
MONTANA DEPARTMENT OF TRANSPORTATION WETLAND MITIGATION MONITORING REPORT: 2001

*Rey Creek
Three Forks, Montana*



Prepared for:

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

July 2002

Project No: 130091.014

Prepared by:

WETLANDS WEST INC.
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Compiled and Edited by:

LAND & WATER CONSULTING, INC.
P.O. Box 8254
Missoula, MT 59807



MONTANA DEPARTMENT OF TRANSPORTATION

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1.0 INTRODUCTION

This annual report summarizes methods and results from the first year's monitoring at the Montana Department of Transportation's (MDT) Rey Creek mitigation site. MDT personnel monitored the site after its creation in 1999. Rey Creek is monitored one time per year and will be monitored for at least two more years to assess whether or not the US Army Corps of Engineers (COE) and other agencies' Section 404 requirements have been fulfilled.

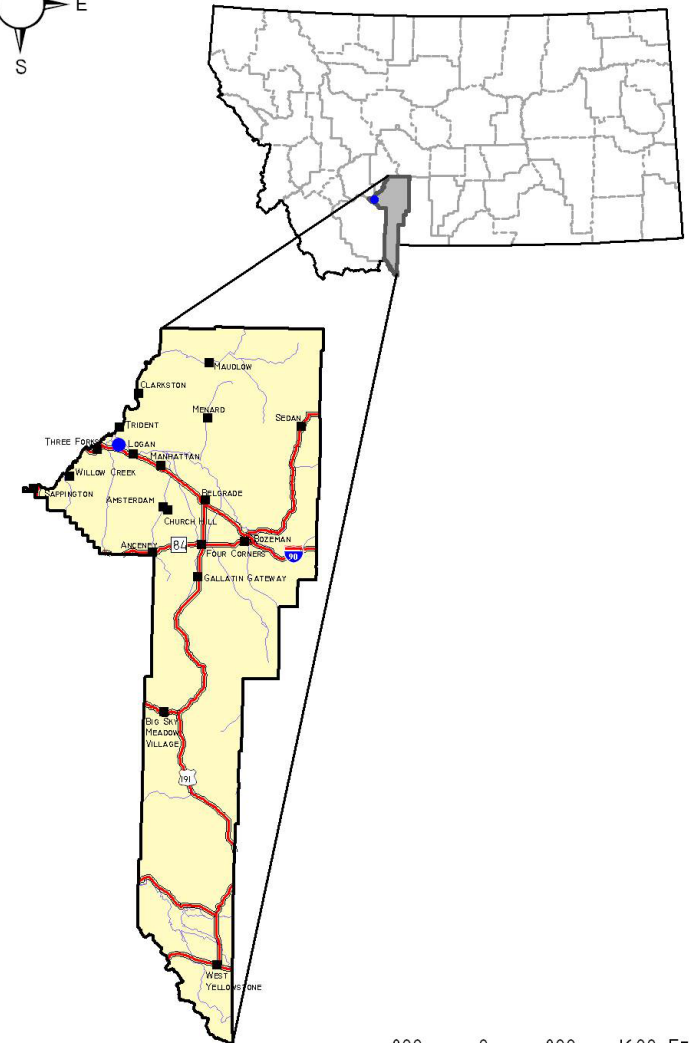
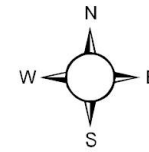
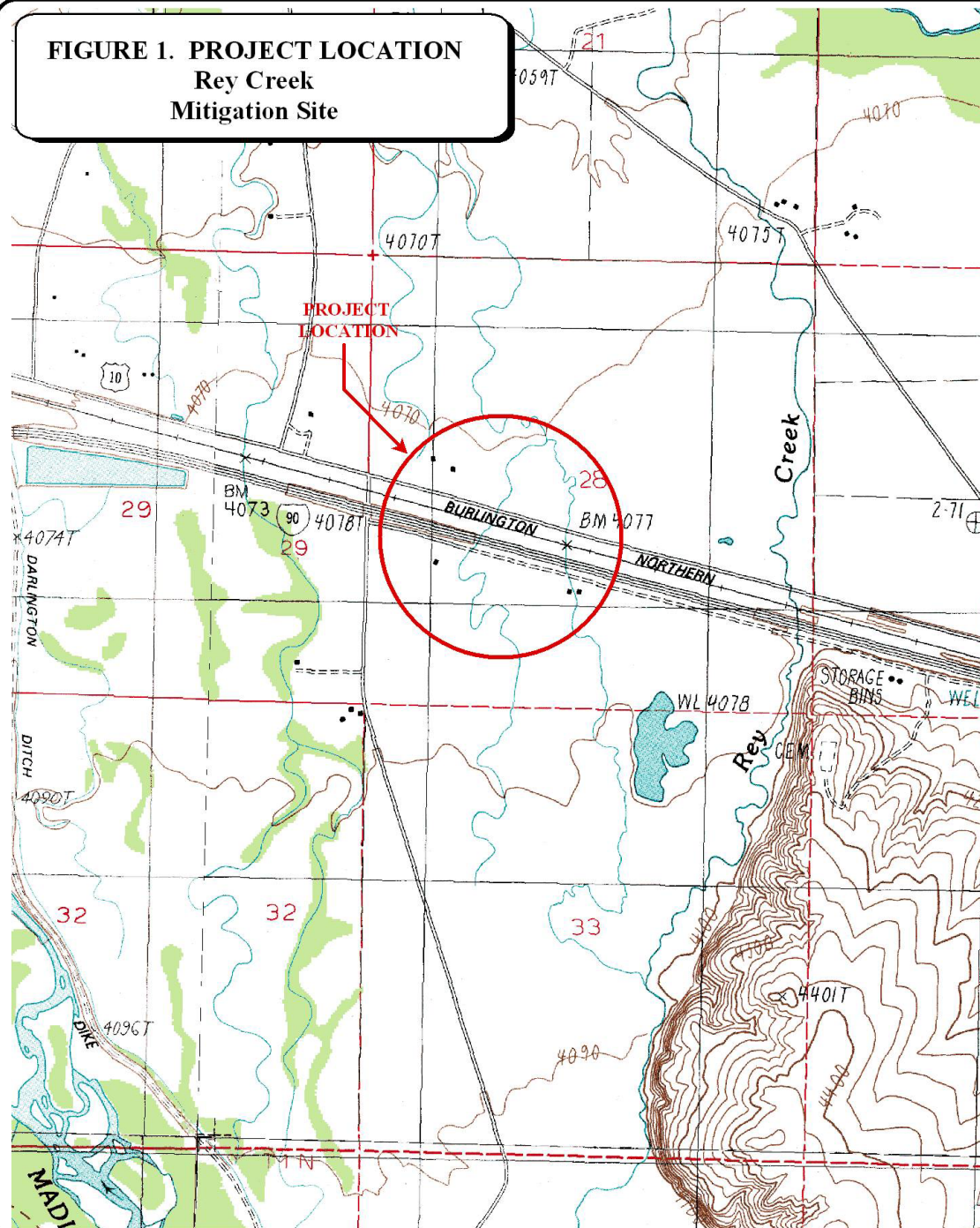
The site is located approximately 2.5 miles west of the town of Logan and approximately 1.5 miles east of Three Forks, MT in Gallatin County. The approximate legal description is Section 28, Township 2 North, Range 2 East (**Figure 1**); the Butte District Watershed (#6). The wetland is situated south and adjacent to Frontage Road (Hwy 10) and north of Interstate-90 and the Burlington Northern railroad tracks (**Figure 2, Appendix A**). Construction was completed in September of 1999 with a goal of creating 1.2 acres of wetland. The elevation of the site is approximately 4,077 feet above sea level.

The Rey Creek mitigation wetland was developed off of a perennial stream, Rey Creek, to mitigate wetland impacts associated with replacement of the onsite culvert and safety improvement to Hwy 10.

Two off-stream impoundments were created on both sides of Rey Creek (**Figure 2, Appendix A**) south of Hwy. 10. The impoundments were constructed off of the outside meanders of Rey Creek resulting in the capture of seasonal high water flows. The impoundments were constructed without permanent control structures and have inlets originally designed at elevations to facilitate movement of high water flows into the created wetlands.

Impoundment #1 (MDT Field Notes 1999), located on the east side of Rey Creek, was designed to hold approximately 8,438 ft² of standing water (MDT 1999). This eastern impoundment has an inflow and an outflow associated with it off of the stream. Impoundment #2, located on the west side of Rey Creek, was designed to hold approximately 7,680 ft² of standing water (MDT 1999) and was constructed with only one connection to the stream allowing the capture of overflow in the constructed depression. The site was designed to mitigate for specific wetland functions impacted by MDT roadway projects. These functions include: storm water retention, roadway runoff filtration, sediment and nutrient retention, water quality, groundwater recharge, waterfowl and wildlife habitats, and riparian restoration.

FIGURE 1. PROJECT LOCATION
Rey Creek
Mitigation Site



800 0 800 1600 FEET
 I: 24,000

PROJECT #: 130091.014
 DATE: APRIL 2001
 LOCATION:
 PROJECT MANAGER: B. DUTTON
 DRAWN BY: B. NOECKER

LAND & WATER CONSULTING, INC.

