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*FINAL REPORT*
*for:*

# PRAIRIE DOG CREEK WATERSHED MASTER PLAN

# LEVEL I STUDY

Prepared for:

**Wyoming Water Development Commission**

**Submitted by:**

***EnTech, Inc.***
***Consulting Engineers***
***Sheridan, Wyoming***
***in association with***
***Steady Stream Hydrology, Inc.***

**November, 2001**

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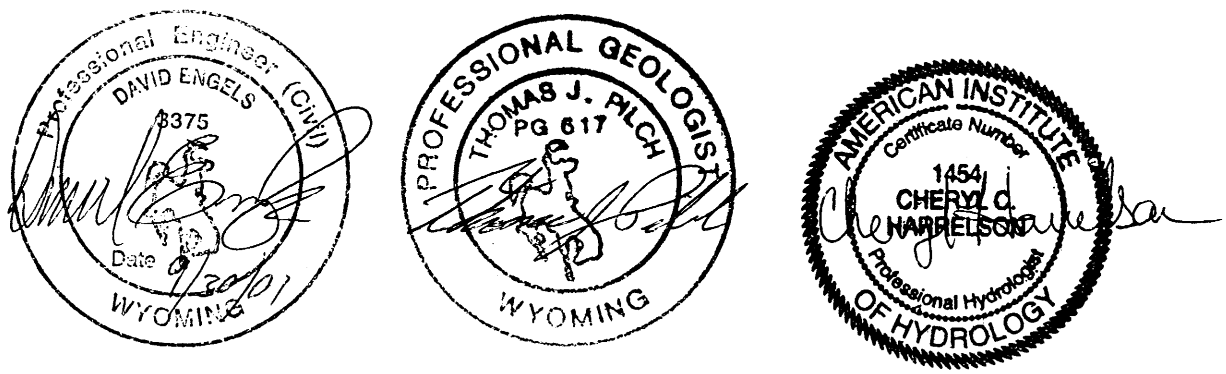


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**November, 2001**

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## APPENDICIES

# 1. INTRODUCTION

## 1.1 Background and Need

In September, 1999, the Sheridan County Conservation District (SCCD) submitted an application to the Wyoming Water Development Commission (WWDC) to conduct an assessment of the Prairie Dog Creek Watershed (PDCW). The application marked the culmination of several years of discussions and ultimately recognition that the PDCW's unique characteristics and associated problems required such an assessment.

In early 1998, the SCCD was approached by the Prairie Dog Water Supply Company (PDWSC), the Piney and Cruse Creek Ditch Company (PCCDC), the Meade Creek Ditch Company (MCDC) and others within the watershed for assistance with the development of a management plan for the watershed. Although attempts at securing grant funds for such a watershed assessment initially failed, a tremendous amount of landowner support at the local level began to be developed. Several landowners complained of "accelerated stream bank erosion, erosive conveyance systems, excessive turbidity, sediment accumulation in irrigation systems and visual impairments."[1]

In addition to working with these interest groups on these watershed assessment issues, the SCCD was requested by members of the group for assistance in engineering assessments for alternatives for the mitigation of possible erosion problems in the upper portion of the PDCW. These possible erosion problems have been suspected of causing downstream impacts, including excessive turbidity and sand accumulation in certain sections of ditches. Assistance was provided to the SCCD at that time by the U.S. Department of Agriculture's National Resources Conservation Service (NRCS) in the form of:

- Survey work, test borings, and a resulting study of ways to address water quality problems associated with the PCCDC's and MCDC's Tunnel Hill transbasin drops; and
- Technical knowledge sharing to assist the SCCD to write and submit a grant application to the Wyoming Association of Conservation Districts.

Finally, two other issues began to surface regarding the PDCW that required assessment. The first issue was the potential impact of the rapidly-developing coal bed methane (CBM) industry within the PDCW. Water wells installed by CBM operating companies have recently begun pumping groundwater from underlying coal beds in order to release methane gas from the underlying coal seams. The quantity and quality of the water produced as part of the CBM development have raised concerns of area wide landowners, as well as the states of both Wyoming and Montana. The second issue dealt with a concern regarding the appropriateness of Prairie Dog Creek's stream classification as promulgated by the Wyoming Department of Environmental Quality (WDEQ). At the time of application by the SCCD to the WWDC, Prairie Dog Creek was classified by WDEQ as a Class 2 coldwater stream, yet ironically, without the presence of the water that is diverted into the PDCW from the Piney Creek drainage, water quality and flow, as well as stream classification, would likely have been considerably different. Since the date of the application, WDEQ has made a reclassification of Wyoming streams. Prairie Dog Creek is now listed as a Class 2AB stream, which is actually very similar to the previous Class 2 designation.

Prairie Dog Creek appeared on the 1996 303(d) list as prepared by the WDEQ, listing the stream as being "impaired". WDEQ included Prairie Dog Creek in its "Beneficial Use Reconnaissance Program" (BURP) to begin the data collection required to commence with an evaluation of the need to establish a Total Maximum Daily Load (TMDL) for constituents in the creek. The BURP assessment included water quality sampling and testing from ten sites along Prairie Dog Creek, beginning at the point where Jenks Creek and Prairie Dog Creek join near I-90. Results of this water quality sampling and testing have been included within this final report, and Prairie Dog Creek has been removed from the 303(d) list. It now appears on WDEQ's "Needs to be Monitored" list. EnTech, Inc. Consulting Engineers of Sheridan, Wyoming (EnTech) has worked closely with the WDEQ in the development of this report. The WWDC stressed the need for this cooperative effort between the WDEQ and EnTech to eliminate the collection of redundant information.

Although the SCCD's grant application to the Wyoming Association of Conservation Districts was unsuccessful in procuring monies for the district, in early 2000 the Wyoming State Legislature authorized the expenditure of up to $100,000 by the WWDC to evaluate and describe the PDCW. This authorization included an evaluation of those lands served by the PCCDC and the MCDC that are outside of the PDCW and are instead within the Little Goose Creek drainage. The funding was also authorized to identify problems and problem areas within the PDCW and proposed practical economic solutions to these problems and problem areas. Finally, a watershed management plan for the PDCW was proposed for development utilizing this funding.

On June 7, 2000, after proceeding through a procurement and negotiation process, the WWDC contracted with EnTech to perform the Level I study of the PDCW.

## 1.2 Scope of Work

The three ditch company presidents, in their letters of support for the assessment of the PDCW, summarized the overall goal of the assessment as being: "..to correctly define present resource conditions". The WWDC specified the following tasks for the comprehensive scope of work for the PDCW Plan Level I Study:

*Task 1 -- Scoping and Project Meetings*
*Task 2 -- Review of Background Information*
*Task 3 -- Watershed Description and Inventory*
*Task 4 -- Surveying*
*Task 5 -- Watershed Management and Irrigation System Rehabilitation Plan*
*Task 6 -- Permits*
*Task 7 -- Cost Estimates*
*Task 8 -- Project Financing*
*Task 9 -- Reports*
*Task 10 -- Results Presentations*

The results of Tasks 1 through 4 are presented in Section 2 of this report entitled, "Description of the Watershed," which addresses the general characteristics of the watershed, including an identification of problem areas. Task 5 is accomplished in Section 3, in which existing problems within the PDCW are identified and recommended solutions outlined. Some of these solutions include conceptual designs of various alternatives. Tasks 6 and 7 are discussed separately in

Sections 4 and 5, respectively, and identify the necessary permits that could logically be anticipated to be procured, and cost estimates for these alternatives outlined. Task 8 is addressed in Section 6, entitled Project Financing Plan, which identifies potential modes of funding the recommended solutions.

The final section, Section 7, provides a summary of this study and recommends a path forward for the SCCD, the three ditch companies, and the many users of the PDCW.

It is the goal of this report to develop a plan to guide the users of the towards decisions that will provide for a healthy future of this important watershed.

# 2. DESCRIPTION OF WATERSHED

## 2.1 GENERAL CHARACTERISTICS

### 2.1.1 Geography

The PDCW encompasses the majority of central Sheridan County in northeastern Wyoming. It extends from the community of Story near the Johnson County line to the Wyoming-Montana border. Figure 2-1 depicts the 112-mile long watershed boundary and the enclosed 226,115 acres (353.3 square miles). The watershed lies within the larger Upper Tongue River watershed, identified by the United States Geological Survey's (USGS) 8-digit Hydrologic Unit Code (HUC) Number 10090101. The Prairie Dog Creek 14-digit HUC identification number is WYTR10090101-020-2.

### 2.1.2 Land Ownership and Topography

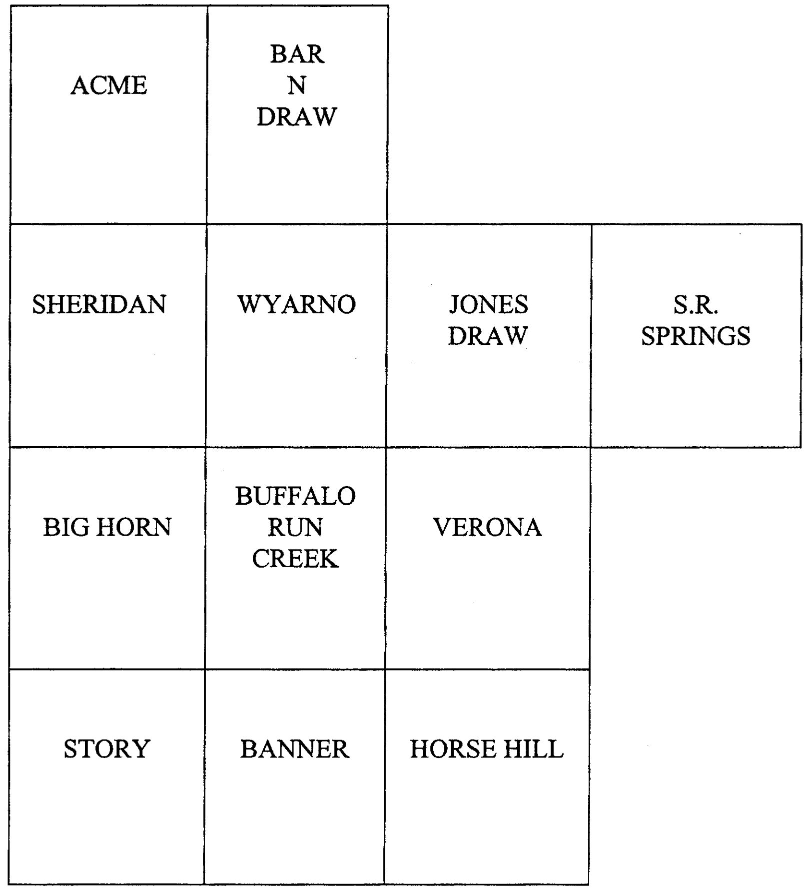
The State of Wyoming owns approximately 45,890 acres (20%) of the land in the PDCW, and the Bureau of Land Management (BLM) administers approximately 7,175 acres (3%) of the land within the watershed. The large number of state-owned lands within the PDCW is noteworthy. The remaining 77% of the watershed, or 173,050 acres, is privately owned.[2]

The highest elevation in the watershed is 6,521 feet, atop Moncreiffe Ridge. This ridge is located in the southwest corner of the watershed, less than 1/2 mile above the headwaters of Prairie Dog Creek. The lowest point in the watershed is at the confluence of Prairie Dog Creek and Tongue River, at the northernmost tip of the watershed (3,435 feet). The total elevation difference is 3,086 feet over a distance of approximately 26 miles (119 feet/mile, or 2.25%), sloping generally from south to north.

Approximately midway between the origin and endpoint of Prairie Dog Creek lies the City of Sheridan. This community of approximately 15,000 lies roughly one mile west of the watershed's western boundary. Within this central portion, the watershed's western boundary has an elevation of approximately 3,900 feet.

After dropping from the western watershed boundary down to Prairie Dog Creek's channel, elevations steadily increase in the rugged terrain to the east. Ridges between Prairie Dog Creek's tributaries have elevations as high as 4,600 feet in the southern half and 4,300 feet in the northern half. The approximate geographic center of the PDCW is three miles west of Verona (elevation 4,300 feet) on a ridge between the Dow and Wagner Prongs of Dutch Creek. The farthest easterly boundary of the watershed lies approximately four miles northeast of Ulm at elevation 4,640 feet.

The USGS's 7½ minute series topographic maps that cover the PDCW include the following:




### 2.1.3 Climate

The National Weather Service maintains Monitoring Station #488160, Sheridan Field Station, at the University of Wyoming Agricultural Experimentation Station, located in the northwest corner of the PDCW in the SE1/4 Section 10, T56N, R83W. Table 2-1 lists typical climatic conditions for the PDCW.[3]

**Table 2-1**
**Typical Climatic Conditions of the Prairie Dog Creek Watershed**

| Climatic Condition | Average Annual |
|---|---|
| Precipitation | 9-15 inches |
| Snowfall | 45 inches |
| Growing Season | 100-120 days |
| Last Day of Frost | May 22 |
| 1st Day of Frost | Sept. 16 |

Typically, 60% of the annual precipitation falls between March and July, as rain in May and June (35% of the total) and as snow in the winter months. More than 30% of the snow is reported in the months of March and April.

This semi-arid region experiences long, cold, sunny winters and short, hot, dry summers. The average high in January is approximately 32°F, and the average low is approximately 6°F.

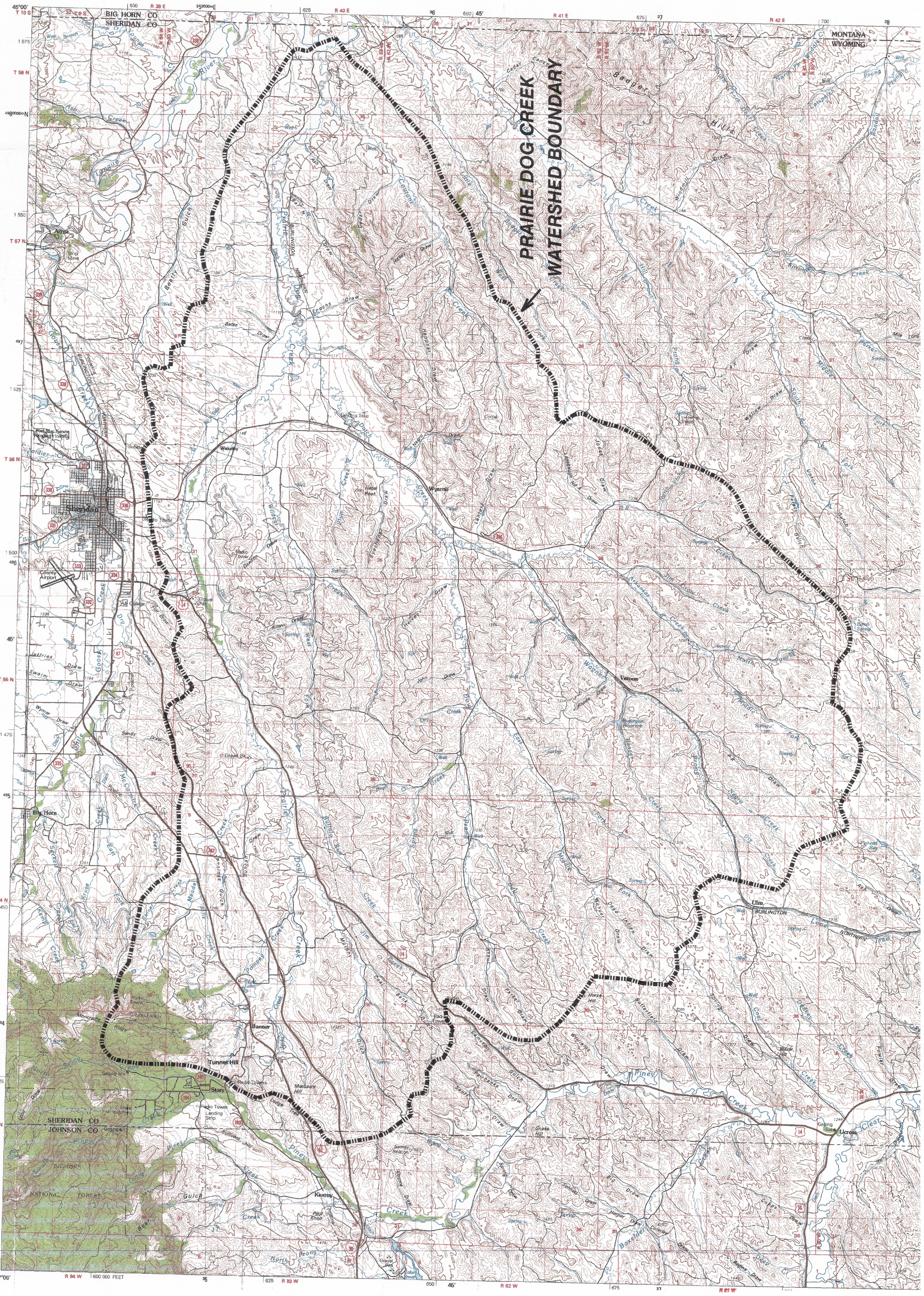



Fig. 2 - 1

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PRAIRIE DOG WATERSHED
MASTER PLAN
LEVEL I STUDY

PRAIRIE DOG CREEK
WATERSHED AREA

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Subzero temperatures and high winds are common when storm fronts pass through. July's average high is approximately 87°F and its average low is approximately 54°F. Daily maximums in the 90's are common, with extremes in the low 100's.

The growing season varies widely within the watershed. The record minimum growing season is reported to be 48 days and the maximum being 161 days. The earliest recorded frost date was April 25th, with the latest recorded date being July 29th.

### 2.1.4 Waterways

The surface water for the PDCW originates from three basic sources:

1. the precipitation and snowmelt described in the previous section,
2. small springs at the headwaters of Prairie Dog Creek and many of the other creeks and tributaries, and
3. the transbasin diversion of Piney Creek water.

The waterways that carry this surface water include Prairie Dog Creek, its tributaries, and three irrigation conveyance systems as outlined below.

#### 2.1.4.1 Prairie Dog Creek

Prairie Dog Creek is approximately 139,000 feet (26.4 miles) in length. Its headwaters lie at a small spring producing less than one cubic foot per second (cfs) of flow. This spring lies at an approximate elevation of 6,200 feet in a small, high valley on the northeast side of Moncreiffe Ridge, approximately three miles northwest of the community of Story. From this point, Prairie Dog Creek flows in a northerly direction to the Tongue River, meeting less than 1/2 mile south of the Montana state line.

Due to changes made in July 2001 to its Chapter 1 Water Quality Rules and Regulations, WDEQ now categorizes Prairie Dog Creek as a Class 2AB stream. The revised Chapter 1 Rules and Regulations defines a Class 2AB stream as:

- "known to support game fish populations or spawning and nursery areas at least seasonally and all their perennial tributaries and adjacent wetlands and where a game fishery and drinking water I use is otherwise attainable";
- "unless shown otherwise, ...presumed to have sufficient water quality and quantity to support drinking water supplies and are protected for that use"; and
- "protected for nongame fisheries, fish consumption, aquatic life other than fish, primary contact recreation, wildlife, industry, agriculture and scenic values". [4]

From its headwaters, Prairie Dog Creek flows east and northeast for approximately 3½ miles across steep grazing land and through one cluster of ranch buildings, before crossing U.S. Highway 87. At that crossing, which is about ¾ of a mile north of the Banner Post Office, the creek's elevation is 4,520 feet, and its flow is typically less than 0.5 cfs.

The creek continues northeasterly from the U.S. Highway 87 crossing for approximately 1½ miles, in the vicinity of Upper Prairie Dog Creek Road, County Road 127, and crosses under I-90, at which point it meets its first major tributary, Jenks Creek, at an elevation of about 4,350 feet. As described below, Jenks Creek carries irrigation water of the PDWSC, which diverts from the Piney Creek drainage basin. Upon receiving this influx of irrigation water, Prairie Dog Creek can flow as high as 60-80 cfs at this point during the irrigation season. Off-season flows are estimated to be approximately ½ - 5 cfs. Downstream of this confluence, the creek is located in a moderately flat alluvial valley lined with benches and terraces, and it is the primary means of conveyance of the PDWSC's irrigation water to the lateral ditches described in Section 2.1.4.4 (Irrigation Delivery Systems within the PDCW).

From the Jenks Creek confluence, Prairie Dog Creek continues northward following County Road 127 for approximately three miles, at which point Murphy Gulch joins Prairie Dog Creek immediately above the intersection of County Road 127 and U.S. Highway 14. Murphy Gulch enters Prairie Dog Creek from the southeast at an elevation of 4,155 ft. The land use in this section of the watershed is open livestock grazing with some irrigated hay meadows. This area of the PDCW has experienced a fair amount of development, as approximately 65 residences are currently located on 2-40 acre ranchettes within the PDCW near the channel of Murphy Gulch.

