MONTANA DEPARTMENT OF TRANSPORTATION
WETLAND MITIGATION MONITORING REPORT: YEAR 2009

Wagner Marsh
Billings, Montana



Prepared for:

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

Prepared by:

POST, BUCKLEY, SCHUH, AND JERNIGAN
820 North Montana Avenue, Suite A
Helena, MT 59601

December 2009

PBS&J Project No: 0B4308802.06.07

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1.0 INTRODUCTION

This report presents the results of the fifth year (2009) 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.

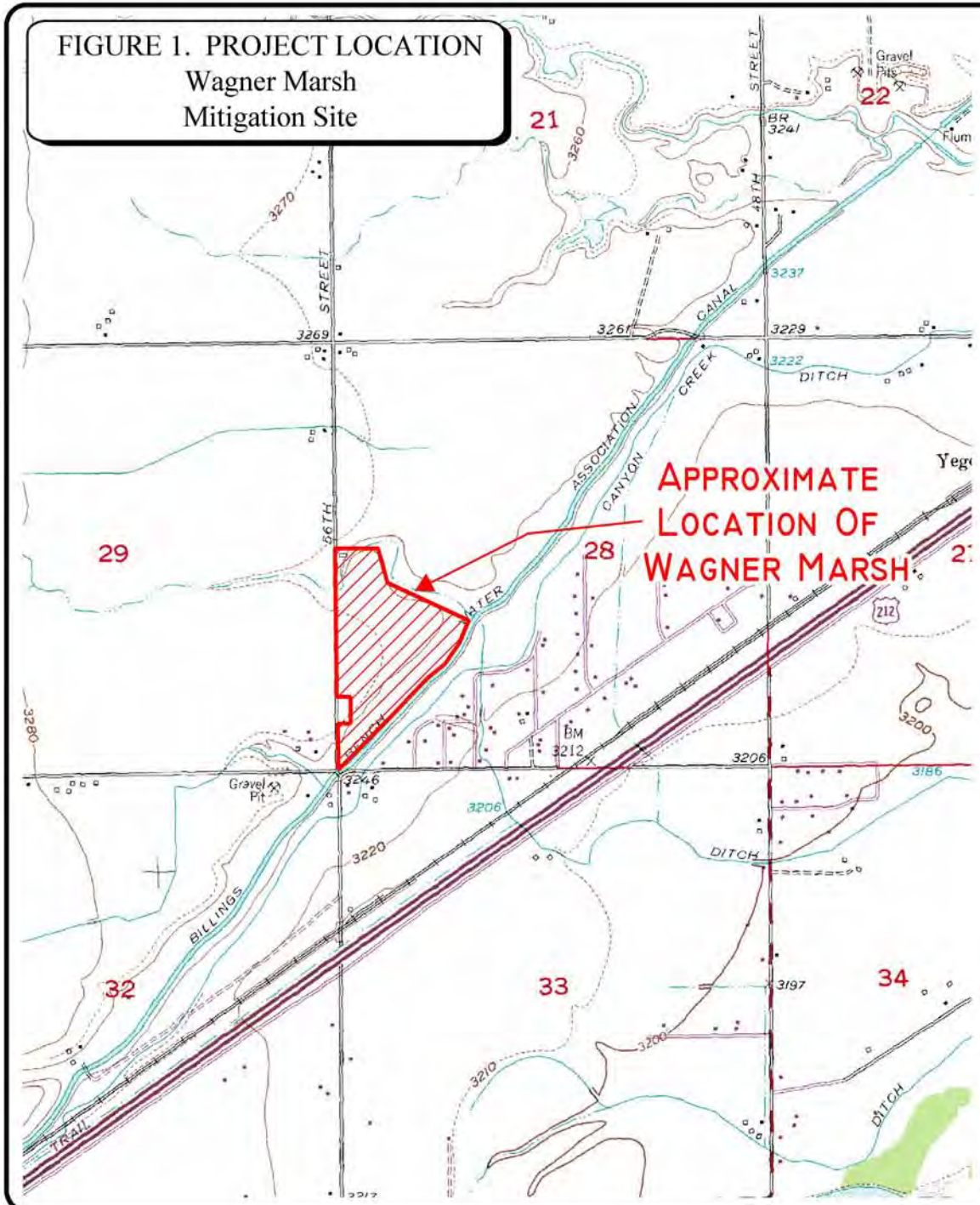
The site occurs at an elevation of approximately 3,240 feet above mean sea level and is located on the west edge of Billings, MT just north and east of the intersection of Danford Road and 56th Street in the SW ¼ of Section 28, Township 1 South, Range 25 East, Yellowstone County (**Figure 1**). Approximate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

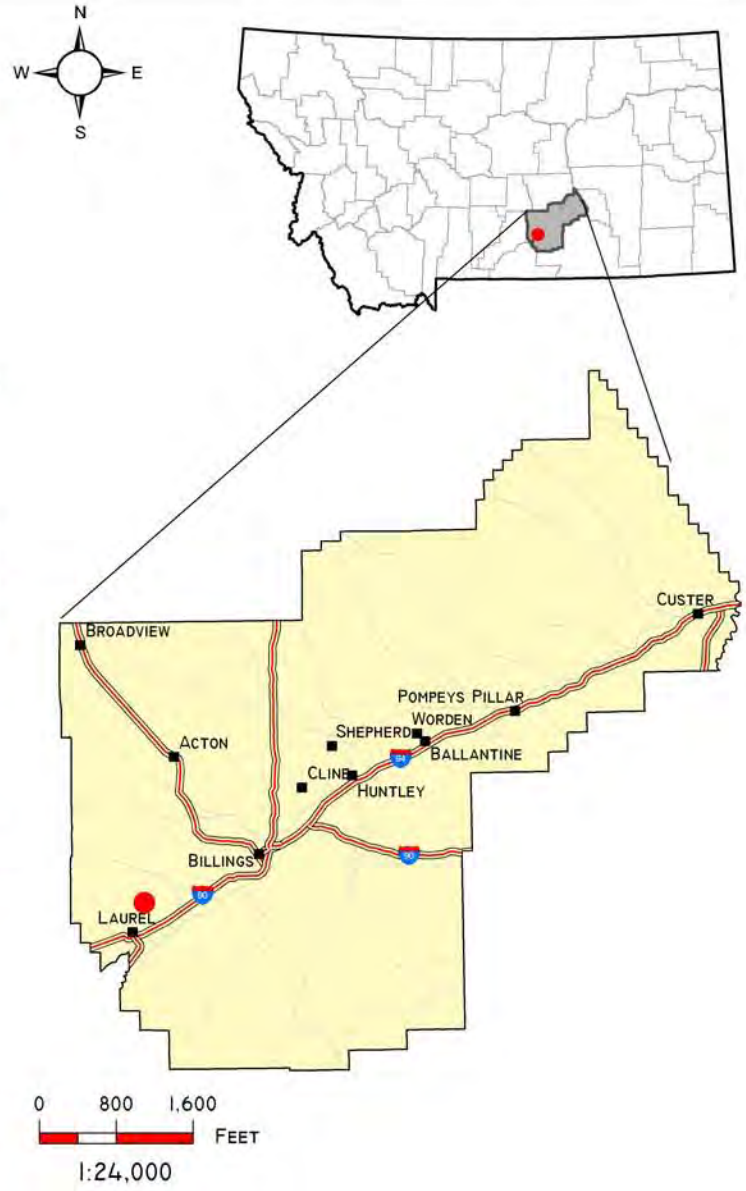
The approximate site boundary is illustrated on **Figure 2** (**Appendix A**), and the original conceptual layout is provided in **Appendix D**. The project incorporates the two incidentally created wetland/open water areas totaling 3.87 acres and seven wetland creation areas (i.e., wetland cells) totaling approximately 17.72 acres for a total projected aquatic habitat size of 21.59 acres. Historically wetland hydrology was supplied primarily through interception of the groundwater table, with some minimal contributions from precipitation. However, construction and operation of a gravel pit on the west side of 56th St. West, in recent years, has resulted in water being pumped from the gravel pit into Wagner Marsh. 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 is 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





PROJECT #:	0B4308801
DATE:	NOVEMBER 2008
LOCATION:	WAGNER MARSH
PROJECT MGR:	J. BERGLUND
DRAWN BY:	JJC

PBS&J
801 N. LAST CHANCE GULCH
SUITE 101
HELENA, MT 59601-3360

2.0 METHODS

2.1 Monitoring Dates and Activities

The site was visited on August 13, 2009 (mid-season visit) and again on October 13, 2009 (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. Several groundwater monitoring wells are monitored monthly between April and October for MDT by the U.S. Geological Survey (USGS). This data is obtained from MDT for use in this report.

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**).

A 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. In 2009 not all of the planting locations were visited. Instead a representative sample of the plantings was taken and the results extrapolated to the entire group of plantings.

2.4 Soils

Soils were evaluated during the mid-season visit according to hydric soil 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-NRCS 2006).

2.5 Wetland Delineation

A wetland delineation was conducted during the mid-season visit in accordance with the 1987 COE Wetland Delineation Manual. In July 2008, consultation with the COE (Steinle pers. comm.) confirmed that, where the 1987 manual was used to establish baseline wetland conditions at MDT wetland mitigation sites, it should continue to be applied at such sites for the duration of the monitoring period. Consequently, application of the new *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Great Plains Region* (COE 2008) was not required or undertaken at this site in 2009. 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 Fish and Wildlife

Observations of mammal, reptile, and amphibian species and indicators of their presence, such as vocalizations, were recorded on the Monitoring Form during each visit (**Appendix B**). Indirect indicators of their presence were recorded and include, but are not limited to, tracks, scat, burrows, eggshells, skins, and bones. 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.

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 2009 mid-season site visit. The sample was collected and preserved according to the Macroinvertebrate Sampling Protocol (**Appendix F**). Laboratory analysis of the sample and reporting were conducting by Rhithron Associates, Inc. in Missoula, Montana.

The approximate location of the 2009 sample point was located on **Figure 2** in **Appendix A**. The sample point in 2007 to 2009 differs from that of 2005 and 2006. The 2005 macroinvertebrate sample was taken in one of the ponds that had been established for several years. This served as baseline for comparing with newly established areas. The 2006 macroinvertebrate sample was in one of the newer shallow pond/emergent marsh areas; it represents the early stages of ecosystem development at the Wagner Marsh. The 2006 sample location was dry during the 2007 mid-season visit, therefore a new site that consistently had water was selected. The 2007-2009 sampling site is similar to the 2006 location in that the site was also newly constructed in 2005.

2.9 Functional Assessment

Since 2001, a functional assessment for each delineated wetland was conducted using the 1999 MDT Montana Wetland Assessment Method (MWAM) (Berglund 1999). In 2008 to 2009 the 2008 MDT Montana Wetland Assessment Method (Berglund and McEldowney 2008) was applied. Field data necessary for this assessment were generally collected during the mid-season site visit. A Functional Assessment Form was completed for each wetland or for a group of wetlands that share similar functions and values (**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 are 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 Monitoring Form (**Appendix B**).

2.11 GPS Data

During the 2005 monitoring season, the Garmin 12CT GPS unit marked the locations of the vegetation transect start and end locations, photograph locations, wetland sample points, and at aerial photograph reference points. The GPS data were not re-collected in 2009. A resource-grade Magellan MobileMapper GPS unit with differential correction was used to map wetland boundaries in 2009. 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

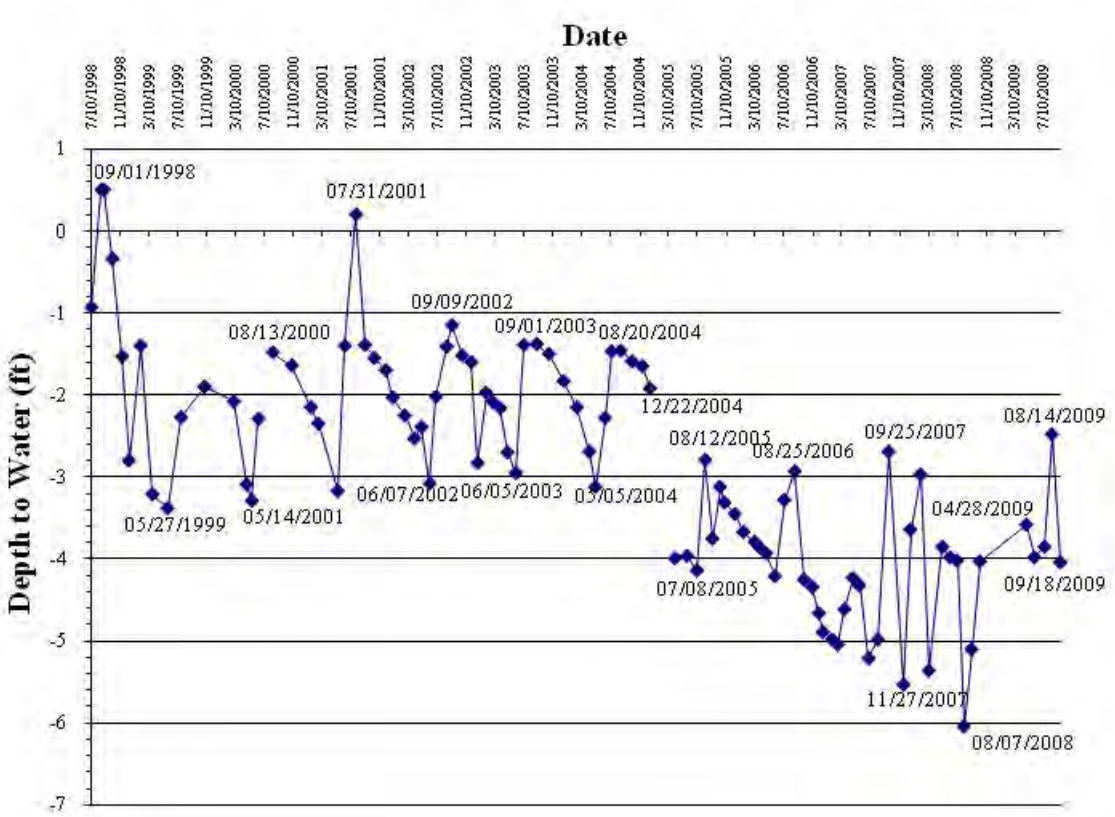
Groundwater has been the primary hydrologic component of Wagner Marsh, with precipitation playing a minor role in the overall water budget. Recently, excavation of the gravel pit on the west side of S. 56th Street has altered groundwater routing, which without corrective measures would likely have caused the dewatering of the Wagner Marsh mitigation site. However, MDT has developed an agreement with the gravel mining company and they now pump water from their gravel pits into the mitigation site. This has resulted in an overall increase in water within the mitigation area. In fact, water levels during the 2009 mid-season visit were the highest observed at the site in the past five years.

