

**ANALYSIS OF**

**MUD CREEK**

**TOWN OF REVILLO**

**GRANT COUNTY, SOUTH DAKOTA**

**December 2004**

**South Dakota  
Department of Environment and Natural Resources  
Division of Environmental Services  
Pierre, South Dakota**

## Table of Contents

Executive Summary . . . . .	3
Introduction . . . . .	3
General Waterbody/Drainage Area Description . . . . .	3
DENR Assessment Results . . . . .	5
Summary . . . . .	6
Reference Documents . . . . .	8
Attachments	
Attachment 1 – Photograph of creek near Site # 1 . . . . .	10
Attachment 2 – Photograph of Site # 2 . . . . .	11
Attachment 3 – Photograph of fish at Site # 2 . . . . .	12
Attachment 4 – Photograph of fish at Site # 2 . . . . .	13
Attachment 5 – Photograph of Site # 3 . . . . .	14
Attachment 6 – Fish collection data for site # 1 . . . . .	15
Attachment 7 – Fish collection data for site # 2. . . . .	16
Attachment 8 – Fish collection data for site # 2. . . . .	17
Attachment 9 – Field water quality analysis data . . . . .	18
Attachment 10 – Laboratory water quality analysis data . . . . .	19
Attachment 11 – Flow data for site # 2 . . . . .	20
Attachment 12 – Map . . . . .	21

## **Executive Summary**

Name of Waterbody: Mud Creek

Location: East of the town of Revillo in southeastern Grant County, South Dakota

Boundaries of Waterbody under Assessment: Mud Creek, from the Revillo wastewater outfall to the confluence with South Fork Yellowbank River.

Condition/Description of Creek Segment: Department of Environment and Natural Resources (DENR) personnel assessed the Mud Creek on three separate occasions, August 5 and 6, 2002, July 1 and 2, 2003, and July 7, 2004. In 2002 and 2003 there was flow in certain segments, while in other segments, the creek appeared to lose flow. In 2004 Mud Creek had no flow, but ponded water was present.

All three sites visits where conducted during the summer, a critical time of the year for flows in most South Dakota streams. Based on the three site visits, it appears the when there is flow, Mud Creek can support a limited number of fish species. Species collected include blacknose dace, creek chub, common shiner, red shiner, johnny darter, largemouth bass, and bluntnose minnow. However, Mud Creek does experience periods of low or no flow.

Recommendation: It is recommended the assigned beneficial use for Mud Creek from Section 22, Township 118 North, Range 48 West, to the confluence with the South Fork Yellowbank River be changed to (6) Warmwater marginal fish life propagation waters, (8) Limited contact recreation waters, (9) Fish and wildlife propagation, recreation, and stock watering waters, and (10) irrigation waters.

## **Introduction**

The town of Revillo is a small community located in northeastern South Dakota. Based upon data from the 2000 Census, the population is 147. The wastewater facility is located in the Northeast ¼ of Section 22, Township 118 North, Range 48 West, in Grant County. The facility has a lift station, two stabilization ponds, and a wetland. The stabilizations ponds are each 1.75 acres in size and the wetland is 2.81 acres. The system is operated in a series. The outlet from the wetland discharges to Mud Creek.

## **General Waterbody/Drainage Area Description**

### Surface Water

Mud Creek is a tributary of the South Fork Yellowbank River. It originates in northern Deuel County, near the Highway 15/Highway 212 junction. Mud Creek flows south and east of the town of Revillo, and next to the wastewater facility. Once it has passed Revillo, Mud Creek

continues to flow in a generally north eastern direction for another six or seven miles until its confluence with the South Forth Yellowbank River. The confluence is in the Northeast ¼ of Section 8, Township 118 North, Range 47 West.

#### Current Assigned Beneficial Uses

Currently, Mud Creek is assigned the beneficial uses for (9) Fish and wildlife propagation, recreation, and stock watering waters, and (10) Irrigation waters.

The South Forth Yellowbank River is assigned the beneficial uses of (3) Coldwater marginal fish life propagation waters, (8) Limited contact recreation waters, (9) Fish and wildlife propagation, recreation, and stock watering waters, and (10) Irrigation waters.

