MONTANA DEPARTMENT OF TRANSPORTATION
WETLAND MITIGATION MONITORING REPORT: YEAR 2006

Rock Creek Ranch
Hinsdale, Montana

Prepared for:

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

Prepared by:

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

December 2006

Project No: B4054.00 - 0413

PBSJ

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1.0 INTRODUCTION

This report documents the second 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. Potential highway impacts have not been quantified or characterized at this time. However, it is expected that impacts will primarily involve emergent wetlands with occasional impacts to scrub-shrub and possible minor impacts to forested wetlands along the Milk River corridor (Urban pers. comm.).

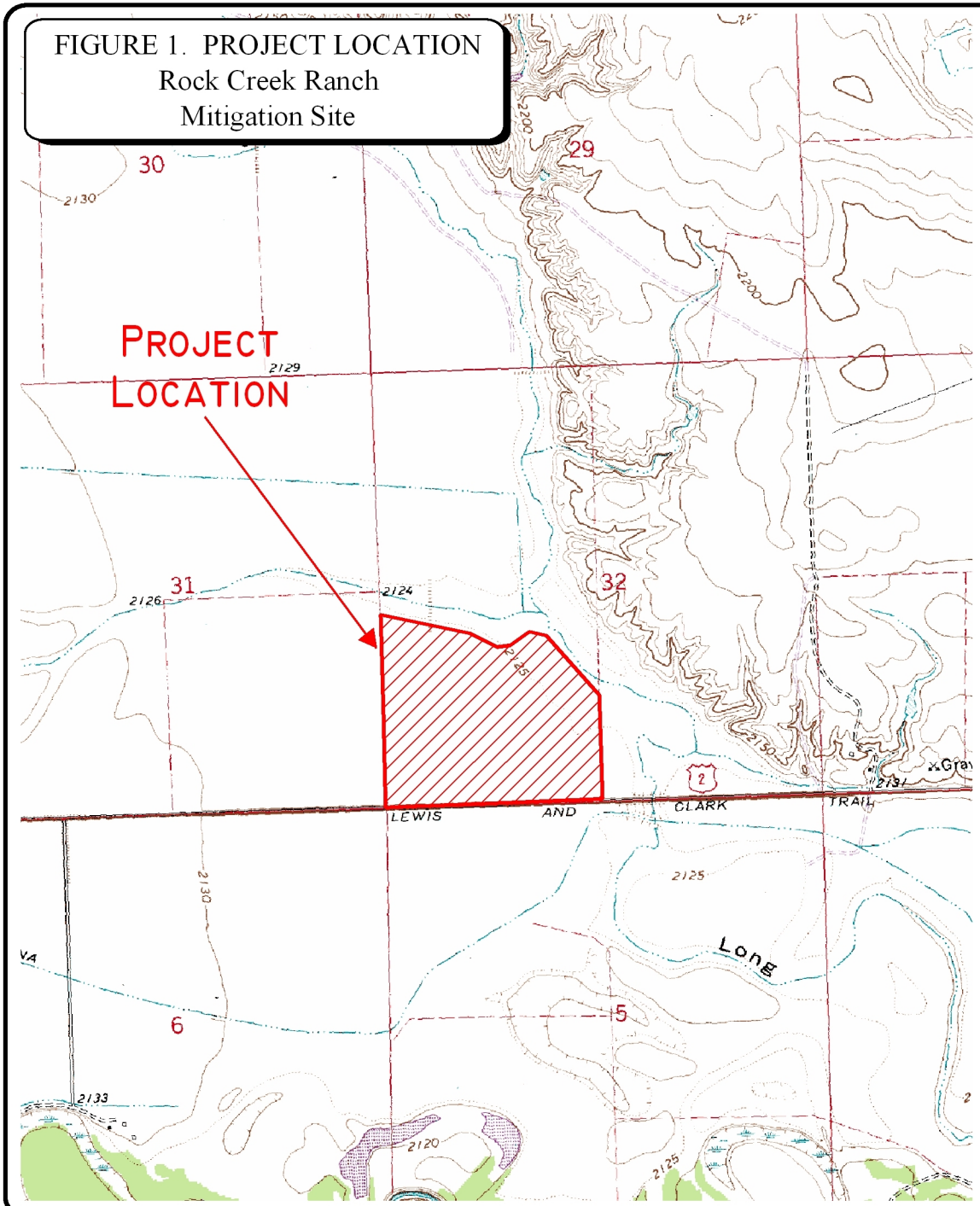
Constructed in fall 2004, the Rock Creek Ranch wetland mitigation project seeks to create / restore (re-establish) up to 75 acres of primarily emergent and, as an added component, scrub/shrub wetlands, within an approximate 116.75-acre perpetual conservation easement in the southeast corner of the ranch 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.

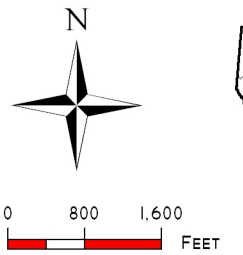
The proposed wetlands are designed to collect water from irrigation and natural seasonal flow down Long Coulee, as well as irrigation return flow and precipitation. As the low point on the ranch, all irrigation return water flows through the wetland mitigation area with the exception of water flowing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

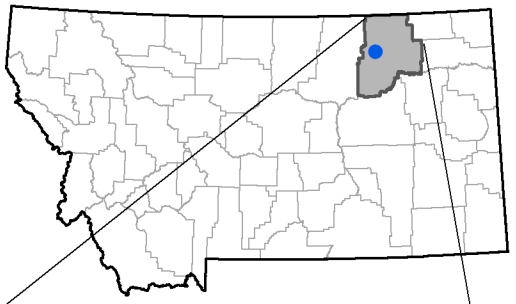
Project components were designed to increase habitat diversity at the site. These include excavating approximately two acres of four foot-deep sinuous “slough” areas within current upland areas to provide open water / vegetated shallows components and maximize edge effect. Spoils from this excavation were placed as two naturally-shaped upland “islands” within the site. Sprigging willow cuttings is proposed in and along the saturated zones of the newly flooded area once water levels are established; likely in spring 2007, providing a 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*).

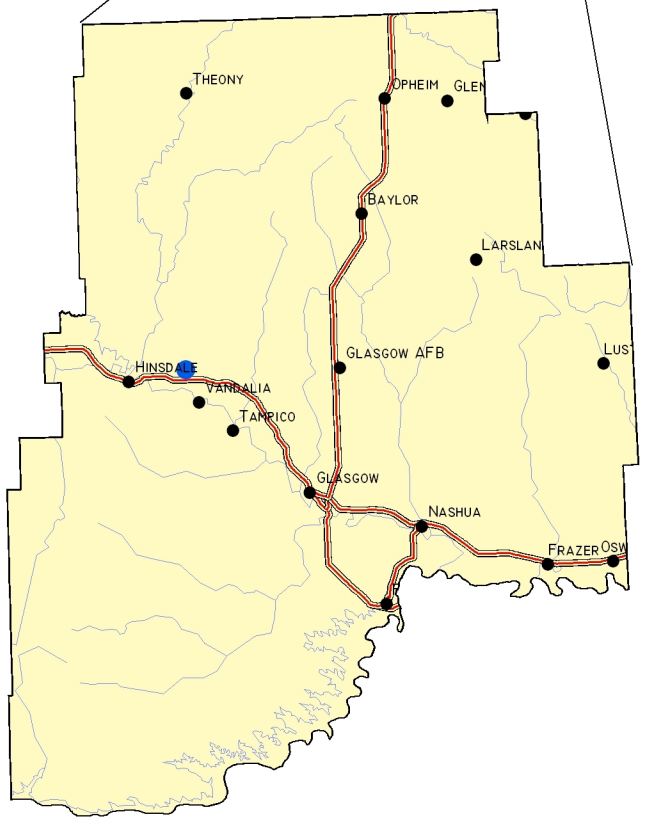
Credit ratios and approximate associated credit acreages agreed to by the Corps of Engineers (COE 2003) are listed in **Table 1**. While up to 76 acres of credit may eventually develop, the short term current MDT credit goal at the site is 50 acres.

FIGURE 1. PROJECT LOCATION
Rock Creek Ranch
Mitigation Site









PROJECT #: 330054.407
DATE: Dec 2005
LOCATION: Hinsdale, MT
PROJECT MANAGER: J. Berglund
DRAWN BY: L. Lundquist

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A Division Of PBS&J

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

Habitat	Credit Ratio	Credit Acreages
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**

This report documents the results of 2006 monitoring efforts. The monitoring area is illustrated in **Figure 2** (**Appendix A**).

2.0 METHODS

2.1 Monitoring Dates and Activities

The site was visited on May 25 (spring), July 19 (mid-season), and October 26 (fall) 2006. The primary purpose of the spring and fall visits was to conduct a bird/general wildlife reconnaissance. The mid-May period was selected for the spring visit because monitoring between mid-May and early June is likely to detect migrant as well as early nesting activities for a variety of avian species (Carlson pers. comm.). In Montana, most amphibian larval stages are also present by early June (Werner pers. comm.).

The mid-season visit was conducted to document vegetation, soil, and hydrologic conditions used to map jurisdictional 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 2004 aerial photograph during the mid-season visit. Standardized community mapping was not employed as many of these systems are geared towards climax vegetation and may not reflect yearly changes. Estimated percent cover of the dominant species in each community type was listed on the site monitoring form (**Appendix B**).

A 10-foot wide belt transect was 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 approximate transect location is depicted on **Figure 2** (**Appendix A**). The transect is used to evaluate changes over time, especially the establishment and increase of hydrophytic vegetation. Transect data were recorded on the mitigation site monitoring form. Photos along 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 in 2006 as new species were encountered. Woody species have not yet been planted at this mitigation site. Consequently, no monitoring relative to the survival of such species was conducted in 2006.

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 1998).

Surface soils were sampled at six locations east of the east dike (**Figure 2** in **Appendix A**) during the mid-season visit and remitted to Energy Labs for salinity analysis.

2.5 Wetland Delineation

Wetland delineation was conducted during the mid-season visit according the 1987 COE Wetland Delineation Manual. 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 and fall visits, 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 all visits, observations were categorized by species, activity code, and general habitat association (**Field Data Forms** in **Appendix B**). Observations from past years will be compared with new data.