The closest weather station to the wetland monitoring area is at Laurel, Station #244894, in Montana. It was closed in 1994. At this station the mean annual precipitation, calculated from August 1951 to February 1994 was approximately 14.3 inches (in) (Western Regional Climate Center (WRCC) 2009a). The majority of this precipitation occurred in April, May, June, and September (WRCC 2009a).

The closest *active* weather station is at Billings WSO, Station #240807, in Montana. The total precipitation received through August in 2009 was 7.87 in (WRCC 2009b). This was slightly below the long-term mean precipitation level of 10.4 inches for the period of July 1948 through August 2009 (WRCC 2009b). Annual evaporation pan rates are estimated to be approximately 41.27 inches at the Huntley Experiment Station # 244345, which is just northeast of the Billings WSO station (WRCC 2008); this rate is almost three times the yearly precipitation rate. Inundation was present at all wetland cells within the monitoring area during the mid-season visit. Open water areas are shown on **Figure 3** (**Appendix A**).

MDT has contracted with the 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,

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.

it is clear that groundwater levels were historically highest in August and September and often the lowest in the spring. These historic water levels were 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. From 2005 through 2007 there is a noticeable downward trend for groundwater elevations at this well. This trend is assumed to be linked to the gravel pit located on the west side of 56th St. Supplemental water from that gravel pit is being pumped into the Wagner Mitigation site to supplement water at the site. Though a different source of water than what existed prior to construction of the new gravel pit in 2007, this supplemental water appears to be working well because surface water levels were both relatively high and stable in 2008 and in 2009.

Of the 39 acres in the monitoring area, approximately 42.5 percent was inundated (**Figure 3** in **Appendix A**), with an average depth of 1 foot and a range of depths from zero to an estimated

five feet. As in previous years, the pond located immediately south of the crescent-shaped pond on the west side of the site appeared to have the greatest maximum depths; approximately 5 feet deep.

3.2 Vegetation

A comprehensive list of vegetation species has been compiled since 2005 (**Table 1**). Vegetative details from the 2009 mid-season visit can be found on the **Monitoring Form** (**Appendix B**). Construction of the site was completed in June 2005.

Table 1: ***Vegetative species observed from 2005 to 2009 at the Wagner Marsh Mitigation Site.***

Scientific Name	1988 Region 9 (Northwest) Wetland Indicator	Scientific Name	1988 Region 9 (Northwest) Wetland Indicator
Agropyron cristatum	--	*Lotus unifoliolatus*	--
Agropyron repens	FACU	***Lythrum salicaria***	OBL
Agropyron smithii	FACU	*Medicago lupulina*	FAC
Agropyron spp.	--	*Medicago sativa*	--
Agrostis alba	FACW	*Melilotus officinalis*	FACU
Alyssum spp.	--	*Nepeta cataria*	FAC
Asclepias spp.	--	*Oenthera biennis*	FACU
Aster brachyactis	FACW	*Onopordum acanthium*	--
Aster spp. (white)	--	*Panicum capillare*	FAC
Beckmannia syzigachne	OBL	*Polygonum aviculare*	FACW-
Brassicaceae (mustard)	--	*Polygonum lapathifolium*	FACW+
Bromus inermis	--	*Polygonum persicaria*	FACW
Bromus japonicus	FACU	*Polypogon monspeliensis*	FACW
Bromus tectorum	--	*Populus deltoides*	FAC
Carex lanuginosa	OBL	*Potentilla anserina*	OBL
Carex nebrascensis	OBL	*Prunus virginiana*[1]	FACU
Carex spp.	--	*Ribes aureum*[1]	FAC+
Centaurea maculosa	--	*Rosa woodsii*[1]	FACU
Chenopodium album	FAC	*Rumex crispus*	FACW
Cirsium arvense	FACU+	*Salix amygdaloides*	FACW
Convolvulus arvensis	--	*Salix exigua*	OBL
Conyza canadensis	FACU	*Salsola iberica*	--
Echinochloa muricata	FACW	*Scirpus acutus*	OBL
Elaeagnus angustifolia	FAC	*Scirpus maritimus*	OBL
Elaeagnus commutata[1]	NI	*Scirpus pungens*	OBL
Eleocharis palustris	OBL	*Shepherdia argentea*[1]	--
Epilobium ciliatum	FACW-	*Sisymbrium altissimum*	FACU-
Erodium cicutarium	--	*Solidago canadensis*	FACU
Festuca pratensis	FACU+	*Sonchus arvensis*	FACU+
Grindelia squarrosa	FACU	*Tamarix ramosissima*	FACW
Hordeum jubatum	FAC+	*Taraxacum officinale*	FACU
Juncus torreyi	FACW	*Thlaspi arvense*	NI
Juniperus scopulorum[1]	--	*Tragopogon dubius*	--
Lactuca serriola	FACU	*Typha angustifolia*	OBL
Leptochloa fusca	FACW	*Typha latifolia*	OBL
Linum lewisii	--	*Verbena bracteata*	FACU+

[1] Species was planted.
Bolded species were first observed in 2009.

In 2009 a total of eight community types were documented at the site, of which five are vegetated wetland community types. These wetland community types were identified and mapped (**Figure 3** in **Appendix A**) as: Type 2 – *Salix exigua-Elaeagnus angustifolia / Carex lanuginosa* [*Salix* type]; Type 3 – *Eleocharis palustris-Typha / Mixed graminoid* [*Eleocharis-Typha* type]; Type 10 – Mixed Graminoid; Type 11 – *Phalaris arundinaceae*, and Type 12 - *Scirpus acutus* [*Scirpus* type]. The Mixed Graminoid and *Phalaris arundinaceae* types occur as wetland fringes around previously existing ponds on the west and northwest sides of the site and evolved from the *Polypogon* and *Polygonum lapathifolium* types from previous years (**Figure 3** in **Appendix A**). The Mixed Graminoid community type also occurs at the western end of the vegetation transect.

The *Eleocharis-Typha* type is the most common wetland type on the site and occurs as scattered pockets throughout the mitigation area. With the supplemental water being added to the site from the gravel mine, the *Carex* type that, in 2007, had taken the place of the *Eleocharis –Typha* type in the northwest portion of the site, east-adjacent to the *Salix* type, reverted back to the *Eleocharis-Typha* type in 2008. The *Echinochloa* type that occurred in the northeastern portion of the site developed into the *Eleocharis –Typha* type in 2008 and has remained that type in 2009.

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 and 2008. During the 2009 mid-season visit it was evident that those efforts have been largely successful in controlling these weeds.

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 has not changed substantially since 2006 (**Charts 2** and **3**). In 2008 and 2009 the total number of plant species dropped substantially compared to previous years. Based on the consistent number of hydrophytic species found in the transect, this drop in plant species is attributed to more stable water levels causing upland plant species to die off (**Table 2**). The overall percent cover in 2009 was about 21%, the lowest recorded to date. The percent cover decrease first observed in 2008, and now again in 2009, appears to be positively correlated to the increased water levels. Herbivory by foraging waterfowl may also have contributed to the decrease in percent plant cover, though the level of waterfowl herbivory is difficult to gauge.

Table 2: ***Data summary for Transect 1 at the Wagner Marsh Wetland Mitigation Site.***

Monitoring Year	2005	2006	2007	2008	2009
Transect Length (feet)	530	530	530	530	530
# Vegetation Community Transitions along Transect	5	5	5	4	5
# Vegetation Communities along Transect	4	3	3	2	2
# Hydrophytic Vegetation Communities along Transect	2	2	1	1	2
Total Vegetative Species	31	31	31	19	20
Total Hydrophytic Species	13	15	15	16	14
Total Upland Species	18	16	16	3	6
Estimated % Total Vegetative Cover	30	45	55	30	21
% Transect Length Comprised of Hydrophytic Vegetation Communities	67	62	65	70	66
% Transect Length Comprised of Upland Vegetation Communities	7	6	5	0	0
% Transect Length Comprised of Unvegetated Open Water	4	31	30	30	34
% Transect Length Comprised of Bare Substrate	22	0	0	0	0

Chart 2: ***Transect maps showing vegetation types from the start of transect (0 feet) to the end of transect (530 feet) for each year monitored.***

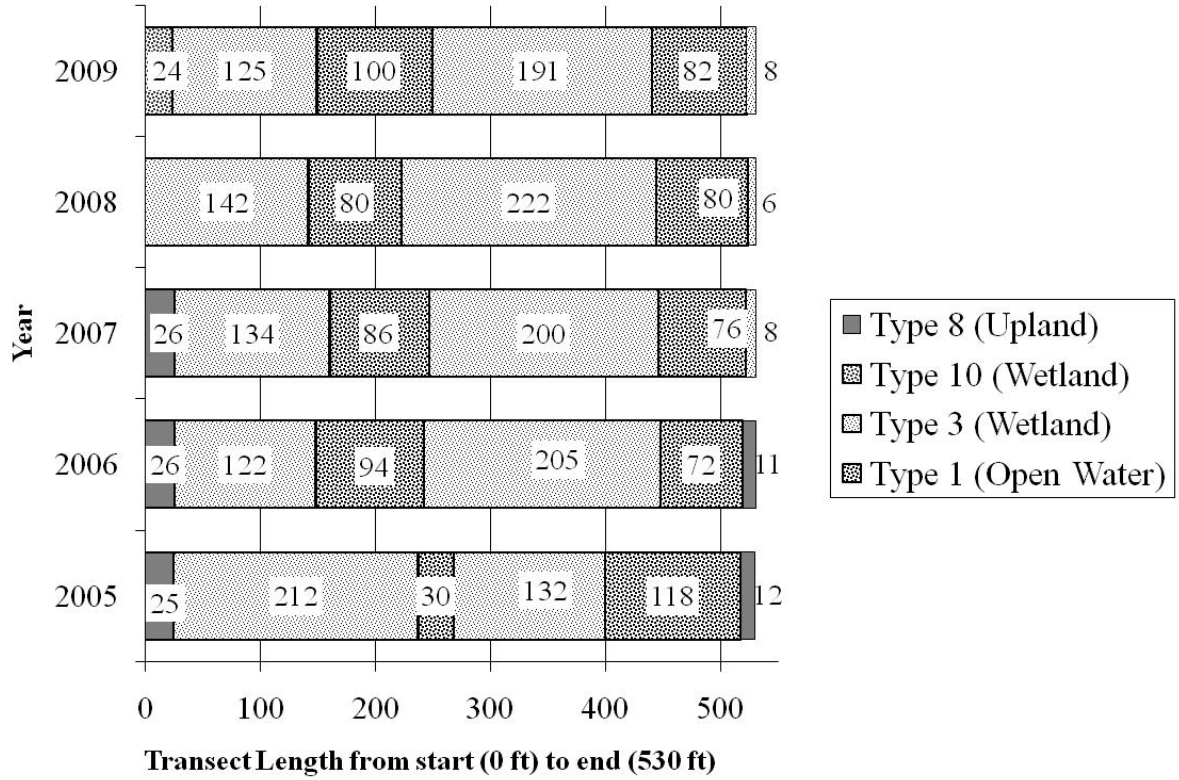
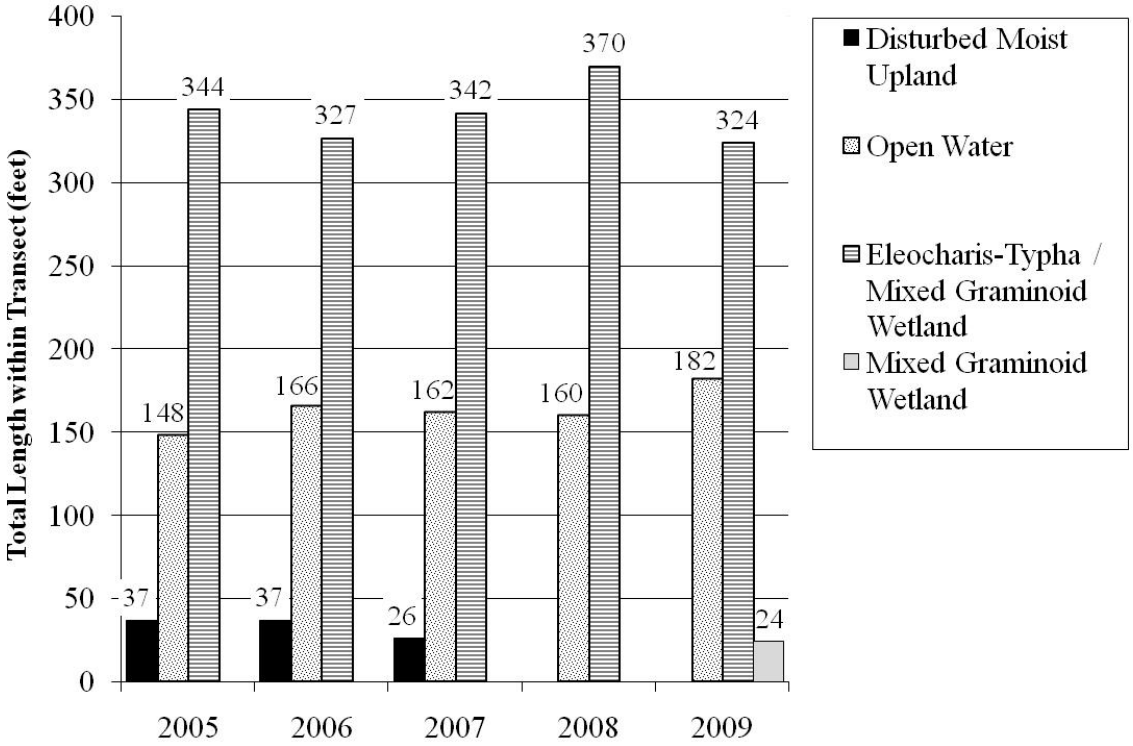