Below the Murphy Gulch confluence, Prairie Dog Creek follows along the west side of U.S. Highway 14 for almost five miles. In this reach, Meade Creek joins Prairie Dog Creek from the southwest (elevation 4,030 ft). U.S. Highway 14 then crosses over the creek and continues streamside for another 2½ miles before veering off to the west over the PDCW divide into the City of Sheridan. This reach of the creek contains several scattered ranches. Much of the land near the creek is irrigated through the laterals diverting water from Prairie Dog Creek predominantly east of U.S. Highway 14. The steep hillsides east of U.S. Highway 14 in this location are dryland, with the primary land use being open livestock grazing.

For the next 3½ miles, Prairie Dog Creek lies within 1½ miles of the City of Sheridan. This section of the watershed contains the Sheridan County East Side Industrial Park Subdivision, a gravel pit, and a small onstream reservoir located in Section 31, T56N, R83W, as well as more scattered ranches. The Burlington Northern Santa Fe Railroad bisects the watershed in this area. Western areas of the PDCW drain into Prairie Dog Creek through a limited number of piped crossings of the railroad. A considerably greater area of lands in this section of the watershed is irrigated hay meadow than is evident upstream. This is due in large part to the land slope of this area. The floodplain is wider in this area and much flatter, with fewer natural breaks and side drainages.

The creek then crosses State Highway 336 and is generally paralleled by Lower Prairie Dog Creek Road (County Road 1211) throughout the remainder of its length. At a point three miles downstream of the State Highway 336 crossing, Prairie Dog Creek receives Wildcat Creek (elevation 3,650 feet) and, within another two miles, Dutch Creek (elevation 3,615 feet). The last major tributary, Coutant Creek, enters approximately six miles further downstream at elevation of 3,470 ft. In another approximately 1½ miles downstream, Prairie Dog Creek flows into the Tongue River at an approximate elevation of 3,435 feet, approximately ½ mile from the Wyoming-Montana state line. This area contains several large, scattered ranches and, at the present time, is experiencing the most significant development within the PDCW due to CBM activities.

Land use downstream from the State Highway 336 crossing over Prairie Dog Creek is predominately irrigated farmland. Crops include hay, barley, and some oats. The floodplain in this section of the watershed is more conducive to irrigation using flood, center pivot sprinkler, and sideroll systems. A very small amount of furrow irrigation is used in this portion of the PDCW.

### 2.1.4.2 Major Tributaries of Prairie Dog Creek

Six major tributaries contribute water to Prairie Dog Creek throughout its length, as described in the following sections (beginning with the furthest upstream). These major tributaries and their respective drainage areas are depicted in Figures 2-1 and 2-2.

- **Jenks Creek** Jenks Creek was likely a steep ephemeral draw until the late 1800's, at which time a trans-basin diversion was constructed to divert water from the North and South Forks of Piney Creek through a tunnel located on the northern side of the present community of Story in the SW1/4 of Section 8, T53N, R83W. The ridge through which the tunnel was constructed is known as Tunnel Hill.

  Jenks Creek has a natural drainage area of approximately 2,850 acres (4.45 square miles), beginning at the head of the PDCW that carries runoff and surfacing groundwater to Prairie Dog Creek during the non-irrigation season. However, since the trans-basin diversion was completed, Jenks Creek has functioned as the principal means of conveyance for the PDWSC water to the confluence with Prairie Dog Creek. As this tributary is primarily an irrigation conveyance, it is more fully described below in Section 2.1.4.4 (Irrigation Delivery Systems within the PDCW).

- **Murphy Gulch** The headwaters of Murphy Gulch are east of U.S. Highway 87. Two smaller tributaries contribute to Murphy Gulch: Coal Bank Gulch and Jim Creek, as do several intermittent and ephemeral draws. County Road 147 generally follows the length of Murphy Gulch from its headwaters to its confluence with Prairie Dog Creek. This road provides access to approximately 65 homes located upon parcels between two and forty acres in size, with the densest development existing near the mouth of the drainage. The Murphy Gulch drainage area totals approximately 12,025 acres (18.8 square miles).

- **Buffalo Run Creek** This relatively small drainage area (2,880 acres, or 4.5 square miles) lies between the Murphy Gulch and Wildcat Creek drainage areas within the PDCW. It lies immediately north and east of U.S. Highway 14. Buffalo Run Creek empties into Prairie Dog Creek from the east approximately one mile upstream of the Meade Creek confluence entering from the west.

- **Meade Creek** Meade Creek begins at a small spring in the southwesterly corner of the PDCW, along the northern face of Moncreiffe Ridge. It flows almost nine miles, receiving water from three smaller creeks (Jennings, Rhiner, and Rifle, also known as Payne) and numerous ephemeral draws. As described below in Section 2.1.5.4.2 (PCCDC Ditch), the PCCDC irrigation water flows into Meade Creek via Paynter Creek. Meade Creek then serves as the primary means of conveyance for all PCCDC water rights downstream. Meade Creek drains an area of approximately 8,350 acres (13.0 square miles).

  Meade Creek crosses four major roads (County Road 28, U.S. Highway 87, State Highway 342, and I-90) before flowing into Prairie Dog Creek. The first 2½ miles of the creek are located in steep, densely-wooded grazing land, after which the creek flattens and is never far from a paved road and scattered ranches. In the lower third along Meade Creek Road (County Road 131) and State Highway 342, development intensifies, with the presence of homes located on smaller parcels of land adjacent to the creek, a petroleum product storage facility and a commercial horse training facility.

- **Wildcat Creek** Wildcat Creek (commonly known as Cat Creek) drains a long, thin, high area in the middle of the watershed approximately eleven miles long and two to three miles wide, encompassing a surface area of 17,450 acres (27.3 square miles). There are three tributaries to the West Fork of Cat Creek: Sandy Draw, Lewis Draw, Allens Draw, and Fields Draw, and there is one named tributary to the main fork, which is Dawson Draw. As with all waterways in the PDCW, Cat Creek is fed by numerous ephemeral draws. It is sparsely populated, with ranches that utilize the area for livestock grazing. Irrigated crop lands in this section of the watershed are predominately located near the bottom of the drainage.

- **Dutch Creek** The largest PDCW tributary in terms of watershed area is Dutch Creek. It drains the entire eastern quarter of the PDCW, which encompasses a surface area of approximately 125,900 acres (196.7 square miles), and thus it is the largest of the PDCW tributaries. The main fork receives water from six small tributaries (Plum Creek, Negro Draw, Eyechaner Draw, Lanters Draw and two unnamed draws) and the following four larger tributaries: Dow Prong, Wagner Prong, Arkansas Creek, and SR Springs Creek.

  Because its watershed area is large, rugged and dominated by ephemeral draws, Dutch Creek transports large quantities of water after major precipitation events. The drainage is a low-density ranching area, with the majority of the land use being livestock grazing.

- **Coutant Creek** The lowest major tributary of Prairie Dog Creek, Coutant Creek, has three intermittent tributaries flowing into it: Cedar Draw, Hickey Draw and Heppner Draw. This drainage area consists of high, arid, ridge-dominated land that includes 16,500 acres of total drainage area (25.8 square miles).

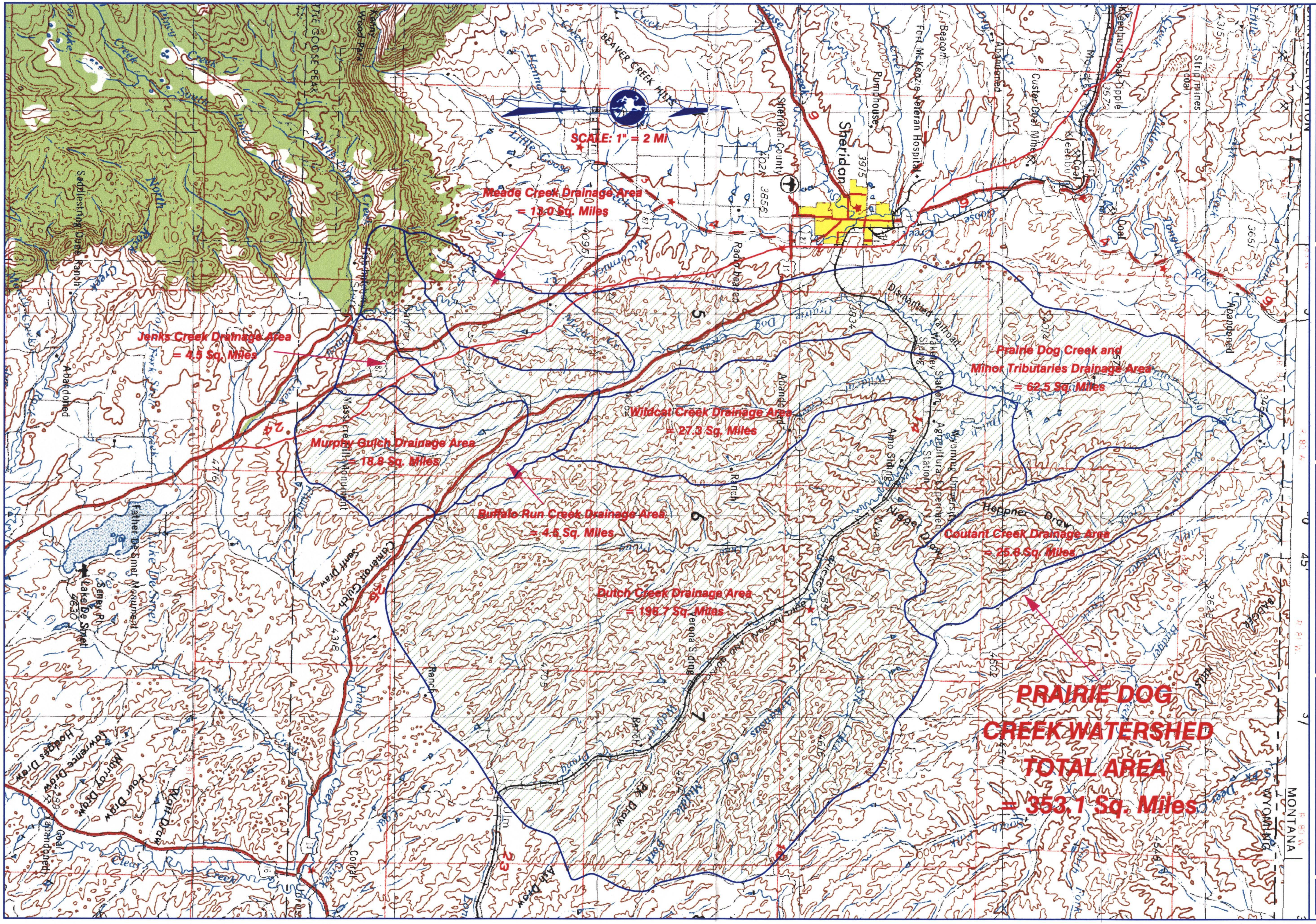
In addition to the named tributaries of Prairie Dog Creek discussed above, there are also several unnamed ephemeral draws and a few minor, single-order named tributaries, including (in order from upstream): Stanley Creek, Pompey Creek, Enochs Draw, Bar N Draw and Ash Draw.

Recent changes to WDEQ's Chapter 1 Water Quality Rules and Regulations no longer list unclassified tributaries as necessarily having the same classification as the receiving stream. As such, the following tributaries of Prairie Dog Creek now have their own stream classification:

| Tributary | Stream Classification |
|---|---|
| Meade Ck. | 2AB |
| Wildcat Ck. | 3B |
| Dutch Ck. | 3B |
| • Arkansas Ck. | 3B |
| • Dow Prong | 3B |
| • Wagner Prong | 3B |
| Coutant Ck. | 3B |

Per the new Chapter 1 Rules and Regulations, streams classified as 3B:

- "are tributary waters…not known to support fish populations or drinking water

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PRAIRIE DOG CREEK WATERSHED SUBDRAINAGE BASINS

PRAIRIE DOG CREEK WATERSHED MASTER PLAN WWDC LEVEL I STUDY

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Fig. 2-2

supplies and where those uses are not attainable";
- "are intermittent and ephemeral streams with sufficient hydrology to normally support and sustain communities of aquatic life"; and
- "are characterized by frequent linear wetland occurrences or impoundments within or adjacent to the stream channel".[4]

Numerous small reservoirs interrupt flow in most of the tributaries discussed above. These reservoirs are not of sufficient capacity to store runoff water and release it to augment irrigation practices during the drier months. Instead, they are typically used as livestock watering ponds, fishing or wildlife enhancement ponds, coal bed methane discharge water containment facilities, or merely to improve aesthetics. This study does not include an inventory of these reservoirs nor their impacts upon water quality and flow.

### 2.1.5 Irrigation Delivery Systems

Three ditch companies were formed in the late 1880's to construct and manage the trans-basin diversion of water from the South and North Forks of Piney Creek to the PDCW. At that time, irrigable lands were being rapidly settled within the PDCW; however, the spring-fed Prairie Dog Creek did not provide sufficient quantities of water to meet the new settlers' irrigation needs. The Piney Creek watershed, on the other hand, had large quantities of water available and less demand upon them. The construction of the trans-basin diversions just north of the present community of Story, at a point where North Piney Creek is within ¼ mile of the PDCW, solved the problem of insufficient water supplies in the PDCW.

The Wyoming State Engineer's Office (WSEO) issued permits for these trans-basin diversions of water into the PDCW at the time of the original construction for the beneficial use of irrigation. The earliest permits for transbasin diversion water were issued in 1884. A tabulation of surface water permits that provide for irrigation in the PDCW is listed in Appendix 1. Manual labor and horse-drawn construction equipment were believed to be the principal construction methods used to complete construction of the ditch systems at that time.

Today, the operations of the three major ditches are performed by hired operators (ditch riders). The PDWSC ditch rider is employed by the PDWSC, but is only responsible for operation of the PDWSC diversion dams in North and South Piney Creeks and the Tunnel Hill transbasin diversion of PDWSC water. All maintenance is the responsibility of the individual users on the individual laterals discussed in later sections. Ditch riders for the PCCDC and the MCDC are responsible for all maintenance of the diversion dams, transbasin diversions, headgate control, and cleaning of each of the two major ditches. Any major work required on these ditches, however, is usually completed with assistance from as many of the PCCDC and MCDC shareholders as possible.

The original systems for delivering water to the lands within the PDCW remain operable, and the ditch configurations have remained constant. Total measured flow records as maintained by the Wyoming State Board of Control (BOC) indicate that PDWSC's diversions have remained essentially the same over the past ten years when compared to its 37-year average, while both PCCDC and MCDC show a marked decrease (23% and 26%, respectively) over the past ten years when compared to historical averages. These reductions could be due to the development of more efficient irrigation systems in the latter two ditch companies' areas, or the fact that South

Piney Creek flows as measured by the BOC have decreased by 7% over the past ten years. (PDWSC's water rights are senior to both PCCDC and MCDC, thus PDWSC is entitled to divert available natural streamflow prior to diversion by PCCDC and MCDC.) It could also conceivably be due to timely precipitation decreasing the need for diversions.[5]

### 2.1.5.1 South Piney Creek and North Piney Creek Diversions

The natural flow originally diverted into the PDCW from the North Piney Creek watershed did not sustain the original water needs of the irrigators within the PDCW throughout the entire irrigation season. As a result, each of the three ditch companies constructed a supplementary "feeder ditch", or used a natural drainage between the two forks of Piney Creek, to convey water from South Piney Creek into North Piney Creek. Water is then diverted out of North Piney Creek from a separate location into the various ditch systems. (See Figure 2-3).

Kearney Lake Reservoir and Willow Park Reservoir, both located near the head of South Piney Creek drainage, provide a secondary source for all three systems. Kearney Lake Reservoir is used by all three ditch companies, whereas Willow Park Reservoir is used by the PCCDC and MCDC but not the PDWSC. Water from these two reservoirs is also conveyed into North Piney Creek via the feeder ditches for use in the PDCW. These reservoir rights are typically utilized during periods of low flow in South Piney Creek and high irrigation demands, which is usually in the late summer. Reservoir permits are also shown in Appendix 1.

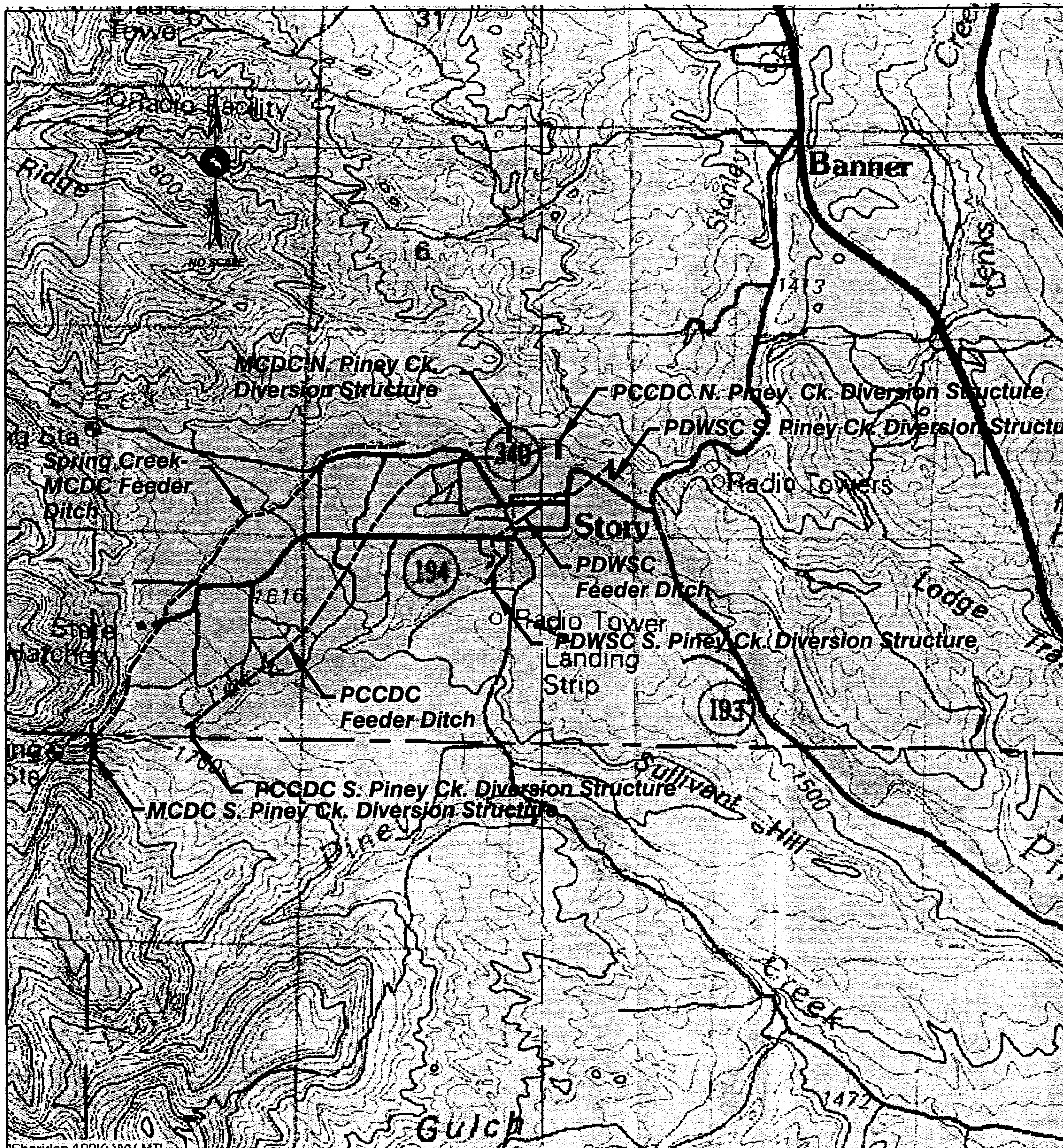
The water supply from Kearney Lake Reservoir was originally attached to specific lands served by the PDWSC. This attachment was done by permit, but was not actually adjudicated. Kearney Lake Reservoir water was not, however, similarly attached to lands served by PCCDC and MCDC. Due to this dilemma and the historical exchange of Kearney Lake Reservoir Company shares, there are now shares of reservoir water attached by permit to lands that the shareholders do not own. Instead of using this water on the lands to which it is attached by permit, the shareholders sell their reservoir rights to others within the drainage. BOC officials are concerned about this situation, and have long recommended a process whereby the Kearney rights are "detached" from their permitted lands, thereby legally freeing them up for a variety of uses at different locations.[5]

### 2.1.5.2 Diversion Dams and Feeder Ditches

The diversion dams and feeder ditches (in other words, those ditches that convey water from their original point in South Piney Creek to North Piney Creek) for each of the three ditch companies are unique. A description of each and their current condition are described below.

Under the recently revised Chapter 1 WDEQ Water Quality Rules and Regulations, the three feeder ditches through the Story area have been designated as Class 4A streams. A Class 4 stream is classified as one in which "it has been determined that aquatic life uses are not attainable". A Class 4A stream is designated as "an artificial canal or ditch that is not known to support fish populations".[4]

Many who view the three feeder ditches for the PDWSC, PCCDC and MCDC in the Story area assume them to be creeks rather than irrigation conveyance systems. Sustenance of a native fish




**PDWSC, PCCDC & MCDC South and North Piney Creek Existing Diversion Structure Locations and Feeder Ditches**

**PRAIRIE DOG WATERSHED MANAGEMENT PLAN WWDC LEVEL I STUDY**

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**Fig. 2-3**

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population and resulting recreational opportunities reinforce this perception, which is somewhat contrary to the new stream designations assigned by WDEQ for the feeder ditches. It is believed that some of these fish travel downstream and are sustained in the downstream reaches of the PDWSC system that includes Jenks Creek and Prairie Dog Creek.

