Milepost:___-_____
Legal description: T 5 S, R 59 E Section_23, 26 Time of Day:_10:30 AM____
Weather Conditions:__few cloudy, slight breeze, mostly sunny Person(s) conducting the assessment: LB/LWC
Initial Evaluation Date:__8_/_22_/_01_ Visit #:__6____ Monitoring Year:___2006_____
Size of evaluation area:__~10_acres Land use surrounding wetland:___grazing land_____

HYDROLOGY

Surface Water Source:___intermittent drainage_____
Inundation**:** Present_X___ Absent____ Average depths:__5 __ft Range of depths:__1_-__8__ft
Assessment area under inundation:_76% to veg line (97% including inundated veg)
Depth at emergent vegetation-open water boundary:__1 foot
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
_____

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: ___The reservoir is over bank-full, heavy snows winter 2005-2006. Wetland vegetation, mostly ELEPAL, emerging from approximately 1 foot deep water. Around 50% of open-water circumference.

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*	<5

COMMENTS/PROBLEMS: _____

_____

_____

_____

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

Dominant Species	% Cover	Dominant Species	% Cover
Hordeum jubatum	90	*Melilotis officinalis*	<1
Chenopodium glaucum	10	*Circium arvensis*	<5

COMMENTS/PROBLEMS: _____This community has been submerged by full-pool level.

_____

_____

_____

_____

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

Dominant Species	% Cover	Dominant Species	% Cover
Typha latifolia	0	*Chenopodium glaucum*	90
Eleocharis palustris	0	*Puccinellia nuttalliana*	<1
Scirpus spp.	0	exposed pond substrate (dried mud)	5
Sagittaria spp.	0	*Hordeum jubatum*	5
Eleocharis acicularis	0	*Scirpus maritinus* (likely)	<1

COMMENTS/PROBLEMS: Community inundated.

_____

_____

Additional Activities Checklist:

__X__Record and map vegetative communities on air photo

VEGETATION COMMUNITIES (continued)

Community No.:__4__ Community Title (main species):___ *Eleocharis palustris.*_____

Dominant Species	% Cover	Dominant Species	% Cover
Open water	95		
Eleocharis palustris	5%		

COMMENTS/PROBLEMS:

_____

_____

Community No.:__5__ Community Title (main species):__*Agropyron repens/Eleocharis palustris*_

Dominant Species	% Cover	Dominant Species	% Cover
Kochia sp.	<3		
Agropyron repens	95		
Circium arvensis	<3		
Rumex crispus	<1		
Elecharis palustris	<5		

COMMENTS/PROBLEMS:

_____

_____

COMPREHENSIVE VEGETATION LIST

Species	Vegetation Community Number(s)	Species	Vegetation Community Number(s)
Achillea millefolium	1		
Agropyron cristatum	1		
Agropyron dasystachyum	1		
Agropyron repens	**1, 5**		
Agropyron smithii	1		
Artemesia cana	1		
Artemesia tridentate	1		
Bouteloua gracilis	1		
Bromus japonicus	1		
Carex spp.	3		
Carex utriculata	3		
Chenopodium glaucum	2, 3		
Circium arvense	1, 5		
Eleocharis acicularis	3		
Eleocharis palustris	3		
Festuca idahoensis	1		
Grindelia gracifolia	1		
Hordeum jubatum	1, 2, 3		
Juncus spp.	2, 3		
Myosotis scorpioides	open water		
Najas flexilis	open water		
Opuntia spp.	1		
Phleum pretense	1, 2		
Puccinelliana nuttalliana	2		
Rumex crispus	**5**		
Sagittaria spp.	3		
Scirpus maritimus (likely)	3		
Thlaspi arvense	1		
Typha latifolia	3		
Xanthium strumarium	2		
Bold denotes observed in 2006 for the first time.			

COMMENTS/PROBLEMS: Notes: AGRREP occurs in water (0-1ft), which is ordinarily where community type 3 occurs; full-pool is confusing the typical community habitats.

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	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	Compass Reading
A	wetland view	194
B	Edge of open water between photo points D and E.	180
C	wetland buffer	280
D	wetland view	90
E	wetland view	0
F	wetland view	330
G	wetland transect end	10
H	UPL transect beginning	190

COMMENTS/PROBLEMS: __Took an extra 15 shots (on file PBSJ) to record full pool and wetland vegetation emergence from inundated edges.