1120 CEDAR PO BOX 8254 MISSOULA, MT 59807

2.0 METHODS

2.1 Monitoring Dates and Activities

The Rey Creek wetland monitoring protocol was initially conducted on July 23, 2001, and completed during the second visit on July 31, 2001. All collected information is presented on the Wetland Mitigation Site Monitoring Form (**Appendix B**). 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; GPS data points; functional assessment; determine maintenance needs of any bird nesting structures; and, inflow and outflow structures (non-engineering).

2.2 Hydrology

Wetland hydrology indicators were recorded using procedures outlined in the COE 1987 Wetland Delineation Manual. Hydrology data was recorded on the COE Routine Wetland Delineation Data Form (**Appendix B**) at each wetland determination point.

All additional hydrologic data were recorded on the mitigation site monitoring form (**Appendix B**). The boundary between emergent vegetation and open water was mapped on the air photograph (**Figure 3, Appendix A**).

There are no groundwater monitoring wells at the site.

2.3 Vegetation

General vegetation types were delineated on an air photograph during the site visit (**Figure 3, Appendix A**). Coverage of the dominant species in each community type is listed on the monitoring form (**Appendix B**). A comprehensive plant species list for the entire site was compiled and will be updated as new species are encountered. Observations from past years will be compared with new data to document vegetation changes over time. Woody species were not planted on this site.

One (1) transect was established during the 2001 monitoring event to represent the range of current vegetation conditions. The location of this transect is shown on **Figure 2, Appendix A**. Percent cover for each species was recorded on the vegetation transect form within the monitoring form (**Appendix B**). The transect will be used to evaluate changes over time, especially the establishment and increase of hydrophytic vegetation. The transect's ends were marked with a metal fence post and its locations recorded with the GPS unit. Photographs of the transect were taken from both ends during the site visit.

2.4 Soils

Soils were evaluated during the site visit according to the procedure 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.

2.5 Wetland Delineation

A wetland delineation was conducted within the assessment area according to the 1987 COE Wetland Delineation Manual. Wetland and upland areas within the monitoring area were investigated for the presence of wetland hydrology, hydrophytic vegetation and hydric soils. The indicator status of vegetation was derived from the National List of Plant Species that Occur in Wetlands: Northwest Region 9 (Reed 1988). The information was recorded on the COE Routine Wetland Delineation Forms (**Appendix B**). The wetland/upland and open water boundaries were used to calculate the wetland area.

2.6 Mammals, Reptiles, and Amphibians

Mammal, reptile, and amphibian species observations were recorded on the wetland monitoring form during the site visit (**Appendix B**). Indirect use indicators were also recorded including tracks, scat and burrows. A comprehensive wildlife species list for the entire site was compiled and will be updated as new species are encountered. Observations from past years will be compared with new data to determine if wildlife use is changing over time.

2.7 Birds

Bird observations were recorded during the site visit according to the established bird survey protocol (**Appendix C**). A general, qualitative bird list has been compiled using these observations. Observations will be compared between years in future studies. No bird nesting structures were observed on this site.

2.8 Macroinvertebrates

No macroinvertebrate samples were collected on the site.

2.9 Functional Assessment

A functional assessment form was completed for the Rey Creek mitigation site using the 1999 MDT Montana Wetland Assessment Method. Field data necessary for this assessment was collected on a condensed data sheet included in the mitigation site monitoring form (**Appendix B**). The remainder of the assessment was completed in the office.

2.10 Photographs

Photographs were taken showing the current land use surrounding the site, the wetland buffer, the monitored area, and the vegetation transects. A description and compass direction for each photograph were recorded on the wetland monitoring form.

During the 2001 monitoring season, each photograph point was marked on the ground with a wooden stake and the location recorded with a resource grade GPS (**Appendix D**). The approximate locations are shown on **Figure 2, Appendix A**. All photographs were taken using a 50 mm lens.

2.11 GPS Data

During the 2001 monitoring season, survey points were collected using a resource grade Trimble, Geoexplorer III hand-held GPS unit. Points collected included: the vegetation transect beginning and ending locations; photograph locations; and the jurisdictional wetland boundary. In addition, during the August 2001 monitoring season survey points were collected at four (4) landmarks recognizable on the air photo for purposes of line fitting to the topography.

2.12 Maintenance Needs

The condition of inflow and outflow structures, habitat enhancement structures or other mitigation related structures were evaluated. Inflow and outflow were controlled by riprap berms; these structures were examined for adequacy in controlling water levels in the ponded areas. This examination did not entail an engineering-level analysis.

3.0 RESULTS

3.1 Hydrology

Both impoundment inlets were initially constructed of natural materials along the outside bends of Rey Creek. Control structures were not installed to regulate inflow or outflow. The west (#1) impoundment has only an inlet, while the east (#2) has an inlet and outlet; the inlet and outlet areas were evidently gaps in the stream bank that allowed water to flow freely into and/or out of the impoundments. MDT personnel visiting the site in 1999 were concerned about the “capture” of the streams by the created wetlands (**Appendix E**). They noted that each wetland inlet “should be hardened with rip-rap to prevent capture of the stream”.

The inlet areas were rip-rapped in June 2001. While monitoring the Rey Creek site in July, Doug Moeller (MDT) stopped at the site to investigate the functioning of the rip-rap placement. It appears that excessive amounts of rip-rap may have been used thereby limiting overflow into the sites; photographs of the rip-rap are included in **Appendix D**. The situation will be assessed again in July of 2002 to determine whether further corrective action is necessary.

On the July 2001 visit approximately 85% of the assessment area was inundated with 0-6 feet of standing water. Water depth at the emergent vegetation/open water boundary was approximately 2.5 feet.

According to the Western Regional Climate Center, Belgrade yearly precipitation totals for 2000 (12.7 inches) and 2001 (10.4 inches) were 89 and 73 percent, respectively, of the total annual mean precipitation (14.2 inches) in this area.

3.2 Vegetation

Vegetation species identified on the site are presented in **Table 1** and in the monitoring form (**Appendix B**). Three (3) wetland vegetation communities were mapped on the mitigation area map (**Figure 3, Appendix A**). The communities include: Type 1, *Typha latifolia*; and, Type 2, *Scirpus spp.*; and Type 3, *Eleocharis spp.* Dominant species within each community are listed on the monitoring form (**Appendix B**). Vegetation is well developed around the circumference of both impoundments and is beginning to invade the open water areas (**Appendix D**).

Table 1: 2001 Rey Creek Wetland Vegetation Species List

Scientific Name	Common Name	Indicator Status
<i>Agropyron trachycaulum</i>	slender wheatgrass	FAC
<i>Agrostis alba</i>	redtop	FACW
<i>Amaranthus albus</i>	tumble weed	FACU
<i>Carex nebrascensis</i>	Nebraska sedge	OBL
<i>Carex utriculata</i>	beaked sedge	OBL
<i>Centaurea maculosa</i>	spotted knapweed	UPL
<i>Chenopodium spp.</i>	lamb's quarter	FACU+ to FACU -
<i>Chenopodium spp.</i>	pigweed	FACU+ to FACU -
<i>Cirsium arvense</i>	Canada thistle	FACU+
<i>Crepis runcinata</i>	hawksbeard	FACU
<i>Eleocharis spp.</i>	spikerush	FACW to OBL
<i>Elymus condensatus</i>	giant wild rye	FACU
<i>Helianthus spp.</i>	sunflower	UPL
<i>Hordeum jubatum</i>	fox-tail barley	FAC+
<i>Juncus balticus</i>	Baltic rush	OBL
<i>Juncus spp.</i>	rush	UPL
<i>Melilotus officinalis</i>	yellow clover	FACU
<i>Phalaris arundinacea</i>	reed canary grass	FACW
<i>Rosa woodsii</i>	rose	FACU
<i>Sagittaria cuneata</i>	arrow-head	OBL
<i>Scirpus spp.</i>	bulrush	FACW-OBL
<i>Solidago spp.</i>	goldenrod	FAC to FACW -
<i>Symphoricarpos albus</i>	snowberry	FACU
<i>Typha latifolia</i>	cattail	OBL
<i>Verbascum thapsus</i>	wooly mullein	UPL
<i>Vicia sativa</i>	vetch	UPL

The vegetation transect results are detailed in the monitoring form (**Appendix B**) and are summarized below.

Tran- sect 1 Start	Upland Type 4 (15')	Wetland Type 3 (15')	Wetland Type 2 (99')	Wetland Type 3 (3')	Upland Type 4 (15')	Total 132'	Tran- sect 1 End
--------------------------	---------------------------	----------------------------	-------------------------	---------------------------	---------------------------	---------------	------------------------

3.3 Soils

The site was mapped as part of the Gallatin County Soil Survey (USDA unpublished). The soil on the site is mapped as the Greycliff-Toston-Threeriv Complex (Series 525A). The complex is comprised of: the Greycliff silt loam, the Toston loam, and the Threeriv silty clay loam components. Inclusions within this series are: Reycreek, Rivra, and Slickspots; all are unranked. The Greycliff and Toston soils, as independent series, are non-hydric soils. The Threeriv silty clay loam, however, is hydric. Soil characteristics at each wetland determination point were compared with those of the Greycliff-Toston-Threeriv complex.

