MONTANA DEPARTMENT OF TRANSPORTATION
WETLAND MITIGATION MONITORING REPORT: YEAR 2009

Rock Creek Ranch
Hinsdale, Montana



Prepared for:

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

Prepared by:

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

December 2009

PBS&J Project No: 0B4308802.05.04

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MDT Project STPX-STPS 53(88)
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1.0 INTRODUCTION

This report documents the fifth year of monitoring at the Rock Creek Ranch wetland mitigation site. The Rock Creek Ranch is located in Valley County, approximately three miles east of Hinsdale along the north side of U.S. Highway 2 (**Figure 1**). The ranch is situated east of Rock Creek and north of the Milk River in Watershed 11. The Montana Department of Transportation (MDT) sought to purchase up to 50 wetland credit acres in Watershed 11 (Milk River) to offset current and potential future wetland impacts resulting from proposed highway construction projects within the watershed.

Constructed in fall 2004, the Rock Creek Ranch wetland mitigation project seeks to create / restore (re-establish) up to 75 acres of primarily emergent and, as an added component, scrub/shrub wetlands, within an approximate 116.75-acre perpetual conservation easement in the southeast corner of the ranch property (**Figure 1**). The first 50 acres of successfully established credits would be allocated to MDT, and MDT would have the option of purchasing additional wetland credits developing within the easement. Approximately 1.08 acres of wetlands occurred in the project area prior to construction. This does not include pre-existing wetlands in an excavated east-west trench within the easement just north of U.S. Highway 2, which were not part of the Rock Creek Ranch project, but were previously constructed by MDT to mitigate wetland impacts associated with the Hinsdale East and West project.

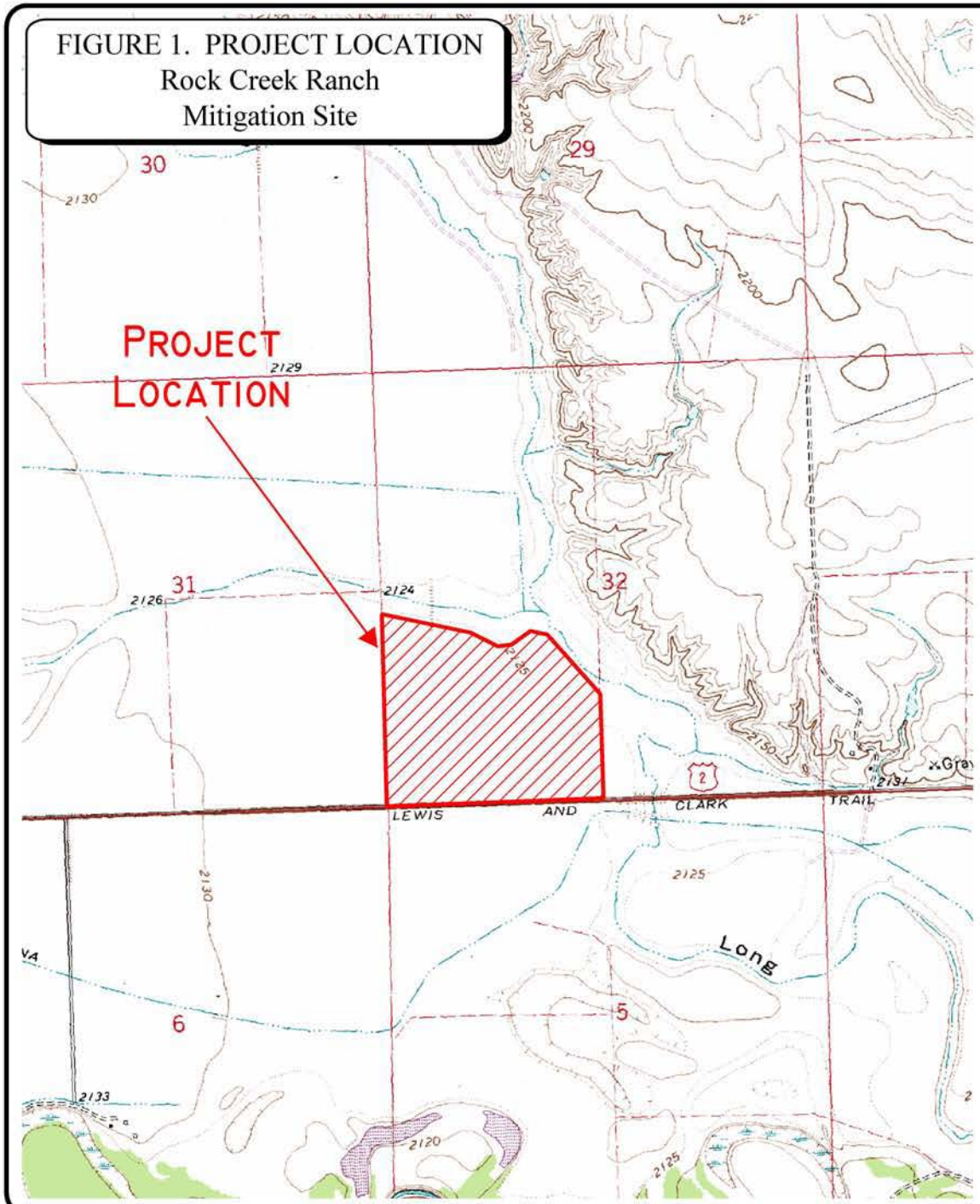
The proposed wetlands are designed to collect water from irrigation and natural seasonal flow down Long Coulee, as well as irrigation return flow and precipitation. As the low point on the ranch, all irrigation return water flows through the wetland mitigation area with the exception of water flowing in the U.S. Highway 2 roadside ditch. Water is retained on the site by two low dikes in the southeast property corner

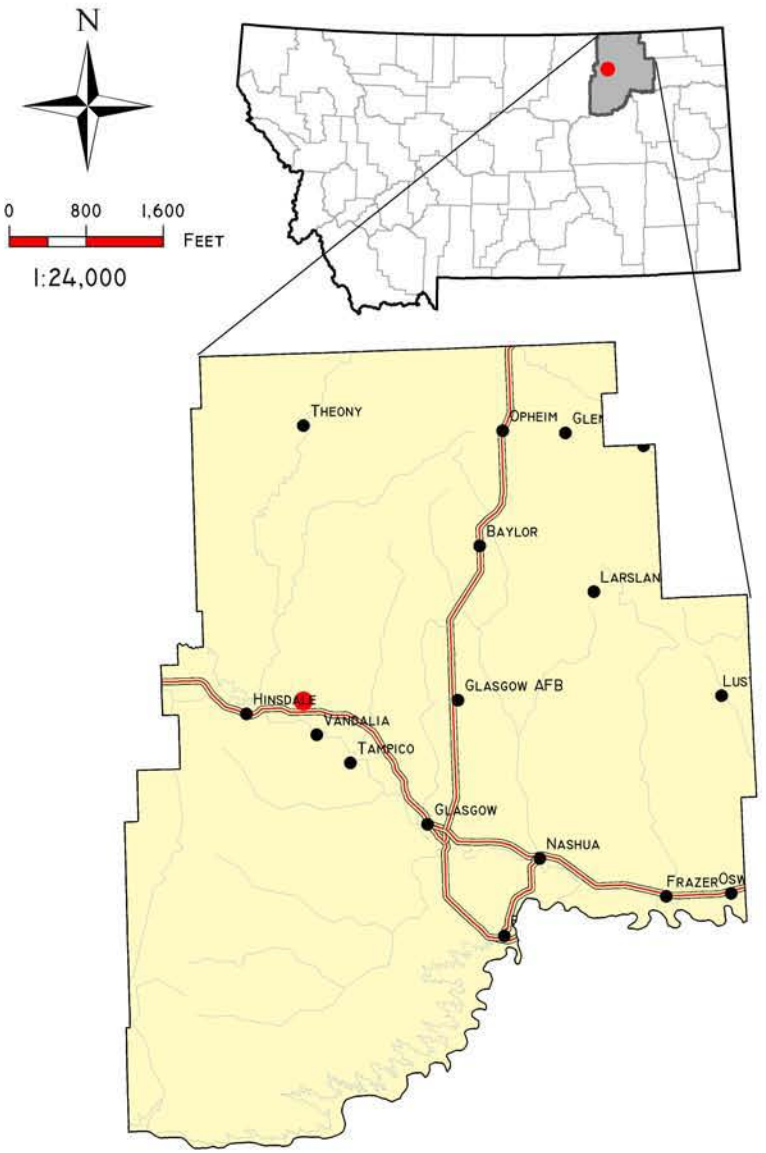
Project components were designed to increase habitat diversity at the site. These include excavating approximately two acres of four foot-deep sinuous “slough” areas within current upland areas to provide open water / vegetated shallows components and maximize edge effect. Spoils from this excavation were placed as two naturally-shaped shallow “islands” within the site. Seedling willow planting occurred in and along the saturated zones of the newly flooded area in spring 2007, with the intent of providing a minor woody scrub-shrub wetland component. Primary target wetland functions include general wildlife habitat, production export, flood attenuation, short and long-term surface water storage, and sediment/nutrient/toxicant retention and removal. The site is also intended to provide habitat for sensitive wildlife species such as the northern leopard frog (*Rana pipiens*) and Black-Necked Stilt (*Himantopus mexicanus*).

Credit ratios and approximate associated credit acreages agreed to by the Corps of Engineers (COE 2003) are listed in **Table 1**. While up to 76 acres of credit may eventually develop, the short term current MDT credit goal at the site is 50 acres.

This report documents the results of 2009 monitoring efforts. The monitoring area is illustrated on **Figure 2** (**Appendix A**).

FIGURE 1. PROJECT LOCATION
Rock Creek Ranch
Mitigation Site





PROJECT #: 0B4308801
DATE: Nov 2008
LOCATION: HINSDALE, MT
PROJECT MGR: J. BERGLUND
DRAWN BY: L. LUNDQUIST

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

Table 1: ***Credit ratios and acreages for Rock Creek Ranch Wetland Mitigation Site.***

HABITAT	CREDIT RATIO	CREDIT ACREAGE
Wetland Creation / Re-Establishment	1:1	75 acres created / re-established 75 acres wetland mitigation credit
Upland Buffer (3,100 x 50 feet along south and southwest wetland borders)	1:4	3.6 acres of buffer established 0.9 acre wetland mitigation credit
Wetland Enhancement (1,000 x 15 feet)	1:3	0.34 acre enhanced 0.11 acre wetland mitigation credit
Total Projected Wetland Mitigation Credit		**76.01 acres**

2.0 METHODS

2.1 Monitoring Dates and Activities

The site was visited on May 21st (spring) and July 28th (mid-season) of 2009. The primary purpose of the spring visit was to conduct a bird/general wildlife reconnaissance. The mid-season visit was conducted to document vegetation, soil, and hydrologic conditions used to map wetlands. All 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; macro-invertebrate sampling; functional assessment; and (non-engineering) examination of dike structures.

2.2 Hydrology

Hydrologic indicators were evaluated at the site during the mid-season visit. Approximate designed water depths are shown on the conceptual plan in **Appendix D**. Wetland hydrology indicators were recorded using procedures outlined in the COE 1987 Wetland Delineation Manual (Environmental Laboratory 1987). Hydrology data were recorded on COE Routine Wetland Delineation Data Forms (**Appendix B**).

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

No groundwater monitoring wells were installed at the site. 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.

2.3 Vegetation

General dominant species-based vegetation community types (e.g., *Typha latifolia / Scirpus acutus*) were delineated on a 2009 aerial photograph. 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 Wetland Mitigation Site Monitoring Form (**Appendix B**).