2.8 Macroinvertebrates

One macroinvertebrate sample was collected during the mid-season site visit and data recorded on the wetland mitigation monitoring form. Macroinvertebrate sampling procedures are included in **Appendix F**. The approximate location of the sample point is shown on **Figure 2** (**Appendix A**). The sample was preserved as outlined in the sampling procedure and sent to Rhithron Associates for analysis.

2.9 Functional Assessment

A functional assessment was completed using the 1999 MDT Montana Wetland Assessment Method (Berglund 1999). Field data necessary for this assessment were generally collected during the mid-season site visit. An abbreviated field data sheet for the 1999 MDT Montana Wetland Assessment Method was compiled to facilitate rapid collection of field information. The remainder of the functional assessment was completed in the office. For each wetland or group of wetlands (that share similar functions and values) a Functional Assessment Form was completed (**Appendix B**)

2.10 Photographs

Photographs were taken during the mid-season visit showing the current land use surrounding the site, the upland buffer, the monitored area, and the vegetation transect (**Appendix C**). The approximate location of photo points is shown on **Figure 2** (**Appendix A**). 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. During 2006, GPS data collected included wetland boundaries and soil sample locations east of the east dike on adjacent property (for purposes of monitoring changes in salinity east of the dike). Wetland boundary changes observed in 2006 were also documented on a 2005 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 2006, with an estimated 60 acres of the designed 75-acre wetland area exhibiting inundation. During the late May spring visit, virtually 100% of the designed wetland area was inundated. Water depths ranged between approximately three to four feet deep in the excavated slough areas, and between one inch and two feet 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 13 inches during the spring visit and 20 inches during the mid-season visit; a vast improvement over 2005 when the distance was about three feet during both spring and summer.

According to the Western Regional Climate Center, mean monthly precipitation from January through July from 1971 to 2005 total 10.43 inches for the Hinsdale 4SW station. During 2005, 9.7 inches (73 % of the mean) of precipitation were recorded at this station between January and July. Thus, the first-year (2005) evaluation was apparently conducted during a sub-normal precipitation period. Precipitation data were incomplete for this and all Glasgow stations during 2006; however, spring and early summer precipitation was generally perceived to be greater in 2006 than in 2005, as evidenced by the increased inundation.

3.2 Vegetation

Vegetation species identified on the site are presented in **Table 2** and on the attached data form. As of 2006, five wetland community types were 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*, Type 6: *Typha latifolia /Ammannia robusta*, and Type 7: *Typha latifolia / Iva axillaris*.

Dominant species within each of these communities are listed on the attached data form (**Appendix B**).

Type 1 greatly expanded in 2006 and 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 an expanding small patch in the northwest corner of the site.

Newly defined on the site in 2006 were Type 6 and Type 7. Type 6 is 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. Type 6 was mapped in two primary areas: along the south dike and in the approximate center of the site. Type 7 is transitional to Type 1 and generally occurs along the outer limits of Type 1 areas. Notably, several seedling plains cottonwood (*Populus deltoides*) and peach-leaf willow (*Salix amygdaloides*) were observed emerging along some excavated slough margins (west slough) within the site.

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.

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

Table 2: ***2006 Rock Creek Ranch vegetation species list.***

Species[1]	Region 4 Wetland Indicator Status
Agropyron repens	FAC
Agropyron smithii	FACU
Agropyron trachycaulum	FACU
Agrostis alba	FACW
Alisma gramineum	OBL
Alopecurus pratensis	FACW
Ammannia robusta	**OBL**
Artemisia cana	FACU
Artemisia frigida	--
Beckmannia syzigachne	OBL
Bromus inermis	--
Carex vesicaria	OBL
Chenopodium album	FAC
Cirsium arvense	FACU
Echinochloa crusgalli	FACW
Eleocharis palustris	OBL
Grindelia squarrosa	UPL
Helianthus annuus	FACU
Hordeum jubatum	FACW
Iva axillaris	FACU

Table 2 (Continued): ***2006 Rock Creek Ranch vegetation species list.***

Kochia scoparia	FAC
Lactuca serriola	FACU
Lemna minor	OBL
Lepidium densiflorum	FACU
Medicago sativa	--
Melilotus alba	**FACU-**
Melilotus officinalis	**FACU-**
Najas flexilis	**OBL**
Oats - domestic	--
Phleum pratense	FACU
Plantago major	FAC
Populus deltoides	FAC
Potamogeton pectinatus	OBL
Rumex crispus	FACW
Sagittaria cuneata	OBL
Salix amygdaloides	FACW
Salix exigua	FACW+
Scirpus acutus	**OBL**
Scirpus maritimus	NI
Spartina pectinata	**FACW**
Tragopogon dubius	--
Typha latifolia	OBL
Wheat - domestic	--

[1] **Bolded** species indicate those observed for the first time in 2006**.**

Table 3: ***2005-2006 Transect 1 data summary.***

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

Chart 1: ***Transect map showing vegetation types from start (0 feet) to the end (385 feet) of transect 1 for 2005 and 2006.***

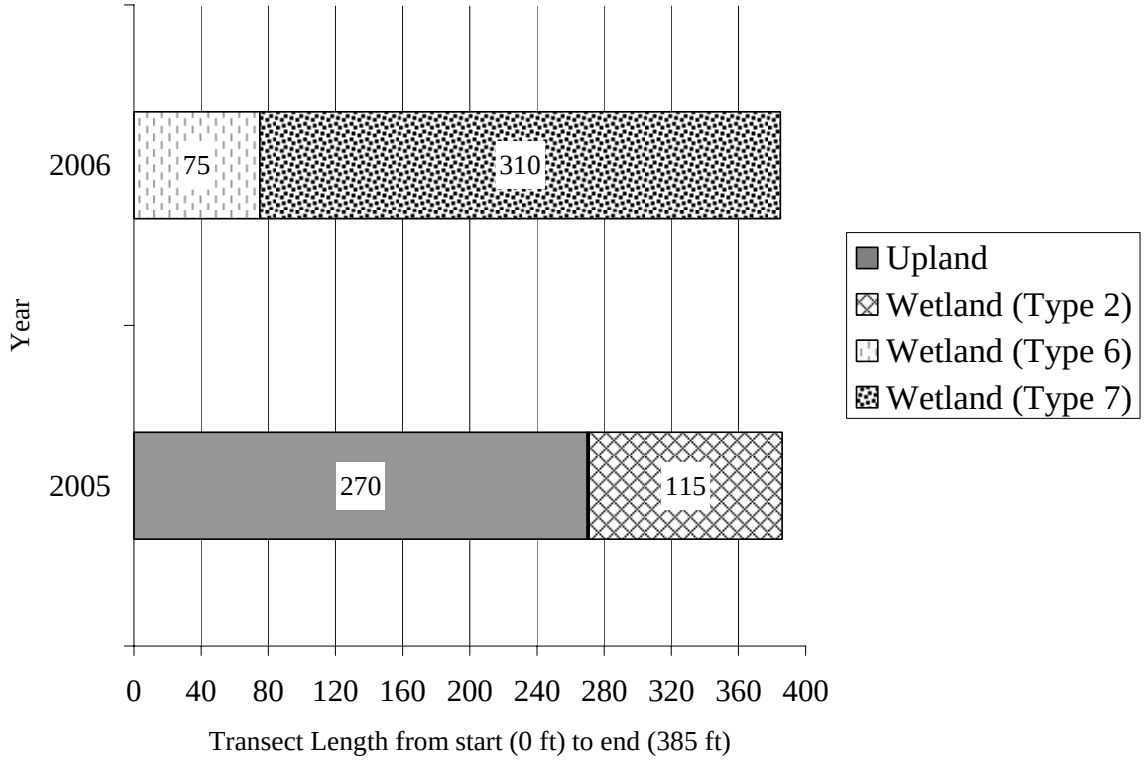
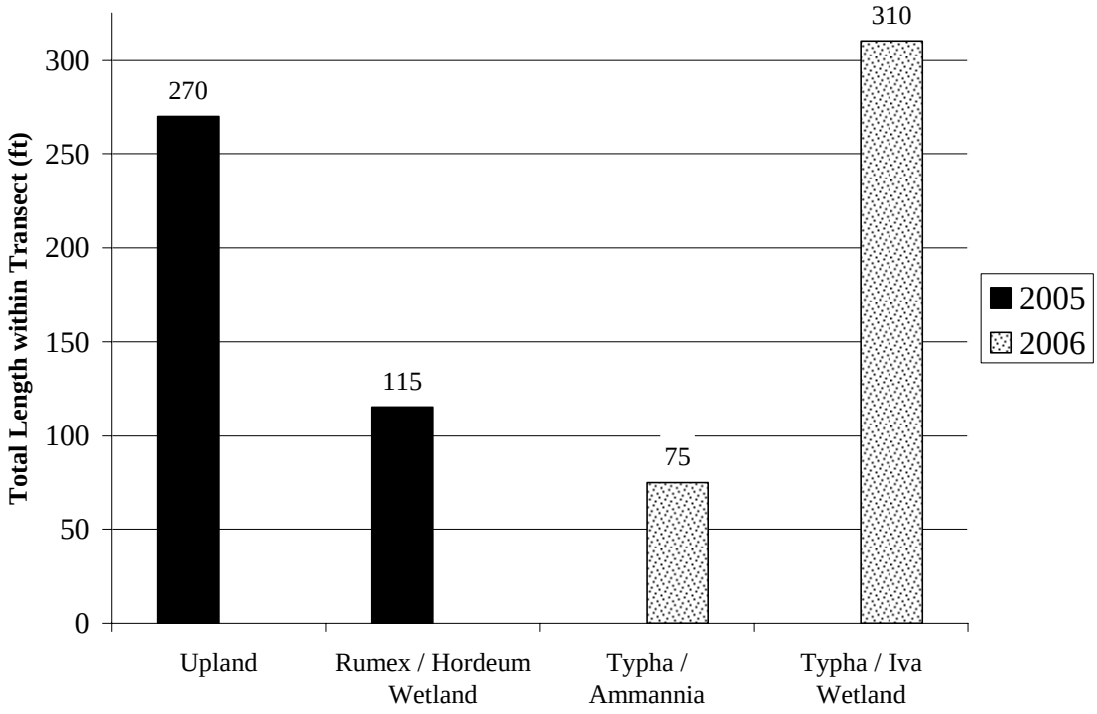


Chart 2: ***Length of vegetation communities within Transect 1 for 2005 and 2006.***



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 2005 and 2006 monitoring. Soils sampled in wetland areas consistently were comprised of clay with a matrix color of 2.5Y4/1 to 10YR 4/1. Most wetland soils were saturated or inundated at the time of the survey.

