MONTANA DEPARTMENT OF TRANSPORTATION
WETLAND MITIGATION MONITORING REPORT: YEAR 2007

Wagner Marsh
Billings, Montana

Prepared for:

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

Prepared by:

POST, BUCKLEY, SCHUH, AND JERNIGAN
801 North Last Chance Gulch, Suite 101
Helena, MT 59601-3360

December 2007

PBS&J Project No: B43088.00 - 0514

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1.0 INTRODUCTION

This report presents the results of the third year (2007) 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 Upper Yellowstone 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 been incidentally created by MDT via pit excavation.

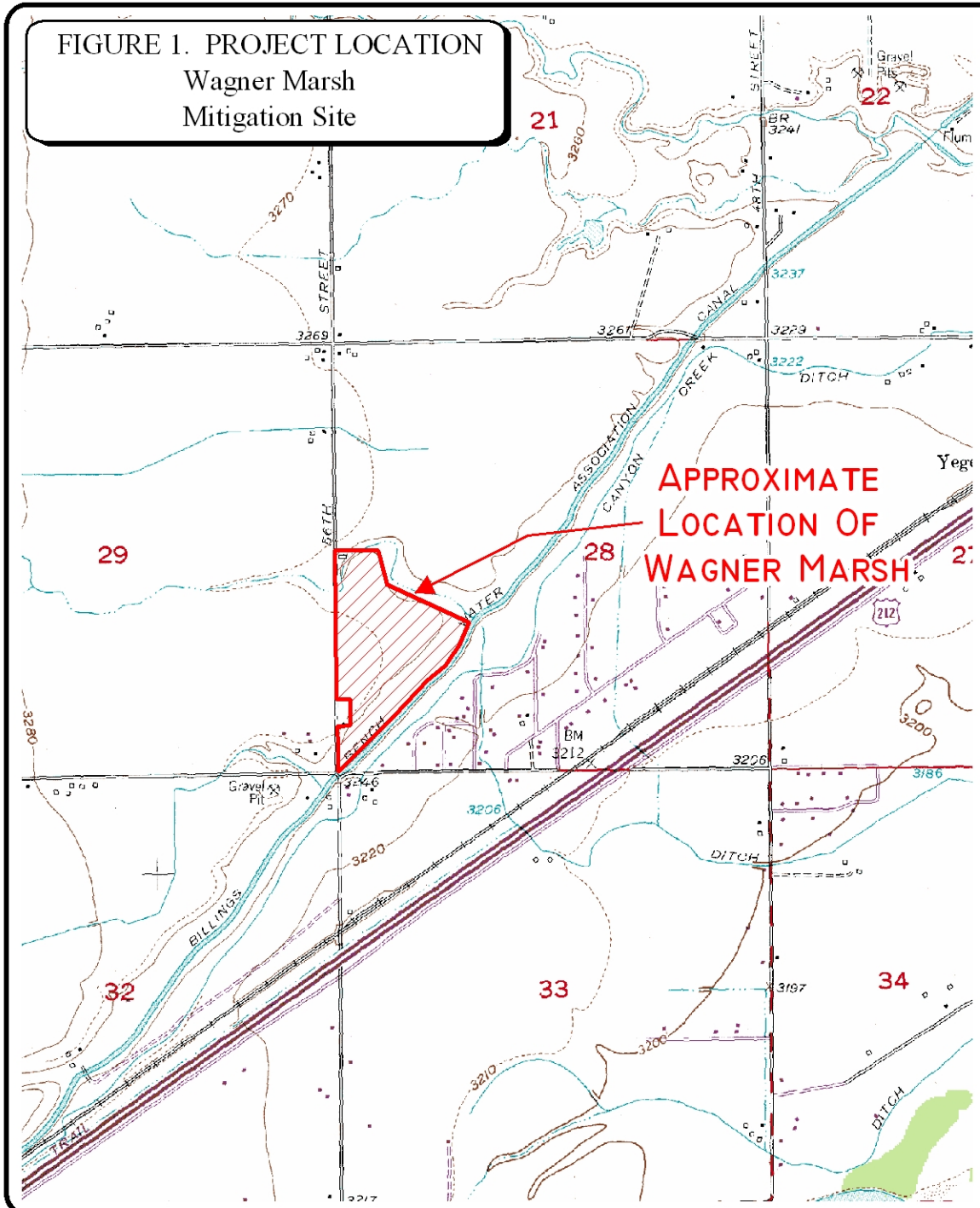
The site occurs at an elevation of approximately 3,240 feet above mean sea level and is located on the west edge of Billings, MT just north and east of the intersection of Danford Road and 56th Street in the SW ¼ of Section 28, Township 1 South, Range 25 East, Yellowstone County (**Figure 1**). Approximate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

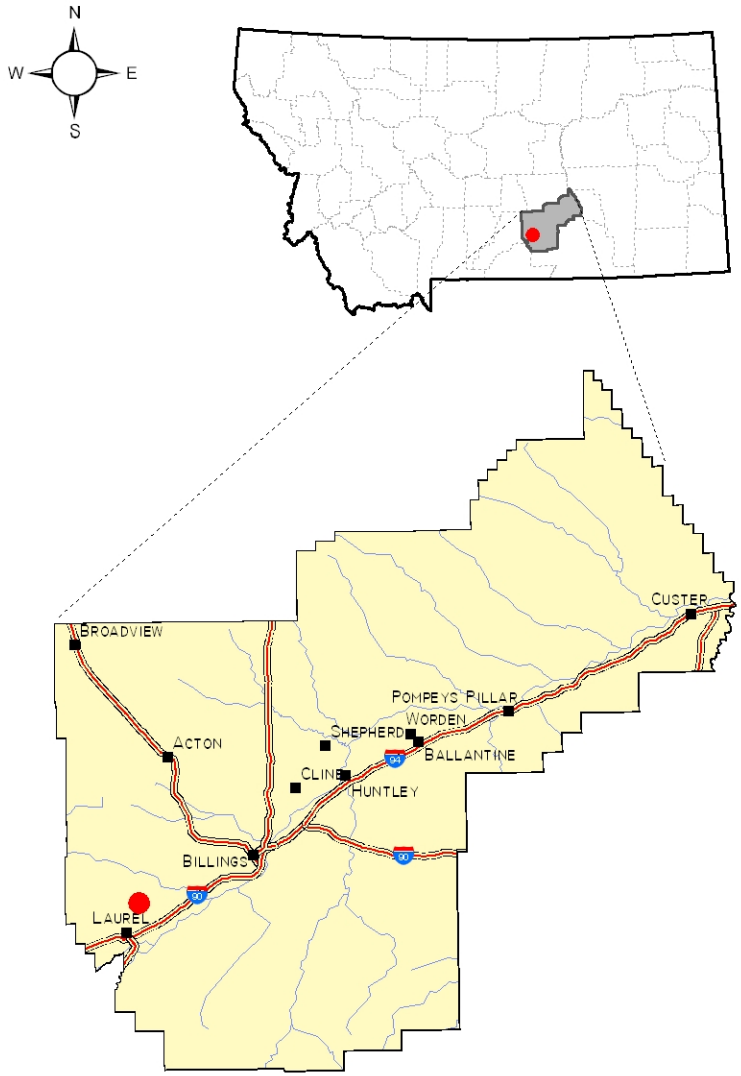
The approximate site boundary is illustrated in **Figure 2** (**Appendix A**), and the original conceptual layout is provided in **Appendix D**. The project incorporates the two incidentally created wetland/open water areas totaling 3.87 acres and seven wetland creation areas (i.e., wetland cells) totaling approximately 17.72 acres for a total projected aquatic habitat size of 21.59 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 reserve'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
A Division Of PBS&J

2.0 METHODS

2.1 Monitoring Dates and Activities

The site was visited on August 6, 2007 (mid-season visit) and again on October 8, 2007 (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 fall bird migrations. Based on past experience with the hydrology of the site, vegetation community mapping was finalized during the fall visit.

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 in 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.

Seven woody species were planted at this mitigation site. Planting locations were documented as point data with a GPS unit. 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 were 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 2007 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 using a resource grade GPS unit 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 past monitoring is 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 (**Bird Survey Field Data Sheets** 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 northeast portion of the site, is shown on **Figure 2** in **Appendix A**. The sample was preserved as outlined in the sampling procedure and sent to a laboratory for analysis. The sample point in 2007 differs from the sample points in 2005 and 2006. The 2005 sample macroinvertebrate sample point was taken in one of the ponds that had been established for several years. This information helps evaluators to understand the site's potential. The sample point taken in 2006 is in one of the new shallow pond/emergent marsh areas and represents the early stages of ecosystem evolution at the Wagner Marsh. The 2006 sample point was dry during the mid-season visit, therefore a new site was selected that has had water during all three years of monitoring, and therefore, presumably, will be able to be sampled in subsequent years. The new 2007 sampling site is similar to the 2006 sample site in that the site was newly constructed in 2005.

2.9 Functional Assessment

A functional assessment form was completed for the monitoring area using the 1999 MDT Montana Wetland Assessment Method (Berglund 1999). 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. For each wetland or group of wetlands (that share similar functions and values) a Functional Assessment form was completed (**Appendix B**)

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 (**Appendix C**). Each photograph point location was recorded with a GPS in 2005. The approximate location of photo points is shown on **Figure 2** in **Appendix A**. All photographs were taken using a 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. These data were not re-collected in 2006. A resource-grade Magellan MobileMapper GPS unit was used to map wetland boundaries in 2007. Procedures for GPS mapping and aerial photography referencing are in **Appendix E.**

2.12 Maintenance Needs

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

3.0 RESULTS

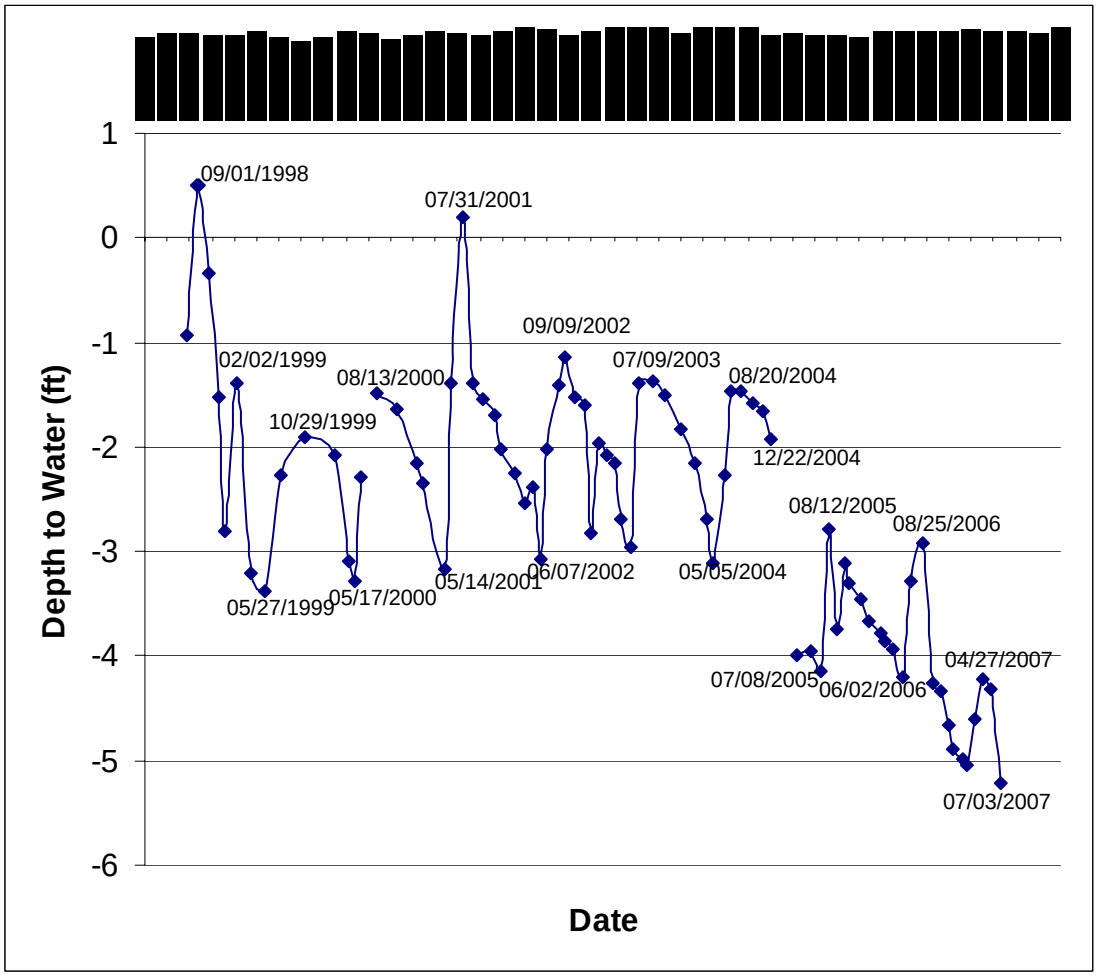
3.1 Hydrology

Groundwater is the primary hydrologic component of Wagner Marsh, with precipitation playing a minor role in the overall water budget. 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) (2007a), 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 September 30, 2007 at the Billings weather station was 11.92 inches (WRCC 2007), which is slightly higher (0.13 inches) than the average for this time of year. Annual evaporation pan rates are estimated to be approximately 41.27 inches at the Huntley Experiment Station (WRCC 2007b), almost three times the yearly precipitation rate.