Soils were sampled at one wetland sample point (SP-1) and one upland sample point (SP-2). The soil at SP-1, taken at the east end of impoundment #2, was a black (5YR2.5/1) clay loam from 0-2 inches without evident mottles; they were likely masked from organic staining. From 2-10 inches the soil was a very dark gray (5YR 3/1) with many, faint mottles of a dark olive gray (5Y 6/8). The texture at this depth was a clay loam. The remainder of the pit depth of 10-18 inches was a dark, yellow-brown alluvium dominated, very coarse clay loam (10YR 4/6) with many distinct mottles of a dark olive gray (5YR 3/2). Very strong hydric soils have developed at this site.

The soil at the upland site, SP-2, was a brown (7.5YR4/3) silty clay loam from 0-4 inches without mottles. From 4-18 inches the soils were a light brown (7.5YR6/4). The texture was a silty clay loam from 4-10 inches and very coarse alluvium below ten inches.

3.4 Wetland Delineation

The delineated wetland boundary is depicted on **Figure 3, Appendix A**. The wetland boundary encompasses 0.54 acres of wetland with an open water component of 0.24 acres. The COE data forms are included in **Appendix B**.

3.5 Wildlife

No direct or indirect signs of wildlife use were noted for mammals, amphibians, or reptiles at the Rey Creek site. The lack of wildlife observations may be due to the location of the site between the frontage road and the railroad, to the south of which is Interstate 90. Another factor may be that the site was visited during mid-afternoon.

Wildlife species are listed in **Table 2**. Activities and densities associated with these observations area included on the monitoring form in **Appendix B**. Wildlife observations were limited to deer tracks and scat; however, the site was visited during a very hot time of day and wildlife activity was likely very limited.

Table 2. Fish and Wildlife Species Observed at the Rey Wetland Mitigation Site

BIRDS
Common yellowthroat (<i>Geothlypis trichas</i>)
Tree swallow (<i>Tachycineta bicolor</i>)
Red-winged blackbird (<i>Agelaius phoeniceus</i>)

3.6 Macroinvertebrates

No macroinvertebrate samples were collected on the site.

3.7 Functional Assessment

Completed functional assessment forms are included in **Appendix B** and summarized in **Table 3**. The two cells were assessed together along with the open-water component of the stream. The mitigation site ranked as a Category III wetland site. The site ranked poorly for wildlife but scored high for sediment/nutrient/toxicant removal as well as groundwater discharge/recharge. Based on the functional assessment results (**Table 3**), approximately 2.9 functional units have been provided at the Rey Creek mitigation site.

Table 3: Summary of 2001 Wetland Function/Value Ratings and Functional Points at the Rey Creek Wetland Mitigation Project

Function and Value Parameters From the 1999 MDT Montana Wetland Assessment Method	2001
Listed/Proposed T&E Species Habitat	Low (0)
MNHP Species Habitat	Low (0)
General Wildlife Habitat	Low (.1)
General Fish/Aquatic Habitat	Moderate (.6)
Flood Attenuation	Low (.15)
Short and Long Term Surface Water Storage	Low (.3)
Sediment, Nutrient, Toxicant Removal	High (.95)
Sediment/Shoreline Stabilization	High (1)
Production Export/Food Chain Support	Moderate (.6)
Groundwater Discharge/Recharge	High (1)
Uniqueness	Low (.2)
Recreation/Education Potential	Low (.2)
Actual Points/Possible Points	5.1/12
% of Possible Score Achieved	43%
Overall Category	III
Total Acreage of Assessed Wetlands within Easement	0.54 ac
Functional Units (acreage x actual points)	2.754 fu
Net Acreage Gain (Includes stream segment)	0.54 ac
Net Functional Unit Gain	2.754 fu
Total Functional Unit "Gain"	2.754 Total fu

3.8 Photographs

Representative photographs taken from photo points and transect ends are included in **Appendix D**.

3.9 Maintenance Needs/Recommendations

No maintenance was required at the site. If the drought persists and/or spring runoff is low, the rip rap may prove excessive by not allowing water to flow into the created wetlands. The affect of the riprap in place on water levels will be monitored each year.

3.10 Current Credit Summary

Wetlands and/or waters of the U.S. were impacted to create these two impoundments off of Rey Creek. No data is available regarding the amount of wetland/waters impact that occurred. The current evaluation is inclusive of Rey Creek within the assessment area.

Although both impoundments have open water components, the depth is likely <6 feet. (Due to the soft sediment in the impoundment the water level could not be determined.) Wetland species such as bulrush and cattail are beginning to encroach into the open water; credit for the entire 0.54 acres of wetland and waters of the US should be considered for the entire site within the delineation boundary. Approximately 2.754 functional units have been created at the site to date.

4.0 REFERENCES

- Berglund, J. 1999. *MDT Montana Wetland Assessment Method*. Prepared for Montana Department of Transportation. May 1999.
- Reed, P.B. 1988. National list of plant species that occur in wetlands: North West (Region 9). Biological Report 88(26.9), May 1988. U.S. Fish and Wildlife Service. Washington, D.C.
- US Army Corps of Engineers. 1987. *Corps of Engineers Wetlands Delineation Manual*. US Army Corps. Washington, DC.
- USDA Natural Resource Conservation Service. Soil Survey of Gallatin County, Montana.

Appendix A

FIGURES 2 - 3

*MDT Wetland Mitigation Monitoring
Rey Creek
Three Forks, Montana*

Figure 2 -Monitoring Activity Locations

Legend

Monitoring Area Limits

Vegetation Transect

Photograph Points

Aerial Reference Points

Soil Sample



SCALE 1"=60ft



NOT TO SCALE

PROJECT NAME
MDT Rey Creek Wetland Mitigation

DRAWING TITLE
Monitoring Activity Features

PROJ. NO. 130091.014
FILE NAME TASK14BASE.dwg
SCALE 1"= 70'

DRAWN: RA
CHECKED: BD
APP'D: BD
PROJ. MGR: BD

LOCATION: Rey Creek

LAND & WATER CONSULTING, INC.
P.O. BOX 1004
Middletown, MD 21132

SHEET NUMBER
2
REV
DATE

Figure 3 -Mapped Site Features

Vegetation Type:

- ① Typha Latifolia
- ② Scirpus spp.
- ③ Eleocharis spp.
- ④ Melilotus officinalis

Legend

- Monitoring Area Limits
- Wetland Boundary
- Vegetation Community Boundary
- Open Water Boundary
- Rip Rap

Wetland Area:

- Gross Wetland Area = 0.540 Acres
- Open Water Area = 0.240 Acres
- Net Wetland Area = 0.300 Acres



Appendix B

**COMPLETED 2001 WETLAND MITIGATION SITE MONITORING
FORM**

COMPLETED 2001 BIRD SURVEY FORMS

COMPLETED 2001 WETLAND DELINEATION FORMS

**COMPLETED 2001 FIELD AND FULL FUNCTIONAL
ASSESSMENT FORMS**

MDT Wetland Mitigation Monitoring

Rey Creek

Three Forks, Montana



DRAFT - MDT WETLAND MITIGATION SITE MONITORING FORM

Project Name: Rey Creek Project Number: 215-14 Assessment Date: 23 July 01
 Location: Three Forks MDT District: Butte Milepost: _____
 Legal description: T2N R2E Section 28 Time of Day: 1:30 p.m.
 Weather Conditions: Partly Cloudy, 70° Person(s) conducting the assessment: R. McCain, D. Lowell
 Initial Evaluation Date: 7/23/01 Visit #: 1 Monitoring Year: 1, 2001
 Size of evaluation area: _____ acres Land use surrounding wetland: Transportation Corridor - Between
Railroad + Frontage Rd.
(N. is rangeland, off of project
site.)

HYDROLOGY

Surface Water

Inundation: Present ☒ Absent ☐ Estimated Average depths: 4 ft Range of depths: 0 - 6 ft
 Assessment area under inundation: 8 % AA is excavated area
 Depth at emergent vegetation-open water boundary: 2.5 ft see field book, pg 6-7
 If assessment area is not inundated are the soils saturated w/in 12" of surface: Yes ☒ No ☐
 Other evidence of hydrology on site (drift lines, erosion, stained vegetation etc.):
stream is flowing through wetland.

Groundwater

Monitoring wells: Present ☐ Absent ☒
 Record depth of water below ground surface

Well #	Depth	Well #	Depth	Well #	Depth

Additional Activities Checklist:

- ☒ Map emergent vegetation-open water boundary on air photo
☐ Observe extent of surface water during each site visit and look for evidence of past surface water elevations (drift lines, erosion, vegetation staining etc.) on east end of #1 there is ~ 10' of dry flood plain
☐ GPS survey groundwater monitoring wells locations if present

COMMENTS/PROBLEMS:

Post construction site visit recommended installing riprap at both inlets. Riprap was installed on both inlets in early June as reported by MDT agent Doug Moller, maintenance chief for MDT, Bozeman MT.