A 10-foot wide belt transect was sampled during the mid-season monitoring event to represent the range of current vegetation conditions. Percent cover was estimated for each vegetative species for each successive 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 transect was used to evaluate changes over time, especially the establishment and increase of hydrophytic vegetation. Transect data were recorded on the mitigation site Wetland Mitigation Site Monitoring Form (**Appendix B**). The transect ends were mapped onto the aerial photographs with the use of a global positioning system (GPS). Photographs of the transect were taken from both ends during the mid-season visit.

A comprehensive plant species list was prepared for the site in 2005, and was updated as new species were encountered. Woody species were planted at this mitigation site in May 2007, and monitoring relative to the survival of such species was conducted in 2007, 2008, and 2009.

2.4 Soils

Soils were evaluated during the mid-season visit according to hydric soils determination procedures outlined in the COE 1987 Wetland Delineation Manual. Soil data were recorded for each wetland determination point on the COE Routine Wetland Delineation Data Form (**Appendix B**). The most current terminology used by NRCS was used to describe hydric soils (USDA 2006).

Surface soils were sampled at six locations east of the east dike during the mid-season visit and remitted to Energy Labs for assessment to include pH, and conductivity. The purpose was to document 2009 soil (salinity) conditions east of the east dike to facilitate comparison with past and future sampling in an effort to monitor potential offsite (down-gradient) soil salinity increases associated with project site inundation.

2.5 Wetland Delineation

Wetland delineation was conducted during the mid-season visit according 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 2008. The indicator status of vegetation was derived from

the *National List of Plant Species that Occur in Wetlands: North Plains Region 4* (Reed 1988). Wetland and upland areas within the monitoring area were investigated for the presence of wetland hydrology, hydrophytic vegetation and hydric soils. The information was recorded on COE Routine Wetland Delineation Data Forms (**Appendix B**). The wetland/upland boundary was recorded with a resource-grade GPS unit. The wetland/upland boundary in combination with the wetland/open water habitat boundary was used to calculate the developed wetland area.

2.6 Mammals, Reptiles, and Amphibians

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

2.7 Birds

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

2.8 Macroinvertebrates

One macroinvertebrate sample was collected during the mid-season site visit and its location was mapped using the GPS. Macroinvertebrate sampling procedures were followed (**Appendix F**). The sample was preserved and sent to Rhithron Associates for analysis as outlined in the sampling procedure (**Appendix F**).

2.9 Functional Assessment

From 2005 to 2007, functional assessments were completed using the 1999 MDT Montana Wetland Assessment Method (Berglund 1999). In 2008 and 2009, the 2008 MDT Montana Wetland Assessment Method (Berglund and McEldowney 2008) was applied (**Appendix B**). Field data necessary for this assessment were generally collected during the mid-season site visit.

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, and the vegetation transect (**Appendix C**). Photograph points were using a GPS. All photographs were taken using a digital camera. A

description and compass direction for each photograph was recorded on the wetland monitoring form.

2.11 GPS Data

GPS data collected during the 2005 monitoring season included vegetation transect beginning and ending locations, all photograph locations, the macroinvertebrate sample point, and wetland boundaries. Wetland boundary changes observed in 2009 were slight and therefore were documented on a 2008 aerial photograph. Procedures used for GPS mapping and aerial photography referencing are included in **Appendix E**.

2.12 Maintenance Needs

Dike structures were examined during all site visits for obvious signs of breaching, damage, seepage, or other problems. This did not constitute an engineering-level structural inspection, but rather a cursory examination. Current or future potential problems were documented.

3.0 RESULTS

3.1 Hydrology

Approximately 50% of the overall 116.75-acre easement was inundated during the July mid-season visit in 2009, with about 60 acres of the designed wetland area exhibiting inundation. During the July visit, about 85% of the designed wetland area was inundated. Water depths ranged between approximately three to four feet deep in the excavated slough areas, and between zero inches and approximately one foot deep in the wetland areas. Specific recorded water depths are provided on the attached data forms. At the southeast control structure, the distance from the water surface elevation to the top of the highest stoplog was approximately 12 inches during the May spring visit and 26 inches during the July mid-season visit. This was similar to 2008 levels during actual monitoring, but peak inundation levels were higher and probably closer to those that occurred in 2007.

According to the Western Regional Climate Center (WRCC), mean monthly precipitation from January through July from 1955 to 2008 totaled 7.7 inches for the Glasgow WSO Airport station approximately 25 miles east of the project site (2009). During 2009, 6.01 inches (78 % of the mean) of precipitation were recorded at this station between January and July (WRCC 2009). Precipitation data were incomplete for the Hinsdale 4 SW station.

3.2 Vegetation

Vegetation species identified on the site are presented in **Table 2** and on the **Monitoring Form** (**Appendix B**). During 2009, five wetland community types were again identified and mapped on the mitigation area (**Figure 3** in **Appendix A**). These included Type 1: *Typha latifolia* / *Alisma gramanium*, Type 2: *Rumex crispus / Hordeum jubatum*, Type 3: *Populus deltoides* / *Salix*, Type 4: *Alopecurus pratensis*, and Type 8: *Rumex crispus / Typha latifolia*. Wetland

communities Type 6: *Typha latifolia / Ammannia robusta* and Type 7: *Typha latifolia / Iva axillaris* were not observed on the site during 2007-2009, and were replaced by Types 1 and 8. Dominant species within each of these communities are listed on the **Monitoring Form** (**Appendix B**).

Type 1 occurs commonly in the Long Coulee ditch and in the east third of the site where the large marsh outside the easement fence line is now expanding to the south. Type 2 occurs primarily in newly developing wetland areas throughout the site; generally along outside perimeters. Type 3 occurs in primarily in the pre-existing roadside ditch wetlands along the south mitigation site boundary that were created by MDT. Type 4 occurs as small patches throughout the site, and seems to be slowly spreading. Type 8 occurs adjacent to (along the drier side of) Type 1 communities.

Types 6 and 7 were replaced in 2007 by types 1 and 8 and were not observed in 2008 or 2009. Type 6 was largely comprised of scarlet ammannia (*Ammannia robusta*), a plant listed as a species of concern by the Montana Natural Heritage Program (MTNHP) and only known from three historic occurrences in Garfield and Phillips counties. In 2006, Type 6 was mapped in two primary areas: along the south dike and in the approximate center of the site. Type 6 may reappear when conditions are again suitable (drying mud around shallow ponds and other wet areas in the valleys and plains). Type 7 was transitional to Type 1 and generally occured along the outer limits of Type 1 areas. Several seedlings of plains cottonwood (*Populus deltoides*) and peach-leaf willow (*Salix amygdaloides*) were observed emerging along some of the excavated slough margins (west slough) within the site in 2007; they were not observed in 2008 or 2009.

Upland communities vary and include foxtail barley (*Hordeum jubatum*) and curly dock (*Rumex crispus*) dominated areas with kochia (*Kochia scoparia*), areas dominated by native upland species such as slender wheatgrass (*Agropyron trachycaulum*) and western wheatgrass (*Agropyron smithii*), and formerly cultivated fields dominated by domestic wheat and oats. Small patches of Canada thistle (*Cirsium arvense*), a State-listed noxious weed, were observed in the north central and southeast areas of the site.

Vegetation transect results are detailed in the **Monitoring Form** (**Appendix B**), and are summarized in **Table 3** and in **Charts 1** and **2**.

Table 2: ***2005 to 2009 Rock Creek Ranch vegetation species list.***

Species	Region 4 Wetland Indicator Status	Species	Region 4 Wetland Indicator Status
Agropyron repens	FAC	*Medicago sativa*	--
Agropyron smithii	FACU	*Melilotus alba*	FACU-
Agropyron trachycaulum	FACU	*Melilotus officinalis*	FACU-
Agrostis alba	FACW	*Najas flexilis*	OBL
Alisma gramineum	OBL	Oats - domestic	--
Alopecurus pratensis	FACW	*Phleum pratense*	FACU
Ammannia robusta	OBL	*Plantago major*	FAC
Artemisia cana	FACU	*Polygonum amphibium*	OBL
Artemisia frigida	--	*Populus deltoides*	FAC
Beckmannia syzigachne	OBL	*Populus trichocarpa*	FACW
Bromus inermis	--	*Potamogeton pectinatus*	OBL
Carex vesicaria	OBL	*Rumex crispus*	FACW
Chenopodium album	FAC	*Rumex maritimus*	FACW+
Cirsium arvense	FACU	*Sagittaria cuneata*	OBL
Coreopsis tinctoria	FAC	*Salix amygdaloides*	FACW
Echinochloa crusgalli	FACW	*Salix exigua*	FACW+
Eleocharis palustris	OBL	*Salix lasiandra*	FACW+
Grindelia squarrosa	UPL	*Salix lutea*	FACW+
Helianthus annuus	FACU	*Scirpus acutus*	OBL
Hordeum jubatum	FACW	*Scirpus maritimus*	NI
Iva axillaris	FACU	*Spartina pectinata*	FACW
Kochia scoparia	FAC	*Thlaspi arvense*	NI
Lactuca serriola	FACU	*Tragopogon dubius*	--
Lemna minor	OBL	*Typha latifolia*	OBL
Lepidium densiflorum	FACU	wheat - domestic	--

Table 3: ***2005 to 2009 Transect 1 data summary at the Rock creek Ranch Wetland Mitigation Site.***

Monitoring Year	2005	2006	2007	2008	2009
Transect Length (feet)	385	385	385	385	385
# Vegetation Community Transitions along Transect	2	1	1	0	1
# Vegetation Communities along Transect	2	2	2	1	2
# Hydrophytic Vegetation Communities along Transect	1	2	2	1	2
Total Vegetative Species	9	7	6	4	7
Total Hydrophytic Species	5	6	6	3	7
Total Upland Species	4	1	0	1	0
Estimated % Total Vegetative Cover	100	70	80	85	90
% Transect Length Comprised of Hydrophytic Vegetation Communities	30	100	100	100	100
% Transect Length Comprised of Upland Vegetation Communities	70	0	0	0	0
% Transect Length Comprised of Unvegetated Open Water	0	0	0	0	0
% Transect Length Comprised of Bare Substrate	0	0	0	0	0

Chart 1: ***Transect map showing vegetation types from start (0 feet) to the end (385 feet) of Transect 1 for 2005 to 2009.***