Soil sample laboratory analysis results are presented in **Appendix B**. Bicarbonate alkalinity (HCO3 saturated paste) was low for all samples. Results suggest that some soluble salts are present in samples 2 (historic Long Coulee drainage) and 5, but not in significant amounts. Sampling will continue in subsequent years and will be compared with these 2006 results, with conductivity and pH added to the analysis.

3.4 Wetland Delineation

Delineated wetland boundaries are illustrated on **Figure 3** (**Appendix A**). Completed wetland delineation forms are included in **Appendix B**. Soils, vegetation, and hydrology are discussed in preceding sections. Although they are shown on **Figure 3** (**Appendix A**) delineation acreage results for 2006 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 4**.

Table 4: ***2006 Wetland delineation results for Rock Creek Ranch Wetland Mitigation Site.***

Aquatic Habitat	Acreages
Wetland	81.52
Open Water	1.25
Total Aquatic Habitat	**82.77**

Approximately 1.08 acres of wetlands occurred on the site prior to project implementation. Consequently, the net aquatic habitat developed to date is 82.77 – 1.08 = 81.69 acres.

3.5 Wildlife

Wildlife species, or evidence of wildlife, observed on the site during 2005 and 2006 monitoring efforts are listed in **Table 5**. Specific evidence observed, and activity codes pertaining to birds, are provided on the completed monitoring form in **Appendix B**. Five mammal, two amphibian, one reptile, and 39 bird species were noted using portions of the mitigation site during 2006

Of special interest were observations of northern leopard frogs (*Rana pipiens*) during 2005/2006, and Bald Eagles (*Haliaeetus leucocephalus)* and a Black-Necked Stilt (*Himantopus mexicanus*)

during 2006. 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. This species has been assigned the rank of S1 (critically imperiled) in intermountain valleys and S3 (rare occurrence and/or restricted range and/or vulnerable to extinction) in the Great Plains region (which includes the project area) by the MTNHP.

The Bald Eagle is a federally-listed threatened species; a pair was observed foraging at the site during October. The Black-Necked Stilt is considered a potential species of concern by the MTNHP and one was observed on the site during July exhibiting possible nesting (broken wing) behavior.

Table 5: ***2005-2006 fish and wildlife species observed[1] on the Rock Creek Ranch Wetland Mitigation Site.***

FISH **None**	
AMPHIBIANS **Northern Leopard Frog (*Rana pipiens*)**	 **Western Chorus Frog (*Pseudacris triseriata*)**
REPTILES **Plains Garter Snake (*Thamnophis radix*)**	
BIRDS **American Avocet (*Recurvirostra americana*)** **American Coot (*Fulica americana*)** American Crow (*Corvus brachyrhynchos*) American White Pelican (*Pelecanus erythrorhynchos*) **Bald Eagle (*Haliaeetus leucocephalus)*** **Bank Swallow (*Riparia riparia*)** **Black-necked Stilt (*Himantopus mexicanus*)** **Blue-winged Teal (*Anas discors*)** Brewer's Blackbird (*Euphagus cyanocephalus*) **Brown-headed Cowbird (*Molothrus ater*)** **Bullock's Oriole (*Icterus bullockii*)** **Canada Goose (*Branta canadensis*)** **Common Snipe (*Gallinago gallinago*)** Common Yellowthroat (*Geothlypis trichas)* **Eared Grebe (*Podiceps nigricollis*)** **Eastern Kingbird (*Tyrannus tyrannus*)** European Starling (*Sturnus vulgaris*) **Gadwall (*Anas strepera*)** **Killdeer (*Charadrius vociferous*)** **Long-billed Dowitcher (*Limnodromus scolopaceus*)** **Mallard (*Anas platyrhynchos*)** **Marbled Godwit (*Limosa fedoa*)** **Marsh Wren (*Cistothorus palustris*)** **Mourning Dove (*Zenaida macroura*)** **Northern Harrier (*Circus cyaneus*)**	 **Northern Pintail (*Anas acuta*)** **Northern Rough-winged Swallow (*Stelgidopteryx serripennis*)** **Northern Shoveler (*Anas clypeata*)** **Redhead (*Aythya americana*)** **Red-tailed Hawk (*Buteo jamaicensis)*** **Red-winged Blackbird (*Agelaius phoeniceus)*** **Ring-necked Pheasant (*Phasianus colchicus*)** **Ruddy Duck (*Oxyura jamaicensis*)** **Sandhill Crane (*Grus Canadensis*)** Savannah Sparrow (*Passerculus sandwichensis*) **Semipalmated Sandpiper (*Calidris pusilla*)** **Sora (*Porzana carolina*)** Swainson's Hawk (*Buteo swainsoni*) Townsend's Warbler (*Dendroica townsendi*) **Tree Swallow (*Tachycineta bicolor*)** **Upland Sandpiper (*Bartramia longicauda*)** **Vesper Sparrow (*Pooecetes gramineus*)** **Western Meadowlark (*Sturnella neglecta*)** **Western Sandpiper (*Calidris mauri*)** Western Tanager (*Piranga ludoviciana*) **Willet (*Catoptrophorus semipalmatus*)** Willow Flycatcher (*Empidonax traillii*) **Wilson's Phalarope (*Phalaropus tricolor*)** **Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*)**
MAMMALS **Coyote (*Canis latrans*)** **Deer (*Odocoileus sp.*)** **Raccoon (*Procyon lotor*)**	 **Richardson's Ground Squirrel (*Spermophilus richardsonii*)** **White-tailed Jack Rabbit (*Lepus townsendii*)**

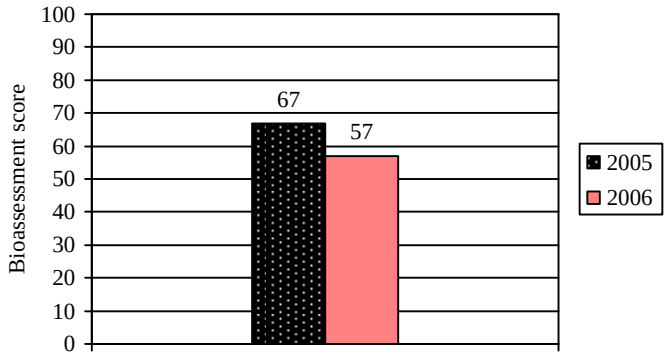
[1] **Bolded** species indicate those observed during 2006 monitoring.

3.6 Macroinvertebrates

Macroinvertebrate sampling results are provided in **Appendix F** and are summarized below by Rhithron Associates (Bollman 2006) and in **Chart 3**.

Sub-optimal conditions apparently persisted at this site between 2005 and 2006, in spite of the complete loss of POET taxa and diminished taxa richness in the latter year. Open water habitats seem to have dominated this wetland. Hypoxic sediments are indicated by hemoglobin-bearing midges, but sediment surfaces may have been better-oxygenated, since ostracods were very abundant, dominating the sampled fauna.

Chart 3: ***Macroinvertebrate bioassessment scores for 2005 and 2006.***



3.7 Functional Assessment

The completed 2006 functional assessment form is presented in **Appendix B**. Functional assessment results are summarized in **Table 6**. For comparative purposes, the functional assessment results for baseline conditions are also included in **Table 6**.

The site currently rates as a Category II wetland, a substantial improvement over baseline Category IV ratings. More significantly, the site has gained over 510 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. Scarlet ammannia, although currently rated an "SH" (historic) species by the MTNHP, would now qualify as an "S1" (probable), "S2" or "S3" species due to its re-discovery (Mincemoyer pers. comm.). This species was rated accordingly in the functional assessment.

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 2006 aerial photograph.

Table 6: ***Summary of 2006 wetland function/value ratings and functional points [1] at the Rock Creek Ranch Mitigation Project***

Function and Value Parameters From the 1999 MDT Montana Wetland Assessment Method	Wetland Numbers		
	Pre-Project Wetland Ditches (2003)	Pre-Project Isolated Wetland Patches (2003)	Post-Project 2006
Listed/Proposed T&E Species Habitat	Low (0.3)	Low (0.0)	Low (0.5)
MTNHP Species Habitat	Low (0.1)	Low (0.1)	High (1.0)
General Wildlife Habitat	Low (0.3)	Low (0.1)	High (0.8)
General Fish/Aquatic Habitat	NA	NA	NA
Flood Attenuation	Low (0.2)	NA	Moderate (0.6)
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)	Moderate (0.7)
Groundwater Discharge/Recharge	Low (0.1)	Low (0.1)	Low (0.1)
Uniqueness	Low (0.1)	Low (0.1)	Low (0.3)
Recreation/Education Potential	Low (0.1)	Low (0.1)	Low (0.3)
Actual Points/Possible Points	2.3 / 11	1.5 / 9	6.2 / 10
% of Possible Score Achieved	21	17	62
Overall Category	IV	IV	II
Total Acreage of Assessed Wetlands within Easement (ac)	**0.77**	**0.31**	**82.77**
Functional Units (acreage x actual points) (fu)	**1.77**	**0.47**	**513.17**
Net Acreage Gain (ac)	**NA**	**NA**	**81.69**
Net Functional Unit Gain (fu)	**NA**	**NA**	**510.93**
Total Functional Unit Gain over baseline	**510.93**		

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

3.9 Maintenance Needs/Recommendations

All dikes were in good condition during the spring, mid-season, and fall visits with no indications of seepage observed during 2006.