#### 2.1.5.2.1 PDWSC Feeder Ditch

The PDWSC diverts water from South Piney Creek in the NE¼NE¼ of Section 18, T53N, R83W. The diversion works from South Piney Creek is made up of a series of three hand-placed rock dams. The three dams are required due to the configuration of the South Piney Creek channel in the location of the feeder ditch headworks. An island splits flow in South Piney Creek immediately upstream from the ditch headgate and the furthest most downstream dam. The middle diversion dam is located at the upstream end of the island and is required to divert water into the northern channel that serves the ditch headgate. The upstream diversion dam is needed to maintain flow to the channel that feeds the headgate. A separate ditch headworks (Little Piney Ditch) exists on the opposite side of the island. This can complicate flow diversion during low flow, as the priority dates for the two ditches' water rights are similar.

The diversion dam area is not accessible by vehicle, and the rocks that make up the three dams are two to four feet in diameter. Despite their relatively large size, spring runoff moves many rocks out of the dams each year, due in large part to the steep slope of the South Piney Creek channel in this vicinity. Replacement of these large rocks requires that ditch operator(s) rebuild the dams each summer in order to divert the water to the headgate following the runoff event. This replacement work is typically completed by hand.

From the PDWSC feeder ditch headgate location, the feeder ditch carries water northeast through the community of Story until it enters North Piney Creek approximately 300 feet upstream of its main diversion out of North Piney Creek located in the NE¼SW¼ of Section 8, T53N, R83W.

Interviews with residents in the Story area provide anecdotal evidence that the feeder ditches support fish populations and local fishing recreation. (This study, however, does not investigate the fisheries in the Piney Creek watershed). Sustaining fish is difficult when the ditch is not in operation; therefore, a minimum flow is maintained in the channel whenever possible. It is important to remember, however, that the fishery within this feeder ditch was an auxiliary benefit obtained by the Story residents as a result of the irrigation delivery system. The sustenance of a fishery population was not the primary purpose of the ditches, nor do the Story residents have any legal right for this fishery to be maintained.

Many residents of Story rely on the feeder ditches for small-scale domestic irrigation, and they also provide some scenic value. Although no lands within Story have been identified as having water rights from these sources, each ditch company has historically allowed residents to pump small quantities from the feeder ditches for irrigating lawns and gardens.

#### 2.1.5.2.2 PCCDC Feeder Ditch

The ditch conveying PCCDC water is sometimes called the Prairie Dog Kruse Ditch (as shown in the USGS quadrangle map), or the Piney and Cruse Ditch. For purposes of this report, it will be known as the PCCDC Ditch, and within the area that it conveys water from South Piney Creek to the Tunnel Hill trans-basin diversion, it will be known as the PCCDC Feeder Ditch.

This feeder ditch diverts irrigation water from South Piney Creek in the SE¼SW¼ of Section 13, T53N, R84W. The feeder ditch joins North Piney Creek approximately ½ mile upstream of its diversion facility from North Piney Creek at a point in the NE1/4SE1/4 of Section 7, T53N, R83W.

The diversion dam in South Piney Creek for this ditch is considered to be in fair condition. It is also constructed of rocks and located in a section of the South Piney Creek channel that is less steep than the downstream diversion into the PDWSC feeder ditch diversion dam. The geometry made up by the diversion dam and headworks produces eddy currents that provide a natural area for collection of debris (tree limbs and other vegetation). Apparently there is no legal access to the diversion dam through private property, although there has never been a problem with PCCDC personnel being able to access the dam. With over 100 years of historical usage, it is assumed that a prescriptive right exists for such access.

The headgate for this diversion dam is considered in poor condition. It consists of a handwheel-operated gate supported by cemented rock wingwalls that are deteriorating and in need of repair. The ditch company has plans to repair the wingwalls with additional concrete around the structures.

The PCCDC Feeder Ditch is similar to the other two feeder ditches as it meanders through Story. The rock channel provides lawn and garden irrigation to the homes as it continues through the community. The ditch company allows pumping from the ditch during times when water is abundant. The ditch company has an agreement with one individual that operates 29 pumping systems to the homes along the feeder ditch. Natural water loss has not been measured, but it is believed to be substantial with the nature of the rock channel, which is visually very open-graded.

The PCCDC assesses non-shareholders a fee of $40 per year for any non-shareholder to pump from their Story feeder ditch, as well as the main PCCDC ditch. At the present time, 31 pumping units are operated by the "Story Water Users Group", which are authorized to pump from the Story feeder ditch.

#### 2.1.5.2.3 MCDC Feeder Ditch

The diversion facilities from South Piney Creek for the MCDC are the furthest west (that is, upstream) of the three diversions. Its feeder ditch (the Menardi & White Ditch and Spring Creek) begins the furthest upstream on South Piney Creek, with a point of diversion in the NE¼NE¼ of Section 23, T53N, R84W. The concrete diversion dam and control structure are in very good condition. It was designed by the U.S. Army Corps of Engineers and is actually located within the Bighorn National Forest.

The Wyoming Game and Fish Department (WG&FD) fish hatchery staff manages and maintains the control structure for the diversion facilities from South Piney Creek, as water levels in the structure affect the hatchery's water source. A series of cracks and fissures visible in the rocky bank immediately upstream of the control structure provide a natural conduit to the spring, which feeds Spring Creek and the hatchery. As such, these cracks must remain submerged. The Menardi & White Ditch conveys water from South Piney Creek to Spring Creek near the hatchery, at which point downstream the ditch water is conveyed within Spring Creek to the confluence with North Piney Creek.

Spring Creek enters North Piney Creek in the NE¼SW¼ of Section 7, T53N, R83W, approximately 1,800 feet upstream of the MCDC's diversion from North Piney Creek.

Spring Creek flows through the steep native rocky terrain, which has resulted in problems in some locations. Two locations exist within 500 feet of the headworks of this ditch in which all water was at one time lost. As a result, pipes were installed to maintain the flow through the ditch. It is assumed that much water is lost through this ditch/creek, as is the case with all feeder ditches in this general area due to infiltration into the rocky soil. This assumption, however, cannot be substantiated without a means to measure the flow immediately prior to each ditch terminating in North Piney Creek.

It is evident that many of the pipes located at road crossings between the diversion from South Piney and the Fish Hatchery road (State Highway 194) are undersized. This observation was made during a field visit with the MCDC ditch rider during July 2000. At the time of the visit, the culvert pipes were running full with less flow than the appropriated right in the ditch. The ditch rider acknowledged that these facilities were undersized facilities, but did not remember a time when flow was above the pipes.

Excessive maintenance is not required along the Menardi & White Ditch or Spring Creek, and the assumed water loss has not presented problems. The undersized culverts in the ditch will require attention if the appropriated right is required to be conveyed through the ditch. The most significant problem with the ditch is perceived to be access and control through the many yards of the homes within Story that the feeder ditch traverses.

#### 2.1.5.2.4 Feeder Ditch Conveyance Capacities

Concern has been expressed by some members of the three ditch companies about the historical occasional conveyance of water via the feeder ditches from South Piney Creek to North Piney Creek, utilizing feeder ditches to convey water not necessarily belonging to the respective ditch company. For instance, apparently there have been times in the past when PDWSC water has been delivered through the PCCDC and MCDC feeder ditches from South Piney Creek to North Piney Creek. This procedure may be due in part to available capacity in the PCCDC and MCDC ditches, and in part to PCCDC and MCDC withdrawals directly from North Piney Creek, thus reducing the amount of water within North Piney Creek available for PDWSC but correspondingly making that much more capacity available in the PCCDC and MCDC ditches. Because of the fact that the principal purpose of all three feeder ditches is to convey water into North Piney Creek, ditch riders (who are often working for more than one of the ditch companies) and the BOC have historically utilized the facilities of the MCDC feeder ditch to occasionally convey some PDWSC and PCCDC water to North Piney Creek.[5] [6] [7]

An evaluation of the carrying capacity of the three feeder ditches was not included within the scope of this study. However, it may be prudent in the Level II study to determine these carrying capacities, compare them with the water supply requirements of the respective ditch companies, and then determine alternative solutions if a problem indeed exists.

### 2.1.5.3 Transbasin Diversions

Ditches and diversions managed by the three ditch companies irrigate approximately 15,840 acres.[8] After conveying some or all of their supply water via their respective feeder ditches, each company diverts water directly from North Piney Creek, as depicted in Figure 2-3. Access to the points of diversion from North Piney Creek for the PCCDC and MCDC ditches is gained by foot through private property; as there is no vehicular access to these points. The point of diversion from North Piney Creek for the PDWSC ditch is located adjacent to an improved gravel road (Ridge Road). In each case, a concrete diversion dam spans the width of the creek, with a turnout for the associated ditch located along the northeasterly bank of the creek. Handwheel-operated headgates control the flow at each turnout. Parshall flumes located downstream of the PCCDC and the MCDC headgates provide the ability to measure diverted flows, whereas flows are measured directly at the headgate of the PDWSC.

Surface cracking is visible at each concrete dam. Differential settlement is not evident and the condition of each of the diversion dams is classified as fair. The three ditch companies report no problems with their operation.

After diverting water from North Piney Creek, each ditch company conveys its water through a ditch for a short distance (typically 1,500 feet or less) to the basin divide along Tunnel Hill. At this location, each ditch company utilizes facilities to convey water from the Piney Creek watershed into the PDCW.

Due to the immediate steep gradient for this diverted water as it enters into the PDCW from the Piney Creek drainage, each of the three drop structures originally built on the north face of Tunnel Hill has failed to differing degrees over time. These failures have all led to a "free fall" of water down this northerly face of Tunnel Hill. The "free fall" has resulted in dramatic head cuts back into the sandy ridge, creating deep (typically 80-100 feet) gullies with nearly vertical walls. These highly visible cuts, the associated loss of soil, and the safety hazard resulting from these near-vertical walls have been cited in many official and private complaints.

Each ditch company's current drop structure is somewhat unique, and each is described in detail below.

#### 2.1.5.3.1 PDWSC Drop Structure

The PDWSC drop structure is the most easterly of the three drop structures, located immediately adjacent to State Highway 193 near the Tunnel Inn. Prior to water entering the drop structure, it had been conveyed by the PDWSC ditch along the southerly side of the ridge for a short distance from its diversion point from North Piney Creek. Water then drops approximately 120 feet at a near vertical slope. Anecdotal accounts indicate that water leaving the original tunnel along the ridge previously fell freely to the base of the Tunnel Hill slope. The resulting drop of water caused an extensive head cut back into the ridge, until the tunnel became an open channel and eroded into a deep V-shaped gully.

The PDWSC has taken steps to alleviate this situation. In approximately the 1960's, it constructed a cantilevered structure which forced the transbasin diversion water to spill onto a rock energy dissipation structure, thereby reducing some of the erosive force of the water. This structure was further supported by a cable system also installed by the PDWSC. When this method ultimately proved unsuccessful, in the mid-1990's the PDWSC, working with the NRCS, constructed a 42-inch and 48-inch diameter welded steel pipeline down Tunnel Hill, conveying the water into an outlet works/energy dissipation structure. This system is now in use today.

The dissipation structure consists of two steel tanks, one set inside the other, with concrete placed between the two tanks and beneath the structure. The 42-inch and 48-inch pipe extends through the structure near the bottom. Water enters the inner tank, rises to the top, then flows out and continues down the PDWSC ditch at the bottom of the hill. Immediately prior to the project's construction, the owner of the property at the location of the PDWSC trans-basin drop site took legal action against the PDWSC, citing damages to his property relating to the historical conveyance of water over Tunnel Hill. This lawsuit was ultimately dismissed.[9]

This current outlet works/energy dissipation system is reported to be working sufficiently. Although sand deposits are evident downstream, they appear to be significantly less than those visible in the other two ditch systems. The steep gully walls formed by past erosion at the Tunnel Hill drop, however, remain, as the landowner of the affected property at Tunnel Hill objected to the increased easement widths required to grade the walls to pre-existing natural slopes.

Photos of the PDWSC drop structure are in Figure 2-4.

#### 2.1.5.3.2 PCCDC Drop Structure

From its point of diversion from North Piney Creek in the NW¼SW¼ of Section 8, T53N, R84W, the PCCDC Ditch flows along the southerly side of Tunnel Hill, essentially parallel to North Piney Creek, until it crosses an access road that leads to a home atop Tunnel Hill. At this location, the PCCDC Ditch is within 50 feet of the PDWSC's Ditch. The PCCDC Ditch then turns north and drops approximately 100 feet over the north face of Tunnel Hill. The trans-basin drop appears as a waterfall that is visible from both U.S. Highway 87 and State Highway 193.

Erosion from this trans-basin drop is severe, resulting in a deep gully with vertical walls approaching approximately 75 feet in height. The eroded channel is very nearly on the property line separating two landowners and is very close to the only access to three homes atop the ridge. It has been lined in part with large rock that is two to six feet in diameter. Water flowing down these rocks generates considerable turbulence as the significant flow (40-60 cfs) travels through the divide. The rocks appear to be slowing further erosion in the bottom of the channel. However, the rock is **not** eliminating continued erosion of the **sides** of the channel, and it is believed that the channel will continue to slough and widen and associated property owners will continue to lose land area. There is, in fact, a concern that at some time the channel wall erosion will impact the access road to the homes discussed above; however, it is believed that this impact will not occur for at least 10-15 years.[10]

A photo of the PCCDC drop structure is in Figure 2-5.

#### 2.1.5.3.3 MCDC Drop Structure

The trans-basin drop structure for the MCDC Ditch is the most westerly of the three drop structures. After its diversion point from North Piney Creek, the MCDC Ditch flows on a flat grade for approximately 1,400 feet along the southerly side of Tunnel Hill before entering a 36-inch drop pipe. Sand deposits are extensive in the bottom of this portion of the upstream ditch, and evidence of leakage is visible on the downstream bank in some areas. The sand deposits are believed to be due to the erosion of naturally-occurring sandstone in the area. The fractured nature of the sandstone geological formation is also believed to be the reason for the observed leakage. The MCDC Ditch is above North Piney Creek in this location; therefore, the wet areas along the bank caused by the apparent leakage pose no hazard to property. However, they **are** a concern when considering water loss from the ditch system.

The pipe for the MCDC drop structure appears to have been hand-tunneled through the hillside. The bottom of the channel in this section of the ditch is very sandy, as the ditch water flows at a very slow velocity, thus allowing for sand deposition. This sand is believed to be the natural soil type existing in the ditch location; thus it is thought that the sand is **not** being transported from North Piney Creek.

On the northerly side of Tunnel Hill, no drop structure is visible, thus the trans-basin diversion water freefalls approximately 150 feet (see photo in Figure 2-6). Over time, undercutting at the base of the hill has caused sections of the pipe to fall into the severely-eroded channel. After reaching the base of the hill, the ditch flows through a steep channel for a few hundred feet before dropping again through a second piped structure.

### 2.1.5.4 Irrigation Delivery Systems Within the PDCW

This section and accompanying subsections provide descriptions and histories of each of the ditch companies' main facilities that deliver irrigation water within the PDCW. As with the tributaries of Prairie Dog Creek, some of the ditches and their laterals are interrupted by small, relatively insignificant reservoirs, which are not inventoried in this study.

Approximately 13,986 acres of lands are shown to be irrigated within the PDCW.[8]. A map depicting the location of irrigated lands within the PDCW is shown in Figure 2-7.

#### 2.1.5.4.1 PDWSC (Prairie Dog) Canal

The PDWSC is comprised of approximately 74 shareholders holding 60 shares. PDWSC's adjudicated water rights total 120 cfs, not including flood rights or reservoir storage rights. For a listing of water rights, see Appendix 1.

Typical flows diverted by the PDWSC from North Piney Creek diversion facilities into the PDWSC system range from 5 to 80 cfs. For the ten-year period of 1991-2000, the total amount of water diverted has stayed essentially the same, from the 37-year average of 11,982 acre-feet to 12,067 acre-feet for the last ten years' average.

Maps associated with WSEO water right applications specify the Canal's and associated laterals' water sources to be the South and North Forks of Piney Creek.[11] Kearney Lake Reservoir, a