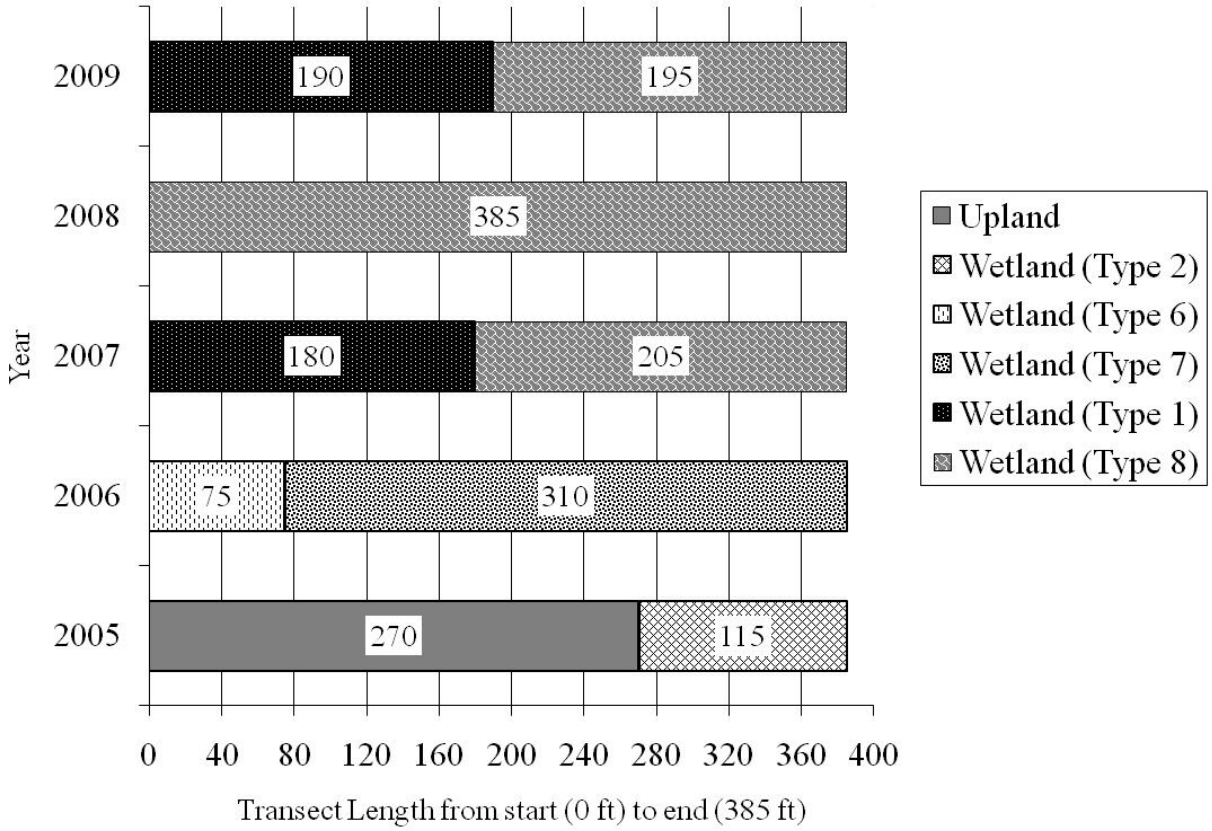
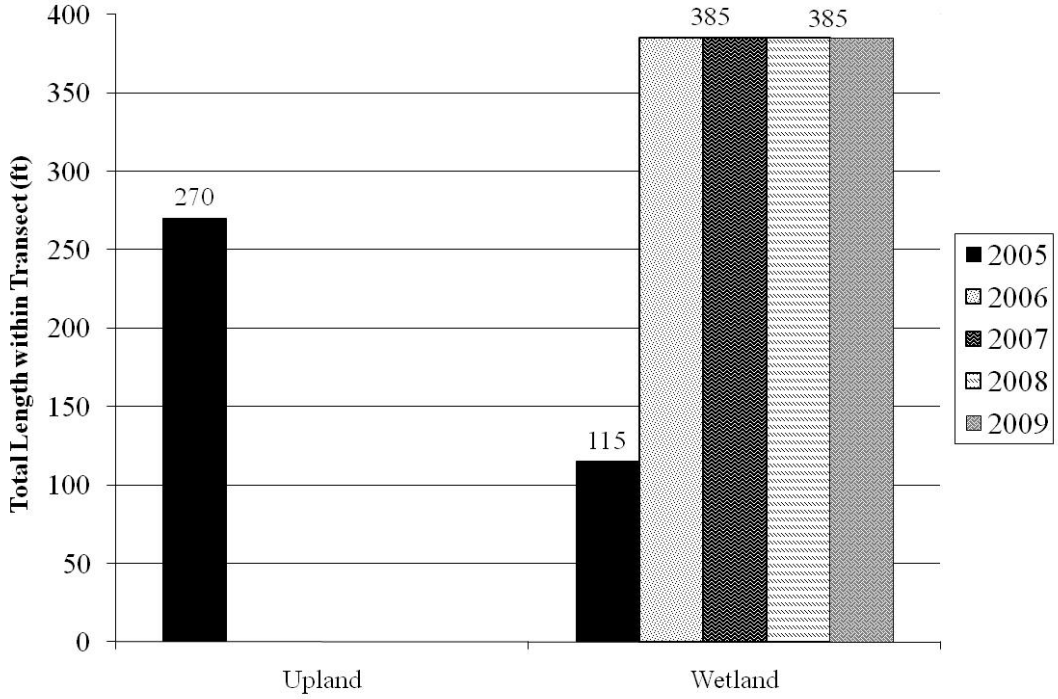


Chart 2: ***Length of vegetation communities within Transect 1 for 2005 to 2009.***



Cottonwood (40 cubic-inch size) and three willow species (30 cubic-inch and one-gallon sizes) were planted at the site in 2007. Observed mortality of planted woody vegetation species were summarized (**Table 4**). No performance standards were associated with planted species survival.

Table 4: ***2009 observed mortality of planted woody species at the Rock Creek Ranch Wetland Mitigation Site.***

Species	Estimated # Originally Planted	Observed # Alive[1]	Comments
Populus trichocarpa (40 cubic-inch)	42	--	No live or dead cottonwoods were observed in 2008 or 2009. Planting was accomplished in spring (May) 2007 during what would normally have been peak inundation. However, peak inundation was achieved later in 2007 due to plentiful early summer precipitation. Mortality was likely due to longer and deeper inundation conditions than were anticipated during early 2007, coupled with substantive wildlife browse, and drawdown during July 2007; the effects of which were originally brought to bear in 2008.
Salix amygdaloides (one-gallon)	126	--	No live or dead willows were observed in 2008 or 2009. Same comments as above. *S. amygdaloides* and *S. lutea* experienced higher mortality initially due to inundation depth and duration than did *S. exigua*.
Salix lutea (30 cubic-inch)	211	--	
Salix exigua (30 cubic-inch)	465	--	
Total	**844**	--	Assumed survival was 0%. Vexar plant protection netting was missing in most cases; likely removed by deer. Due to the precipitation-dependent variable inundation regime (as learned over the past 4 years), the flatness of the site (resulting in substantive inundation extent variability from small changes in precipitation), and extensive deer use (and browse) of the area, shrub establishment is unlikely to succeed at this site over the short term. This is also exemplified by the lack of persistent shrub volunteers both on-site and at adjacent wetlands (with the exception of the excavated highway ditch).

[1] Difficult to locate due to herbaceous growth.

3.3 Soils

Soil at the mitigation site is mapped as Harlem clay. Permeability is slow (0.06 to 0.2 inches / hour), and this soil type is considered "favorable" for reservoir development (Soil Conservation Service 1984). The NRCS excavated four soil pits in the current designed inundation area with a backhoe in November 2000. Pit logs indicated clay to depths of 25, 32, and 29 inches in three of the pits (the apparent maximum pit depths). At a fourth pit, soil was classified as silty clay to 12 inches, clay from 12 to 22 inches, and loam / clay loam from 22 to 40 inches. Harlem clay is not included on the Valley County hydric soils list. These characteristics were generally confirmed during the 2005 to 2009 monitoring. Soils sampled in wetland areas consistently were comprised of clay with a matrix color of 2.5Y4/1 to 10YR 4/1. All wetland soils were saturated or inundated at the time of the survey.

Surface soil sample laboratory analysis results are presented in **Table 5** and **Appendix B**. Electrical conductivity and pH values in 2009 remained below all initially measured 2007 values at sample sites east of the Rock Creek Project (these two parameters were not measured in 2006, but were implemented in 2007 as the most reliable measures of potential saline seep conditions). Sampling will continue in 2010 and will be compared with these results.

Table 5: ***2007 to 2009 soil analysis results east of the Rock Creek Mitigation Site.***

SAMPLE	YEAR	PH (S.U.)	CONDUCTIVITY (MMHOS/CM)
SS-1	2007	7.4	1.15
	2008	7.2	0.68
	2009	7.0	1.03
SS-2	2007	--	--
	2008	6.5	4.3
	2009	6.3	4.02
SS-3	2007	6.7	0.74
	2008	6.5	0.53
	2009	6.2	0.95
SS-4	2007	7.3	0.72
	2008	6.3	0.62
	2009	6.9	0.67
SS-5	2007	7.9	4.28
	2008	6.5	0.45
	2009	6.5	0.63
SS-6	2007	7.6	7.69
	2008	7.3	3.85
	2009	7.5	6.70

3.4 Wetland Delineation

Delineated wetland boundaries are illustrated on **Figure 3** (**Appendix A**). Soils, vegetation, and hydrology are discussed in preceding sections and on the COE Forms (**Appendix B**). Although they are shown on **Figure 3** (**Appendix A**) delineation acreage results for 2009 did not include the pre-existing MDT-created wetland ditches along the south easement border, just north of U.S. Highway 2, as these areas are technically not part of the Rock Creek Ranch mitigation project. Delineation results are listed in **Table 6**.

Table 6: ***2009 wetland delineation results for Rock Creek Ranch Wetland Mitigation Site.***

AQUATIC HABITAT	ACREAGE
Wetland	86.4
Open Water	0.00
Total Aquatic Habitat	**86.4**

Approximately 1.08 acres of wetlands occurred on the site prior to project implementation. Consequently, the net aquatic habitat developed to date is 86.4 – 1.08 = 85.32 acres, a 2.58-acre increase from 2008.

3.5 Wildlife

Wildlife species, or evidence of wildlife, observed on the site during the 2005 to 2009 monitoring efforts are listed in **Table 7**. Specific evidence observed, and activity codes pertaining to birds, are provided on the **Monitoring Form** (**Appendix B**). Five mammal, two amphibian, 1 reptile, and 22 bird species were noted using portions of the mitigation site during 2009.

Of special interest were observations of northern leopard frogs (*Rana pipiens*) during 2005 to 2009. Leopard frogs are considered a "species of special concern" by the MTNHP due largely to their apparent extirpation from the portion of their historic distribution west of the Continental Divide. As of July 2009, this species has been assigned the rank of S1 (critically imperiled) throughout its range in Montana by the MTNHP.

Table 7: ***Fish and wildlife species observed at the Rock Creek Ranch Wetland Mitigation Site from 2005 to 2009.***

FISH **None**	
AMPHIBIAN **Northern Leopard Frog (*Rana pipiens*)**	**Western Chorus Frog (*Pseudacris triseriata*)**
REPTILE **Plains Garter Snake (*Thamnophis radix*)**	**Painted Turtle (*Chrysemys picta*)**

Bolded species were observed in 2009.