Chart 3: ***Length of vegetation communities within Transect 1 for each year monitored.***



A total of 550 woody plantings were installed as part of the overall revegetation plan for the site. In 2009 435, or 79 percent, of the plantings were monitored. Overall mortality of planted woody vegetation species was extrapolated from this sample and is summarized in **Table 3**. As of August 13, 2009, the overall survival rate is estimated at 37 percent. This is down from the 92 percent survival rate reported in 2005, the 64 percent survival rate in 2006, the 57 percent survival rate in 2007, and the 45 percent survival in 2008. Of the seven different shrub species planted, the juniper (*Juniperus scopulorum*) plantings continue to do well and have the highest survival rate (98 percent). Conversely, none of the buffaloberry (*Shepherdia argentea*) plantings have survived. Chokecherry (*Prunus virginiana*), plains cottonwood (*Populus deltoides*), and golden currant (*Ribes aureum*) have fared moderately well at 55, 44, and 40 percent survival, respectively. At 20, and 18 percent survival rates, silverberry (*Elaeagnus commutata*) and Wood's rose (*Rosa woodsii*) have had much lower survival rates than what might be expected from these generally hardy species. Shrub planting mortality at the site is thought to be primarily due to a lack of available water during the summer months; however, in some areas the higher water levels observed in 2009 had actually inundated several plantings and may have caused some mortality at those locations.

Table 3: ***2009 observed mortality of planted woody species at the Wagner Marsh Wetland Mitigation Site.***

Plant Species	Number Originally Planted	Number Extrapolated Alive	Number Extrapolated Dead	Cause of Mortality
Elaeagnus commutata	50	10	40	Mortality assumed to be caused by a lack of consistent water.
Juniperus scopulorum	50	49	1	Mortality assumed to be caused by a lack of consistent water.
Populus deltoides	50	22	28	Mortality assumed to be caused by a lack of consistent water.
Prunus virginiana	100	55	45	Mortality assumed to be caused by a lack of consistent water.
Ribes aureum	100	40	60	Mortality assumed to be caused by a lack of consistent water.
Rosa woodsii	100	18	82	Mortality assumed to be caused by a lack of consistent water.
Shepherdia argentea	100	0	100	Mortality assumed to be caused by a lack of consistent water.
TOTAL	**550**	**194**	**356**	

3.3 Soils

Since the site was excavated and graded in Spring 2005, soils are highly disturbed throughout the site. Wetland area (SP-1) soils had a silty clay texture. The primary matrix color of the second horizon at SP-1 was 10YR 5/2 and contained abundant and prominent (5YR 3/4) mottles. The second horizon also contained seams/pores that were black in color, which is indicative of a reducing environment.

3.4 Wetland Delineation

Delineated wetland boundaries are illustrated on **Figure 3** (**Appendix A**). Completed **COE Wetland Delineation Forms** are included in **Appendix B**. Total aquatic habitat on the site in 2009 was 16.58 acres, up from the 16.19 acres observed in 2008 (**Figure 3** in **Appendix A**). The majority of this increase was due to the continued expansion of wetland habitat at the site. Wetlands comprised 8.32 acres of the 16.58-acre total, consisting of 2.12 acres of wetland originally created on the site by MDT, plus 6.2 acres that have developed to date since implementation of the formal mitigation design in 2005. This is an increase of 0.94 acre over the wetland extent in 2008.

Open water comprised 8.26 acres of the 16.58-acre total, a decrease of 0.55 acre from the 8.81 acres of open water documented in 2008. Assuming water levels remain fairly constant, the shallow (<2.0 feet) open water habitat observed in 2009 is expected to continue to become vegetated with emergent hydrophytic species over time. 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 Fish and Wildlife

Though only constructed in 2005, the wetland complex created on the site provides habitat for several wildlife species. One reptile, two amphibian, four mammal and 26 bird species were observed at the site during 2009 monitoring (**Table 4**). The site continues to be a favored resting/foraging area for birds. In 2009 the most numerous species observed during the fall bird monitoring visit were Mallards, Mourning Doves, Brewer's Blackbirds, and Ring-necked Pheasants (**Appendix B**). Damselfly and dragonfly adults were noticeably more abundant during the mid-season visit than in previous years.

Table 4: ***Fish and wildlife species observed at the Wagner Marsh Wetland Mitigation Site from 2005 to 2009.***

FISH	
none	
AMPHIBIAN	
Boreal chorus frog (*Pseudacris maculata*)[1] [syn. Western chorus frog (*Pseudacris triseriata*)]	**Northern leopard frog (*Rana pipiens*)** Woodhouse's toad (*Bufo woodhousii*)
REPTILE	
Western garter snake (*Thamnophis elegans*) **Plains garter snake (*Thamnophis radix*)**[1]	
BIRD	
American Black Duck (*Anas rubripes*)(?) American Coot (*Fulica americana*) **American Crow (*Corvus brachyrhynchos*)** American Goldfinch (*Carduelis tristis*) **American Robin (*Turdus migratorius*)** **American Wigeon (*Anas americana*)**[1] **Barn Swallow (*Hirundo rustica*)** **Black-billed Magpie (*Pica hudsonia*)** **Blue-winged Teal (*Anas discors*)**[1] **Brewer's Blackbird (*Euphagus cyanocephalus*)** California Gull (*Larus californicus*) **Canada Goose (*Branta canadensis*)** Cinnamon Teal (*Anas cyanoptera*)[1] Cliff Swallow (*Hirundo pyrrhonota*) **Common Snipe (*Gallinago gallinago*)** Eastern Kingbird (*Tyranus tyranus*) Gadwall (*Anas strepera*) Grasshopper Sparrow (*Ammodramus savannarum*) **Great Blue Heron (*Ardea herodias*)**[1] Greater Yellowlegs (*Tringa melanoleuca*) **Green-winged Teal (*Anas crecca*)**[1] **Killdeer (*Charadrius vociferous*)** Lesser Scaup (*Aythya affinis*)[1]	Lesser Yellowlegs (*Tringa flavipes*)[1] **Mallard (*Anas platyrhynchos*)** **Mourning Dove (*Zenaida macroura*)** **Northern Flicker (*Colaptes auratus*)** **Northern Harrier (*Circus cyaneus*)** Northern Pintail (*Anas acuta*)[1] **Northern Shoveler (*Anas clypeata*)**[1] Pied-billed Grebe (*Podilymbus podiceps*) Red-tailed Hawk (*Buteo jamaicensis*) **Red-winged Blackbird (*Agelaius phoeniceus)*** Redhead (*Aythya americana*)[1] **Ring-necked Pheasant (*Phasianus colchicus*)** Rock Dove (*Columba livia*)[1] **Sandhill Crane (*Grus canadensis*)** Song Sparrow (*Melospiza melodia*) **Spotted Sandpiper (*Actitis macularia*)**[1] **Tree Swallow (*Tachycineta bicolor*)**[1] **Vesper Sparrow (*Pooecetes gramineus*)**[1] **Western Meadowlark (*Sturnella neglecta*)**[1] **Wilson's Phalarope (*Phalaropus tricolor*)**[1] **Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*)**[1]

[1] Species observed by MDT staff.
Bolded species were observed in 2009.

Table 4 (continued): ***Fish and wildlife species observed at the Wagner Marsh Wetland Mitigation Site from 2005 to 2009.***

MAMMAL	
Black-tailed jackrabbit (*Lepus californicus*)[1]	Red Fox (*Vulpes vulpes*)[1]
Eastern cottontail (*Sylvilagus floridanus*)	**Vole (unidentified species)**
Mule deer (*Odocoileus hemionus*)	White-tailed jackrabbit (*Lepus townsendi*)
Muskrat (*Ondatra zibethicus*)[1]	**White-tailed deer (*Odocoileus virginiana*)**
Raccoon *(Procyon lotor)*	

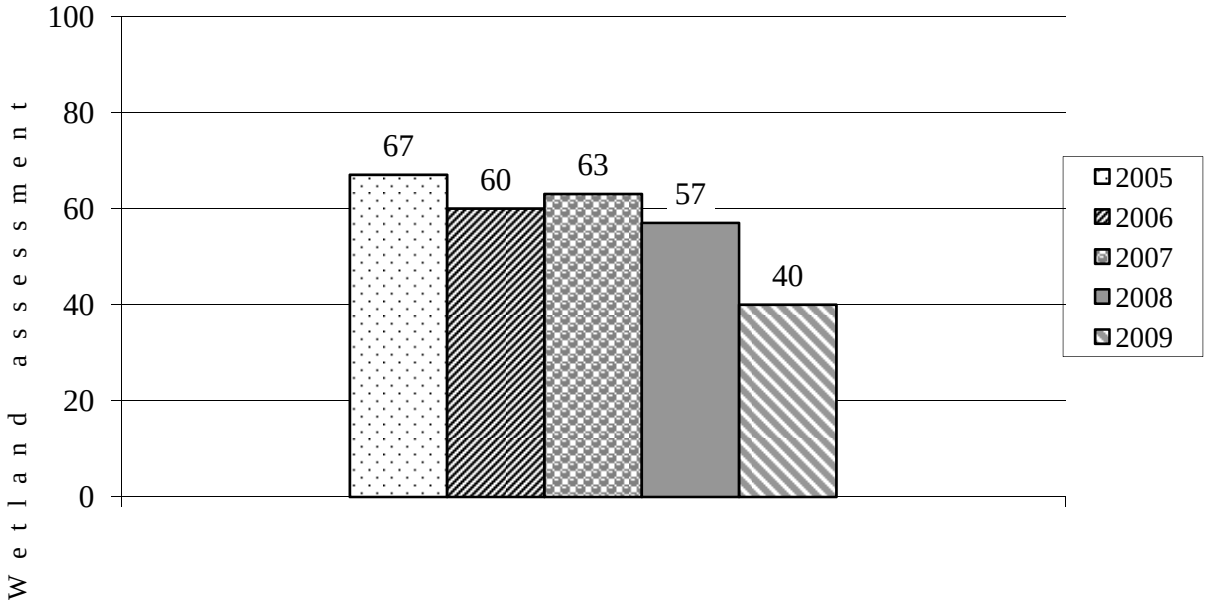
[1] Species observed by MDT staff.
Bolded species were observed in 2009.

3.6 Macroinvertebrates

In 2005 macroinvertebrates were sampled within the emergent marsh complex on the east side of the site at the northern end of the crescent-shaped pond. 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 changed 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 that year; it had not been dry in the two preceding years. The current sample location is located in an area that was constructed in 2005, but appears to have a more stable water regime than did the 2006 sample site. This site has now been sampled for the three years (2007, 2008, and 2009).
The complete 2009 sampling results are provided in **Appendix F** and were summarized by Rhithron Associates, Inc. in the italicized section below (Bollman 2009).

> *Similar to 2008, taxa richness remained low at Wagner Marsh in 2009, while invertebrate abundance was high. Large numbers of mayflies (*Callibaetis *sp. and* Caenis *sp.) were collected in the sample, suggesting good water quality, and indicating stable conditions between 2008 and 2009, when mayflies also dominated the fauna. Functional complexity continued an increasing trend noted in 2008: gatherers dominated the mix in 2009, but predators and scrapers were also abundant. There was evidence of the presence of filamentous algae, emergent macrophytes, and open water column habitats. Thermal preference of the assemblage was calculated at 17.0ºC. The wetland assessment index continued to indicate "optimal" conditions, despite a lower score in 2009 compared to the previous years of study (**Chart 4**).*

Chart 4: ***Macroinvertebrate bioassessment scores using the wetland index for the Wagner Marsh Wetland Mitigation Site from 2005 to 2009.***



NOTE: Direct comparisons can only be made between the 2007, 2008 and 2009 scores.

3.7 Functional Assessment

Pre-construction through 2007 conditions were assessed using the 1999 MDT MWAM while 2008 to 2009 conditions were assessed using the 2008 MDT MWAM. The complete 2009 Functional Assessment Forms are presented in **Appendix B.** Although direct comparisons cannot be made, general trends in wetland development can still be determined (**Table 5**).

The created wetlands at Wagner Marsh were ranked as Category II wetlands in 2006, 2007, 2008, and 2009, as compared to Category IV in 2001. Functions that increased substantially over 2001 baseline conditions include MTNHP species habitat, general wildlife habitat, short and long term surface water storage, production export, and uniqueness. The pre-project site provided about 16.6 functional units within the monitoring area, and the post-project site currently provides about 111 functional units, for a conservative gain of 94 functional units.