#### Wetlands

Wetlands found in the segment of the Mud Creek under review are palustrine and/or riverine systems. Details and site specific wetland classifications are summarized below. Definitions for wetland classes, systems, water regimes, and subsystems are found at the end of this section:

- Just upstream from the Reville wastewater facility (in Section 22), Mud Creek carries the wetland classification for a temporarily flooded water regime, forested class, palustrine system;
- Within a mile below the Reville wastewater facility (in Section 13), Mud Creek carries the wetland classification for a semi-permanently flooded water regime, intermittent subsystem, streambed class, riverine system;
- From one and one-half to two miles below the Reville wastewater facility (in Section 18), Mud Creek carries the wetland classification for a temporarily flooded water regime, emergent class, palustrine system;
- Within a couple of miles from the confluence with the South Fork Yellowbank River (in Section 17), Mud Creek carries the wetland classification for a semi-permanently flooded water regime, intermittent subsystem, streambed class, riverine system; and
- Near the confluence with the South Fork Yellowbank River (in Section 8), Mud Creek carries the wetland classification for a temporarily flooded water regime, forested class, palustrine system.

*Systems:* Palustrine systems are either dominated by trees, shrubs, persistent emergents, or are wetlands lacking such vegetation, but that are less than 20 acres in size and less than 6.6 feet deep during period of low water. Riverine systems are contained within a channel which periodically or continuously contains moving water.

*Classes:* Forested class wetlands are characterized by woody vegetation that is 19.7 feet or taller. The characteristics of streambed class wetlands vary depending upon gradient, water velocity, and sediment load. They may contain riffles, pools, bars, and islands. Emergent class wetlands are characterized by erect, rooted, perennial plants. This vegetation is present for most of the growing season.

*Subsystem:* Wetlands assigned the intermittent subsystem classification contain flowing water for part of the year. These wetlands often hold pooled water when flow is absent.

*Water Regimes:* A wetland with a temporarily flooded water regime holds surface water for brief periods. A wetland with a semi-permanently flooded water regime holds surface water that persists throughout the growing season.

### Soils/Ground Water

The Veblen Aquifer is located in eastern Grant County, and underlies Mud Creek. While the aquifer is near land surface along its western boundary, available data indicates it is not at ground surface near Mud Creek. For this reason, it does not appear that Mud Creek obtains flow from this aquifer. Further, during periods of the year when precipitation is limited, Mud Creek appears to lose flow in certain segments while it maintains flow in other segments. It appears this loss of flow constitutes seepage of water through till that underlies the creek. Available information indicates this water is recharge for the Veblen Aquifer.

## **DENR Assessment Results**

On August 5 and 6, 2002, July 1 and 2, 2003, and July 7, 2004, DENR personnel visited the town of Revillo to assess a segment of the Mud Creek from the wastewater treatment ponds to the South Fork Yellowbank River. Details pertaining to sampling, flow measurements, and fish collection are discussed below.

### Site # 1 (Northwest ¼ of Section 23, Township 118 North, Range 48 West):

Site # 1 is on Mud Creek, near the Revillo wastewater facility outfall. Attachment 1 is a photograph showing the creek at the Revillo outfall. A map showing the sample site location is in Attachment 12.

When DENR personnel first visited the site in 2002 the site had flow. In 2003 the site held ponded water. The site was dry in 2004. There is no evidence that any immersion recreation activities such as swimming, skiing, boating, etc. occur in this segment of Mud Creek. Additionally, the site is unsuitable for immersion recreation because the water is shallow and as illustrated by the photograph in Attachment 1, the area is overgrown with trees and aquatic plants.

At this location, DENR personnel did not take water quality samples or flow measurements.

In 2002 DENR personnel collected fish from a 100 yard segment of creek, utilizing a Engineering Technical Services (ET) Model APB-3 electrofisher. Species found included red shiner, blacknose dace, common shiner, johnny darter, creek chub, and largemouth bass. Of these, the creek chub and common shiner were most abundant and were represented by multiple age classes. Attachment 6 is a summary of the fish collection data.

### Site # 2 (between Sections 14 and 23, Township 118 North, Range 48 West):

Site # 2 is on Mud Creek, almost a mile downstream of the wastewater facility. A map showing the sample site location is in Attachment 12. Attachment 2 is a photograph showing the creek at this location.

When DENR personnel first visited the site in 2002 the site had flow. In 2003, the site held ponded water. The site was dry in 2004. There is no evidence that any immersion recreation activities such as swimming, skiing, boating, etc. occur in this segment of Mud Creek. Additionally, the site is unsuitable for immersion recreation because the water is shallow and as illustrated by the photograph in Attachment 2, the area is overgrown with terrestrial weeds and aquatic plants.

