MONTANA DEPARTMENT OF TRANSPORTATION
WETLAND MITIGATION MONITORING REPORT: YEAR 2005

Wagner Marsh
Billings, Montana

Prepared for:

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

Prepared by:

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

December 2005

Project No: B43054.00 - 0514

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1.0 INTRODUCTION

This report presents the results of the first year (2005) of wetland monitoring at the Wagner Marsh wetland mitigation project. This mitigation site was constructed during the spring of 2005 in the eastern portion of the UpperYellowstone River watershed (Watershed #13). It is anticipated that this site will compensate for wetland impacts resulting from Montana Department of Transportation (MDT) highway and bridge reconstruction projects in the watershed. Wagner Marsh was constructed on MDT property originally purchased in 1954 and used as a borrow area (gravel mining) for construction of the Interstate 90 (I-90) corridor. For this reason the Wagner Marsh is also known as the 'Wagner Pit'. The goal of the project is to create wetland hydrology at the site, and thereby ultimately provide approximately 21.59 acres of palustrine emergent and scrub-shrub wetland within the confines of the 39 acre site. Prior to construction approximately 2.12 acres of palustrine emergent and scrub-shrub wetland and 1.75 acres of open water had developed without intervention by MDT.

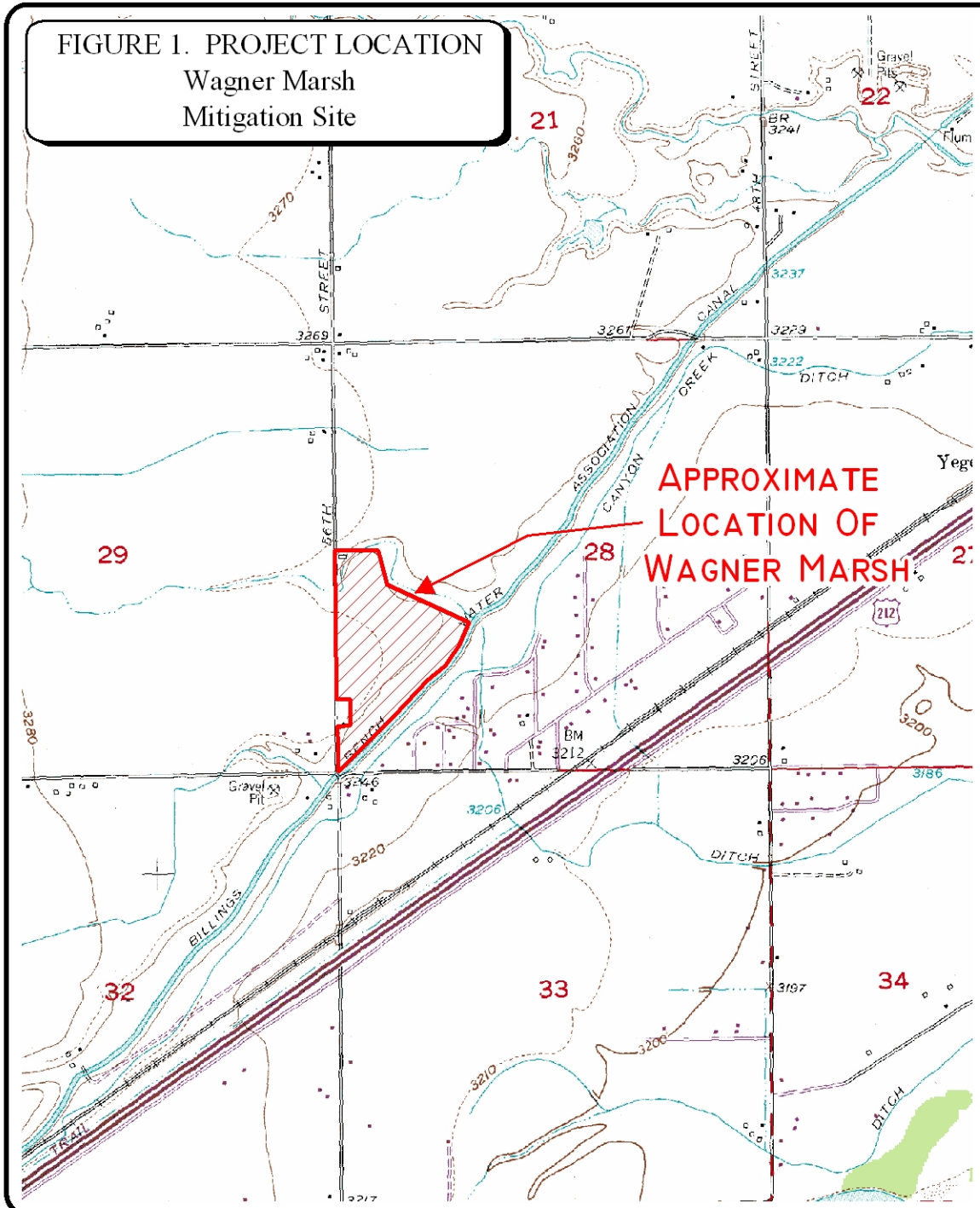
The site occurs at an elevation of approximately 3,240 feet above mean sea level and is located on the west edge of Billings, MT just north and east of the intersection of Danford Road and 56th Street in the SW ¼ of Section 28, Township 1 South, Range 25 East, Yellowstone County (**Figure 1**). Approximate universal transverse mercator (UTM) coordinates for the central portion of the site are (Zone 12N) 5,065,220 Northing, 682,385 Easting.

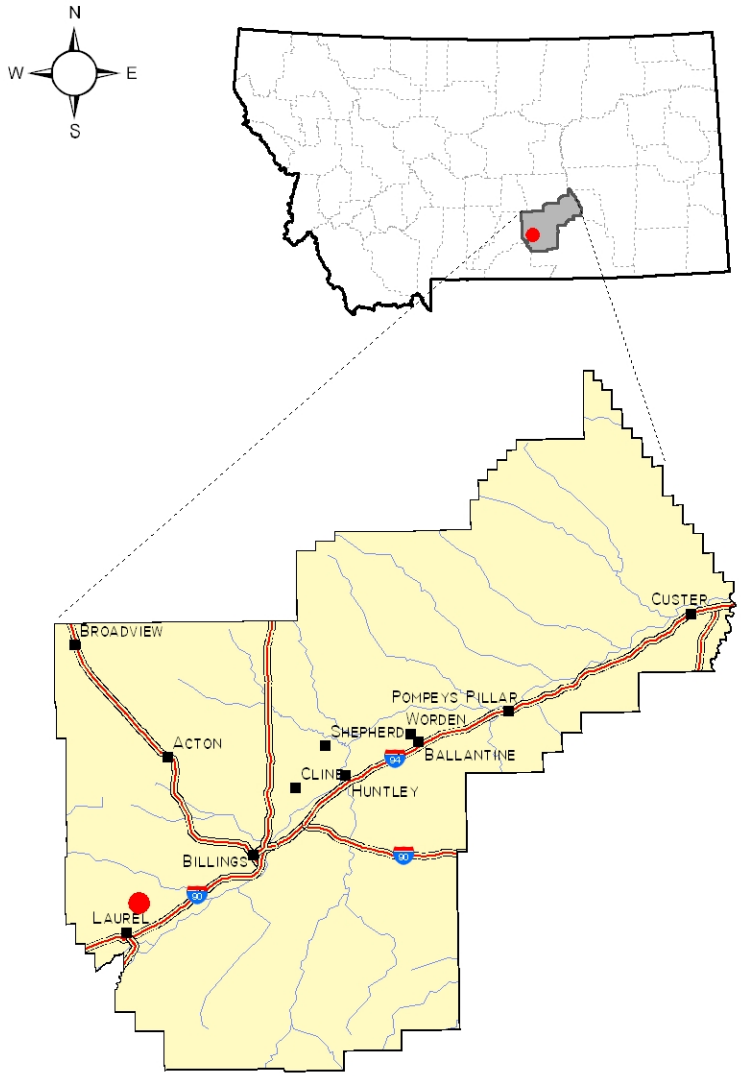
The approximate site boundary is illustrated in **Figure 2** (**Appendix A**), and the original conceptual layout is provided in **Appendix D**. The project is comprised of two existing wetland/open water areas totaling 3.87 acres and seven wetland creation areas (i.e., wetland cells) totaling approximately 17.72 acres. Wetland hydrology is supplied primarily through interception of the groundwater table, with some minimal contributions from precipitation. No surface outlet exists at the site. To ensure sufficient water for the wetland creation areas into the future, MDT previously secured groundwater rights. The establishment of an upland buffer is also a part of this project and will be tied into the crediting for the project. Monitoring occurs on the site in mid-summer when wetland data is collected, and in the fall when bird and other wildlife use is documented.

Wetland credits for the site are determined by the following ratios:

- 1:1 for wetland establishment/reestablishment for in-kind mitigation conducted prior to wetland impacts
- 1.5:1 for out-of-kind wetland mitigation, or if wetland impacts occurred prior to the bank's establishment
- Credit for open water is limited to no more than 20% of the amount of actual wetland acreage that develops onsite.
- Upland buffers are limited to a maximum width of 50 feet and are credited at a ratio of 4:1.

FIGURE 1. PROJECT LOCATION
Wagner Marsh
Mitigation Site





0 800 1,600 FEET
1:24,000

PROJECT #: B43054.00 514
DATE: SEPTEMBER 2005
LOCATION: WAGNER MARSH
PROJECT MGR: R. MCELDOWNEY
DRAWN BY: JJC

LAND & WATER CONSULTING
801 N. Last Chance Gulch, Ste. 100
Helena, MT 59601
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2.0 METHODS

2.1 Monitoring Dates and Activities

The site was visited on August 1, 2005 (mid-season visit) and again on September 28, 2005 (fall visit). The mid-season visit was conducted to document vegetation, soil, and hydrologic conditions used to map jurisdictional wetlands. The majority of the information contained on the Wetland Mitigation Site Monitoring Form (**Appendix B**) was collected at this time. Activities and information conducted/collected included: wetland delineation; wetland/open water boundary mapping; vegetation community mapping; vegetation transects; soils data; hydrology data; bird and general wildlife use; photograph points; macroinvertebrate sampling; functional assessment; and survival of planted woody vegetation.

The primary purpose of the fall visit was to conduct bird/general wildlife reconnaissance of the site. The fall visit was timed to coincide with the fall bird migrations.

2.2 Hydrology

Hydrologic indicators were primarily evaluated at the site during the mid-season visit, but additional notes were also taken during the fall visit. Wetland hydrology indicators were recorded using procedures outlined in the Corps of Engineers (COE) Wetlands Delineation Manual (Environmental Laboratory 1987) and hydrology data were recorded on COE Routine Wetland Delineation Data Forms (**Appendix B**). If located within 18 inches of the ground surface (soil pit depth for purposes of delineation), groundwater depths were documented on the routine wetland delineation data form at each data point.

All additional hydrologic data were recorded on the mitigation site monitoring form (**Appendix B**). 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.

2.3 Vegetation

General dominant species-based vegetation community types (e.g., *Typha latifolia/Scirpus acutus*) were delineated on an aerial photograph during the fall visit. Standardized community mapping was not employed as many of these systems are geared towards climax vegetation and may not reflect yearly changes. Estimated percent cover of the dominant species in each community type was listed on the site monitoring form (**Appendix B**).

The 10-foot wide belt transect was established this year (2005) **(Figure 2 in Appendix A)**. Within the transect belt percent cover was estimated for each vegetative species for each vegetation community encountered within the "belt" using the following values: + (<1%); 1 (1-5%); 2 (6-10%); 3 (11-20%); 4 (21-50%); and 5 (>50%).

The purpose of the transect is to evaluate changes over time, especially the establishment and increase of hydrophytic vegetation. The transect location was marked on the aerial photo and all

data recorded on the mitigation site monitoring form. Transect endpoint locations were recorded with a global positioning system (GPS) unit. Metal fence posts were installed to physically mark the transect ends. Photos of the transect were taken from both ends during the mid-season visit.

A comprehensive plant species list for the site was compiled. Ultimately, observations from future years will be compared with data gathered in 2005 to document vegetation changes over time.

Seven woody species were planted at this mitigation site. Planting locations were documented as point data with a GPS. Observers recorded the number of dead individuals for each species observed and compared them to known planting numbers.

2.4 Soils

Soils were evaluated during the mid-season visit according to hydric soils determination procedures outlined in the COE 1987 Wetland Delineation Manual. Soil data was recorded for each wetland determination point on the COE Routine Wetland Delineation Data Form (**Appendix B**). The most current terminology used by NRCS was used to describe hydric soils (USDA 2003).

2.5 Wetland Delineation

A wetland delineation of the mitigation site was conducted during the 2005 mid-season visit according to the 1987 COE of Engineers 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: Northwest (Region 9) (Reed 1988).