Table 5: ***Summary of the 2001 and 2005 through 2009 wetland function/value ratings and functional points at the Wagner Marsh Wetland Mitigation Site.***

Function and Value Parameters from the MDT Montana Wetland Assessment Method	2001[1] Baseline Assessment	2005[1]	2006[1]	2007[1]	2008[2]	2009[2]
Listed/Proposed T&E Species Habitat	Low (0.5)	Low (0.5)	Low (0.5)	Low (0.0)	Low (0.0)	Low (0.0)
MTNHP Species Habitat	Low (0.2)	Low (0.2)	Low (0.2)	Low (0.2)	Mod (0.6)	Mod (0.7)
General Wildlife Habitat	Low (0.3)	Mod (0.7)	Mod (0.7)	Mod (0.7)	High (0.9)	High (0.9)
General Fish/Aquatic Habitat	N/A	N/A	N/A	N/A	N/A	N/A
Flood Attenuation	N/A	N/A	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)	High (1.0)	High (1.0)
Sediment/Nutrient/Toxicant Removal	Mod (0.7)	Mod (0.7)	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)	Mod (0.7)	Mod (1.0)
Production Export/Food Chain Support	Mod (0.6)	High (0.8)	High (0.9)	High (0.9)	High (0.8)	High (0.8)
Groundwater Discharge/Recharge	High (1.0)	High (1.0)	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)	Mod (0.5)	Mod (0.5)
Recreation/Education Potential	Low (0.2)	Low (0.1)	Mod (0.5)	High (1.0)	Mod (0.1)	Mod (0.1)
Actual Points / Possible Points	4.3 / 9	5.8 / 10	6.7 / 10	6.7 / 10	6.3 / 9	6.7 / 9
% of Possible Score Achieved	48%	58%	67%	67%	70%	74%
Overall Category	IV	III	II	II	II	II
Total Acreage of Assessed Aquatic Habitat within AA Boundaries	**3.87**	**11.84**	**11.49**	**13.30**	**16.19**	**16.58**
Functional Units (acreage x actual points)	**16.64**	**68.70**	**77.00**	**89.11**	**102.00**	**111.1**
Net Acreage Gain	N/A	**7.84**	**7.62**	**9.43**	**12.32**	**12.71**
Net Functional Unit Gain	N/A	**52.1**	**60.36**-2001 **8.30**-2005	**72.47**-2001 **12.11**-2006	**85.36**-2001 **12.89**-2007	**94.46**-2001 **9.10**-2008

[1] Assessed using the 1999 MDT Montana Wetland Assessment Method.
[2] Assessed using the 2008 MDT Montana Wetland Assessment Method. The completed form is in **Appendix B**.

3.8 Photographs

Representative photographs were taken from photo-points and transect ends (**Appendix C**).

3.9 Maintenance Needs/Recommendations

A few salt cedar saplings were observed, but were too large to easily remove during monitoring in 2009. The presence of salt cedar on the site should continue to be monitored and individuals removed when encountered, but overall the threat of salt cedar invasion appears to be low.
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 mid-season visits in 2007 and again in 2008 it was noted that a comprehensive weed spraying program had been implemented at the site. This effort was especially noticeable in 2009 by the relatively low cover of these species now found on the site. Continued, occasional spraying in subsequent years is still needed to prevent future weed issues.

A single purple loosestrife plant was observed onsite during the mid-season visit. Within one week MDT had removed this individual from the site. Future infestations of this aquatic noxious weed will be identified and eradicated immediately.

It appears that the supplemental water being pumped into Wagner Marsh from the gravel mine west of 56th St. site is helping to maintain a more consistent water regime throughout the growing season. The PVC pipes delivering water to Wagner Marsh have been buried (**Figure 2**) and the outfalls stabilized with riprap. During the mid-season visit water levels were the highest observed to date. In fact, they were close to topping the emergency outfall located in the middle of the east side. MDT was alerted and the water levels were immediately dropped. Since that time MDT has discussed this issue with the WJH Bird Sanctuary and the gravel mine operators to prevent the water levels from attaining that height in the future.

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: the April 1, 2004 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**]; the July 23, 2004 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 2009, a total of approximately 16.58 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 0.39 acres from 2008 totals (16.19 acres).

Of the 16.58-acre 2009 total, approximately 8.26 acres are currently open water habitat and the remaining 8.32 acres are vegetated wetland areas. Much of the 'disturbed-moist' vegetation type of previous monitoring years was classified as emergent wetlands or open water in 2008 and 2009. 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 in 2001 and from 2005 to 2009.***

YEAR	OPEN WATER (acre)	WETLAND (acre)	TOTAL AQUATIC HABITAT (acre)
Pre-mitigation Creation:			
2001	1.75	2.12	3.87
Post-Construction:			
2005	7.88	3.96	11.84
On-going Establishment:			
2006	4.96	6.53	11.49
2007	5.80	7.50	13.30
2008	8.81	7.38	16.19
2009	**8.26**	**8.32**	**16.58**

The Corps of Engineers will determine final credits achieved at the site. However, using the credit ratios listed, **Table 7** summarizes compensatory mitigation credits developed to date at the Wagner Marsh. Using these credit ratios for wetlands, open water, and upland buffer, approximately 11.28 acres of credit are currently available, an increase of 1.12 credits. If the water levels remain relatively constant, there is considerable potential for the extent of the emergent wetlands to increase, especially in the eastern half of the site.

Table 7: ***2009 mitigation credit summary for the Wagner Marsh Wetland Mitigation Site.***

Credit Category	Acre	Credit Ratio	Credit [1]
Total Scrub/Shrub and Emergent Wetland	8.32	1:1	8.32
Total Open water	8.26	20% of wetland acreage[2]	1.66
50-foot wide upland buffer	5.19	4:1	1.30
TOTAL	**21.77**		**11.28**

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

[2] According to July 23, 3004 correspondence from the Corps to MDT, "credit for open water will be limited to no more than 20% of the amount of actual wetland that develops at the site. For example, if 20 acres of wetland develops, up to 4 acres of additional acres of open water credit could be used as wetland mitigation credit."

The pre-project site provided about 16.6 functional units within the monitoring area, and in 2009 the mitigation site provides about 111 functional units, for a conservative gain of 94 functional units.

4.0 REFERENCES

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Appendix A

FIGURES 2 & 3

MDT Wetland Mitigation Monitoring
Wagner Marsh
Billings, Montana



GRAPHICAL REPRESENTATION MAY OR MAY NOT DEPICT THE LEGAL DESCRIPTION OF ANY PARCEL HEREIN. THIS FIGURE IS A VISUAL AID ONLY; BOUNDARY RESTORATION MUST BE MADE BY A LICENSED LAND SURVEYOR. THIS FIGURE IS INTENDED TO DISPLAY INFORMATION RELEVANT TO THE REFERENCED REPORT. PBS&J MAKES NO REPRESENTATION OR WARRANTY OF ANY KIND REGARDING THIS DRAWING FOR ANY USE OTHER THAN THE ORIGINAL. ANY OTHER USE IS AT THE USER'S SOLE RISK.

10/26/2009 | REV - | FIGURE 2

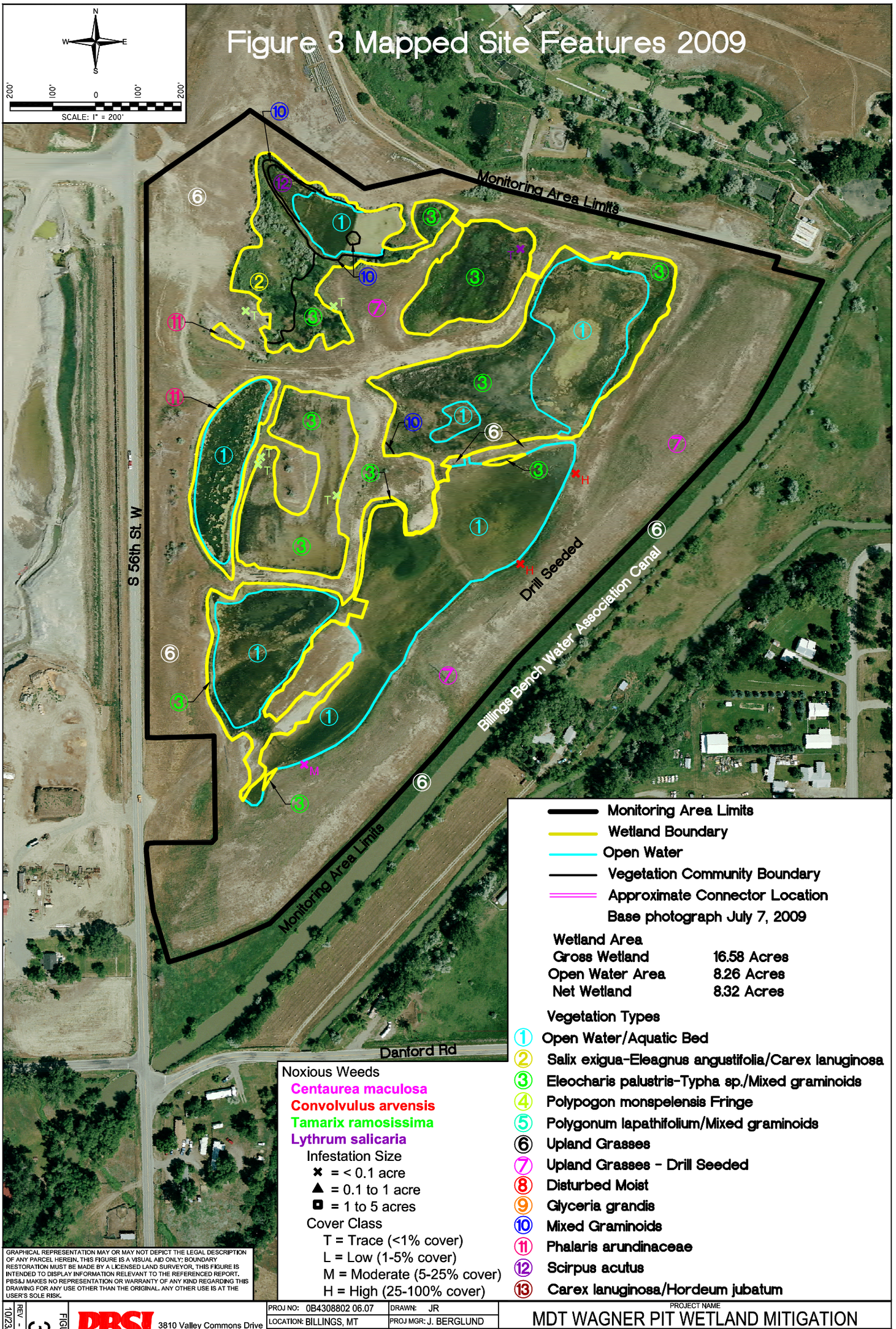
PBSJ
3810 Valley Commons Drive
Suite 4
Bozeman, MT 59718

PROJ NO: 0B4308802 06.07	DRAWN: JR		
LOCATION: BILLINGS, MT	PROJ MGR: J. BERGLUND		
SCALE: NOTED	CHECKED: RM	APPVD: JB	
FILE NAME: BASE-2009.dwg	PLOTTED: Oct/27/2009		

PROJECT NAM
MDT WAGNER PIT WET

DRAWING TITL
MONITORING ACTIVITY

Figure 3 Mapped Site Features 2009



Monitoring Area Limits
Wetland Boundary
Open Water
Vegetation Community Boundary
Approximate Connector Location
Base photograph July 7, 2009

Wetland Area	
Gross Wetland	16.58 Acres
Open Water Area	8.26 Acres
Net Wetland	8.32 Acres

Vegetation Types

1. Open Water/Aquatic Bed
2. Salix exigua-Eleagnus angustifolia/Carex lanuginosa
3. Eleocharis palustris-Typha sp./Mixed graminoids
4. Polypogon monspelensis 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

Noxious Weeds
Centaurea maculosa
Convolvulus arvensis
Tamarix ramosissima
Lythrum salicaria
Infestation Size
✖ = < 0.1 acre
▲ = 0.1 to 1 acre
◘ = 1 to 5 acres
Cover Class
T = Trace (<1% cover)
L = Low (1-5% cover)
M = Moderate (5-25% cover)
H = High (25-100% cover)

GRAPHICAL REPRESENTATION MAY OR MAY NOT DEPICT THE LEGAL DESCRIPTION OF ANY PARCEL HEREIN. THIS FIGURE IS A VISUAL AID ONLY; BOUNDARY RESTORATION MUST BE MADE BY A LICENSED LAND SURVEYOR. THIS FIGURE IS INTENDED TO DISPLAY INFORMATION RELEVANT TO THE REFERENCED REPORT. PBS&J MAKES NO REPRESENTATION OR WARRANTY OF ANY KIND REGARDING THIS DRAWING FOR ANY USE OTHER THAN THE ORIGINAL. ANY OTHER USE IS AT THE USER'S SOLE RISK.

REV	FIGURE	
-	3	10/23/2009

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Suite 4
Bozeman, MT 59718

PROJ NO: 0B4308802 06.07	DRAWN: JR		
LOCATION: BILLINGS, MT	PROJ MGR: J. BERGLUND		
SCALE: NOTED	CHECKED: RM	APPVD: JB	
FILE NAME: BASE-2009.dwg	PLOTTED: Oct/28/2009		

PROJECT NAME
MDT WAGNER PIT WETLAND MITIGATION

DRAWING TITLE
MAPPED SITE FEATURES 2008

Appendix B

2009 WETLAND MITIGATION SITE MONITORING FORMS
2009 BIRD SURVEY FORMS
2009 COE WETLAND DELINEATION FORMS
2009 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 13, 2009** 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: **5** # Visits in Year: **2**
Size of evaluation area: **39 acres** Land use surrounding wetland: **Rural/agricultural mostly, gravel pit being excavated immediately west of S. 56th St. West**

HYDROLOGY

Surface Water Source: **Groundwater, overland flow, and pumped water from gravel pit.**
Inundation: **Present** Average Depth: 2.5 **feet** Range of Depths: **1-7 ft**
Percent of evaluation area under inundation: **42.5%**
Depth at emergent vegetation-open water boundary: **Varies - 0 to 2 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.):
Dried algal mats

Groundwater Monitoring Wells: **Present - monitored on 8/13/09**
Record depth of water below ground surface (in feet):

Well Number	Depth	Well Number	Depth	Well Number	Depth
8/13/09 #1	2.38 ft				
8/13/09 #2	Locked				
8/13/09 #3	1.66 ft				

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

COMMENTS / PROBLEMS:
Water levels at site on 8/13/2009 were the highest observed to date.