Table 7 (continued): ***Fish and wildlife species observed at the Rock Creek Ranch Wetland Mitigation Site from 2005 to 2009.***

BIRD	
American Avocet (*Recurvirostra americana*)	**Mourning Dove (*Zenaida macroura*)**
American Bittern (*Botaurus lentiginosus*)	**Northern Harrier (*Circus cyaneus*)**
American Coot (*Fulica americana*)	**Northern Pintail (*Anas acuta*)**
American Crow (*Corvus brachyrhynchos*)	Northern Rough-winged Swallow (*Stelgidopteryx serripennis*)
American White Pelican (*Pelecanus erythrorhynchos*)	**Northern Shoveler (*Anas clypeata*)**
Bald Eagle (*Haliaeetus leucocephalus*)	**Redhead (*Aythya americana*)**
Bank Swallow (*Riparia riparia*)	Red-tailed Hawk (*Buteo jamaicensis*)
Barn Swallow (*Hirundo rustica*)	**Red-winged Blackbird (*Agelaius phoeniceus*)**
Black-necked Stilt (*Himantopus mexicanus*)	**Ring-necked Pheasant (*Phasianus colchicus*)**
Blue-winged Teal (*Anas discors*)	**Ruddy Duck (*Oxyura jamaicensis*)**
Brewer's Blackbird (*Euphagus cyanocephalus*)	Sandhill Crane (*Grus Canadensis*)
Brown-headed Cowbird (*Molothrus ater*)	Savannah Sparrow (*Passerculus sandwichensis*)
Bullock's Oriole (*Icterus bullockii*)	Semipalmated Sandpiper (*Calidris pusilla*)
Canada Goose (*Branta canadensis*)	**Sora (*Porzana carolina*)**
Common Snipe (*Gallinago gallinago*)	Swainson's Hawk (*Buteo swainsoni*)
Common Yellowthroat (*Geothlypis trichas*)	Swamp Sparrow (*Melospiza georgiana*)
Eared Grebe (*Podiceps nigricollis*)	Townsend's Warbler (*Dendroica townsendi*)
Eastern Kingbird (*Tyrannus tyrannus*)	Tree Swallow (*Tachycineta bicolor*)
European Starling (*Sturnus vulgaris*)	Upland Sandpiper (*Bartramia longicauda*)
Gadwall (*Anas strepera*)	Vesper Sparrow (*Pooecetes gramineus*)
Golden Eagle (*Aquila chrysaetos*)	**Western Meadowlark (*Sturnella neglecta*)**
Hairy Woodpecker (*Picoides villosus*)	Western Sandpiper (*Calidris mauri*)
Killdeer (*Charadrius vociferous*)	Western Tanager (*Piranga ludoviciana*)
Long-billed Curlew (*Numenius americanus*)	Willet (*Catoptrophorus semipalmatus*)
Long-billed Dowitcher (*Limnodromus scolopaceus*)	Willow Flycatcher (*Empidonax traillii*)
Mallard (*Anas platyrhynchos*)	**Wilson's Phalarope (*Phalaropus tricolor*)**
Marbled Godwit (*Limosa fedoa*)	**Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*)**
Marsh Wren (*Cistothorus palustris*)	Yellow-rumped Warbler (*Dendroica coronata*)
MAMMAL	
Coyote (*Canis latrans*)	**Raccoon (*Procyon lotor*)**
Deer (*Odocoileus sp.*)	**Richardson's Ground Squirrel (*Spermophilus richardsonii*)**
Long-tailed Weasel (*Mustela frenata*)	White-tailed Jack Rabbit (*Lepus townsendii*)
Mink (*Mustela vison*)	

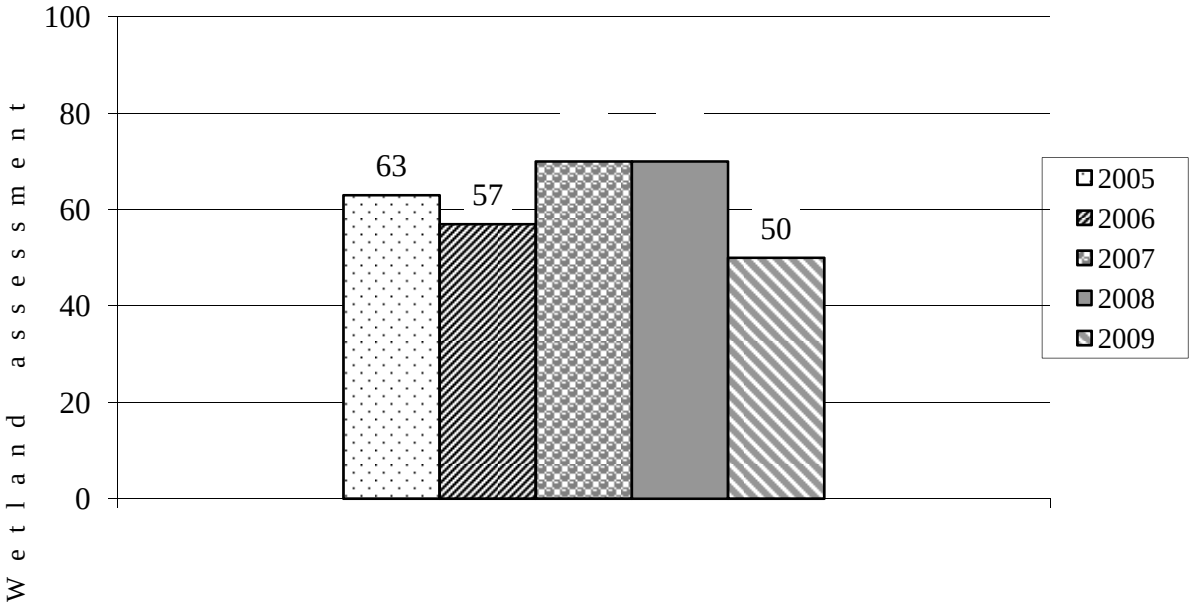
Bolded species were observed in 2009.

3.6 Macroinvertebrates

The 2009 macroinvertebrate sampling results are provided in **Appendix F** and were summarized by Rhithron Associates, Inc. in the italicized section below (Bollman 2009). Bioassessment scores from 2005 through 2009 have been graphically illustrated (Bollman 2009) (**Chart 3**).

> *The wetland assessment index indicated "optimal" conditions at the Rock Creek Ranch site; although, the total index score was lower in 2009 compared to all earlier years. In spite of this, the site supported a complex assemblage, dominated by copepods. The complexity of the fauna suggests that dewatering is not a limiting factor at this site. The presence of copepods and the phantom midge* Chaoborus *sp. suggests that the water was deep at the sampled site. Some invertebrates collected here are typically associated with filamentous algae. Other habitats may have included emergent macrophytes as well as the open water column. Water temperatures were estimated at 17.5ºC.*

Chart 3: ***Macroinvertebrate bioassessment scores using the wetland index for the Rock Creek Wetland Mitigation Site from 2005 to 2009.***



3.7 Functional Assessment

The completed 2009 functional assessment form is presented in **Appendix B**. Functional assessment results were summarized and the baseline conditions are provided for a general comparative purpose (**Table 8**).

The site currently rates as a Category II wetland, a substantial improvement over baseline Category IV ratings (**Table 8**). More significantly, the site has gained almost 473 functional units over baseline conditions. Prominent functions include general wildlife habitat, surface water storage, sediment/nutrient/toxicant removal, documented MTNHP species habitat (northern leopard frog, scarlet ammannia), and production export.

3.8 Photographs

Representative photographs taken from photo-points and transect ends are provided in **Appendix C**. **Figures 2** and **3** (**Appendix A**) are based on the 2009 aerial photograph.

3.9 Maintenance Needs/Recommendations

All dikes were in good condition during the spring and mid-season visits with no indications of seepage observed during 2009.

Three small patches of Canada thistle (*Cirsium arvense*), a State-listed noxious weed, were observed (**Figure 3** in **Appendix A**). These should be treated to prevent spreading.

Table 8: ***Summary of 2003 and 2009 wetland function/value ratings and functional points at the Rock Creek Ranch Mitigation Project.***

Function and Value Parameters from the MDT Montana Wetland Assessment Method	Pre-Project Wetland Ditches (2003)[1]	Pre-Project Isolated Wetland Patches (2003)[1]	Post-Project (2009)[2]
Listed/Proposed T&E Species Habitat	Low (0.3)	Low (0.0)	Low (0.1)
MTNHP Species Habitat	Low (0.1)	Low (0.1)	High (1.0)
General Wildlife Habitat	Low (0.3)	Low (0.1)	High (0.9)
General Fish/Aquatic Habitat	NA	NA	NA
Flood Attenuation	Low (0.2)	NA	NA
Short and Long Term Surface Water Storage	Low (0.3)	Low (0.3)	High (0.9)
Sediment/Nutrient/Toxicant Removal	Low (0.3)	Mod (0.5)	High (1.0)
Sediment/Shoreline Stabilization	Low (0.2)	NA	NA
Production Export/Food Chain Support	Low (0.3)	Low (0.2)	High (1.0)
Groundwater Discharge/Recharge	Low (0.1)	Low (0.1)	Low (0.1)
Uniqueness	Low (0.1)	Low (0.1)	Mod (0.4)
Recreation/Education Potential	Low (0.1)	Low (0.1)	Mod (0.1)
Actual Points / Possible Points	**2.3 / 11**	**1.5 / 9**	**5.5 / 8**
% of Possible Score Achieved	**21**	**17**	**69**
Overall Category	**IV**	**IV**	**II**
Total Acreage of Assessed Wetlands within Easement (ac)	**0.77**	**0.31**	**86.40**
Functional Units (acreage x actual points) (fu)	**1.77**	**0.47**	**475.20**
Net Acreage Gain (ac)	NA	NA	**85.32**
Net Functional Unit Gain (fu)	NA	NA	**472.96**

1 Assessed using the 1999 MDT Montana Wetland Assessment Method (MWAM).
[2] Assessed using the 2008 MDT MWAM. The completed forms are in **Appendix B.**

3.10 Current Credit Summary

Approximately 86.4 acres of wetlands were delineated on the mitigation site in 2009. Approximately 1.08 acres of wetlands occurred on the site prior to project implementation. Consequently, the net aquatic habitat created / restored to date is 86.4 – 1.08 = 85.32 acres. This is credited at a 1:1 ratio.

Additionally, the pre-existing 1.08 acres were enhanced at a credit ratio of 1:3, resulting in 0.36 acre of credit. Finally, approximately 3.6 acres of upland buffer were included in the easement at a credit ratio of 1:4, resulting in 0.9 acre of credit.

As of 2009, the maximum assignable credit at the Rock Creek Ranch mitigation site is 85.32 + 0.36 + 0.9 = 86.58 acres, or 173% of the initial 50-acre goal. Additional wetland communities are likely to form and stabilize if there is consistent annual inundation.

4.0 REFERENCES

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Appendix A

FIGURES 2 & 3

MDT Wetland Mitigation Monitoring
Rock Creek Ranch
Hinsdale, Montana

Figure 2 - Monitoring Activity Locations 2009

N
W E
S

300' 150' 0 150' 300'
SCALE: 1" = 300'

PP4
Monitoring Area Limits
DP3
DP2
SS1
SS2
PP5
SS3
SS4
SS5
DP1
T-1
END
SS6
PP1
MS1
PP2
T-1
START
PP3

LEGEND
Monitoring Limits
Soil Sample
Photo Point
Vegetation Transect
Macroinvertebrate Sample
Corps Delineation Form Data Point

Base Photograph Date: July 9 2009

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.

MDT ROCK CREEK RANCH WETLAND MITIGATION

MONITORING ACTIVITY LOCATIONS 2009

DRAWN: JR
PROJ MGR: J. BERGLUND
CHECKED: JB
APPVD: JB
PROJ NO: 0B4308801 05.04
LOCATION: HINSDALE, MT
SCALE: NOTED
PLOTTED: Aug/13/2009
FILE NAME: BASE2009.dwg

801 N. Last Chance Gulch
Suite 101
Helena, MT 59601
PBSJ

FIGURE
2
REV -
DATE 08/13/2009

Figure 3 - Mapped Site Features 2009

N
W E
S

300' 150' 0 150' 300'
SCALE: 1" = 300'

Monitoring Area Limits

LEGEND
Monitoring Limits
Wetland Limits
Vegetation Communities

Base Photograph Date: July 9 2009

Gross wetland*:	86.65 acres
Pre-existing wetland*:	1.08 acres
Upland Islands:	0.25 acre
Open Water:	0 acres
Net Wetland*:	85.32 acres

* Does not include pre-existing ditch wetlands along US Hwy 2.

Noxious Weeds

Cirsium Arvense

Infestation Size

✖ = < 0.1 acre

Cover Class

H = High (25-100% cover)

Vegetation Types

① Typha/Alisma
② Rumex/Hordeum
③ Populus/Salix
④ Alopecurus
⑤ Upland
⑥ Typha/Ammannia
⑦ Typha/Iva
⑧ Rumex/Typha

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.