The information was recorded on COE Routine Wetland Delineation Data Forms (**Appendix B**). The wetland/upland boundary was delineated on the July 2005 aerial photo during the fall visit. The wetland/upland boundary in combination with the wetland/open water habitat boundary was used to calculate the wetland area that has developed within the monitoring area.

2.6 Mammals, Reptiles, and Amphibians

Mammal, reptile, and amphibian species observations and other positive indicators of use, such as vocalizations, were recorded on the wetland monitoring form during each visit. Indirect use indicators, including tracks; scat; burrows; eggshells; skins; bones; etc., were also recorded. Observations were recorded as the observer traversed the site while conducting other required activities. Direct sampling methods, such as snap traps, live traps, and pitfall traps, were not implemented. A comprehensive list of observed species was compiled. Observations from future monitoring will ultimately be compared to this data.

2.7 Birds

Bird observations were recorded during each visit. No formal census plots, spot mapping, point counts, or strip transects were conducted. During the mid-season visit, bird observations were recorded incidental to other monitoring activities. During the Fall visit, observations were recorded in compliance with the bird survey protocol in **Appendix E**. During both visits, observations were categorized by species, activity code, and general habitat association (see data forms in **Appendix B**).

2.8 Macroinvertebrates

One macroinvertebrate sample was collected during the mid-season site visit and data recorded on the wetland mitigation monitoring form. Macroinvertebrate sampling procedures and analysis are included in **Appendix F**. The approximate location of this sample point, within emergent marsh habitat in the east portion of the site, is shown on **Figure 2**, **Appendix A**. The sample was preserved as outlined in the sampling procedure and sent to a laboratory for analysis.

2.9 Functional Assessment

Functional assessment forms were completed for various assessment areas within the monitoring area using the 1999 MDT Montana Wetland Assessment Method. Field data necessary for this assessment were generally collected during the mid-season site visit. The remainder of the functional assessment was completed in the office.

2.10 Photographs

Photographs were taken during the mid-season visit showing the current land use surrounding the site, the upland buffer, the monitored area, macroinvertebrate sampling location, and the vegetation transect. Each photograph point location was recorded with a GPS. The approximate location of photo points is shown on **Figure 2**, **Appendix A**. All photographs were taken using an Olympus Stylus 300 digital camera, with no optical zoom used. A description and compass direction for each photograph was recorded on the wetland monitoring form.

2.11 GPS Data

During the 2005 monitoring season, data were collected with a Garmin 12CT GPS unit at the vegetation transect beginning and ending locations, at all photograph locations, wetland sample points, and at aerial photograph reference points.

2.12 Maintenance Needs

Where encountered, current or potential future problems were documented and conveyed to MDT.

3.0 RESULTS

3.1 Hydrology

The closest weather station to the wetland monitoring area is Laurel, MT station #244894, but it was closed in 1994. According to the Western Regional Climate Center (WRCC) (2005a), mean annual precipitation at this station is approximately 14.61 inches; with the majority of precipitation occurring in April, May, June, and September. The closest *active* weather station is Billings WSO (Sta. #240807). The precipitation total through July 2005 at the Billings weather station was 8.94 inches (WRCC 2005a). Annual evaporation pan rates are estimated to be approximately 58.2 inches at the Billings airport (WRCC 2005b), almost four times the yearly precipitation rate. Based on these data it is clear that groundwater is the primary hydrologic component of Wagner Marsh, with precipitation playing a minor role in the overall water budget.

Inundation was present, to some extent, at all wetlands within the monitoring area during the mid-season visit despite the slightly below average precipitation year. It was noted that water levels were higher during the fall visit compared to the mid-season visit. In fact, wetland sample point 2 was dry during the mid-season visit, but was inundated with several inches of water during the fall visit. Though the cause for this is unknown, it is likely that water levels were higher due to less irrigation occurring on farms in the area in September. Open water areas are shown on **Figure 3** (**Appendix A**).

Of the 39 acres in the monitoring area approximately 20 percent was inundated (**Figure 3, Appendix A**), with an average depth of three inches and a range of depths from 0.25 to an estimated five feet. The pond located immediately south of the crescent shaped pond on the west side of the site appeared to have the greatest depths; approximately 5 feet deep.

3.2 Vegetation

Vegetation species identified on the site are presented in **Table 1** and on the attached data form (**Appendix B**). Because construction of the site was only completed in June 2005 much of the site was sparsely vegetated and/or dominated by annuals. A total of 8 community types were documented at the site, of which four are vegetated wetland community types. These wetland community types were identified and mapped on the mitigation area (**Figure 3**, **Appendix A**) and included *Polygonum lapathifolium* (POLLAP type), *Typha sp./Mixed graminoids* (Typha sp. type), *Salix exigua-Eleagnus angustifolia/Carex lanuginosa* (Salix type), and *Polypogon monspeliensis* (Polypogon type). Dominant species within each of these communities are listed on the attached data form (**Appendix B**). The POLLAP and Polypogon types occur as a wetland fringes around previously existing ponds on the west and northwest sides of the site (**Figure 3**). The Typha sp. type is the most common wetland type found on the site and occurs as scattered pockets throughout the mitigation area. Potential future wetland areas occur in all of the wetland cells and are mapped on **Figure 3** as the Disturbed – Moist vegetation type. These areas currently do not qualify as wetlands, but are expected to transition into wetland habitat over time.

Upland communities are primarily dominated by seeded and/or weedy herbaceous species including, smooth brome (*Bromus inermis*), crested wheatgrass (*Agropyron cristatum*), western

wheatgrass (*Agropyron smithii*), meadow fescue (*Festuca pratensis*), Japanese brome (*Bromus japonicus*), quackgrass (*Agropyron repens*), field bindweed (*Convolvulus arvensis*), and lambsquarters (*Chenopodium album*).

Table 1: ***2005 Wagner Marsh vegetation species list.***

Scientific Name	1988 Region 9 (Northwest) Wetland Indicator
Agropyron cristatum	--
Agropyron repens	FACU
Agropyron smithii	FACU
Agropyron sp.	--
Agrostis alba	FACW
Alyssum sp.	--
Asclepias sp.	--
Aster spp. (white)	--
Beckmannia syzigachne	OBL
Bromus inermis	--
Bromus japonicus	FACU
Carex lanuginose	OBL
Carex nebrascensis	OBL
Carex sp.	--
Chenopodium album	FAC
Cirsium arvense	FACU+
Convolvulus arvensis	--
Conyza Canadensis	FACU
Descurainia Sophia	--
Echinochloa muricata	FACW
Eleagnus angustifolia	FAC
Eleagnus commutate (planted)	NI
Eleocharis palustris	OBL
Epilobium ciliatum	FACW-
Erodium cicutarium	--
Festuca pratensis	FACU+
Grindellia squarrosa	FACU
Hordeum jubatum	FAC+
Juncus bufonius	FACW+
Juncus torreyi	FACW
Juniperus scopulorum (planted)	--
Lactuca serriola	FACU
Linum sp.	--
Lotus unifoliolatus	--
Medicago lupulina	FAC
Medicago sativa	--
Melilotus officinalis	FACU
Mustard sp.	--
Panicum capillare	FAC
Polygonum aviculare	FACW-
Polygonum persicaria	FACW
Polypogon monspeliensis	FACW
Populus deltoides	FAC
Potentilla sp. (Potentilla paradoxa?)	(FACW)
Prunus virginiana (planted)	FACU
Ribes aureum (planted)	FAC+

Scientific Name	1988 Region 9 (Northwest) Wetland Indicator
Rosa woodsii (planted)	FACU
Rumex crispus	FACW
Salix amygdaloides	FACW
Salix exigua	OBL
Salsola iberica	--
Scirpus acutus	OBL
Scirpus pungens	OBL
Sheperdia argentea (planted)	--
Sisymbrium altissimum	FACU-
Solidago canadensis	FACU
Sonchus arvensis	FACU+
Tamarix ramosissima	FACW
Taraxacum officinale	FACU
Thlaspi arvense	NI
Tragopogon dubius	--
Typha angustifolia	OBL
Typha latifolia	OBL

Chart 1: ***Transect maps showing vegetation types from the start of transect (0 feet) to the end of transect (530 feet) for 2005.***

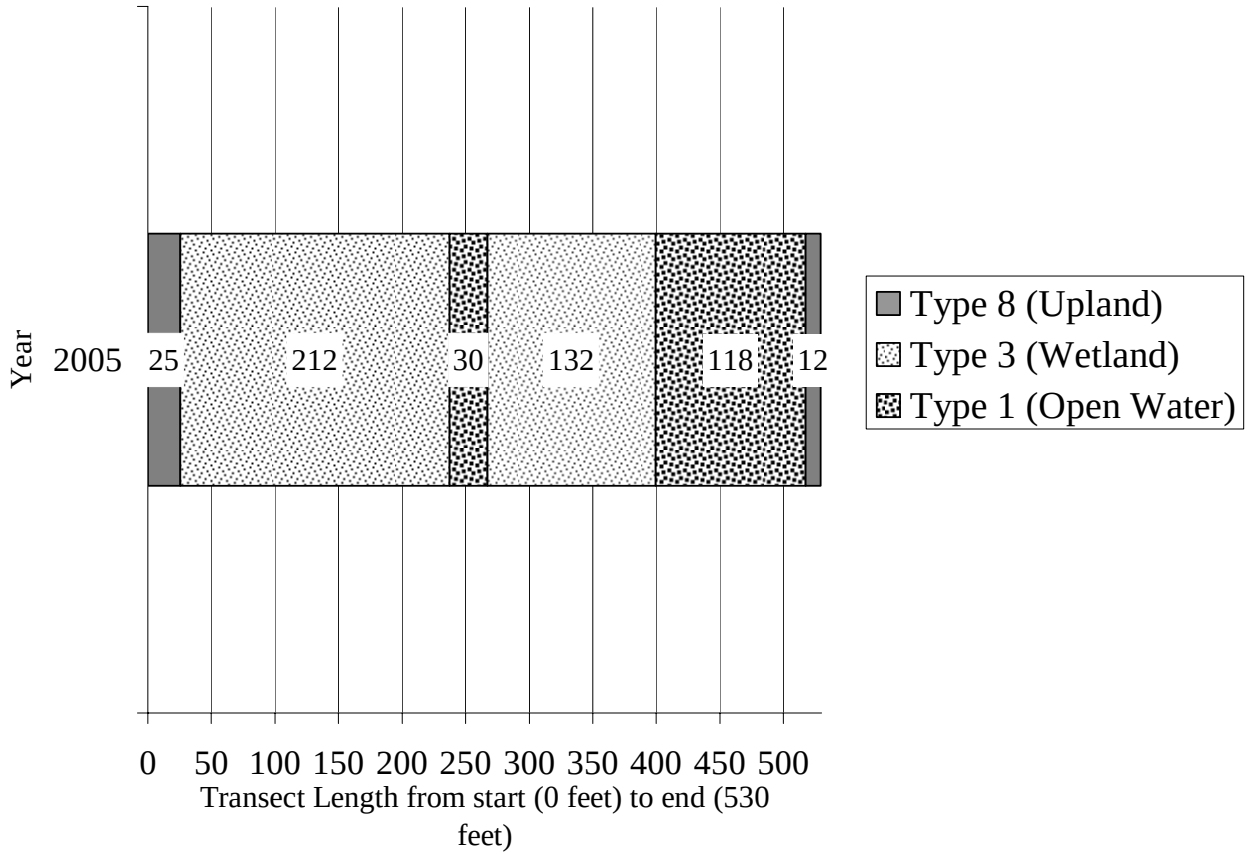
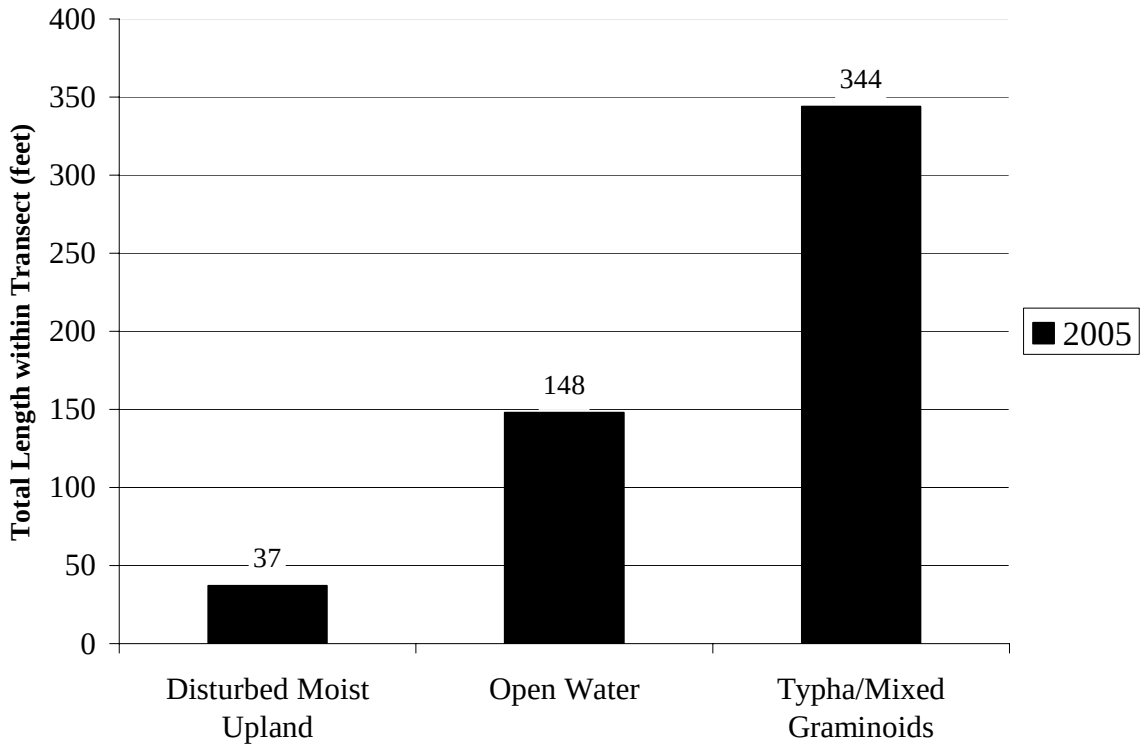