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. 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%
Scirpus pungens	3 = 11-20%		

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 2009. Evolved into Community Number 10 in 2007.**

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 2009. Evolved into Community number 11 in 2007.**

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	1 = 1-5%		

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, 2008, or 2009.**

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 Type 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: **Was a new community in 2007, but not obs. in 2008. Site was classified as Community Type 3 in 2005 and 2006 and reverted to that community type in 2008 and 2009.**

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, but not observed in 2008 or 2009.**

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

Comments / Problems: <u>Total number of species observed = 74 (excluding planted shrubs). Application of herbicides on knapweed and Canada thistle has been effective at controlling these noxious weeds on the site. Continued weed management is recommended.</u>

PLANTED WOODY VEGETATION SURVIVAL

Plant Species	Number Originally Planted	Live Number Predicted*	Mortality Causes
Elaeagnus commutata	50	10	Mortality assumed to be primarily due to lack of water.
Juniperus scopulorum	50	49	Mortality assumed to be primarily due to lack of water.
Populus deltoides	50	22	Mortality assumed to be primarily due to lack of water.
Prunus virginiana	100	55	Mortality assumed to be primarily due to lack of water.
Ribes aureum	100	40	Mortality assumed to be primarily due to lack of water.
Rosa woodsii	100	18	Mortality assumed to be primarily due to lack of water.
Shepherdia argentea	100	0	Mortality assumed to be primarily due to lack of water.

Comments / Problems: Many of the deer protector meshes inhibiting growth in previous years were removed by MDT in 2009. Small rodent girdling also observed.

*Twenty of the 30 planting sites were visited. At each planting site the numbers of live plants observed were counted by species. Percent survival for each species was calculated based on this representative sample. Each species-specific percent survival was then multiplied by the total number of a shrub species known to have been planted at Wagner Marsh to end up with a predicted number of a shrub species still alive. This representative sampling approach was used to save time during monitoring.

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 and whitetail deer	5	☐	☐	☐	
Voles	3	☐	☐	☐	
Cottontail	3	☐	☐	☐	
N. leopard Frog	2	☐	☐	☐	
Garter snake	1	☐	☐	☐	
		☐	☐	☐	
		☐	☐	☐	
		☐	☐	☐	

Additional Activities Checklist:
Yes Macroinvertebrate Sampling (if required)

Comments / Problems: Numerous adult damselflies and adult dragonflies observed during August site visit, many more than in previous monitoring years.

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: **All GPS data listed above had been collected in previous years. The wetland boundaries were verified and modified where appropriate with a GPS or on the 2009 aerial photo.**

WETLAND DELINEATION

(attach COE delineation forms)

At each site conduct these checklist items:

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

Comments / Problems: _____

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: **8/13/2009** Examiner: **R. McEldowney (PBS&J)**
Transect Number: **1** Approximate Transect Length: **530 feet** Compass Direction from Start: **70˚** Note: _____

Vegetation Type A: **Mixed graminoids**

Length of transect in this type: 24 feet (inundated ~3 in)

Plant Species	Cover
CARLAN	5 = > 50%
TYPLAT	1 = 1-5%
GLYGRA	1 = 1-5%
JUNBAL	1 = 1-5%
CARNEB	1 = 1-5%
ASCSPE	+ = < 1%
Oenthera sp.	+ = < 1%
SCIPUN, SCIACU	+ = < 1%
ELEPAL	1 = 1-5%
JUNTOR	+ = < 1%
MENARV	1 = 1-5%
Total Vegetative Cover:	98%

Vegetation Type B: **Eleocharis palustris-Typha sp./Mixed graminoids**

Length of transect in this type: 26 feet (inundated 6-12 in)

Plant Species	Cover
TYPLAT	3 = 11-20%
ELEPAL	4 = 21-50%
CARLAN	1 = 1-5%
CARNEB	+ = < 1%
SCIPUN	1 = 1-5%
JUNTOR	+ = < 1%
ASCSPE	1 = 1-5%
SONARV	+ = < 1%
ELEANG	1 = 1-5%
SALAMY	1 = 1-5%
Total Vegetative Cover:	66%

Vegetation Type C: **Eleocharis palustris-Typha sp./Mixed graminoids**

Length of transect in this type: 31 feet (inundated 6-16 in)

Plant Species	Cover
SALAMY	1 = 1-5%
SCIPUN	2 = 6-10%
ELEPAL	1 = 1-5%
Solidago sp.	1 = 1-5%
JUNTOR	+ = < 1%
CARLAN	1 = 1-5%
SALEXI, Salix sp.	+ = < 1%
JUNBAL	1 = 1-5%
SCIACU, CIRARV, TYPANG	1 = 1-5%
Total Vegetative Cover:	35%

Vegetation Type D: **Eleocharis palustris-Typha sp./Mixed graminoids**

Length of transect in this type: 68 feet (inundated ~16 in)

Plant Species	Cover
ELEPAL	4 = 21-50%
SCIACU	1 = 1-5%
SCIPUN	2 = 6-10%
Total Vegetative Cover:	38%

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **Wagner Marsh** Date: **August 13, 2009** Examiner: **R. McEldowney (PBS&J)**
Transect Number: **1** Approximate Transect Length: **530 feet** Compass Direction from Start: **70˚** Note: _____

Vegetation Type E**: Open water (sparse veg)**	
Length of transect in this type: 100 feet (inundated ~24 in)	
Plant Species	**Cover**
SCIPUN	1 = 1-5%
SCIACU	1 = 1-5%
	1 = 1-5%
Aquatic veg cover (not included in total cover)	5 = > 50%
Total Vegetative Cover:	2%

Vegetation Type F**: Eleocharis palustris-Typha sp./Mixed graminoids**	
Length of transect in this type: 191 feet (inundated 18-24 in)	
Plant Species	**Cover**
TYPLAT	1 = 1-5%
SCIPUN	1 = 1-5%
SCIACU	1 = 1-5%
ELEPAL	1 = 1-5%
JUNTOR	1 = 1-5%
Aquatic veg cover (not included in total cover)	5 = > 50%
Total Vegetative Cover:	15%

Vegetation Type G: **Open water (sparse veg)**	
Length of transect in this type: 82 feet (inundated > 24 in)	
Plant Species	**Cover**
Aquatic veg cover (not included in total cover)	4 = 21-50%
Total Vegetative Cover:	0%

Vegetation Type H: **Eleocharis palustris-Typha sp./Mixed graminoids**	
Length of transect in this type: 8 feet (inundated ~ 18 in)	
Plant Species	**Cover**
SCIACU	3 = 11-20%
ELEPAL	3 = 11-20%
TYPLAT	1 = 1-5%
END OF TRANSECT	
Total Vegetative Cover:	40%

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: **Based on waterlines, water levels were slightly deeper earlier in the summer and is likely at least partially the cause of the shift in species composition and percent cover in some portions of the transect.**

BIRD SURVEY – FIELD DATA SHEET

Site: **Wagner** Date: 5/22 & 5/31/2009
Survey Time: **am** to **PM**

Bird Species	#	Behavior	Habitat	Bird Species	#	Behavior	Habitat
Great Blue Heron	1	F	MA AB	RW Blackbirds	7		
Canada Goose	15	L	MA	YH Blackbirds	6		
Killdeer	15	N	MA MF	Am. Robin	1	N	
Mallard	30		MA	Vesper Sparrow	2		
Blue Winged Teal	1	L	MA SS	W. Meadowlark	3		
Green winged teal	14	L	UP				
Am. Wigeon	5						
Northern Shovellers	10						
Wilson's Phalarope	8			Above Data: 5/22 & 5/31/2009			
Spotted Sandpiper	4						
Barn Swallows	8						
Tree Swallows	6						
Ring-necked Pheasant	4						

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:

Notes: Notes from site visits on 5/22 and 5/31/2009 by Larry Urban, MDT wetland mitigation specialist.

BIRD SURVEY – FIELD DATA SHEET

Site: **Wagner** Date: 8/13/2009
Survey Time: **9 am** to **4 PM**

Bird Species	#	Behavior	Habitat	Bird Species	#	Behavior	Habitat
Sandhill cranes	1	F	MA				
Canada Goose	18	L	MA				
Killdeer	6	F	MA MF				
Mallard	22	F L	MA				
Redwing Blackbirds	1	L	MA SS				
Ring-necked Pheasant	14	L	UP				
Mourning dove	1	L	UP				
Above data: 8/13/2009				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: **80+ degrees, clear, breezy**

Notes:

BIRD SURVEY – FIELD DATA SHEET

Site: **Wagner Marsh** Date: **10/13/09**
Survey Time: **7:45 am** to **9:30 am**

Bird Species	#	Behavior	Habitat	Bird Species	#	Behavior	Habitat
Canada Goose	7	FO					
Mallard	172	F	OW AB MA				
N. Harrier	2	F L	MA UP				
Brewer's Blackbirds	15	F	UP				
Ring-necked Pheasant	12	F	UP				
Sandhill Cranes	1	FO					
Common Snipe	6	F	MA MF				
American Crow	3	FO					
Magpie	1	L	UP				
N. Flicker	1	F	SS				
Mourning Dove	22	F	UP				
Am. Robin	2	F	SS				
			SS				

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: **Overcast, light breeze, 25 degrees F.**

Notes: **Sunrise occurred at approximately 7:28 am.**

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

Project/Site:	Wagner Marsh – Billings, MT			Date:	8/13/2009
Applicant/Owner:	Montana Department of Transportation			County:	Yellowstone
Investigator:	PBS&J (McEldowney)			State:	MT
Do Normal Circumstances exist on the site:		Yes	X No	Community ID:	
Is the site significantly disturbed (Atypical Situation)?	X	Yes	No	Transect ID:	
Is the area a potential Problem Area?:		Yes	X No	Plot ID:	SP-1
(If needed, explain on reverse.)					

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	TYPLAT	H	OBL	9			
2	TYPANG	H	OBL	10			
3	AGRREP	H	FACU	11			
4				12			
5				13			
6				14			
7				15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-). 2/3 = 67%

Remarks: Area was disturbed from construction of mitigation site in 2005. Other species that are present but not dominant include ELEPAL, BECSYZ, HORJUB, SCIACU, and JUNTOR.

HYDROLOGY

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

No Recorded Data Available

Field Observations:

Depth of Surface Water: 12 (in.)

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

Depth to Saturated Soil: 0 (in.)

Wetland Hydrology Indicators:

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

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

Remarks:
Site was inundated to a depth of 12 inches during the site visit.

SOILS

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

Drainage Class: Well drained

Taxonomy (Subgroup): Loamy-skeletal, mixed, superactive, mesic Ustic Calciargids

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.
0-0.5	1	N 2.5/0			Silty clay
0.5 - 5	2	10YR 5/2	5YR 3/4	Abundant, prominent	Clay

Hydric Soil Indicators:

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

Remarks: Site was disturbed by wetland mitigation construction in 2005. Unable to dig below 5 inches due to cobbles. Horizon 2 also has seams/pores black in color, indicating a reducing environment. Sample point was inundated with 12 inches of water during sampling.

WETLAND DETERMINATION

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

Remarks:

Wetland sample point. Site is dominated by cattails, was inundated, and has several hydric soil indicators.

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

Project/Site:	Wagner Marsh – Billings, MT	Date:	8/13/2009
Applicant/Owner:	Montana Department of Transportation	County:	Yellowstone
Investigator:	PBS&J (McEldowney)	State:	MT

Do Normal Circumstances exist on the site:		Yes	X	No	Community ID:
Is the site significantly disturbed (Atypical Situation)?	X	Yes		No	Transect ID:
Is the area a potential Problem Area?:		Yes	X	No	Plot ID: SP-2
(If needed, explain on reverse.)					

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	AGRREP	H	FACU	9			
2	PASSMI	H	FACU	10			
3	BROTEC	H	NL	11			
4				12			
5				13			
6				14			
7				15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-). 0/3 = 0%

Remarks: Area was disturbed from construction of mitigation site in 2005. NL = not listed, assumed to be upland species.

HYDROLOGY

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

No Recorded Data Available

Field Observations:

Depth of Surface Water: -- (in.)

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

Depth to Saturated Soil: 0 (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- Inundated
- X 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:
Site appears to have been inundated briefly earlier in the summer, but does not have strong indications of wetland hydrology.

SOILS

Map Unit Name (Series and Phase): Le- Larim loam, 0-4% slopes
Drainage Class: Well drained
Field Observations
Taxonomy (Subgroup): Loamy-skeletal, mixed, superactive, mesic Ustic Calciargids
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.
0-7	1	10YR 5/2	--	--	Clay

Hydric Soil Indicators:

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

Remarks:
No hydric soil indicators observed. Soil was saturated to the surface. Could not dig below 7 inches due to cobbles.

WETLAND DETERMINATION

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

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

Remarks: The site was disturbed by mitigation construction in 2005. Site lacks dominance by hydrophytic vegetation and does not exhibit hydric soil indicators. Site hydrology is in flux. Though this area was saturated during the site visit, it appears to have been saturated relatively briefly because there was no hydrophytic vegetation or hydric soil indicators.