MDT ROCK CREEK RANCH WETLAND MITIGATION

MAPPED SITE FEATURES 2009

DRAWN: JR
PROJ MGR: J. BERGLUND
CHECKED: JB
APPVD: JB
PLOTTED: Oct/15/2009

PROJ NO: 0B4308802 05.04
LOCATION: HINSDALE, MT
SCALE: NOTED
FILE NAME: BASE2009.dwg

801 N. Last Chance Gulch
Suite 101
Helena, MT 59601

PBSJ

FIGURE 3

REV -

DATE 08/13/2009

Appendix B

2009 WETLAND MITIGATION SITE MONITORING FORM
2009 BIRD SURVEY FORMS
2009 WETLAND DELINEATION FORMS
2009 FUNCTIONAL ASSESSMENT FORMS
2009 SOIL SAMPLE LAB RESULTS

MDT Wetland Mitigation Monitoring
Rock Creek Ranch
Hinsdale, Montana

PBS&J / MDT WETLAND MITIGATION SITE MONITORING FORM

Project Name: **Rock Creek Ranch Mitigation** Project Number: **0B4308802.05.04**
Assessment Date: **July 28, 2009** Person(s) conducting the assessment: **Berglund**
Location: **West of Hinsdale, north of US HGWY 2** MDT District: **Glendive** Milepost: **520**
Legal Description: T **27N** R **43E** Section **1**
Weather Conditions: **Sunny, dry, calm** Time of Day: **11:00 - 16:00**
Initial Evaluation Date: **May 18, 2005** Monitoring Year: **5** # Visits in Year: **2**
Size of evaluation area: **119 acres** Land use surrounding wetland: **Agricultural**

HYDROLOGY

Surface Water Source: **Rock Creek Canal irrigation return, runoff, ppt.**
Inundation: **Present** Average Depth: **4"** Range of Depths: **0-3 feet**
Percent of assessment area under inundation: **50%**
Depth at emergent vegetation-open water boundary: **3 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.):
Drift lines, drainage patterns, and drowned vegetation present.

Groundwater Monitoring Wells: **Absent**
Record depth of water below ground surface (in feet):

Well Number	Depth	Well Number	Depth	Well Number	Depth

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:
The excavated slough area is full and 3-4 feet deep. Inundation in wetlands ranges from approximately 0 inches to 1 foot deep. At the SE control structure, distance from current water elevation to top of top stoplog is approximately 26". During the May 21 visit, distance between water surface and top stoplog at SE structure was about 12", and inundation of proposed wetland areas was approximately 85%.

VEGETATION COMMUNITIES

Community Number: **1** Community Title (main spp): **Typha latifolia / Alisma gramanium**

Dominant Species	% Cover	Dominant Species	% Cover
TYP LAT	5 = > 50%	SCI ACU	1 = 1-5%
ALI GRA	5 = > 50%	SCI MAR	1 = 1-5%
ELE PAL	4 = 21-50%	NAJ FLE	1 = 1-5%
BEC SYZ	3 = 11-20%	HOR JUB	1 = 1-5%
RUM CRI	1 = 1-5%	ALO PRA	1 = 1-5%
CAR VES	1 = 1-5%		

Comments / Problems: **Occurs in main ditch and sloughs and continued to spread dramatically in east half of site.**

Community Number: **2** Community Title (main spp): **Rumex crispus / Hordeum jubatum**

Dominant Species	% Cover	Dominant Species	% Cover
RUM CRI	5 = > 50%	HEL ANN	1 = 1-5%
HOR JUB	5 = > 50%	ELE PAL	1 = 1-5%
KOC SCO	2 = 6-10%	DOMESTIC OATS	1 = 1-5%
AGR REP	2 = 6-10%	TYP LAT	2 = 6-10%
IVA AXI	3 = 11-20%	ALI GRA	1 = 1-5%
ECH CRU	1 = 1-5%	ALO PRA	1 = 1-5%

Comments / Problems: **One of the predominant types on the site as the site transitions to wetter communities.**

Community Number: **3** Community Title (main spp): **Populus / Salix**

Dominant Species	% Cover	Dominant Species	% Cover
POP DEL	5 = > 50%		
SAL EXI	3 = 11-20%		
SAL AMY	4 = 21-50%		
TYP LAT	4 = 21-50%		
RUM CRI	1 = 1-5%		

Comments / Problems: **This type occurs mainly in the former MDT excavated mitigation area along the south property line.**

Community Number: **4** Community Title (main spp): **Alopecurus pratensis**

Dominant Species	% Cover	Dominant Species	% Cover
ALO PRA	5 = > 50%		
RUM CRI	2 = 6-10%		
HOR JUB	2 = 6-10%		
CHE ALB	1 = 1-5%		
TYP LAT	3 = 11-20%		

Comments / Problems: **Occured in previous years as small patch in the northwest corner of the site - Appears to be expanding in patches throughout site.**

VEGETATION COMMUNITIES (continued)

Community Number: **5** Community Title (main spp): **Upland**

Dominant Species	% Cover	Dominant Species	% Cover
DOMESTIC OATS	5 = > 50%	ARG TRA	3 = 11-20%
DOMESTIC WHEAT	5 = > 50%	ART CAN	1 = 1-5%
RUM CRI	2 = 6-10%		
HOR JUB	3 = 11-20%		
KOC SCO	2 = 6-10%		
AGR SMI	4 = 21-50%		

Comments / Problems: **Composition of the upland community varies throughout the site.**

Community Number: **6** Community Title (main spp): **Typha / Ammania**

Dominant Species	% Cover	Dominant Species	% Cover
TYP LAT	4 = 21-50%		
AMM ROB	4 = 21-50%		
ALI GRA	3 = 11-20%		
HOR JUB	1 = 1-5%		
BEC SYZ	1 = 1-5%		
RUM CRI	1 = 1-5%		

Comments / Problems: **New in 2006, but not observed in 2007-2009 - presumably due to slightly increased and prolonged inundation. Ammania robusta is a sensitive species.**

Community Number: **7** Community Title (main spp): **Typha / Iva**

Dominant Species	% Cover	Dominant Species	% Cover
TYP LAT	4 = 21-50%		
IVA AXI	4 = 21-50%		
ALI GRA	1 = 1-5%		
RUM CRI	1 = 1-5%		

Comments / Problems: **New in 2006, but not observed in 2007-2009. Was mainly replaced by Types 1 and 8 in 2007.**

Community Number: **8** Community Title (main spp): **Rumex / Typha**

Dominant Species	% Cover	Dominant Species	% Cover
RUM CRI	5 = > 50%		
ALI GRA	3 = 11-20%		
TYP LAT	3 = 11-20%		
NAJ FLE	3 = 11-20%		
POL AMP	2 = 6-10%		
COR TIN	2 = 6-10%		

Comments / Problems: **New in 2007 and continued through 2009, replacing much of Type 7.**

COMPREHENSIVE VEGETATION LIST

Plant Species	Vegetation Community Number (s)	Plant Species	Vegetation Community Number (s)
Agropyron repens	2,5	*Phleum pratense*	5
Agropyron smithii	5	*Plantago major*	2,5
Agropyron trachycaulum	2,5	*Polygonum amphibium*	8
Agrostis alba	1,2	*Populus deltoides*	3
Alisma gramineum	1, 2, 8	*Populus trichocarpa*	2, 8
Alopecurus pratensis	1, 2, 4	*Potamogeton pectinatus*	1
Ammania robusta (Coccinea)	6 (ABSENT 2007)	*Rumex crispus*	1,2,4,5, 8
Artemisia cana	5	*Rumex maritimus*	1,2,4,5
		Sagittaria cuneata	1
Artemisia frigida	5	*Salix amygdaloides*	2, 3, 8
Beckmannia syzigachne	1, 2	*Salix exigua*	2, 8, 3
Bromus inermis	5	*Salix lutea*	2, 8
Carex vesicaria	1	*Scirpus acutus*	1
Chenopodium album	1,2,4	*Scirpus maritimus*	1
Cirsium arvense	1,2,5	*Spartina pectinata*	1
Echinochloa crusgalli	1,2	*Thlaspi arvense*	5
Coreopsis tinctoria	8	*Tragopogon dubius*	5
Eleocharis palustris	1,2	*Typha latifolia*	1, 2, 3, 4, 8
Grindelia squarrosa	5	*Wheat - domestic*	2,5
Helianthus annuus	5		
Hordeum jubatum	2,4,5		
Iva axillaris	2,5		
Kochia scoparia	2,5		
Lactuca serriola	2,5		
Lemna minor	1		
Lepidium densiflorum	2,5		
Medicago sativa	5		
Melilotus alba	5		
Melilotus officinalis	5		
Najas flexilis	1, 8		
Oats - domestic	2,5		

Comments / Problems: Ammannia robusta newly discovered in 2006 at the site (two populations). but was not observed in 2007-2009 - presumably due to increased inundation period. This annual species is listed as a species of concern by the Montana Natural Heritage Program. Also, seedling POP DEL and SAL AMY were starting to emerge along the western-most excavated slough in 2006 and were observed in 2007, but not in 2008-2009. POP TRI, SAL EXI, SAL LUT, and SAL AMY were planted in 2007, but most were dead in 2008-2009 (animal browse, variable water regime).

PLANTED WOODY VEGETATION SURVIVAL

Species	Estimated # Originally Planted	Observed # Alive[1]	Comments
Populus trichocarpa (40 cubic-inch)	42	--	No live or dead POP TRI were observed in 2008 or 2009. Planting was accomplished in spring (May) 2007 during what would normally have been peak inundation. However, peak inundation was achieved later in 2007 due to plentiful early summer precipitation. Mortality was likely due to longer and deeper inundation conditions than were anticipated during early 2007, coupled with substantive wildlife browse, and drawdown during July 2007; the effects of which were originally brought to bear in 2008.
Salix amygdaloides (one-gallon)	126	--	No live or dead SAL AMY or SAL LUT were observed in 2008 or 2009. Same comment as above. These two species experienced higher mortality initially due to inundation depth and duration than did S. exigua.
Salix lutea (30 cubic-inch)	211	---	
Salix exigua (30 cubic-inch)	465	--	Same comment as above
Total	**844**	**--**	Assumed % survival was virtually 0%. Vexar netting was gone in most cases; likely pulled off by deer. Due to the precipitation-dependent variable inundation regime (as learned over the past 4 years), the flatness of the site (resulting in substantive inundation extent variability from small changes in precipitation), and extensive deer use (and browse) of the area, shrub establishment in unlikely to succeed at this site. This is also exemplified by the lack of shrub volunteers both onsite and at adjacent wetlands (with the exception of the excavated highway ditch).

1: Difficult to locate due to herbaceous growth.

Comments / Problems: <u>Planting was implemented in May 2007. See comments in table above.</u>

WILDLIFE

Birds

Were man-made nesting structures installed? **No**
If yes, type of structure: **NA** How many? **NA**
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
Mink		☐	☒	☐	
Richardson's ground squirrel		☐	☐	☒	
White-tailed Deer		☒	☒	☐	
Raccoon		☒	☐	☐	
Northern leopard frog	10	☐	☐	☐	
Badger		☐	☐	☒	
Painted turtle	1	☐	☐	☐	
		☐	☐	☐	

Additional Activities Checklist:
Yes Macroinvertebrate Sampling (if required)

Comments / Problems: Numbers above were recorded during July visit.

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 (°)
		see attached photosheets	

Comments / Problems: _____

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: _____

WETLAND DELINEATION

(attach COE delineation forms)

At each site conduct these checklist items:

- ☒ Delineate wetlands according to the 1987 Army COE manual.
- ☒ Delineate wetland – upland boundary onto aerial photograph.