Table 2: ***Vegetation transect data summary.***

Monitoring Year	2005
Transect Length (feet)	530
# Vegetation Community Transitions along Transect	5
# Vegetation Communities along Transect	4
# Hydrophytic Vegetation Communities along Transect	2
Total Vegetative Species	31
Total Hydrophytic Species	13
Total Upland Species	18
Estimated % Total Vegetative Cover	30
% Transect Length Comprised of Hydrophytic Vegetation Communities	67
% Transect Length Comprised of Upland Vegetation Communities	7
% Transect Length Comprised of Unvegetated Open Water	4
% Transect Length Comprised of Bare Substrate	22

Chart 2: ***Length of vegetation communities within Transect 1.***



A total of 547 woody plantings were observed as part of the overall revegetation plan for the site. Observed mortality of planted woody vegetation species is summarized below in **Table 3**. As of August 1, 2005, the overall survival rate is estimated at 92 percent, with a total of 41 individuals observed to be dead; likely due to a lack of available water during the summer months, and/or shock due to transplanting.

Table 3: ***2005 observed mortality of planted woody species.***

Plant Species	Number Originally Planted	Number Observed Alive	Number Observed Dead	Mortality Causes
Eleagnus commutata	52	51	1	Mortality assumed to be due to lack of water.
Juniperus scopulorum	50	50	0	No mortality observed.
Populus deltoides	50	47	3	Mortality assumed to be due to lack of water.
Prunus virginiana	98	94	4	Mortality assumed to be due to lack of water.
Ribes aureum	96	87	9	Mortality assumed to be due to lack of water.
Rosa woodsii	101	101	0	No mortality observed.
Sheperdia argentea	100	76	24	Mortality assumed to be due to lack of water.
TOTAL	**547**	**506**	**41**	

3.3 Soils

The site was recently excavated and graded in Spring 2005; therefore, soils were highly disturbed throughout the site. Soils sampled in wetland areas were comprised of sandy clay in the upper horizon and fine sand with cobbles in the lower horizon. Though recently disturbed the matrix color of the upper horizon was 10YR 5/2 and contained distinct mottles (5YR 3/4). The cobbly deeper horizon showed evidence of hydric conditions by exhibiting a low chroma of 10YR 4/1. During the mid-season visit an aquic moisture regime was assumed for soils at sample point 1 because the depth to water was only 4.5 inches below the soil surface. Note that both wetland sample points 1 and 2 were inundated during the fall site visit.

3.4 Wetland Delineation

Delineated wetland boundaries are illustrated on **Figure 3**. Completed wetland delineation forms are included in **Appendix B**. Soils, vegetation, and hydrology are discussed in preceding sections. As shown on **Figure 3** total wetland area for the site was 3.96 acres, an increase of 1.84 acres over the 2.12 acres of wetland that existed onsite prior to wetland creation activities. An additional 7.88 acres are currently open water habitat. Much of the open water habitat observed in 2005 is also expected to become vegetated with emergent hydrophytic species over time. It is also likely that the 4.02 acres of the 'disturbed-moist' vegetation type will also convert into wetland over the next few years. A 50 foot wetland buffer around wetlands found on the site is approximately 5.19 acres in size.

3.5 Wildlife and Fish

Though only recently constructed, the wetland complex created on the site provides habitat for several wildlife species. Three mammal, one reptile, two amphibian, and 19 bird species were observed at the site during 2005 monitoring (**Table 4**), with an additional two mammal species observed by MDT. The habitat value of the site is expected to increase as vegetation continues to establish and diversify. Of particular interest is the use of the site by wading and shorebirds, such as great blue herons, sandhill cranes, and spotted sandpipers. Canada geese were the most numerous bird species observed to utilize the site during the fall bird monitoring event, and numbered over 150 individuals (**Appendix B**).

Table 4: ***Fish and wildlife species observed on the Wagner Marsh Site in 2005.***

AMPHIBIANS	
Western chorus frog (*Pseudacris triseriata*)	
Woodhouse's toad (*Bufo woodhousii*)	
REPTILES	
Western garter snake (*Thamnophis elegans*)	
BIRDS	
American coot (*Fulica americana*)	Killdeer (*Charadrius vociferous*)
American goldfinch (*Carduelis tristis*)	Mallard (*Anas platyrhynchos*)
Barn swallow (*Hirundo rustica*)	Mourning dove (*Zenaida macroura*)
Canada Goose (*Branta canadensis*)	Red-tailed hawk (*Buteo jamaicensis*)
Cliff swallow (*Hirundo pyrrhonota*)	Red-winged blackbird (*Agelaius phoeniceus)*
Eastern Kingbird (*Tyranus tyranus*)	Ring-necked pheasant (*Phasianus colchicus*)
Gadwall (*Anas strepera*)	Rock dove (*Columba livia*)
Grasshopper sparrow (*Ammodramus savannarum*)	Sandhill Crane (*Grus canadensis*)
	Spotted sandpiper (*Actitis macularia*)
Great blue heron (*Ardea herodias*)	Vesper sparrow (*Pooecetes gramineus*)
MAMMALS	
Mule deer (*Odocoileus hemionus*)	
Eastern cottontail (*Sylvilagus floridanus*)	
Muskrat (*Ondatra zibethicus*)	
Raccoon *(Procyon lotor)*[1]	
Red Fox (*Vulpes vulpes*)[1]	

[1] Species observed by MDT staff

3.6 Macroinvertebrates

Macroinvertebrates were sampled within the emergent marsh complex east of the creek in the western portion of the site (see **Figure 2**). Macroinvertebrate sampling results are provided in **Appendix F** and were summarized by Rhithron Associates in the italicized sections below (Bollman 2005).

Taxa richness was high at this site, and 5 POET taxa were collected, including the expected mayfly taxa. This suggests that water quality was good here. The elevated biotic index value was skewed by the unusually large number of notonectid hemipterans (Notonecta sp.) taken in the sample. Habitats were apparently complex and included filamentous algae, macrophyte surfaces, the water column, and benthic substrates. Sub-optimal conditions were indicated by bioassessment scores.

3.7 Functional Assessment

Completed functional assessment forms are presented in **Appendix B** and are summarized in **Table 5**. For comparative purposes, the functional assessment results for baseline conditions prepared by MDT in 2001 are also included in **Table 5**.

The created wetlands at Wagner Marsh were ranked as Category III wetlands in 2005 as compared to Category IV in 2001. Functions that increased substantially over 2001 baseline conditions include general wildlife habitat, short and long term surface water storage, production export, and uniqueness. The pre-project site provided about 17.2 functional units within the

monitoring area, and the post-project site currently provides about 68.7 functional units, for a conservative gain of at least 51.5 functional units.

Table 5: ***Summary of 2005 wetland function/value ratings and functional points [1] at the Wagner Marsh Mitigation Site.***

Parameter	2001 Baseline Assessment	2005
Listed/Proposed T&E Species Habitat	Low (0.5)	Low (0.5)
MNHP Species Habitat	Low (0.2)	Low (0.2)
General Wildlife Habitat	Low (0.3)	Moderate (0.7)
General Fish/Aquatic Habitat	N/A	N/A
Flood Attenuation	N/A	N/A
Short and Long Term Surface Water Storage	Moderate (0.6)	High (1.0)
Sediment, Nutrient, Toxicant Removal	Moderate (0.7)	Moderate (0.7)
Sediment/Shoreline Stabilization	N/A	Moderate (0.7)
Production Export/Food Chain Support	Moderate (0.6)	High (0.8)
Groundwater Discharge/Recharge	High (1.0)	High (1.0)
Uniqueness	Low (0.2)	Moderate (0.5)
Recreation/Education Potential	Low (0.2)	Low (0.1)
Actual Points/Possible Points	4.3/9	5.8/10
% of Possible Score Achieved	48%	58%
Overall Category	IV	III
Total Acreage of Assessed Aquatic Habitat within AA Boundaries	**4**	**11.84**
Functional Units (acreage x actual points)	**17.2**	**68.7**
Net Acreage Gain		**7.84**
Net Functional Unit Gain		**51.5**

[1] See completed MDT functional assessment forms in Appendix B for further detail.

3.8 Photographs

Representative photographs taken from photo-points and transect ends, as well as a 2005 aerial photograph are provided in **Appendix C**.

3.9 Maintenance Needs/Recommendations

Tamarisk eradication measures were undertaken by the MDT Wetland Mitigation Specialist on August 1, 2005. This effort should continue to ensure the complete eradication of this noxious weed species from the site before it becomes well established. The majority of tamarisk seedlings/saplings were observed in the north end of the site, and particularly in the Palustrine scrub-shrub wetland area.

3.10 Current Credit Summary

Based on documentation provided by MDT, approximately 2.12 acres of wetland and 1.92 acres of open water (4.04 acres total) occurred within the monitoring area prior to project implementation. MDT is receiving credit for these wetlands as they were originally created in association with the 2000-2001 Shiloh Road interchange project and protected from construction by MDT (Urban pers. comm.). As of 2005, a total of approximately 11.84 acres of open water and wetland habitat occur within the monitoring area (**Table 6**). Of the 11.84 acres, approximately 7.88 acres are currently open water habitat, and the remaining 3.96 acres are vegetated wetland area. The increase in vegetated wetland area is 1.84 acres over pre-construction conditions, while the increase in open water area is 5.96 acres (**Table 6**). Note that much of the open water habitat observed in 2005 is expected to become vegetated with emergent hydrophytic species over time. An additional 4.02 acres of the 'disturbed-moist' vegetation type is expected to convert to wetland over the next few years; which would increase the total acreage of open water and wetland to 15.88 acres. A 50 foot wetland buffer around wetlands found on the site is approximately 5.19 acres in size (**Table 6**).

Table 6: ***Summary of open water and wetland acreages on the Wagner Marsh Mitigation Site.***

Period	Open Water (acres)	Wetland (acres)	50-Foot Wetland Buffer (acres)	Total Aquatic Habitat
Pre-construction (2001)	1.92	2.12	Unknown	4.04
Post-construction (2005)	7.88	3.96	5.19	11.84
Difference	+5.96	+1.84	+5.19	+7.8

The Corps of Engineers will determine which crediting ratios are applicable to the site. However, using the credit ratios listed, **Table 7** summarizes compensatory mitigation credits developed to date at the Wagner Marsh.

Table 7: ***2005 compensatory mitigation credit summary for the Wagner Marsh Mitigation Site.***

Credit Category	Acres	Assumed Credit Ratio[a]	Credit
Palustrine emergent	2.93	1:1	2.93
Palustrine scrub-shrub	1.03	1:1	1.03
Total Wetland	3.96	1:1	3.96
Open water	7.88	20% of wetland acreage	0.79
50-foot wetland buffer	5.19	4:1	1.3
TOTAL	17.03		6.05

[a]The Corps of Engineers is the regulatory authority and will determine the actual mitigation ratios.

The pre-project site provided about 17.2 functional units within the monitoring area, and the post-project site provides about 68.7 functional units, for a conservative gain of at least 51.5 functional units.