Inundation was present, to some extent, at most wetland cells within the monitoring area during the mid-season visit. It was noted that water levels were the lowest ever observed during the mid-season visit in August 2007. This is confirmed by groundwater data for July 3, 2007 (**Chart 1**) and the July 20, 2007 aerial photograph (**Figures 2** and **3**). Conversely, water levels at the site during the fall 2007 visit were the highest observed since 2005 when mitigation monitoring began. Though the cause for this water level rise is unknown, it is likely that pumping of water from the new gravel mining operation on the property immediately west of 56th Street into Wagner Marsh was at least partially responsible for the higher water levels. Open water areas are shown on **Figure 3** (**Appendix A**).

MDT has contracted with the U.S. Geologic Survey (USGS) to monitor groundwater wells at the Wagner Marsh since 1998. **Chart 1** depicts groundwater fluctuations for one well and provides an example of groundwater fluctuations in the area. Based on the dates of recorded high and low water levels, it is clear that groundwater levels are typically highest in August and September and lowest in the spring and are presumably linked to agricultural use and irrigation periods. This hydroperiod is the opposite of most wetlands in Montana and may hinder the establishment of hydrophytic plant species that have evolved under a more natural hydrologic regime (i.e., wettest in spring, driest in late summer/early fall). The graph also shows that groundwater levels dropped in 2005 when the mitigation site was constructed. It is unclear if the drop in groundwater levels is due to the construction of the mitigation site, groundwater de-watering at nearby gravel pit operations, an increase in evaporation, a change in irrigation practices, drought, or a combination of these factors. It is interesting to note that water levels were the lowest ever recorded on July 3, 2007, the last day groundwater at the site was monitored.

Chart 1: ***An example of the variation in groundwater levels at the Wagner Marsh Wetland Mitigation Site (USGS Well #5).***



NOTE: The line connecting points is for display purposes only and is included to show general trends in groundwater levels. It should be understood that groundwater levels can vary substantially between monitoring dates.

Of the 39 acres in the monitoring area, approximately 25 percent was inundated (**Figure 3** in **Appendix A**), with an average depth of eight inches and a range of depths from 0.25 to an estimated five feet. As with previous years, 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 **Monitoring Form** (**Appendix B**). Construction of the site was completed in June 2005. In 2007 a total of eleven community types were documented at the site, of which seven are vegetated wetland community types. These wetland community types were identified and mapped (**Figure 3** in **Appendix A**) as: Type 2 - *Salix exigua-Eleagnus angustifolia/Carex lanuginosa* (*Salix* type), Type 3 - *Eleocharis palustris-Typha sp./Mixed graminoids* (*Eleocharis-Typha* type), Type 9 - *Mixed graminoids*, Type 11 - *Phalaris arundinaceae*, Type 12 - *Scirpus acutus* (*Scirpus* type),

Table 1: ***2005 – 2007 vegetation species list for the Wagner Marsh Wetland Mitigation Site.***

Scientific Name*	1988 Region 9 (Northwest) Wetland Indicator
Agropyron cristatum	--
Agropyron repens	FACU
Agropyron smithii	FACU
Agropyron spp.	--
Agrostis alba	FACW
Alyssum spp.	--
Asclepias spp.	--
Aster brachyactis	FACW
Aster spp. (white)	--
Beckmannia syzigachne	OBL
Brassicaceae (mustard)	--
Bromus inermis	--
Bromus japonicus	FACU
Carex lanuginosa	OBL
Carex nebrascensis	OBL
Carex spp.	--
Centaurea maculosa	--
Chenopodium album	FAC
Cirsium arvense	FACU+
Convolvulus arvensis	--
Conyza canadensis	FACU
Echinochloa muricata	FACW
Eleagnus angustifolia	FAC
Eleagnus commutata (planted)	NI
Eleocharis palustris	OBL
Epilobium ciliatum	FACW-
Erodium cicutarium	--
Festuca pratensis	FACU+
Grindelia squarrosa	FACU
Hordeum jubatum	FAC+
Juncus torreyi	FACW
Juniperus scopulorum (planted)	--
Lactuca serriola	FACU
Leptochloa fusca	FACW
Linum lewisii	--
Lotus unifoliolatus	--
Medicago lupulina	FAC
Medicago sativa	--
Melilotus officinalis	FACU
Nepeta cataria	FAC
Oenthera biennis	FACU
Onopordum acanthium	--
Panicum capillare	FAC
Polygonum aviculare	FACW-
Polygonum lapathifolium	FACW+
Polygonum persicaria	FACW
Polypogon monspeliensis	FACW
Populus deltoides	FAC
Potentilla anserina	OBL
Prunus virginiana (planted)	FACU

*__Bolded plant species__ were observed for the first time in 2007.

Table 1 (continued): ***2005 – 2007 vegetation species list for the Wagner Marsh Wetland Mitigation Site.***

Scientific Name*	1988 Region 9 (Northwest) Wetland Indicator
Ribes aureum (planted)	FAC+
Rosa woodsii (planted)	FACU
Rumex crispus	FACW
Salix amygdaloides	FACW
Salix exigua	OBL
Salsola iberica	--
Scirpus acutus	OBL
Scirpus maritimus	OBL
Scirpus pungens	OBL
Shepherdia 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
Verbena bracteata	FACU+

*__Bolded plant species__ were observed for the first time in 2007.

Type 13 - *Carex lanuginosa/Hordeum jubatum* (*Carex* type), and Type 14 - *Echinochloa muricata*/*Hordeum jubatum*. Dominant species within each of these communities are listed on the **Monitoring Forms** (**Appendix B**). The mixed graminoid and *Phalaris arundinaceae* types occur as a wetland fringes around previously existing ponds on the west and northwest sides of the site (**Figure 3** in **Appendix A**) and evolved from the *Polypogon* and *Polygonum lapathifolium* types from previous years.

The *Eleocharis-Typha* type is the most common wetland type on the site and occurs as scattered pockets throughout the mitigation area. The *Carex* type has taken the place of the *Eleocharis – Typha* type that occurred in the northwest portion of the site east-adjacent to the *Salix* type in 2005 and 2006. This appears to have been caused by a reduction in inundation in this area. The *Echinochloa* type occurs in the northeastern portion of the site in an area previously classified as "disturbed" moist habitat.

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*), lambsquarters (*Chenopodium album*), and spotted knapweed (*Centaurea maculosa*). Weed control efforts primarily for knapweed and Canada thistle (*Cirsium arvense*) were implemented in upland areas in 2007.

Vegetation community data were recorded from a transect (**Monitoring Forms** in **Appendix B**) and summarized in **Table 2**. The types of communities and their relative extent did not change

substantially from 2006 to 2007 (**Charts 2** and **3**). In 2007 the number of hydrophytic and upland plant species was consistent with 2006 results (**Table 2**). The overall percent cover increased from 30% in 2005 to roughly 55 percent in 2007, and the amount of bare ground decreased. These results confirm results from 2006 that the area where the transect was placed is developing along a normal path of wetland recruitment and establishment. If water levels and the timing of high water at the site remain similar to what had occurred in 2005 and 2006, then one might expect the continued persistence in the number of species and their composition.

Table 2: ***2005 – 2007 vegetation transect data summary.***

Monitoring Year	2005	2006	2007
Transect Length (feet)	530	530	530
# Vegetation Community Transitions along Transect	5	5	5
# Vegetation Communities along Transect	4	3	3
# Hydrophytic Vegetation Communities along Transect	2	2	1
Total Vegetative Species	31	31	31
Total Hydrophytic Species	13	15	15
Total Upland Species	18	16	16
Estimated % Total Vegetative Cover	30	45	55
% Transect Length Comprised of Hydrophytic Vegetation Communities	67	62	65
% Transect Length Comprised of Upland Vegetation Communities	7	6	5
% Transect Length Comprised of Unvegetated Open Water	4	31	30
% Transect Length Comprised of Bare Substrate	22	0	0

Chart 2: ***Transect maps showing vegetation types from the start of transect (0 feet) to the end of transect (530 feet) for 2005, 2006, and 2007.***

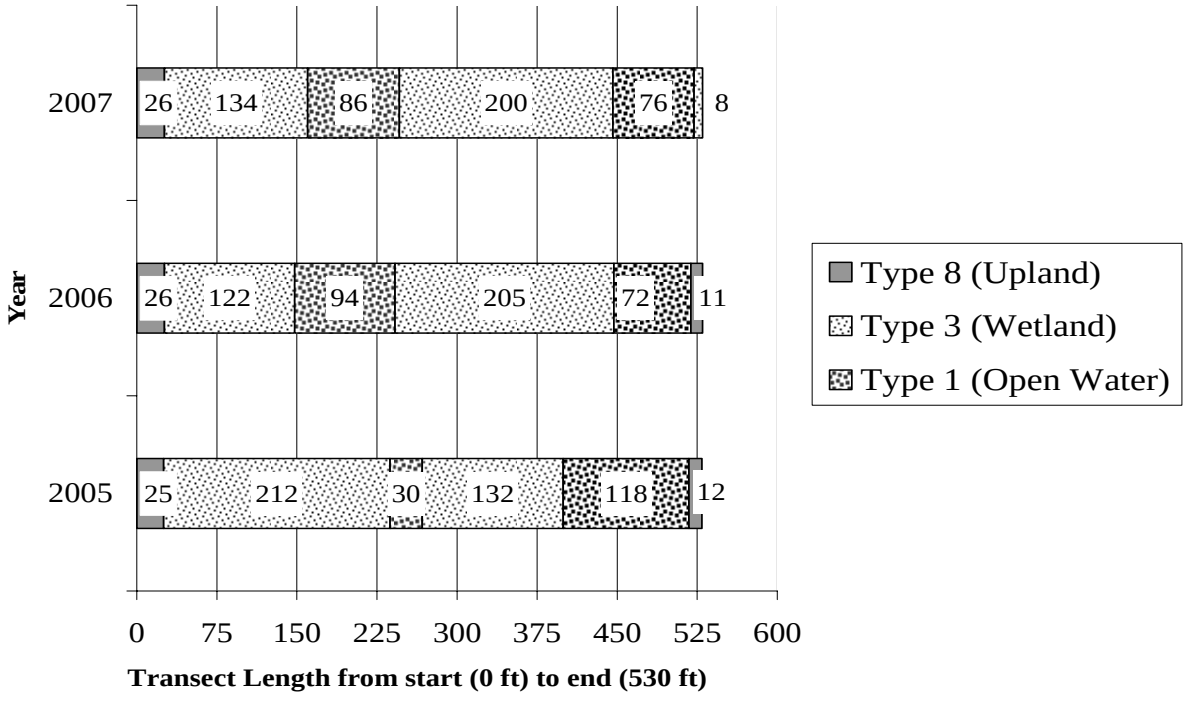
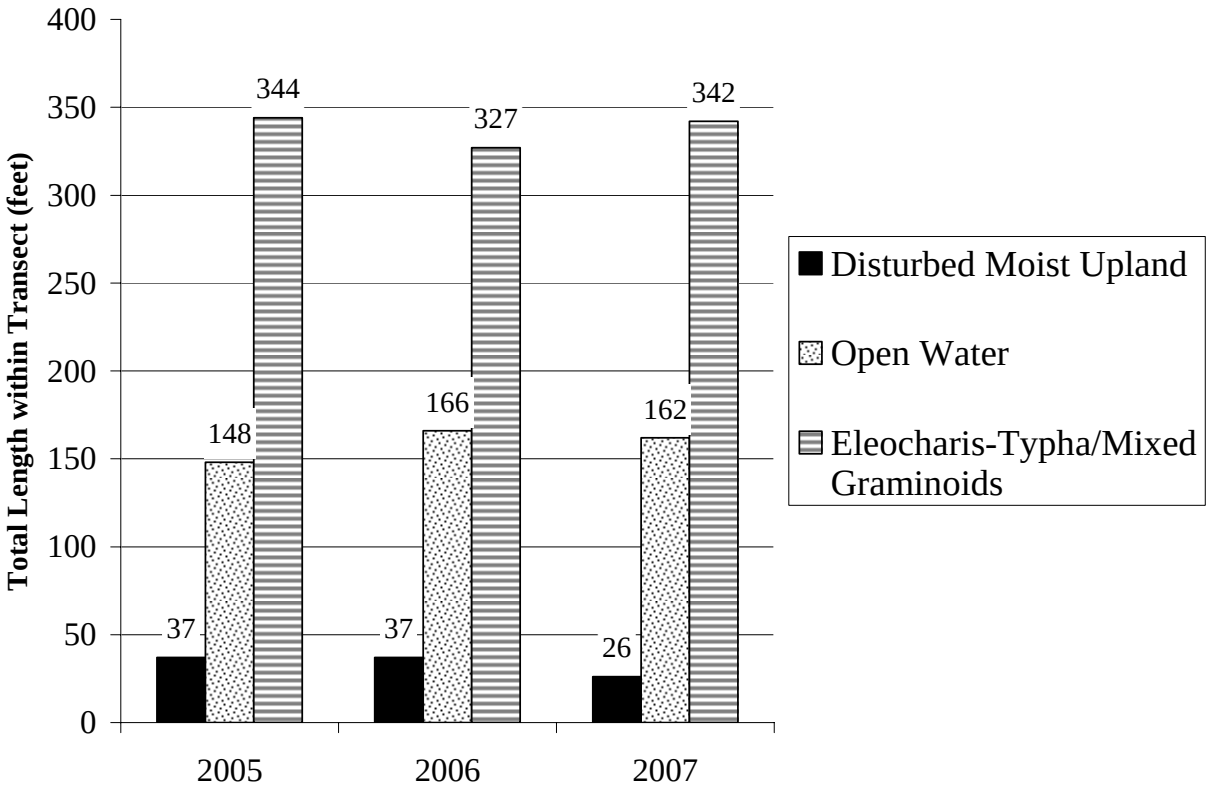


Chart 3: ***Length of vegetation communities within Transect 1 for 2005, 2006, and 2007.***



A total of 550 woody plantings were installed 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 6, 2007, the overall survival rate is estimated at 57 percent, with a total of 204 individuals observed to be dead and an additional 32 that were not located and presumed dead. This is down from the 92 percent survival rate reported in 2005 and the 64 percent survival rate in 2006. Juniper plantings continue to do well; mortality of the other species is likely due to a lack of available water during the summer months.