3.10 Current Credit Summary

Approximately 81.52 acres of wetlands and 1.25 acres of open water were delineated on the mitigation site in 2006, for a total of 82.77 acres of aquatic habitat. Approximately 1.08 acres of wetlands occurred on the site prior to project implementation. Consequently, the net aquatic habitat created / restored to date is 82.77 – 1.08 = 81.69 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 2006, the maximum assignable credit at the Rock Creek Ranch mitigation site is 81.69 + 0.36 + 0.9 = 82.95 acres, or 166% of the initial 50-acre goal. Additional wetland communities are likely to form and stabilize with consistent inundation from year to year

4.0 REFERENCES

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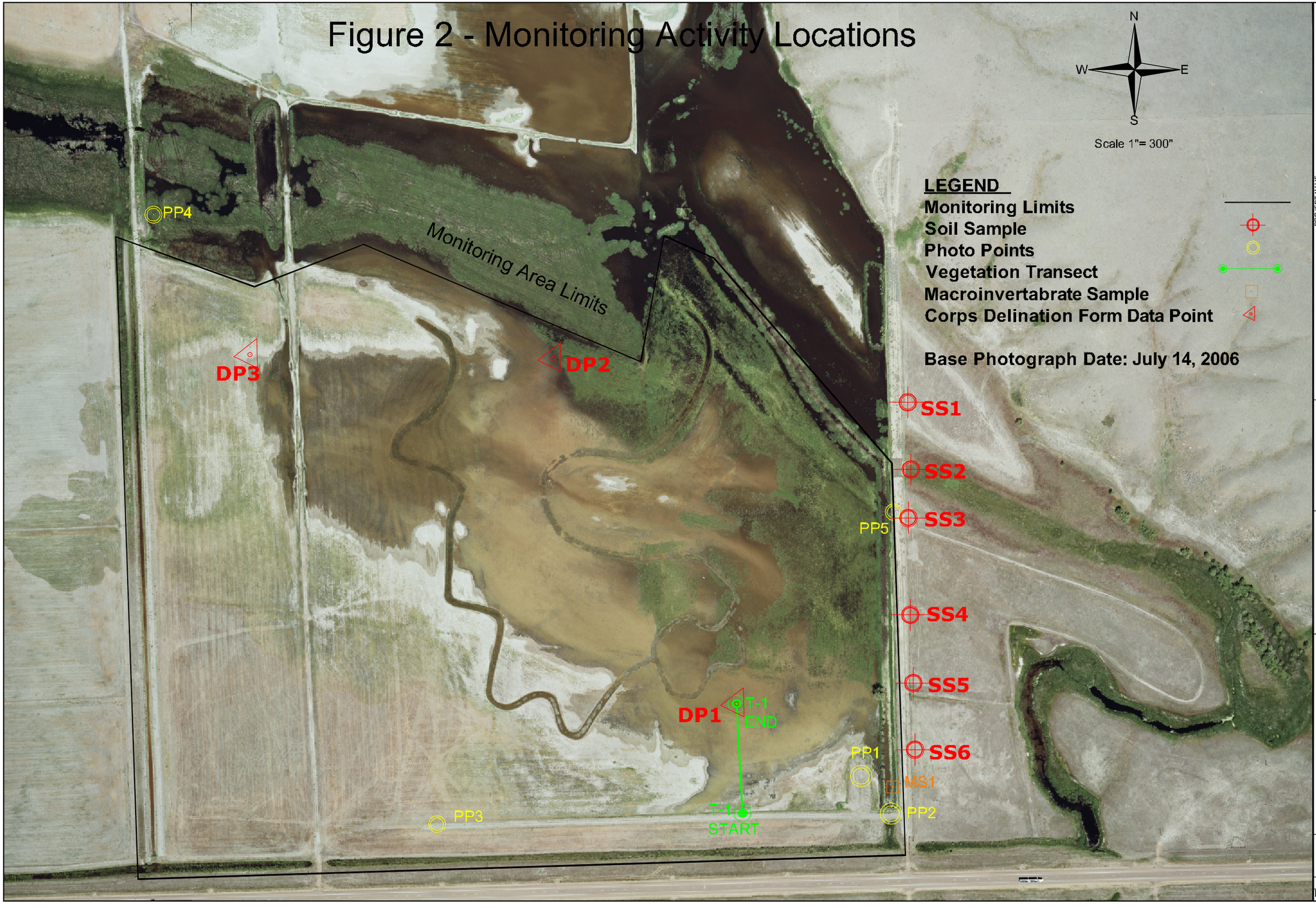
Appendix A

FIGURES 2 & 3

MDT Wetland Mitigation Monitoring
Rock Creek Ranch
Hinsdale, Montana

Figure 2 - Monitoring Activity Locations



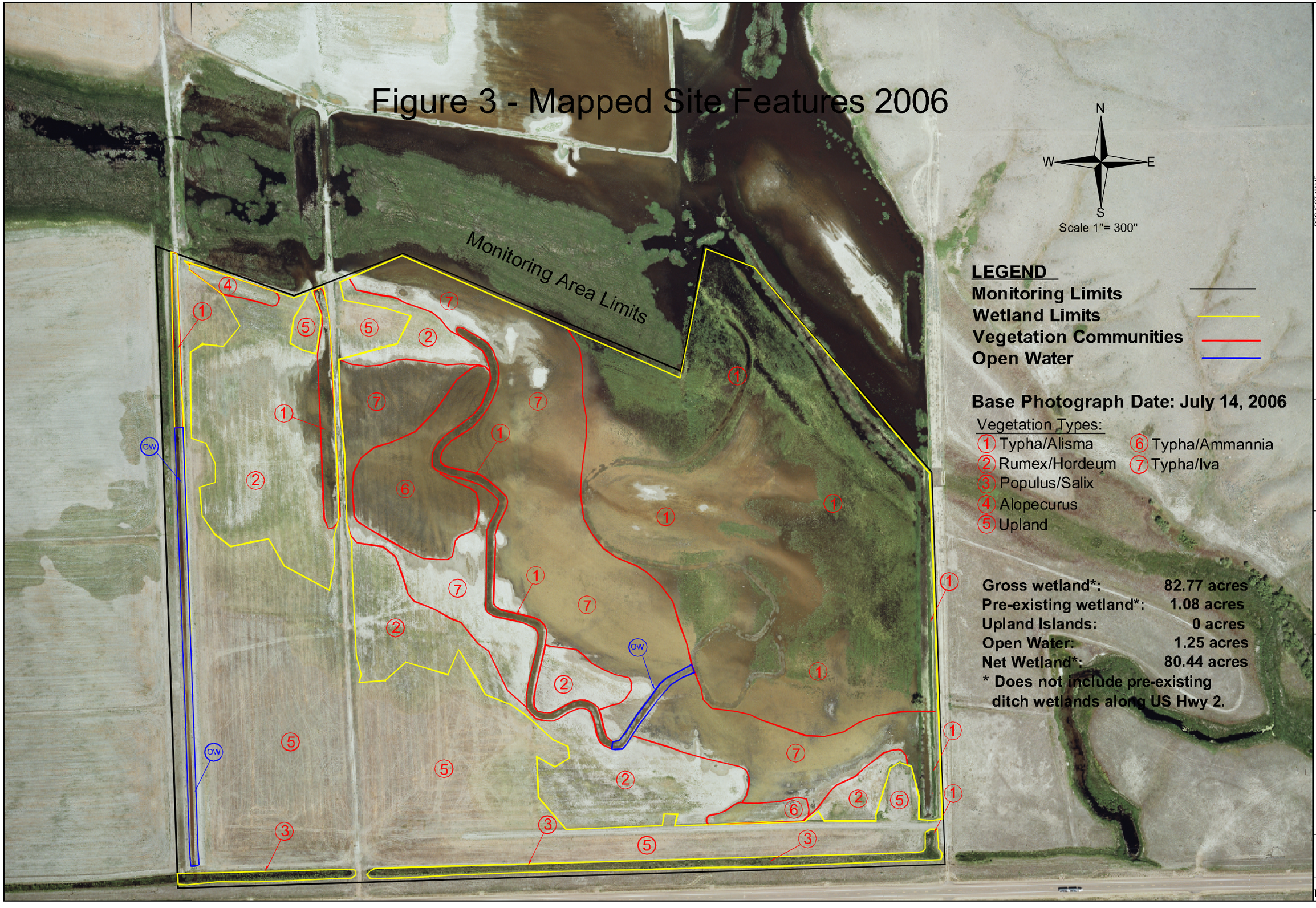
PROJECT NAME
MDT Rock Creek Ranch Wetland Mitigation
DRAWING TITLE
Monitoring Activity Locations

PROJ NO: B33054.414	DRAWN: LL		
LOCATION: Hinsdale, MT	PROJ MGR: J.Berglund		
SCALE: 1"=300'	CHECKED:	APP'VD:	
FILE NAME: L:\33054.414\RockCreek\dwg\RockCr2006.dwg			

LAND & WATER CONSULTING
P.O. BOX 8254
Missoula, MT 59807
A division of LFG

FIGURE
2 OF -
REV -
Nov/16/2006

Figure 3 - Mapped Site Features 2006



N
W E
S

Scale 1"= 300"

LEGEND

- **Monitoring Limits**
- **Wetland Limits**
- **Vegetation Communities**
- **Open Water**

Base Photograph Date: July 14, 2006

Vegetation Types:

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

Gross wetland*:	**82.77 acres**
Pre-existing wetland*:	**1.08 acres**
Upland Islands:	**0 acres**
Open Water:	**1.25 acres**
Net Wetland*:	**80.44 acres**

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

PROJECT NAME
MDT Rock Creek Ranch Wetland Mitigation
DRAWING TITLE
Mapped Site Features 2006

DRAWN: LL
PROJ MGR: J.Berglund
CHECKED: APPVD:
PROJ NO: B33054.414
LOCATION: Hinsdale, MT
SCALE: 1"=300'
FILE NAME: L:\33054.414\RockCreek\dwg\RockCr2006.dwg

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P.O. BOX 8254
Missoula, MT 59807
A division of LFG

FIGURE
3 OF
REV -
Nov/16/2006

Appendix B

2006 WETLAND MITIGATION SITE MONITORING FORM
2006 BIRD SURVEY FORMS
2006 WETLAND DELINEATION FORMS
2006 FUNCTIONAL ASSESSMENT FORMS
2006 SOIL SAMPLE LAB RESULTS

MDT Wetland Mitigation Monitoring
Rock Creek Ranch
Hinsdale, Montana

LWC / MDT WETLAND MITIGATION SITE MONITORING FORM

Project Name: **Rock Creek Ranch Mitigation** Project Number: **B43054.00 0414**
Assessment Date: **July 19, 2006** Person(s) conducting the assessment: **Berglund**
Location: **West of Hinsdale, north of US HGWY 2** MDT District: **Glendive** Milepost: _____
Legal Description: T **31N** R **37E** Section **32**
Weather Conditions: **Sunny, dry, calm** Time of Day: **7:00 - 13:30**
Initial Evaluation Date: **May 18, 2005** Monitoring Year: **2** # 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: **6"** 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 3-4 feet deep. Wetlands range from saturated to approximately 2 feet deep. At the SE control structure, distance from current water elevation to top of top stoplog is approximately 20". During the May 25 visit, distance between water surface and top stoplog at SE structure was about 13", and inundation of proposed wetland areas was approximately 90%.