4.0 REFERENCES

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Appendix A

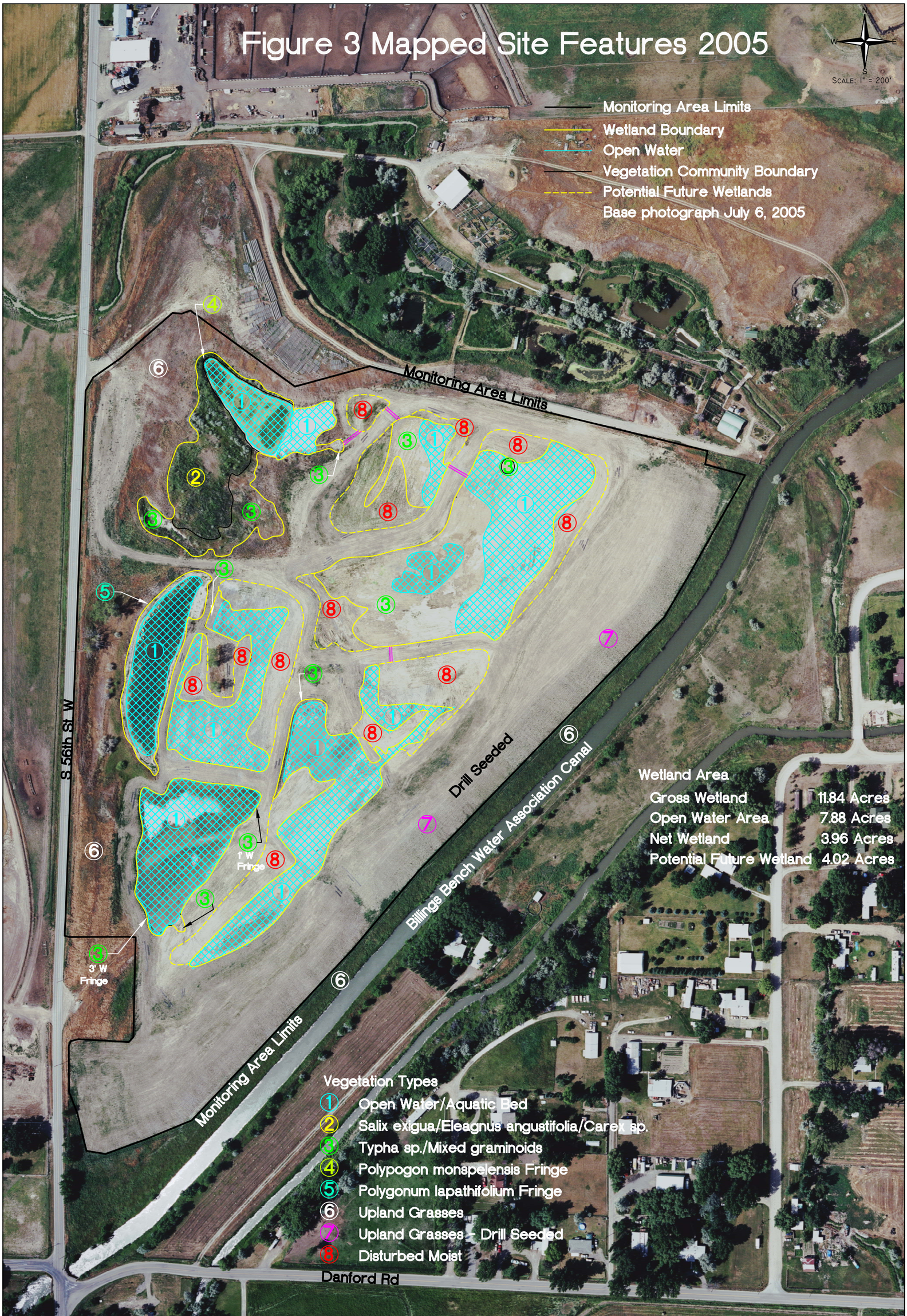
FIGURES 2 & 3

MDT Wetland Mitigation Monitoring
Wagner Marsh
Billings, Montana

PBSJ

LAND & WATER

REV: 01 Oct/24/2005	SHEET 2 OF	LAND & WATER CONSULTING P.O. BOX 1122 Bozeman, MT 59771 A division of PBSJ	PROJ NO: B43054.00 0514	DRAWN: SH	PROJECT NAME: MDT Wagner Pit Wetland Mitigation
			LOCATION: Billings, MT	PROJ MGR: JB	
			SCALE: 1"=200'	CHECKED: RM APPVD: JB	DRAWING TITLE: Monitoring Activity Locations 2005
			FILE NAME: 2005 Base.dwg		



Oct/31/2005	REV. 01	SHEET 3 of	LAND & WATER CONSULTING, P.O. BOX 1122, Bozeman, MT 59771, A division of PBSJ

PROJ NO: B43054.00 0514	DRAWN: SH	PROJECT NAME: MDT Wagner Pit Wetland Mitigation	
LOCATION: Billings, MT	PROJ MGR: JB		
SCALE: 1"=200'	CHECKED: RM APPVD: JB	DRAWING TITLE: Mapped Site Features 2005	
FILE NAME: 2005 Base.dwg			

Appendix B

COMPLETED 2005 WETLAND MITIGATION SITE MONITORING FORM
COMPLETED 2005 BIRD SURVEY FORMS
COMPLETED 2005 WETLAND DELINEATION FORMS
COMPLETED 2005 FUNCTIONAL ASSESSMENT FORMS

MDT Wetland Mitigation Monitoring
Wagner Marsh
Billings, Montana

PBSJ

LAND & WATER

LWC / MDT WETLAND MITIGATION SITE MONITORING FORM

Project Name: **Wagner Marsh** Project Number: _____
Assessment Date: **August 1, 2005** Person(s) conducting the assessment: **R. McEldowney and L. Bacon**
Location: _____ MDT District: **Billings** Milepost: **NA**
Legal Description: T **1S** R **25E** Section **28**
Weather Conditions: **Clear, calm, 95 deg F** Time of Day: **Noon to 5 pm**
Initial Evaluation Date: **August 1, 2005** Monitoring Year: **1** # Visits in Year: **2**
Size of evaluation area: **39 acres** Land use surrounding wetland: **Rural/agricultural**

HYDROLOGY

Surface Water Source: **Groundwater and overland flow**
Inundation: **Present** Average Depth: **3 in** Range of Depths: **0-5**
Percent of assessment area under inundation: **%**
Depth at emergent vegetation-open water boundary: **0.25 feet**
If assessment area is not inundated then are the soils saturated within 12 inches of surface: **Yes**
Other evidence of hydrology on the site (ex. – drift lines, erosion, stained vegetation, etc.):

_____

Groundwater Monitoring Wells: **Present - monitored on 9/28/05**
Record depth of water below ground surface (in feet):

Well Number	Depth	Well Number	Depth	Well Number	Depth
1	3.08 ft				
2	2.04 ft				
3	2.23 ft				

Additional Activities Checklist:
☒ Map emergent vegetation-open water boundary on aerial photograph.
☒ Observe extent of surface water during each site visit and look for evidence of past surface water elevations (drift lines, erosion, vegetation staining, etc.)
☒ Use GPS to survey groundwater monitoring well locations, if present.

COMMENTS / PROBLEMS:
GPS receiver used for mapping was not working. Mapped communities from notes and aerial photograph. A Garmin 12CT GPS unit was used to mark points. Three groundwater wells are present on the site and were located with the GPS. They were monitored on 9/28/05.

VEGETATION COMMUNITIES

Community Number: **1** Community Title (main spp): Open water/aquatic bed

Dominant Species	% Cover	Dominant Species	% Cover
Aquatic bed	5 = > 50%		

Comments / Problems: **Shallow ponds less than 5 feet deep that either contain submergent vegetation or are currently inundated but sparsely vegetated due to the recent construction of the project. Over time it is expected that some of these areas will become palustrine emergent wetlands. In some locations scattered individuals of emergent species occur.**

Community Number: **2** Community Title (main spp): **Salix exigua-Eleagnus angustifolia/Carex lanuginosa**

Dominant Species	% Cover	Dominant Species	% Cover
Eleagnus angustifolia	3 = 11-20%	Typha latifolia	2 = 6-10%
Salix exigua	4 = 21-50%	Carex lanuginosa	4 = 21-50%
Scirpus pungens	3 = 11-20%	Populus deltoides (sap)	2 = 6-10%
Cirsium arvense	3 = 11-20%		

Comments / Problems: **Palustrine scrub-shrub area on the northwest side of the site.**

Community Number: **3** Community Title (main spp): **Typha sp./Mixed graminoids**

Dominant Species	% Cover	Dominant Species	% Cover
Typha latifolia	3 = 11-20%	Eleocharis palustris	4 = 21-50%
Typha angustifolia	3 = 11-20%	Juncus bufonius	2 = 6-10%

Comments / Problems: **Palustrine emergent wetland.**

Community Number:4 Community Title (main spp): **Polypogon monspeliensis**

Dominant Species	% Cover	Dominant Species	% Cover
Polypogon monspeliensis	5 = > 50%		
Typha latifolia	2 = 6-10%		
Scirpus acutus	1 = 1-5%		
Agropyron smithii	1 = 1-5%		

Comments / Problems: **Palustrine emergent fringe around the pond in PSS area - northwest portion of site.**

Community Number: 5 Community Title (main spp): **Polygonum lapathifolium**

Dominant Species	% Cover	Dominant Species	% Cover
Polygonum lapathifolium	5 = > 50%		

Comments / Problems: **Palustrine emergent fringe averages 2 feet wide around the crescent-shaped pond on the west side of the site.**

Community Number: **6** Community Title (main spp): **Upland Grasses**

Dominant Species	% Cover	Dominant Species	% Cover
Festuca pratensis	5 = > 50%		
Bromus inermis	2 = 6-10%		
Bromus japonicus	3 = 11-20%		
Convolvulus arvensis	1 = 1-5%		
Sisymbrium altissimum	2 = 6-10%		

Comments / Problems: **Upland grassland community surrounding the constructed wetland area. The areas between wetland cells are primarily weedy, percent cover varies greatly and bare soil is prevalent throughout. These areas are dominated primarily by Chenopodium alba, Agropyron repens, Melilotus officinale, Convolulvus arvensis, Medicago sativa, Polygonum aviculare, and Agropyron smithii.**

Community Number: **7** Community Title (main spp): **Upland grasses – Drill Seeded**

Dominant Species	% Cover	Dominant Species	% Cover
Medicago sativa	1 = 1-5%		
Agropyron sp.	4 = 21-50%		
Chenopodium album	2 = 6-10%		
Agropyron smithii	1 = 1-5%		
Convolvulus arvensis	2 = 6-10%		

Comments / Problems: **Upland area - drill seeded berm on the east side of the site.**

Community Number: **8** Community Title (main spp): **Disturbed moist**

Dominant Species	% Cover	Dominant Species	% Cover
Polygonum lapathifolium	1 = 1-5%		
Chenopodium album	1 = 1-5%		
Typha angustifolia	1 = 1-5%		

Comments / Problems: **Area is primarily bare ground with a variety of weedy and hydrophytic species. This community type is expected to become dominated by hydrophytic vegetation over time.**

Additional Activities Checklist:

☒ Record and map vegetative communities on aerial photograph.

COMPREHENSIVE VEGETATION LIST

Plant Species	Vegetation Community Number (s)	Plant Species	Vegetation Community Number (s)
Asclepias sp.	6	Medicago lupulina	6,7,8
Agrostis alba	2,3	Medicago sativa	6,7,8
Agropyron cristatum	6	Melilotus officinale	8
Agropyron repens	6,7,8	Mustard sp.	8
Agropyron smithii	6,7	Panicum capillare	8
Agropyron sp.	6,7	Polygonum aviculare	6,7,8
Alyssum sp.	6	Polygonum lapathifolium	1,3,5,8
Beckmannia syzigachne	8	Polypogon monspeliensis	4
Bromus inermis	6,7	Populus deltoides	2
Bromus japonicus	6,8	Potentilla sp. (Potentilla paradoxa?)	8
Carex lanuginosa	2	Rumex crispus	2
Carex nebrascensis	2,3	Salix amygdaloides	2
Carex sp.	3	Salix exigua	2
Centaurea maculosa	6,7	Salsola iberica	6
Chenopodium album	3,6,7,8	Scirpus acutus	3
Cirsium arvense	2,6	Scirpus pungens	2
Convolvulus arvensis	6,7,8	Sisymbrium altissimum	6
Conyza canadensis	6,8	Solidago canadensis	6
Descurainia sophia	8	Sonchus arvensis	6
Echinochloa muricata	1	Tamarix ramosissima	2
Eleagnus angustifolia	2	Taraxacum officinale	2,8
Eleocharis palustris	1,3,8	Thlaspi arvense	2
Epilobium ciliatum	2,3,8	Tragopogon dubius	6
Erodium cicutarium	6,8	Typha angustifolia	3
Festuca pratensis	6	Typha latifolia	3
Grindellia squarrosa	6	Unidentified white aster	6
Hordeum jubatum	6		
Juncus bufonius	3		
Juncus torreyi	3		
Kochia scoparia	6		
Lactuca serriola	6		
Linum sp.	6		
Lotus unifoliolatus	7		

Comments / Problems: <u>Total number of species observed = 59. Weed control (cutting) on tamarisk was done on 8/1/05 by MDT (Larry Urban).</u>

PLANTED WOODY VEGETATION SURVIVAL

Plant Species	Number Originally Planted	Live Number Observed	Mortality Causes
Eleagnus commutata	52	51	Mortality assumed to be due to lack of water.
Juniperus scopulorum	50	50	
Populus deltoides	50	47	Mortality assumed to be due to lack of water
Prunus virginiana	98	94	Mortality assumed to be due to lack of water
Ribes aureum	96	87	Mortality assumed to be due to lack of water
Rosa woodsii	101	101	
Sheperdia argentea	100	76	Mortality assumed to be due to lack of water

Comments / Problems: **The woody plantings were planted in clusters around the site, however, the way they were planted is less than optimal. The shrubs were planted in rows of the same species, as is often done for wind-rows or live snow fences. To achieve a more natural effect, it would have been better to plant the shrubs/saplings in more randomly assembled clusters of species, and not use row plantings.**

WILDLIFE

Birds

Were man-made nesting structures installed? **No**
If yes, type of structure: _____ How many? _____
Are the nesting structures being used? **NA**
Do the nesting structures need repairs? **NA**

Mammals and Herptiles

Mammal and Herptile Species	Number Observed	Indirect Indication of Use			
		Tracks	Scat	Burrows	Other
Mule deer*	1	☐	☐	☐	outside fence
adult deer and fawn		☒	☐	☐	beds in willows
Muskrat		☐	☐	☒	
Eastern cottontail rabbit	1	☐	☐	☐	
Western garter snake	1	☐	☐	☐	
Chorus frog	1	☐	☐	☐	
Western toad	10	☐	☐	☐	
		☐	☐	☐	

Additional Activities Checklist:
Yes Macroinvertebrate Sampling (if required)

Comments / Problems:

PHOTOGRAPHS

Using a camera with a 50mm lens and color film take photographs of the following permanent reference points listed in the check list below. Record the direction of the photograph using a compass. When at the site for the first time, establish a permanent reference point by setting a ½ inch rebar or fencepost extending 2-3 feet above ground. Survey the location with a resource grade GPS and mark the location on the aerial photograph.