Table 3: ***2007 observed mortality of planted woody species for the Wagner Marsh Wetland Mitigation Site.***

Plant Species	Number Originally Planted	Number Observed Alive	Number Observed Dead	Mortality Causes
Eleagnus commutata	50	28	12	Mortality assumed to be due to lack of water.
Juniperus scopulorum	50	48	2	No mortality observed.
Populus deltoides	50	31	19	Mortality assumed to be due to lack of water.
Prunus virginiana	100	68	30	Mortality assumed to be due to lack of water.
*Ribes aureum**	100	65	25	Mortality assumed to be due to lack of water.
Rosa woodsii	100	63	27	No mortality observed.
*Shepherdia argentea**	100	11	89	Mortality assumed to be due to lack of water.
TOTAL	**550**	**314**	**204***	

*10 silverberry, 2 chokecherry, 10 golden currant, and 10 Wood's rose could not be located and are presumed dead.

3.3 Soils

Since the site was excavated and graded in Spring 2005, soils are highly disturbed throughout the site. Soils sampled in wetland areas were comprised of cobbly gravelly sandy loam. The matrix color of the upper horizon was 10YR 4/1. The site was inundated.

3.4 Wetland Delineation

Delineated wetland boundaries are illustrated on **Figure 3** (**Appendix A**). Completed COE Wetland Delineation Forms are included in **Appendix B**. Soils, vegetation, and hydrology were discussed in preceding sections. Total aquatic habitat on the site in 2007 was 13.30 acres (**Figure 3** in **Appendix A**). Wetlands comprised 7.50 acres of the 13.3-acre total, consisting of 2.12 acres of wetland originally created on the site by MDT plus 5.38 acres that have developed to date since implementation of the formal mitigation design in 2005. This is an increase of 0.97 acre over the wetland extent in 2006.

Open water comprised 5.80 acres of the 13.30-acre total, an increase of 0.84 acre from the 4.96 acres of open water reported in 2006. Shallow open water habitat observed in 2007 is expected to continue to become vegetated with emergent hydrophytic species over time. Much of the 'disturbed-moist' vegetation type of previous years was inundated or has converted into wetland community types. A 50-foot wetland buffer around wetlands on the site is approximately 5.19 acres in size. Credits that have developed to date are discussed below in **Section 3.10**.

3.5 Wildlife and Fish

Though only constructed in 2005, the wetland complex created on the site provides habitat for several wildlife species. Five mammal and 16 bird species were observed at the site during 2007 monitoring (**Table 4**). The habitat value of the site is expected to increase as vegetation continues to establish and diversify. Mallards and Red-winged Blackbirds were the most numerous bird species observed at the site during the fall bird monitoring event (**Appendix B**). Literally hundreds of mallards were observed onsite as well as flying over the site to nearby wetland areas. This is somewhat different from previous years when Canada Geese have been the most numerous waterfowl.

Table 4: ***Fish and wildlife species observed at the Wagner Marsh Wetland Mitigation Site during 2005 to 2007.***

AMPHIBIAN	
Western chorus frog (*Pseudacris triseriata*)	Woodhouse's toad (*Bufo woodhousii*)
REPTILE	
Western garter snake (*Thamnophis elegans*)	
BIRD	
American Black Duck (*Anas rubripes*)(?)	**Killdeer (*Charadrius vociferous*)**
American Coot (*Fulica americana*)	Lesser Scaup (*Aythya affinis*)[1]
American Goldfinch (*Carduelis tristis*)	**Mallard (*Anas platyrhynchos*)**
American Robin (*Turdus migratorius*)[1]	**Mourning Dove (*Zenaida macroura*)**
American Wigeon (*Anas americana*)[1]	Northern Harrier (*Circus cyaneus*)
Barn Swallow (*Hirundo rustica*)	Northern Pintail (*Anas acuta*)[1]
Blue-winged Teal (*Anas discors*)[1]	Northern Shoveler (*Anas clypeata*)[1]
California Gull (*Larus californicus*)	**Pied-billed Grebe (*Podilymbus podiceps*)**
Canada Goose (*Branta canadensis*)	Red-tailed Hawk (*Buteo jamaicensis*)
Cinnamon Teal (*Anas cyanoptera*)[1]	**Red-winged Blackbird (*Agelaius phoeniceus)***
Cliff Swallow (*Hirundo pyrrhonota*)	Redhead (*Aythya americana*)[1]
Common Snipe (Gallinago gallinago)	**Ring-necked Pheasant (*Phasianus colchicus*)**
Eastern Kingbird (*Tyranus tyranus*)	**Rock Dove (*Columba livia*)**
Gadwall (*Anas strepera*)	**Sandhill Crane (*Grus canadensis*)**
Grasshopper Sparrow (*Ammodramus savannarum*)	**Song Sparrow (*Melospiza melodia*)**
Great Blue Heron (*Ardea herodias*)	Spotted Sandpiper (*Actitis macularia*)
Greater Yellowlegs (*Tringa melanoleuca*)[1]	Tree Swallow (*Tachycineta bicolor*)[1]
Green-winged Teal (*Anas crecca*)	Vesper Sparrow (*Pooecetes gramineus*)
	Western Meadowlark (*Sturnella neglecta*)
MAMMAL	
Mule deer (*Odocoileus hemionus*)	Red Fox (*Vulpes vulpes*)[1]
Eastern cottontail (*Sylvilagus floridanus*)	Vole (unidentified species)
Muskrat (*Ondatra zibethicus*)	**White-tailed jackrabbit (*Lepus townsendi*)**
Raccoon *(Procyon lotor)*	

[1] Species observed by MDT staff
Bolded species represent those observed in 2007.

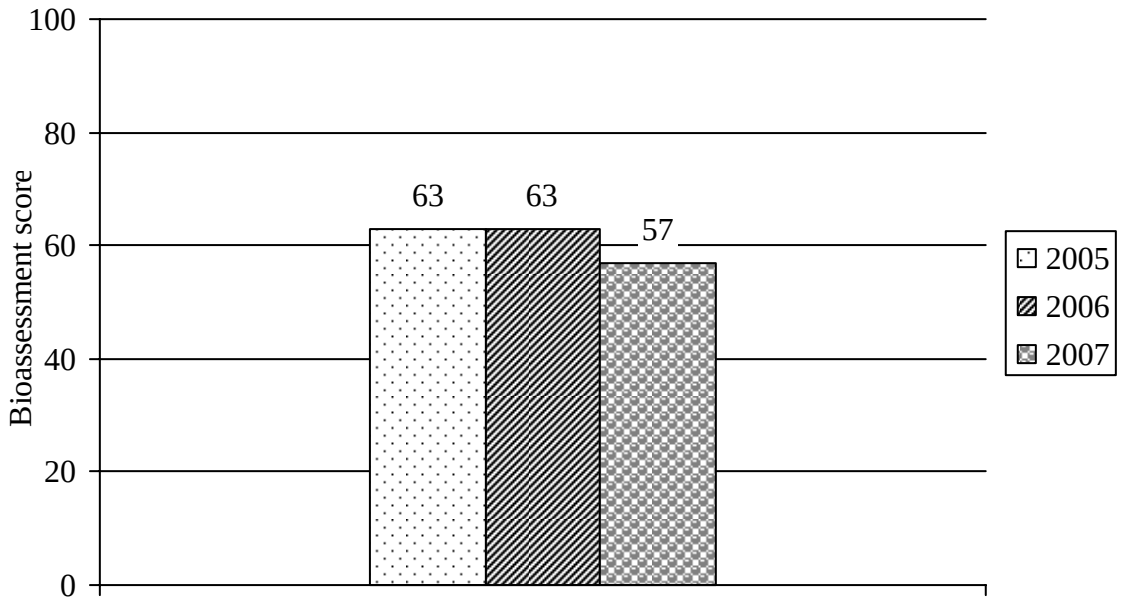
3.6 Macroinvertebrates

In 2005 macroinvertebrates were sampled within the emergent marsh complex on the east side of the site on the northern end of the crescent-shaped pond (**Figure 2** in **Appendix A**). This site represented an area that had already been established prior to the construction of the mitigation site, and to some degree represented the site's potential after several years of establishment. That site had high taxa richness and an unusually high number of notonectid hemipterans (Bollman 2005). To better understand how the macroinvertebrate community changes over time, the sampling location was moved in 2006 to a portion of the mitigation site that was constructed in 2005. This site was much less developed in terms of the macroinvertebrate assemblage and was dominated by biting flies (Bollman 2006). The sample site was moved again in 2007 due to the 2006 sample site being dry during the mid-season visit; it had not been dry in the two preceding years. The new sample site is located in an area that was constructed in 2005, but appears to have a more stable water regime than the 2006 sample site. For this reason future

changes in macroinvertebrate sample site locations is not expected. Sampling results are provided in **Appendix F** and were summarized by Rhithron Associates, Inc. in the italicized section below (Bollman 2007).

2007: Sub-optimal biotic conditions are indicated by bioassessment scores in 2007. Taxa richness remained low in this year, but POET taxa (namely the mayflies Caenis *sp. and* Callibaetis *sp.) were present. Similar to 2006, biting gnats (Ceratopogoninae) were the dominant taxa, suggesting that the proximity of cattle to the site influenced the aquatic biota. Aquatic habitats appear to have been limited to open-water environs and hypoxic benthic substrates; some filamentous algae may also have been present.*

Chart 4: ***Macroinvertebrate bioassessment scores for the Wagner Marsh Wetland Mitigation Site from 2005 to 2007.***



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 II wetlands in 2006 and 2007, 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, uniqueness, and recreation/education potential. The pre-project site provided about 16.6

Table 5: ***Summary of 2001 and 2005 through 2007 wetland function/value ratings and functional points at the Wagner Marsh Wetland Mitigation Site.***

Function and Value Parameters from the 1999 MDT Montana Wetland Assessment Method[1]	2001 Baseline Assessment	2005	2006	2007
Listed/Proposed T&E Species Habitat	Low (0.5)	Low (0.5)	Low (0.5)	Low (0.0)
MNHP Species Habitat	Low (0.2)	Low (0.2)	Low (0.2)	Low (0.2)
General Wildlife Habitat	Low (0.3)	Mod (0.7)	Mod (0.7)	Mod (0.7)
General Fish/Aquatic Habitat	N/A	N/A	N/A	N/A
Flood Attenuation	N/A	N/A	N/A	N/A
Short and Long Term Surface Water Storage	Mod (0.6)	High (1.0)	High (1.0)	High (1.0)
Sediment, Nutrient, Toxicant Removal	Mod (0.7)	Mod (0.7)	Mod (0.7)	Mod (0.7)
Sediment/Shoreline Stabilization	N/A	Mod (0.7)	Mod (0.7)	Mod (0.7)
Production Export/Food Chain Support	Mod (0.6)	High (0.8)	High (0.9)	High (0.9)
Groundwater Discharge/Recharge	High (1.0)	High (1.0)	High (1.0)	High (1.0)
Uniqueness	Low (0.2)	Mod (0.5)	Mod (0.5)	Mod (0.5)
Recreation/Education Potential	Low (0.2)	Low (0.1)	Mod (0.5)	High (1.0)
Actual Points/Possible Points	4.3/9	5.8/10	6.7/10	6.7/10
% of Possible Score Achieved	48%	58%	67%	67%
Overall Category	IV	III	II	II
Total Acreage of Assessed Aquatic Habitat within AA Boundaries	**3.87**	**11.84**	**11.49**	**13.30**
Functional Units (acreage x actual points)	**16.64**	**68.7**	**77.0**	**89.11**
Net Acreage Gain	NA	**7.84**	**-0.35**	**1.81**
Net Functional Unit Gain	NA	**52.1**	**60.36 (2001) 8.3 (2005)**	**72.47 (2001) 12.11 (2006)**

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

functional units within the monitoring area, and the post-project site currently provides about 89 functional units, for a conservative gain of at least 72 functional units.

3.8 Photographs

Representative photographs taken from photo-points and transect ends are provided in **Appendix C**.

3.9 Maintenance Needs/Recommendations

A few tamarisk saplings were observed and removed during monitoring in 2007. The presence of tamarisk on the site should continue to be monitored and individuals removed when encountered, but overall the threat of tamarisk invasion appears to be low. The majority of tamarisk seedlings/saplings that were pulled were found in the central portion of the site, east of the crescent shaped pond and south of the wetland cell containing the vegetation transect.

In 2006 it was noted that spotted knapweed was well established on the berm on the east side of the site, and in upland communities and that Canada thistle was prevalent in the cattail area in the northwestern portion of the site. During the mid-season visit it was noted that a comprehensive weed spraying program had been implemented at the site. This effort made significant progress

toward eradicating these species from the site, however, spraying in subsequent years is needed to fully address the severity of the problem.

Water levels continue to be variable, with the site being the driest observed to date in August 2007 and the wettest to date in October 2007.

The plant protectors used when planting woody species have started to greatly affect the growth of many of these plants. It is suggested that the plant protectors be removed.