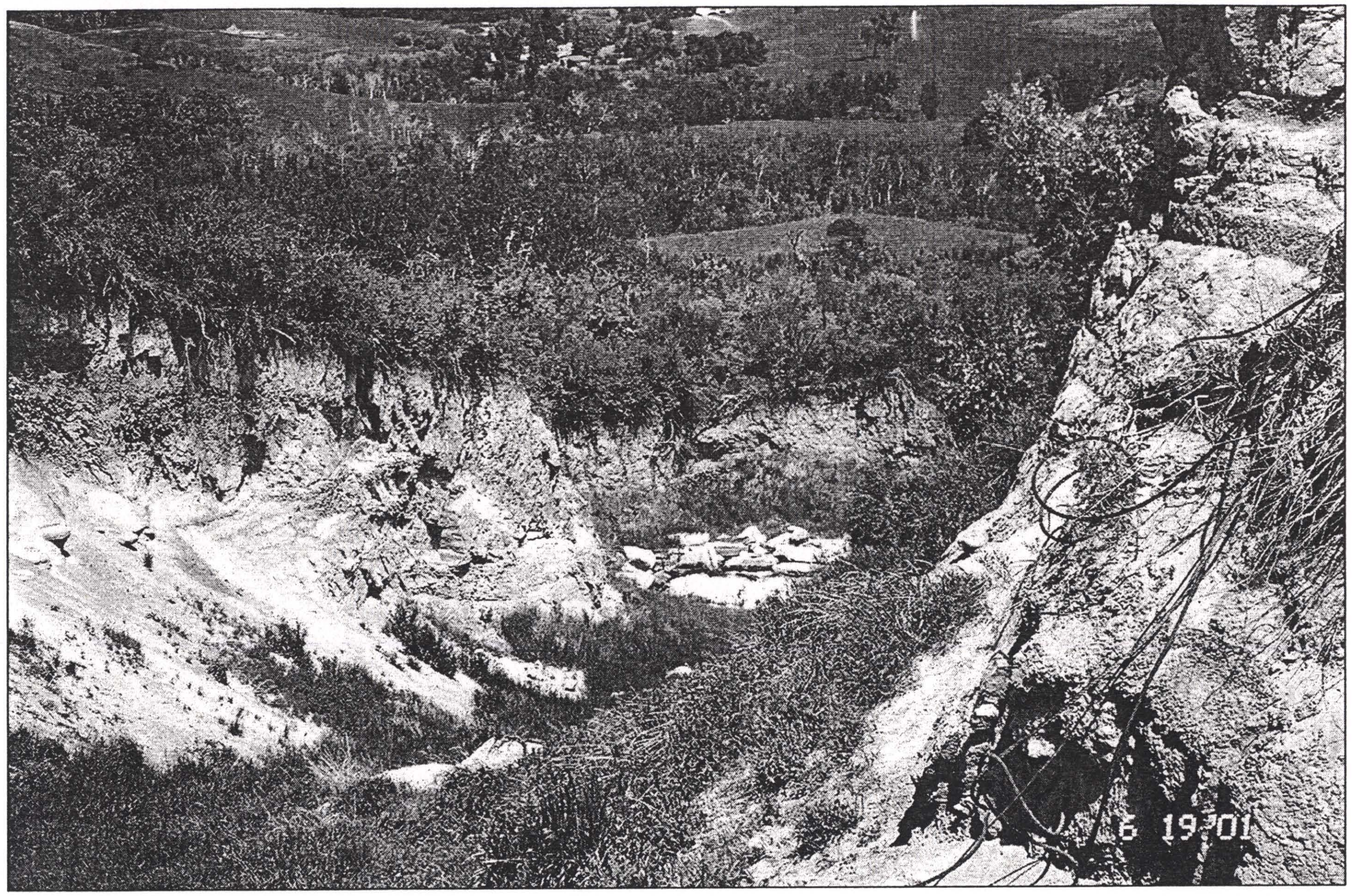


**Photo A**
**PDWSC Historic Erosion At Transbasin Diversion**

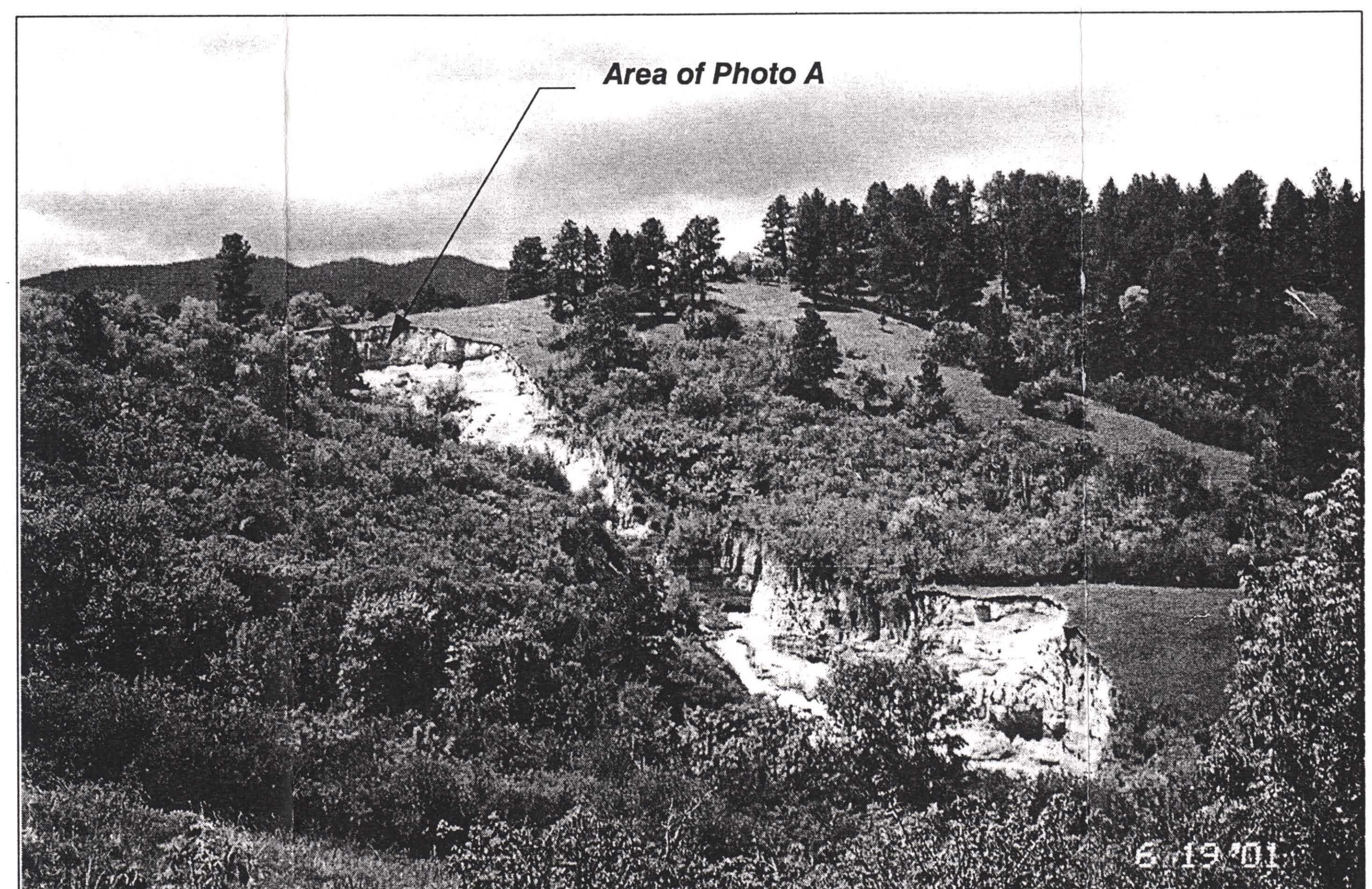


**Photo B**
**PDWSC Transbasin Diversion**

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PDWSC Drop Structure @ Tunnel Hill Tranbasin Diversion

PRAIRIE DOG WATERSHED MANAGEMENT PLAN WWDC LEVEL I STUDY


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**Fig. 2-4**

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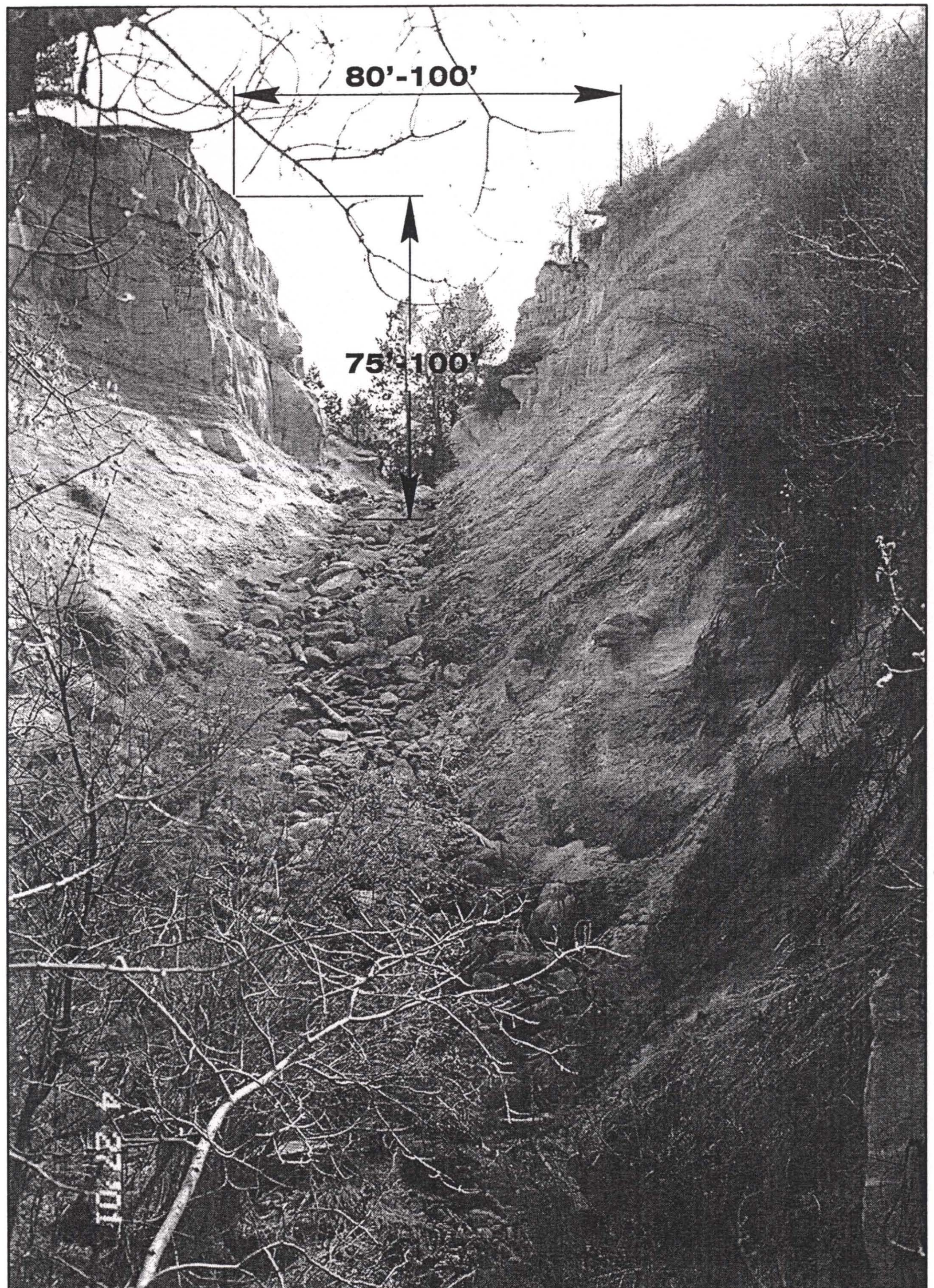


**Photo A**
**PCCDC**
**@ Transbasin Diversion**


**Photo B**
**PCCDC**
**Erosion @ 2nd Drop**
**+/-1200' Downstream**
**of Transbasin Diversion**

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**PCCDC DROP STRUCTURE AT TUNNEL HILL AND 2ND DROP LOCATION**

**PRAIRIE DOG WATERSHED MANAGEMENT PLAN WWDC LEVEL I STUDY**

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**Fig. 2-5**

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**Photo A**
**Meade-Coffeen Ditch**
**@ Transbasin Diversion**

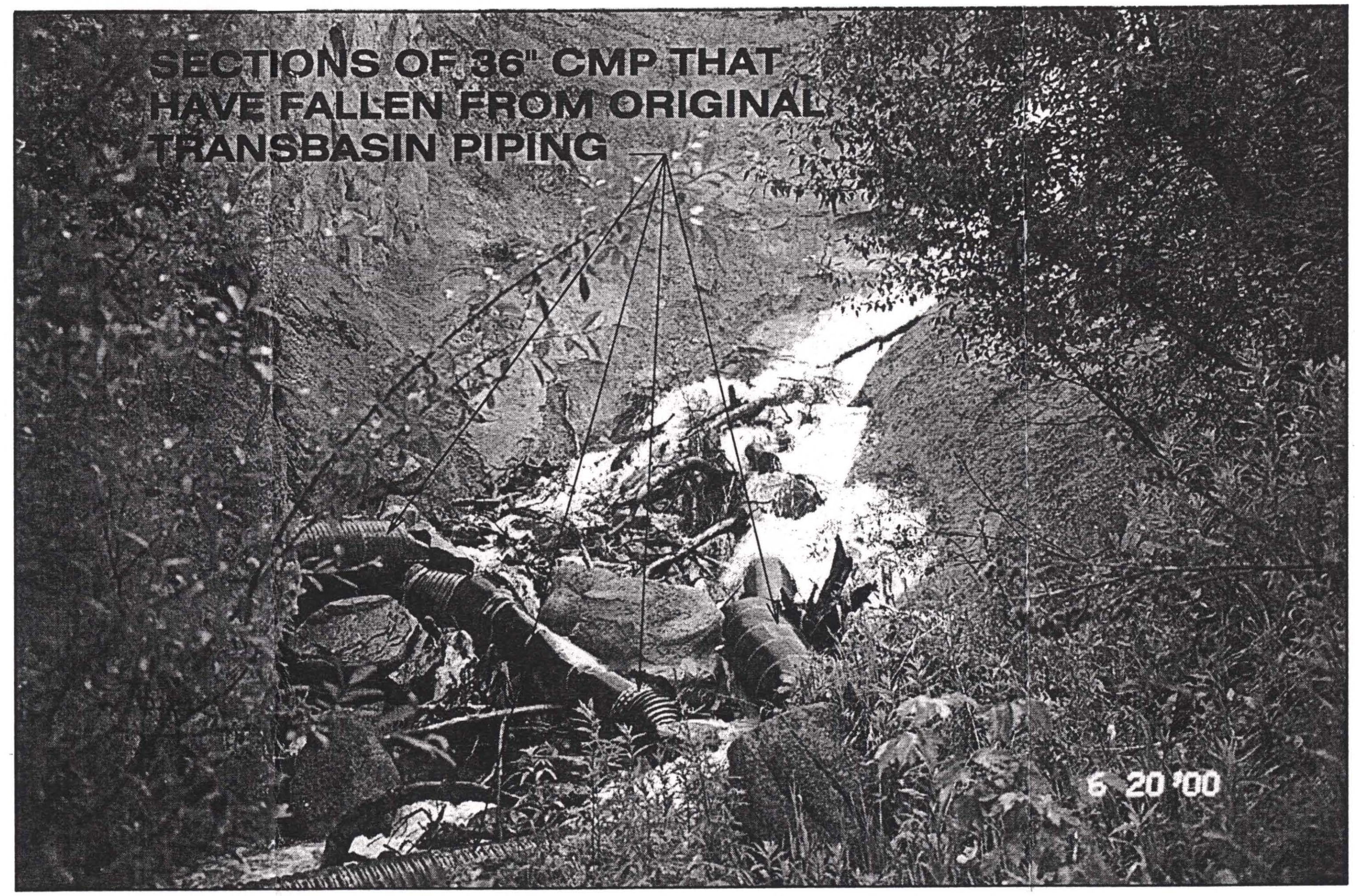


**Photo B**
**Lower End of**
**Transbasin Diversion**

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MCDC DROP STRUCTURE AT TUNNEL HILL TRANSBASIN DIVERSION

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**Fig. 2-6**

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Fig. 2 - 7

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PRAIRIE DOG WATERSHED MANAGEMENT PLAN
LEVEL I STUDY

PRAIRIE DOG CREEK WATERSHED AREA
IRRIGATED LANDS

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secondary supply, is also identified as a secondary source of water for approximately 5,500 acres of these lands.

After the initial trans-basin drop through Tunnel Hill, the Prairie Dog Ditch essentially becomes Jenks Creek, as it uses this creek's channel to transport the irrigation water approximately 5½ miles down to Prairie Dog Creek. As such, Jenks Creek is sometimes referred to as the first part of the "Prairie Dog Canal". Jenks Creek crosses three major roads: State Highway 193, U.S. Highway 87 and I-90, and flows through two ranches before meeting Prairie Dog Creek.

For much of its length, the Jenks Creek channel is approximately 10 - 12 feet wide measured at the bottom with nearly vertical walls. The channel depth approaches 100 feet in some locations, presenting potential hazards for livestock and wildlife. Channel walls continue to erode, deepening gully depths and further decreasing slope stability in and around the channel. Slope failures are evident throughout the upper regions of the channel between State Highway 193 and U.S. Highway 87. Associated sediment loads are transported and deposited downstream, altering channel pattern and profile. A large slope failure along Jenks Creek could result in large-scale lateral movement of the stream. As a result, affected landowners have complained to the PDWSC, WDEQ and NRCS about these current conditions and have requested remediation of the current situation.

A second drop structure along Jenks Creek exists approximately 2,000 feet downstream of the Tunnel Hill drop at the head of Stanley Creek. It is located in the NE1/4 of Section 8, T53N, R83W. The channel between the Tunnel Hill drop outlet and the second drop is steep, and the erosion is severe. In the location of the second drop, water drops through a nearly vertical pipe approximately 25 feet. Erosion at the bottom of this second drop is also severe. The years of water erosion and sloughing in this location have resulted in a deep channel that is a perceived problem for the landowner and his livestock. This problem led to attempts by the landowner to mitigate this situation in April of 2001 by constructing a ramp into the steep channel, in order to allow livestock to escape the channel. These efforts, however, yielded no positive results.[12]

The total elevation drop along Jenks Creek from the bottom of Tunnel Hill to its confluence with Prairie Dog Creek is 650 feet, or 118 feet/mile (2.2%).

Once the confluence with Prairie Dog Creek is reached, water from Jenks Creek continues within Prairie Dog Creek itself. As such, Prairie Dog Creek from this point to its terminus at the Tongue River is the main "ditch" conveying water to downstream irrigators. This area of Prairie Dog Creek is often referred to as the second part of the Prairie Dog Canal.

A total of 15 ditches and laterals convey water from the Prairie Dog Canal to the various delivery systems for the irrigated lands within the PDCW served by the PDWSC.[11] The ditch laterals are generally numbered sequentially downstream along the Prairie Dog Canal, although the Prairie Dog Lateral #10's diversion is actually just immediately **up**stream of that for #9. Prairie Dog Lateral #1 takes water from the PDWSC's main diversion ditch immediately upstream of the trans-basin diversion of water at Tunnel Hill. Prairie Dog Laterals #2 through #4 divert water from the Jenks Creek portion of the canal. Finally, Prairie Dog Laterals #5 through #15 divert water from the Prairie Dog Creek portion of the Prairie Dog Canal.

These laterals and their corresponding points of diversions (headgate locations) are identified in

Figure 2-8 (A-D), and they are described in detail below. Acreage totals are generally shown along with a permitted flow rate ascribing to the one cfs/70 acre allowance as stipulated by Wyoming law.

**Prairie Dog Lateral #1** is referred to as the Massacre Hill Ditch. It delivers water to lands above Jenks Creek and south of U.S. Highway 87 before leaving the Jenks Creek drainage and crossing into the Murphy Gulch drainage to irrigate lands along Murphy Gulch. This ditch is approximately 4.5 miles long and crosses County Road 193, Hwy 87 and I-90. Approximately 425 acres (6 cfs) are irrigated from this ditch. Prairie Dog Lateral #1 supplies water to all lateral ditches receiving water from Murphy Gulch; in other words, Murphy Gulch Laterals 1, 2 and 3. The topography along this ditch is very steep in many locations, and sloughing and erosion problems are evident.

**Prairie Dog Lateral #2** is diverted from Prairie Dog Canal at the pool created by the second drop structure on Jenks Creek. Prairie Dog Lateral #2 conveys water to the lands both east and west of State Highway 193 through a contour ditch that is siphoned beneath this highway and Stanley Creek as well. Prairie Dog Lateral #2 is appropriated for approximately 0.3 cfs. This ditch crosses U.S. Highway 87 near its intersection with State Highway 193 and continues northeast before joining Prairie Dog Creek between U.S. Highway 87 and I-90 near the Pompey Creek Subdivision along County Road 127. Irrigated lands under this ditch are entirely native grass and alfalfa hay.

The channel of Stanley Creek serves as part of the Prairie Dog Lateral #2 system, as it is diverted at the same point from Jenks Creek. It flows through a minimum of four small- to medium-sized reservoirs along its length. Landowners irrigating from this creek at its downstream end have reported that it can take as many as four days to receive water following the opening of the headgate. This is attributed to the numerous wide sections of Stanley Creek and the capacity/level of the in-channel reservoirs.

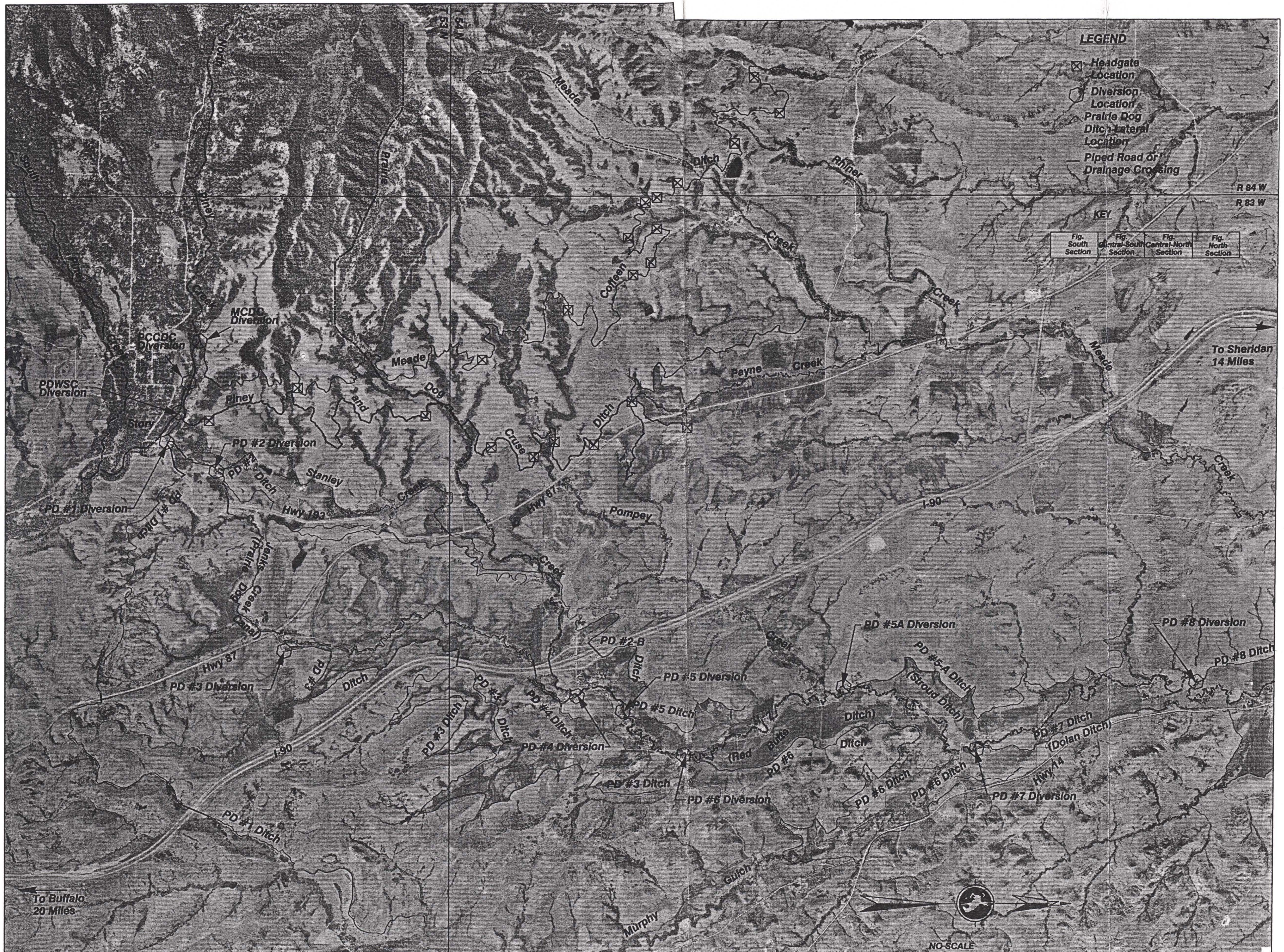
Prairie Dog Lateral #2 does not end at its confluence with Prairie Dog Creek southwest of I-90, as it is again diverted further downstream, where it continues across I-90 and returns to the Prairie Dog Canal on the northeast side of I-90. This ditch crosses County Road 127 a total of seven times before crossing I-90. Access to the ditch is good in most areas in this vicinity, but maintenance is mandatory due to the small corrals that it crosses.