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

Comments / Problems: _____

FUNCTIONAL ASSESSMENT

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

Comments / Problems: _____

MAINTENANCE

Were man-made nesting structure installed at this site? **No**
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? **Yes**
If yes, are the structures working properly and in good working order? **Yes**
If no, describe the problems below.

Comments / Problems: **Water surface elevation currently about 26" below top of stoplog in SE control structure.**

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **Rock Creek Ranch** Date: **July 28, 2009** Examiner: **Berglund**
Transect Number: **1** Approximate Transect Length: **385 feet** Compass Direction from Start: **6˚** Note: _____

Vegetation Type A: **Typha/Alisma**	
Length of transect in this type: 190 feet	
Plant Species	**Cover**
TYP LAT	5 = > 50%
RUM CRI	3 = 11-20%
HOR JUB	2 = 6-10%
ALI GRA	4 = 21-50%
ALO PRA	+ = < 1%
WETLAND COMMUNITY	
Total Vegetative Cover:	100%

Vegetation Type B: **Rumex/Typha**	
Length of transect in this type: 195 feet	
Plant Species	**Cover**
TYP LAT	4 = 21-50%
RUM CRI	5 = > 50%
ELE PAL	2 = 6-10%
NAJ FLE	3 = 11-20%
WETLAND COMMUNITY	
Total Vegetative Cover:	80%

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

Vegetation Type D:	
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): **95%**

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: **Site is continuing to develop wetland characteristics.**

BIRD SURVEY – FIELD DATA SHEET

Date: 5/21/09

SITE: Rock Creek Ranch

Survey Time: 11:30-13:30

Bird Species	#	Behavior	Habitat	Bird Species	#	Behavior	Habitat
American Bittern	3	F	MA				
American Coot	15	F	MA, OW				
Barn Swallow	4	F	MA				
Blue-Winged Teal	20	F	MA				
Canada Goose	10	F, N	MA				
Eared Grebe	10	F	MA, OW				
Gadwall	25	F	MA, OW				
Mallard	6	F	MA, OW				
Marsh Wren	2	F	MA				
Mourning Dove	6	F	UP				
Northern Pintail	30	F	MA, OW				
Northern Shoveler	25	F	MA, OW				
Redhead	6	F	MA, OW				
Red-Winged Blackbird	30	N, F	MA				
Ring-necked Pheasant	3	F	UP, MA				
Ruddy Duck	4	F	MA, OW				
Sora	2	F	MA				
Western Meadowlark	2	F	UP				
Wilson's Phalarope	10	F	MA, OW				
Yellow-Headed Blackbird	30	F,N	MA				

Notes: Hundreds of western chorus frogs throughout inundated portions of site, several Richardson's ground squirrel burrows on uplands, scattered deer and raccoon tracks, coyote scat, 1 dead mink.
Approximately 12" from water surface in SE control structure to top of top stoplog.
Drainage at SS 2 east of site is inundated to 2-3".
Site is about 85% inundated, all sloughs overtopped, west ditch full.
Dry, sunny, breezy conditions – about 60 degrees.
Many bird species heard within inaccessible, well-vegetated portions of site.

Behavior: BP – one of a breeding pair; BD – breeding display; F – foraging; FO – flyover; L – loafing; N – nesting
Habitat: AB – aquatic bed; FO – forested; I – island; MA – marsh; MF – mud flat; OW – open water; SS – scrub/shrub; UP – upland buffer; WM – wet meadow, US – unconsolidated shoreline

BIRD SURVEY – FIELD DATA SHEET

Date: 7/28/09

SITE: Rock Creek Ranch

Survey Time: 11:30-16:00

Bird Species	#	Behavior	Habitat	Bird Species	#	Behavior	Habitat
American Coot	4	F	OW				
Barn Swallow	20	F	MA				
Blue-wing teal	10	F	MA				
Eared Grebe	2	F	OW				
Gadwall	4	F	OW				
Killdeer	6	F	MA				
Marsh wren	2	F	MA				
Mourning dove	2	F	UP				
Northern Harrier	1	F	MA				
Northern Shoveler	2	F	OW				
Red-winged blackbird	10	F	MA				
Ring-Necked Pheasant	10	F	MA				
Ruddy Duck	2	F	OW				
Wilson's Phalarope	4	F	MA				
Yellow-headed blackbird	12	F	MA				

Notes: Few northern leopard frogs; painted turtle in SE ditch, several Richardson's ground squirrel burrows on uplands, scattered deer and raccoon tracks, coyote scat, mink scat.

Approximately 26" from water surface in SE control structure to top of top stoplog.
Site is about 50% inundated, vast majority at 4-8 inches.
Overcast, calm-breezy with occ. light rain.

Behavior: BP – one of a breeding pair; BD – breeding display; F – foraging; FO – flyover; L – loafing; N – nesting

Habitat: AB – aquatic bed; FO – forested; I – island; MA – marsh; MF – mud flat; OW – open water; SS – scrub/shrub; UP – upland buffer; WM – wet meadow, US – unconsolidated shoreline

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

Project / Site: **Rock Creek Ranch**	Date: **July 28, 2009**
Applicant / Owner: **Rock Creek Lands LLP**	County: **Valley**
Investigator: **Berglund**	State: **MT**

Do Normal Circumstances exist on the site? **Yes**	Community ID: **Emergent**
Is the site significantly disturbed (Atypical Situation)? **No**	Transect ID: **1**
Is the area a potential Problem Area? **No**	Plot ID: **1**
(If needed, explain on reverse side)	

VEGETATION

Dominant Species	Stratum	Indicator	Dominant Species	Stratum	Indicator
1. *TYP LAT*	Herb	OBL	11.		
2. *HOR JUB*	Herb	FACW	12.		
3. *ELE PALI*	Herb	OBL	13.		
4. *NAJ FLE*	Herb	OBL	14.		
5.			15.		
6.			16.		
7.			17.		
8.			18.		
9.			19.		
10.			20.		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): **4** / **4** = **100**%	FAC Neutral: **4** / **4** = **100**%

Remarks: **Slightly wetter habitat than in 2008.**

HYDROLOGY

No Recorded Data (Describe in Remarks):
- **N/A** Stream, Lake, or Tide Gauge
- **N/A** Aerial Photographs
- **N/A** Other

Yes No Recorded Data

Field Observations:
- Depth of Surface Water = **8** (in.)
- Depth to Free Water in Pit **N/A** **0** (in.)
- Depth to Saturated Soil **N/A** **0** (in.)

Wetland Hydrology Indicators
Primary Indicators:
- **YES** Inundated
- **YES** Saturated in Upper 12 Inches
- **YES** Water Marks
- **YES** Drift Lines
- **YES** Sediment Deposits
- **YES** Drainage Patterns in Wetland

Secondary Indicators (2 or more required):
- **NO** Oxidized Root Channels in Upper 12 inches
- **NO** Water-Stained Leaves
- **NO** Local Soil Survey Data
- **YES** FAC-Neutral Test
- **NO** Other (Explain in Remarks)

Remarks: **Inundated to 8" depth.**

SOILS

Map Unit Name (Series and Phase): **Harlem Clay**
Map Symbol: **23** Drainage Class: **WD** Mapped Hydric Inclusion? **No**
Taxonomy (Subgroup): **Ustic Torrifluvents** Field Observations confirm Mapped Type? **Yes**

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color(s) (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
6	B	2.5 Y 4/1	/ /	N/A N/A	Clay
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	

Hydric Soil Indicators:

- **NO** Histosol
- **NO** Histic Epipedon
- **NO** Sulfidic Odor
- **NO** Aquic Moisture Regime
- **NO** Reducing Conditions
- **YES** Gleyed or Low-Chroma Colors
- **NO** Concretions
- **NO** High Organic Content in Surface Layer in Sandy Soils
- **NO** Organic Streaking in Sandy Soils
- **NO** Listed on Local Hydric Soils List
- **NO** Listed on National Hydric Soils List
- **NO** Other (Explain in Remarks)

Remarks: **Inundated soils**

WETLAND DETERMINATION

Hydrophytic Vegetation Present? **YES**
Wetland Hydrology Present? **YES**
Hydric Soils Present? **YES**

Is this Sampling Point within a Wetland? **YES**

Remarks: **Plot taken at north end of Transect 1 in former (pre-project) upland area.**

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

Project / Site: **Rock Creek Ranch**	Date: **July 28, 2009**
Applicant / Owner: **Rock Creek Lands LLP**	County: **Valley**
Investigator: **Berglund**	State: **MT**

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

VEGETATION

Dominant Species	Stratum	Indicator	Dominant Species	Stratum	Indicator
1. *TYP LAT*	Herb	OBL	11.		
2. *SCI ACU*	Herb	OBL	12.		
3. *RUM CRI*	Herb	FACW	13.		
4. *ELE PAL*	Herb	OBL	14.		
5. *HOR JUB*	Herb	FACW	15.		
6.			16.		
7.			17.		
8.			18.		
9.			19.		
10.			20.		

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): **5** / **5** = **100**%	FAC Neutral: **5** / **5** = **100**%
Remarks:	

HYDROLOGY

No Recorded Data (Describe in Remarks): **N/A** Stream, Lake, or Tide Gauge **N/A** Aerial Photographs **N/A** Other **Yes** No Recorded Data	Wetland Hydrology Indicators Primary Indicators: **YES** Inundated **YES** Saturated in Upper 12 Inches **YES** Water Marks **YES** Drift Lines **YES** Sediment Deposits **NO** Drainage Patterns in Wetland
Field Observations: Depth of Surface Water = **6** (in.) Depth to Free Water in Pit **N/A** ____ (in.) Depth to Saturated Soil **N/A** ____ (in.)	Secondary Indicators (2 or more required): **NO** Oxidized Root Channels in Upper 12 inches **NO** Water-Stained Leaves **NO** Local Soil Survey Data **YES** FAC-Neutral Test **NO** Other (Explain in Remarks)
Remarks: **Site inundated to 6".**	

SOILS

Map Unit Name (Series and Phase): **Harlem Clay**
Map Symbol: **23** Drainage Class: **WD** Mapped Hydric Inclusion? **No**
Taxonomy (Subgroup): **Ustic Torrifluvents** Field Observations confirm Mapped Type? **Yes**

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color(s) (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
6	B	2.5 Y 4/1	/ /	N/A N/A	Clay
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	
		/	/ /	N/A N/A	

Hydric Soil Indicators:

- **NO** Histosol
- **NO** Histic Epipedon
- **NO** Sulfidic Odor
- **NO** Aquic Moisture Regime
- **NO** Reducing Conditions
- **YES** Gleyed or Low-Chroma Colors
- **NO** Concretions
- **NO** High Organic Content in Surface Layer in Sandy Soils
- **NO** Organic Streaking in Sandy Soils
- **NO** Listed on Local Hydric Soils List
- **NO** Listed on National Hydric Soils List
- **NO** Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? **YES**
Wetland Hydrology Present? **YES**
Hydric Soils Present? **YES**

Is this Sampling Point within a Wetland? **YES**

Remarks: **Plot taken approximately 100 feet south and west of south "tip" in jog of north propert boundary within former (pre-project) upland area.**

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

Project / Site: **Rock Creek Ranch**	Date: **July 28, 2009**
Applicant / Owner: **Rock Creek Lands LLP**	County: **Valley**
Investigator: **Berglund**	State: **MT**

Do Normal Circumstances exist on the site? **Yes**	Community ID: **Emergent**
Is the site significantly disturbed (Atypical Situation)? **No**	Transect ID: **3**
Is the area a potential Problem Area? **No**	Plot ID: **3**
(If needed, explain on reverse side)	

VEGETATION

Dominant Species	Stratum	Indicator	Dominant Species	Stratum	Indicator
1. *TYP LAT*	Herb	OBL	11.		
2. *HOR JUB*	Herb	FACW	12.		
3. *RUM MAR*	Herb	FACW+	13.		
4. *ALO PRA*	Herb	FACW	14.		
5.			15.		
6.			16.		
7.			17.		
8.			18.		
9.			19.		
10.			20.		
Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): **4** / **4** = **100**%			FAC Neutral: **4** / **4** = **100**%		
Remarks: **TYP and HOR are still main dominants in 2009, although TYP becoming more dominant.**					

HYDROLOGY

No Recorded Data (Describe in Remarks):
- **N/A** Stream, Lake, or Tide Gauge
- **N/A** Aerial Photographs
- **N/A** Other

Yes No Recorded Data

Field Observations:
- Depth of Surface Water **N/A** ____ (in.)
- Depth to Free Water in Pit **N/A** ____ (in.)
- Depth to Saturated Soil = **0** (in.)