3.10 Current Credit Summary

Based on documentation provided by MDT, approximately 2.12 acres of wetland and 1.75 acres of open water (3.87 acres total of aquatic habitat) were incidentally created on the site via pit excavation prior to formal mitigation project implementation in 2005 (*note: 4/1/04 MDT correspondence to the COE indicated 3.87 acres of wetlands and 1.75 acres of open water, which appears to have inadvertently double-counted the open water, adding 1.75 acres to the 2.12 wetland acres [see map in **Appendix D**]; 7/23/04 COE correspondence to MDT correctly indicated 2.12 acres of wetlands, but inadvertently provided an incorrect 1.92-acre figure for the actual 1.75 acres of open water*).

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 disturbance by MDT (Urban pers. comm.). As of 2007, a total of approximately 13.3 acres of open water and wetland habitat (including the original 3.87 acres) occur within the monitoring area (**Table 6**). This is an increase of approximately 1.81 acres from 2006 totals (11.49 acres) and is attributed primarily to higher water levels in October 2007.

Of the 13.30-acre 2007 total, approximately 5.80 acres are currently open water habitat and the remaining 7.50 acres are vegetated wetland areas. Due to the variability in water levels at Wagner Marsh, it is unclear how much of the open water habitat will evolve into emergent wetland areas. Much of the 'disturbed-moist' vegetation type of previous monitoring years was classified as emergent wetlands or open water in 2007. A 50 foot wetland buffer around wetlands on the site comprises approximately 5.19 acres (**Table 6**).

Table 6: ***Summary of open water and wetland acreages at the Wagner Marsh Wetland Mitigation Site for 2001, 2005, 2006, and 2007.***

Period	Open Water (acres)	Wetland (acres)	Total Aquatic Habitat
2001 (pre-mitigation creation)	1.75	2.12	3.87
2005 (post-construction)	7.88	3.96	11.84
2006 (ongoing establishment)	4.96	6.53	11.49
2007 (ongoing establishment)	**5.80**	**7.50**	**13.30**

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. Using these assumed credit ratios for wetlands, open water, and upland buffer, approximately 10.3 acres of credit are currently available.

Table 7: ***2007 mitigation credit summary for the Wagner Marsh Wetland Mitigation Site.***

Credit Category	Acres	Assumed Credit Ratio[a]	Credit [1]
Total Scrub/Shrub and Emergent Wetland	7.50	1:1	7.50
Total Open water	5.80	20% of wetland acreage	1.50
50-foot wide upland buffer	5.19	4:1	1.30
TOTAL	**16.68**		**10.30**

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

The pre-project site provided about 16.6 functional units within the monitoring area, and the in 2007 the mitigation site provides about 89 functional units, for a conservative gain of at least 72 functional units.

4.0 REFERENCES

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Appendix A

FIGURES 2 & 3

MDT Wetland Mitigation Monitoring
Wagner Marsh
Billings, Montana

Figure 2 Monitoring Activity Locations 2007

N
W
E
S
200' 100' 0' 100' 200'
SCALE: 1" = 200'

Monitoring Area Limits
Vegetation Transect
Photograph Point
Aerial Reference Point
SP Soil Sample Point
MB Macro-Invertebrate Sample Point
MW Monitoring Well
Base photograph July 20, 2007

Monitoring Area Limits
MW2
MW3
PP A
SP2
MB
SP1
PP D
MW1
PP B
PP C
S 56th St. W
Drill Seeded
Billings Bench Water Association Canal
Monitoring Area Limits
Danford Rd
1
2
3
4

REV - Nov/13/2007	FIGURE 2 OF	PBSJ 3810 Valley Commons Drive Suite 4 Bozeman, MT 59718	PROJ NO: B43088.00 0514	DRAWN: JR	PROJECT NAME: MDT WAGNER PIT WETLAND MITIGATION
			LOCATION: BILLINGS, MT	PROJ MGR: J. BERGLUND	
			SCALE: NOTED	CHECKED: RM APPVD: JB	DRAWING TITLE: MONITORING ACTIVITY LOCATIONS 2007
			FILE NAME: 2007 Base.dwg		

Figure 3 Mapped Site Features 2007

N
W E
S

200' 150' 0 100' 200'

SCALE: 1" = 200'

Monitoring Area Limits
Wetland Boundary
Open Water
Vegetation Community Boundary
Approximate Connector Location
Base photograph July 20, 2007

Monitoring Area Limits

S 56th St. W

Drill Seeded

Billings Bench Water Association Canal

Monitoring Area Limits

Danford Rd

Wetland Area	
Gross Wetland	13.30 Acres
Open Water Area	5.80 Acres
Net Wetland	7.50 Acres

Vegetation Types

1. Open Water/Aquatic Bed
2. Salix exigua-Eleagnus angustifolia/Carex spp.
3. Eleocharis palustris-Typha sp./Mixed graminoids
4. Polypogon monspeliensis Fringe
5. Polygonum lapathifolium/Mixed graminoids
6. Upland Grasses
7. Upland Grasses - Drill Seeded
8. Disturbed Moist
9. Glyceria grandis
10. Mixed Graminoids
11. Phalaris arundinaceae
12. Scirpus acutus
13. Carex lanuginosa/Hordeum jubatum
14. Echinochloa muricata/Hordeum jubatum

REV - Nov/13/2007

FIGURE 3 OF

PBSJ
3810 Valley Commons Drive
Suite 4
Bozeman, MT 59718

PROJ NO: B43088.00 0514	DRAWN: JR		
LOCATION: BILLINGS, MT	PROJ MGR: J. BERGLUND		
SCALE: NOTED	CHECKED: RM	APPVD: JB	
FILE NAME: 2007 Base.dwg			

PROJECT NAME
MDT WAGNER PIT WETLAND MITIGATION

DRAWING TITLE
MAPPED SITE FEATURES 2007

Appendix B

2007 WETLAND MITIGATION SITE MONITORING FORMS
2007 BIRD SURVEY FORMS
2007 COE WETLAND DELINEATION FORMS
2007 FUNCTIONAL ASSESSMENT FORMS

MDT Wetland Mitigation Monitoring
Wagner Marsh
Billings, Montana

PBS&J / MDT WETLAND MITIGATION SITE MONITORING FORM

Project Name: **Wagner Marsh** Project Number: _____
Assessment Date: **August 6, 2007** Person(s) conducting the assessment: **R. McEldowney**
Location: _____ MDT District: **Billings** Milepost: **NA**
Legal Description: T **1S** R **25E** Section **28**
Weather Conditions: **Clear, calm, 70-95 deg F** Time of Day: **9 to 4 pm**
Initial Evaluation Date: **August 1, 2005** Monitoring Year: **3** # Visits in Year: **2**
Size of evaluation area: **39 acres** Land use surrounding wetland: **Rural/agricultural mostly, new gravel pit being excavated immediately west of S. 56th St. West**

HYDROLOGY

Surface Water Source: **Groundwater and overland flow**
Inundation: **Present** Average Depth: **6 in** Range of Depths: **0-5 ft**
Percent of assessment area under inundation: **25%**
Depth at emergent vegetation-open water boundary: **Varies - 0 to 1 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 8/6/07 and 10/8/07**
Record depth of water below ground surface (in feet):

Well Number	Depth	Well Number	Depth	Well Number	Depth
8/6/07 #1	3.21 ft	10/8/07 #1	2.58		
8/6/07 #2	Locked	10/8/07 #2	Locked		
8/6/07 #3	2.58 ft	10/8/07 #3	3.02		

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:
Site examined on October 8th also. Monitoring well 2 has a USGS lock box on it, presumably because they have a data logger in the well. Surface water levels in the mitigation site on October 8th were the highest ever observed during a monitoring event over the past 3 years.

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 relatively recent (2005) construction of the project and the dynamic fluctuations of water levels. 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): **Eleocharis palustris-Typha latifolia/Mixed graminoids**

Dominant Species	% Cover	Dominant Species	% Cover
Typha latifolia	2 = 6-10%	Eleocharis palustris	5 = > 50%
Typha angustifolia	2 = 6-10%	Juncus torreyi	4 = 21-50%
Scirpus acutus	2 = 6-10%	Agropyron repens	2 = 6-10%
Hordeum jubatum	3 = 11-20%	Polygonum lapathifolium	1 = 1-5%

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%		
Carex lanuginosa	1 = 1-5%		

Comments / Problems: **Not observed in 2007. Evolved into Community Number 10.**

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

Dominant Species	% Cover	Dominant Species	% Cover
Polygonum lapathifolium	5 = > 50%	Eleocharis palustris	2 = 6-10%
Juncus torreyi	1 = 1-5%		

Comments / Problems: **Not observed in 2007. Evolved into Community number 11.**

VEGETATION COMMUNITIES (continued)

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%		
Centaurea maculosa	4 = 21-50%		

Comments / Problems: **Upland area - drill seeded berm on the east side of the site. Spotted knapweed is a problem in this area.**

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

Dominant Species	% Cover	Dominant Species	% Cover
Melilotus officinale	3 = 11-20%		
Kochia scoparia	1 = 1-5%		
Hordeum jubatum	1 = 1-5%		

Comments / Problems: **Area is primarily bare ground with a variety of weedy and hydrophytic species. This community type may become dominated by hydrophytic vegetation over time if the hydroperiod and required duration of inundation occurs.**

Community Number: **9** Community Title (main spp): **Glyceria grandis**

Dominant Species	% Cover	Dominant Species	% Cover
Glyceria grandis	3 = 11-20%		

Comments / Problems: **Not observed in 2007.**

VEGETATION COMMUNITIES (continued)

Community Number:**10** Community Title (main spp): **Mixed Graminoids**

Dominant Species	% Cover	Dominant Species	% Cover
Typha latifolia	1 = 1-5%	Phalaris arundinaceae	2 = 6-10%
Scirpus acutus	1 = 1-5%	Leptochloa fusca	3 = 11-20%
Carex lanuginosa	3 = 11-20%		

Comments / Problems: **New community in 2007. Evolved from Community Number 4.**

Community Number:**11** Community Title (main spp): **Phalaris arundinaceae**

Dominant Species	% Cover	Dominant Species	% Cover
Phalaris arundinaceae	5 = > 50%		
Polygonum lapathifolium	1 = 1-5%		

Comments / Problems: **New community in 2007. Evolved from Community Number 5.**

Community Number: **12** Community Title (main spp): **Scirpus acutus**

Dominant Species	% Cover	Dominant Species	% Cover
Scirpus acutus	5 = > 50%		
Echinochloa muricata	1 = 1-5%		

Comments / Problems: **New community in 2007. Located in the pond in NW portion of site where the PSS wetland is located.**

Community Number: **13** Community Title (main spp): **Carex lanuginosa/Hordeum jubatum**

Dominant Species	% Cover	Dominant Species	% Cover
Carex lanuginosa	4 = 21-50%	Cirsium arvense	2 = 6-10%
Hordeum jubatum	3 = 11-20%		
Phalaris arundinaceae	1 = 1-5%		
Festuca pratensis	1 = 1-5%		

Comments / Problems: **New community in 2007. Site was classified as Community Type 3 in 2005 and 2006. Likely caused by a loss of inundation in this area.**

Community Number: **14** Community Title (main spp): **Echinochloa muricata/Hordeum jubatum**

Dominant Species	% Cover	Dominant Species	% Cover
Echinochloa muricata	4 = 21-50%		
Hordeum jubatum	3 = 11-20%		

Comments / Problems: **New community in 2007.**

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	3,6,7,8	Mustard sp.	8
Agropyron smithii	6,7	Nepeta cataria	13
Agropyron sp.	6,7	Onopordum acanthium	7
Alyssum sp.	6	Oenthera biennis	6
Aster brachyactis	3	Panicum capillare	8
Beckmannia syzigachne	8	Phalaris arundinaceae	11,13
Bromus inermis	6,7	Polygonum aviculare	3,6,7,8
Bromus japonicus	6,8	Polygonum lapathifolium	1,3,5,8
Carex lanuginosa	2,4,10,13	Polygonum pensylvanicum	1,3,8
Carex nebrascensis	2,3	Polypogon monspeliensis	4
Carex sp.	3	Populus deltoides	2
Centaurea maculosa	6,7,8	Potentilla anserina	1,8
Chenopodium album	6,7,8	Potentilla recta	6
Cirsium arvense	2,3,6	Rumex crispus	2
Convolvulus arvensis	6,7,8	Salix amygdaloides	2
Conyza canadensis	6,8	Salix exigua	2
Descurainia sophia	8	Salix lutea	3
Echinochloa muricata	1,12,14	Salsola iberica	6,8
Elaeagnus angustifolia	2	Scirpus acutus	3,10,12
Eleocharis palustris	1,3,8	Scirpus maritimus	3
Epilobium ciliatum	2,3,8	Scirpus pungens	2
Erodium cicutarium	6,8	Sisymbrium altissimum	6
Festuca idahoensis	6	Solidago canadensis	6
Festuca pratensis	6,13	Sonchus arvensis	6
Grindellia squarrosa	6	Tamarix ramosissima	2
Glyceria grandis	9	Taraxacum officinale	2,8
Hordeum jubatum	3,6,8,13,14	Thlaspi arvense	2
Juncus bufonius	3	Tragopogon dubius	6
Juncus torreyi	3	Typha angustifolia	3
Kochia scoparia	6	Typha latifolia	3,10
Lactuca serriola	6	Unidentified white aster	6
Leptochloa fusca	10	Verbena bracteata	3,8
Linum lewisii	6,8		
Lotus unifoliolatus	7		

Comments / Problems: <u>Total number of species observed = 71 (excluding planted shrubs). Application of herbicides on knapweed and Canada thistle appears to have been conducted in July. This was effective, but must be repeated in subsequent years if these noxious weeds are to be controlled.</u>

PLANTED WOODY VEGETATION SURVIVAL

Plant Species	Number Originally Planted	Live Number Observed	Mortality Causes
Elaeagnus commutata	50	28	Mortality assumed to be due to lack of water.
Juniperus scopulorum	50	48	Mortality assumed to be due to lack of water.
Populus deltoides	50	31	Mortality assumed to be due to lack of water
Prunus virginiana	100	68	Mortality assumed to be due to lack of water
Ribes aureum	100	65	Mortality assumed to be due to lack of water
Rosa woodsii	100	63	Mortality assumed to be due to lack of water
Shepherdia argentea	100	11	Mortality assumed to be due to lack of water

Comments / Problems: Could not locate 10 buffaloberry (*Shepherdia argentea*), 10 golden currant (*Ribes aureum*), 10 Wood's rose (*Rosa woodsii*), or 10 silverberry (*Elaeagnus commutata*). These were presumed dead based on the success of the other sites.