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
_(X)__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:

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 2006 _____
_____
_____
_____
_____

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: ____Full-pool, perhaps beyond. _____
_____
_____
_____

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: Wigeon Date: 7/15/06 Examiner: LB/PBSJ 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:	10	feet
Species:		Cover:
ARTTRI		5
GRIGRA		10
FESIDA		15
Bare soil		20
AGRDAS		10
BOUGRA		10
AGRREP		30
		80%

Vegetation type B:	CT 5	
Length of transect in this type:	5	feet
Species:		Cover:
AGRREP		95
mud		5
	Total Vegetative Cover:	95%

Vegetation type C:	CT 4	
Length of transect in this type:	39	feet
Species:		Cover:
OW		95
ELEPAL		5
	Total Vegetative Cover:	5%

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 **21-50** % 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:

ELEPAL starting to appear in 0-1 ft deep water, perhaps 50% of circumference has a sparse community scattered at that water depth; see Extra Photo on photo page.

BIRD SURVEY – FIELD DATA SHEET

Page__1__of_1_
Date:6/15/06
Survey Time: 10:30 AM

SITE: Wigeon

Bird Species	#	Behavior	Habitat	Bird Species	#	Behavior	Habitat
Killdeer	5	BR*	Berm area				
Mallard	1	N	UPL				
American Wigeon	5	F	OW				
Wilson's Phalarope	1	F	OW				
Northern Pintail	1	F	OW				
Willet	2	BR*	Berm area				
Red-winged Blackbird	3	BR*	WL/UPL				

*** defensive behavior, likely defending nest and/or young**

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: 6/15/06
Applicant/Owner: MDT	County: Carter
Investigator: LB/PBSJ	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 (dominant)*	H	OBL	9			
2	*CIRARV*	H	FACU	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-). 1/1

ELEPAL submerged, as well as CIRARV.

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: 1 (in.)

Depth to Saturated Soil: 12 (in.)

Wetland Hydrology Indicators:

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

Inundated, full-pool to Community 1 level.

SOILS

Map Unit Name (Series and Phase): Moyerson-Orinoco (277D)-non-hydric

Drainage Class: mod. well

Field Observations

Taxonomy (Subgroup): NA

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.
10”	A	10 YR 4/1, 4/3	10YR 4/6	Many/prom	Silt clay

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)

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 not >30% cover, but occurring in >50% of full-pool circumference from 0-1 foot inundation line. Adequate moisture for 1-2 years would dramatically increase this vegetation cover if grazing minimal.

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

Project/Site: Wigeon	Date: 6/15/06
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	*ARTTRI*	H	UPL	10			
3	*MELOFF*	H	(no listing)	11			
4	*BROTEC*	N	(no listing)	12			
5				13			
6				14			
7				15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-). 0/4

Water edge up to upland community line.

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

SOILS

Map Unit Name (Series and Phase): Moyerson-Orinoco (277D)-non-hydric

Drainage Class: mod. 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 4/2			silt

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
____ Gleyed or Low-Chroma Colors	____ Other (Explain in Remarks)

No mottles or dark soil in this area.

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:

Water level has reached upland community line; given soils, may convert to wetland over time if moisture levels continue to be adequate over the next few years.

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

1. Project Name: Wigeon Reservoir **2. Project #:** B43054 416 **Control #:** _____

3. Evaluation Date: 6/15/2006 **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

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

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

9. Assessment Area (total acres): _____ (visually estimated)
8.71 (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	---	76
Depression	Palustrine	---	Emergent Wetland	Intermittently Exposed	---	23
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.	---	moderate disturbance	---
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.) no cattle observed on day of investigation

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	---	Moderate	---

Comments: _____

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

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

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

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

Highest Habitat Level	doc/primary	sus/primary	doc/secondary	sus/secondary	doc/incidental	sus/incidental	none
Functional Point and Rating	---	---	---	---	---	---	0 (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	_____
Secondary habitat **(list species)**	☒ D	☐ S	Rana pipiens
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	---	---	.7 (M)	---	---	---	---

If documented, list the source (e.g., observations, records, etc.)**:** R. pipiens observed in 2003 and not since by LWC.