MDT MONTANA WETLAND ASSESSMENT FORM (revised March 2008)

1. Project Name: Wagner Marsh Wetland Mitigation Site **2. MDT Project #:** _____ **3. Control #:** _____

3. Evaluation Date: 8/13/2009 **4. Evaluator(s):** RRM (PBS&J) **5. Wetland/Site #(s):** Wagner Marsh

6. Wetland Location(s): Township 1 S, Range 25 E, Section 28; Township ___ N, Range ___ E, Section _____

Approximate Stationing or Roadposts: _____

Watershed: 13 - Upper Yellowstone **County:** _ _ Yellowstone _____

7. Evaluating Agency: PBS&J

Purpose of Evaluation:

- ☐ **Wetland potentially affected by MDT project**
- ☐ **Mitigation wetlands; pre-construction**
- ☒ **Mitigation wetlands; post-construction**
- ☐ **Other** _____

8. Wetland Size (acre): _____ (visually estimated)
8.32 (measured, e.g. GPS)

9. Assessment Area (AA) Size (acre): _____ (visually estimated)
(see manual for determining AA) 16.58 (measured, e.g. GPS)

10. CLASSIFICATION OF WETLAND AND AQUATIC HABITATS IN AA (See manual for definitions.)

HGM Class (Brinson)	Class (Cowardin)	Modifier (Cowardin)	Water Regime	% OF AA
Depressional	Emergent Wetland	Excavated	Seasonal / Intermittent	37
Depressional	Aquatic Bed	Excavated	Permanent / Perennial	20
Depressional	Scrub-Shrub Wetland	Excavated	Seasonal / Intermittent	13
Depressional	Unconsolidated Bottom	Excavated	Permanent / Perennial	30

Comments: A mitigation site created in an old MDT gravel pit.

11. ESTIMATED RELATIVE ABUNDANCE (of similarly classified sites within the same Major Montana Watershed Basin; see manual.)
abundant

12. GENERAL CONDITION OF AA

i. Disturbance: Use matrix below to select the appropriate response; see manual for Montana listed noxious weed and aquatic nuisance vegetation species lists.

Conditions within AA	Predominant Conditions Adjacent to (within 500 feet of) AA		
	Managed in predominantly natural state; is not grazed, hayed, logged, or otherwise converted; does not contain roads or buildings; and noxious weed or ANVS cover is ≤15%.	Land not cultivated, but may be moderately grazed or hayed or selectively logged; or has been subject to minor clearing; contains few roads or buildings; noxious weed or ANVS cover is ≤30%.	Land cultivated or heavily grazed or logged; subject to substantial fill placement, grading, clearing, or hydrological alteration; high road or building density; or noxious weed or ANVS cover is >30%.
AA occurs and is managed in predominantly natural state; is not grazed, hayed, logged, or otherwise converted; does not contain roads or occupied buildings; and noxious weed or ANVS cover is ≤15%.	---	---	moderate disturbance
AA not cultivated, but may be moderately grazed or hayed or selectively logged; or has been subject to relatively minor clearing, fill placement, or hydrological alteration; contains few roads or buildings; noxious weed or ANVS cover is ≤30%.	---	---	---
AA cultivated or heavily grazed or logged; subject to relatively substantial fill placement, grading, clearing, or hydrological alteration; high road or building density; or noxious weed or ANVS cover is >30%.	---	---	---

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 mitigaiton site the disturbance has ceased. No further disturbances are expected onsite. Immediately west of the site a new gravel pit has been constructed by a private company.

ii. Prominent noxious, aquatic nuisance, and other exotic vegetation species: Some Russian olive occurs scattered around the site. Salt cedar does occur, but is being managed effectively and is becoming less and less. Some limited amounts of Canada thistle occurs in wetland areas; spotted knapweed is being controlled in the upl;ands. Japanese brome and cheatgrass occur in upland areas.

iii. Provide brief descriptive summary of AA and surrounding land use/habitat: AA is an old gravel pit converted into a wetland complex. Hydrology of the site is being augmented by pumping water from the gravel pit on the west side of S. 56th St. W. onto the site at two locations. Surrounding land has a rolling topography and land use is predominantly agricultural - hay and livestock production.

13. STRUCTURAL DIVERSITY (Based on number of "Cowardin" ***vegetated*** classes present [do not include unvegetated classes]; see #10 above.)

Existing # of "Cowardin" Vegetated Classes in AA	Initial Rating	Is current management preventing (passive) existence of additional vegetated classes?		Modified Rating
≥3 (or 2 if one is forested) classes	high	NA	NA	NA
2 (or 1 if forested) classes	---	NA	NA	NA
1 class, but not a monoculture	---	←NO	YES→	---
1 class, monoculture (1 species comprises ≥90% of total cover)	---	NA	NA	NA

Comments: PSS, PEM, PAB. Some scattered cottonwoods.

Wetland/Site #(s): Wagner Marsh

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

i. AA is Documented (D) or Suspected (S) to contain: Check box based on definitions in manual.

Primary or critical habitat (**list species**) ☐ D ☐ S _____
Secondary habitat (**list species**) ☐ D ☐ S _____
Incidental habitat (**list species**) ☐ D ☐ S _____
No usable habitat ☒ S

ii. Rating: Based on the strongest habitat chosen in 14A(i) above, select the corresponding functional point and rating.

Highest Habitat Level	Doc/Primary	Sus/Primary	Doc/Secondary	Sus/Secondary	Doc/Incidental	Sus/Incidental	None
Functional Point/Rating	---	---	---	---	---	---	0L

Sources for documented use (e.g. observations, records): Only the black footed ferret and whooping crane are listed by USFWS (9/2009) as potentially occurring in Yellowstone County.

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

i. AA is Documented (D) or Suspected (S) to contain: Check box based on definitions in manual.

Primary or critical habitat (**list species**) ☐ D ☐ S _____
Secondary habitat (**list species**) ☒ D ☐ S Sandhill crane (S2N), N. leopard frog (S1), migrating raptors
Incidental habitat (**list species**) ☐ D ☐ S _____
No usable habitat ☐ S

ii. Rating: Based on the strongest habitat chosen in 14A(i) above, select the corresponding functional point and rating.

Highest Habitat Level	Doc/Primary	Sus/Primary	Doc/Secondary	Sus/Secondary	Doc/Incidental	Sus/Incidental	None
S1 Species Functional Point/Rating	---	---	.7M	---	---	---	---
S2 and S3 Species Functional Point/Rating	---	---	---	---	---	---	---

Sources for documented use (e.g. observations, records): Observed during site visits enough to believe that sandhill cranes are using the site regularly. Northern leopard frogs observed onsite for the first time in 2009; if they are present in 2010 then rating should move to Doc/Primary.

14C. GENERAL WILDLIFE HABITAT RATING

i. Evidence of Overall Wildlife Use in the AA: Check substantial, moderate, or low based on supporting evidence.

☒ ***Substantial:*** Based on any of the following [check].
- ☒ 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
- ☐ interview with local biologist with knowledge of the AA

☐ ***Minimal:*** Based on any of the following [check].
- ☐ few or no wildlife observations during peak use periods
- ☐ little to no wildlife sign
- ☐ sparse adjacent upland food sources
- ☐ interview with local biologist with knowledge of AA

☐ ***Moderate:*** Based on any of the following [check].
- ☐ 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
- ☐ interview with local biologist with knowledge of the AA

ii. Wildlife Habitat Features: Working from top to bottom, check appropriate AA attributes in matrix to arrive at rating. Structural diversity is from #13. For class cover to be considered evenly distributed, the most and least prevalent **vegetated** classes must be within 20% of each other in terms of their percent composition of the AA (see #10). Abbreviations for surface water durations are as follows: P/P = permanent/perennial; S/I = seasonal/intermittent; T/E = temporary/ephemeral; and A = absent [see manual for further definitions of these terms].

Structural Diversity (see #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 #12i)	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
☐ **Moderate Disturbance** at AA (see #12i)	---	---	---	---	H	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
☐ **High Disturbance** at AA (see #12i)	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

iii. Rating: Use the conclusions from i and ii above and the matrix below to select the functional point and rating.

Evidence of Wildlife Use (i)	Wildlife Habitat Features Rating (ii)			
	☐ **Exceptional**	☒ **High**	☐ **Moderate**	☐ **Low**
☒ **Substantial**	---	.9H	---	---
☐ **Moderate**	---	---	---	---
☐ **Minimal**	---	---	---	---

Comments: Site is well used by migrating waterfowl, upland game birds, deer, and moderate to small-sized mammals..

Wetland/Site #(s): Wagner Marsh

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

If the AA is not used by fish, fish use is not restorable due to habitat constraints, or is not desired from a management perspective [such as fish entrapped in a canal], then check the NA box and proceed to 14E.

Assess this function if the AA is used by fish or the existing situation is "correctable" such that the AA could be used by fish [i.e., fish use is precluded by perched culvert or other barrier].

Type of Fishery: ☐ Cold Water (**CW**) ☐ Warm Water (**WW**) **Use the CW or WW guidelines in the manual to complete the matrix.**

i. Habitat Quality and Known / Suspected Fish Species in AA: Use matrix to select the functional point and rating.

Duration of Surface Water in AA	☐ **Permanent / Perennial**						☐ **Seasonal / Intermittent**						☐ **Temporary / Ephemeral**					
Aquatic Hiding / Resting / Escape Cover	☐ **Optimal**		☐ **Adequate**		☐ **Poor**		☐ **Optimal**		☐ **Adequate**		☐ **Poor**		☐ **Optimal**		☐ **Adequate**		☐ **Poor**	
Thermal Cover: optimal / suboptimal	**O**	**S**	**O**	**S**	**O**	**S**	**O**	**S**	**O**	**S**	**O**	**S**	**O**	**S**	**O**	**S**	**O**	**S**
FWP Tier I fish species	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
FWP Tier II or **Native Game** fish species	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
FWP Tier III or **Introduced Game** fish	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
FWP Non-Game Tier IV or **No** fish species	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Sources used for identifying fish spp. potentially found in AA: _____

ii. Modified Rating: NOTE: Modified score cannot exceed 1.0 or be less than 0.1.

a) Is fish use of the AA significantly reduced by a culvert, dike, or other man-made structure or activity, ***or*** *is the waterbody included on the current final MDEQ list of waterbodies in need of TMDL development with listed "Probable Impaired Uses" including cold or warm water fishery or aquatic life support,* ***or*** *do aquatic nuisance plant or animal species (see* ***Appendix E****) occur in fish habitat?* ☐ **YES**, reduce score in **i** by 0.1 = __ or ☐ **N0**

b) Does the AA contain a documented spawning area or other critical habitat feature (i.e., sanctuary pool, upwelling area; specify in comments) for native fish or introduced game fish? ☐ **YES**, add to score in **i** or **iia** 0.1 = __ or ☐ **N0**

iii. Final Score and Rating: _ **Comments:** Though the Biological Resources Rpt states that black-nosed dace and carp can be found within the ponds no fish have been observed during site visits in 2005, 2006, 2007, 2008, or 2009 and no surface inlet or outlet exists. The ponds are relaitvely shallow and so provide poor overwintering habitat for fish.

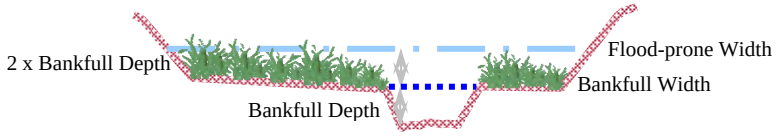
14E. FLOOD ATTENUATION ☒ **NA** (proceed to 14F)

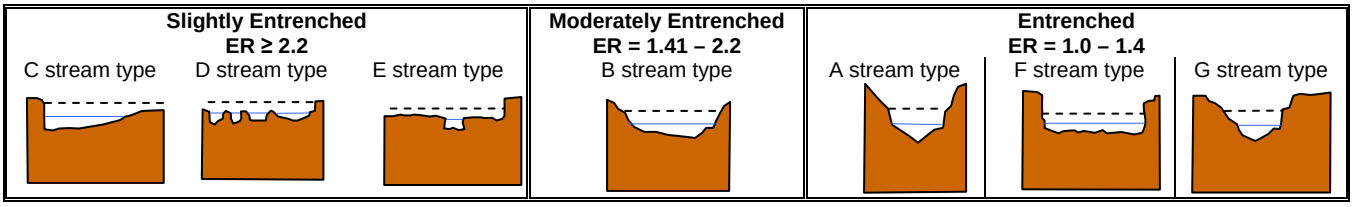
Applies only to wetlands that are subject to flooding via in-channel or overbank flow.
If wetlands in AA are not flooded from in-channel or overbank flow, check the NA box and proceed to 14F.

Entrenchment Ratio (ER) Estimation (see manual for additional guidance). Entrenchment ratio = (flood-prone width) / (bankfull width).
Flood-prone width = estimated horizontal projection of where 2 X maximum bankfull depth elevation intersects the floodplain on each side of the stream.

_____ / _____ = _____

flood prone width / bankfull width = entrenchment ratio





i. Rating: Working from top to bottom, use the matrix below to select the functional point and rating.

Estimated or Calculated Entrenchment (Rosgen 1994, 1996)	☐ Slightly Entrenched C, D, E stream types			☐ Moderately Entrenched B stream type			☐ Entrenched A, F, G stream types		
Percent of Flooded Wetland Classified as Forested and/or Scrub/Shrub	☐ 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 ≥10 acres of wetland in the AA subject to flooding AND are man-made features which may be significantly damaged by floods located within 0.5 mile downstream of the AA? ☐ YES ☐ NO **Comments:** _____

Wetland/Site #(s): Wagner Marsh

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 the NA box and proceed to 14G.

i. Rating: Working from top to bottom, use the matrix below to select the functional point and rating. Abbreviations for surface water durations are as follows: P/P = permanent/perennial; S/I = seasonal/intermittent; and T/E = temporary/ephemeral [see manual for further definitions of these terms].