The following work was completed on Prairie Dog Lateral #2 as part of the State Highway 193 reconstruction in 1992:

- Installation of a 36-inch reinforced concrete pipe (RCP) crossing to convey beneath the reconstructed highway;
- Relocation of the ditch paralleling the east side of State Highway 193 to a location east of its previous location; and
- Installation of a new 24-inch RCP siphon to convey Prairie Dog Lateral #2 across U.S. Highway 87.

The reconstruction of the ditch in these areas did not change the historic irrigation patterns but improved the systems that were in place.

**Prairie Dog Lateral #3** is diverted from the Prairie Dog Canal immediately north of the U.S.




1994 NRCS PHOTO

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**PRAIRIE DOG WATERSHED MANAGEMENT PLAN WWDC LEVEL I STUDY**

**PDWSC, PCCDC, & MCDC Diversions, Headgate Locations and Laterals (South Section)**

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**Fig. 2-8 (A)**

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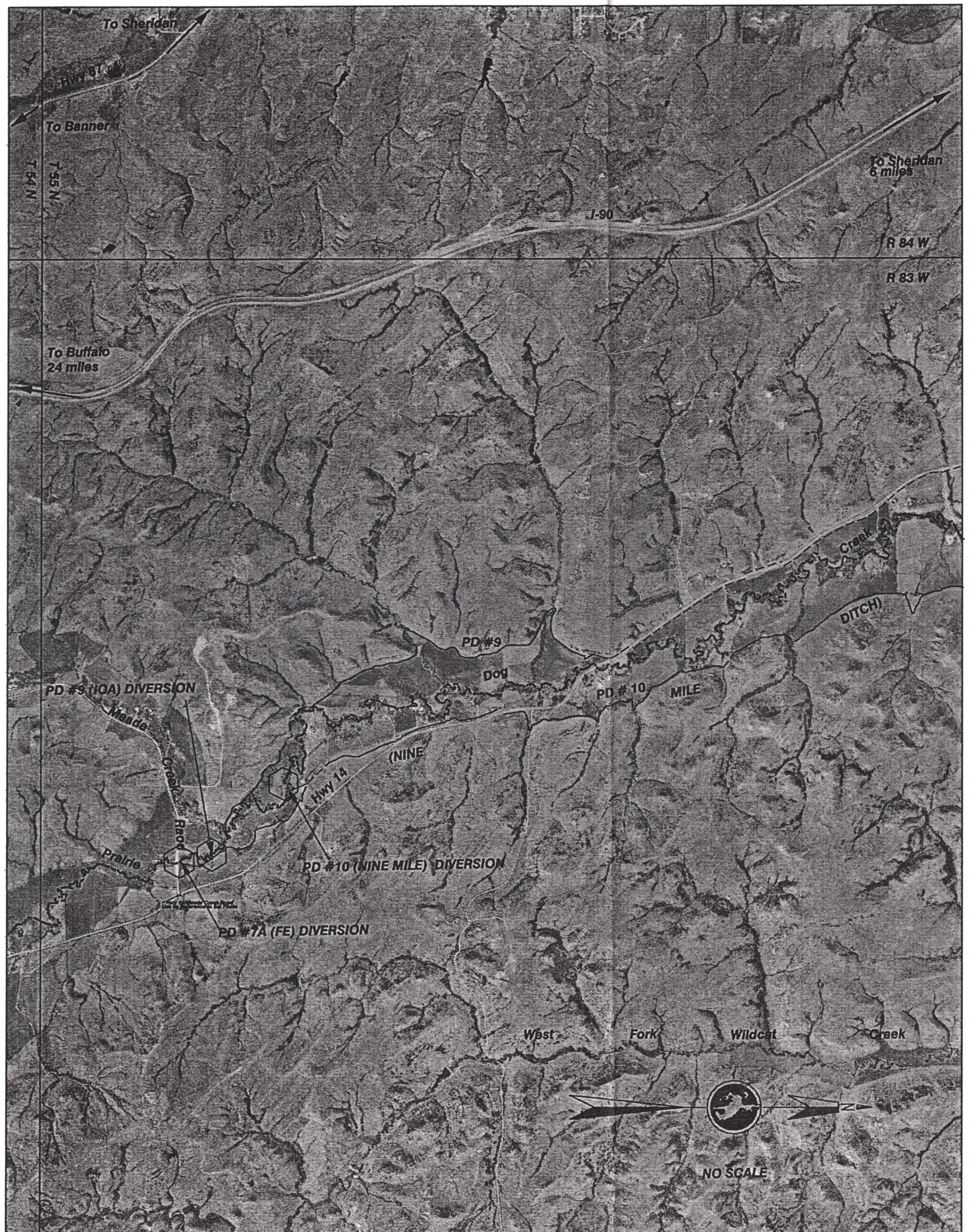


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**LEGEND**

- Diversion Location
- Prairie Dog Ditch Lateral Location
- Prairie Dog Ditch Lateral Assumed Location

**KEY**

| Fig. South Section | Fig. Central-South Section | Fig. Central-North Section | Fig. North Section |
|---|---|---|---|

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**PDWSC, PCCDC & MCDC Diversions, Headgate Locations and Laterals (Central-South Section)**

**PRAIRIE DOG WATERSHED MANAGEMENT PLAN WWDC LEVEL I STUDY**


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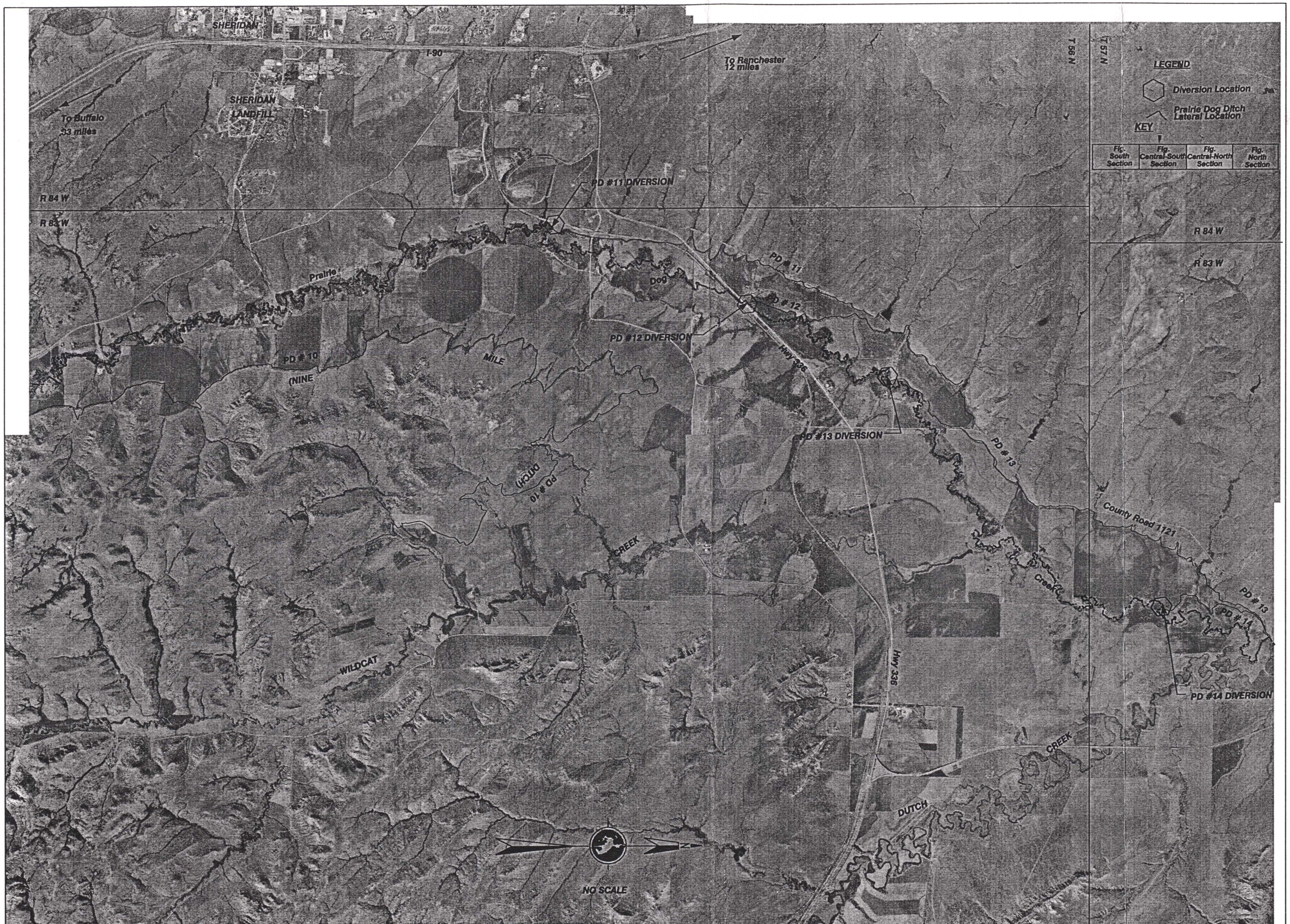
**Fig. 2-8(B)**




1994 NRCS PHOTO

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**PDWSC, PCCDC AND MCDC DIVERSIONS, HEADGATE LOCATIONS AND LATERALS (Central-North Section)**

**PRAIRIE DOG WATERSHED MANAGEMENT PLAN WWDC LEVEL I STUDY**

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**Fig. 2-8 (C)**

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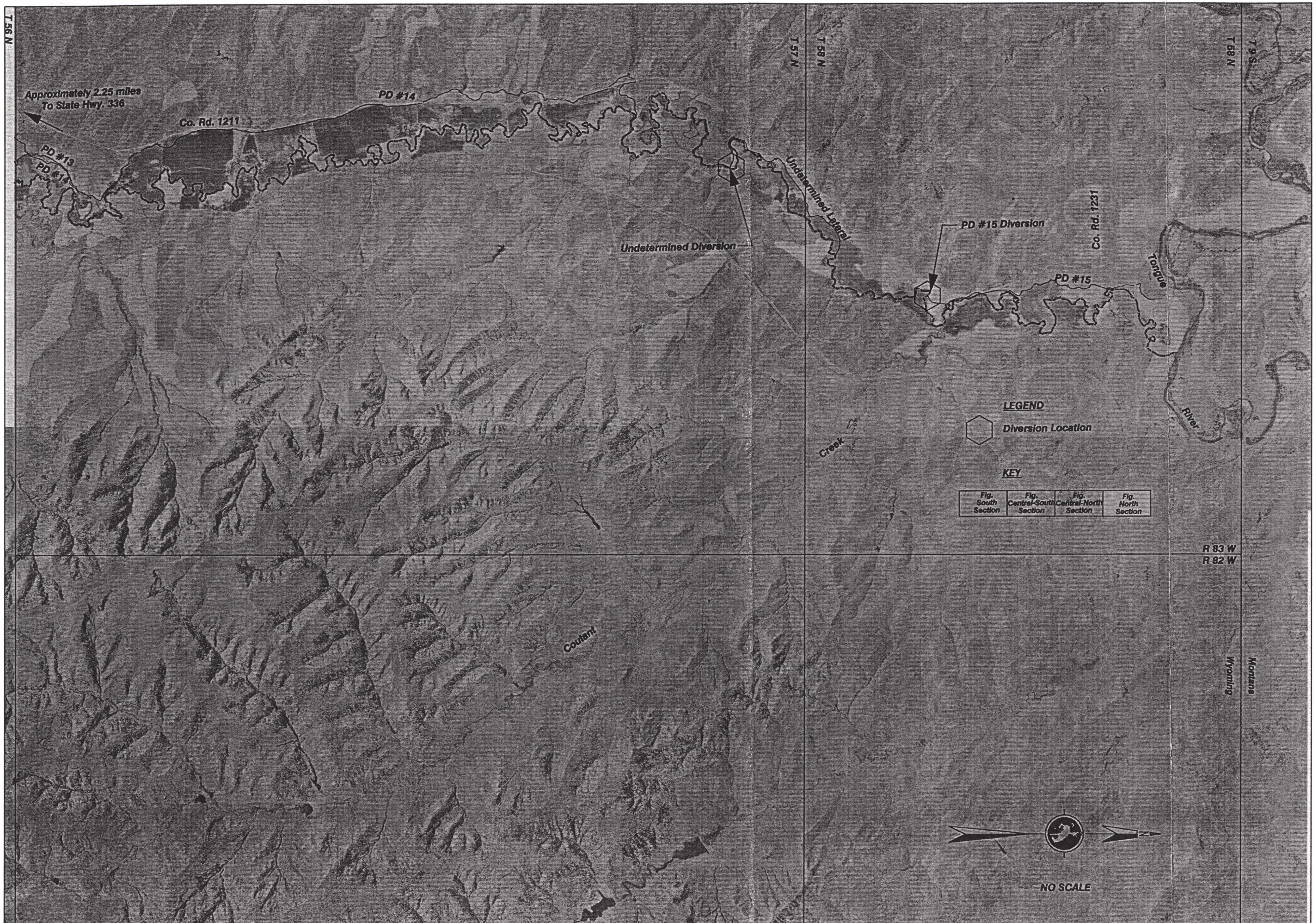


1994 NRCS PHOTO

**Fig. 2-8 (D)**

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**PRAIRIE DOG WATERSHED MANAGEMENT PLAN WWDC LEVEL 1 STUDY**

**PDWSC, PCCDC AND MCDC DIVERSIONS, HEADGATE LOCATIONS AND LATERALS (North Section)**

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Highway 87 crossing, within lands owned by the Banner Ranch. This lateral serves approximately 561 acres (8.0 cfs) south and north of the interstate in the southeast portion of the watershed. A turnout, 30-inch. drop pipe, and plunge pool were all constructed for this Lateral #3 in 1977. In 1986-87, a slide occurred near the head of the lateral. Earthwork was required to stabilize the ditch banks in that area after the slide.

In 1992, the owner of the Banner Ranch filed a written complaint with the PDWSC requesting that improvements be made to the Prairie Dog Lateral #3 structure in order to eliminate erosion losses on his property. The complaint also requested that alternatives be developed to reduce the accelerated erosion along the length of Jenks Creek. The landowner charged that the amount of water being conveyed through the Prairie Dog Canal system was too great (up to 80 cfs) and suggested that the system could handle no more than 60 cfs without producing severe damage to lands and structures. The PDWSC responded to the complaint by participating in a cost share project with the landowner which included installation of rock riprap along the ditch channel near the diversion. During the research for this study, no further documentation was brought forward regarding the allegation that the Prairie Dog Canal exceeds its capacity.[13]

**Prairie Dog Lateral #4** is diverted from the Prairie Dog Canal (Jenks Creek in this area) immediately upstream of its convergence with Prairie Dog Creek. This lateral is approximately 0.7 miles in length and serves approximately 177 acres (2.5 cfs) east of Jenks and Prairie Dog Creeks. **Prairie Dog Laterals #4-1 and #4-1-A** are two sub-laterals diverting from this lateral. Together these laterals serve all of Prairie Dog Lateral #4's irrigated lands, including those in Story Creek, a tributary of Prairie Dog Creek.

**Prairie Dog Lateral #5** begins approximately ¼ mile downstream of the confluence of Jenks Creek and Prairie Dog Creek. This lateral serves approximately 133 acres (1.9 cfs) in its 1.6 mile length. The lands irrigated from this lateral are west of Prairie Dog Creek.

**Prairie Dog Lateral #5-A** is diverted from Prairie Dog Creek near the termination of Lateral #5 and is designated as the Stroud Ditch. Prairie Dog Lateral #5-A extends approximately 1.5 miles along the west banks of the creek, serving some 240 acres (3.4 cfs).

**Prairie Dog Lateral #6** (Red Butte Ditch) is one of the longest laterals in the Prairie Dog system. The ditch diverts water from Prairie Dog Creek between the diversion points for Laterals #5 and #5-A. This lateral serves approximately 588 acres (8.4 cfs) through its 6.4 mile length. Prairie Dog Lateral #6 serves lands adjacent to Prairie Dog Creek and along both sides of Murphy Gulch. The ditch crosses Murphy Gulch approximately 1.25 miles above its confluence with Prairie Dog Creek. **Prairie Dog Lateral #6-A** is a small lateral that diverts water from Murphy Gulch in this area and irrigates 32.6 acres.

**Prairie Dog Lateral #7** (Dolan Ditch) diverts water from Prairie Dog Creek to serve the lands on the east side of the creek in Section 10, T54N, R83W. This ditch serves approximately 416 acres (5.9 cfs) along its 5.4 mile length. The ditch serves lands in the Buffalo Run Creek drainage, a tributary to Prairie Dog Creek.

**Prairie Dog Lateral #7-A** (FE Ditch) is diverted at the Meade Creek Road (County Road 131) bridge, upstream of the confluence of Meade and Prairie Dog Creeks. This lateral serves 72 acres (1.0 cfs) on the east side of the creek through its 1.5 mile length.

**Prairie Dog Lateral #8's** point of diversion from Prairie Dog Creek is approximately one (1) mile downstream of the Lateral #7 diversion. This lateral serves 170 acres (2.4 cfs) west of the creek. Its total length is 1.6 miles, as it terminates near Meade Creek.

**Prairie Dog Lateral #10** (Nine Mile Ditch) is diverted from Prairie Dog Creek approximately ½ mile downstream of the Lateral #9 diversion to serve lands both east and west of Prairie Dog Creek. Water from this lateral serves lands in the Prairie Dog Creek drainage as well as within the Wildcat Creek drainage. **Prairie Dog Lateral #10A** is a sub-lateral that terminates in the Wildcat Creek drainage, 4.8 miles from the turnout. Lateral #10 serves the largest area within the PDCW: approximately 1,392 acres (19.9 cfs). Sections of this ditch have been improved in recent years through highway construction and lining systems to eliminate water loss.

**Prairie Dog Lateral #9** (IOA Ditch) is diverted from the creek approximately ¼ mile upstream of the Meade Creek confluence with Prairie Dog Creek. This lateral crosses Meade Creek and serves lands on the western side of Prairie Dog Creek. Approximately 287 acres receive water through this lateral of approximately two miles in length.

**Prairie Dog Lateral #11** diverts water from Prairie Dog Creek immediately east of the City of Sheridan, near the Burlington Northern Sante Fe Railroad. This lateral serves approximately 208 acres (3.0 cfs) located on the west side of the creek during its 3.9 mile length. It crosses the railroad and State Highway 336, with the majority of the lands served by this lateral located north of State Highway 336. **Prairie Dog Lateral #11-1** is a sub-lateral that diverts approximately nine cfs out of Lateral #11, crosses County Road 1211 in a pipe hung next to the bridge, and continues to the northeast.

**Prairie Dog Lateral #12** diverts water from Prairie Dog Creek at a point adjacent to State Highway 336 in Section 8, T56N, R83W. A drop structure exists at this diversion point in the creek. The ditch serves 194 acres (2.8 cfs) lands on the west side of the creek along its 2.4 mile length.

**Prairie Dog Lateral #13's** diversion point is located immediately upstream of the Prairie Dog Creek crossing of County Road 1211. The ditch serves lands located on the west side of the creek: 507 acres (7.2 cfs) in its 5.4 mile length.

**Prairie Dog Lateral #14** parallels Lateral #13 for an approximate distance of one mile at its northerly end is. Lateral #14 diverts water from the creek in Section 34, T57N, R83W and is approximately 5.7 miles in length. The lateral serves 453 acres (6.5 cfs).

**Prairie Dog Lateral #15** is the last PDWSC ditch to divert from Prairie Dog Creek. The diversion point is approximately ¾ mile downstream of the termination of Lateral #14. Lands served by this lateral are very near the Tongue River: 12 acres (0.2 cfs). The ditch is approximately 1.1 miles in length.

#### 2.1.5.4.2 PCCDC Ditch

The PCCDC has adjudicated water rights totaling 64 cfs, not including storage rights or flood rights from South and North Piney Creek, Kearney Lake Reservoir and Willow Park Reservoir.

It is made up of 72 shareholders holding 4874.4 shares. Distribution of shares is determined by total irrigable acres. Shareholder assessments are typically $2.00/year/acre with an annual charge of $40/year/pumping unit installed in the ditch by non-shareholders. For a listing of water rights, see Appendix 1.

Typical flow diverted from the South Piney Creek and North Piney Creek diversion facilities into the PCCDC system over the past twenty years, as reported by the BOC, has varied from 4 to 37 cfs. For the ten-year period of 1991-2000, the total amount of water diverted has decreased from the 37-year average of 3693 acre-feet to 2809 acre-feet, or 23%. It is not known why this significant reduction has occurred, but it could possibly be attributed to more efficient irrigation techniques (e.g., sprinklers), less direct flow or storage water being available, or timely precipitation decreasing the need for diversions.[5]

A map depicting the location of irrigated lands within the PDCW that includes those served by the PCCDC is shown in Figure 2-7. A total of seven headgates were identified by the PCCDC ditch rider along the length of the ditch that deliver water to the lands served by the PCDDC. These headgates are depicted in Figure 2-8 (A). Other headgates exist along Payne Creek and Meade Creek that were not identified, but deliver water conveyed by the PCCDC.