* Note: fill in veg data w/ proper ID names/Latin

VEGETATION COMMUNITIES

LAND & WATER B-2

Community No.: 1 Community Title (main species): Typha latifolia (Cattail)

Dominant Species	% Cover	Dominant Species	% Cover
<u>Typha latifolia</u>	<u>75</u>		
<u>Carex utriculata</u>	<u>15</u>		
<u>Solidago</u>	<u>10</u>		

COMMENTS/PROBLEMS: _____

Community No.: 2 Community Title (main species): Scirpus Bulrush

Dominant Species	% Cover	Dominant Species	% Cover
<u>Scirpus</u> (Bulrush)	<u>80%</u>		
<u>Typha latifolia</u>	<u>20%</u>		

COMMENTS/PROBLEMS: _____

Community No.: 3 Community Title (main species): mudflat Eleocharis spp.
in the east end of #1 in mud flat

Dominant Species	% Cover	Dominant Species	% Cover
<u>Hordeum?</u>	<u>1-5</u>		
<u>Eleocharis?</u>	<u>5-10</u>		
<u>mudflat</u>	<u>88</u>		
<u>collected - 3" tall</u>	<u>5-10</u>		
<u>redtop</u>	<u>1-5</u>		

Comm. #4:
COMMENTS/PROBLEMS: upland ridge - melaleucis officinalis (saline)
very prolific; spotted knapweed; Canada thistle; wheat grass

Additional Activities Checklist:

☒ Record and map vegetative communities on air photo

pond

LB, PL, DSL

$$4 \frac{4}{2} m$$

Vegetation type	Upward Fringe - east end
Length of transect in this type:	5m feet
Species:	Cover:
clover	50%
wheatgrass	25%
russian thistle	1%
prickly _____	24%
tumble mustard	10%
clown	5m length 80%
wheatgrass	10%
bare soil	15%
Total Vegetative Cover:	100%

Vegetation type 2:	Bulrush (<i>Scirpus</i>) / open H ₂ O	
Length of transect in this type:	33 m	feet
Species:	Cover:	
<i>Scirpus</i>	15%	
open H ₂ O	80%	
<i>Typha latifolia</i>	5%	
	</	

Vegetation type 3:		feet
Length of transect in this type:		
Species:		Cover:
1st: Eleocharis ("putt butt")	1m (1/3)	45%
mud		10%
bullrush		45%
2nd: eleocharis	5m	10%
mud		50%
bullrush (invasion)		30%
other obs.		10%
Total Vegetative Cover:		90%

Vegetation type #:	
Length of transect in this type:	feet
Species:	Cover:
(^{sm. ant.} typha mixed in w Bullrush)	
see Veg type 2 above	
Total Vegetative Cover:	



$\uparrow N$

MDT WETLAND MONITORING – VEGETATION TRANSECT (back of form)

**Cover Estimate**

+ = <1% 3 = 11-20%
 1 = 1-5% 4 = 21-50%
 2 = 6-10% 5 = >50%

Indicator Class:

+ = Obligate
 - = Facultative/Wet
 0 = Facultative

Source:

P = Planted
 V = Volunteer

Percent of perimeter 85 % developing wetland vegetation – excluding dam/berm structures.

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 a point where water depths or saturation are maximized. Mark this location with another metal fencepost. *-not done*

Estimate cover within a 10 ft 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.

Notes:

banks of wet are steep 3-4:1 slope? , a constructed FP would have helped ↑ % of wet veg around perimeter

transect - 270° (west)

[illegible]

COMMENTS/PROBLEMS: _____

1

B-6

COMMENTS/PROBLEMS: _____

Blank lined paper with a faint red stamp on the right side.

PHOTOGRAPHS



Using a camera with a 50 mm lenses and color film take photographs of the following permanent reference points listed in the checklist below. Record the direction of the photograph using a compass. (The first time at each site establish a permanent reference point by setting a 1/2 inch rebar or fencepost extending 2-3' above ground, survey the location with a resource grade GPS and mark the location on the air photo.)

Checklist:

- ☒ One photo for each of the 4 cardinal directions surrounding wetland
- ☒ At least one photo showing upland use surrounding wetland – if more than one upland use exists, take additional photos
- ☒ At least one photo showing buffer surrounding wetland
- ☒ One photo from each end of vegetation transect showing transect

Location	Photo Frame #	Photograph Description	Compass Reading
A	6	Photo looking N over wetland	N
B	7	Photo looking W over wetland	W
C	8	upland surrounding wetland	120°
D	9	Photo looking S over wetland	S
E	10	Photo looking E over wetland	E
F	11	Wetland Buffer	E
G	12	Taken at West end of veg transect looking	E
H	13	Taken at E end of veg transect Looking	W

COMMENTS/PROBLEMS: Photos were taken following the protocol outlined on this data sheet which supersedes earlier protocol in the Roy Creek TSMF

I	0	inlet riprap of west pond	N
J	1	riprap of west pond	N
K	2	outlet of east pond	E
L	3	inlet of east pond	N

GPS SURVEYING

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

m 4 North of Frontage Rd? N

Checklist:

- ☐ Jurisdictional wetland boundary
- ☐ 4-6 landmarks recognizable on the air photo
- ☐ Start and end points of vegetation transect(s)
- ☐ Photo reference points
- ☐ Groundwater monitoring well locations

COMMENTS/PROBLEMS: _____

WETLAND DELINEATION



At each site conduct the items on the checklist below:

- ☒ Delineate wetlands according to the 1987 Army Corps manual.
- ☒ Delineate wetland-upland boundary on the air photo
- ☒ Survey wetland-upland boundary with a resource grade GPS survey

COMMENTS/PROBLEMS: _____

FUNCTIONAL ASSESSMENT

Complete Jeff's abbreviated MDT Function and Values Assessment field form.

MAINTENANCE

Were man-made nesting structures installed at this site? YES NO ☒

If yes, do they need to be repaired? YES _____ NO _____ NA _____

If yes, describe problems below and indicate if any actions were taken to remedy the problems.

Were man-made structures build or installed to impound water or control water flow into or out of the wetland?

YES ☒ NO ☐ *rip rap*

If yes, are the structures working properly and in good working order? YES _____ NO _____

If no, describe the problems below.

COMMENTS/PROBLEMS: too much Riprap?

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

Project/Site: <u>REY CREEK MITIGATION SITE</u>	Date: <u>7-23-01</u>
Applicant/Owner: <u>MDT</u>	County: <u>Gallatin</u>
Investigator: <u>Wetlands West, Inc. (DL, RL, LB) /</u>	State: <u>MT</u>
Do Normal Circumstances exist on the site? <input checked="" type="radio"/> Yes <input type="radio"/> No	Community ID: <u>Mudflat</u>
Is the site significantly disturbed (Atypical Situation)? <input type="radio"/> Yes <input checked="" type="radio"/> No	Transect ID: <u>SP 1</u>
Is the area a potential Problem Area? <input type="radio"/> Yes <input checked="" type="radio"/> No	Plot ID: <u>SP 1</u>
(If needed, explain on reverse.)	

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. <u>TYLA</u>	<u>H</u>	<u>Obl</u>	9. _____	_____	_____
2. <u>Scirpus spp.</u>	<u>H</u>	<u>Obl</u>	10. _____	_____	_____
3. <u>CAUT</u>	<u>H</u>	<u>Obl</u>	11. _____	_____	_____
4. <u>Hordeum spp.</u>	<u>H</u>	_____	12. _____	_____	_____
5. <u>Eleocharis spp.</u>	<u>H</u>	_____	13. _____	_____	_____
6. <u>Sm. Juncus?</u>	<u>H</u>	_____	14. _____	_____	_____
7. <u>AG Slender</u>	<u>H</u>	_____	15. _____	_____	_____
8. _____	_____	_____	16. _____	_____	_____

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 95%

Remarks: Interspersed TYLA & Scirpus spp. are dominant. CAUT used as indicator species.

HYDROLOGY

<p>Recorded Data (Describe in Remarks):</p> <p><input type="checkbox"/> Stream, Lake, or Tide Gauge</p> <p><input type="checkbox"/> Aerial Photographs</p> <p><input type="checkbox"/> Other</p> <p><input checked="" type="checkbox"/> No Recorded Data Available</p>	<p>Wetland Hydrology Indicators:</p> <p>Primary Indicators:</p> <p><input checked="" type="checkbox"/> Inundated</p> <p><input type="checkbox"/> Saturated in Upper 12 Inches</p> <p><input type="checkbox"/> Water Marks</p> <p><input type="checkbox"/> Drift Lines</p> <p><input type="checkbox"/> Sediment Deposits</p> <p><input checked="" type="checkbox"/> Drainage Patterns in Wetlands</p> <p>Secondary Indicators (2 or more required):</p> <p><input type="checkbox"/> Oxidized Root Channels in Upper 12 Inches</p> <p><input type="checkbox"/> Water-Stained Leaves</p> <p><input type="checkbox"/> Local Soil Survey Data</p> <p><input type="checkbox"/> FAC-Neutral Test</p> <p><input type="checkbox"/> Other (Explain in Remarks)</p>
<p>Field Observations:</p> <p>Depth of Surface Water: <u>0-6'</u> (in.)</p> <p>Depth to Free Water in Pit: _____ (in.)</p> <p>Depth to Saturated Soil: _____ (in.)</p>	

Remarks: Two impoundments. Both E + W impoundments (192, respectively) have standing H₂O. Both have rip-rap added to the inflow areas (6-2001 install). Water can flow in to each during high flow. No other features observed.