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 or whitetail deer		☒	☐	☐	Beds
Raccoon		☒	☒	☐	
Cottontail	1	☐	☐	☒	
White-tailed jackrabbit (10/8/07)	1	☐	☐	☐	
		☐	☐	☐	
		☐	☐	☐	
		☐	☐	☐	
		☐	☐	☐	

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 wetland boundaries were mapped onsite using a Magellan MobileMapper on 10/08/2007 and data from the 8/6/2007 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.

Yes Survey wetland – upland boundary with a resource grade GPS survey.

Comments / Problems: _____

FUNCTIONAL ASSESSMENT

(Complete and attach full MDT Montana Wetland Assessment Method field forms.)
(Also attach 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: **8/6/2007** Examiner: **R. McEldowney (PBS&J)**
Transect Number: **1** Approximate Transect Length: **530 feet** Compass Direction from Start: **70˚** Note: _____

Vegetation Type A: **Disturbed Moist –** (AGRREP (disturbed weedy, upl))	
Length of transect in this type: 26 feet	
Plant Species	**Cover**
AGRREP	4 = 21-50%
AGRSTO	1 = 1-5%
GLYGRA	+ = < 1%
CIRARV	1 = 1-5%
ELEPAL	1 = 1-5%
SCIPUN	+ = < 1%
FESPRA	+ = < 1%
TYPLAT	+ = < 1%
SCIACU	+ = < 1%
BROINE	4 = 21-50%
TYPANG; CARLAN; BROJAP EACH	+ = < 1%
Total Vegetative Cover:	90%

Vegetation Type B: **Eleocharis palustris-Typha sp./Mixed graminoids** (ELEPAL/weedy (transition, wetland)	
Length of transect in this type: 66 feet	
Plant Species	**Cover**
ELEPAL	5 = > 50%
SCIPUN	1 = 1-5%
SALLUT	1 = 1-5%
AGRREP	1 = 1-5%
TYPANG	1 = 1-5%
JUNTOR	2 = 6-10%
PLAAQU	1 = 1-5%
SCIACU	1 = 1-5%
TYPLAT	1 = 1-5%
SONARV; CIRVUL; SALEXI	+ = < 1%
MELOFF; CIRARV; HORJUB; CARLAN; AGRSMI; FESPRA EACH	+ = < 1%
Total Vegetative Cover:	90%

Vegetation Type C: **Eleocharis palustris-Typha sp./Mixed graminoids**	
Length of transect in this type: 68 feet	
Plant Species	**Cover**
SCIMIC	1 = 1-5%
ELEPAL	5 = > 50%
SCIPUN	1 = 1-5%
JUNTOR	3 = 11-20%
SCIACU	1 = 1-5%
Unidentified forb (no flower)	+ = < 1%
SALIBE	+ = < 1%
Total Vegetative Cover:	65%

Vegetation Type D: **Open water (sparse veg)**	
Length of transect in this type: 86 feet	
Plant Species	**Cover**
ELEPAL	1 = 1-5%
Total Vegetative Cover:	3%

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **Wagner Marsh** Date: **August 6, 2007** Examiner: **R. McEldowney (PBS&J)**
Transect Number: **1** Approximate Transect Length: **530 feet** Compass Direction from Start: **70˚** Note: _____

Vegetation Type E**: Eleocharis palustris-Typha latifolia./Mixed graminoids**	
Length of transect in this type: 200 feet	
Plant Species	**Cover**
ELEPAL	4 = 21-50%
JUNTOR	3 = 11-20%
SCIMIC	1 = 1-5%
POLPEN	+ = < 1%
UNK FORB	+ = < 1%
TYPLAT	1 = 1-5%
SALIBE	+ = < 1%
POTANS	1 = 1-5%
SCIACU; SCIMAR;HORJUB; TRIREP; TYPANG	+ = < 1%
Total Vegetative Cover:	60%

Vegetation Type F**: Open water (sparse veg)**	
Length of transect in this type: 76 feet	
Plant Species	**Cover**
POLPEN	1 = 1-5%
ELEPAL	1 = 1-5%
Total Vegetative Cover:	1%

Vegetation Type G: **Eleocharis palustris-Typha sp./Mixed graminoids**	
Length of transect in this type: 8 feet	
Plant Species	**Cover**
POLAVI	+ = < 1%
AGRREP	+ = < 1%
ELEPAL	5 = > 50%
POLPEN	1 = 1-5%
SCIACU	+ = < 1%
ECHMUR	+ = < 1%
SCIPUN	1 = 1-5%
TYPANG	1 = 1-5%
END OF TRANSECT	
Total Vegetative Cover:	60%

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

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: 8/6/2007
Survey Time: **9 am** to **4 PM**

Bird Species	#	Behavior	Habitat	Bird Species	#	Behavior	Habitat
Barn Swallow	5	F	MA OW				
Canada Goose	20	F	MA				
Cliff Swallow	9	FO	MA OW UP				
Killdeer	3	F	MA MF				
Mallard	6	F	MA				
Mourning Dove	5	L	UP				
RW Blackbird	3	L	MA				
Ring-necked Pheasant	1	F	UP				
Above data: 8/6/2007				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: **70+ degrees, clear, breezy**

Notes:

BIRD SURVEY – FIELD DATA SHEET

Site: **Wagner Marsh** Date: **10/8/07**
Survey Time: **7:32 am** to **9:30 am**

Bird Species	#	Behavior	Habitat	Bird Species	#	Behavior	Habitat
Canada Goose	9	F L FO	MA AB				
Mallard	100+	F L FO	OW AB MA MF				
Pied Billed Grebe (?)	7	F	AB				
Redwinged Blackbirds	26	FO L	UP				
Ring-necked Pheasant	3	F	UP				
Sandhill Cranes	3	FO					
Unidentified Sparrows	20	F FO	UP				
Unidentified ducks	16	FO					
California Gull	14	FO					
Rock Dove	4	FO					
Western Meadowlark	1	L FO	UP				
American Black Duck (?)	1	L	MF				
Common Snipe	15	F FO	MA				

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, windy, 45 degrees F.**

Notes: **Sunrise occurred at approximately 7:30 am. Surface water levels in ponds and wetlands were the highest observed since monitoring began in 2005.**

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

Project/Site: Wagner Marsh – Billings, MT				Date: 8/6/2007	
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.)					

Location: 682531 Easting, 5065131 Northing (UTM, WGS84, meters)

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	LOTUNI	H	NL	9			
2	CONARV	H	NL	10			
3	VERBRA	H	FACU+	11			
4	CENMAC	H	NL	12			
5				13			
6				14			
7				15			
8				16			

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

Remarks: Area was disturbed from construction of mitigation site in 2005. Some vegetation has established, but are upland, weedy species.
NL=not listed.

HYDROLOGY

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

____ No Recorded Data Available

Field Observations:

Depth of Surface Water: -- (in.)

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

Depth to Saturated Soil: -- (in.)

Wetland Hydrology Indicators:

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

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

Remarks:
No evidence of 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.
0-10	1	10YR 4/2			COBBLY, GRAVELLY SANDY CLAY 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: No hydric soil indicators observed. Site was disturbed by wetland mitigation construction in 2005.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? ____ Yes X No

Wetland Hydrology Present? ____ Yes X No

Hydric Soils Present? ____ Yes X No

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

Remarks:

No evidence of wetland hydrology observed and no redoximorphic features observed in the soil. Vegetation at this sample point was comprised of weedy upland species.

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

Project/Site:	Wagner Marsh – Billings, MT			Date:	8/6/2007
Applicant/Owner:	Montana Department of Transportation			County:	Yellowstone
Investigator:	PBS&J (RRM)			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.)					

Location: 682507 Easting, 5065144 Northing (UTM, WGS84, meters)

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	SCIACU	H	OBL	9			
2	ELEPAL	H	OBL	10			
3	JUNTOR	H	FACW	11			
4				12			
5				13			
6				14			
7				15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-). 3/3 = 100%

Remarks: Area was disturbed from construction of mitigation site in 2005.

HYDROLOGY

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

_____ No Recorded Data Available

Field Observations:

Depth of Surface Water: 0-3 (in.)

Depth to Free Water in Pit: 0 (in.)

Depth to Saturated Soil: 0 (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- X 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
- x FAC-Neutral Test
- _____ Other (Explain in Remarks)

Remarks:
Water levels in the mitigation site appear to be influenced by irrigation practices. Saturated to the surface. Pools of inundation 3 inches in depth in the immediate vicinity.

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.
0-10	1	10YR 4/1			COBBLY, GRAVELLY SANDY LOAM

Hydric Soil Indicators:

____	Histosol	____	Concretions
____	Histic Epipedon	____	High Organic Content in surface Layer in Sandy Soils
X	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:

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: The site was disturbed by mitigation construction in 2005; however, the site continues to develop wetland characteristics, including dominance by hydrophytic vegetation and hydric soil indicators including a low chroma and a sulfidic odor. Wetland hydrology was evidenced by inundation. .

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

1. Project Name: MDT- Wetland Mitigation Monitoring **2. Project #:** _____ **Control #:** _____

3. Evaluation Date: 8/6/2007 **4. Evaluator(s):** RRM (PBS&J) **5. Wetland / Site #(s):** Wagner Marsh

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

8. Wetland Size (total acres): _____ (visually estimated)
7.50 (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)
13.30 (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	Semipermanently Flooded	Excavated	37
Depression	Palustrine	---	Emergent Wetland	Seasonally Flooded	Excavated	56
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)
Abundant **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.	---	---	moderate disturbance
AA not cultivated, but moderately grazed or hayed or selectively logged or has been subject to relatively minor clearing, or fill placement, or hydrological alteration; contains few roads or buildings.	---	---	---
AA cultivated or heavily grazed or logged; subject to relatively substantial fill placement, grading, clearing, or hydrological alteration; high road or building density.	---	---	---

Comments: (types of disturbance, intensity, season, etc.) Wetland mitigation site constructed in 2005. 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. Immediately west of the site a new gravel pit is being excavated.

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

iii. Briefly describe AA and surrounding land use / habitat: AA is an old borrow pit converted into a groundwater dependent wetland complex. Surrounding land use is predominantly agricultural - hay and livestock production. Gravel pit being excavated on west side of S. 56th St. W. Rolling topography

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 _____
No usable habitat ☐ D ☒ S _____

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

Highest Habitat Level	doc/primary	sus/primary	doc/secondary	sus/secondary	doc/incidental	sus/incidental	none
Functional Point and Rating	---	---	---	---	---	---	0 (L)

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

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

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

Primary or Critical habitat **(list species)** ☐ D ☐ S _____
Secondary habitat **(list species)** ☐ D ☐ S _____
Incidental habitat **(list species)** ☒ D ☐ S 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 or 2006 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 %	.7 (M)	--	--
< 35 %	--	--	--

Comments: As a relatively new 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	--	.9H	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
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)	--	--	--	--	--	.5M	--	--	--
Moderate disturbance at AA (#12i)	--	--	--	--	--	--	--	--	--
High disturbance at AA (#12i)	--	--	--	--	--	--	--	--	--

Comments: _____

14L. RECREATION / EDUCATION POTENTIAL

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

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

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

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

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

Comments: According to MDT, the site definitively receives educational use through the WJH Bird Facility north-adjacent to the mitigation area.

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	0.00	1	0.00
B. MT Natural Heritage Program Species Habitat	low	0.20	1	2.66
C. General Wildlife Habitat	moderate	0.70	1	9.31
D. General Fish/Aquatic Habitat	N/A		--	
E. Flood Attenuation	N/A		--	
F. Short and Long Term Surface Water Storage	high	1.00	1	13.30
G. Sediment/Nutrient/Toxicant Removal	moderate	0.70	1	9.31
H. Sediment/Shoreline Stabilization	moderate	0.70	1	9.31
I. Production Export/Food Chain Support	high	0.90	1	11.97
J. Groundwater Discharge/Recharge	high	1.00	1	13.30
K. Uniqueness	moderate	0.50	1	6.65
L. Recreation/Education Potential	high	1.0	1	6.65
	Totals:	**6.7**	**10.00**	82.46
		Percent of Total Possible Points:	**67%** (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**

NOTE: Site was a Category II wetland in 2006 due to the overall score being 67% of the total possible score. The initial overall score decreased in 2007 due to the delisting of the Bald Eagle as a threatened species under the Endangered Species Act, but MDT also documented educational use in 2007. Because of this, the overall score remained 67% of the total possible and thus the site qualifies as a Category II wetland.