Water quality samples were taken at this location in 2002 and again in 2003. There were no violations of the standards for the currently assigned (9) and (10) beneficial uses. However, if the segment under review were reclassified to a (6), (8), (9), and (10) waterbody, data indicate it is possible there would be violations for dissolved oxygen and fecal coliform bacteria.

Flow measurements were taken at this site in August 2002. Flow was calculated at 0.04 cubic feet per second (cfs). Attachment 11 is a summary of the flow data.

In 2002 and again in 2003, DENR personnel collected fish from Mud Creek, utilizing a Engineering Technical Services (ET) Model APB-3 electrofisher. Species found included red shiner, bluntnose minnow, common shiner, and sand shiner. Attachments 3 and 4 are photographs of red shiners found at this site. Based upon available data, bluntnose minnows were most abundant and were represented by multiple age classes. Attachments 7 and 8 are summaries of the fish collection data.

Site # 3 (Between Sections 8 and 17, Township 118 North, Range 47 West):

Site # 3 is on Mud Creek, around a mile upstream from the confluence with the South Fork Yellowbank River. Attachment 5 is a photograph showing the creek at this location. A map showing the site is in Attachment 12.

This site was dry at the time of each DENR site visit. For this reason, water quality samples were not taken, flow measurements were not made, and fish collection was not possible. There is no evidence that any immersion recreation activities such as swimming, skiing, boating, etc. occur in this segment of Mud Creek. Based upon the visual observations of DENR personnel, the site is unsuitable for immersion recreation because water is typically absent.

Recreation Use

Water in Mud Creek is generally shallow, may have ponded areas, or may be completely dry based on location and season. The stream channel is overgrown with plant life making (7) Immersion recreation unlikely or impossible. For these reasons, DENR does not recommend the beneficial use classification for Mud Creek include (7) Immersion recreation activities.

Nevertheless, because water is often present, there is a potential for limited contact use related to fishing or minnow collection activities.

## **Summary**

Mud Creek is a waterbody that appears to maintain flow for most of the year. Based upon available information, during some years, later in the summer, Mud Creek may lose flow in the lower segment while the upstream segment (near sites # 1 and # 2) continues to flow or hold ponded water. Finally, the creek will occasionally go dry along the entire segment under assessment.

When flow is present in Mud Creek, a variety of warmwater fish species are found. These include the red shiner, blacknose dace, common shiner, johnny darter, creek chub, bluntnose minnow, sand shiner, and largemouth bass. Based upon available data, Mud Creek can support multiple age classes of creek chub, common shiner, and bluntnose minnow. It appears these populations are stable when there is sufficient flow and remain in the creek for months at a time. Based on the average depth of Mud Creek, it appears that the creek most likely completely freezes over during the winter. Fish are most likely recruited from the South Fork Yellow Bank during the spring when there are periods of higher flow. For the time period studied, Mud Creek only maintained flow through the summer one year of three. This marginal flow regime suggests the fish kills due to critical natural conditions occur frequently as flow diminish and fish cannot make it back to South Fork Yellowstone Creek.

Based upon the above information, the Mud Creek is a marginal waterbody. During wet years, the creek maintains flow and can support many fish species. During dry years, Mud Creek goes completely dry.

Water in Mud Creek is shallow and in most locations, is overgrown with plant life. For this reason, it is not utilized for immersion recreation activities. Nevertheless, because water is often present, there is a potential for limited-contact use related to fishing or minnow collection activities.

It is recommended the assigned beneficial use for the Mud Creek from Section 22, Township 118 North, Range 48 West, to the confluence with the South Fork Yellowbank River be changed to (6) Warmwater marginal fish life propagation waters, (8) Limited contact recreation waters, (9) Fish and wildlife propagation, recreation, and stock watering waters, and (10) Irrigation waters.