SOILS

Map Unit Name: <u>Greycliff-Toston-Three Rivers</u>		Drainage Class: <u>Well Drained</u>
(Series and Phase): <u>Complex (525A)</u>		Field Observations
Taxonomy (Subgroup): _____		Confirm Mapped Type? Yes <input type="radio"/> No <input checked="" type="radio"/>

Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2	A	5Y ^{2.5/1} (black)	(masked)	—	CLLM
2-10	B	5Y ^{3/1} (v. dk gray)	5Y 6/8 (Olive Yellow)	many/Faint	Clg Loam
10-18	C	10YR 4/6 (dk)	5Y 3/2 (dk olive)	many/Distinct	Alluvium

Hydric Soil Indicators:	
<input type="checkbox"/> Histosol <input type="checkbox"/> Histic Epipedon <input type="checkbox"/> Sulfidic Odor <input type="checkbox"/> Aquic Moisture Regime <input checked="" type="checkbox"/> Reducing Conditions <input checked="" type="checkbox"/> Gleyed or Low-Chroma Colors	<input type="checkbox"/> Concretions <input type="checkbox"/> High Organic Content in Surface Layer in Sandy Soils <input type="checkbox"/> Organic Streaking in Sandy Soils <input type="checkbox"/> Listed on Local Hydric Soils List <input type="checkbox"/> Listed on National Hydric Soils List <input type="checkbox"/> Other (Explain in Remarks)

Remarks:	<u>Photos taken - nice mottles developed already.</u> <u>Soil pit @ #1 - E. end of WL.</u>
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WETLAND DETERMINATION

Hydrophytic Vegetation Present? <input checked="" type="radio"/> Yes <input type="radio"/> No (Circle) Wetland Hydrology Present? <input checked="" type="radio"/> Yes <input type="radio"/> No Hydric Soils Present? <input checked="" type="radio"/> Yes <input type="radio"/> No	Is this Sampling Point Within a Wetland? <input checked="" type="radio"/> Yes <input type="radio"/> No
---	--

Remarks:	<u>MDT mitigation site between highway, railroad & frontage road - former borrow pits - nice depressionnal/riverine wetlands. Former 'capture' concerns should have been fixed w/ rip-rap.</u>
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Approved by HQUSACE 3/92

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

Project/Site: <u>ROY CREEK / Three-Forks, MT</u>	Date: <u>7-23-01</u>
Applicant/Owner: <u>MDT</u>	County: <u>Gallatin</u>
Investigator: <u>Wetlands West, Inc. / DSL, LR & RL</u>	State: <u>MT</u>
Do Normal Circumstances exist on the site? <input checked="" type="radio"/> Yes <input type="radio"/> No	Community ID: <u>MEOF</u>
Is the site significantly disturbed (Atypical Situation)? <input type="radio"/> Yes <input checked="" type="radio"/> No	Transect ID: <u>SP2</u>
Is the area a potential Problem Area? <input type="radio"/> Yes <input checked="" type="radio"/> No	Plot ID: <u>SP2</u>
(If needed, explain on reverse.)	

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. <u>MEOF</u>	<u>H</u>	<u>UP?</u>	9. _____	_____	_____
2. <u>AG slender</u>	<u>H</u>	<u>UP?</u>	10. _____	_____	_____
3. <u>Hawks beard</u>	<u>H</u>	<u>UP?</u>	11. _____	_____	_____
4. <u>SAMO</u>	<u>H</u>	<u>UP?</u>	12. _____	_____	_____
5. <u>CI (Thistle)</u>	<u>H</u>	_____	13. _____	_____	_____
6. <u>RRIN</u>	<u>H</u>	_____	14. _____	_____	_____
7. _____	_____	_____	15. _____	_____	_____
8. _____	_____	_____	16. _____	_____	_____

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

Remarks: Upland area E. of wetland SP-1.

HYDROLOGY

<p>___ Recorded Data (Describe in Remarks):</p> <p>___ Stream, Lake, or Tide Gauge</p> <p>___ Aerial Photographs</p> <p>___ Other</p> <p><input checked="" type="checkbox"/> No Recorded Data Available</p> <hr/> <p>Field Observations:</p> <p>Depth of Surface Water: <u>NA</u> (in.)</p> <p>Depth to Free Water in Pit: _____ (in.)</p> <p>Depth to Saturated Soil: _____ (in.)</p>	<p>Wetland Hydrology Indicators:</p> <p>Primary Indicators:</p> <p>___ Inundated</p> <p>___ Saturated in Upper 12 Inches</p> <p>___ Water Marks</p> <p>___ Drift Lines</p> <p>___ Sediment Deposits</p> <p>___ Drainage Patterns in Wetlands</p> <p>Secondary Indicators (2 or more required):</p> <p>___ Oxidized Root Channels in Upper 12 Inches</p> <p>___ Water-Stained Leaves</p> <p>___ Local Soil Survey Data</p> <p>___ FAC-Neutral Test</p> <p>___ Other (Explain in Remarks)</p>
<p>Remarks: <u>Dry</u></p>	

SOILS

Map Unit Name

(525A)
(Series and Phase): Graycliff-Toston-Three Rivers Complex

Drainage Class: Well

Field Observations

Taxonomy (Subgroup):

Confirm Mapped Type? Yes ☒ No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-4	A	7.5YR 4/3	(Brown)	NA	Silty Clay Loam
4-10	B	7.5YR 6/4	(Lt. Brown)	NA	
10-18	C	—	—	NA	Alluvium

Hydric Soil Indicators:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☐ Gleyed or Low-Chroma Colors

- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Local Hydric Soils List
- ☐ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks:

Upl. - dry alluvium throughout site. (Three Forks, MT)

WETLAND DETERMINATION

Hydrophytic Vegetation Present?

Yes ☒ No (Circle)

Wetland Hydrology Present?

Yes ☒ No

Hydric Soils Present?

Yes ☒ No

(Circle)

Is this Sampling Point Within a Wetland?

Yes ☒ No

Remarks:

Upland border of the Key Creek mit. site.

Approved by HQUSACE 3/92

Draft Field Data Collection Sheet for MDT Montana Wetland Assessment Form

west side + E
east side - E

1. CLASSIFICATION "west" = west of inflow stream, north of RR and S of Frontage Rd; E = east

Vegetated Cowardin Class	Estimated % of AA	Predominant Water Regime (CIRCLE)
Emergent	W - 30% E - 40%	<input checked="" type="radio"/> PF <input type="radio"/> IE <input type="radio"/> SPF <input type="radio"/> SF <input type="radio"/> S <input type="radio"/> TF <input type="radio"/> IF
Aquatic Bed	0 5%	PF IE SPF SF S TF IF
Moss-Lichen	0 0	PF IE SPF SF S TF IF
Scrub-Shrub	0 0 (3 shrubs)	PF IE SPF SF <input checked="" type="radio"/> S <input type="radio"/> TF IF
Forested	0	PF IE SPF SF S TF IF
Total Estimated % Vegetated	95% 85%	

AA +
east
pond
of
east
pond

2. DISTURBANCE is: High Moderate Low

3. HYDROLOGY since when? N - good water and overbank from Reg Co; E - Reg creek

Do wetlands on site pond or flood? ☒ Y ☐ N (if no, skip to groundwater discharge/recharge portion of this section)Does AA contain surface or subsurface outlet? ☒ Y = E N If outlet present, is it restricted (subsurface will always be "yes")? ☒ Y = W N

Longest duration of surface water:	Surface Water Duration and other attributes (circle)		
at any wetlands within AA E+W	<input checked="" type="radio"/> Perm / <input checked="" type="radio"/> Peren	Seas / Intermit	Temp / Ephem
in at least 10% of AA (both wetlands and nonwetlands [deepwater, streambed...])	Perm / Peren	Seas / Intermit	Temp / Ephem
where fish are or historically were present (cross out if not applicable) (low) E=	<input checked="" type="radio"/> Perm / <input checked="" type="radio"/> Peren	Seas / Intermit	Temp / Ephem
% of waterbody containing cover objects	>25%	10-25%	<input checked="" type="radio"/> <10% E+W
% bank or shore with riparian or wetland shrub or forested communities	>75%	50-74%	<input checked="" type="radio"/> <50% E+W
adjacent to rooted wetland vegetation along a defined watercourse or shoreline subject to wave action (cross out if not applicable)	<input checked="" type="radio"/> Perm / <input checked="" type="radio"/> Peren E+W	Seas / Intermit	Temp / Ephem
% cover of wetland bank or shore by sp. with binding rootmasses	<input checked="" type="radio"/> >65%	35-64%	<35%

Do any wetlands on site flood as a result of in-channel or overbank flow? ☒ Y ☐ N (if no, go to groundwater section below)

Estimated wetland area subject to periodic flooding (acres): ≥10

Estimated % of flooded wetland classified SS, FO or both:

2-10

≥75

<2

25-74

<25

Evidence of groundwater discharge or recharge? ☒ Y ☐ N List: areas adj. to ponds ~ 3-4' above have w/ obl. veg.