After the trans-basin drop, the PCCDC ditch flattens to a gradual slope for a distance of 1,200 to 1,400 feet before free falling a second time over a wooden weir, located in NE1/4SW1/4 of Section 8, T53N, R84W. The channel sides surrounding the weir and the headwall below it are eroding and appear close to failure. The channel walls below the drop are steep and V-shaped through the sandstone bedrock. Large rocks 12 to 30 inches in diameter have been placed in the channel at various locations, but the quantity and size of rock are inadequate to prevent continued erosion of the channel. This gully is approximately 1,000 feet long and 60 feet deep. It is not visible when approached from the east, and it continues to present a potential danger to livestock, wildlife, and humans. A photo of this second drop is shown in Figure 2-5.

Oral reports from the affected landowner indicate that he continues to have livestock fall into the channel, and that he must winch them out of the deep channel once they enter.[12] The PCCDC has suggested that the landowner fence the area to limit the danger to livestock; however, as with the second drop on the PDWSC's Ditch, this is not an option that the landowner wishes to implement.

The PCCDC Ditch is approximately six miles long from the base of Tunnel Hill to the ditch's confluence with Payne Creek in the NW¼ of Section 29, T54N, R83W. (Payne Creek is referred to as Rifle Creek on the applicable USGS quadrangle map). The ditch provides irrigation water for lands beginning at a point below Tunnel Hill to areas alongside Meade Creek east of I-90. PCCDC Ditch water is conveyed to the areas east of I-90 through Meade Creek after it has flowed into Meade Creek via Payne Creek. Approximately 1,214 shares of the total PCCDC water are delivered to lands that exist in the adjoining Little Goose Creek Watershed.

The PCCDC Ditch follows primarily natural contours subsequent to its second drop and runs parallel to and below the MCDC delivery system for most of its length. The two ditch systems lie within 800 feet of each other in one location and are typically between 1,000 and 1,500 feet apart. The waters of the PCCDC Ditch cross Prairie Dog Creek via a siphon located in the SW¼ of Section 32, R83W, T54N.

In many areas, the PCCDC ditch flows alongside relatively steep side slopes, and these uphill side slopes, with their makeup of sand and sandy loams, have suffered from erosion. Sand deposits in the bottom of the ditch measure a minimum of six inches in depth throughout the length of the ditch. Many areas of deeper deposits exist, typically near headgates and abrupt changes in direction.

As discussed previously, the PCCDC ditch flows water until its intersection with Payne Creek in the NW¼ of Section 29, T54N, R83W, which is approximately ¼ mile west of U.S. Highway 87. At this location, a concrete splitter box has been constructed, and five lateral ditches begin. A 300-foot length of 24-inch pipe was installed in 1979 from the splitter box to divert water directly into Payne Creek, which flows northerly approximately two miles before intersecting with Meade Creek near the intersection of U.S. Highway 87 and I-90. Payne Creek and Meade Creek are the means of conveyance for PCCDC water rights to lands downstream of the splitter box. The laterals splitting from the box deliver water to lands located northeast of U.S. Highway 87 and also lands higher in elevation than Payne Creek below the MCDC Ditch. Significant sand deposits have accumulated at the splitter box immediately upstream of where water is diverted into the pipes.

Erosion and sedimentation are evident in Payne Creek as it conveys PCCDC water downstream, although its channel walls are well vegetated with thick brush in many areas. Payne Creek runs parallel to U.S. Highway 87 before joining Meade Creek in the NE1/4SE1/4 of Section 18, T54N, R83W, with as little as 60 feet distance between the creek and the highway right-of-way in some locations in this general area. The Payne Creek channel is well described below the splitter box, but dense vegetation along its banks hides the channel in the upper portions of the drainage.

Construction of several small, on-channel dams and reservoirs has occurred in the past five years on this reach of Payne Creek. The dams have been constructed with 12-inch outlet pipes near the bottom of the dams, which are now acting as a constriction for water deliveries to downstream irrigators that require water be delivered via the Payne Creek channel. The PCCDC has requested that the landowner who constructed these dams breach them, or that 42-inch outlet pipes be installed to replace the 12-inch pipes. This request was made of the applicable landowner in 2000, but as of the date of this report, the work has not been completed.

After Payne Creek joins Meade Creek near U.S. Highway 87, it flows approximately five miles to its confluence with Prairie Dog Creek. The lands located east of I-90 receiving PCCDC water from Meade Creek to its confluence with Prairie Dog Creek are used as small hay meadows. The channel through this reach is predominately through silt and sand deposits common to this area. The channel is very flat in this area before entering a steeper channel east of the I-90 crossing.

#### 2.1.5.4.3 MCCDC Ditch

The MCDC ditch has adjudicated water rights totaling 34 cfs, not including flood rights or reservoir storage rights. (For a listing of water rights, see Appendix 1.) Typical flow diverted since 1980 from the North Piney Creek diversion facilities into the MCDC Ditch system varies from 10 to 31 cfs. It should be noted that the maximum diversions prior to 1989 ranged between 20 and 31 cfs. Since 1989, however, the peak diversion is reported by the BOC to have decreased to 21 cfs. This phenomena may be due to the fact that more of the area is being irrigated by sprinkler irrigation than in the past and thus using less water.

The MCDC ditch is approximately 10.4 miles in length and serves the highest areas of the three major ditches within the PDCW (within the southwestern corner of the watershed). It also serves some lands in the Little Goose Creek watershed to the northwest. Approximately 2,345 acres are irrigated under the MCDC ditch in both the PDCW and the Little Goose Creek watershed, with estimates of up to 50% of the total irrigated lands served by the MCDC ditch being in the Little Goose Creek drainage.

The MCDC is made up of twelve shareholders holding 37 total shares. Approximately 1/2 of the 37 shares are for land that is within the Little Goose Creek drainage, with 41% of the total MCDC shares being held by one landowner. For the ten-year period of 1991-2000, the total amount of water diverted has decreased from the 36-year average of 4,163 acre-feet to 3,067 acre-feet, or 26%. Again, it is not known why this significant reduction has occurred, but it could possibly be attributed to more efficient irrigation techniques (e.g., sprinklers), less direct flow or storage water being available, or timely precipitation decreasing the need for diversions.[

A map depicting the location of irrigated lands within the PDCW is shown in Figure 2-7, which includes those lands irrigated by the MCDC. (This figure does not depict those irrigated lands outside of the PDCW that are in the Little Goose Creek drainage.) The location of headgates diverting from the MCDC ditch is depicted in Figure 2-8 (A).

After the second drop (which is within a few hundred feet of the Tunnel Hill trans-basin drop), the MCDC ditch follows natural contours for the rest of its length. It has an inverted siphon beneath Prairie Dog Creek, and it also crosses Meade Creek in the N½ of Section 25, T54N, R84W. No commingling of water occurs at either of these two crossings. The ditch is typically 10-12 feet wide and two to four feet deep as it traverses through the PDCW. A total of 13 headgates were identified along the length of the ditch. All but two of these turnouts serve lands owned by one individual.

The MCDC Ditch exits the PDCW and enters the Little Goose Creek watershed approximately 3½ miles downstream of the trans-basin facilities at Tunnel Hill. After entering the Little Goose Creek basin, the ditch co-mingles with the East Fork of Kruse Creek for approximately 2,000 feet and crosses three more streams within the Little Goose Creek drainage (Johnson Draw, Kruse Creek, and East Fork of Sackett Creek) before terminating at the junction with Sackett Creek near the Big Horn Equestrian Center.

Sand and sediment accumulations in the MCDC Ditch are similar to those observed in the PCCDC system. These deposits are believed to be generated at the trans-basin drop, the second drop, and due to continued erosion of the ditch banks along the length of the ditch. The majority of the ditch is on grade from the location of the second drop; however, some areas do exist along the length of the ditch where grades increase and resulting higher velocities erode the ditch banks, adding sand and sediment to the system. This material then settles to the bottom of the ditch when the ditch's gradient decreases at locations downstream.

Erosion is also continually occurring as the ditch flows around steep hillsides. This erosion is particularly evident in the SE1/4 of Section 30, T54N, R83W as the ditch follows a contour around a hill. The east bank stands nearly vertical in this vicinity as a result of continued erosion. The material from the bank is deposited into the ditch at this location, requiring frequent cleaning maintenance. When the ditch is cleaned, the material cannot be placed on the west bank, as its added weight to the slope is feared to eventually cause a ditch break.

Sand deposits are routinely the largest in locations of turnouts and changes in direction of flow. Not only is this sand an ongoing maintenance problem in the ditches, but also sand deposits can affect the mechanical equipment associated with the gradual change to sprinkler irrigation by some property owners.

### 2.1.6 Geology and Soils

#### 2.1.6.1 Geology

The PDCW lies entirely within one geologic region: the Powder River Basin, a bowl-shaped syncline filled with sediment. The surficial geology of the Powder River Basin is dominated by one stratigraphic unit: the Wasatch Formation.

Geologic time is divided into four eras: Pre-Cambrian, Paleozoic, Mesozoic and Cenozoic, each of which is divided into periods. The following discussion of the geology of the PDCW begins with the Cenozoic era, as it was during this era that the Wasatch Formation developed.

The Cenozoic era began 66 million years ago and is characterized by mountain building and continental sedimentation. In Wyoming, the primary mountain building event was the Laramide orogeny, which formed the Big Horn Mountains along the western boundary of the Powder River Basin.

The characteristic "comma" shape of the Big Horn Mountains was caused by faults dividing the Big Horns into three structural segments: northern, central and southern. Some of these faults lie along the PDCW boundary. The northern segment of the Big Horn Range lies north of the Tongue River fault, which roughly parallels U.S. Highway 14 across the mountains. This segment was moved southwest over the Big Horn Basin by the Five Springs Thrust Fault, located on the western base of the mountains. The edge of this segment lines the northwest border of the PDCW.

The southern segment of the Big Horns lies south of the Ten Sleep Fault, which roughly parallels U.S. Highway 16 across the mountains. This segment was moved west by the Bigtrails High-angle Reverse Fault, located along its western base.

Between U.S. Highways 14 and 16 is the central segment, the Piney Creek block, which lines most of the western edge of the PDCW. This central segment was formed by thrust faults moving in an east-west direction. One of the thrust fault lines lies immediately west of the headwaters of Prairie Dog Creek.

Continental sedimentation began as soon as the mountains were created. Erosion eventually began to tear them down and deposit the eroded material into adjacent basins. During the early Cenozoic era, northeast Wyoming was filled with swampy, deciduous forests, so the material deposited in the Powder River Basin formed the coal-rich Fort Union Formation. This formation surfaces along the eastern and western edges of the Powder River Basin. Above the Fort Union Formation lies the Wasatch Formation, deposited during the later part of the Cenozoic era.

The main body of the Wasatch Formation covers the entire surface of the PDCW (except for the drainages and creek bottoms described below). It is characterized by drab sandstone, drab to variegated claystone (shale), conglomerate lenses near the Big Horn Mountains, and numerous coal beds in the lower part. The Wasatch Formation is approximately 900 feet deep in the central and eastern portions of the watershed, and it slopes from west to east at approximately 5 feet/mile. It outcrops near the southwest boundary of the PDCW.

Some of the Wasatch Formation's exposed coal beds ignited thousands of years ago and slowly burned. The shales and sandstones surrounding the burning coal were metamorphosed into clinker (also known as porcellanite, scoria or red shale), a rough, reddish-orange slag. This clinker is resistant to erosion. Areas capped by this material are visible as high ridges around the edge of the watershed and between its waterways. The clinker deposits are typically mixed with bedrock outcrops, with the areas immediately below the ridges are primarily slopewash and/or colluvium.

Basin filling continued during the middle period of the Cenozoic era, until the most recent period began two million years ago and the entire intermountain region, including northeast Wyoming, arched upward. As a result of the uplifting, rivers began to down cut their channels and exhume the Laramide mountain ranges and basins. This accelerated erosion period continues today. In the PDCW, erosion moved out intermediate deposits, so only later deposits, such as the Wasatch Formation, are surficial.

There is, however, one exception. Very recent unconsolidated alluvial deposits from the Quaternary Period (less than two million years ago) are surficial along drainages and active creeks. These alluvial deposits are prominent along the length of Prairie Dog Creek and the downstream half of Dutch Creek and the Dow Prong of Dutch Creek. Composed of long thin bands of clay, silt, sand, and gravel, these deposits are found in flood plains, fans, benches, terraces, and slopes.[14][15]

### 2.1.6.2 Soils

The NRCS "Soil Survey of Sheridan County" delineates boundaries for the nine general soil units that dominate the PDCW, as shown in Figure 2-9.[15] Review of these general units provides the following large-scale understanding of the watershed's soils.

At the headwaters of Prairie Dog Creek, as well as along the ridge through which the three irrigation ditches cut, soils are sandy, and the underlying bedrock is sandstone and granite. These areas contribute to the sandy deposits common in the irrigation systems.

Along the floodplain and alluvial terraces of Prairie Dog Creek and its tributaries lie deep loams that are often clayey, especially east of the creek and in the lower soil layers. Table 2.2 defines terms for soil designation depth, layers and slope. Loams are soils that contain 7 to 27 percent clay, 28 to 50 percent silt and less than 52 percent sand. Modifying adjectives indicate the relative concentration of those constituents; for example, a clayey loam will have a higher percentage of clay. These loams generally overlie shale bedrock, have permeabilities of 0.6 to 2 inches/hour, and are affected by water with a high Sodium Adsorption Ratio (SAR).

Salinity, expressed as the electrical conductivity of the soil's saturation extract, is estimated to be less than 2,000 micromhos per centimeter (µmhos/cm) in all parts of the PDCW except for low-lying, moist portions of the Haverdad soils. The Haverdad soils cover approximately 20% of the narrow soil unit lying along the length of Prairie Dog Creek and the lower half of Dutch Creek.

The nine general soil units within the PDCW are listed below by their NRCS name and number. A general unit consists of several sub-units, each of which is characterized by a different soil type. For each general unit, Table 2.2 lists the percentage of its area that is covered by a specific soil type. The table also describes the characteristics of each specific soil type.

1. **Unit WY066, Moskee-Hargreave** At the uppermost end of the PDCW, where the three trans-basin diversions of irrigation water cut through Tunnel Hill, the Moskee-Hargreave unit covers the nearly level ridgeline, the strongly sloping hills and the gently sloping alluvial fans at the bottom of the ridges. This sandy and sandy clay loam unit continues north along the western side of the higher (southern) third of Prairie Dog Creek. The less steep areas in this unit are well suited to irrigation.

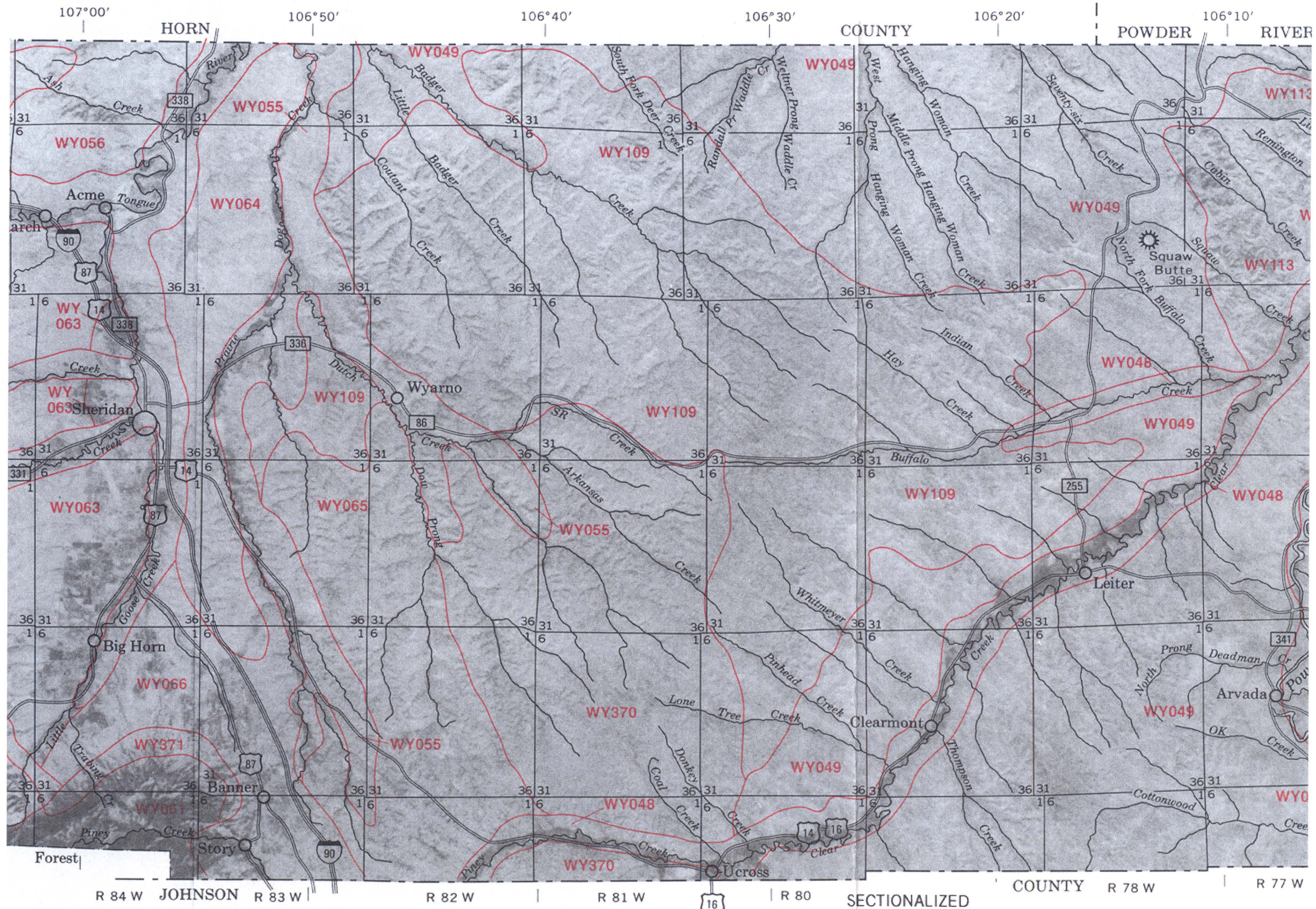
2. **Unit WY061, Agneston-Granile-Rock outcrop** The headwaters of Prairie Dog Creek begin on mountain slopes north of Moncreiffe Ridge. These areas are characterized by rock outcrops and strongly sloping, moderately deep and very deep, sandy and gravelly loams. This unit is used for livestock grazing, limited by steep slopes and the low productivity of understory vegetation. Roads and trails are subject to severe water erosion hazards when grades are steep.

3. **Unit WY371, Norbert-Savage-Savar** Prairie Dog Creek travels approximately 2½ miles through the sandy Agneston-Granile-Rock outcrop unit before continuing approximately one-half mile through the clayey Norbert-Savage-Savar unit on less steep hills, terraces and alluvial fans. The nearly level and gently sloping portions are well suited to cropland. Rapid runoff and severe water erosion hazards exist on the steeper parts, which are susceptible to soil creep (inches of movement per year) and slippage (feet of movement per second), especially on south- and east-facing slopes.

4. **Unit WY055, Haverdad-Zigweid-Nuncho** This unit parallels the length of Prairie Dog Creek, Murphy Gulch and the lower half of Dutch Creek. It typically covers the nearly level or gently sloping alluvial fans, low terraces and flood plains that lie in a band from the creek bottoms to approximately one mile eastnortheasterly. The soils are very deep loams.

Few limitations affect irrigated cropland, non-irrigated cropland, or grazing. In the low-lying moist Haverdad soils, estimated salinity levels range from less than 2,000 µmhos/cm to 4,000 µmhos/cm in the top few inches, but the salinity increases with depth in some moist areas (up to 16,000 µmhos/cm). The Haverdad soils experience seasonal flooding hazards. In Nuncho soils, slow permeability limits septic tank operation and high shrink-swell potential limits dwelling sites.

5. **Unit WY065, Nuncho-Recluse-Baux** This unit lies east of the deep alluvial soils lining the upper half of Prairie Dog Creek and also covers the high rugged center of the watershed (west of the Dow Prong of Dutch Creek, near the headwaters of Wildcat Creek). Slopes are from




Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than as a basis for decisions on the use of specific tracts.