## REFERENCES

- United States Environmental Protection Agency. 1983. Methods for Chemical Analysis of Water and Wastes. EPA 600/4-79-020. Cincinnati, Ohio.
- South Dakota Department of Environment and Natural Resources. 1999. Recommended Procedures for Reviewing Beneficial Use Designations, With Special Emphasis on Fishery and Recreational Uses.
- South Dakota Department of Environment and Natural Resources. Chapters 74:51:01 and 74:51:03, Surface Water Quality Standards.
- South Dakota Department of Environment and Natural Resources. Town of Revillo Permit file.
- South Dakota Department of Transportation, 1989. General Highway Map, Deuel County, South Dakota.
- South Dakota Department of Transportation, 1985. General Highway Map, Grant County, South Dakota.
- DeLorme, 1997. South Dakota Atlas and Gazetteer.
- United States Department of the Interior, Geological Survey, 1973. Revillo Quadrangle, South Dakota.
- United States Department of the Interior, Fish and Wildlife Service, 1995. National Wetlands Inventory Map, Marietta, Minnesota.
- United States Department of the Interior, Fish and Wildlife Service, 1992. National Wetlands Inventory Map, Revillo, South Dakota.
- United States Geological Survey prepared in cooperation with the South Dakota Geological Survey, Deuel and Hamlin Counties, and the East Dakota Conservancy Sub-District 1982. Water Resources of Deuel and Hamlin Counties, South Dakota. Water Resources Investigations Report 84-4089.
- Department of Environment and Natural Resources, South Dakota Geological Survey prepared in cooperation with the United States Geological Survey, East Dakota Conservancy Sub-District, and Deuel and Hamlin Counties 1987. Geology and Water Resources of Deuel and Grant Counties, South Dakota Part 1:Geology.
- United States Geological Survey prepared in cooperation with the South Dakota Geological Survey, East Dakota Water Development District, and Codington and Grant Counties 1990.

Water Resources of Codington and Grant Counties, South Dakota. Water Resources Investigations Report 89-4147.

U.S. Department of Commerce. Monthly Station Normals of Temperature, Precipitation, and Heating and Cooling Degree Days 1961-90. January 1992.

National Oceanic and Atmospheric Administration. Monthly Station Normals of Temperature, Precipitation, and Heating and Cooling Degree Days 1971-2000.

## ATTACHMENT 1



### **Mud Creek**

This photograph was taken on August 5, 2002. The location is at the Reville wastewater facility outfall. The photographer is facing east. The wetland designation for the creek just upstream of the treatment facility indicates the site is forested. It appears that the forested segment is larger than indicated on the National Wetlands Inventory map. Sample site # 1 is on Mud Creek, very near this spot. Fish collected at site # 1 included red shiner, blacknose dace, creek chub, common shiner, johnny darter, and largemouth bass.

## ATTACHMENT 2



### **Mud Creek**

#### **Site # 2**

This photograph was taken on August 5, 2002. The site is along 163<sup>rd</sup> Street. There was flow in the creek at this site. Field notes indicate that several species of fish including red shiner were found at this location.

### ATTACHMENT 3



**Mud Creek**

**Site # 2**

This photograph was taken on August 5, 2002, at site # 2. The fish in the photograph is a red shiner.

## ATTACHMENT 4



**Mud Creek  
Site # 2**

This photograph was taken on August 5, 2002, at site # 2. The fish in the photograph is a red shiner.

## ATTACHMENT 5



### **Mud Creek**

#### **Site # 3**

This photograph was taken on August 5, 2002. The site is along 162<sup>nd</sup> Street. Mud Creek had flow and fish life upstream from this point.

**ATTACHMENT 6**

**SITE # 1**

**FISH COLLECTION SUMMARY**

**Length in Millimeters**

**August 5, 2002**

Electroshocking – 100 yards

	<u>Red Shiner</u>	<u>Blacknose Dace</u>	<u>Creek Chub</u>	<u>Common Shiner</u>	<u>Johnny Darter</u>	<u>Largemouth Bass</u>
	75	64 82	128 95 44 68 42 84 45 72 46 45 105 42 102 40 76 38 68 42 45 98 52 44 44 53 81 64 44 58 108 42 94 49 98 62	101 77 52 68 61 49 92 68 120 64 70 62 34 69 58 81 44	67 52 48 52	52
<b>Number of fish:</b>	1	2	34	17	4	1
<b>Maximum Length:</b>	75	82	128	120	67	52
<b>Minimum Length:</b>	75	64	38	34	48	52
<b>Average Length:</b>	75	73	65	69	55	52
<b>Median Length:</b>	57	73	56	68	52	52
<b>Comments:</b>	DENR personnel collected multiple age classes of creek chub and common shiner.					