Appendix C

2007 REPRESENTATIVE PHOTOGRAPHS

MDT Wetland Mitigation Monitoring
Wagner Marsh
Billings, Montana

Wagner Marsh Wetland Mitigation Site 2007

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

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

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

Wagner Marsh Wetland Mitigation Site 2007

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

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

Wagner Marsh Wetland Mitigation Site 2007

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

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

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

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

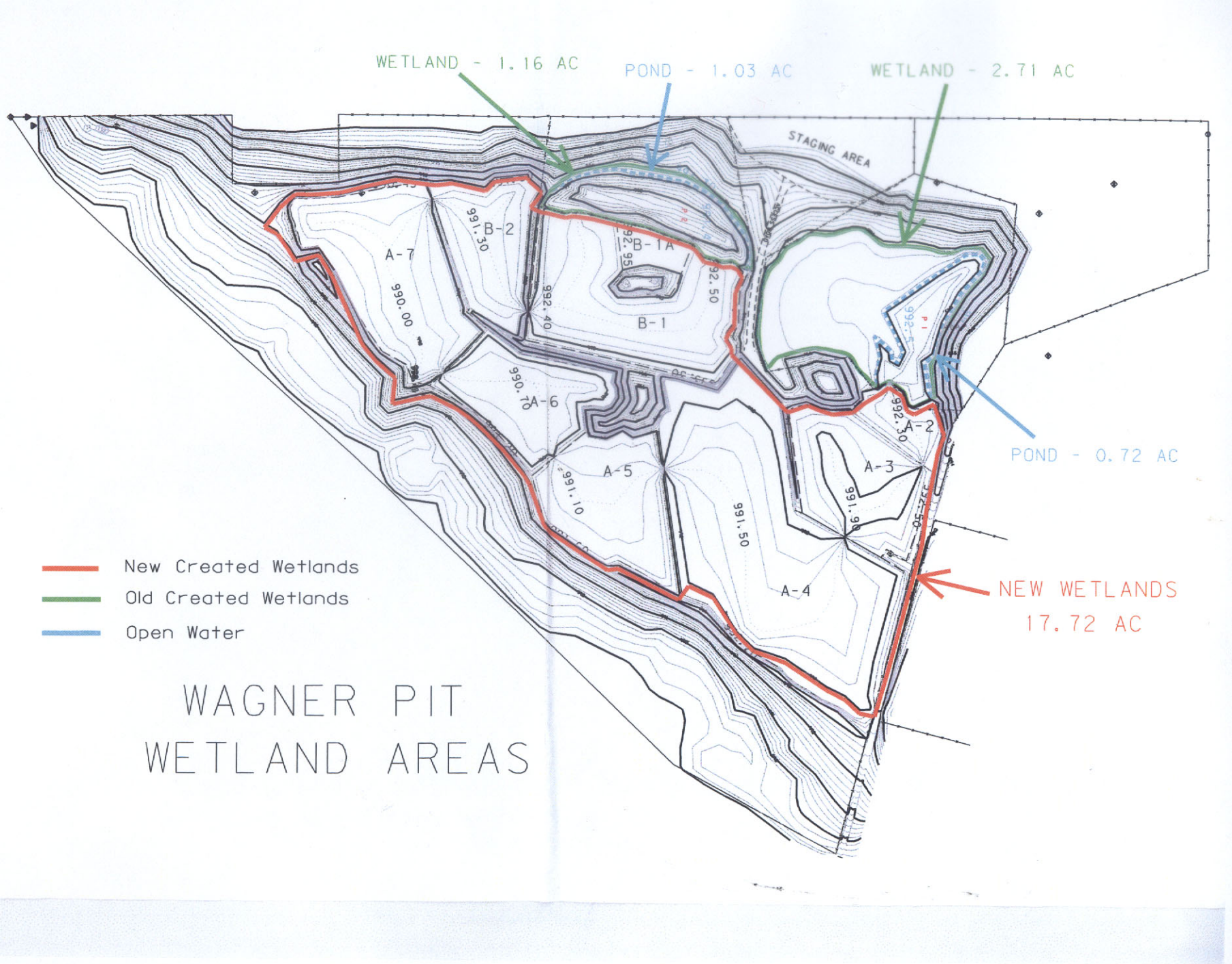
2007 macroinvertebrate sampling location

Nearly dry 2006 macroinvertebrate sampling location.

Appendix D

CONCEPTUAL SITE LAYOUT

MDT Wetland Mitigation Monitoring
Wagner Marsh
Billings, Montana


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

BIRD SURVEY PROTOCOL

This protocol was developed by the Montana Department of Transportation (MDT) to monitor bird use within their Wetland Mitigation Sites. Though each wetland mitigation site is vastly different, the bird survey data collection methods were standardized to order to increase repeatability. The protocol uses an "area search within a restricted time frame" to collect data on bird species, density, behavior, and habitat-type use.

Survey Area

Sites that can be entirely walked: Sites where the entire perimeter or area can be walked include, but are not limited to: small ponds, enhanced historic river channels, and wet meadows. If the wetland is not uncomfortably inundated, walk several meandering transects to sufficiently cover the wetland. Meandering transects can be used, even if a small portion of the area is inaccessible (e.g. cannot cross due to inundation). Use binoculars to identify the bird species, to count the number of individuals, and to identify their behavior and habitat type. Data can be recorded directly onto the bird survey form or into a field notebook. The number of meandering transects and their direction (or location) should be recorded in the field notebook and/or drawn onto the aerial photograph or topographic map. Meandering transects are not formal and should not be staked. Each site should be walked and surveyed to the fullest extent within the set time limit.

Sites than cannot be entirely walked: Sites where the entire perimeter or area cannot be walked include, but are not limited to: very large sites (i.e. perimeter of 2-3 miles), and large-bodied waters (i.e. reservoirs), where deep water habitat (> 6 feet) is close to shore. For large-bodied waters where only one area was graded to create or enhance the development of wetland, bird surveys should be walked along meandering transects within or around the graded area (see above.). For sites that cannot be walked, bird surveys should be conducted from many lookout posts, established at key vantage points. The general location of lookout posts should be recorded in the field notebook or drawn onto the aerial photograph or topographic map. Lookout post locations do not need to be staked. Both binoculars and spotting scopes may be used in order to accurately identify and count the birds. Depending upon the size of the open water, more time may be spent viewing the mitigation area from lookout posts than is spent traveling between posts.

Survey Time

Ideally, bird surveys should be conducted in the morning hours when bird activity is often greatest (i.e. sunrise to no later than 11:00 am). Surveys can be completed before 11am if all transects have been walked or all lookout posts have been viewed with no new bird activity observed. For some sites bird surveys may need to be performed in the late afternoon or evening due to traveling constraints or weather. The overall limiting time factor will be the number of budgeted hours for the project.

Data Recording

Bird Species List: Record each bird species observed onto the Bird Survey-Field Data Sheet (or field notebook). Record the bird's common name using the appropriate 4-letter code. The 4-letter code uses the first two letters of the first two word's of the bird's common name or if one name, the first four letters. For example, Mourning Dove is coded as MODO while Mallard is coded as MALL. If an unknown individual is observed, use the 4-letter protocol, but define your

abbreviation at the bottom of the field data sheet. For example, unknown shorebird is UNSB; unknown brown bird is UNBR; unknown warbler is UNWA; and unknown waterfowl is 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 parenthesis; do not fill in the habitat column. For example, a flock of black, medium-sized birds could be coded as UNBB / FO (25).

Bird Density: For each observation record the actual or estimated number of individuals observed per species and per behavior. Totals can be tallied in the office and entered onto the Bird Survey-Field Data Sheet.

Bird Behavior: Bird behavior must be identified by what is known. When a species is observed, the behavior that is immediately exhibited is recorded. Only behaviors that have discreet descriptive terms should be used. The following terms are recommended: breeding pair (BP); foraging (F); flyover (FO); loafing (L), which is defined as sleeping, roosting, or floating with head tucked under wing; and nesting (N). If other behaviors that have a specific descriptive word are observed then it can be used and should later be added to the protocol. Descriptive words or phrases such as "migrating" or "living on site" are unknown behaviors.

Bird Species Habitat Use: When a species is observed, the habitat is also recorded. The following broad habitat categories are used:

- aquatic bed (AB), defined as rooted-floating, floating-leaved, or submergent vegetation.
- marsh (MA), defined as emergent (e.g. cattail, bulrush) vegetation with surface water.
- wet meadow (WM), defined as grasses, sedges, or rushes with little to no surface water.
- scrub-shrub (SS), defined as shrub covered wetland.
- forested (FO), defined as tree covered wetland.
- open water (OW), defined as unvegetated surface water.
- upland (UP), defined as the upland buffer.

Other categories can be used and defined on the data sheet and should later be added to the protocol.

Other Fields

Bird Visit: Each bird survey (i.e. spring, fall, and mid-season) should be completed on separate Bird Survey-Field Data Sheets.

Time: Record the start time and end time on the Bird Survey-Field Data Sheet.

Date: Record the date of the bird survey.

Weather: Record the weather conditions (i.e. temperature, wind, condition).

Notes: Note if a particular individual bird is using a constructed nest box and note the condition of constructed nest box(es). Also record any comments about the site, wildlife, wetland conditions, etc.

GPS MAPPING AND AERIAL PHOTO REFERENCING PROCEDURE

From 2001 through 2006, PBS&J mapped the vegetation community boundaries, photograph points, and other sampling locations in the field using the resource-grade Trimble GEO III GPS (Global Positioning System) unit. The data were collected with a minimum of three positions per feature using Course/Acquisition code. The collected data were then transferred to a personal computer (PC) and differentially corrected to the nearest operating Community Base Station. The corrected data were then exported to ACAD drawings in Montana State Plain Coordinates NAD 83 international feet.

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

In 2007, some sites continued to be mapped using the Trimble GEO III GPS unit while most sites were mapped using the resource-grade Magellan MobileMapper Office GPS unit. The Magellan GPS unit has a comparable accuracy level to the Trimble Geo III unit.

Each year, MDT photographs each mitigation site from the air. These aerial photographs are not geo-referenced, but serve as a visual aid to map wetland development and vegetation communities, and to show approximate locations for various monitoring activities (i.e. photograph points, transects, or macroinvertebrate sampling). Reference points that are observable on the aerial photo (i.e. road, stream channel, or fence) were also marked with the GPS unit in order to better position the aerial photograph. This positioning did not remove any of the distortion inherent to all photos. All mapped features and community boundaries were reviewed by the wetland biologist, to increase the figure's accuracy.

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

2007 MACROINVERTEBRATE SAMPLING PROTOCOL AND DATA

MDT Wetland Mitigation Monitoring
Wagner Marsh
Billings, Montana

AQUATIC INVERTEBRATE SAMPLING PROTOCOL

Equipment List

- D-frame sampling net with 1 mm mesh.
- 1-liter, wide-mouth, plastic sample jars provided by Rhithron Associates, Inc. (Quart sized, wide-mouthed canning jars can be substituted.)
- 95% ethanol (alternatively isopropyl alcohol).
- Pre-printed sample labels (printed on rite-in-the-rain paper); two labels per sample.
- Pencil.
- Clear packaging tape.
- 3-5 gallon plastic pail.
- Large tea strainer or framed screen.
- Cooler with ice for storing sample.

Site Selection

Select a site that is accessible with hip waders or rubber boots. If the substrate is too soft, place a wide board down to walk on. Choose a site that is representative of the overall condition of the wetland. Annual sampling should occur at the same site within the wetland.

Sampling Procedure

Wetland invertebrates (macroinvertebrates) inhabit the substrate, the water column, the stems and leaves of aquatic vegetation, and the water surface. At the given location, each habitat type is sampled and combined into a single 1-liter sample jar. Pre-cautions are made to minimize disturbing the sample site in order to maximize the number of animals collected.

Fill the pail with approximately 1 gallon of wetland water. Ideally, sample the water column from near-shore outward to a depth of 3 feet. Sample the water column using a long sweep of the net, keeping the net at about half the depth of the water. Sample the water surface with a long sweep of the net. Aquatic vegetation is sampled by pulling the net beneath the water surface, for at least a meter in distance. The substrate is sampled by pulling the net along the bottom, bumping it against the substrate several times as you pull. Be sure to place some muck, mud, and/or vegetation into the jar. After sampling a habitat, rinse the net in the bucket and look for insects, crustaceans, and other aquatic invertebrates. It is not necessary to sample habitats in any specific order, but all habitats, if present, are to be sampled. Habitats can be sampled more than once.

Fill about 1 cup of ethanol into the sample jar. Sieve the contents of the bucket through the straining device and pour or carefully scrape the contents of the strainer into the sample jar. Top off the jar with enough ethanol to cover all the material and leave as little headroom as possible. Alternatively, sampled materials can be lifted out of the net and put directly into the jar. Be sure to include some muck, mud, and/or vegetation into the jar. Each macroinvertebrate sampling site should have only one sampling jar.

Using pencil, complete two labels with the required information: project name, project number, date, collector's name, and habitats sampled. Do not complete the label with ink as it will dissolve in ethanol. For wetlands with at least two macroinvertebrate sampling sites, number the site consecutively followed by the total number of sites (e.g. Sample 2 of 3 sites). Place one label into the jar and seal the jar. Dry the jar off, if necessary, and tape the second label to the outside of the jar.

Photograph each macroinvertebrate sampling site.

Sample Handling/Delivery

In the field, keep sample jars cool by placing in a cooler with a small amount of ice.
Deliver samples to the PBS&J office in Missoula, where they will be inventoried and delivered to Rhithron Associates, Inc.

MDT Mitigated Wetland Monitoring Project: Aquatic Invertebrate Monitoring
Summary 2001 – 2007

Prepared for Post, Buckley, Schuh, and Jernigan (PBS&J)
Prepared by W.Bollman, Rhithron Associates, Inc.