Estimated Maximum Acre Feet of Water Contained in Wetlands within the AA that are Subject to Periodic Flooding or Ponding	☒ **>5 acre feet**			☐ **1.1 to 5 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**	1H	---	---	---	---	---	---	---	---
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 wetland with potential to receive 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 the NA box and proceed to 14H.

i. Rating: Working from top to bottom, use the matrix below to select the functional point and rating.

Sediment, Nutrient, and Toxicant Input Levels within AA	**AA receives or surrounding land use has potential to deliver sediments, nutrients, or compounds at levels such that other functions are not substantially impaired. Minor sedimentation, sources of nutrients or toxicants, or signs of eutrophication present.**				**Waterbody is 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 / Ponding in AA	☐ **Yes**	☐ **No**	☒ **Yes**	☐ **No**	☐ **Yes**	☐ **No**	☐ **Yes**	☐ **No**
AA contains **no or restricted outlet**	---	---	.7M	---	---	---	---	---
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 which is subject to wave action.
If 14H does not apply, check the NA box and proceed to 14I.

% Cover of Wetland Streambank or Shoreline by Species with Stability Ratings of ≥6 (see Appendix F).	**Duration of Surface Water Adjacent to Rooted Vegetation**		
	☒ **Permanent / Perennial**	☐ **Seasonal / Intermittent**	☐ **Temporary / Ephemeral**
☒ **≥ 65%**	1H	---	---
☐ **35-64%**	---	---	---
☐ **< 35%**	---	---	---

Comments: Shoreline vegetation is generally well established and continues to become established in areas where cover is more scarce. Cottonwood and willow seedlings observed at high water marks in 2009.

14I. PRODUCTION EXPORT / FOOD CHAIN SUPPORT

i. Level of Biological Activity: Synthesis of wildlife and fish habitat rates (select).

General Fish Habitat Rating (14Diii)	**General Wildlife Habitat Rating (14Ciii)**		
	☒ **E/H**	☐ **M**	☐ **L**
☐ **E/H**	---	---	---
☐ **M**	---	---	---
☐ **L**	---	---	---
☒ **NA**	H	---	---

ii. Rating: Working from top to bottom, use the matrix below to select the functional point and rating. Factor A = acreage of vegetated wetland component in the AA; Factor B = level of biological activity rating from above (14Ii); Factor C = whether or not the AA contains a surface or subsurface outlet; the final three rows pertain to the duration of surface water in the AA, where P/P, S/I, and T/E were previously defined, and A = "absent" [see manual for further definitions of these terms].

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	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**
P/P	---	.7M	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
S/I	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
T/E/A	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Wetland/Site #(s): Wagner Marsh

14I. PRODUCTION EXPORT / FOOD CHAIN SUPPORT (continued)

iii. Modified Rating: Note: Modified score cannot exceed 1.0 or be less than 0.1.

Vegetated Upland Buffer: Area with ≥ 30% plant cover, ≤ 15% noxious weed or ANVS cover, AND that is not subjected to periodic mechanical mowing or clearing (unless for weed control).
Is there an average ≥ 50-foot wide vegetated upland buffer around ≥ 75% of the AA's perimeter? ☒ **YES**, add 0.1 to score in **ii** = 0.80 ☐ **NO**

iv. Final Score and Rating: .8H **Comments:** _____

14J. GROUNDWATER DISCHARGE / RECHARGE
Check the appropriate indicators in i and ii below.

i. Discharge Indicators
- ☐ The AA is a slope wetland.
- ☐ Springs or seeps 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.
- ☐ Shallow water table and the site is saturated to the surface.
- ☐ Other: _____

ii. Recharge Indicators
- ☐ Permeable substrate present without underlying impeding layer.
- ☐ Wetland contains inlet but no outlet.
- ☐ Stream is a known 'losing' stream. Discharge volume decreases.
- ☐ Other: _____

iii. Rating: Use the information from i and ii above and the table below to select the functional point and rating.

Criteria	Duration of Saturation at AA Wetlands ***FROM GROUNDWATER DISCHARGE*** or ***WITH WATER THAT IS RECHARGING THE GROUNDWATER SYSTEM*** ☒ **P/P**	☐ **S/I**	☐ **T**	☐ **None**
☒ **Groundwater Discharge or Recharge**	1H	---	---	---
☐ **Insufficient Data/Information**	---			

Comments: _____

14K. UNIQUENESS

i. Rating: Working from top to bottom, use the matrix below to select the functional point and rating.

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 (#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: Used "low disturbance" because the site itself has a low level of disturbance and three of the four sides surrounding the site are relatively undisturbed. It also has a substantial buffer between the wetlands and the road and gravel pit on its west side.

14L. RECREATION / EDUCATION POTENTIAL ☐ NA (proceed to Overall Summary and Rating page)
Affords 'bonus' points if AA provides a recreational or educational opportunity.

i. Is the AA a known or potential recreational or educational site? ☒ **YES**, go to ii. ☐ **NO**, check the NA box.

ii. Check categories that apply to the AA: ☒ Educational/Scientific Study ☐ Consumptive Recreational ☐ Non-consumptive recreational ☐ Other: _____

iii. Rating: Use the matrix below to select the functional point and rating.

Known or Potential Recreational or Educational Area	**Known**	**Potential**
Public ownership or public easement with general public access (no permission required)	---	---
Private ownership with general public access (no permission required)	---	---
Private or public ownership without general public access, or requiring permission for public access	.1M	---

Comments: The site receives educational use through the WJH Bird Facility that is north-adjacent to the mitigation area. Site is also used by Audubon Society for bird counts.

15. GENERAL SITE NOTES: _____

Wetland/Site #(s): Wagner Marsh

Function & Value Variables	Rating – Actual Functional Points	Possible Functional Points	Functional Units: Actual Points x Estimated AA Acreage	Indicate the Four Most Prominent Functions with an Asterisk
A. Listed / Proposed T&E Species Habitat	low 0.00	1.00	0	
B. MT Natural Heritage Program Species Habitat	mod 0.70	1.00	11.61	
C. General Wildlife Habitat	high 0.90	1.00	14.92	*
D. General Fish Habitat	NA	---		
E. Flood Attenuation	NA	---		
F. Short and Long Term Surface Water Storage	high 1.00	1.00	16.58	*
G. Sediment / Nutrient / Toxicant Removal	mod 0.70	1.00	11.61	
H. Sediment / Shoreline Stabilization	high 1.00	1.00	16.58	
I. Production Export / Food Chain Support	high 0.80	1.00	13.26	*
J. Groundwater Discharge / Recharge	high 1.00	1.00	16.58	
K. Uniqueness	mod 0.50	1.00	8.29	
L. Recreation / Education Potential (bonus point)	mod 0.10		1.66	*
Total Points	**6.7**	**9**	**111 Total Functional Units**	
Percent of Possible Score 74% (round to nearest whole number)				

Category I Wetland: (must satisfy **one** of the following criteria; otherwise go 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 possible score > 80% (round to nearest whole #).

Category II Wetland: (Criteria for Category I not satisfied **and** meets any **one** of the following criteria; otherwise go to Category IV)
- ☐ Score of 1 functional point for MT Natural Heritage Program Species Habitat; **or**
- ☒ Score of .9 or 1 functional point for General Wildlife Habitat; **or**
- ☐ Score of .9 or 1 functional point for General Fish 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 possible score > 65% (round to nearest whole #).

☐ **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 go to Category III)
- ☐ "Low" rating for Uniqueness; **and**
- ☐ Vegetated wetland component < 1 acre (do not include upland vegetated buffer); **and**
- ☐ Percent of possible score < 35% (round to nearest whole #).

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

☐ **I** ☒ **II** ☐ **III** ☐ **IV**

Appendix C

2009 REPRESENTATIVE PHOTOGRAPHS

MDT Wetland Mitigation Monitoring
Wagner Marsh
Billings, Montana

Wagner Marsh Wetland Mitigation Site 2009



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 2009



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 2009



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



Wetland Sample Point 1. Shovel is at sample pt.



Wetland Sample Point 2. Shovel is at sample point.

Wagner Marsh Wetland Mitigation Site 2009

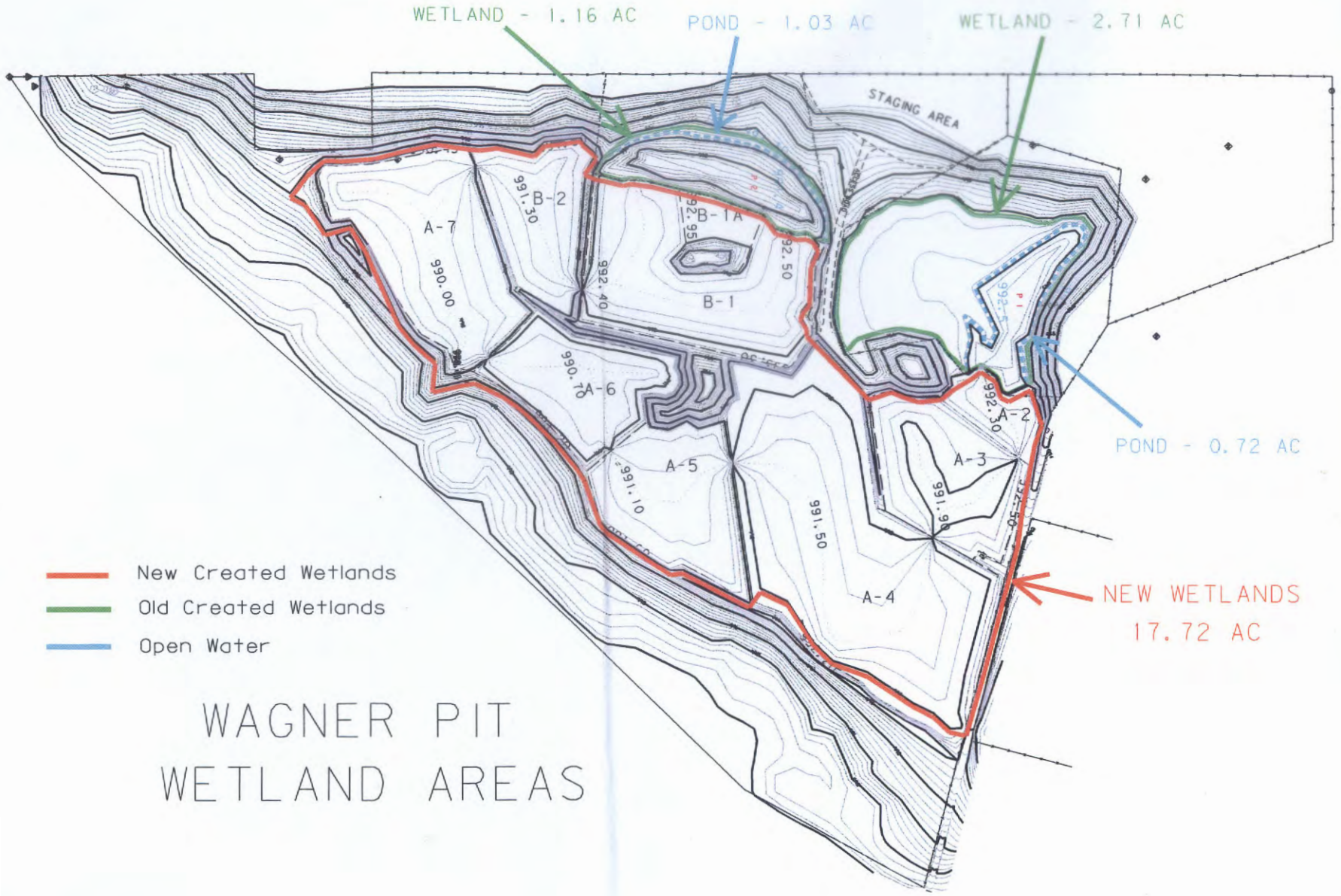


2009 macro-invertebrate sampling location

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
990.00
991.30
B-2
992.40
B-1A
992.95
B-1
992.50
990.70
A-6
A-5
991.10
991.50
A-4
992.30
A-2
A-3
991.90
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 Trimble GEO III GPS unit was also used for some sites in 2007.

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 and 2008 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

2009 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 – 2009

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

INTRODUCTION

This report summarizes data generated from eight years of mitigated wetland monitoring from sites throughout the State of Montana. A total of 229 invertebrate samples have been collected over the study period. Table 1 lists the currently monitored sites at which aquatic invertebrates were collected in 2009, and summarizes the sampling history of each.

METHODS

Sampling and Sample Processing

Aquatic invertebrate samples were collected at mitigated wetland sites in the summer months of 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, and 2009 by personnel of PBS&J. Sampling procedures were based on the protocols developed by the Montana Department of Environmental Quality (MDEQ) 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.

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 for this report. 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, “good” 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 good, 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 between 2001 and 2007. Data from a total of 167 sites were used to develop criteria.

Six 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 2008, the lotic sites were Camp Creek (2 sites), Cloud Ranch stream, Jack Creek – McKee Spring, and Jocko Spring Creek (2 sites). 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 (MVFP index: 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 bioassessment index used in this report may not be universally applicable to all wetland types, and in particular, to constructed wetlands. Scores and impairment classifications derived from the index may not be valid indications of impairment or non-impairment. In addition, 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 (Hilsenhoff Biotic Index [HBI] 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 2009 samples are given in Tables 4a-4c and 5. Thermal preference of invertebrate assemblages was calculated using 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 are 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 sites sampled in 2009 are included. An asterisk indicates lotic sites.