4. VERTEBRATES

Evidence of or potential for T&E or MNHP species use? (For general wildlife use, see separate form.)

Fish observations?

5. OTHERS

Do wetlands have potential to receive excess sediments, nutrients, or toxicants? ☒ Y ☐ N From: interstate, Frontage Rd

Potential to receive: low to moderate levels

high levels

Does site contain bog, fen, warm springs, >80 year-old forested wetland, or MNHP "S1" or "S2" plant association? Y ☒ N

List:

Is AA a known recreation / education site? Y ☒ N

Type:

Does AA offer strong potential for use as recreation / education site? ☒ Y ☐ N Type:

turtles?

MDT Montana Wetland Assessment Form (revised 5/25/1999)

1. Project Name: Ray Creek 2. Project #: 25 Control
14 Task No.

3. Evaluation Date: Mo. 7 Day 23 Yr. 01 4. Evaluator(s): B/D/L 5. Wetlands/Site #s: 25

6. Wetland Location(s): i. Legal: T 2 N or S; R 2 E or W; S 28; T N or S; R E or W; S

ii. Approx. Stationing or Mileposts:

iii. Watershed: 10020007 GPS Reference No. (if applies):

Other Location Information:

7. a. Evaluating Agency: Wetlands west

b. Purpose of Evaluation:

1. Wetlands potentially affected by MDT project
2. Mitigation wetlands; pre-construction
3. Mitigation wetlands; post-construction
4. Other

8. Wetland size: (total acres) 0.540 (visually estimated)
(measured, e.g. by GPS [if applies])

9. Assessment area: (AA, tot., ac., see instructions on determining AA) 0.540 (visually estimated)
(measured, e.g. by GPS [if applies])

10. Classification of Wetland and Aquatic Habitats in AA (HGM according to Brinson, first col.; USFWS according to Cowardin [1979], remaining cols.)

M Class	System	Subsystem	Class	Water Regime	Modifier	% of AA
<u>Palustrine</u>		<u>Emergent</u>		<u>PF</u>		<u>100</u>

(Abbreviations: System: Palustrine (P)/ Subsystem: none/ Classes: Rock Bottom (RB), Unconsolidated bottom (UB), Aquatic Bed (AB), Unconsolidated Shore (US), Moss-lichen Wetland (ML), Emergent Wetland (EM), Scrub-Shrub Wetland (SS), Forested Wetland (FO)/ System: Lacustrine (L)/ Subsystem: Littoral (2)/ Classes: RB, UB, AB/ Subsystem: Littoral (4)/ Classes: RB, UB, AB, US, EM/ System: Riverine (R)/ Subsystem: Lower Perennial (2)/ Classes: RB, UB, AB, US, EM/ Subsystem: Upper Perennial (3)/ Classes: RB, UB, AB, US/ Water Regimes: Permanently Flooded (H), Intermittently Exposed (G), Semipermanently Flooded (F), Seasonally Flooded (C), Saturated (B), Temporarily Flooded (A), Intermittently Flooded (J) Modifiers: Excavated (E), Impounded (I), Diked (D), Partly Drained (PD), Farmed (F), Artificial (A) HGM Classes: Riverine, Depressional, Slope, Mineral Soil Flats, Organic Soil Flats, Lacustrine Fringe

11. Estimated relative abundance: (of similarly classified sites within the same Major Montana Watershed Basin, see definitions)
(Circle one) Unknown Rare Common Abundant
Comments:

12. General condition of AA:

i. Regarding disturbance: (use matrix below to determine [circle] appropriate response)

Conditions within AA	Predominant conditions adjacent to (within 500 feet of) 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 is managed in predominantly natural state; is not grazed, hayed, logged, or otherwise converted; does not contain roads or buildings.	low disturbance	low disturbance	moderate disturbance
AA not cultivated, but moderately grazed or hayed or selectively logged; or has been subject to relatively minor clearing, fill placement, or hydrological alteration; contains few roads or buildings.	moderate disturbance	moderate disturbance	high disturbance
AA cultivated or heavily grazed or logged; subject to relatively substantial fill placement, grading, clearing, or hydrological alteration; high road or building density.	high disturbance	high disturbance	<u>high disturbance</u>

Comments: (types of disturbance, intensity, season, etc.):

- ii. Prominent weedy, alien, & introduced species (including those not domesticated, feral): (list) *Russian thistle, solidago, hedeum, knapweed, lamb's quarters, pigweed, mullein,*
- iii. Provide brief descriptive summary of AA and surrounding land use/habitat: *Frontage Rd, I 90, RR track*

13. Structural Diversity: (based on number of "Cowardin" vegetated classes present [do not include unvegetated classes], see #10 above)

# of "Cowardin" vegetated classes present in AA (see #10)	≥ 3 vegetated classes (or ≥ 2 if one is forested)	2 vegetated classes (or 1 if forested)	≤ 1 vegetated class
Rating (circle)	High	Moderate	Low

Comments:

SECTION PERTAINING to FUNCTIONS & VALUES ASSESSMENT

14A. Habitat for Federally Listed or Proposed Threatened or Endangered Plants or Animals:

- i. AA is Documented (D) or Suspected (S) to contain (circle one based on definitions contained in instructions):

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 (use the conclusions from i above and the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function)

Highest Habitat Level	doc./primary	sus./primary	doc./secondary	sus./secondary	doc./incidental	sus./incidental	None
Functional Points and Rating	1 (H)	.9 (H)	.8 (M)	.7 (M)	.5 (L)	.3 (L)	0 (L)

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

14B. Habitat for plant or animals rated S1, S2, or S3 by the Montana Natural Heritage Program: (not including species listed in 14A above)

- i. AA is Documented (D) or Suspected (S) to contain (circle one based on definitions contained in instructions):

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 (use the conclusions from i above and the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function)

Highest Habitat Level	doc./primary	sus./primary	doc./secondary	sus./secondary	doc./incidental	sus./incidental	None
Functional Points and Rating	1 (H)	.8 (H)	.7 (M)	.6 (M)	.2 (L)	.1 (L)	0 (L)

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

14C. General Wildlife Habitat Rating:

- i. Evidence of overall wildlife use in the AA (circle substantial, moderate, or low based on supporting evidence):

Substantial (based on any of the following [check]):

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

of the AA

Low (based on any of the following [check]):

- few or no wildlife observations during peak use periods
- little to no wildlife sign
- sparse adjacent upland food sources
- interviews with local biologists with knowledge

Moderate (based on any of the following [check]):

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

- ii. Wildlife habitat features (working from top to bottom, circle appropriate AA attributes in matrix to arrive at 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 of the AA (see #10). Abbreviations for surface water durations are as follows: P/P = permanent/perennial;

S/I = seasonal/intermittent; T/E = temporary/ephemeral; and A = absent [see instructions for further definitions of these terms].)

Structural diversity (see #13)	High								Moderate								Low			
	Even				Uneven				Even				Uneven				Even			
Less cover distribution (all vegetated classes)	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
Duration of surface water in > 10% of AA																				
Low disturbance at AA (see #12i)	E	E	E	I	E	E	H	I	E	H	H	M	E	H	M	M	E	H	M	I
Moderate disturbance at AA (see #12i)	H	H	H	I	H	H	H	I	H	H	M	M	H	M	M	L	H	M	L	L
High disturbance at AA (see #12i)	M	M	M	L	M	M	L	L	M	M	L	L	M	L	L	L	L	L	L	L

iii. Rating (use the conclusions from i and ii above and the matrix below to arrive at [circle] the functional points and rating [E = exceptional, H = high, M = moderate, or L = low] for this function)

Evidence of wildlife use (i)	Wildlife habitat features rating (ii)			
	Exceptional	High	Moderate	Low
Substantial	1 (E)	.9 (H)	.8 (H)	.7 (M)
Moderate	.9 (H)	.7 (M)	.5 (M)	.3 (L)
Minimal	.6 (M)	.4 (M)	.2 (L)	.1 (L)

Comments: bad place for animals and aves spp - too much traffic

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

i. Habitat Quality (circle appropriate AA attributes in matrix to arrive at exceptional (E), high (H), moderate (M), or low (L) quality rating.)