## ATTACHMENT 7

### SITE # 2

#### FISH COLLECTION SUMMARY

##### Length in Millimeters

August 5, 2002

Comments: DENR personnel electrochoked the creek at this site. Fish of various species were found, but other than the presence of red shiner, species names were not documented. Fish lengths were not recorded.

## ATTACHMENT 8

<b>SITE # 2</b>							
<b>FISH COLLECTION SUMMARY</b>							
<b>Length in Millimeters</b>							
<b>July 1, 2003</b>							
Electroshocking – 100 yards							
		<u>Bluntnose Minnow</u>		<u>Unidentified Shiner</u>		<u>Sand Shiner</u>	
		35	32	39	39	61	72
		42	33	39	38		
		38	34	38	33		
		41	37	27	29		
		44	46	34	42		
		38	43	32	35		
		36	44	33	47		
		38	19	40	32		
		42	38	39	38		
		47	40	31	33		
		32	29	42	36		
		29	34	35	28		
		39	31	36	41		
		23	40	37			
<b>Number of fish:</b>		55		1		1	
<b>Maximum Length:</b>		47		61		72	
<b>Minimum Length:</b>		19		61		72	
<b>Average Length:</b>		36		61		72	
<b>Median Length:</b>		37		61		72	
<p>Comments: An additional 500 fish were collected, but were not measured or identified by species. Based upon cursory visual observations, these fish were of similar lengths and of the same species as fish listed above. It appears there is more than one age class of bluntnose minnow.</p>							

## ATTACHMENT 9

### FIELD ANALYSIS PARAMETERS, INSTRUMENTS, AND RESULTS

PARAMETER	INSTRUMENT / REFERENCE METHOD	RESULTS	
		<u>Site # 2</u> August 6, 2002	<u>Site # 2</u> July 2, 2003
Temperature Air (°C)	Thermometer / EPA (170.1)	17.8	25.5
Water (°C)	Hanna 9025 portable pH meter / EPA (170.1)	18.7	20.3
Dissolved oxygen (mg/L)	Azide Modification of Winkler / EPA (360.2)	4.0	1.3
pH (su)	Hanna 9025 portable pH meter / EPA (360.2)	8.00	7.20

mg/L = *Milligrams per liter;*  
 su = *Standard Unit; and*  
 EPA = *Environmental Protection Agency.*

## ATTACHMENT 10

<b>LABORATORY ANALYSIS PARAMETERS, METHODS, AND RESULTS</b>			
<b>PARAMETER</b>	<b>METHOD / REFERENCE</b>	<b>RESULTS</b>	
		<b><u>Site # 2</u> August 6, 2002</b>	<b><u>Site # 2</u> July 2, 2003</b>
Fecal Coliform Bacteria (organisms/100 ml)	SM 9222 B EC	17,000	170
Ammonia (mg/L)	SM 4500 NH3 H	0.11	0.07
Nitrate (mg/L)	SM 4500 NO3 F	0.3	0.1
Biochemical Oxygen Demand (mg/L)	5 day incubation, 20°C / EPA Method (405.1)	<2	5
Total Suspended Solids (mg/L)	SM 2540 D	33	66
Total Dissolved Solids (mg/L)	SM 2540 C	1223*	1391*
Total Solids (mg/L)	SM 2540 B	1256	1457

umhos/cm = *Micro mhos per centimeter;*

< = *Not detected, followed by a number documenting the detection limit;*

ml = *Milliliter;*

\* = *Calculated - not directly determined by laboratory analysis;*

SM = *Standard Method;*

EPA = *Environmental Protection Agency;*

-- = *Not measured; and*

mg/L = *Milligrams per liter.*

## ATTACHMENT 11

<b>SITE # 2</b>			
<b>VELOCITY MEASUREMENTS AND CALCULATED FLOW RATE*</b>			
<b>Field Data</b>			<b>CALCULATED FLOW RATE (CUBIC FEET/SECOND)</b>
<b>LOCATION</b>	<b>WATER DEPTH (FEET)</b>	<b>VELOCITY (FEET/SECOND)</b>	
Shore	0.1	0.00	0.00
2	0.6	0.01	0.01
4	0.5	0.03	0.03
6	0.4	0.00	0.0
Shore (7 feet 8 inches)	0.1	0.00	0.00
<b>August 6, 2002 Flow Rate:</b>			<b>0.04</b>

\*As Determined Using A Marsh McBirney Model-201E Flow Meter.

ATTACHMENT 12