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%		
RUM CRI	1 = 1-5%		
CAR VES	1 = 1-5%		

Comments / Problems: **Occurs in main ditch and sloughs and is spreading 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%		
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: **Predominant type on 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: **Occurs in the northwest corner of the site - Appears to be shifting to Type 1.**

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	2 = 6-10%		
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 - small patch along south dike. 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 - appears to be replacing Type 2. These areas were flooded, with Typha and Iva replacing dead (flooded) kochia.**

Community Number: ___ Community Title (main spp): _____

Dominant Species	% Cover	Dominant Species	% Cover

Comments / Problems: _____

VEGETATION COMMUNITIES (continued)

Community Number: ___ Community Title (main spp): _____

Dominant Species	% Cover	Dominant Species	% Cover

Comments / Problems: _____

Community Number: ___ Community Title (main spp): _____

Dominant Species	% Cover	Dominant Species	% Cover

Comments / Problems: _____

Community Number: ___ Community Title (main spp): _____

Dominant Species	% Cover	Dominant Species	% Cover

Comments / Problems: _____

Community Number: ___ Community Title (main spp): _____

Dominant Species	% Cover	Dominant Species	% Cover

Comments / Problems: _____

Additional Activities Checklist:

☒ Record and map vegetative communities on aerial photograph.

COMPREHENSIVE VEGETATION LIST

Plant Species	Vegetation Community Number (s)	Plant Species	Vegetation Community Number (s)
Agropyron repens	2,5	*Salix exigua*	3
Agropyron smithii	5	*Scirpus maritimus*	1
Agropyron trachycaulum	2,5	*Tragopogon dubius*	5
Agrostis alba	1,2	*Typha latifolia*	1, 2, 3, 4, 6, 7
Alisma gramineum	1, 2, 6, 7	*Wheat - domestic*	2,5
Alopecurus pratensis	2, 4	Scirpus acutus	1
Artemisia cana	5	Ammania robusta (coccinea)	6
Artemisia frigida	5	Najas flexilis	1
Beckmannia syzigachne	1, 6	Melilotus alba	5
Bromus inermis	5	Melilotus officinalis	5
Carex vesicaria	1	Spartina pectinata	1
Chenopodium album	1,2,4		
Cirsium arvense	1,2,5		
Echinochloa crusgalli	1,2		
Eleocharis palustris	1,2		
Grindelia squarrosa	5		
Helianthus annuus	5		
Hordeum jubatum	2,4,5, 6		
Iva axillaris	2,5, 7		
Kochia scoparia	2,5		
Lactuca serriola	2,5		
Lemna minor	1		
Lepidium densiflorum	2,5		
Medicago sativa	5		
Oats - domestic	2,5		
Phleum pratense	5		
Plantago major	2,5		
Populus deltoides	3		
Potamogeton pectinatus	1		
Rumex crispus	1,2,4,5, 6, 7		
Sagittaria cuneata	1		
Salix amygdaloides	3		

Comments / Problems: <u>Ammannia robusta newly discovered in 2006 at the site (two populations). This is listed as a species of concern by the Montana Natural Heritage Program. Also, seedling POP DEL and SAL AMY are starting to emerge along the western-most excavated slough.</u>

PLANTED WOODY VEGETATION SURVIVAL

Plant Species	Number Originally Planted	Number Observed	Mortality Causes

Comments / Problems: **No woody species planted to date.**

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
White-tailed jack-rabbit	1	☐	☐	☐	
Richardson's ground squirrel		☐	☐	☒	
Deer		☒	☒	☐	
Raccoon		☒	☐	☐	
Western chorus frog	24	☐	☐	☐	
Northern leopard frog	12	☐	☐	☐	
Plains garter snake	1	☐	☐	☐	
Coyote		☐	☒	☐	

Additional Activities Checklist:
Yes Macroinvertebrate Sampling (if required)

Comments / Problems: A few leopard frogs were extremely large, approaching 8-9 inches in overall length.

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 20" below top of stoplog in SE control structure.**

MDT WETLAND MONITORING – VEGETATION TRANSECT

Site: **Rock Creek Ranch** Date: **July 19, 2006** Examiner: **Berglund**
Transect Number: **1** Approximate Transect Length: **385 feet** Compass Direction from Start: **6˚** Note: _____

Vegetation Type A: **Ammania / Typha**	
Length of transect in this type: 75 feet	
Plant Species	**Cover**
AMM ROB	4 = 21-50%
TYP LAT	4 = 21-50%
BEC SYZ	1 = 1-5%
HOR JUB	1 = 1-5%
IVA AXI	1 = 1-5%
ALI GRA	1 = 1-5%
RUM CRI	1 = 1-5%
WETLAND COMMUNITY	
Total Vegetative Cover:	80%

Vegetation Type B: **Typha / Iva**	
Length of transect in this type: 310 feet	
Plant Species	**Cover**
RUM CRI	2 = 6-10%
TYP LAT	4 = 21-50%
IVA AXI	3 = 11-20%
WETLAND COMMUNITY	
Total Vegetative Cover:	60%

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): **70%**

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 developing wetland characteristics; dramatically changed in 2006, becoming much wetter.**

BIRD SURVEY – FIELD DATA SHEET

Date: 5/25/06

SITE: Rock Creek Ranch

Survey Time: 0715-1000

Bird Species	#	Behavior	Habitat	Bird Species	#	Behavior	Habitat
American Avocet	6	F	MA				
American Coot	100	F	UP				
Blue-Winged Teal	100	F, N	MA				
Canada Goose	12	F	MA				
Common Snipe	30	F	MA				
Eastern Kingbird	6	F	UP				
Gadwall	4	F	MA				
Killdeer	200	N, F	MA				
Mallard	6	F	MA				
Marbled Godwit	10	F	MA				
Northern Pintail	10	F	MA				
Northern Rough-winged Swallow	10	F	MA				
Northern Shoveler	20	F	MA				
Redhead	2	F	MA				
Red-Winged Blackbird	200	N, F	MA				
Ring-necked Pheasant	2	F	UP				
Semi-palmated Sandpiper	2	F	MA				
Vesper Sparrow	2	F	UP				
Western Meadowlark	6	L	UP				
Willet	12	F	MA				
Wilson's Phalarope	100	F	MA				
Yellow-Headed Blackbird	100	F, N	MA				

Notes: Thousands of western chorus frogs throughout inundated portions of site, several Richardson's ground squirrel burrows on uplands, scattered deer and raccoon tracks. Plains garter snake observed.

Approximately 13" from water surface in SE control structure to top of top stoplog. Approximately 11" from water surface to top of spillway along east dike.

Site is about 90% inundated, vast majority at 2-3 inches.

Dry, sunny, windy conditions.

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: 7/19/06

SITE: Rock Creek Ranch

Survey Time: 0700-1330

Bird Species	#	Behavior	Habitat	Bird Species	#	Behavior	Habitat
American Avocet	10	N, F	MA				
American Coot	20	F, N	MA				
Bank Swallow	30	F	MA				
Black-necked Stilt	1	F	MA				
Blue-winged Teal	50	N, F	MA				
Brown-Headed Cowbird	10	F	UP				
Bullock's Oriole	6	F	MA				
Canada Goose	12	F	MA				
Common Snipe	20	F	MA				
Eared Grebe	6	N	MA				
Eastern Kingbird	2	F	UP				
Gadwall	20	F	MA				
Killdeer	50	N, F	MA				
Long-billed Dowitcher	30	F	MA				
Mallard	10	F, N	MA				
Marbled Godwit	1	F	MA				
Marsh Wren	3	F	MA				
Mourning Dove	6	F	UP				
Red-Winged Blackbird	30	N, F	MA				
Ring-necked Pheasant	2	F	UP				
Ruddy Duck	10	N	MA				
Sora	2	F	MA				
Tree Swallow	20	F	MA				
Upland Sandpiper	1	F	MA				
Vesper Sparrow	20	F	UP				
Western Meadowlark	6	F	UP				
Western Sandpiper	30	F	MA				
Willet	20	F	MA				
Wilson's Phalarope	20	F	MA				
Yellow-Headed Blackbird	20	F, N	MA				

Notes: Numerous chorus and leopard frogs throughout inundated portions of site, several Richardson's ground squirrels on uplands, scattered deer tracks, raccoon tracks.
White-tailed jackrabbit observed. Several bw teal broods present. Black necked stilt exhibiting "broken wing " behavior. Site is roughly 75-80% inundated – slough portion 100% inundated.
Sunny, hot, calm to light breeze.

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: 10/26/06

SITE: Rock Creek Ranch

Survey Time: 1045-1230

Bird Species	#	Behavior	Habitat	Bird Species	#	Behavior	Habitat
Bald eagle	2	F, FO	MA				
Blue-wing teal	6	F	MA				
Brown-headed cowbird	6	F	MA				
Mallard	50+	F	MA				
Mourning dove	1	F	UP				
Northern harrier	1	F	MA				
Red-tailed hawk	2	F	MA				
Ring-necked pheasant	25+	F	MA				
Sandhill crane	400+	FO	MA				

Deer and raccoon tracks, coyote scat, ground squirrel burrows present
All of slough and east ditch inundated, main body of site has no surface water.
Sunny, calm to light breeze.
Several flocks of sandhill cranes observed flying over site; some flocks landed to north of site.
Two mature bald eagles observed foraging over site and wetlands to north.
Seedling POP DEL and SAL AMY starting to come in along constructed slough margins.
Additional large AMM ROB (COC) (sensitive plant) population observed in NW portion of site.
No signs of dike seepage to west.