Duration of surface water in AA	Permanent / Perennial			Seasonal / Intermittent			Temporary / Ephemeral		
	>25%	10-25%	<10%	>25%	10-25%	<10%	>25%	10-25%	<10%
Cover - % of waterbody in AA containing cover objects such as submerged logs, large rocks & boulders, overhanging rocks, floating-leaved vegetation, etc.									
Shading - >75% of streambank or shoreline within AA contains riparian or wetland scrub-shrub or forested communities	E	E	H	H	H	M	M	M	M
Shading - 50 to 75% of streambank or shoreline within AA contains rip. or wetland scrub-shrub or forested communities	H	H	M	M	M	M	M	L	L
Shading - < 50% of streambank or shoreline within AA contains rip. or wetland scrub-shrub or forested communities	H	M	M	M	L	L	L	L	L

ii. Modified Habitat Quality (Circle the appropriate response to the following question. If answer is Y, then reduce rating in i above by one level [E = H, H = M, M = L, L = NA]). Is fish use of the AA precluded or significantly reduced by a culvert, dike, or other man-made structure or activity or is the waterbody included on the MDEQ list of waterbodies in need of TMDL development with listed "Probable Impaired Uses" including cold or warm water fishery or aquatic life support? Y N Modified habitat quality rating = (circle) E H M L

iii. Rating (use the conclusions from i and ii above and the matrix below to arrive at [circle] the functional points and rating [E = exceptional, H = high, M = moderate, or L = low] for this function)

Types of fish known or suspected within AA	Modified Habitat Quality (ii)			
	Exceptional	High	Moderate	Low
Native game fish	1 (E)	.9 (H)	.7 (M)	.5 (M)
Introduced game fish	.9 (H)	.8 (H)	.6 (M)	.4 (M)
Non-game fish	.7 (M)	.6 (M)	.5 (M)	.3 (L)
No fish	.5 (M)	.3 (L)	.2 (L)	.1 (L)

Comments: too much riprap in pond outlets/inlets (are there permits for that?! [404, 310, 600 DNRC??])

14E. Flood Attenuation: (applies only to wetlands subject to flooding via in-channel or overbank flow. If wetlands in AA are not flooded from in-channel or overbank flow, circle NA here and proceed to next function.)

i. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function)

Flooded wetland area in AA subject to periodic flooding	> 10 acres			<10, >2 acres			≤ 2 acres		
	75%	25-75%	<25%	75%	25-75%	<25%	75%	25-75%	<25%
% of flooded wetland classified as forested, scrub/shrub, or both									
AA contains no outlet or restricted outlet	1(H)	.9(H)	.6(M)	.8(H)	.7(H)	.5(M)	.4(M)	.3(L)	.2(L)
AA contains unrestricted outlet	.9(H)	.8(H)	.5(M)	.7(H)	.6(M)	.4(M)	.3(L)	.2(L)	.1(L)

ii. Are residences, businesses, or other features which may be significantly damaged by floods located within 0.5 miles downstream of the AA (circle)?

Short and Long Term Surface Water Storage: (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, circle NA here and proceed with the evaluation.)

i. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function. Abbreviations for surface water durations are as follows: P/P = permanent/perennial; S/I = seasonal/intermittent; and T/E = temporary/ephemeral [see instructions for further definitions of these terms].)

Estimated maximum acre feet of water contained in wetlands within the AA that are subject to periodic flooding or ponding	>5 acre feet			<5, >1 acre feet			≤1 acre foot		
Duration of surface water at wetlands within the AA	P/P	S/I	T/E	P/P	S/I	T/E	P/P	S/I	T/E
Wetlands in AA flood or pond ≥ 5 out of 10 years	1(H)	.9(H)	.8(H)	.8(H)	.6(M)	.5(M)	.4(M)	.3(L)	.2(L)
Wetlands in AA flood or pond < 5 out of 10 years	.9(H)	.8(H)	.7(M)	.7(M)	.5(M)	.4(M)	.3(L)	.2(L)	.1(L)

Comments:

14G. Sediment/Nutrient/Toxicant Retention and Removal: (Applies to wetlands with 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, circle NA here and proceed with the evaluation.)

i. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function.

Sediment, nutrient, and toxicant input levels within AA	AA receives or surrounding land use with 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 with 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
contains no or restricted outlet	1 (H)	.8 (H)	.7 (M)	.5 (M)	.5 (M)	.4 (M)	.3 (L)	.2 (L)
contains unrestricted outlet	.9 (H)	.7 (M)	.6 (M)	.4 (M)	.4 (M)	.3 (L)	.2 (L)	.1 (L)

Comments: No listing for Key Creek = 95 - split inlet/outlet

14H Sediment/Shoreline Stabilization: (applies only if AA occurs on or within the banks of a river, stream, or other natural or man-made drainage, or on the shoreline of a standing water body which is subject to wave action. If does not apply, circle NA here and proceed to next function)

i. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating [E = exceptional, H = high, M = moderate, or L = low] 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%	1 (H)	.9 (H)	.7 (M)
35-64%	.7 (M)	.6 (M)	.5 (M)
< 35%	.3 (L)	.2 (L)	.1 (L)

Comments:

14I. Production Export/Food Chain Support:

i. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function. Factor A = acreage of vegetated component in the AA; Factor B = structural diversity rating from #13; Factor C = whether or not the AA contains a surface or subsurface outlet; the final three rows pertain to duration of surface water in the AA, where P/P = permanent/perennial; S/I = seasonal/intermittent; T/E = temporary/ephemeral or absent [see instructions for further definitions of these terms].)

A	Vegetated component >5 acres						Vegetated component 1-5 acres						Vegetated component <1 acre					
B	High		Moderate		Low		High		Moderate		Low		High		Moderate		Low	
C	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
P/P	1H	.9H	.9H	.8H	.8H	.7M	.9H	.8H	.8H	.7M	.7M	.6M	.7M	.6M	.6M	.4M	.4M	.3L
S/I	.9H	.8H	.8H	.7M	.7M	.6M	.8H	.7M	.7M	.6M	.6M	.5M	.6M	.5M	.5M	.3L	.3L	.2L
T/E	.8H	.7M	.7M	.6M	.6M	.5M	.7M	.6M	.6M	.5M	.5M	.4M	.5M	.4M	.4M	.2L	.2L	.1L

Comments:

Groundwater Discharge/Recharge: (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

ii. Recharge Indicators

- ☒ Permeable substrate present without underlying impeding layer
- ☐ Wetland contains inlet but no outlet
- ☐ Other

Other

iii. Rating: Use the information from i and ii above and the table below to arrive at [circle] the functional points and rating [H = high, L = low] for this function.

Criteria	Functional Points and Rating
AA is known Discharge/Recharge area or one or more indicators of D/R present	1 (H)
No Discharge/Recharge indicators present	.1 (L)
Available Discharge/Recharge information inadequate to rate AA D/R potential	N/A (Unknown)

Comments:

14K. Uniqueness:

i. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] 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 MNHP			AA does not contain previously cited rare types and structural diversity (#13) is high or contains plant association listed as "S2" by the MNHP			AA does not contain previously cited rare types or associations and structural diversity (#13) is low-moderate		
Estimated relative abundance (#11)	rare	common	abundant	rare	common	abundant	rare	common	abundant
Low disturbance at AA (#12i)	1 (H)	.9 (H)	.8 (H)	.8 (H)	.6 (M)	.5 (M)	.5 (M)	.4 (M)	.3 (L)
Moderate disturbance at AA (#12i)	.9 (H)	.8 (H)	.7 (M)	.7 (M)	.5 (M)	.4 (M)	.4 (M)	.3 (L)	.2 (L)
High disturbance at AA (#12i)	.8 (H)	.7 (M)	.6 (M)	.6 (M)	.4 (M)	.3 (L)	.3 (L)	.2 (L)	.1 (L)

Comments:

14L. Recreation/Education Potential: i. Is the AA a known rec./ed. site: (circle) Y N (If yes, rate as [circle] High [1] and go to ii; if no go to 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 strong potential for rec./ed. use? Y N

(If yes, go to ii, then proceed to iv; if no, then rate as [circle] Low [0.1])

iv. Rating (use the matrix below to arrive at [circle] the functional points and rating [H = high, M = moderate, or L = low] for this function.

Ownership	Disturbance at AA (#12i)		
	low	moderate	high
public ownership	1 (H)	.5 (M)	.2 (L)
private ownership	.7 (M)	.3 (L)	.1 (L)

Comments:

too close to roads + R2

FUNCTION & VALUE SUMMARY & OVERALL RATING

Function & Value Variables	Rating	Actual Functional Points	Possible Functional Points	Functional Units; (Actual Points x Estimated AA Acreage) (0.54 acres)
A. Listed/Proposed T&E Species Habitat	Low	0	1	0
B. MT Natural Heritage Program Species Habitat	Low	0	1	0
C. General Wildlife Habitat	Low	.1	1	0.054
D. General Fish/Aquatic Habitat	Mod.	.6	1	0.324
E. Flood Attenuation	Low	.15	1	0.081
F. Short and Long Term Surface Water Storage	Low	.3	1	0.162
G. Sediment/Nutrient/Toxicant Removal	High	.95	1	0.513
H. Sediment/Shoreline Stabilization	High	1	1	0.54
I. Production Export/Food Chain Support	Mod.	.6	1	0.324
J. Groundwater Discharge/Recharge	High	1	1	0.54
K. Uniqueness	Low	.2	1	0.108
L. Recreation/Education Potential	Low	.2	1	0.108
Totals:		5.1	12	2.754

$$5.1 \times .54ac = 2.754$$

43%

OVERALL ANALYSIS AREA (AA) RATING: (Circle appropriate category based on the criteria outlined below) I II III IV

Category I Wetland: (Must satisfy one of the following criteria; if does not meet criteria, go to Category II)

- ☐ Score of 1 functional point for Listed/Proposed Threatened or Endangered Species; or
- ☐ Score of 1 functional point for Uniqueness; or
- ☐ Score of 1 functional point for Flood Attenuation and answer to Question 14E.ii is "yes"; or
- ☐ Total actual functional points > 80% (round to nearest whole #) of total possible functional points.