N

SECTIONALIZED TOWNSHIP

| | | | | | |
|---|---|---|---|---|---|
| 6 | 5 | 4 | 3 | 2 | 1 |
| 7 | 8 | 9 | 10 | 11 | 12 |
| 18 | 17 | 16 | 15 | 14 | 13 |
| 19 | 20 | 21 | 22 | 23 | 24 |
| 30 | 29 | 28 | 27 | 26 | 25 |
| 31 | 32 | 33 | 34 | 35 | 36 |

## SOIL LEGEND*

AREAS DOMINATED BYSHALLOW, MODERATELY DEEP, AND VERY DEEP SOILS AND AREAS OF ROCK OUTCROP; ON MOUNTAINS

- WY060 Tolman-Cloud Peak-Starley
- WY061 Agneston-Granile-Rock outcrop

AREAS DOMINATED BY SHALLOW AND VERY DEEP SOILS ON HILLS, TERRACES, AND ALLUVIAL FANS ADJACENT TO MOUNTAINS

- WY371 Norbert-Savage-Savar
- WY372 Trimad-Trivar-Abac

AREAS DOMINATED BY SHALLOW, MODERATELY DEEP, AND VERY DEEP SOILS AND AREAS OF ROCK OUTCROP; ON HILLS, TERRACES, AND ALLUVIAL FANS

- WY049 Shingle-Theedle-Bidman
- WY056 Worfka-Samday-Parmleed
- WY109 Shingle-Kishona-Cambria
- WY113 Shingle-Samday-Rock outcrop
- WY370 Baux-Shingle-Kirtley
- WY373 Rock outcrop-Norbert-Reget

AREAS DOMINATED BY SHALLOW, MODERATELY DEEP, AND VERY DEEP SOILS ON TERRACES, ALLUVIAL FANS, AND HILLS

- WY051 Bidman-Ulm-Wyarno
- WY057 Doney-Farnuf-Reeder
- WY063 Nuncho-Platsher-Samday
- WY064 Bidman-Parmleed-Shingle
- WY065 Nuncho-Recluse-Baux
- WY066 Moskee-Hargreave

AREAS DOMINATED BY VERY DEEP SOILS ON FLOOD PLAINS, LOW TERRACES, AND ALLUVIAL FANS

- WY048 Haverdad-Kishona-Draknab
- WY055 Haverdad-Zigweid-Nuncho

*The units on this legend are described in the text under the heading "General Soil Map Units."

Compiled 1995

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
UNIVERSITY OF WYOMING AGRICULTURAL EXPERIMENT STATION

# GENERAL SOIL MAP

## SHERIDAN COUNTY AREA WYOMING

# FIGURE 2-9

**Table 2.2, Sheet 1 of 3**
**General Soil Units of Prairie Dog Creek Watershed**

| UNIT | CLAY (%) | PERMEABILITY (IN/HR) | SOILS (% of the general unit covered by that soil) | LOCATIONS AND SLOPE | DEPTH | COMPOSITION OF SOIL LAYERS: Surface | Subsoil: Upper | Subsoil: Lower | FORMED FROM |
|---|---|---|---|---|---|---|---|---|---|
| WY O66 | 10 -35 | Top few inches: 2 -6<br>Lower layers: 0.6 - 2.0 | | | | | | | |
| | | | 45 % Moskee | Nearly level to strongly sloping | Very deep | Fine, sandy loam | Sandy clay loam | Sandy loam or sandy clay loam | Alluvium, colluvium and eolian deposits derived from sandstone |
| | | | 25 % Hargreave | Gently sloping to strongly sloping | Moderately deep over sandstone | Fine sandy loam | Sandy clay loam | Same as upper | Residuum and colluvium derived from limestone |
| WY O61 | 0 - 28 | Top 8 in and below 19 in: 2 - 6<br>Middle layers: 0.2 - 2.0 | | | | | | | |
| | | | 35% Agneston | Strongly sloping to steep mountain sides | Moderately deep over granite | Gravelly coarse sandy loam | Very gravelly sandy loam | Same as upper | Residuum and colluvium derived from granite |
| | | | 20% Granite | Strongly sloping and moderately steep mountains slopes | Very deep | Gravelly sandy loam | Very gravelly sandy clay loam with substratum of very gravelly sandy loam | Same as upper | Residuum and colluvium derived from granite |
| | | | 15% Rock Outcrop | -- | -- | Granite, schist, limestone, sandstone and shale | Same as surface | Same as surface | -- |
| WY 371 | 15 - 70 | Lower layers: 0.06<br>Top few in: 0.6 | | | | | | | |
| | | | 25% Norbert | Strongly sloping to steep hills | Shallow over soft shale | Clay | Same as surface | Same as surface | Alluvium derived from sedimentary rock |
| | | | 25% Savage | Nearly level to strongly sloping alluvial fans, terraces and hillslopes | Very deep | Clay loam | Clay | Same as upper | Colluvium and alluvium derived from shale |
| | | | 15% Savar | Gently to strongly sloping alluvial fans and hillslopes | Very deep | Clay | Clay | Same as upper | Colluvium and alluvium derived from shale |

**Table 2.2, continued, Sheet 2 of 3**
**General Soil Units of Prairie Dog Creek Watershed**

| UNIT | CLAY (%) | PERMEABILITY (IN/HR) | SOILS (% of the general unit covered by that soil) | LOCATIONS AND SLOPE | DEPTH | COMPOSITION OF SOIL LAYERS | | | FORMED FROM |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Surface | Subsoil | | |
| | | | | | | | Upper | Lower | |
| WY 055 | 7 -27 | .06 - 2.0 | | | | | | | |
| | | | 30% Haverdad | Nearly level flood plains | Very deep | Very fine sandy Loam | Stratified loam, sandy loam, clay loam, and silt loam | Same as upper | Alluvium derived from sedimentary rock |
| | | | 20% Zigweid | Nearly level and gently sloping terraces and alluvial fans | Very deep | Loam | Loam or clay loam | Same as upper | Alluvium derived from sedimentary rock |
| | | | 15% Nuncho | Nearly level and gently sloping terraces and alluvial fans | Very deep | Loam | Clay | Clay loam | Alluvium derived from sedimentary rock |
| | | | | | | | | | |
| WY 065 | 15 - 50 except Baux | 0.6 - 2.0 | | | | | | | |
| | | | 25% Nuncho | See above | See above | See above | See above | See above | See above |
| | | | 25% Recluse | Nearly level to strongly sloping hillspoes and alluvial fans adjacent to drainages | Very deep | Loam | Clay loam | Loam | Alluvium derived from sedimentary rock |
| | | Underlying layer: > 20 | 15% Baux | Nearly level to very steep ridges | Very deep but with shallow rooting depth | Channery loam and very channery loam | Fractured porcellanite material with little or no earthy material between rock fragments | Same as upper | Residuum and colluvium derived from porcellanite |
| WY 370 | 15 - 35 | 0.6 - 2 | | | | | | | |
| | | | 25% Baux | See above | See above | See above | See above | See above | See above |
| | | | 25% Shingle | Nearly level to very steep ridges | Shallow over soft shale | Clay loam | | | Residuum and colluvium derived from inter-bedded sedimentary rock |
| | | | 15% Kirtley | Gently sloping to strongly sloping hill sides | Moderately deep over soft shale | Loam | Clay loam | | Alluvium and residuum derived from shale |

**Table 2.2, continued, Sheet 3 of 3**
**General Soil Units of Prairie Dog Creek Watershed**

| UNIT | CLAY (%) | PERMEABILITY (IN/HR) | SOILS (% of the general unit covered by that soil) | LOCATIONS AND SLOPE | DEPTH | COMPOSITION OF SOIL LAYERS | | | FORMED FROM |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Surface | Subsoil | | |
| | | | | | | | Upper | Lower | |
| WY 109 | 15 - 35 | 0.6 - 2 | | | | | | | |
| | | | 30 % Shingle | See above | See above | See above | See above | See above | See above |
| | | | 20% Kishona | Nearly level to strongly sloping hill slopes and alluvial fans | Very deep | Loam | Clay loam | Loam | Alluvium and colluvium derived from inter-bedded sedimentary rock |
| | | | 15% Cambria | Nearly level to strongly sloping terraces and alluvial fans | Very deep | Loam | Clay loam | Loam | Alluvium and colluvium derived from inter-bedded sedimentary rock |
| WY 064 | 20 - 50 | 0.6 - 2 | | | | | | | |
| | | | 30 % Bidman | Nearly level to strongly sloping terraces, lower hillsides and alluvial fans | Very deep | Loam | Clay loam or clay | Clay loam | Alluvium derived from shale |
| | | | 25% Parmleed | Nearly level to moderately steep tablelands and hills | Moderately deep over shale | Loam | Clay | Clay loam | Residuum, colluvium and alluvium derived from shale |
| | | | 15% Shingle | See above | See above | See above | See above | See above | See above |
| WY 049 | 25 | 0.6 - 2.0 | | | | | | | |
| | | | 30% Shingle | See above | | | | | |
| | | | 30% Theedle | Moderately sloping to very steep lower hillsides and ridges | Moderately deep over soft shale | Loam | Clay loam | | Residuum, alluvium and colluvium derived from inter-bedded sedimentary rock. |
| | | | 10% Bidman | See above | See above | See above | See above | See above | See above |

nearly level to very steep along ridges, hills and alluvial fans. Less steep areas of this loam unit are well-suited to livestock grazing and non-irrigated hay. Steeper areas are dominated by Baux soils, with shallow rooting depths and extremely high permeability rates.

6. **Unit WY370, Baux-Shingle-Kirtley** The entire southeast corner of the watershed is covered by these loamy soils. This hilly ridge-covered area, characterized by very steep slopes, drains into Dutch Creek and its tributaries. As in the previous unit, Baux soils dominate ridges. This unit is used mainly for livestock and wildlife grazing, limited by slopes and root depth. Overgrazing results in an increase in undesirable grasses and shrubs.

7. **Unit WY109, Shingle-Kishona-Cambria** Continuing north down the PDCW, this loamy unit covers areas east of the deep alluvial soils along the middle section of Prairie Dog Creek and the lower half of Dutch Creek. This unit is used mainly for livestock grazing; however, the Kishona and Cambria soils are well suited to non-irrigated hay production. In the northerly areas where the Kishona soils exist, salinity may be as high as 4 μmhos/cm.

8. **Unit WY064, Bidman-Parmleed-Shingle** The west side of the northerly two-thirds of the PDCW is covered by this unit, which is used primarily for livestock and wildlife grazing. Bidman soils are well suited for hay and cultivated crops in moderately sloping to nearly level areas, but overgrazing increases the amount of undesirable grasses and shrubs.

9. **Unit WY049, Shingle-Theedle-Bidman** The smallest soil unit lies east of the deep alluvial soils lining the lowest reach of Prairie Dog Creek, around the confluence with Coutant Creek. The unit is used mainly for livestock grazing, availability of which is limited by steep slopes and deep gullies that contribute to overgrazing. Overgrazed areas become infested with prickly pear and cheat grass. As with the above unit, Bidman soils are particularly well suited for hay and cultivated crops in moderately sloping to nearly level areas.

### 2.1.7 Demographics and Land Use

#### 2.1.7.1 Population

The 2000 census stated that the population of Sheridan County is 26,560. Based upon approximately 500 residences within the PDCW as of September 1, 2001 and three (3) persons per residence, an estimate of the number of Sheridan County residents living within the PDCW is 1,500. Although there are no incorporated towns or cities within the PDCW, the areas of greatest density include:

- near the crossing of Meade Creek by I-90 downstream to this creek's confluence with Prairie Dog Creek;
- Murphy Gulch from its confluence with Prairie Dog Creek upstream for approximately three miles;
- just upstream of the crossing of Prairie Dog Creek by I-90;
- the Rocky Hills Subdivision, located just east of the City of Sheridan on the north side of U.S. Highway 14;
- the Hidden Hills area located approximately four miles southeast of the City of Sheridan;
- along Peno Road approximately one mile north of U.S. Highway 14, just east of the Rocky Hills Subdivision;and
- adjacent to the confluence of Bar N Draw and Prairie Dog Creek.

### 2.1.7.2 Transportation

U.S. Highways 14 and 87, I-90, three state highways, and many county roads pass through and serve the PDCW. There are no airports or other mass transit systems in existence within the watershed boundary.

The Burlington Northern Santa Fe Railroad runs through the PDCW. The main line connecting Sheridan to Gillette parallels State Highway 336 until it reaches the Dow Prong of Dutch Creek, where it turns southeast and continues through Verona. The railroad tracks of the main line cross the Dow Prong of Dutch Creek (twice), Dutch Creek, Wildcat Creek, Prairie Dog Creek, and several of its minor ephemeral tributaries. The Decker spur runs from Sheridan to the coal mines north of the PDCW, roughly paralleling Lower Prairie Dog Road (County Road 1211) on the east side of the Prairie Dog Creek valley. The spur's railroad tracks cross each of Prairie Dog Creek's tributaries from Dutch Creek to the north.

### 2.1.7.3 Employment and Education

Most residents of the PDCW work in Sheridan or the coal mines to the north. Employment within the watershed itself is primarily in agriculture. Over the last few years, there has been a rapid rise in employment relating to CBM construction and operations.

Children attend school either in Sheridan or Big Horn, from elementary through high school. Sheridan also has a two-year community college.

### 2.1.7.4 Agricultural Land Use

The primary land use within the PDCW is agricultural, and most of that agricultural activity is livestock (cattle) ranching. Approximately 92% of the irrigated cropland in this area is used to cultivate hay, which is used to feed area livestock. The remaining irrigated acreage is planted in barley, oats and corn.

Approximately 50% of the non-irrigated cropland is used for dryland and pasture. The other half of the non-irrigated acreage is planted in winter wheat and barley.

### 2.1.7.5 Residential Land Use

Originally inhabited by Native Americans (Crow, Cheyenne and Sioux), northern Wyoming was acquired by the United States as part of the Louisiana Purchase in 1803. Pioneers traveled through the area in the 1860's and many Anglo-Indian conflicts occurred, including the Fetterman Massacre (Massacre Hill is located near Banner, along the southeast border of the PDCW). By the late 1870's, Native Americans were largely confined to reservations, and settlers moved to the area in the 1880's and 1890's to take advantage of the Homestead Acts. Ranchers constructed large scale irrigation systems in the 1880's, including the trans-basin diversions of water into the PDCW from Piney Creek watershed discussed in Section 2.1.4 (Irrigation Delivery Systems). Irrigated lands allowed increased ranching activity along Prairie Dog Creek. Coal mining began in 1892 north of Sheridan, attracting many European immigrants.[15]

There are no incorporated towns within the PDCW, although there are two post offices (Banner, 82832 and Wyarno, 82845) and two place-names remaining from old settlements (Verona and Wakeley). Platted subdivisions in the PDCW and their locations are listed in Table 2.3.

**Table 2.3**
**Platted Subdivisions in the PDCW**

| Subdivision Name | Section | Township | Range | No. of Lots |
|---|---|---|---|---|
| Weaver | 3 & 10 | 57 N | 83 W | 5 |
| Wyarno | 15 | 56 N | 83 W | 7 |
| Grady Minor | 15 | 56 N | 83 W | 5 |
| Ruby | 14 | 55 N | 83 W | 3 |
| Bertalan | 18 | 55 N | 83 W | 3 |
| Los Cerros | 18 & 30 | 55 N | 83 W | 4 |
| Meade Creek Minor | 32 & 33 | 55 N | 83 W | 7 |
| Edward J. Barbula Minor | 8 | 54 N | 83 W | 3 |
| Hutton | 20 | 54 N | 83 W | 14 |
| Fetterman Hills | 28 | 54 N | 83 W | 14 |
| Means | 28 | 54 N | 83 W | 7 |
| Kirk Minor | 28 | 54 N | 83 W | 2 |
| Winding Brook Meadows | 23 | 54 N | 83 W | 6 |
| Conklin | 23 | 54 N | 83 W | 2 |
| Woodward-Linton | 23 | 54 N | 83 W | 5 |
| Sierra Dawn No. 1 | 24 | 54 N | 83 W | 6 |
| Conklin | 24 | 54 N | 83 W | 3 |
| Sierra Dawn No. 4 | 24 | 54 N | 83 W | 5 |
| Sierra Dawn No. 2 | 23 | 54 N | 83 W | 5 |
| Brayton | 27 | 54 N | 83 W | 3 |
| Wilson | 15 | 54 N | 83 W | 4 |
| Winding Brook Meadows | 14 | 54 N | 83 W | 2 |
| Winding Brook Meadows 2nd Add. | 14 | 54 N | 83 W | 2 |
| Winding Brook Meadows 1st Add. | 14 | 54 N | 83 W | 3 |
| Sunny Hills | 14 | 54 N | 83 W | 7 |
| Johnson-Brown | 14 | 54 N | 83 W | 2 |
| Sunny Hills First Addition | 14 | 54 N | 83 W | 2 |
| Earth Shelter Estates | 14 | 54 N | 83 W | 12 |
| | | | **TOTALS** | **143** |

### 2.1.7.6 Industrial Land Use

The Planning and Engineering Office of Sheridan County shows the only area zoned Industrial within the PDCW to be portions of the City of Sheridan's landfill, located immediately east of the City in Section 25, T56N, R84W. The Conoco tank farm (located in Section 8, T54N, R83W immediately west of the I-90 - Meade Creek interchange) would qualify as requiring industrial zoning. However, due to the fact that it existed prior to zoning implementation in Sheridan County, it has been "grandfathered" at its current location.

Sand and gravel mining is another small industry. The Land Quality Division of the WDEQ monitors eight active surface mining sites within the PDCW. Table 2.4 includes the mining sites' permittees, locations, minerals mined and sizes of disturbed areas. All of the sites are permitted under WDEQ's ten-acre exemption regulations for very small mining operations.

**Table 2.4**
**Active Surface Mining Sites**

| Permittee | WDEQ Permit No | Location (S, T, R) | Mineral(s) | Active Area (acres) |
|---|---|---|---|---|
| Ronald Butcher | 93-ET | 27,54,83 | Shale, gravel | 1 |
| Dale Cunningham | 761-ET | 11,54,83 | Shale, scoria | 1 |
| Larry's, Inc. | 1033-ET | 24,56,84 | Sand, gravel | 10 |
| Cundy Asphalt | 1047-ET | 11,54,83 | Sand, gravel | 2 |
| Mullinax Concrete | 1081-ET | 24,56,84 | Sand, gravel | 10 |
| Redstone Partners | 1102-ET | 21,58,83 | Sand, gravel | 8 |
| US Energy | 1124-ET | 5,57,83 | Scoria | 9.9 |
| K & H Constr. | 1132-ET | 15,56,82 | Scoria | 9.6 |

As discussed previously, there has been a rapid rise in CBM development taking place within the PDCW over the last few years. Most of the activity to date has occurred in the most northerly area of the PDCW.

A more specific discussion on CBM development within the PDCW occurs within Section 2.2.3.

### 2.1.8 <u>Fisheries</u>

#### 2.1.7.1 Stream Classifications

Two state agencies include Prairie Dog Creek within their fishery classifications. As stated previously, WDEQ lists Prairie Dog Creek as a Class 2AB stream and, because it is not listed as a Class 2ABww (i.e., ww signifying "warm water"), it is presumed to support cold water game fish. The revised WDEQ Chapter 1 Water Quality Rules and Regulations define cold water game fish as burbot, grayling, trout, salmon, char, and whitefish. "Warm water game fish" are defined as bass, catfish and bullhead, crappie, yellow perch, sunfish, walleye and sauger, sturgeon, pike, and freshwater drum. All other fish species not cited are designated as "non-game fish"[4].

The WG&FD Trout Stream Classification Map labels Prairie Dog Creek as a Class 5 trout stream. Class 5, the lowest category, includes "very low production waters" that are "often incapable of sustaining a trout fishery." The trout stream classification uses various characteristics to calculate values for a stream's aesthetics, accessibility, and productivity. WG&FD personnel assign a weight to these values and combine them to determine a stream's classification. The trout stream classification does not consider non-trout fish species.

#### 2.1.8.2 Fish Population Data

WG&FD files contain data from 14 fish population estimates that the WG&FD conducted on Prairie Dog Creek between 1959 and 1999. In addition to the estimates, WG&FD fish biologists refer to "occurrence" data from a 2000 University of Wyoming doctoral thesis.[16] This doctoral thesis listed species of fish that were found in northeastern Wyoming streams; however, it does not specify the quantities of fish that were found.

Table 2.5 lists all species identified in the WG&FD estimates and the above-referenced thesis as occurring in Prairie Dog Creek.

**Table 2.5**
**Fish Species Identified in Prairie Dog Creek**

| Common Name (* indicates native species) | Scientific Name |
|---|---|
| **Nongame Fish** | |
| Brassy minnow * | *Hybognathus hankinsoni* |
| Common carp | *Cyprinus carpio* |
| Creek chub * | *Semotilus atromaculatus* |
| Fathead minnow * | *Pimephales promelas* |
| Flathead chub * | *Platygobio gracilis* |
| Lake chub * | *Couesius plumbeus* |
| Longnose dace * | *Rhinichthys cataractaae* |
| Longnose sucker * | *Catostomus catostomus* |
| Mountain sucker * | *Catostomus platyrhynchus* |
| Shorthead redhorse ("N. redhorse sucker") * | *Moxostoma macrolepidotum* |
| Sand shiner * | *Notropis stramineus* |
| Western silvery minnow (Silver minnow) * | *Hybognathus argyritis* |
| White sucker * | *Catostomus commersoni* |
| **Game Fish** | |
| Black bullhead | *Ameiurus melas* |
| Brown trout | *Salmo trutta* |
| Channel catfish * | *Ictalurus punctatus* |
| Rock bass | *Ambloplites rupestris* |
| Stonecat * | *Noturus flavus* |
| White crappie | *Pomoxis annularis* |

* indicates native to Wyoming

Ten of these WG&FD fish population estimates conducted between 1959 and 1999 contained the numerical data necessary to calculate population density (fish per mile). Table 2.6 contains those calculated densities.