Photograph Checklist:

- ☒ One photograph for each of the four cardinal directions surrounding the wetland.
- ☒ At least one photograph showing upland use surrounding the wetland. If more than one upland exists then take additional photographs.
- ☒ At least one photograph showing the buffer surrounding the wetland.
- ☒ One photograph from each end of the vegetation transect, showing the transect.

Location	Photograph Frame #	Photograph Description	Compass Reading (°)
Photopoint A	1	North side of site looking NNE toward WJH bird sanctuary.	22
Photopoint A	2	North side of site looking east across wetland creation area (and transect) toward berm on the east side of site and the canal beyond it.	105
Photopoint A	3	North side of site looking southeast across created wetlands and the south end of the transect.	162
Photopoint A	4	North side of site looking south at central area of the site.	214
Photopoint A	5	North side of site looking at cattail area and south end of the PSS area.	250
Photopoint A	6	North side looking at PSS area in NW corner of site.	310
Photopoint A	7	North side of site looking at pond in NW corner of site.	335
Photopoint B	1	West side of site looking north at the crescent shaped pond in the central portion of the west side of the site.	01
Photopoint B	2	West side of site looking east at a wetland creation area.	74
Photopoint B	3	West side of site looking south at wetland creation areas.	153
Photopoint C	1	South side of site looking NNE at drill seeding on the berm and wetland creation areas to the north.	24
Photopoint C	2	South side of site looking WSW at berm and wetland creation areas at southernmost tip of the site.	243
Photopoint C	3	South side of site looking WNW at wetland creation areas.	294
Photopoint C	4	South side of site looking NNW at wetland creation areas in the south side of the central portion of the site.	343
Photopoint D	1	East side of site looking WSW at beerm and wetland creation areas on the SE side of the site.	241

Photopoint D	2	East side of site looking WNW at the central portion of the site.	293
Photopoint D	3	East side of site looking NW at the transect area in a wetland creation area.	324
Photopoint D	4	East side of site looking north at the drill seeded berm and the north end of the transect.	356
Transect	1	West end of the transect looking ENE.	70
Transect	2	East end of the transect looking WSW.	250

Comments / Problems: <u>Surrounding upland uses (agriculture) and buffer areas are shown in many of the photos listed in the table above.</u>

GPS SURVEYING

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

GPS Checklist:

- ☐ Jurisdictional wetland boundary.
- ☒ 4-6 landmarks that are recognizable on the aerial photograph.
- ☒ Start and End points of vegetation transect(s).
- ☒ Photograph reference points.
- ☒ Groundwater monitoring well locations.

Comments / Problems: **The Trimble GPS unit wasnot functioning correctly, therefore GPS points were taken using a Garmin 12CT GPS unit. The wetland boundaries were mapped onsite on 9/28/2005 using July 2005 aerial photography and data from the 8/1/2005 site visit.**

WETLAND DELINEATION

(attach COE delineation forms)

At each site conduct these checklist items:

- ☒ Delineate wetlands according to the 1987 Army COE manual.
- ☒ Delineate wetland – upland boundary onto aerial photograph.
- **NA** Survey wetland – upland boundary with a resource grade GPS survey.

Comments / Problems: **GPS unit not functioning correctly, mapped wetlands using aerial.**

FUNCTIONAL ASSESSMENT

(Complete and attach full MDT Montana Wetland Assessment Method field forms.)
(Also attach any completed abbreviated field forms, if used)

Comments / Problems: **None.**

MAINTENANCE

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

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

Comments / Problems: _____

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **Wagner Marsh** Date: 8/1/2005 Examiner: **R. McEldowney (PBS&J)**
Transect Number: **1** Approximate Transect Length: **530 feet** Compass Direction from Start: **270˚** Note: _____

Vegetation Type A: **Disturbed Moist –** (AGRREP/Chenopodium sp. (disturbed weedy, upl))	
Length of transect in this type: 25 feet	
Plant Species	**Cover**
AGRREP	4 = 21-50%
CHEALB	2 = 6-10%
MELOFF	2 = 6-10%
BROJAP	1 = 1-5%
KOCSCO	1 = 1-5%
CENMAC	1 = 1-5%
CIRARV	1 = 1-5%
POLAVI	1 = 1-5%
DESSOP	1 = 1-5%
MEDSAT	1 = 1-5%
LATSER; BROINE; MEDLUP; HORJUB; MUSTARD SP. EACH	1 = 1-5%
Total Vegetative Cover:	75%

Vegetation Type B: **Typha sp./Mixed graminoids** (ELEPAL/weedy (transition, wetland)	
Length of transect in this type: 49 feet	
Plant Species	**Cover**
ELEPAL	3 = 11-20%
MELOFF	2 = 6-10%
CHEALB	1 = 1-5%
AGRREP	1 = 1-5%
TYPANG	1 = 1-5%
JUNTOR	1 = 1-5%
JUNBUF	1 = 1-5%
POLLAP	1 = 1-5%
AGRSMI	1 = 1-5%
EPICIL	+ = < 1%
AGRALB; RUMCRI; AGRSMI; FESPRA; MEDSAT; SCIACU EACH	+ = < 1%
Total Vegetative Cover:	55%

Vegetation Type C: **Typha sp./Mixed graminoids** (JUNBUF-TYPANG/SHALLOW OW)	
Length of transect in this type: 42 feet	
Plant Species	**Cover**
JUNBUF	3 = 11-20%
ELEPAL	2 = 6-10%
TYPANG	1 = 1-5%
JUNTOR	1 = 1-5%
SCIACU	1 = 1-5%
Shallow water (20' of transect; 3" deep)	
Total Vegetative Cover:	30%

Vegetation Type D: **Typha sp. /Mixed graminoids**	
Length of transect in this type: 121 feet	
Plant Species	**Cover**
TYPANG	3 = 11-20%
TYPLAT	1 = 1-5%
ELEPAL	1 = 1-5%
JUNTOR	1 = 1-5%
JUNBUF	+ = < 1%
Total Vegetative Cover:	25%

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **Wagner Marsh** Date: **August 1, 2005** Examiner: **R. McEldowney (PBS&J)**
Transect Number: **1** Approximate Transect Length: **530 feet** Compass Direction from Start: **270˚** Note: _____

Vegetation Type E**: Open water** (Disturbed/Bare ground)	
Length of transect in this type: 30 feet	
Plant Species	**Cover**
POLLAP	1 = 1-5%
CHEALB	1 = 1-5%
POTENTILLA SP. (Potentilla paradoxa?)	1 = 1-5%
TYPANG	1 = 1-5%
ELEPAL	1 = 1-5%
POLAVI	1 = 1-5%
BECSYZ	+ = < 1%
HORJUB	+ = < 1%
RUMCRI	+ = < 1%
AGRREP	+ = < 1%
MELOFF	+ = < 1%
Total Vegetative Cover:	7%

Vegetation Type F**: Typha sp./Mixed graminoids**	
Length of transect in this type: 132 feet	
Plant Species	**Cover**
TYPANG	2 = 6-10%
TYPLAT	1 = 1-5%
ELEPAL	3 = 11-20%
JUNTOR	1 = 1-5%
POLLAP	+ = < 1%
SCIACU	+ = < 1%
UNK DICOT (undeveloped, no flwrs)	+ = < 1%
Shallow water - 2" deep	
Total Vegetative Cover:	30%

Vegetation Type G: **Open water** (Bare ground)	
Length of transect in this type: 118 feet	
Plant Species	**Cover**
TYPANG	1 = 1-5%
POLLAP	+ = < 1%
ELEPAL	+ = < 1%
Total Vegetative Cover:	2%

Vegetation Type H: **Disturbed moist** (CONARV/Bare ground)	
Length of transect in this type: 12 feet	
Plant Species	**Cover**
CONARV	3 = 11-20%
TYPANG	1 = 1-5%
ELEPAL	+ = < 1%
TAROFF	+ = < 1%
END OF TRANSECT	
Total Vegetative Cover:	17%

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: _____ Date: _____ Examiner: _____
Transect Number: _____ Approximate Transect Length: _____**feet** Compass Direction from Start: ___° Note: _____

Vegetation Type I:	
Length of transect in this type: feet	
Plant Species	**Cover**
Total Vegetative Cover:	%

Vegetation Type J:	
Length of transect in this type: feet	
Plant Species	**Cover**
Total Vegetative Cover:	%

Vegetation Type K:	
Length of transect in this type: feet	
Plant Species	**Cover**
Total Vegetative Cover:	%

Vegetation Type L:	
Length of transect in this type: feet	
Plant Species	**Cover**
Total Vegetative Cover:	%

MDT WETLAND MONITORING – VEGETATION TRANSECT

Cover Estimate		**Indicator Class**	**Source**
+ = < 1%	3 = 11-10%	+ = Obligate	P = Planted
1 = 1-5%	4 = 21-50%	- = Facultative/Wet	V = Volunteer
2 = 6-10%	5 = > 50%	0 = Facultative	

Percent of perimeter developing wetland vegetation (excluding dam/berm structures): 50%

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

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

Comments: _____

BIRD SURVEY – FIELD DATA SHEET

Site: **Wagner** Date: **2005**
Survey Time: **12-** to **5 PM**

Bird Species	#	Behavior	Habitat	Bird Species	#	Behavior	Habitat
American Goldfinch	3	F FO	MA UP				
American Kestrel	1	FO	UP MA				
Barn Swallow	5*	F	MA				
Canada Goose	50*	L	MA				
Eastern Kingbird	1						
Grasshopper Sparrow	1						
Killdeer	50*	FO	MA UP				
Mallard	10*	F	MA				
Mourning Dove	2	L	UP				
Red-tailed Hawk	1	F	MA UP				
Red-winged Blackbird	1	BD F	MA				
Rock Dove	1	L	UP				
Spotted Sandpiper	2	F	MA				
Vesper Sparrow	1						
Yellow Warbler	1						
Above Data: 8/1/05				Above Data:			

BEHAVIOR CODES
BP = One of a breeding pair
BD = Breeding display
F = Foraging
FO = Flyover
L = Loafing
N = Nesting

HABITAT CODES
AB = Aquatic bed
FO = Forested
I = Island
MA = Marsh
MF = Mud Flat
OW = Open Water
SS = Scrub/Shrub
UP = Upland buffer
WM = Wet meadow
US = Unconsolidated shore

Weather: **100+ degrees, partly cloudy**

Notes: **LUrban, MDT, observed brood of spotted sandpipers early in breeding season. * = estimated**

BIRD SURVEY – FIELD DATA SHEET

Site: **Wagner Marsh** Date: **9/28/05**
Survey Time: **7:10 am** to **9:15 am**

Bird Species	#	Behavior	Habitat	Bird Species	#	Behavior	Habitat
American coot	2	L	OW				
American goldfinch	2	F	UP				
Canada goose	148	F L FO	MA AB MF				
Cliff swallow	6	F FO	UP				
Gadwall	5		OW				
Great blue heron	3	F L	MA FO				
Killdeer	15	L F	US				
Spotted sandpiper	1	F	US				
Mallard	54	F L	OW AB				
Mourning dove	15	L	FO				
Redwinged blackbirds	9	L FO					
Ring-necked pheasant	11	F FO	UP				
Rock dove	3	F	UP				
Sandhill cranes	3	L	UP				
Unidentified hawk	2	FO					
Unidentified passerine species	20	F FO	UP				
Unidentified ducks	5	FO					

BEHAVIOR CODES
BP = One of a breeding pair
BD = Breeding display
F = Foraging
FO = Flyover
L = Loafing
N = Nesting

HABITAT CODES
AB = Aquatic bed
FO = Forested
I = Island
MA = Marsh
MF = Mud Flat
OW = Open Water
SS = Scrub/Shrub
UP = Upland buffer
WM = Wet meadow
US = Unconsolidated shore

Weather: **Clear, 40 degrees F, mist over ponds at start.**

Notes: **Sunrise occurred at approximately 7:20 am. Water levels in ponds and wetlands are higher than during the mid-season visit.**

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

Project/Site: Wagner Marsh – Billings, MT	Date: 8/1/2005
Applicant/Owner: Montana Department of Transportation	County: Yellowstone
Investigator:	State: MT

Do Normal Circumstances exist on the site:		Yes	X	No	Community ID:
Is the site significantly disturbed (Atypical Situation)?	X	Yes		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	TYPLAT	H	OBL	9			
2	ELEPAL	H	OBL	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-). 2/2 = 100%

Remarks: Area is disturbed from construction of mitigation site. Very little vegetation has established, but what has are wetland obligates.