Category II Wetland: (Criteria for Category I not satisfied and meets any one of the following criteria; if not satisfied, go 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
- ☐ Total Actual Functional Points > 65% (round to nearest whole #) of total possible functional points.

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 does not satisfy criteria go to Category III)

- ☐ "Low" rating for Uniqueness; and
- ☐ "Low" rating for Production Export/Food Chain Support; and
- ☐ Total actual functional points < 30% (round to nearest whole #) of total possible functional points

Appendix C

BIRD SURVEY PROTOCOL GPS PROTOCOL

*MDT Wetland Mitigation Monitoring
Rey Creek
Three Forks, 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 D

REPRESENTATIVE PHOTOGRAPHS

MDT Wetland Mitigation Monitoring

Rey Creek

Three Forks, Montana



Photo point B, East Impoundment (#1). View West.



Photo point A, Rip rap to East Impoundment (#1). Inflow looking North.



Photo point K, Outlet of East impoundment. No rip-rap placed. View is SE.



Photo point D, view is South.



Photo point E, view is East across #2 West Impoundment.



Photo point F, West Impoundment (#2); wetland buffer.



Photo point J, Silt fence and rip-rap on West Impoundment (#2). View is North.



Photo point H, Impoundment #2 East end of transect. View is West.



Photo point I, inlet rip-rap on streamside of West Impoundment (#2). View is North.



Photo point G, West end of transect. View is East

Appendix E

MDT FIELD NOTES 1999

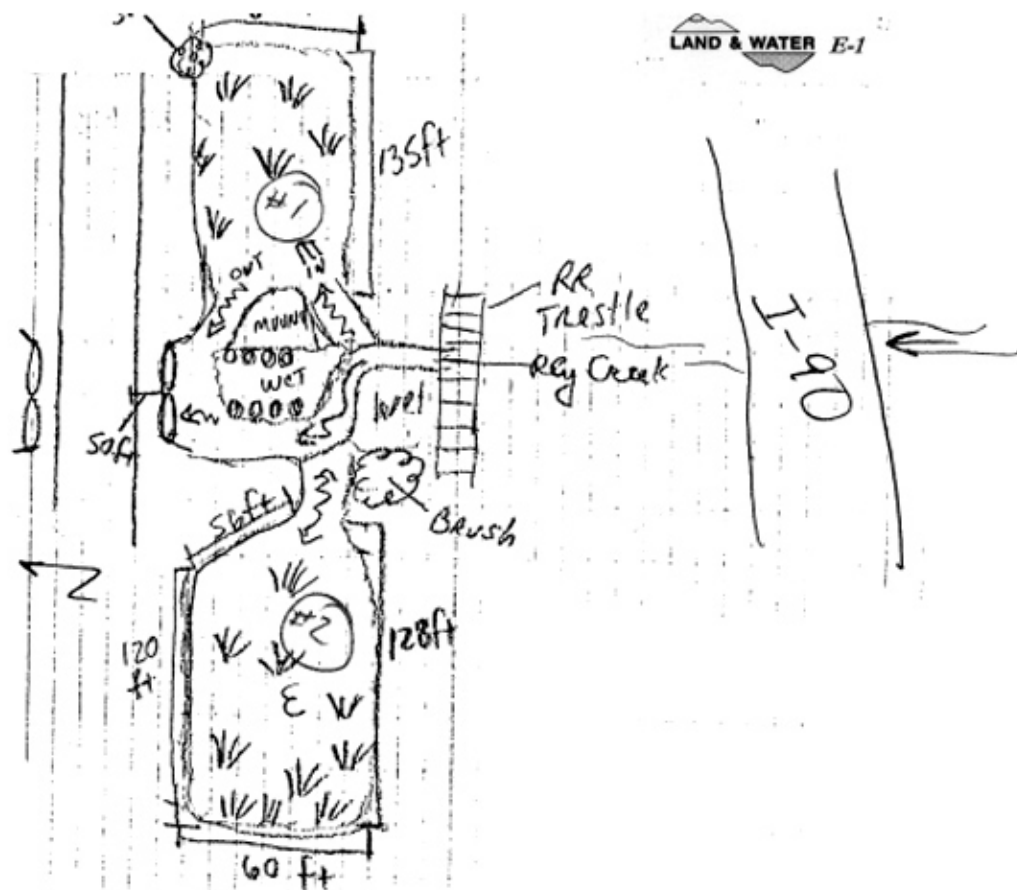
MDT Wetland Mitigation Monitoring

Rey Creek

Three Forks, Montana

POST INSTRUCTION

- Visited on 10/28/99 approximately 1 1/2 months after completion of project.
- Mitigation for impacts associated with replacement of timber bridge over Key Creek with Twin galvanized culverts.
- Mitigation occurred in areas of excavation within an abandoned railroad grade to the south of the frontage road between I-90.
- Two impoundments were created on either side of Key Creek with inlets to facilitate movement of high water flows into the created wetlands.
- Impoundment #1 situated to the East of Key Creek is approximately 8,938 sq ft in size and contains an inlet and outlet.
- Impoundment #2 is situated to the west of Key Creek, has a single inlet and is approximately 7,680 sq ft in size.
- wetland vegetation was salvaged from existing wetlands and utilized in both of the completed excavated wetland areas.



Problems observed:

- Both inlets to each wetland were constructed on an outside bend of Key Creek which could potentially lead to capture of stream. Each inlet should be hardened with rip-rap to prevent capture of stream.

h. lens observed:

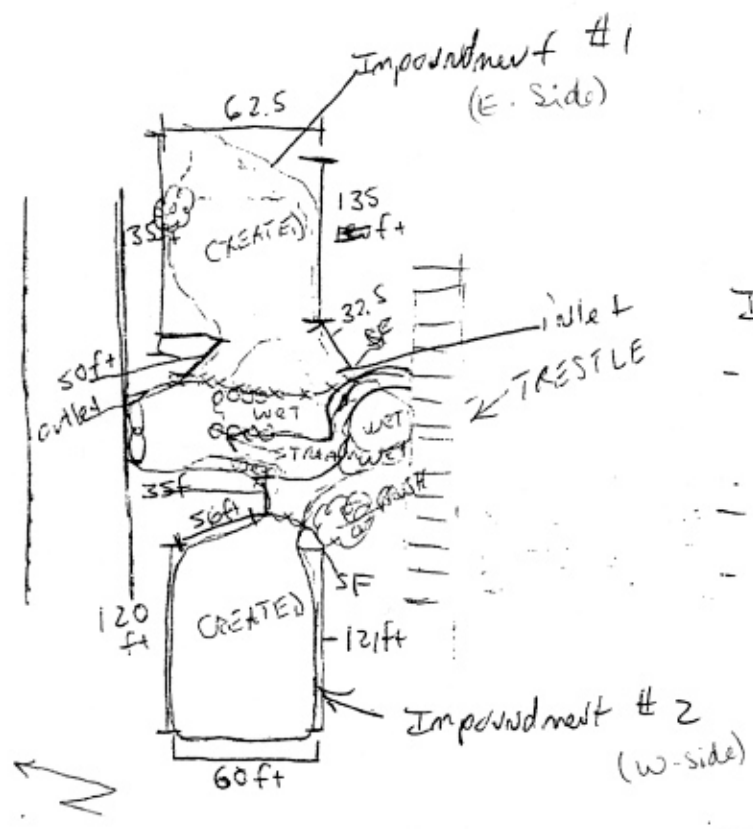
- Why only an inlet on the wetland to the west of Key Creek? —?
- There is some concern that project impacted more wetlands than necessary as culvert on south side of road extends 50 feet from edge of pavement. Slopes and fill into wetland was it really necessary? Why wasn't graded rail considered?
- Wetlands Engineer should be contacted for advice during construction and finalization of wetland projects.

$$\begin{array}{r} 13 \\ \times 2.5 \\ \hline 65 \\ 260 \\ \hline 32.5 \end{array}$$

$$\begin{array}{r} \\ \times 2.5 \\ \hline 270 \\ 1080 \\ \hline 1850 \end{array}$$

$$\begin{array}{r} \\ \times 2.5 \\ \hline 125 \\ 500 \\ \hline 62.5 \end{array}$$

LAND & WATER E-3



- Impoundment #1 - standing water
- Area has been revegetated with wetland plants + soils
 - has an inlet and an outlet
 - concern about capture of stream in inlet area - recommended hardening of inlet with large rip-rap #2 or 3
 - island in interior needs to be seeded and/or brought down to a lower elevation

Impoundment #2

- west of stream channel
- inlet area needs to be hardened or vegetated quickly
- concern about outside bend of stream being captured by inlet
- Area has been revegetated ~~at~~ with salvaged vegetation + soils
- concern that project impacted more wetlands than necessary - end of culvert abutment 50 feet from edge of pavement Why??
- Recommend that Wetlands Engineer be involved in future construction of this nature
- Substantial fill placed into north side wetlands needed

$$\begin{array}{r} 135 \\ \times 57.5 \\ \hline 9000 \\ 50625 \\ \hline 77625 \end{array}$$