Site identifier	2002	2003	2004	2005	2006	2007	2008	2009
Camp Creek MS-1*	+	+	+	+	+	+	+	+
Camp Creek MS-2*					+	+	+	+
Cloud Ranch Pond			+	+	+	+	+	+
Cloud Ranch Stream (Big Timber)*			+			+	+	+
Jack Creek – McKee Spring Creek*					+	+	+	+
Jack Creek – pond			+	+	+	+	+	+
Rock Creek Ranch				+	+	+	+	+
Wagner Marsh				+	+	+	+	+
Alkali Lake 1					+	+	+	+
West Fork of Charley Creek						+	+	+
Little Muddy Creek						+	+	+
Selkirk Ranch						+	+	+
Jocko Spring Creek MS1							+	+
Jocko Spring Creek MS2							+	+
Sportsman's Campground Site #1							+	+
Sportsman's Campground Site #2							+	+
Sportsman's Campground Site #3							+	+
Lonepine #1							+	+
Lonepine #2							+	+

Table 2. Aquatic invertebrate metrics employed for wetland (lentic) invertebrate assemblages in the MDT mitigated wetlands study, 2001 – 2009.

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

RESULTS

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

Table 4a. Metric values and scores for wetland (lentic) sites in the MDT mitigated wetland study – 2009 sampling.

METRIC	Cloud Ranch Pond	Jack Creek Pond	Rock Creek Ranch	Wagner Marsh	Alkali Lake	West Fork of Charley Creek	Little Muddy Creek
Total taxa	15	11	20	18	17	7	18
POET	2	0	2	3	1	0	1
Chironomidae taxa	6	3	3	5	10	2	6
Crustacea + Mollusca	0	5	6	7	1	1	6
% Chironomidae	14.47%	66.67%	43.75%	16.07%	61.00%	2.73%	42.40%
Orthocladiinae/Chir	45.45%	20.00%	57.14%	22.22%	52.46%	0.00%	86.79%
%Amphipoda	0.00%	3.33%	0.00%	1.79%	0.00%	91.82%	4.80%
%Crustacea + %Mollusca	0.00%	23.33%	32.14%	34.82%	1.00%	91.82%	34.40%
HBI	6.026666	9	7.045045	7.981652	6	7.90909	7.448
%Dominant taxon	40.79%	53.33%	23.21%	23.21%	30.00%	91.82%	36.00%
%Collector-Gatherers	21.05%	73.33%	61.61%	43.75%	51.00%	91.82%	37.60%
%Filterers	0.00%	0.00%	7.14%	4.46%	0.00%	0.00%	4.80%
Total taxa	3	1	3	3	3	1	3
POET	1	1	1	3	1	1	1
Chironomidae taxa	3	3	3	3	5	1	3
Crustacea + Mollusca	1	3	5	5	1	1	5
% Chironomidae	5	1	1	5	1	5	1
Orthocladiinae/Chir	5	3	5	3	5	1	5
%Amphipoda	5	5	5	5	5	1	3
%Crustacea + %Mollusca	5	5	5	3	5	1	3
HBI	5	1	3	1	5	1	3
%Dominant taxon	3	1	5	5	5	1	3
%Collector-Gatherers	1	3	3	1	3	5	1
%Filterers	3	3	1	3	3	3	3
Total score	**40**	**30**	**40**	**40**	**42**	**22**	**34**
Percent of maximum score	**66.67%**	**50.00%**	**66.67%**	**66.67%**	**70.00%**	**36.67%**	**56.67%**
Impairment classification	**optimal**	**sub-optimal**	**optimal**	**optimal**	**optimal**	**poor**	**sub-optimal**

Table 4b. Metric values and scores for wetland (lentic) sites in the MDT mitigated wetland study – 2009 sampling.

METRIC	Selkirk Ranch	Sportsman's Campground Site #1	Sportsman's Campground Site #2	Sportsman's Campground Site #3	Lonepine #1	Lonepine #2
Total taxa	17	19	11	23	22	19
POET	1	1	0	2	2	3
Chironomidae taxa	6	10	8	11	11	8
Crustacea + Mollusca	6	4	2	4	4	2
% Chironomidae	27.27%	38.46%	90.00%	41.82%	67.83%	25.86%
Orthocladiinae/Chir	43.33%	37.50%	3.33%	23.91%	7.69%	16.67%
%Amphipoda	5.45%	25.96%	2.00%	4.55%	0.00%	0.00%
%Crustacea + %Mollusca	62.73%	51.92%	5.00%	50.00%	6.96%	18.10%
HBI	8.245455	6.942309	6.9	7.345455	7.196427	7.191304
%Dominant taxon	30.00%	24.04%	45.00%	27.27%	51.30%	15.52%
%Collector-Gatherers	57.27%	50.00%	91.00%	83.64%	86.09%	63.79%
%Filterers	3.64%	25.96%	18.00%	29.09%	1.74%	6.03%
Total taxa	3	3	1	5	5	3
POET	1	1	1	1	1	3
Chironomidae taxa	3	5	5	5	5	5
Crustacea + Mollusca	5	3	1	3	3	1
% Chironomidae	3	3	1	1	1	3
Orthocladiinae/Chir	3	3	1	3	1	1
%Amphipoda	3	1	5	3	5	5
%Crustacea + %Mollusca	3	3	5	3	5	5
HBI	1	3	3	3	3	3
%Dominant taxon	5	5	3	5	1	5
%Collector-Gatherers	3	3	5	5	5	3
%Filterers	3	1	1	1	3	1
Total score	**36**	**34**	**32**	**38**	**38**	**38**
Percent of maximum score	**60.00%**	**56.67%**	**53.33%**	**63.33%**	**63.33%**	**63.33%**
Impairment classification	**sub-optimal**	**sub-optimal**	**sub-optimal**	**sub-optimal**	**sub-optimal**	**sub-optimal**

Table 5. Metric values and scores for stream (lotic) sites in the MDT mitigated wetland study – 2009 sampling.

METRIC	Camp Creek MS-1	Camp Creek MS-2	Cloud Ranch Stream	Jack Creek McKee	Jocko Spring Creek MS-1	Jocko Spring Creek MS-2
E Richness	2	4	1	1	2	1
P Richness	1	0	0	0	0	0
T Richness	2	4	4	1	3	2
Pollution Sensitive Richness	1	1	0	0	1	0
Filterer Percent	11.88%	22.02%	18.18%	25.23%	27.36%	10.91%
Pollution Tolerant Percent	13.86%	12.84%	15.15%	8.41%	12.26%	32.73%
E Richness	1	2	0	0	1	0
P Richness	1	0	0	0	0	0
T Richness	1	2	2	0	2	1
Pollution Sensitive Richness	1	1	0	0	1	0
Filterer Percent	1	1	1	0	0	1
Pollution Tolerant Percent	1	1	1	2	1	1
Total score	**6**	**7**	**4**	**2**	**5**	**3**
Percent of maximum score	**33.33%**	**38.89%**	**22.22%**	**11.11%**	**27.78%**	**16.67%**
Impairment classification	**moderate**	**moderate**	**moderate**	**severe**	**moderate**	**severe**

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Caton, L. W. 1991. Improving subsampling methods for the EPA's "Rapid Bioassessment" benthic protocols. Bulletin of the North American Benthological Society. 8(3): 317-319.

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

Taxa Listing

Project ID: MDT09PBSJ
RAI No.: MDT09PBSJ018

RAI No.: MDT09PBSJ018 **Sta. Name:** Wagner Marsh
Client ID:
Date Coll.: 8/13/2009 **No. Jars:** 1 **STORET ID:**

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Non-Insect							
Cladocera	3	2.68%	Yes	Unknown		8	CF
Copepoda	1	0.89%	Yes	Unknown		8	CG
Ostracoda	7	6.25%	Yes	Unknown		8	CG
Glossiphoniidae							
Glossiphoniidae	1	0.89%	Yes	Immature		9	PR
Hyalellidae							
Hyalella sp.	2	1.79%	Yes	Unknown		8	CG
Lymnaeidae							
Fossaria sp.	1	0.89%	Yes	Unknown		6	SC
Lymnaeidae	2	1.79%	No	Immature		6	SC
Physidae							
Physa sp.	9	8.04%	Yes	Unknown		8	SC
Planorbidae							
Gyraulus sp.	14	12.50%	Yes	Unknown		8	SC
Odonata							
Coenagrionidae							
Coenagrionidae	20	17.86%	No	Larva	Early Instar	7	PR
Enallagma sp.	2	1.79%	Yes	Larva		7	PR
Ephemeroptera							
Baetidae							
Callibaetis sp.	26	23.21%	Yes	Larva		9	CG
Caenidae							
Caenis sp.	4	3.57%	Yes	Larva		7	CG
Heteroptera							
Corixidae							
Hesperocorixa sp.	1	0.89%	Yes	Adult		10	PH
Notonectidae							
Notonecta sp.	1	0.89%	Yes	Adult		5	PR
Chironomidae							
Chironomidae							
Apedilum sp.	3	2.68%	Yes	Larva		11	CG
Cricotopus (Isocladius) sp.	4	3.57%	Yes	Larva		7	SH
Glyptotendipes sp.	1	0.89%	Yes	Larva		10	SH
Micropsectra sp.	1	0.89%	Yes	Larva		4	CG
Parachironomus sp.	7	6.25%	Yes	Larva		10	PR
Tanytarsini	2	1.79%	No	Larva	Damaged	6	CF
Sample Count	**112**						

Metrics Report

Project ID: MDT09PBSJ
RAI No.: MDT09PBSJ018
Sta. Name: Wagner Marsh
Client ID:
STORET ID:
Coll. Date: 8/13/2009

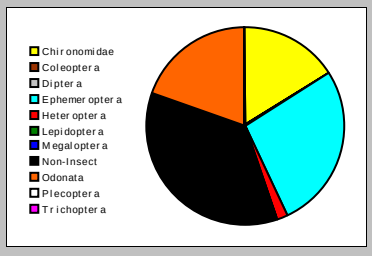
Abundance Measures

Sample Count: 112
Sample Abundance: 3,360.00 3.33% of sample used

Coll. Procedure:
Sample Notes:

Taxonomic Composition

Category	R	A	PRA
Non-Insect	8	40	35.71%
Odonata	1	22	19.64%
Ephemeroptera	2	30	26.79%
Plecoptera			
Heteroptera	2	2	1.79%
Megaloptera			
Trichoptera			
Lepidoptera			
Coleoptera			
Diptera			
Chironomidae	5	18	16.07%

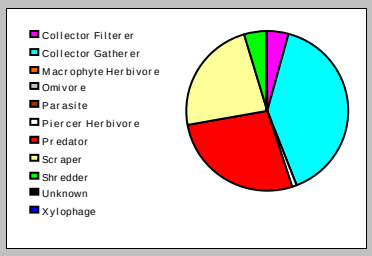


Dominant Taxa

Category	A	PRA
Callibaetis	26	23.21%
Coenagrionidae	20	17.86%
Gyraulus	14	12.50%
Physa	9	8.04%
Parachironomus	7	6.25%
Ostracoda	7	6.25%
Cricotopus (Isocladius)	4	3.57%
Caenis	4	3.57%
Cladocera	3	2.68%
Apedilum	3	2.68%
Tanytarsini	2	1.79%
Lymnaeidae	2	1.79%
Hyalella	2	1.79%
Enallagma	2	1.79%
Micropsectra	1	0.89%

Functional Composition

Category	R	A	PRA
Predator	4	31	27.68%
Parasite			
Collector Gatherer	7	44	39.29%
Collector Filterer	1	5	4.46%
Macrophyte Herbivore			
Piercer Herbivore	1	1	0.89%
Xylophage			
Scraper	3	26	23.21%
Shredder	2	5	4.46%
Omivore			
Unknown			



Metric Values and Scores

Metric	Value	BIBI	MTP	MTV	MTM
Composition					
Taxa Richness	18	1	2		0
Non-Insect Percent	35.71%				
E Richness	2	1		1	
P Richness	0	1		0	
T Richness	0	1		0	
EPT Richness	2		0		0
EPT Percent	26.79%		1		0
Oligochaeta+Hirudinea Percent	0.89%				
Baetidae/Ephemeroptera	0.867				
Hydropsychidae/Trichoptera	0.000				
Dominance					
Dominant Taxon Percent	23.21%		3		3
Dominant Taxa (2) Percent	41.07%				
Dominant Taxa (3) Percent	53.57%	3			
Dominant Taxa (10) Percent	86.61%				
Diversity					
Shannon H (loge)	2.328				
Shannon H (log2)	3.359		3		
Margalef D	3.797				
Simpson D	0.134				
Evenness	0.082				
Function					
Predator Richness	4		2		
Predator Percent	27.68%	5			
Filterer Richness	1				
Filterer Percent	4.46%			3	
Collector Percent	43.75%		3		3
Scraper+Shredder Percent	27.68%		2		1
Scraper/Filterer	5.200				
Scraper/Scraper+Filterer	0.839				
Habit					
Burrower Richness	1				
Burrower Percent	0.89%				
Swimmer Richness	3				
Swimmer Percent	25.00%				
Clinger Richness	1	1			
Clinger Percent	3.57%				
Characteristics					
Cold Stenotherm Richness	0				
Cold Stenotherm Percent	0.00%				
Hemoglobin Bearer Richness	5				
Hemoglobin Bearer Percent	23.21%				
Air Breather Richness	0				
Air Breather Percent	0.00%				
Voltinism					
Univoltine Richness	9				
Semivoltine Richness	0	1			
Multivoltine Percent	49.11%		2		
Tolerance					
Sediment Tolerant Richness	2				
Sediment Tolerant Percent	15.18%				
Sediment Sensitive Richness	0				
Sediment Sensitive Percent	0.00%				
Metals Tolerance Index	2.432				
Pollution Sensitive Richness	0	1		0	
Pollution Tolerant Percent	74.11%	1		0	
Hilsenhoff Biotic Index	7.982		0		0
Intolerant Percent	0.00%				
Supertolerant Percent	64.29%				
CTQa	97.714				

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	16	32.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	18	60.00%	Slight
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	4	22.22%	Moderate
MTM	Montana DEQ Mountains (Bukantis 1998)	7	33.33%	Moderate