Wetland Hydrology Indicators
Primary Indicators:
- **NO** Inundated
- **NO** Saturated in Upper 12 Inches
- **YES** Water Marks
- **YES** Drift Lines
- **YES** Sediment Deposits
- **NO** Drainage Patterns in Wetland

Secondary Indicators (2 or more required):
- **NO** Oxidized Root Channels in Upper 12 inches
- **NO** Water-Stained Leaves
- **NO** Local Soil Survey Data
- **YES** FAC-Neutral Test
- **NO** Other (Explain in Remarks)

Remarks: **Was saturated to surface in spring; currently moist but not saturated.**

SOILS

Map Unit Name (Series and Phase): **Harlem Clay**
Map Symbol: **23** Drainage Class: **WD** Mapped Hydric Inclusion? **No**
Taxonomy (Subgroup): **Ustic Torrifluvents** Field Observations confirm Mapped Type? **Yes**

Profile Description

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color(s) (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
6	B	2.5 Y 4/1	2.5 Y 4/4 /	Common Distinct	Clay
		/ 	/ /	N/A N/A	
		/ 	/ /	N/A N/A	
		/ 	/ /	N/A N/A	
		/ 	/ /	N/A N/A	

Hydric Soil Indicators:

- **NO** Histosol
- **NO** Histic Epipedon
- **NO** Sulfidic Odor
- **NO** Aquic Moisture Regime
- **NO** Reducing Conditions
- **YES** Gleyed or Low-Chroma Colors
- **NO** Concretions
- **NO** High Organic Content in Surface Layer in Sandy Soils
- **NO** Organic Streaking in Sandy Soils
- **NO** Listed on Local Hydric Soils List
- **NO** Listed on National Hydric Soils List
- **NO** Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? **YES**
Wetland Hydrology Present? **YES**
Hydric Soils Present? **YES**

Is this Sampling Point within a Wetland? **YES**

Remarks: **Plot taken approximately 200-300 feet south of north easement fence in west half of site within former (pre-project) upland area.**

MDT MONTANA WETLAND ASSESSMENT FORM (revised March 2008)

1. Project Name: Rock Creek Ranch Mitigation **2. MDT Project #:** NA **3. Control #:** NA

3. Evaluation Date: 7/28/09 **4. Evaluator(s):** Berglund **5. Wetland/Site #(s):** Rock Creek Ranch Complex

6. Wetland Location(s): Township 31 N, Range 37 E, Section 32; Township ___ N, Range ___ E, Section _____

Approximate Stationing or Roadposts: Just north of US Highway 2, MP 520

Watershed: 11 - Milk **County:** _ _ Valley _____

7. Evaluating Agency: MDT

Purpose of Evaluation:

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

8. Wetland Size (acre): 300+ (visually estimated)
_____ (measured, e.g. GPS)

9. Assessment Area (AA) Size (acre): _____ (visually estimated)
(see manual for determining AA) 86.4 (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	Impounded	Seasonal / Intermittent	95
Depressional	Unconsolidated Bottom	Impounded	Seasonal / Intermittent	5

Comments: _____

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

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%.	---	low 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.)**:** Adjacent lands are cultivated haylands and pasture; lands to north are in WRP.

ii. Prominent noxious, aquatic nuisance, and other exotic vegetation species: Domestic wheat and oats, 2 small patches of Canada thistle

iii. Provide brief descriptive summary of AA and surrounding land use/habitat: Large impounded emergent marsh; the AA only includes those areas within the conservation easement boundary, even though substantive wetlands occur to north and west. Surrounding use is agricultural.

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	---	NA	NA	NA
2 (or 1 if forested) classes	---	NA	NA	NA
1 class, but not a monoculture	mod	←NO	YES→	---
1 class, monoculture (1 species comprises ≥90% of total cover)	---	NA	NA	NA

Comments: _____

Wetland/Site #(s): Rock Creek Ranch

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 Whooping crane
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	---	---	---	---	---	.1L	---

Sources for documented use (e.g. observations, records): _____

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 Scarlet Ammannia, Northern Leopard Frog
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
S1 Species Functional Point/Rating	1H	---	---	---	---	---	---
S2 and S3 Species Functional Point/Rating	---	---	---	---	---	---	---

Sources for documented use (e.g. observations, records): Population of scarlet ammannia disovered on site in 2006. Leopard frogs observed 2005,6, 7, 8. and 2009

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)	---	---	---	---	---	---	---	---	---	H	---	---	---	---	---	---	---	---	---	---
☐ **Moderate Disturbance** at AA (see #12i)	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
☐ **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: Numerous waterfowl and shorebirds observed.

Wetland/Site #(s): Rock Creek Ranch

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**

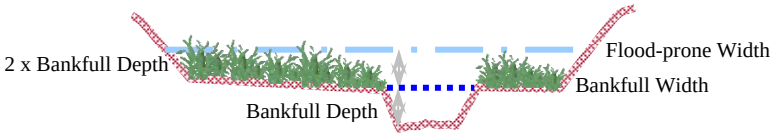
iii. Final Score and Rating: _ **Comments:** _____

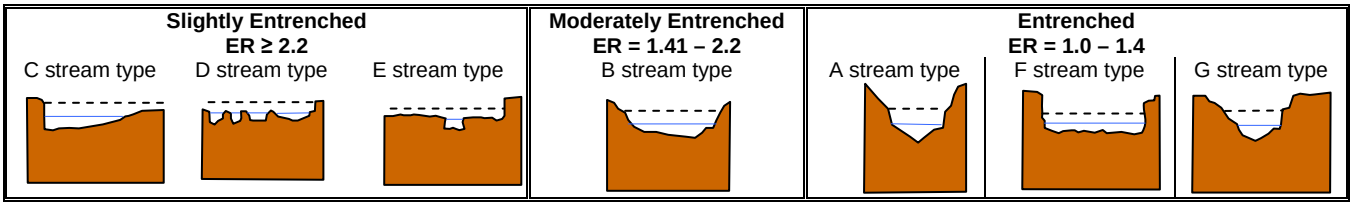
14E. FLOOD ATTENUATION ☒ **NA** (proceed to 14F)

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): Rock Creek Ranch

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**	---	.9H	---	---	---	---	---	---	---
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**	1H	---	---	---	---	---	---	---
AA contains **unrestricted outlet**	---	---	---	---	---	---	---	---

Comments: Site treats agricultural runoff.

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%**	---	---	---
☐ **35-64%**	---	---	---
☐ **< 35%**	---	---	---

Comments: _____

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	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
S/I	.9H	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
T/E/A	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Wetland/Site #(s): Rock Creek Ranch

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** = ___ ☐ **NO**

iv. Final Score and Rating: 1H **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**	---	---	---	.1L
☐ **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)	---	---	---	---	---	---	---	.4M	---
☐ **Moderate Disturbance** at AA (#12i)	---	---	---	---	---	---	---	---	---
☐ **High Disturbance** at AA (#12i)	---	---	---	---	---	---	---	---	---

Comments: _____

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: _____

15. GENERAL SITE NOTES: _____

Wetland/Site #(s): Rock Creek Ranch

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 0.10	1.00		
B. MT Natural Heritage Program Species Habitat	high 1.00	1.00		
C. General Wildlife Habitat	high 0.90	1.00		*
D. General Fish Habitat	NA	NA		
E. Flood Attenuation	NA	NA		
F. Short and Long Term Surface Water Storage	high 0.90	1.00		*
G. Sediment / Nutrient / Toxicant Removal	high 1.00	1.00		*
H. Sediment / Shoreline Stabilization	NA	NA		
I. Production Export / Food Chain Support	high 1.00	1.00		*
J. Groundwater Discharge / Recharge	low 0.10	1.00		
K. Uniqueness	mod 0.40	1.00		
L. Recreation / Education Potential (bonus point)	mod 0.10			
Total Points	**5.5**	**8**	**Total Functional Units**	
Percent of Possible Score 69% (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**

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LABORATORY ANALYTICAL REPORT

Client: PBS and J
Project: Rock Creek Ranch Wetland Mitagation
Workorder: H09070352

Report Date: 08/17/09
Date Received: 07/30/09

		Analysis		pH-SatPst	Cond-SatPst	HCO3 SatPst	Lime	SO4-SatPst
		Units		s_u_	mmhos/cm	meq/L	%	meq/L
Sample ID	Client Sample ID	Up	Low	Results	Results	Results	Results	Results
H09070352-001	SS-1	0	0	7.0	1.03	3.79	1.2	1.7
H09070352-002	SS-2	0	0	6.3	4.02	9.37	1.8	37
H09070352-003	SS-3	0	0	6.2	0.95	2.99	1.3	2.3
H09070352-004	SS-4	0	0	6.9	0.67	2.79	1.6	1.7
H09070352-005	SS-5	0	0	6.5	0.63	2.19	1.6	0.60
H09070352-006	SS-6	0	0	7.5	6.70	3.39	2.1	76

Appendix C

2009 REPRESENTATIVE PHOTOGRAPHS

MDT Wetland Mitigation Monitoring
Rock Creek Ranch
Hinsdale, Montana

ROCK CREEK RANCH WETLAND MITIGATION SITE 2009



Photo Point 1: Facing north.



Photo Point 1: Facing west.



Photo Point 2: Facing north along Long Coulee Ditch from SE control structure.



Photo Point 3: Facing north. Upland with fallow domestic wheat and oats. Wetland in far background.



Photo Point 3: Facing east along new dike structure.



Photo Point 4: Facing east along easement fence line.

ROCK CREEK RANCH WETLAND MITIGATION SITE 2009



Photo Point 4: Facing south along ditch spoil pile.



Photo Point 5: Facing northwest along easement fence line. Pre-existing wetland is to right of fence and new wetland is to left.



Photo Point 5: Facing west. Long Coulee Ditch wetland in foreground and new wetland in background.



Photo Point 5: Facing south / southwest along dike. Long Coulee Ditch wetland along dike toe and new wetland in background.



Photo from Transect 1 start. Facing north along transect. *Typha* / *Alisma* wetland in foreground.