INTRODUCTION

Aquatic invertebrate assemblages were collected at a number of mitigated wetlands throughout Montana. This report summarizes data generated from seven years of collection. Over all years of sampling, a total of 182 invertebrate samples were collected. Table 1 lists the currently monitored sites at which aquatic invertebrates were collected in 2007, and summarizes the sampling history of each.

METHODS

Sample processing

Aquatic invertebrate samples were collected at mitigated wetland sites in the summer months of 2001, 2002, 2003, 2004, 2005, 2006 and 2007 by personnel of PBS&J. Sampling procedures utilized were based on the protocols developed by the Montana Department of Environmental Quality (MT DEQ) for wetland sampling. Sampling consisted of D-frame net sweeps through emergent vegetation (when present), the water column, and over the water surface, and included disturbing and scraping substrates at each sampled site. These sample components were composited and preserved in ethanol at each wetland site. Samples were delivered to Rhithron Associates, Inc. for processing, taxonomic determinations, and data analysis.

Standard sorting protocols were applied to achieve representative subsamples of a minimum of 100 organisms. Caton sub-sampling devices (Caton 1991), divided into 30 grids, each approximately 5 cm by 6 cm, were used. Grid contents were examined under stereoscopic microscopes using 10x-30x magnification. All aquatic invertebrates from each selected grid were sorted from the substrate, and placed in 95% ethanol for subsequent identification. Grid selection, examination, and sorting continued until at least 100 organisms were sorted. A large/rare search was conducted to collect any taxa not found in the subsampling procedure.

Organisms were individually examined using 10x – 80x stereoscopic dissecting scopes (Leica S8E and S6E) and identified to the lowest practical taxonomic levels using appropriate published taxonomic references. Identification, counts, life stages, and information about the condition of specimens were recorded on bench sheets. To obtain accuracy in richness measures, organisms that could not be identified to the target level specified in MDEQ protocols were designated as “not unique” if other specimens from the same group could be taken to target levels. Organisms designated as “unique” were those that could be definitively distinguished from other organisms in the sample. Identified organisms were preserved in 95% ethanol in labeled vials, and archived at the Rhithron laboratory. Midges were morphotyped using 10x – 80x stereoscopic dissecting microscopes (Leica S8E and S6E) and representative specimens were slide mounted and examined at 200x – 1000x magnification using an Olympus BX 51 compound microscope. Slide mounted organisms were also archived at the Rhithron laboratory.

Quality assurance systems

Quality control procedures for initial sample processing and subsampling involved checking sorting efficiency. These checks were conducted on 96% of the samples by independent observers who microscopically re-examined 20% of sorted substrate from each sample. All organisms that were missed were counted and this number was added to the total number obtained in the original sort. Sorting efficiency was evaluated by applying the following calculation:

$$SE = \frac{n_1}{n_{1+2}} \times 100$$

where: SE is the sorting efficiency, expressed as a percentage, n_1 is the total number of specimens in the first sort, and n_{1+2} is the total number of specimens in the first and second sorts combined.

Quality control procedures for taxonomic determinations of invertebrates involved checking accuracy, precision and enumeration. At least 10% of samples are targeted for quality assurance procedures. For this project, three samples were randomly selected and all organisms re-identified and counted by an independent taxonomist. Taxa lists and enumerations were compared by calculating a Bray-Curtis similarity statistic (Bray and Curtis 1957) for each

selected sample. Routinely, discrepancies between the original identifications and the QC identifications are discussed among the taxonomists, and necessary rectifications to the data are made. Discrepancies that cannot be rectified by discussions are routinely sent out to taxonomic specialists for identification. However, taxonomic certainty for identifications in this project was high, and no external verifications were necessary.

Assessment

The method employed to assess these wetlands is based on an index incorporating a battery of 12 bioassessment metrics or attributes (Table 1) tested and recommended by Stribling et al. (1995) in a report to the Montana Department of Health and Environmental Science. In that study, it was determined that some of the metrics were of limited use in some geographic regions, and for some wetland types. Despite that finding, all 12 metrics are used in this evaluation of mitigated wetlands, since detailed geographic information and wetland classifications were unavailable. Scoring criteria for the 12 metrics were developed specifically for this project, since mitigated wetlands were not included in original criteria development.

Scoring criteria for wetland metrics were developed by generally following the tactic used by Stribling et al. (1995). Boxplots were generated using a statistical software package (Statistica™), and distributions, median values, ranges, and quartiles for each metric were examined. For the wetland sites, "optimal" scores were generally those that fell above the 75th percentile (for those metrics that decrease in value in response to stress) or below the 25th percentile (for metrics that respond to stress by an increase in value) of all scores. Additional scoring ranges were established by bisecting the range below the 75th percentile for decreasing scores (or above the 25th percentile for increasing scores) into "sub-optimal" and "poor" assessment categories. A score of 5, 3, or 1 was assigned to optimal, sub-optimal, and poor metric performance, respectively. In this way, metric values were translated into normalized metric scores, and scores for all metrics were summed to produce a total bioassessment score, which is expressed as a percentage of the maximum possible score (60). 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. Data from a total of 167 samples were used to develop criteria.

Several sites in this study supported aquatic fauna characteristic of lotic habitats rather than lentic wetland habitats; these sites were excluded from mitigated wetland scoring criteria development, and were evaluated with a metric battery specific to flowing water habitats. In 2007, the lotic sites were Camp Creek (2 sites), Cloud Ranch stream, Kleinschmidt stream, Jack Creek, and Woodson Creek-Ringling stream. Invertebrate assemblages at these sites were generally characteristic of montane or foothill stream conditions and were assessed using the tested metric battery developed for montane streams of Western Montana (Bollman 1998).

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. However, the nature of the action needed is not determined solely by the index score or impairment classification, but by consideration of an analysis of the component metrics, the taxonomic composition of the assemblages, and other issues. The diagnostic functions of the metrics and taxonomic data need more study since our understanding of the interrelationships of natural environmental factors and anthropogenic disturbances is tentative. Thus, the further interpretive remarks accompanying the raw taxonomic and metric data in this summary are offered cautiously. Year-to-year comparisons depend on an assumption that specific sites were revisited in each year, and that equivalent sampling methods were utilized at each site revisit.

Bioassessment metrics - wetlands

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.

Summary metric values and scores for the 2007 samples are given in Tables 4a-4c and 5.

In 2007, thermal preference of the invertebrate assemblages was calculated when possible, using the tool developed by Brandt 2001.

Bioassessment metrics – lotic habitats

For sites supporting rheophilic invertebrate assemblages, bioassessment was based on a metric battery and scoring criteria developed for montane regions of Montana (MVFP index: Bollman 1998). The six metrics constituting the bioassessment index used for MVFP sites in this study were selected because, both individually and as an integrated metric battery, they are robust at distinguishing impaired sites from relatively unimpaired sites (Bollman 1998). They have been demonstrated to be more variable with anthropogenic disturbance than with natural environmental gradients (Bollman 1998). Each of the six metrics, and their expected responses to various stressors is described below.

1. Ephemeroptera (mayfly) taxa richness. The number of mayfly taxa declines as water quality diminishes. Impairments to water quality which have been demonstrated to adversely affect the ability of mayflies to flourish include elevated water temperatures, heavy metal contamination, increased turbidity, low or high pH, elevated specific conductance and toxic chemicals. Few mayfly species are able to tolerate certain disturbances to instream habitat, such as excessive sediment deposition.
2. Plecoptera (stonefly) taxa richness. Stoneflies are particularly susceptible to impairments that affect a stream on a reach-level scale, such as loss of riparian canopy, streambank instability, channelization, and alteration of morphological features such as pool frequency and function, riffle development and sinuosity. Just as all benthic organisms, they are also susceptible to smaller scale habitat loss, such as by sediment deposition, loss of interstitial spaces between substrate particles, or unstable substrate.
3. Trichoptera (caddisfly) taxa richness. Caddisfly taxa richness has been shown to decline when sediment deposition affects habitat. In addition, the presence of certain case-building caddisflies can indicate good retention of woody debris and lack of scouring flow conditions.
4. Number of sensitive taxa. Sensitive taxa are generally the first to disappear as anthropogenic disturbances increase. The list of sensitive taxa used here includes organisms sensitive to a wide range of disturbances, including warmer water temperatures, organic or nutrient pollution, toxic pollution, sediment deposition, substrate instability and others. Unimpaired streams of western Montana typically support at least four sensitive taxa (Bollman 1998).
5. Percent filter feeders. Filter-feeding organisms are a diverse group; they capture small particles of organic matter, or organically enriched sediment material, from the water column by means of a variety of adaptations, such as silken nets or hairy appendages. In forested montane streams, filterers are expected to occur in insignificant numbers. Their abundance increases when canopy cover is lost and when water temperatures increase and the accompanying growth of filamentous algae occurs. Some filtering organisms, specifically the Arctopsychid caddisflies (*Arctopsyche* spp. and *Parapsyche* spp.) build silken nets with large mesh sizes that capture small organisms such as chironomids and early-instar mayflies. Here they are considered predators, and, in this study, their abundance does not contribute to the percent filter feeders metric.
6. Percent tolerant taxa. Tolerant taxa are ubiquitous in stream sites, but when disturbance increases, their abundance increases proportionately. The list of taxa used here includes organisms tolerant of a wide range of disturbances, including warmer water temperatures, organic or nutrient pollution, toxic pollution, sediment deposition, substrate instability and others.

Table 1. Montana Department of Transportation Mitigated Wetlands Monitoring Project sites: sampling history. Only those sites monitored in 2007 are included. An asterisk (*) indicates lotic sites.

Site Identifier	2001	2002	2003	2004	2005	2006	2007
Roundup	+	+	+	+	+	+	+
Ridgeway	+	+	+	+	+	+	+
Hoskins Landing MS-1		+	+	+	+		+
Hoskins Landing MS-2							+
Peterson Ranch pond 1		+	+	+	+	+	+
Peterson Ranch pond 2		+		+	+	+	+
Peterson Ranch pond 4		+	+	+	+	+	+
Peterson Ranch pond 5		+	+	+	+	+	+
Camp Creek MS-1*		+	+	+	+	+	+
Camp Creek MS-2*						+	+
Kleinschmidt		+	+	+	+	+	+
Kleinschmidt – stream*			+	+	+	+	+
Cloud Ranch Pond				+	+		+
Cloud Ranch Stream*				+			+
Jack Creek – pond				+	+		+
Jack Creek – McKee*							+
Norem				+	+	+	+
Rock Creek Ranch					+	+	+
Wagner Marsh					+	+	+
Alkali Lake 1						+	+
Charley Creek							+
Woodson pond MI 1							+
Woodson stream MI 2*							+
Little Muddy Creek							+
Selkirk Ranch							+
DH Ranch							+

Table 2. Aquatic invertebrate metrics employed for wetland (lentic) invertebrate assemblages in the MDT mitigated wetlands study, 2001 – 2007.

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

RESULTS

(Note: Individual site discussions were removed from this report by PBS&J and are included in the macroinvertebrate section of individual project monitoring reports. Summary tables for lentic (4a – 4c) and lotic (5) sites and project specific taxa listings and metrics reports are provided on the following pages.)

Quality Assurance

Table 3 gives the results of quality assurance procedures for sample sorting efficiency (SE) and Bray-Curtis similarity statistics for comparisons of taxonomic determinations and enumeration. Sorting efficiency averaged 97.54% for the project, and taxonomic similarity averaged 97.44%.

Table 3. Results of quality control procedures for subsampling and taxonomic and enumeration similarity.

Site name	SE	Bray-Curtis similarity
Roundup	100.00%	
Ridgeway	100.00%	
Hoskins Landing MS-1	100.00%	
Hoskins Landing MS-2	93.40%	
Peterson Ranch pond 1	100.0%	95.38%
Peterson Ranch pond 2	96.64%	
Peterson Ranch pond 4	91.66%	
Peterson Ranch pond 5	96.64%	
Camp Creek MS-1	100.00%	
Camp Creek MS-2	100.00%	96.94%
Kleinschmidt – pond	100.00%	
Kleinschmidt – stream	99.10%	
Cloud Ranch Pond	95.65%	
Cloud Ranch Stream	91.61%	
Jack Creek – pond	n.a.	
Jack Creek - McKee	96.49%	
Norem	100.00%	100.00%
Rock Creek Ranch	100.00%	
Wagner Marsh	100.00%	
Alkali Lake 1	98.04%	
Charley Creek	100.00%	
Woodson pond	91.37%	
Woodson stream	100.00%	
Little Muddy Creek	92.31%	
Selkirk Ranch	95.56%	
DH Ranch	100.00%	

Table 4a. Metric values and scores for wetland (lentic) sites in the MDT mitigated wetland study – 2007 sampling.