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 19, 2006**
Applicant / Owner: **Rock Creek Lands LLP**	County: **Valley**
Investigator: **Berglund**	State: **MT**

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

VEGETATION

Dominant Species	Stratum	Indicator	Dominant Species	Stratum	Indicator
1. *TYP LAT*	Herb	OBL	11.		
2. *IVA AXI*	Herb	FACU	12.		
3. *RUM MAR*	Herb	FACW+	13.		
4. *ALI GRA*	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-): **3** / **4** = **75**%			FAC Neutral: **3** / **4** = **75**%		
Remarks: **Much wetter habitat than in 2005.**					

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 **YES** Drainage Patterns in Wetland
Field Observations: Depth of Surface Water **N/A** **6** (in.) Depth to Free Water in Pit **N/A** **0** (in.) Depth to Saturated Soil **N/A** **0** (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: **Inundated to 6" 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 19, 2006**
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. *ALI GRA*	Herb	OBL	13.		
4. *ELE PAL*	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:					

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 = **16** (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 16".**	

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 19, 2006**
Applicant / Owner: **Rock Creek Lands LLP**	County: **Valley**
Investigator: **Berglund**	State: **MT**

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

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:					

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: **NO** 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 **N/A** ____ (in.) Depth to Free Water in Pit **N/A** ____ (in.) Depth to Saturated Soil = **8** (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: **Inundated earlier in season.**	

PBS&J

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 May 25, 1999)

1. Project Name: Rock Creek Ranch Wetland Mitigation **2. Project #:** B43054.00-0413 **Control #:** NA

3. Evaluation Date: 10/26/2006 **4. Evaluator(s):** Berglund **5. Wetland / Site #(s):** Rock Creek Ranch Complex

6. Wetland Location(s) i. T: 31 N **R:** 37 E **S:** 32 **T:** __ N **R:** __ E **S:** _____

ii. Approx. Stationing / Mileposts: Just north of US Highway 2, east of Hinsdale and 20 miles west of Glasgow.

iii. Watershed: 11 - Milk **GPS Reference No. (if applies):** NA

Other Location Information: On Rock Creek Ranch, Valley County

7. A. Evaluating Agency MDT

B. Purpose of Evaluation:

- ☐ Wetlands potentially affected by MDT project
- ☐ Mitigation wetlands; pre-construction
- ☒ Mitigation wetlands; post-construction
- ☐ Other

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

9. Assessment Area (total acres): _____ (visually estimated)
80.44 (measured, e.g. GPS)

Comments: AA includes 1.08 pre-existing acres; ditch wetlands along Highway 2 not included.

10. CLASSIFICATION OF WETLAND AND AQUATIC HABITATS IN AA

HGM CLASS [1]	SYSTEM [2]	SUBSYSTEM [2]	CLASS [2]	WATER REGIME [2]	MODIFIER [2]	% OF AA
Depression	Palustrine	None	Emergent Wetland	Seasonally Flooded	Impounded	95
Depression	Palustrine	None	Unconsolidated Bottom	Seasonally Flooded	Impounded	5
---	---	---	---	---	---	
---	---	---	---	---	---	

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

Comments: _____

11. ESTIMATED RELATIVE ABUNDANCE (of similarly classified sites within the same Major Montana Watershed Basin)
Common **Comments:** _____

12. GENERAL CONDITION OF AA

i. Regarding Disturbance: (Use matrix below to select appropriate response.)

Conditions Within AA	Predominant Conditions Adjacent (within 500 Feet) To AA		
	Land managed in predominantly natural state; is not grazed, hayed, logged, or otherwise converted; does not contain roads or buildings.	Land not cultivated, but moderately grazed or hayed or selectively logged or has been subject to minor clearing; contains few roads or buildings.	Land cultivated or heavily grazed or logged; subject to substantial fill placement, grading, clearing, or hydrological alteration; high road or building density.
AA occurs and is managed in predominantly a natural state; is not grazed, hayed, logged, or otherwise converted; does not contain roads or occupied buildings.	---	---	moderate disturbance
AA not cultivated, but moderately grazed or hayed or selectively logged or has been subject to relatively minor clearing, or fill placement, or hydrological alteration; contains few roads or buildings.	---	---	---
AA cultivated or heavily grazed or logged; subject to relatively substantial fill placement, grading, clearing, or hydrological alteration; high road or building density.	---	---	---

Comments: (types of disturbance, intensity, season, etc.) Adjacent lands are cultivated haylands and pasture.

ii. Prominent weedy, alien, & introduced species: DOMESTIC WHEAT, DOMESTIC OATS, LEP DEN

iii. Briefly describe AA and surrounding land use / habitat: AA consists of large impounded emergent marsh; the AA only includes those wetlands within the conservation easement boundary, even though substantive pre-existing wetlands extend to the north and west. Surrounding land use is agricultural.

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

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

Comments: Scattered shrubs occur in the excavated ditch to the south, but this area was not included in the AA.

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

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

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

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

Highest Habitat Level	doc/primary	sus/primary	doc/secondary	sus/secondary	doc/incidental	sus/incidental	none
Functional Point & Rating	---	---	---	---	.5 (L)	---	---

If documented, list the source (e.g., observations, records, etc.)**:** Pair of bald eagles observed foraging at site during October 2006 bird survey.

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

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

Primary or Critical habitat **(list species)**	☒ D ☐ S	Scarlet Ammannia (Ammannia robusta)
Secondary habitat **(list species)**	☒ D ☐ S	Northern leopard frog
Incidental habitat **(list species)**	☐ D ☐ S	_____
No usable habitat	☐ D ☐ S	_____

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

Highest Habitat Level	doc/primary	sus/primary	doc/secondary	sus/secondary	doc/incidental	sus/incidental	none
Functional Point & Rating	1 (H)	---	---	---	---	---	---

If documented, list the source (e.g., observations, records, etc.)**:** Large population of Ammannia robusta discovered on site in 2006. This species is ranked "SH" as it was know only from historic occurrences in Montana - assummed that warrants S1-S3 ranking. A few northern leopard frogs were observed in 05 and 06.

14C. GENERAL WILDLIFE HABITAT RATING

i. Evidence of overall wildlife use in the AA: Check either substantial, moderate, or low.

☒ **Substantial** (based on any of the following)
- ☒ observations of abundant wildlife #s or high species diversity (during any period)
- ☒ abundant wildlife sign such as scat, tracks, nest structures, game trails, etc.
- ☐ presence of extremely limiting habitat features not available in the surrounding area
- ☐ interviews with local biologists with knowledge of the AA

☐ **Low** (based on any of the following)
- ☐ few or no wildlife observations during peak use periods
- ☐ little to no wildlife sign
- ☐ sparse adjacent upland food sources
- ☐ interviews with local biologists with knowledge of AA

☐ **Moderate** (based on any of the following)
- ☐ observations of scattered wildlife groups or individuals or relatively few species during peak periods
- ☐ common occurrence of wildlife sign such as scat, tracks, nest structures, game trails, etc.
- ☐ adequate adjacent upland food sources
- ☐ interviews with local biologists with knowledge of the AA

ii. Wildlife Habitat Features: Working from top to bottom, select the AA attribute to determine the exceptional (E), high (H), moderate (M), or low (L) rating. Structural diversity is from 13. For class cover to be considered evenly distributed, vegetated classes must be within 20% of each other in terms of their percent composition in the AA (see 10). Duration of Surface Water: P/P = permanent/perennial; S/I = seasonal/intermittent; T/E = temporary/ephemeral; A= absent.

Structural Diversity (from 13)	☐ **High**								☐ **Moderate**								☒ **Low**			
Class Cover Distribution (all vegetated classes)	☐ **Even**				☐ **Uneven**				☐ **Even**				☐ **Uneven**				☒ **Even**			
Duration of Surface Water in ≥ 10% of AA	**P/P**	**S/I**	**T/E**	**A**	**P/P**	**S/I**	**T/E**	**A**	**P/P**	**S/I**	**T/E**	**A**	**P/P**	**S/I**	**T/E**	**A**	**P/P**	**S/I**	**T/E**	**A**
Low disturbance at AA (see 12)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Moderate disturbance at AA (see 12)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	M	--	--
High disturbance at AA (see 12)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

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

Evidence of Wildlife Use from 14C(i)	**Wildlife Habitat Features Rating** from 14C(ii)			
	☐ **Exceptional**	☐ **High**	☒ **Moderate**	☐ **Low**
Substantial	--	--	.8 (H)	--
Moderate	--	--	--	--
Low	--	--	--	--

Comments: Numerous waterfowl and shorebirds observed at the site during spring and summer visits.

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

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

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

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

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

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

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

Comments: _____

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

Applies only to wetlands subject to flooding via in-channel or overbank flow. If wetlands in AA do not flood from in-channel or overbank flow, then check NA.

i. Rating: Working from top to bottom, mark the appropriate attributes to arrive at the functional point and rating of high (H), moderate (M), or low (L) for this function.

Estimated wetland area in AA subject to periodic flooding	☒ **≥ 10 acres**			☐ **<10, >2 acres**			☐ **≤2 acres**		
% of flooded wetland classified as forested, scrub/shrub, or both	**75%**	**25-75%**	**<25%**	**75%**	**25-75%**	**<25%**	**75%**	**25-75%**	**<25%**
AA contains **no outlet or restricted outlet**	--	--	.6 (M)	--	--	--	--	--	--
AA contains **unrestricted outlet**	--	--	--	--	--	--	--	--	--

ii. Are residences, businesses, or other features which may be significantly damaged by floods located within 0.5 miles downstream of the AA? (check)
☐**Y** ☒**N** **Comments:** Flooded by Long Coulee and irrigation return.

14F. SHORT AND LONG TERM SURFACE WATER STORAGE ☐ **NA** (proceed to 14G)

Applies to wetlands that flood or pond from overbank or in-channel flow, precipitation, upland surface flow, or groundwater flow.
If no wetlands in the AA are subject to flooding or ponding, then check NA above.

i. Rating: Working from top to bottom, use the matrix below to arrive at the functional point and rating of high (H), moderate (M), or low (L) for this function.
P/P = permanent/perennial; S/I = seasonal/intermittent; T/E = temporary/ephemeral.

Estimated maximum acre feet of water contained in wetlands within the AA that are subject to periodic flooding or ponding**.**	☒ **>5 acre feet**			☐ **<5, >1 acre feet**			☐ **≤1 acre foot**		
Duration of surface water at wetlands within the AA	**P/P**	**S/I**	**T/E**	**P/P**	**S/I**	**T/E**	**P/P**	**S/I**	**T/E**
Wetlands in AA flood or pond **≥ 5 out of 10 years**	--	.9 (H)	--	--	--	--	--	--	--
Wetlands in AA flood or pond **< 5 out of 10 years**	--	--	--	--	--	--	--	--	--

Comments: _____

14G. SEDIMENT/NUTRIENT/TOXICANT RETENTION AND REMOVAL ☐ **NA** (proceed to 14H)

Applies to wetlands with the potential to receive excess sediments, nutrients, or toxicants through influx of surface or ground water or direct input.
If no wetlands in the AA are subject to such input, check NA above.