HYDROLOGY

Recorded Data (Describe in Remarks):
- ____ Stream, Lake, or Tide Gauge
- ____ Aerial Photographs
- ____ Other
- X No Recorded Data Available

Field Observations:
- Depth of Surface Water: 0 (in.)
- Depth to Free Water in Pit: 4.5 (in.)
- Depth to Saturated Soil: ____ (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- X Saturated in Upper 12 Inches
- ____ 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:
Water levels in the mitigation site appear to be influenced by irrigation practices, because the water levels in some areas of the site were observed to increase during the site visit.

SOILS

Map Unit Name (Series and Phase): Le- Larim Loam, 0-4% slopes

Drainage Class: Well to excessive

Taxonomy (Subgroup): TYPIC ARGIBOROLLS, LOAMY-SKELETAL, MIXED

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.
0-4.5	1	10YR 5/2	5YR 3/2	Common/Distinct	Sandy Clay
4.5 - 10	2	10YR 4/1			Fine sand with cobbles

Hydric Soil Indicators:

____	Histosol	____	Concretions
____	Histic Epipedon	____	High Organic Content in surface Layer in Sandy Soils
____	Sulfidic Odor	____	Organic Streaking in Sandy Soils
X	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)

Remarks: Low chroma in second horizon. Depth to water in pit = 4.5 inches.

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: Though disturbed, the site is developing wetland characteristics, including wetland vegetation and hydric soil indicators. Wetland hydrology was evidenced by the presence of water at 4.5 inches below the soil surface.

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

Project/Site: Wagner Marsh – Billings, MT	Date: 8/1/2005
Applicant/Owner: Montana Department of Transportation	County: Yellowstone
Investigator:	State: MT

Do Normal Circumstances exist on the site:		Yes	X	No	Community ID:
Is the site significantly disturbed (Atypical Situation)?	X	Yes		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	KOCSCO	H	FAC	9			
2	MEDSAT	H	NL	10			
3	CONARV	H	NL	11			
4	PANCAP	H	FAC	12			
5				13			
6				14			
7				15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-). 2/4 = 50%

Remarks: Area is disturbed from construction of mitigation site. Very little vegetation has established, but what has established is borderline in determining if the site is a wetland.

HYDROLOGY

Recorded Data (Describe in Remarks):
- ____ Stream, Lake, or Tide Gauge
- ____ Aerial Photographs
- ____ Other
- X 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 wetland hydrology observed.

SOILS

Map Unit Name (Series and Phase): Ll- Larim gravelly loam, 15-35% slopes

Drainage Class: Well to excessive

Taxonomy (Subgroup): TYPIC USTORTHENTS, SANDY-SKELETAL, MIXED, FRIGID

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.
0-5.5	1	10YR 4/3			Sandy loam
5.5 - 9	2	2.5Y 4/2			Gravelly sandy loam

Hydric Soil Indicators:

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

Remarks: Very difficult digging. Site has been disturbed by wetland mitigation construction. No hydric soil indicators observed.

WETLAND DETERMINATION

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

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

Remarks:

This site is drier than SP-1. No evidence of wetland hydrology observed and no redoximorphic features observed in the soil. Vegetation at this sample point was FAC and comprised of weedy and annual species.

NOTE: During the site visit on 9/28/2005 the area where SP-2 is located was observed to be inundated due to an increase in groundwater levels.

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

1. Project Name: Wagner Marsh **2. Project #:** B43054.00 - 0514 **Control #:** _____

3. Evaluation Date: 9/28/2005 **4. Evaluator(s):** RRM (PBS&J/LWC) **5. Wetland / Site #(s):** _____

6. Wetland Location(s) i. T: 1 S **R:** 25 E **S:** 28 **T:** __ N **R:** __ E **S:** _____

ii. Approx. Stationing / Mileposts: _____

iii. Watershed: 13 - Upper Yellowstone **GPS Reference No. (if applies):** _____

Other Location Information: _____

7. A. Evaluating Agency PBS&J/LWC **8. Wetland Size (total acres):** _____ (visually estimated)
_____ (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)
11.84 (measured, e.g. GPS)

Comments: _____

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		Aquatic Bed	Permanently Flooded	Excavated	67
Depression	Palustrine	---	Emergent Wetland	Semipermanently Flooded	Excavated	16
Depression	Palustrine	---	Scrub-Shrub Wetland	Saturated	Excavated	17
---	---	---	---	---	---	

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

Comments: Site is a mitigaiton wetland developed in an old MDT borrow pit.

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.) Recently constructed wetland mitigation site. Disturbance within the AA has been high in the past, but with the creation of the wetland mitigation site the disturbance has ceased and the site is vegetating. No further disturbances expected onsite.

ii. Prominent weedy, alien, & introduced species: Some tamarisk and Russian olive in scrub-shrub area, limited Canada thistle in wetlands, Japanese brome in uplands.

iii. Briefly describe AA and surrounding land use / habitat: Surrounding land use is predominantly agricultural - hay and livestock production. AA itself is a newly constructed wetland mitigaiton site in a borrow pit.

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

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

Comments: Palustrine scrub-shrub, palustrine aquatic bed, and palustrine emergent. Some scattered cottonwoods.

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

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

Primary or Critical habitat **(list species)**	☐ D ☐ S	_____
Secondary habitat **(list species)**	☐ D ☐ S	_____
Incidental habitat **(list species)**	☒ D ☐ S	Bald eagles hunting on waterfowl.
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	---	---	---	---	.5 (L)	---	---

If documented, list the source (e.g., observations, records, etc.)**:** Personal communication from WJH Bird Center noted in Biol. Res. Report.

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	_____
Incidental habitat **(list species)**	☒ D ☐ S	Great blue heron (S3/S4), Sandhill crane (S2N), migrating raptors
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	---	---	---	---	.2 (L)	---	---

If documented, list the source (e.g., observations, records, etc.)**:** Observed during site visits.

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

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

Evidence of Wildlife Use from 14C(i)	**Wildlife Habitat Features Rating** from 14C(ii)			
	☐ Exceptional	☒ High	☐ Moderate	☐ Low
Substantial	--	--	--	--
Moderate	--	.7 (M)	--	--
Low	--	--	--	--

Comments: _____

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

If the AA is not or was not historically used by fish due to lack of habitat or excessive gradient, then check the NA box above.

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

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

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

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

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

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

Comments: Though the Biological Resources Report states that black-nosed dace and carp can be found within the ponds, no fish were observed during the 2005 site visits and no inlet or outlet exists. The ponds are relatively shallow and as such provide poor overwintering habitat for fish.

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 flood from in-channel or overbank flow, then 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**	--	--	--	--	--	--	--	--	--
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, then check NA above.

i. Rating Working from top to bottom, use the matrix below to arrive at the functional point and rating of high (H), moderate (M), or low (L) for this function.
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 the potential to receive excess sediments, nutrients, or toxicants through influx of surface or ground water or direct input.
If no wetlands in the AA are subject to such input, check NA above.

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

Sediment, Nutrient, and Toxicant Input Levels Within AA	AA receives or surrounding land use has potential to deliver low to moderate levels of sediments, nutrients, or compounds such that other functions are not substantially impaired. Minor sedimentation, sources of nutrients or toxicants, or signs of eutrophication present.				Waterbody on MDEQ list of waterbodies in need of TMDL development for "probable causes" related to sediment, nutrients, or toxicants **or** AA receives or surrounding land use has potential to deliver high levels of sediments, nutrients, or compounds such that other functions are substantially impaired. Major sedimentation, sources of nutrients or toxicants, or signs of eutrophication present.			
% 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 of a river, stream, or other natural or man-made drainage, or on the shoreline of a standing water body that is subject to wave action. If this does not apply, then check NA above.

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

% Cover of wetland streambank or shoreline by species with deep, binding rootmasses.	Duration of Surface Water Adjacent to Rooted Vegetation		
	☒Permanent / Perennial	☐Seasonal / Intermittent	☐Temporary / Ephemeral
≥ 65 %	--	--	--
35-64 %	--	--	--
< 35 %	.3 (L)	--	--

Comments: As a newly constructed wetland mitigaiton site shoreline vegetation is just starting to become established.

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	--	--	--	--	--	--	--	.8H	--	--	--	--	--	--	--	--	--	--
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 slope.
- ☐ Seeps are present at the wetland edge.
- ☒ AA permanently flooded during drought periods.
- ☐ Wetland contains an outlet, but no inlet.
- ☐ Other _____

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

iii. **Rating:** Use 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: This is a groundwater supported wetland complex.

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)	--	--	--	--	.5M	--	--	--	--
High disturbance at AA (#12i)	--	--	--	--	--	--	--	--	--

Comments: _____

14L. RECREATION / EDUCATION POTENTIAL

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

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

iii. Based on the location, diversity, size, and other site attributes, is there a strong potential for recreational or educational use?

☐ **Yes** [Proceed to 14L (ii) and then 14L(iv)] ☒ **No** [Rate as low in 14L(iv)]

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

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

Comments: Site was scored as low due to the fact that MDT will not be allowing public access to the site due to the storage of equipment and materials in one area of the northern portion of the property.

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	low	0.50	1	5.92
B. MT Natural Heritage Program Species Habitat	low	0.20	1	2.37
C. General Wildlife Habitat	moderate	0.70	1	8.29
D. General Fish/Aquatic Habitat	N/A		--	
E. Flood Attenuation	N/A		--	
F. Short and Long Term Surface Water Storage	high	1.0	1	11.84
G. Sediment/Nutrient/Toxicant Removal	moderate	0.70	1	8.29
H. Sediment/Shoreline Stabilization	low	0.30	1	3.55
I. Production Export/Food Chain Support	high	0.80	1	9.47
J. Groundwater Discharge/Recharge	high	1.00	1	11.84
K. Uniqueness	moderate	0.50	1	5.92
L. Recreation/Education Potential	low	0.10	1	1.18
	Totals:	**5.80**	**10.00**	68.70
		Percent of Total Possible Points:	**58%** (Actual / Possible) x 100 [rd to nearest whole #]	

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

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

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

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

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

☐ **I** ☐ **II** ☒ **III** ☐ **IV**

Appendix C

REPRESENTATIVE PHOTOGRAPHS

MDT Wetland Mitigation Monitoring
Wagner Marsh
Billings, Montana

PBSJ

LAND & WATER

WAGNER MARSH WETLAND MITIGATION SITE 2005

Photo Point A – ***Photo 1*** **Location:** North Side
Compass bearing: 22 degrees

Photo Point A – ***Photo 2*** **Location:** North Side
Compass bearing: 105 degrees

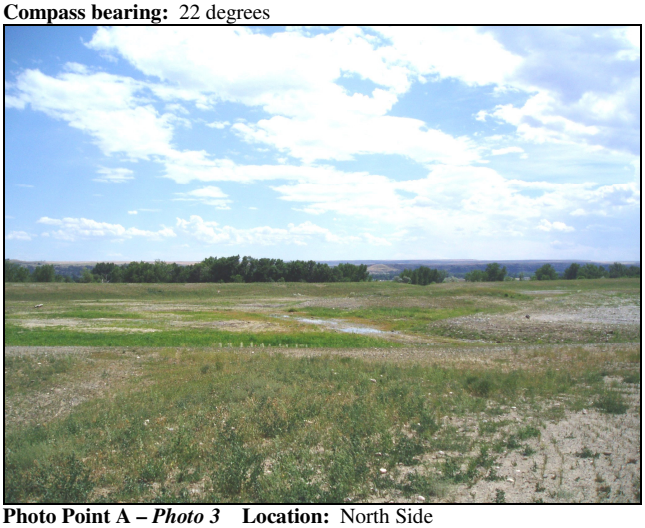


Photo Point A – ***Photo 3*** **Location:** North Side
Compass bearing: 162 degrees