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)	--	--	--	--	--	--	--	--	H	--	--	--	--	--	--	--	H	--	--	--
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	--	.9 (H)	--	--
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	--	--	.5 (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 **≥ 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
≥ 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 or piped 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)	--	--	--	--	--	--	--	.3L	--
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	--	.5(M)	--
Private ownership	--	--	--

Comments: _____

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	M	0.70	1	
C. General Wildlife Habitat	H	0.90	1	
D. General Fish/Aquatic Habitat	M	0.50	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	0.70	1	
J. Groundwater Discharge/Recharge	H	1.00	1	
K. Uniqueness	L	0.30	1	
L. Recreation/Education Potential	M	0.50	1	
	Totals:	7.10	12.00	61
		Percent of Total Possible Points:	**59%** (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
2001-2006 AERIAL PHOTOGRAPH COMPARISON

MDT Wetland Mitigation Monitoring
Wigeon Reservoir
Alzada, Montana

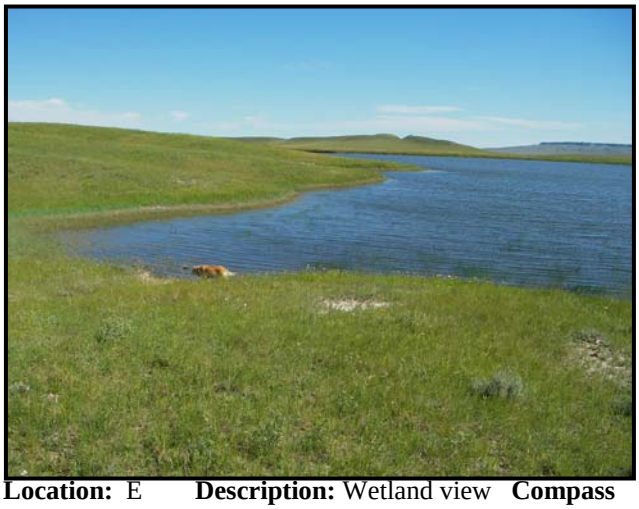
2006 WIGEON RESERVOIR WETLAND MITIGATION SITE

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 **Description:** Wetland view **Compass Reading:** 46°



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

Location: F Description: Wetland view **Compass Reading: 330°**

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

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

Extra Photo: From B and E vicinity, view to southwest depicting *Eleocharis palustris* emerging from 1 foot deep water.

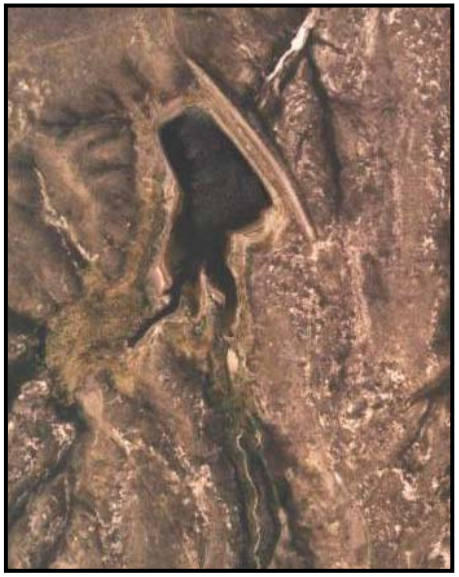
SIX-YEAR AERIAL PHOTOGRAPH COMPARISON – WIGEON RESERVOIR WETLAND MITIGATION SITE

JULY 17, 2001

JULY 22, 2002

SEPTEMBER 17, 2003

JULY 25, 2004



JULY 6, 2005

JULY 6, 2006

Appendix D

GPS PROTOCOL

MDT Wetland Mitigation Monitoring
Wigeon Reservoir
Alzada, Montana

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

AQUATIC INVERTEBRATE SAMPLING PROTOCOL

Equipment List

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

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

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

Site Selection

Select the sampling site with these considerations in mind:

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

Sampling

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

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

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

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

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

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

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

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

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

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

Photograph the sampled site.

Sample Handling/Shipping

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

MDT Mitigated Wetland Monitoring Project: Aquatic Invertebrate Monitoring Summary 2001 – 2006

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

INTRODUCTION

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

METHODS

Sample processing

Aquatic invertebrate samples were collected at mitigated wetland sites in the summer months of 2001, 2002, 2003, 2004, 2005 and 2006 by personnel of PBS&J, Inc. Sampling procedures utilized were based on the protocols developed by the Montana Department of Environmental Quality (MT DEQ). Sampling consisted of D-frame net sweeps through emergent vegetation (when present), the water column, and over the water surface, and included disturbing and scraping substrates at each sampled site. These sample components were composited and preserved in ethanol at each wetland site. Samples were delivered to Rhithron Associates, Inc. for processing, taxonomic determinations, and data analysis.