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

Sediment, Nutrient, and Toxicant Input Levels Within AA	AA receives or surrounding land use has potential to deliver low to moderate levels of sediments, nutrients, or compounds such that other functions are not substantially impaired. Minor sedimentation, sources of nutrients or toxicants, or signs of eutrophication present.				Waterbody on MDEQ list of waterbodies in need of TMDL development for "probable causes" related to sediment, nutrients, or toxicants **or** AA receives or surrounding land use has potential to deliver high levels of sediments, nutrients, or compounds such that other functions are substantially impaired. Major sedimentation, sources of nutrients or toxicants, or signs of eutrophication present.			
% cover of wetland vegetation in AA	☒ **≥ 70%**		☐ **< 70%**		☐ **≥ 70%**		☐ **< 70%**	
Evidence of flooding or ponding in AA	☒ **Yes**	☐ **No**	☐ **Yes**	☐ **No**	☐ **Yes**	☐ **No**	☐ **Yes**	☐ **No**
AA contains **no or restricted outlet**	1 (H)	--	--	--	--	--	--	--
AA contains **unrestricted outlet**	--	--	--	--	--	--	--	--

Comments: Site treats adjacent 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 that is subject to wave action. If this does not apply, then check NA above.

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

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

Comments: _____

14I. PRODUCTION EXPORT / FOOD CHAIN SUPPORT

i. Rating: Working from top to bottom, use the matrix below to arrive at the functional point and rating of high (H), moderate (M), or low (L) for this function. **A** = acreage of vegetated component in the AA. **B** = structural diversity rating from #13. **C** = Yes (Y) or No (N) as to whether or not the AA contains a surface or subsurface outlet. **P/P** = permanent/perennial; **S/I** = seasonal/intermittent; **T/E/A**= temporary/ephemeral/absent.

A	☒ Vegetated component >5 acres						☐ Vegetated component 1-5 acres						☐ Vegetated component <1 acre					
B	☐ High		☐ Moderate		☒ Low		☐ High		☐ Moderate		☐ Low		☐ High		☐ Moderate		☐ Low	
C	☐Y	☐N	☐Y	☐N	☒Y	☐N	☐Y	☐N	☐Y	☐N	☐Y	☐N	☐Y	☐N	☐Y	☐N	☐Y	☐N
P/P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
S/I	--	--	--	--	.7M	--	--	--	--	--	--	--	--	--	--	--	--	--
T/E/A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Comments: _____

14J. GROUNDWATER DISCHARGE / RECHARGE (DR) (Check the indicators in i & ii below that apply to the AA.)

i. ☐ **Discharge Indicators**

- ☐ Springs are known or observed.
- ☐ Vegetation growing during dormant season / drought.
- ☐ Wetland occurs at the toe of a natural slope.
- ☐ Seeps are present at the wetland edge.
- ☐ AA permanently flooded during drought periods.
- ☐ Wetland contains an outlet, but no inlet.
- ☐ Other _____

ii. ☐ **Recharge Indicators**

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

iii. Rating: Use information from 14J(i) and 14J(ii) above and the table below to arrive at the functional point and rating of high (H) or low (L) for this function.

Criteria	Functional Point and Rating
AA has known Discharge/Recharge area or one or more indicators of D/R present	--
No Discharge/Recharge indicators present	0.1 (L)
Available Discharge/Recharge information inadequate to rate AA D/R potential	--

Comments: _____

14K. UNIQUENESS

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

Replacement Potential	AA contains fen, bog, warm springs or mature (>80 yr-old) forested wetland or plant association listed as "S1" by the MTNHP.			AA does not contain previously cited rare types and structural diversity (#13) is high or contains plant association listed as "S2" by the MTNHP.			AA does not contain previously cited rare types or associations and structural diversity (#13) is low-moderate.		
Estimated Relative Abundance from 11	☐rare	☐common	☐abundant	☐rare	☐common	☐abundant	☐rare	☒common	☐abundant
Low disturbance at AA (12i)	--	--	--	--	--	--	--	--	--
Moderate disturbance at AA (12i)	--	--	--	--	--	--	--	.3L	--
High disturbance at AA (12i)	--	--	--	--	--	--	--	--	--

Comments: _____

14L. RECREATION / EDUCATION POTENTIAL

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

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

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

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

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

Ownership	Disturbance at AA from 12(i)		
	☐ Low	☒ Moderate	☐ High
Public ownership	--	--	--
Private ownership	--	.3(L)	--

Comments: Good potential for educational study, given its access and proximity to Hinsdale.

FUNCTION, VALUE SUMMARY, AND OVERALL RATING

Function and Value Variables	Rating	Actual Functional Points	Possible Functional Points	Functional Units (Actual Points x Estimated AA Acreage)
A. Listed/Proposed T&E Species Habitat	low	0.50	1	
B. MT Natural Heritage Program Species Habitat	high	1.0	1	
C. General Wildlife Habitat	high	0.80	1	
D. General Fish/Aquatic Habitat	N/A		--	
E. Flood Attenuation	moderate	0.60	1	
F. Short and Long Term Surface Water Storage	high	0.90	1	
G. Sediment/Nutrient/Toxicant Removal	high	1.00	1	
H. Sediment/Shoreline Stabilization	N/A		--	
I. Production Export/Food Chain Support	moderate	0.70	1	
J. Groundwater Discharge/Recharge	low	0.10	1	
K. Uniqueness	low	0.30	1	
L. Recreation/Education Potential	low	0.30	1	
	Total:	**6.20**	**10.00**	____
		Percent of Total Possible Points:	**62%** (Actual / Possible) x 100 [rd to nearest whole #]	

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

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

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

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

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

☐ **I** ☒ **II** ☐ **III** ☐ **IV**

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LABORATORY ANALYTICAL REPORT

Client: PBS and J
Project: Rock Creek Ranch
Workorder: H06050318

Report Date: 06/09/06
Date Received: 05/26/06

		Analysis		HCO3 SatPst	SO4	Lime
		Units		meq/L	mg/L	%
Sample ID	Client Sample ID	Up	Low	Results	Results	Results
H06050318-001	Rock Creek Ranch #1	0	0	3.20	44	2.6
H06050318-002	Rock Creek Ranch #2			5.99	1630	1.4
H06050318-003	Rock Creek Ranch #3			3.20	137	1.6
H06050318-004	Rock Creek Ranch #4			3.20	76	1.6
H06050318-005	Rock Creek Ranch #5			3.20	867	1.8
H06050318-006	Rock Creek Ranch #6			2.40	278	2.0

Appendix C

REPRESENTATIVE PHOTOGRAPHS

MDT Wetland Mitigation Monitoring
Rock Creek Ranch
Hinsdale, Montana

ROCK CREEK RANCH WETLAND MITIGATION SITE 2006

Photo Point 1; facing north. Typha / Iva wetland in foreground, Typha / Alisma wetland in background.

Photo Point 1; facing west. Hordeum / Rumex wetland in foreground, Typha / Alisma wetland at photo right.

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. Note new wetland encroaching into easement from the north (left).

ROCK CREEK RANCH WETLAND MITIGATION SITE 2006

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; new wetland is to left.

Photo Point 5; facing west. Long Coulee Ditch wetland in foreground; new wetland in background.

Photo Point 5; facing south / southwest along dike. Long Coulee Ditch wetland along dike toe; new wetland in background.

Photo from Transect 1 start, facing north along transect. Note new Typha / Ammannia wetland in foreground.

Photo from Transect 1 end, facing south along transect. Note new Typha / Iva wetland in foreground.

Appendix D

CONCEPTUAL SITE LAYOUT

MDT Wetland Mitigation Monitoring
Rock Creek Ranch
Hinsdale, Montana

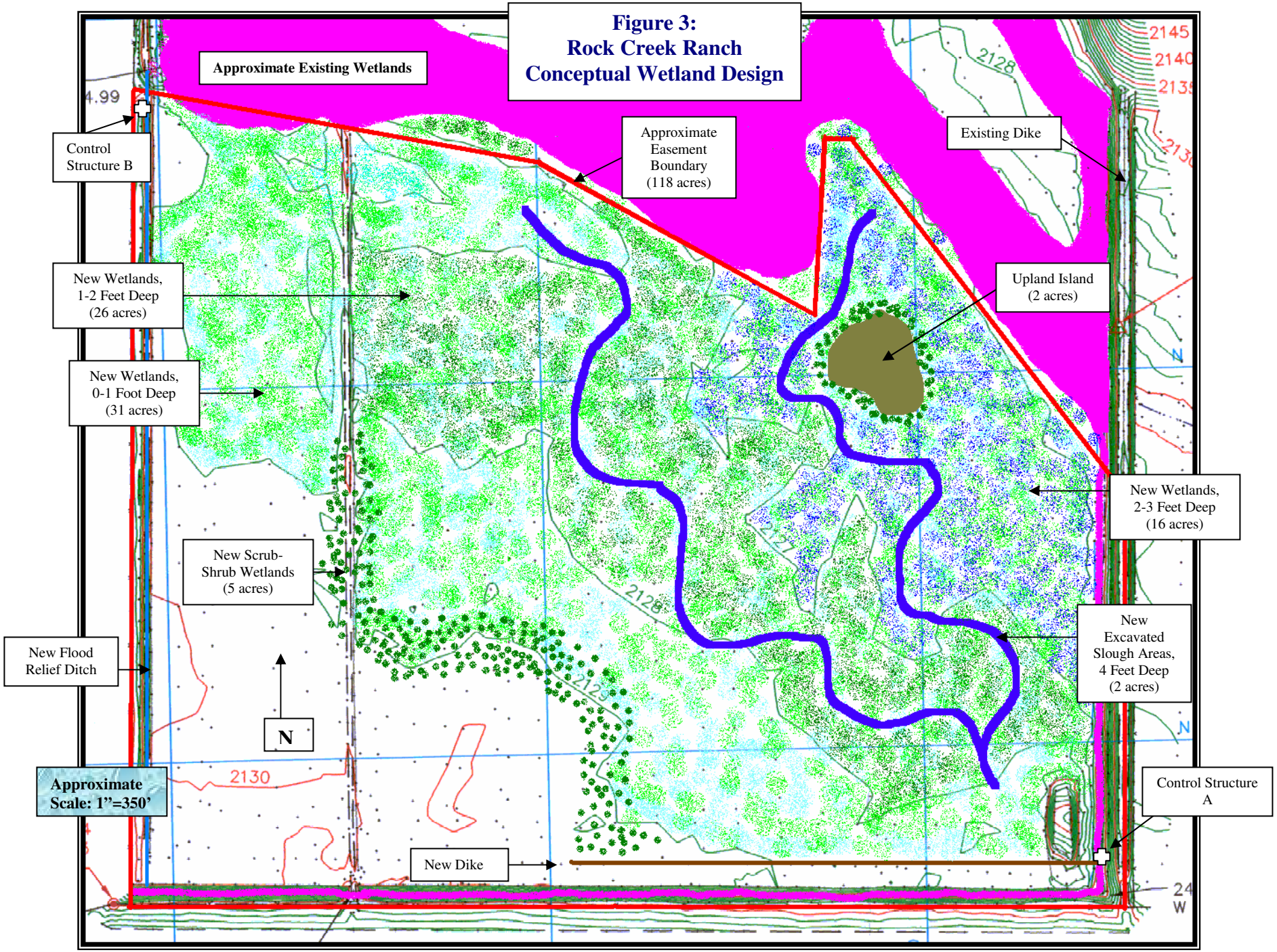
Figure 3:
Rock Creek Ranch
Conceptual Wetland Design
Approximate Existing Wetlands
Control Structure B
Approximate Easement Boundary (118 acres)
Existing Dike
New Wetlands, 1-2 Feet Deep (26 acres)
Upland Island (2 acres)
New Wetlands, 0-1 Foot Deep (31 acres)
New Wetlands, 2-3 Feet Deep (16 acres)
New 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
2127
2126
2129
2130