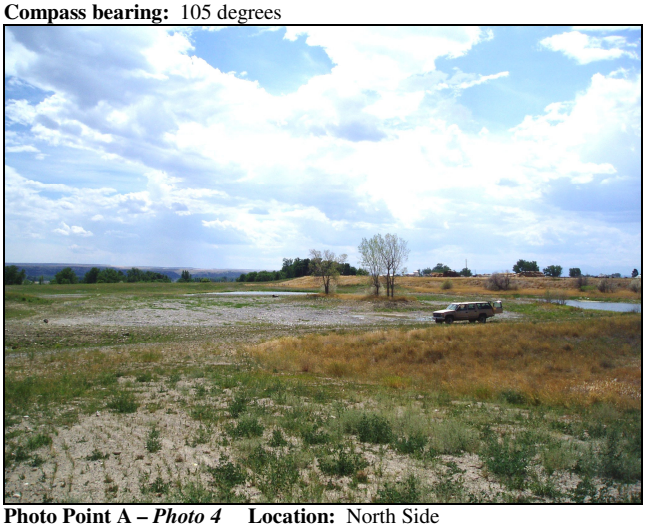


Photo Point A – ***Photo 4*** **Location:** North Side
Compass bearing: 214 degrees

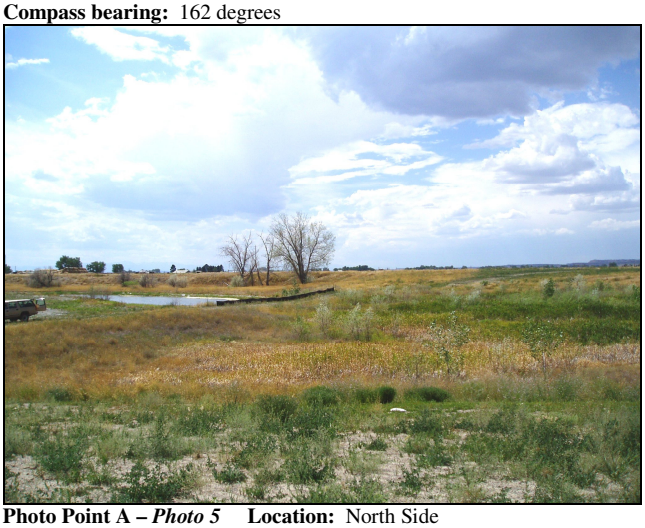


Photo Point A – ***Photo 5*** **Location:** North Side
Compass bearing: 250 degrees

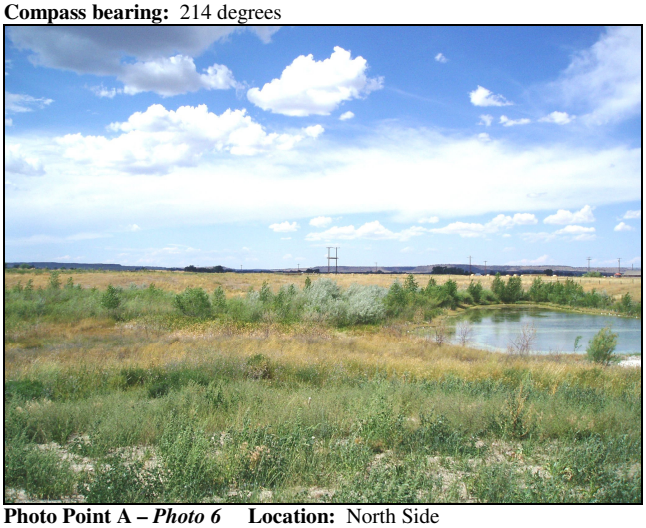


Photo Point A – ***Photo 6*** **Location:** North Side
Compass bearing: 310 degrees