	ROUNDUP	RIDGEWAY	HOSKINS LANDING MS-1	HOSKINS LANDING MS-2	PETERSON RANCH 1	PETERSON RANCH 2	PETERSON RANCH 4	PETERSON RANCH 5
Total taxa	7	13	18	21	17	18	26	18
POET	0	2	3	5	2	0	6	4
Chironomidae taxa	5	5	2	8	8	12	12	6
Crustacea + Mollusca	1	2	5	4	4	5	4	4
% Chironomidae	7.62%	30.00%	18.75%	52.68%	36.45%	51.79%	42.59%	14.78%
Orthocladiinae/Chir	0.38	0.17	0.00	0.03	0.08	0.16	0.09	0.12
%Amphipoda	0.00%	10.00%	0.00%	0.00%	0.93%	0.00%	21.30%	1.74%
%Crustacea + %Mollusca	89.52%	15.00%	26.79%	8.04%	10.28%	43.75%	28.70%	37.39%
HBI	8.02	7.11	7.23	6.55	7.42	7.76	6.53	7.23
%Dominant taxon	89.52%	30.00%	17.86%	35.71%	39.25%	23.21%	17.59%	30.43%
%Collector-Gatherers	92.38%	70.00%	78.57%	82.14%	49.53%	71.43%	38.89%	26.96%
%Filterers	0.00%	0.00%	0.89%	6.25%	9.35%	3.57%	1.85%	5.22%
Total taxa	1	1	3	5	3	3	5	3
POET	1	1	3	5	1	1	5	5
Chironomidae taxa	3	3	1	5	5	5	3	3
Crustacea + Mollusca	1	1	3	3	3	3	1	3
% Chironomidae	5	3	3	1	3	1	1	5
Orthocladiinae/Chir	3	1	1	1	1	1	3	1
%Amphipoda	5	3	5	5	5	5	5	5
%Crustacea + %Mollusca	1	5	5	5	5	3	5	3
HBI	1	3	3	5	3	1	5	3
%Dominant taxon	1	5	5	3	3	5	1	5
%Collector-Gatherers	5	3	3	5	3	3	3	1
%Filterers	3	3	3	1	1	3	5	3
Total score	**30**	**32**	**38**	**44**	**36**	**34**	**42**	**40**
Percent of maximum score	**50.00%**	**53.33%**	**63.33%**	**73.33%**	**60.00%**	**56.67%**	**70.00%**	**66.67%**
Impairment classification	**poor**	**sub-optimal**	**optimal**	**optimal**	**sub-optimal**	**sub-optimal**	**optimal**	**optimal**

Table 4b. Metric values and scores for wetland (lentic) sites in the MDT mitigated wetland study – 2007 sampling.

	KLEIN-SCHMIDT POND	CLOUD RANCH POND	JACK CREEK POND	NOREM	ROCK CREEK RANCH	WAGNER MARSH	ALKALI LAKE 1	CHARLEY CREEK
Total taxa	25	13	9	6	18	11	9	13
POET	5	2	0	1	2	2	0	0
Chironomidae taxa	8	11	5	2	4	4	2	3
Crustacea + Mollusca	8	1	4	1	4	0	2	3
% Chironomidae	18.63%	81.54%	92.79%	31.58%	4.76%	11.39%	1.96%	27.17%
Orthocladiinae/Chir	0.53	0.38	0.03	0.00	0.60	0.44	0.50	0.68
%Amphipoda	10.78%	3.08%	0.00%	0.00%	17.14%	0.00%	0.00%	22.83%
%Crustacea + %Mollusca	36.27%	3.08%	7.21%	21.05%	23.81%	0.00%	61.76%	53.26%
HBI	7.35	7.22	9.73	6.63	6.33	7.28	8.07	6.88
%Dominant taxon	13.73%	18.46%	62.16%	26.32%	29.52%	45.57%	60.78%	29.35%
%Collector-Gatherers	53.92%	84.62%	70.27%	57.89%	29.52%	15.19%	70.59%	32.61%
%Filterers	11.76%	9.23%	0.90%	0.00%	0.95%	0.00%	0.00%	0.00%
Total taxa	5	1	1	1	3	1	1	1
POET	5	1	1	1	1	1	1	1
Chironomidae taxa	5	5	3	1	3	3	1	3
Crustacea + Mollusca	5	1	3	1	3	1	1	1
% Chironomidae	3	1	1	3	5	5	5	3
Orthocladiinae/Chir	5	3	1	1	5	3	5	5
%Amphipoda	3	5	5	5	3	5	5	3
%Crustacea + %Mollusca	3	5	5	5	5	5	3	3
HBI	3	3	1	5	5	3	1	5
%Dominant taxon	5	5	1	5	5	3	1	5
%Collector-Gatherers	3	5	3	3	1	1	3	1
%Filterers	1	1	3	3	3	3	3	3
Total score	**46**	**36**	**28**	**34**	**42**	**34**	**30**	**34**
Percent of maximum score	**76.67%**	**60.00%**	**46.67%**	**56.67%**	**70.00%**	**56.67%**	**50.00%**	**56.67%**
Impairment classification	**optimal**	**sub-optimal**	**poor**	**sub-optimal**	**poor**	**sub-optimal**	**poor**	**sub-optimal**

Table 4c. Metric values and scores for wetland (lentic) sites in the MDT mitigated wetland study – 2007 sampling.

	WOODSON POND	LITTLE MUDDY CREEK	SELKIRK RANCH	DH RANCH
Total taxa	12	2	16	8
POET	0	0	2	1
Chironomidae taxa	9	0	8	4
Crustacea + Mollusca	1	1	2	2
% Chironomidae	85.71%	0.00%	77.27%	27.50%
Orthocladiinae/Chir	0.32	0.00	0.61	0.00
%Amphipoda	0.00%	0.00%	0.00%	0.00%
%Crustacea + %Mollusca	2.86%	75.00%	8.18%	64.17%
HBI	9.34	8.50	7.82	7.38
%Dominant taxon	33.33%	75.00%	46.36%	39.17%
%Collector-Gatherers	55.24%	75.00%	32.73%	27.50%
%Filterers	0.00%	0.00%	8.18%	17.50%
Total taxa	1	1	3	1
POET	1	1	1	1
Chironomidae taxa	5	1	5	3
Crustacea + Mollusca	1	1	1	1
% Chironomidae	1	5	1	3
Orthocladiinae/Chir	3	1	5	1
%Amphipoda	5	5	5	5
%Crustacea + %Mollusca	5	1	5	1
HBI	1	1	1	3
%Dominant taxon	5	1	3	3
%Collector-Gatherers	3	3	1	1
%Filterers	3	3	1	1
Total score	**34**	**24**	**32**	**24**
Percent of maximum score	**56.67%**	**40.00%**	**53.33%**	**40.00%**
Impairment classification	**sub-optimal**	**poor**	**sub-optimal**	**poor**

Table 5. Metric values and scores for stream (lotic) sites in the MDT mitigated wetland study – 2007 sampling.

	CAMP CREEK MS-1	CAMP CREEK MS-2	KLEIN-SCHMIDT STREAM	CLOUD RANCH STREAM	JACK CREEK - MCKEE	WOODSON STREAM
E Richness	6	6	0	2	1	1
P Richness	0	0	0	2	0	0
T Richness	4	6	2	4	4	0
Pollution Sensitive Richness	3	4	0	1	0	0
Filterer Percent	4.85%	5.56%	7.14%	3.57%	2.83%	16.67%
Pollution Tolerant Percent	32.04%	34.26%	9.82%	14.29%	58.49%	8.33%
E Richness	3	3	0	1	0	0
P Richness	0	0	0	2	0	0
T Richness	2	3	1	2	2	0
Pollution Sensitive Richness	2	3	0	1	0	0
Filterer Percent	3	2	2	3	3	1
Pollution Tolerant Percent	1	1	2	1	0	2
Total score	**11**	**12**	**5**	**10**	**5**	**3**
Percent of maximum score	**61.11%**	**66.67%**	**27.78%**	**55.56%**	**27.78%**	**16.67%**
Impairment classification	**slight**	**slight**	**moderate**	**slight**	**moderate**	**severe**

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Taxa Listing

Project ID: MDT07PBSJ
RAI No.: MDT07PBSJ018

RAI No.: MDT07PBSJ018 **Sta. Name:** Wagner Marsh
Client ID:
Date Coll.: 8/6/2007 **No. Jars:** 1 **STORET ID:**

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Ephemeroptera							
Baetidae							
Callibaetis sp.	7	8.86%	Yes	Larva		9	CG
Caenidae							
Caenis sp.	1	1.27%	Yes	Larva		7	CG
Heteroptera							
Corixidae							
Sigara sp.	1	1.27%	Yes	Adult		5	PH
Notonectidae							
Notonecta sp.	1	1.27%	Yes	Adult		5	PR
Notonectidae	17	21.52%	No	Larva		10	PR
Coleoptera							
Dytiscidae							
Dytiscidae	1	1.27%	Yes	Larva		5	PR
Hydrophilidae							
Hydrophilidae	3	3.80%	No	Larva		5	PR
Tropisternus sp.	1	1.27%	Yes	Adult		5	PR
Diptera							
Ceratopogonidae							
Ceratopogoninae	9	11.39%	No	Pupa		6	PR
Ceratopogoninae	27	34.18%	Yes	Larva		6	PR
Chaoboridae							
Chaoboridae	2	2.53%	Yes	Larva		8	PR
Chironomidae							
Chironomidae							
Chironomidae	2	2.53%	No	Pupa		10	CG
Cricotopus (Isocladius) sp.	4	5.06%	Yes	Larva		7	SH
Glyptotendipes sp.	1	1.27%	Yes	Larva		10	SH
Pseudochironomus sp.	2	2.53%	Yes	Larva		5	CG
Sample Count	**79**						

Metrics Report

Project ID: MDT07PBSJ
RAI No.: MDT07PBSJ018
Sta. Name: Wagner Marsh
Client ID:
STORET ID:
Coll. Date: 8/6/2007

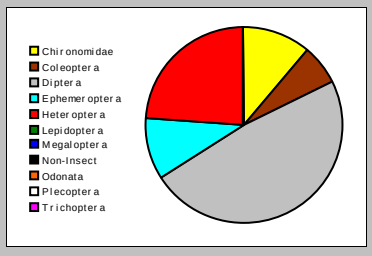
Abundance Measures

Sample Count: 79
Sample Abundance: 79.00 100.00% of sample used

Coll. Procedure:
Sample Notes:

Taxonomic Composition

Category	R	A	PRA
Non-Insect			
Odonata			
Ephemeroptera	2	8	10.13%
Plecoptera			
Heteroptera	2	19	24.05%
Megaloptera			
Trichoptera			
Lepidoptera			
Coleoptera	2	5	6.33%
Diptera	2	38	48.10%
Chironomidae	3	9	11.39%

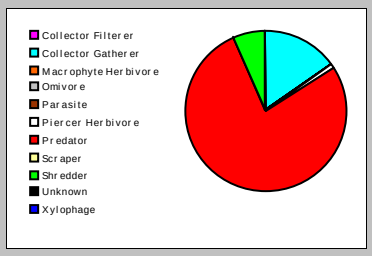


Dominant Taxa

Category	A	PRA
Ceratopogoninae	36	45.57%
Notonectidae	17	21.52%
Callibaetis	7	8.86%
Cricotopus (Isocladius)	4	5.06%
Hydrophilidae	3	3.80%
Pseudochironomus	2	2.53%
Chironomidae	2	2.53%
Chaoboridae	2	2.53%
Tropisternus	1	1.27%
Sigara	1	1.27%
Notonecta	1	1.27%
Glyptotendipes	1	1.27%
Dytiscidae	1	1.27%
Caenis	1	1.27%

Functional Composition

Category	R	A	PRA
Predator	5	61	77.22%
Parasite			
Collector Gatherer	3	12	15.19%
Collector Filterer			
Macrophyte Herbivore			
Piercer Herbivore	1	1	1.27%
Xylophage			
Scraper			
Shredder	2	5	6.33%
Omivore			
Unknown			



Metric Values and Scores

Metric	Value	BIBI	MTP	MTV	MTM
Composition					
Taxa Richness	11	1	0		0
Non-Insect Percent	0.00%				
E Richness	2	1		1	
P Richness	0	1		0	
T Richness	0	1		0	
EPT Richness	2		0		0
EPT Percent	10.13%		1		0
Oligochaeta+Hirudinea Percent					
Baetidae/Ephemeroptera	0.875				
Hydropsychidae/Trichoptera	0.000				
Dominance					
Dominant Taxon Percent	45.57%		1		0
Dominant Taxa (2) Percent	67.09%				
Dominant Taxa (3) Percent	75.95%	1			
Dominant Taxa (10) Percent	94.94%				
Diversity					
Shannon H (loge)	1.560				
Shannon H (log2)	2.251		1		
Margalef D	2.583				
Simpson D	0.337				
Evenness	0.109				
Function					
Predator Richness	5		2		
Predator Percent	77.22%	5			
Filterer Richness	0				
Filterer Percent	0.00%			3	
Collector Percent	15.19%		3		3
Scraper+Shredder Percent	6.33%		1		0
Scraper/Filterer	0.000				
Scraper/Scraper+Filterer	0.000				
Habit					
Burrower Richness	3				
Burrower Percent	49.37%				
Swimmer Richness	4				
Swimmer Percent	12.66%				
Clinger Richness	1	1			
Clinger Percent	5.06%				
Characteristics					
Cold Stenotherm Richness	0				
Cold Stenotherm Percent	0.00%				
Hemoglobin Bearer Richness	3				
Hemoglobin Bearer Percent	26.58%				
Air Breather Richness	2				
Air Breather Percent	6.33%				
Voltinism					
Univoltine Richness	4				
Semivoltine Richness	2	1			
Multivoltine Percent	20.25%		3		
Tolerance					
Sediment Tolerant Richness	0				
Sediment Tolerant Percent	0.00%				
Sediment Sensitive Richness	0				
Sediment Sensitive Percent	0.00%				
Metals Tolerance Index	3.769				
Pollution Sensitive Richness	0	1		0	
Pollution Tolerant Percent	11.39%	5		1	
Hilsenhoff Biotic Index	7.278		0		0
Intolerant Percent	0.00%				
Supertolerant Percent	36.71%				
CTQa	87.429				

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	18	36.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	12	40.00%	Moderate
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	5	27.78%	Moderate
MTM	Montana DEQ Mountains (Bukantis 1998)	3	14.29%	Severe