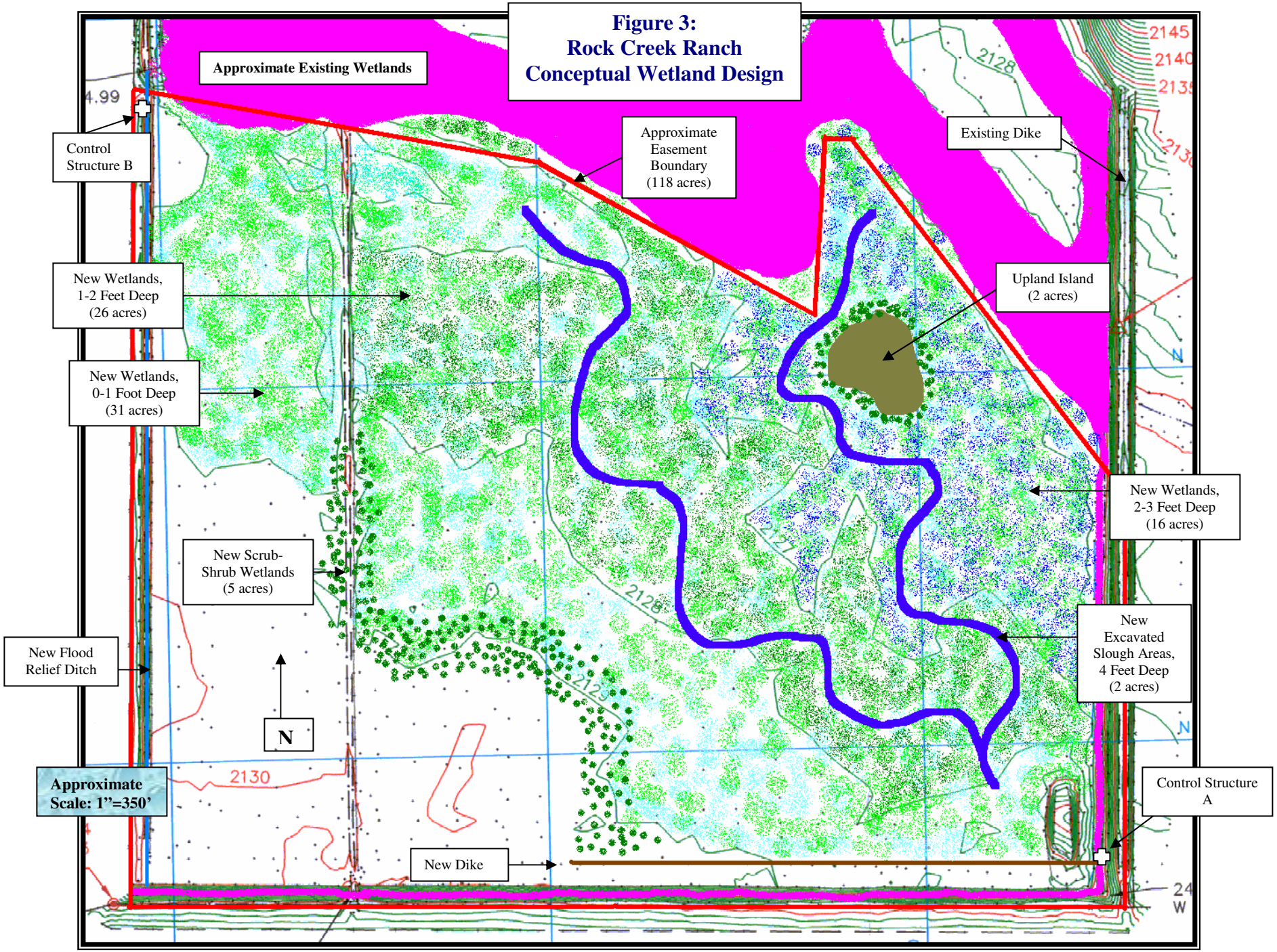


Photo from Transect 1 end. Facing south along transect. *Rumex* / *Typha* wetland in foreground.

Appendix D

CONCEPTUAL SITE LAYOUT

MDT Wetland Mitigation Monitoring
Rock Creek Ranch
Hinsdale, Montana


Figure 3:
Rock Creek Ranch
Conceptual Wetland Design
Approximate Existing Wetlands
Control Structure B
Approximate Easement Boundary (118 acres)
Existing Dike
New Wetlands, 1-2 Feet Deep (26 acres)
Upland Island (2 acres)
New Wetlands, 0-1 Foot Deep (31 acres)
New Wetlands, 2-3 Feet Deep (16 acres)
New Scrub-Shrub Wetlands (5 acres)
New Excavated Slough Areas, 4 Feet Deep (2 acres)
New Flood Relief Ditch
N
Approximate Scale: 1"=350'
Control Structure A
New Dike
2145
2140
2128
2130
2127
2126
2129

Appendix E

BIRD SURVEY PROTOCOL
GPS PROTOCOL

MDT Wetland Mitigation Monitoring
Rock Creek Ranch
Hinsdale, 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
Rock Creek Ranch
Hinsdale, 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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Taxa Listing

Project ID: MDT09PBSJ
RAI No.: MDT09PBSJ002

RAI No.: MDT09PBSJ002 **Sta. Name:** Rock Creek Ranch
Client ID:
Date Coll.: 7/28/2009 **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	26	23.21%	Yes	Unknown		8	CG
Hydrozoa	1	0.89%	Yes	Unknown		5	PR
Ostracoda	1	0.89%	Yes	Unknown		8	CG
Lymnaeidae							
Stagnicola sp.	1	0.89%	Yes	Unknown		6	SC
Naididae							
Naididae (Naidinae)	1	0.89%	Yes	Unknown	Immature	8	CG
Naididae (Tubificinae) - with capillary setae	1	0.89%	Yes	Unknown	Immature	11	CG
Nais sp.	4	3.57%	Yes	Unknown	Immature	8	CG
Stylaria sp.	3	2.68%	Yes	Unknown		8	CG
Planorbidae							
Gyraulus sp.	1	0.89%	Yes	Unknown		8	SC
Planorbidae	4	3.57%	Yes	Immature		6	SC
Odonata							
Coenagrionidae							
Coenagrionidae	2	1.79%	Yes	Larva	Early Instar	7	PR
Ephemeroptera							
Baetidae							
Baetidae	5	4.46%	Yes	Larva	Early Instar	4	CG
Heteroptera							
Corixidae							
Corixidae	3	2.68%	No	Larva		10	PH
Hesperocorixa sp.	1	0.89%	Yes	Adult		10	PH
Coleoptera							
Hydrophilidae							
Hydrophilidae	1	0.89%	Yes	Larva		5	PR
Diptera							
Ceratopogonidae							
Ceratopogoninae	1	0.89%	Yes	Larva		6	PR
Chaoboridae							
Chaoborus sp.	4	3.57%	Yes	Larva		7	PR
Chironomidae							
Chironomidae							
Cricotopus (Isocladius) sp.	24	21.43%	Yes	Larva		7	SH
Orthocladiinae	2	1.79%	No	Larva	Early Instar	6	CG
Paratanytarsus sp.	16	14.29%	Yes	Larva		6	CG
Psectrocladius sp.	2	1.79%	Yes	Larva		8	CG
Tanytarsini	5	4.46%	No	Larva	Early Instar	6	CF
Sample Count	**112**						

Metrics Report

Project ID: MDT09PBSJ
RAI No.: MDT09PBSJ002
Sta. Name: Rock Creek Ranch
Client ID:
STORET ID:
Coll. Date: 7/28/2009

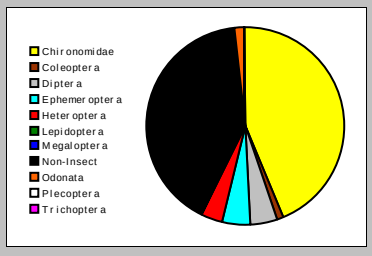
Abundance Measures

Sample Count: 112
Sample Abundance: 840.00 13.33% of sample used

Coll. Procedure:
Sample Notes:

Taxonomic Composition

Category	R	A	PRA
Non-Insect	11	46	41.07%
Odonata	1	2	1.79%
Ephemeroptera	1	5	4.46%
Plecoptera			
Heteroptera	1	4	3.57%
Megaloptera			
Trichoptera			
Lepidoptera			
Coleoptera	1	1	0.89%
Diptera	2	5	4.46%
Chironomidae	3	49	43.75%

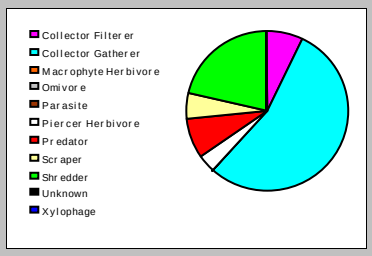


Dominant Taxa

Category	A	PRA
Copepoda	26	23.21%
Cricotopus (Isocladius)	24	21.43%
Paratanytarsus	16	14.29%
Tanytarsini	5	4.46%
Baetidae	5	4.46%
Planorbidae	4	3.57%
Nais	4	3.57%
Chaoborus	4	3.57%
Stylaria	3	2.68%
Corixidae	3	2.68%
Cladocera	3	2.68%
Psectrocladius	2	1.79%
Orthocladiinae	2	1.79%
Coenagrionidae	2	1.79%
Ceratopogoninae	1	0.89%

Functional Composition

Category	R	A	PRA
Predator	5	9	8.04%
Parasite			
Collector Gatherer	9	61	54.46%
Collector Filterer	1	8	7.14%
Macrophyte Herbivore			
Piercer Herbivore	1	4	3.57%
Xylophage			
Scraper	3	6	5.36%
Shredder	1	24	21.43%
Omivore			
Unknown			



Metric Values and Scores

Metric	Value	BIBI	MTP	MTV	MTM
Composition					
Taxa Richness	20	3	2		1
Non-Insect Percent	41.07%				
E Richness	1	1		0	
P Richness	0	1		0	
T Richness	0	1		0	
EPT Richness	1		0		0
EPT Percent	4.46%		0		0
Oligochaeta+Hirudinea Percent	8.04%				
Baetidae/Ephemeroptera	1.000				
Hydropsychidae/Trichoptera	0.000				
Dominance					
Dominant Taxon Percent	23.21%		3		3
Dominant Taxa (2) Percent	44.64%				
Dominant Taxa (3) Percent	58.93%	3			
Dominant Taxa (10) Percent	83.93%				
Diversity					
Shannon H (loge)	2.278				
Shannon H (log2)	3.286		3		
Margalef D	4.108				
Simpson D	0.147				
Evenness	0.083				
Function					
Predator Richness	5		2		
Predator Percent	8.04%	1			
Filterer Richness	1				
Filterer Percent	7.14%			2	
Collector Percent	61.61%		2		2
Scraper+Shredder Percent	26.79%		2		1
Scraper/Filterer	0.750				
Scraper/Scraper+Filterer	0.429				
Habit					
Burrower Richness	1				
Burrower Percent	0.89%				
Swimmer Richness	1				
Swimmer Percent	3.57%				
Clinger Richness	1	1			
Clinger Percent	21.43%				
Characteristics					
Cold Stenotherm Richness	0				
Cold Stenotherm Percent	0.00%				
Hemoglobin Bearer Richness	2				
Hemoglobin Bearer Percent	4.46%				
Air Breather Richness	1				
Air Breather Percent	0.89%				
Voltinism					
Univoltine Richness	9				
Semivoltine Richness	1	1			
Multivoltine Percent	75.00%		1		
Tolerance					
Sediment Tolerant Richness	3				
Sediment Tolerant Percent	5.36%				
Sediment Sensitive Richness	0				
Sediment Sensitive Percent	0.00%				
Metals Tolerance Index	2.828				
Pollution Sensitive Richness	0	1		0	
Pollution Tolerant Percent	8.93%	5		2	
Hilsenhoff Biotic Index	7.045		0		0
Intolerant Percent	0.00%				
Supertolerant Percent	40.18%				
CTQa	100.000				

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	18	36.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	15	50.00%	Moderate
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	4	22.22%	Moderate
MTM	Montana DEQ Mountains (Bukantis 1998)	7	33.33%	Moderate