WAGNER MARSH WETLAND MITIGATION SITE 2005

Photo Point A – *Photo 7* **Location:** North Side
Compass bearing: 335 degrees

Photo Point B – *Photo 1* **Location:** West Side
Compass bearing: 01 degrees

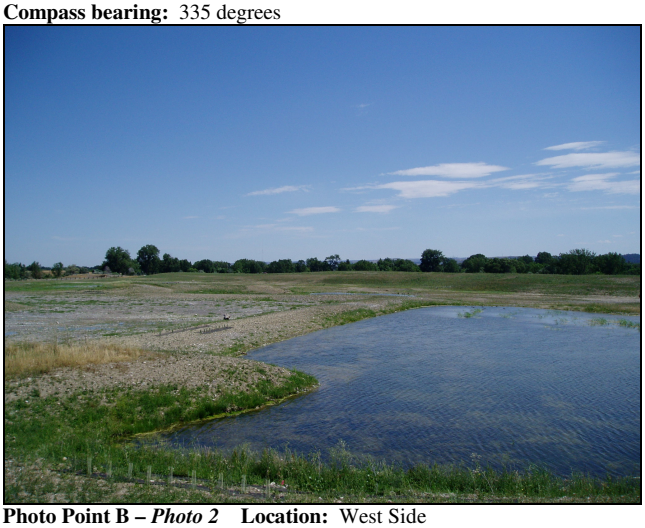


Photo Point B – *Photo 2* **Location:** West Side
Compass bearing: 74 degrees

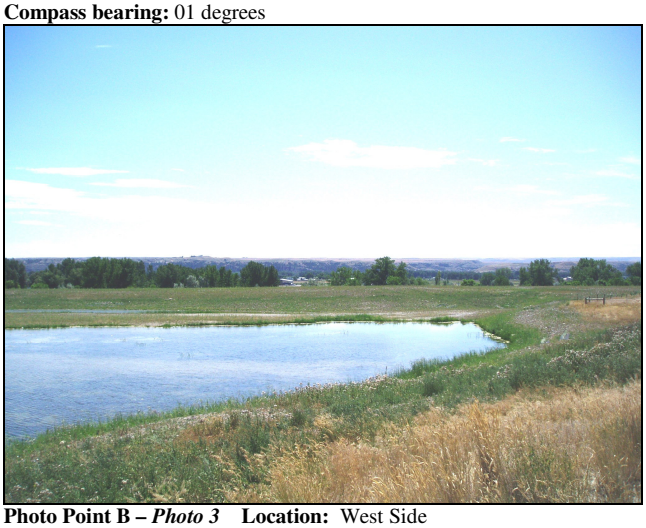


Photo Point B – *Photo 3* **Location:** West Side
Compass bearing: 153 degrees

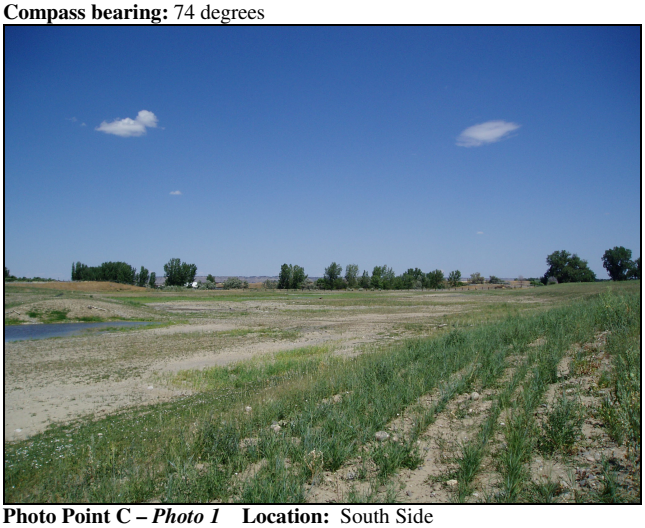


Photo Point C – *Photo 1* **Location:** South Side
Compass bearing: 24 degrees

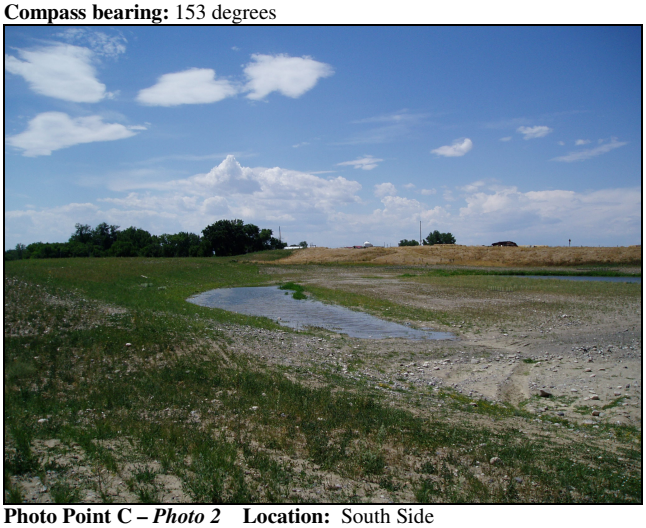


Photo Point C – *Photo 2* **Location:** South Side
Compass bearing: 243 degrees

WAGNER MARSH WETLAND MITIGATION SITE 2005

Photo Point C – *Photo 3* **Location:** South Side
Compass bearing: 294 degrees

Photo Point C – *Photo 4* **Location:** South Side
Compass bearing: 343 degrees

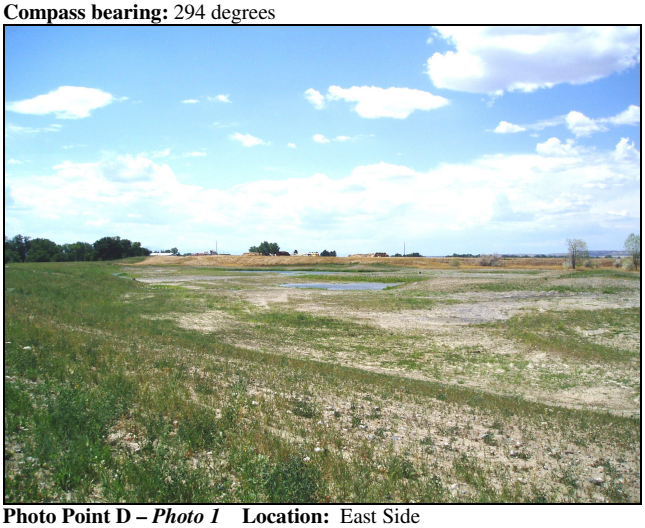


Photo Point D – *Photo 1* **Location:** East Side
Compass bearing: 241 degrees

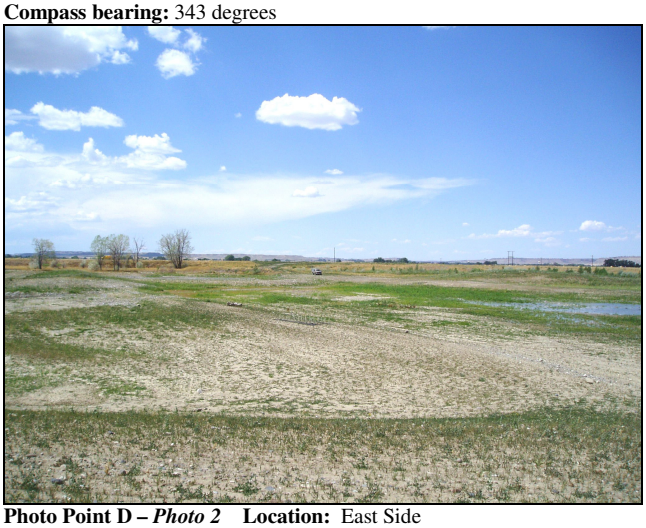


Photo Point D – *Photo 2* **Location:** East Side
Compass bearing: 293 degrees

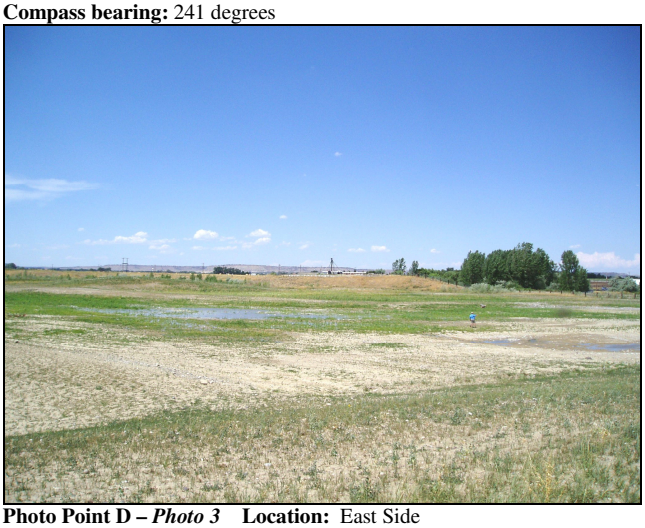


Photo Point D – *Photo 3* **Location:** East Side
Compass bearing: 324 degrees

Photo Point D – *Photo 4* **Location:** East Side
Compass bearing: 356 degrees

WAGNER MARSH WETLAND MITIGATION SITE 2005

Transect Photo Point #1 Location: West end
Compass bearing: 70 degrees

Transect Photo Point #2 Location: East end
Compass bearing: 250 degrees

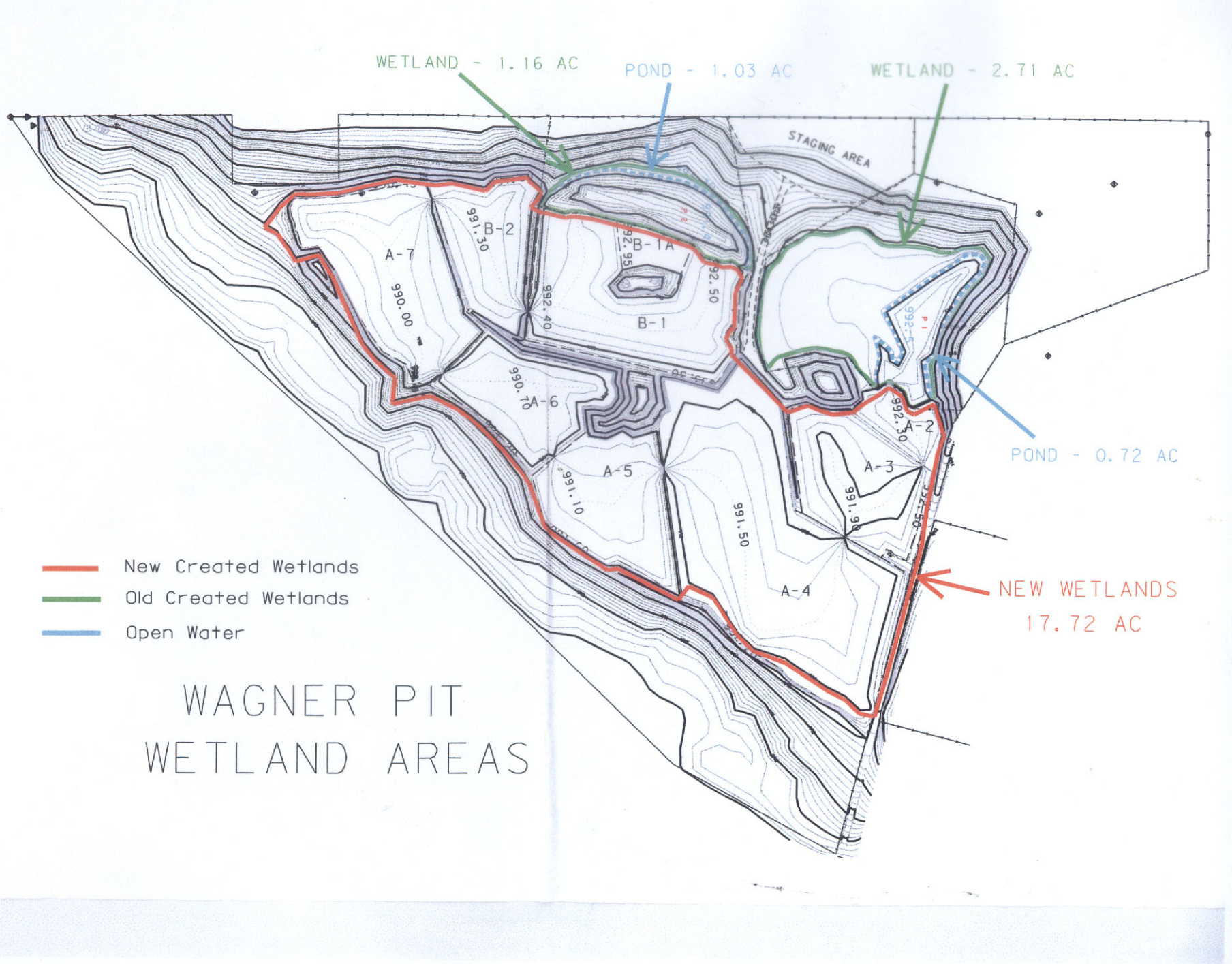
Appendix D

CONCEPTUAL SITE LAYOUT

MDT Wetland Mitigation Monitoring
Wagner Marsh
Billings, Montana

PBSJ

LAND & WATER


WETLAND - 1.16 AC
POND - 1.03 AC
WETLAND - 2.71 AC
STAGING AREA
A-7
B-2
B-1A
B-1
A-6
A-5
A-4
A-3
A-2
POND - 0.72 AC
NEW WETLANDS
17.72 AC
New Created Wetlands
Old Created Wetlands
Open Water
WAGNER PIT
WETLAND AREAS

Appendix E

BIRD SURVEY PROTOCOL
GPS PROTOCOL

MDT Wetland Mitigation Monitoring
Wagner Marsh
Billings, Montana

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LAND & WATER

BIRD SURVEY PROTOCOL

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

Species Use within the Mitigation Wetland: Survey Method

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

Sites that can be circumambulated or walked throughout.

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

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

Sites that cannot be circumambulated.

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

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

Species Use within the Mitigation Wetland: Data Recording

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

1. Bird Species List

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

2. Bird Density

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

3. Bird Behavior

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

4. Bird Species Habitat Use

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

GPS Mapping and Aerial Photo Referencing Procedure

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

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

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

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

Appendix F

MACROINVERTEBRATE SAMPLING PROTOCOL AND DATA

MDT Wetland Mitigation Monitoring
Wagner Marsh
Billings, Montana

PBSJ

LAND & WATER

AQUATIC INVERTEBRATE SAMPLING PROTOCOL

Equipment List

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

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

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

Site Selection

Select the sampling site with these considerations in mind:

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

Sampling

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

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

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

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

This step is optional, but it gives you a chance to <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 - 2005

METHODS

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

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

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

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

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

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

Sample Processing

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

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

Bioassessment Metrics

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

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

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

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

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

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

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

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 times that taxon's modified Hilsenhoff Biotic Index value. These numbers are summed over all taxa in the subsample.	Increase
%Dominant taxon	Percent abundance of the most abundant taxon in the subsample	Increase
%Collector-Gatherers	Percent abundance of organisms in the collector-gatherer functional group	Decrease
%Filterers	Percent abundance of organisms in the filterer functional group	Increase

RESULTS

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

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

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

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

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

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

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

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

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

Literature Cited

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

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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: MDT05LW
RAI No.: MDT05LW024

RAI No.: MDT05LW024 **Sta. Name:** STILLWATER
Client ID:
Date Coll.: **No. Jars:** 1 **STORET ID:**

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Non-Insect							
Acari	1	0.94%	Yes	Unknown		5	PR
Cladocera	4	3.77%	Yes	Unknown		8	CF
Copepoda	8	7.55%	Yes	Unknown		8	CG
Ostracoda	35	33.02%	Yes	Unknown		8	CG
Planorbidae							
Planorbidae	2	1.89%	Yes	Immature	Immature	6	SC
Talitridae							
Hyalella sp.	8	7.55%	Yes	Unknown		8	CG
Odonata							
Coenagrionidae							
Coenagrionidae	16	15.09%	No	Larva	Early Instar	7	PR
Enallagma sp.	9	8.49%	Yes	Larva		7	PR
Ephemeroptera							
Baetidae							
Baetidae	8	7.55%	Yes	Larva	Early Instar	4	CG
Caenidae							
Caenis sp.	2	1.89%	Yes	Larva		7	CG
Diptera							
Ceratopogonidae							
Ceratopogoninae	1	0.94%	Yes	Larva	Larva	6	PR
Culicidae							
Culicidae	2	1.89%	Yes	Larva	Larva	10	CG
Chironomidae							
Chironomidae							
Chironomidae	1	0.94%	No	Pupa	Pupa	10	CG
Cricotopus (Cricotopus) sp.	4	3.77%	Yes	Larva		7	SH
Cricotopus trifascia	1	0.94%	Yes	Larva		7	SH
Paratanytarsus sp.	3	2.83%	Yes	Larva		6	CG
Pseudochironomus sp.	1	0.94%	Yes	Larva		5	CG
Sample Count	**106**						

Metrics Report

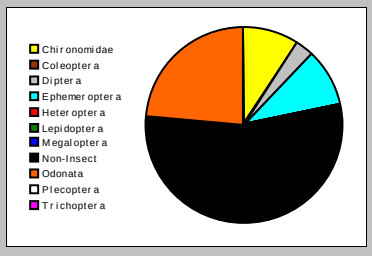
Project ID: MDT05LW
RAI No.: MDT05LW024
Sta. Name: STILLWATER
Client ID:
STORET ID
Coll. Date:

Abundance Measures

Sample Count:	106	
Sample Abundance:	106.00	100.00% of sample used
Total Abundance:	142.57	
Coll. Procedure:		
Sample Notes:		

Taxonomic Composition

Category	R	A	PRA
Non-Insect	6	58	54.72%
Odonata	1	25	23.58%
Ephemeroptera	2	10	9.43%
Plecoptera			
Heteroptera			
Megaloptera			
Trichoptera			
Lepidoptera			
Coleoptera			
Diptera	2	3	2.83%
Chironomidae	4	10	9.43%

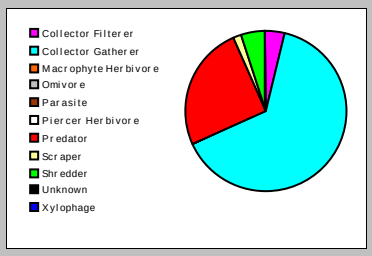


Dominant Taxa

Category	A	PRA
Ostracoda	35	33.02%
Coenagrionidae	16	15.09%
Enallagma	9	8.49%
Hyalella	8	7.55%
Copepoda	8	7.55%
Baetidae	8	7.55%
Cricotopus (Cricotopus)	4	3.77%
Cladocera	4	3.77%
Paratanytarsus	3	2.83%
Planorbidae	2	1.89%
Culicidae	2	1.89%
Caenis	2	1.89%
Pseudochironomus	1	0.94%
Ceratopogoninae	1	0.94%
Acari	1	0.94%

Functional Composition

Category	R	A	PRA
Predator	3	27	25.47%
Parasite			
Collector Gatherer	8	68	64.15%
Collector Filterer	1	4	3.77%
Macrophyte Herbivore			
Piercer Herbivore			
Xylophage			
Scraper	1	2	1.89%
Shredder	2	5	4.72%
Omivore			
Unknown			



Metric Values and Scores

Metric	Value	BIBI	MTP	MTV	MTM
Composition					
Taxa Richness	15	1	1		0
Non-Insect Percent	54.72%				
E Richness	2	1		1	
P Richness	0	1		0	
T Richness	0	1		0	
EPT Richness	2		0		0
EPT Percent	9.43%		0		0
Oligochaeta+Hirudinea Percent					
Baetidae/Ephemeroptera	0.800				
Hydropsychidae/Trichoptera	0.000				
Dominance					
Dominant Taxon Percent	33.02%		2		2
Dominant Taxa (2) Percent	48.11%				
Dominant Taxa (3) Percent	56.60%	3			
Dominant Taxa (10) Percent	91.51%				
Diversity					
Shannon H (loge)	2.099				
Shannon H (log2)	3.028		3		
Margalef D	3.119				
Simpson D	0.187				
Evenness	0.093				
Function					
Predator Richness	3		1		
Predator Percent	25.47%	5			
Filterer Richness	1				
Filterer Percent	3.77%			3	
Collector Percent	67.92%		2		2
Scraper+Shredder Percent	6.60%		1		0
Scraper/Filterer	0.500				
Scraper/Scraper+Filterer	0.333				
Habit					
Burrower Richness	2				
Burrower Percent	1.89%				
Swimmer Richness	0				
Swimmer Percent	0.00%				
Clinger Richness	2	1			
Clinger Percent	4.72%				
Characteristics					
Cold Stenotherm Richness	0				
Cold Stenotherm Percent	0.00%				
Hemoglobin Bearer Richness	2				
Hemoglobin Bearer Percent	2.83%				
Air Breather Richness	1				
Air Breather Percent	1.89%				
Voltinism					
Univoltine Richness	6				
Semivoltine Richness	0	1			
Multivoltine Percent	62.26%		1		
Tolerance					
Sediment Tolerant Richness	1				
Sediment Tolerant Percent	1.89%				
Sediment Sensitive Richness	0				
Sediment Sensitive Percent	0.00%				
Metals Tolerance Index	3.023				
Pollution Sensitive Richness	0	1		0	
Pollution Tolerant Percent	20.75%	3		1	
Hilsenhoff Biotic Index	7.283		0		0
Intolerant Percent	0.00%				
Supertolerant Percent	54.72%				
CTQa	97.714				

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	18	36.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	11	36.67%	Moderate
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	5	27.78%	Moderate
MTM	Montana DEQ Mountains (Bukantis 1998)	4	19.05%	Severe