Appendix E

BIRD SURVEY PROTOCOL
GPS PROTOCOL

MDT Wetland Mitigation Monitoring
Rock Creek Ranch
Hinsdale, Montana

BIRD SURVEY PROTOCOL

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

Species Use within the Mitigation Wetland: Survey Method

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

Sites that can be circumambulated or walked throughout.

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

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

Sites that cannot be circumambulated.

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

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

Species Use within the Mitigation Wetland: Data Recording

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

1. Bird Species List

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

2. Bird Density

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

3. Bird Behavior

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

4. Bird Species Habitat Use

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

GPS Mapping and Aerial Photo Referencing Procedure

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

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

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

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

Appendix F

2006 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. Wildco is a good source of these.
- Spare net.
- 1-liter plastic sample jars, wide-mouth. VWR has these: catalog #36319-707.
- 95% ethanol: Northwest Scientific in Billings carries this.

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

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

Site Selection

Select the sampling site with these considerations in mind:

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

Sampling

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

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

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

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

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

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

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

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

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

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

Photograph the sampled site.

Sample Handling/Shipping

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

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

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

INTRODUCTION

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

METHODS

Sample processing

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

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

Assessment

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

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

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

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

Bioassessment metrics

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

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

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

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

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

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

Quality control

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

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

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

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

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

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

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

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

RESULTS

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

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Quality Assurance

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

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

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

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

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

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

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

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

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

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

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

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

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Taxa Listing

Project ID: MDT06PBSJ
RAI No.: MDT06PBSJ005

RAI No.: MDT06PBSJ005 **Sta. Name:** ROCK CREEK RANCH
Client ID:
Date Coll.: 7/19/2006 **No. Jars:** 1 **STORET ID:**

Taxonomic Name	Count	PRA	Unique	Stage	Qualifier	BI	Function
Non-Insect							
Acari	11	9.24%	Yes	Unknown		5	PR
Copepoda	3	2.52%	Yes	Unknown		8	CG
Ostracoda	56	47.06%	Yes	Unknown		8	CG
Physidae							
Physidae	9	7.56%	Yes	Unknown		8	SC
Planorbidae							
Gyraulus sp.	10	8.40%	Yes	Unknown		8	SC
Heteroptera							
Corixidae							
Callicorixa sp.	1	0.84%	Yes	Adult		11	PR
Corixidae	3	2.52%	No	Larva		10	PH
Hesperocorixa sp.	1	0.84%	Yes	Adult		10	PH
Notonectidae							
Notonectidae	1	0.84%	Yes	Larva		10	PR
Coleoptera							
Haliplidae							
Haliplus sp.	5	4.20%	Yes	Adult		5	PH
Haliplus sp.	2	1.68%	No	Larva		5	PH
Diptera							
Ceratopogonidae							
Ceratopogoninae	2	1.68%	No	Pupa		6	PR
Ceratopogoninae	5	4.20%	Yes	Larva		6	PR
Chironomidae							
Chironomidae							
Chironomus sp.	7	5.88%	Yes	Larva		10	CG
Cricotopus (Isocladius) sp.	1	0.84%	Yes	Larva		7	SH
Orthocladius sp.	1	0.84%	Yes	Larva		6	CG
Psectrotanypus sp.	1	0.84%	Yes	Larva		10	PR
Sample Count	**119**						

Metrics Report

Project ID: MDT06PBSJ
RAI No.: MDT06PBSJ005
Sta. Name: ROCK CREEK RANCH
Client ID:
STORET ID:
Coll. Date: 7/19/2006

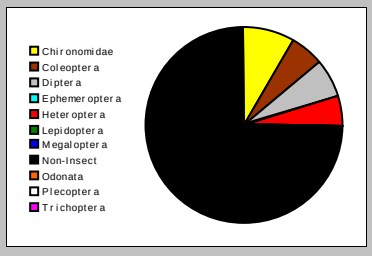
Abundance Measures

Sample Count: 119
Sample Abundance: 510.00 23.33% of sample used

Coll. Procedure:
Sample Notes:

Taxonomic Composition

Category	R	A	PRA
Non-Insect	5	89	74.79%
Odonata			
Ephemeroptera			
Plecoptera			
Heteroptera	3	6	5.04%
Megaloptera			
Trichoptera			
Lepidoptera			
Coleoptera	1	7	5.88%
Diptera	1	7	5.88%
Chironomidae	4	10	8.40%

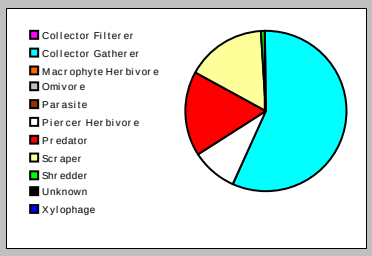


Dominant Taxa

Category	A	PRA
Ostracoda	56	47.06%
Acari	11	9.24%
Gyraulus	10	8.40%
Physidae	9	7.56%
Haliplus	7	5.88%
Chironomus	7	5.88%
Ceratopogoninae	7	5.88%
Corixidae	3	2.52%
Copepoda	3	2.52%
Psectrotanypus	1	0.84%
Orthocladius	1	0.84%
Notonectidae	1	0.84%
Hesperocorixa	1	0.84%
Cricotopus (Isocladius)	1	0.84%
Callicorixa	1	0.84%

Functional Composition

Category	R	A	PRA
Predator	5	21	17.65%
Parasite			
Collector Gatherer	4	67	56.30%
Collector Filterer			
Macrophyte Herbivore			
Piercer Herbivore	2	11	9.24%
Xylophage			
Scraper	2	19	15.97%
Shredder	1	1	0.84%
Omivore			
Unknown			



Metric Values and Scores

Metric	Value	BIBI	MTP	MTV	MTM
Composition					
Taxa Richness	14	1	1		0
Non-Insect Percent	74.79%				
E Richness	0	1		0	
P Richness	0	1		0	
T Richness	0	1		0	
EPT Richness	0		0		0
EPT Percent	0.00%		0		0
Oligochaeta+Hirudinea Percent					
Baetidae/Ephemeroptera	0.000				
Hydropsychidae/Trichoptera	0.000				
Dominance					
Dominant Taxon Percent	47.06%		1		0
Dominant Taxa (2) Percent	56.30%				
Dominant Taxa (3) Percent	64.71%	3			
Dominant Taxa (10) Percent	95.80%				
Diversity					
Shannon H (loge)	1.793				
Shannon H (log2)	2.587		2		
Margalef D	2.755				
Simpson D	0.277				
Evenness	0.098				
Function					
Predator Richness	5		2		
Predator Percent	17.65%	3			
Filterer Richness	0				
Filterer Percent	0.00%			3	
Collector Percent	56.30%		3		3
Scraper+Shredder Percent	16.81%		2		0
Scraper/Filterer	0.000				
Scraper/Scraper+Filterer	0.000				
Habit					
Burrower Richness	2				
Burrower Percent	11.76%				
Swimmer Richness	3				
Swimmer Percent	10.08%				
Clinger Richness	1	1			
Clinger Percent	0.84%				
Characteristics					
Cold Stenotherm Richness	0				
Cold Stenotherm Percent	0.00%				
Hemoglobin Bearer Richness	4				
Hemoglobin Bearer Percent	15.97%				
Air Breather Richness	0				
Air Breather Percent	0.00%				
Voltinism					
Univoltine Richness	6				
Semivoltine Richness	1	1			
Multivoltine Percent	67.23%		1		
Tolerance					
Sediment Tolerant Richness	1				
Sediment Tolerant Percent	8.40%				
Sediment Sensitive Richness	0				
Sediment Sensitive Percent	0.00%				
Metals Tolerance Index	3.917				
Pollution Sensitive Richness	0	1		0	
Pollution Tolerant Percent	28.57%	3		1	
Hilsenhoff Biotic Index	7.619		0		0
Intolerant Percent	0.00%				
Supertolerant Percent	76.47%				
CTQa	101.250				

Bioassessment Indices

BioIndex	Description	Score	Pct	Rating
BIBI	B-IBI (Karr et al.)	16	32.00%	
MTP	Montana DEQ Plains (Bukantis 1998)	12	40.00%	Moderate
MTV	Montana Revised Valleys/Foothills (Bollman 1998)	4	22.22%	Moderate
MTM	Montana DEQ Mountains (Bukantis 1998)	3	14.29%	Severe