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

Assessment

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

Scoring criteria for metrics were developed by generally following the tactic used by Stribling et al. Boxplots were generated using a statistical software package (Statistica™), and distributions, median values, ranges, and quartiles for each metric were examined. All sites in all years of sampling were used. Camp Creek, which was sampled in 2002, 2003, 2004, 2005 and 2006, and Kleinschmidt Creek, sampled in 2003, 2004, 2005 and 2006, were assessed using the tested metric battery developed for montane streams of Western Montana (Bollman 1998).Invertebrate assemblages at these sites differed from those of the other sites, and suggested montane or foothill stream conditions rather than wetland conditions. For the wetland sites, "optimal" scores were generally those that fell above the 75th percentile (for those metrics that decrease in value in response to stress) or below the 25th percentile (for metrics that respond to stress by an increase in value) of all scores. Additional scoring ranges were established by bisecting the range below the 75th percentile for decreasing scores (or above the 25th percentile for increasing scores) into "sub-optimal" and "poor" assessment categories. A score of 5, 3, or 1 was assigned to optimal, sub-optimal, and poor metric performance, respectively. In this way, metric values were translated into normalized metric scores, and scores for all metrics were summed to produce a total bioassessment score. Total bioassessment scores were classified according to a similar process, using the ranges and distributions of total scores for all sites studied in all years.

The purpose of constructing an index from biological attributes or metrics is to provide a means of integrating information to facilitate the determination of whether management action is needed. The nature of the action needed is not determined solely by the index score, however, but by consideration of an

analysis of the component metrics, the taxonomic composition of the assemblages, and other issues. The diagnostic functions of the metrics and taxonomic data need more study since our understanding of the interrelationships of natural environmental factors and anthropogenic disturbances is tentative. Thus, the further interpretive remarks accompanying the raw taxonomic and metric data in this summary are offered cautiously. Year-to-year comparisons depend on an assumption that specific sites were revisited in each year, and that equivalent sampling methods were utilized at each site revisit.

Bioassessment metrics

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

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

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

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

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

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

Quality control

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

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

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

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

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

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

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

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

RESULTS

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

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Quality Assurance

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

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

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

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

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

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

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

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

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

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

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

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

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

Taxa Listing

Project ID: MDT06PBSJ
RAI No.: MDT06PBSJ029

RAI No.: MDT06PBSJ029 **Sta. Name:** Wigeon Reservoir
Client ID:
Date Coll.: **No. Jars:** 1 **STORET ID:**

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Non-Insect							
Glossiphoniidae							
Theromyzon sp.	1	0.92%	Yes	Unknown		10	PR
Physidae							
Physidae	80	73.39%	Yes	Unknown		8	SC
Talitridae							
Hyalella sp.	7	6.42%	Yes	Unknown		8	CG
Odonata							
Coenagrionidae							
Enallagma sp.	4	3.67%	Yes	Larva		7	PR
Heteroptera							
Corixidae							
Corixidae	7	6.42%	No	Larva		10	PH
Sigara sp.	1	0.92%	Yes	Adult		5	PH
Coleoptera							
Haliplidae							
Haliplus sp.	1	0.92%	Yes	Adult		5	PH
Hydrophilidae							
Hydrophilidae	1	0.92%	Yes	Larva		5	PR
Chironomidae							
Chironomidae							
Cricotopus (Isocladius) sp.	2	1.83%	Yes	Larva		7	SH
Endochironomus sp.	4	3.67%	Yes	Larva		10	SH
Parachironomus sp.	1	0.92%	Yes	Larva		10	PR
Sample Count	**109**						

Metrics Report

Project ID: MDT06PBSJ
RAI No.: MDT06PBSJ029
Sta. Name: Wigeon Reservoir
Client ID:
STORET ID:
Coll. Date:

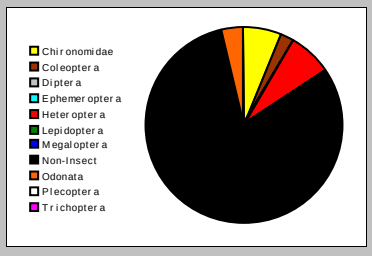
Abundance Measures

Sample Count: 109
Sample Abundance: 125.77 86.67% of sample used

Coll. Procedure:
Sample Notes:

Taxonomic Composition

Category	R	A	PRA
Non-Insect	3	88	80.73%
Odonata	1	4	3.67%
Ephemeroptera			
Plecoptera			
Heteroptera	1	8	7.34%
Megaloptera			
Trichoptera			
Lepidoptera			
Coleoptera	2	2	1.83%
Diptera			
Chironomidae	3	7	6.42%

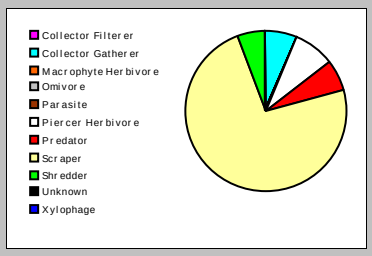


Dominant Taxa

Category	A	PRA
Physidae	80	73.39%
Hyalella	7	6.42%
Corixidae	7	6.42%
Endochironomus	4	3.67%
Enallagma	4	3.67%
Cricotopus (Isocladius)	2	1.83%
Theromyzon	1	0.92%
Sigara	1	0.92%
Parachironomus	1	0.92%
Hydrophilidae	1	0.92%
Haliplus	1	0.92%

Functional Composition

Category	R	A	PRA
Predator	4	7	6.42%
Parasite			
Collector Gatherer	1	7	6.42%
Collector Filterer			
Macrophyte Herbivore			
Piercer Herbivore	2	9	8.26%
Xylophage			
Scraper	1	80	73.39%
Shredder	2	6	5.50%
Omivore			
Unknown			

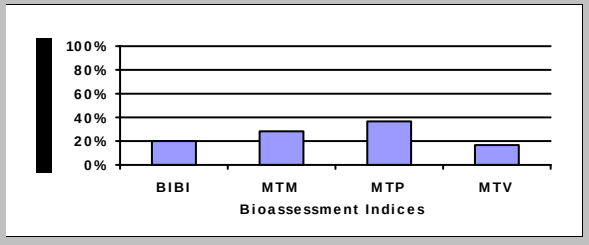


Metric Values and Scores

Metric	Value	BIBI	MTP	MTV	MTM
Composition					
Taxa Richness	10	1	0		0
Non-Insect Percent	80.73%				
E Richness	0	1		0	
P Richness	0	1		0	
T Richness	0	1		0	
EPT Richness	0		0		0
EPT Percent	0.00%		0		0
Oligochaeta+Hirudinea Percent	0.92%				
Baetidae/Ephemeroptera	0.000				
Hydropsychidae/Trichoptera	0.000				
Dominance					
Dominant Taxon Percent	73.39%		0		0
Dominant Taxa (2) Percent	79.82%				
Dominant Taxa (3) Percent	86.24%	1			
Dominant Taxa (10) Percent	99.08%				
Diversity					
Shannon H (loge)	0.932				
Shannon H (log2)	1.345		0		
Margalef D	1.946				
Simpson D	0.620				
Evenness	0.076				
Function					
Predator Richness	4		2		
Predator Percent	6.42%	1			
Filterer Richness	0				
Filterer Percent	0.00%			3	
Collector Percent	6.42%		3		3
Scraper+Shredder Percent	78.90%		3		3
Scraper/Filterer	0.000				
Scraper/Scraper+Filterer	0.000				
Habit					
Burrower Richness	0				
Burrower Percent	0.00%				
Swimmer Richness	2				
Swimmer Percent	8.26%				
Clinger Richness	1	1			
Clinger Percent	1.83%				
Characteristics					
Cold Stenotherm Richness	0				
Cold Stenotherm Percent	0.00%				
Hemoglobin Bearer Richness	2				
Hemoglobin Bearer Percent	4.59%				
Air Breather Richness	1				
Air Breather Percent	0.92%				
Voltinism					
Univoltine Richness	5				
Semivoltine Richness	2	1			
Multivoltine Percent	6.42%		3		
Tolerance					
Sediment Tolerant Richness	0				
Sediment Tolerant Percent	0.00%				
Sediment Sensitive Richness	0				
Sediment Sensitive Percent	0.00%				
Metals Tolerance Index	3.295				
Pollution Sensitive Richness	0	1		0	
Pollution Tolerant Percent	78.90%	1		0	
Hilsenhoff Biotic Index	8.101		0		0
Intolerant Percent	0.00%				
Supertolerant Percent	91.74%				
CTQa	90.000				

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	10	20.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	11	36.67%	Moderate
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	3	16.67%	Severe
MTM	Montana DEQ Mountains (Bukantis 1998)	6	28.57%	Moderate



Thursday, September 14, 2006