**Table 2.6**
**Historic Fish Population Densities in Prairie Dog Creek**

| Date | Location<br>Section-Township-Range | Non-Trout Species<br>Number/Mile | Trout Species<br>Number/Mile |
|---|---|---|---|
| Aug, 1959 | 4-56-83<br>Henry Burgess Ranch downstream of Wildcat Creek | Too Numerous to Count | Too Numerous to Count |
| Oct, 1959 | 27-54-83<br>Steve Will Ranch below Jenks Creek | 61 | 281 |
| Nov, 1968 | 33-55-83<br>Willey Ranch Above Meade Creek | No Data | 420 |
| Nov, 1969 | 33-55-83<br>Willey Ranch Above Meade Creek | No Data | 215 |
| Nov, 1970 | 33-55-83<br>Willey Ranch Above Meade Creek | No Data | 22 |
| June, 1994 | 22-54-83<br>Deam Ranch Above Pompey Creek | 464 | 112 |
| June, 1994 | 22-57-83<br>Dyecrest Ranch Between Enochs and Bar N Draws | 1360 | - |
| June, 1994 | 26-58-83<br>Peddicord Ranch, Trembaths Above Tongue River | 1040 | 16 |
| March, 1999 | NW¼ of 17-55-83<br>Baccari Property; Below U.S. Highway 14 Crossing | 1472 | 257 |

In reviewing this data, the following general observations can be made.

- The only cold water game fish found in Prairie Dog Creek is trout.
- Population levels of trout are well below those in recreational fishing streams within the local area, such as the North Fork of the Tongue River (3,300 cutthroat trout/mile). Thus Prairie Dog Creek should not be characterized as a significant trout fishing stream based upon these relatively low species counts.
- WDEQ's classification of Prairie Dog Creek as a Class 2AB cold water fishery upstream of the State Highway 336 crossing (immediately east of the City of Sheridan) appears somewhat logical. However, the more recent population estimates also suggest that Prairie Dog Creek downstream of the State Highway 336 crossing (Dyecrest and Pennicord) may be more characteristic of a Class 2AB warm water fishery, or perhaps a lower classification of fishery. This conclusion correlates well with water quality data, as the lower reaches of the creek have higher temperatures than the upper reaches. (See Section 2.2 on Water Quality.) It is also consistent with the 2000 Sheridan County Conservation District Tongue River Watershed Assessment, in which it was recommended that the Tongue River below I-90 be re-classified as a warm water fishery. The Chapter 1 WDEQ Water Quality Rules and Regulations now list the Tongue River

that is not within the Bighorn National Forest as a Class 2AB stream.[4][17]

### 2.1.9 Game Animals

Game animals in the PDCW include pronghorn antelope, mule deer, and white-tailed deer. Game birds in the area include pheasant, wild turkey, sage grouse, sharp-tailed grouse and mourning dove. It is reported that historical sage grouse and sharp-tailed grouse strutting grounds were documented in the study area, but no active grounds were identified in a 1999 survey. [18]

Numerous nongame animals exist within the PDCW, but their identification is beyond the scope of this study.

### 2.1.10 Threatened and Endangered Species

According to this and other data, no endangered or threatened animal species exist within the PDCW. It is known that the Black-Tailed Prairie Dog does exist within the PDCW. It, along with the Swift Fox and Mountain Plover, is currently considered as a candidate for the U. S. Fish & Wildlife Service's endangered species list. Additionally, the WG&FD lists "species of concern", and this list contains the yellow-billed cuckoo, least weasel, and three bat species that may exist within the PDCW.

### 2.1.11 Recreation

The WG&FD has described Prairie Dog Creek as being "very low production" and "incapable of sustaining a trout fishery". As such, fishing within the PDCW is not an important recreational activity. Instead, hunting is the primary recreational activity within the PDCW. In particular, the 45,890 acres of Wyoming state lands found within the watershed are popular for bird, deer and antelope hunting. However, with most of the lands near streams privately held, the PDCW is not perceived as being a significant hunting area.

Very little other recreational activity occurs related to Prairie Dog Creek or its tributaries. There are no public parks within the PDCW.

### 2.1.12 Surface Water

Appendix 1 provides information on water rights in the PDCW. Section 2.1.4 (Waterways) outlines the sources for surface water in the PDCW. Quantifying the total water rights within the PDCW was beyond the scope of this study. Some water rights were researched from the WSEO to determine the total appropriated right needed to size and evaluate existing facilities.

### 2.1.13 Groundwater

#### 2.1.13.1 Sources

As described in the previous discussion of the PDCW's geology, the Wasatch Formation covers most of the drainage basin. The only exceptions are the drainage floors, which are covered with a layer of Quaternary unconsolidated alluvial deposits. Many wells are drilled into these unconsolidated deposits that are very shallow (<50 feet) wells near the waterways and draws. Such shallow wells are usually hydraulically connected to the streams themselves, in which case water quality and quantity of the wells and streams are likely to be interdependent.

Deeper wells are drilled into the sandstone, mudstone and conglomerate lenses of the Wasatch Formation, which is approximately 900 feet deep in the center of the PDCW and outcrops near the southwesterly edge. There are also still deeper wells that are drilled into the Fort Union Formation, which is the primary source of CBM and thus a current target for dewatering. The Wasatch and Fort Union formations are recharged where they surface, which is near the edges of the Powder River Basin.

### 2.1.13.2 Groundwater Permits

Records from the WSEO indicated that, as of June, 2000, approximately 1,030 permitted groundwater wells in the PDCW. Well depths vary widely, from one (1) feet deep to 2,400 feet deep. The wells located in the alluvial deposits along waterways are shallow, while those atop the ridges are generally deeper. Well yields also vary widely, from one to 270 gallons per minute.

The total number of wells is increasing rapidly due to the increase in CBM development. Most of the CBM wells have been and are expected to continue to be drilled deep into the Fort Union Formation, although in adjoining watersheds, some methane is being extracted from the thicker coal seams in the shallower Wasatch Formation. Some estimate that the number of CBM wells in Sheridan County is expected to increase to as many as 5,000 wells, with approximately 75% to be drilled within the PDCW.[19]

### 2.1.13.3 Possible Groundwater Contamination Sites

The Groundwater Section of the Water Quality Division of WDEQ monitors two groundwater contamination sites within the PDCW. The first site is adjacent to Peno Creek, a tributary of Jenks Creek, near Banner (Sections 9 and 10, T53N, R83W). On June 26, 1997, a hillside slump ruptured a Conoco pipeline, resulting in an uncontrolled release of approximately 700 barrels of unleaded gasoline. The release occurred immediately adjacent to Peno Creek. The product flowed into Peno Creek and traveled downstream, where the majority of the product accumulated in a stock pond. Site investigators believe that no free product reached Jenks Creek; however, dissolved phase hydrocarbons were initially detected in surface water samples collected just above the confluence of Peno and Jenks Creeks. None of the samples collected from Jenks Creek below that confluence contained detectable concentrations of benzene, toluene, ethyl benzene or xylene (BTEX) compounds. Approximately 245 barrels of free product were recovered using underflow cofferdams, oil absorbent pads and booms, and vacuum trucks with oil-skimming attachments. Therefore, an estimated 495 barrels of free product were calculated to have been "lost" to the environment, such as via volatilization or migration. Aeration units were installed to strip dissolved petroleum hydrocarbon constituents from Peno Creek water below the stock pond. WDEQ continues to monitor the surface and groundwater in this area. Recent WDEQ quarterly reports indicate no evidence of residual groundwater contamination, although some soil excavation will be required. Upon completion of the soil excavation, WDEQ will again perform groundwater sampling to assure that there remains no contamination of this resource.[20]

The second possible pollution source is Conoco's Sheridan Product Terminal, located at the intersection of County Road 342 and U.S. Highway 87 adjacent to Meade Creek in Section 7, T54N, R83W. The site contains six product storage tanks and one evaporation tank. On July 15, 1998, hydrocarbon odors were reported during the drilling of a geotechnical boring at the site. Five groundwater monitoring wells have been installed onsite since then, and one was installed offsite by WDEQ in 2001. Diesel range organics were detected in each of the monitoring wells, and gasoline range organics were detected in one of the monitoring wells. No groundwater analyte levels exceeded Maximum Contaminant Levels (MCLs) for drinking water as established in the Safe Drinking Water Act for both the onsite and offsite wells. Soil and groundwater monitoring continues at this site.

Other potential significant impacts on groundwater quality within the PDCW are the City of Sheridan's municipal landfill and the Eastside Industrial Park. The landfill's eastern boundary is 300 feet west of Prairie Dog Creek, as is the industrial park's eastern boundary.

Other small industrial locations with the potential to impact the watershed's groundwater quality are discussed under Section 2.1.6 (Demographics and Land Use).

An additional possible impact on groundwater quality is the use of re-injection wells utilized by CBM operators as a means of disposal of the water generated during development and/or operation of CBM wells. As of September 4, 2001, there were 30 wells within the PDCW authorized or soon to be authorized by WDEQ for re-injecting CBM water. Their permits authorized reinjection into any one of the following formations:

- Wasatch,
- Ft. Union,
- Lance, and
- Fox Hills.

The future of re-injection may have an important impact on the quantity and quality of water discharged into surface waters within the PDCW, as well as on the groundwater aquifers themselves.[21]

For more specific information on CBM reinjection permits, see Section 2.2.3 (Coal Bed Methane).

#### 2.1.13.4 Onsite Wastewater Disposal Systems

There are approximately 210 permitted onsite wastewater disposal systems in the PDCW as reported by the Sheridan County Engineer's Office.[22] All leach fields that are part of these disposal systems are required to be installed a minimum of 50 feet from any stream or body of water. The system must also be installed a minimum of four feet above the seasonal high groundwater level and no less than six inches from the ground surface.

## 2.2 Water Quality

### 2.2.1 Inventory and Evaluation

#### 2.2.1.1 Sampling and Analysis Plan

A plan for sampling the water quality and flow within Prairie Dog Creek was developed for this study. The parameters selected, the frequency selected, and the location of sampling sites are discussed in more detail below. Thought was given in the development of the plan to making sure that the data collected can be used as a baseline that can be carried forward as the need warrants for additional water quality characterization.

#### 2.2.1.2 Parameters and Frequency

Seven water quality sampling events were performed as part of this study. The first and last samplings were analyzed for the "long list" of constituents shown in Table 2.7, and the other five samplings were analyzed for the "short list" shown in Table 2.8. The sampling dates are included in the tables. The originally scheduled dates were within the months of August, September and October, 2000, and June, July, August and September 2001. The sampling schedule, however, was somewhat altered during the study to include additional data for the non-irrigation season and to compare such data to that collected during the irrigation season.

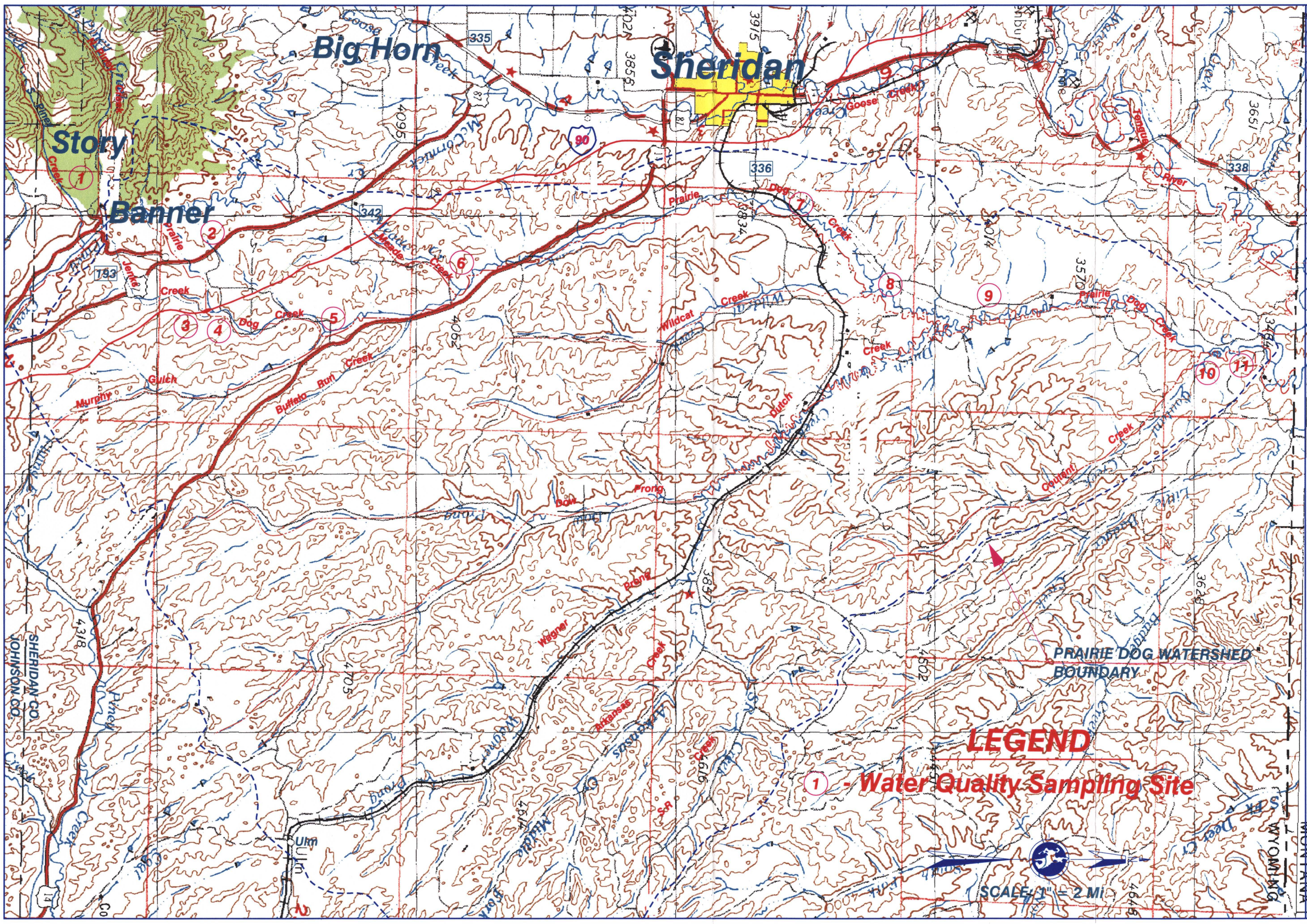
The constituents for whom samples were taken were selected to provide a baseline for potential future impacts to the PDCW. These identifiable future impacts include CBM, agricultural practices, and activities due to man's presence upon the lands. The "short list" was developed as a means to provide comparable data during the non-irrigation season of certain key constituents (such as electrical conductivity, fecal coliform, and turbidity), and do so throughout the entire length of Prairie Dog Creek in order to possibly identify trends as water traversed downstream. The short list could also be performed relatively cost-effectively and thus more frequently.

In addition to the sampling parameters and frequencies chosen for this study, in 1998 WDEQ performed two sampling events on Prairie Dog Creek. This additional data was collected by WDEQ as part of its BURP assessment. While the parameters selected for analysis were not identical, many analytes were the same in both studies. Those analytes are noted in Table 2.7. WDEQ also collected considerable amounts of biological data.

#### 2.2.1.3 Sampling Site Locations

Figure 2-10 and Table 2.10 depict the locations for sites at which samples were collected as part of this study to determine water quality for the analytes itemized in Tables 2.7 and 2.8. Table 2.10 also lists the distances between the sampling sites and their distances downstream of the headwaters of Prairie Dog Creek. These sites were generally selected immediately below locations where tributaries entered Prairie Dog Creek, thereby possibly aiding in a future determination of sources leading to substandard water quality. They also emulated, where possible, the WDEQ sampling sites discussed below.

WDEQ's selected locations for the collection of water quality data along Prairie Dog Creek in 1998 was similar to those in this study, but not identical.




WATER QUALITY SAMPLING SITE LOCATIONS

PRAIRIE DOG WATERSHED MANAGEMENT PLAN WWDC LEVEL I STUDY

EnTech, Inc. Consulting Engineers

DESIGN MM | CHECK DE | DATE 9/2001

PROJECT NO. 00008

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Fig. 2-10

**Table 2.7**
**"Long List" of Water Quality Analytes**
**Sampling Performed 8/2000 and 8/2001**

| Parameter (mg/l unless noted) |
|---|
| Temperature (°C) [1] |
| pH (SU) |
| Electrical Conductivity (micromho/cm) [1] |
| Dissolved Oxygen |
| Turbidity (NTU) [1] |
| Total Settleable Solids |
| Total Dissolved Solids[1] |
| Total Suspended Solids[1] |
| Alkalinity[1] |
| Total Phosphorus |
| (Nitrate + Nitrite)Nitrogen[1] |
| Total Chlorides[1] |
| Sulfate[1] |
| Calcium |
| Magnesium |
| Sodium |
| Potassium |
| Carbonate |
| Bicarbonate |
| Total Iron |
| Total Barium |
| Boron |
| Fecal Coliform (groups/100 ml) |
| Flow (cfs)[1] |

(1) – indicates parameter also sampled by WDEQ

**Table 2.8**
**"Short List" of Water Quality Analytes**
**Sampling Performed 9/2000, 10/2000, 2/2001, 4/2001 & 6/2001**

| Parameters |
|---|
| Temperature (°C) [1] |
| pH (SU) [1] |
| Electrical Conductivity (µmho/cm) |
| Dissolved Oxygen (mg/l) [1] |
| Turbidity (NTU) |
| Fecal Coliform (groups/100ml) |
| Flow (cfs) |

(1) – indicates parameter also sampled by WDEQ

### 2.2.1.4 Possible Influence of Precipitation Events

Precipitation events can oftentimes significantly influence data results. In order to correlate precipitation events with dates of data collection, historical data was obtained from the National Weather Service's three area recording stations:

- Sheridan County Airport;
- Sheridan Field Station #488160 at the University of Wyoming Agricultural Experimentation Station (just south of the Dutch Creek - Prairie Dog Creek confluence); and
- Story.

Table 2.9 provides information on precipitation events recorded on the day of and the two days preceding the dates of water quality sampling. While it is possible that precipitation events within the PDCW could go unrecorded at all of these three recording stations (or vice versa), the data shown in Table 2.9 should be a fairly reliable determination of precipitation events that could potentially influence water quality data results.

**Table 2.9**
**Precipitation Events Recorded During Water Quality Sampling**

| Date Sampled | Precipitation on Sampling Date (inches) | | | Precipitation One Day Before Sampling Date (inches) | | | Precipitation Two Days Before Sampling Date (inches) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Story | Airport | Field Sta. | Story | Airport | Field Sta. | Story | Airport | Field Sta. |
| 8/23/00 | 0.00 | 0.00 | ND | 0.00 | 0.00 | ND | 0.00 | 0.00 | ND |
| 8/25/00 | 0.00 | 0.00 | ND | 0.00 | 0.00 | ND | 0.00 | 0.00 | ND |
| 9/12/00 | 0.00 | 0.00 | 0.00 | 0.05 | 0.01 | 0.04 | 0.00 | T | ND |
| 10/11/00 | 0.00 | 0.15 | 0.00 | 0.00 | T | 0.00 | 0.00 | 0.00 | 0.00 |
| 2/1/01 | 0.54 | 0.00 | 0.06 | T | 0.23 | T | 0.00 | 0.00 | 0.00 |
| 4/26/01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 6/21/01 | 0.00 | 0.00 | 0.00 | 0.16 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 8/16/01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

T - Trace
ND – No Data

As can be seen, with the exception of 0.54 inches recorded on February 1, 2001 and 0.23 inches recorded on January 31, 2001, there were no major precipitation events that would have likely significantly influenced water quality data obtained.

### 2.2.1.5 Methods and Quality Assurance

Technicians from Inter-Mountain Laboratories, Inc. (IML) gathered and analyzed all water samples for this study in accordance with 40 CFR 136, "Guidelines Establishing Test Procedures for Analysis of Pollutants under the Clean Water Act", as amended. In this way, it is believed that this data could be utilized as a baseline for further sampling, and that the protocol utilized would provide for repetition of results during future sampling events. IML's quality assurance/quality control program procedures included calculating anion/cation balances for the first and last samplings' analyses. Calculated balances indicated that the difference between the number of positive (cation) and negative (anion) equivalents were generally within acceptable bounds. For those that weren't within acceptable bounds, it is believed that this can be attributed to the presence of anions that were not analyzed by IML.

In order to relate water quality measured values to the amount of water existing in the stream, IML also performed flow measurements at all times that water quality samples were taken. These measurements were performed using a current meter and measuring cross-sectional area at the sampled location for each event.

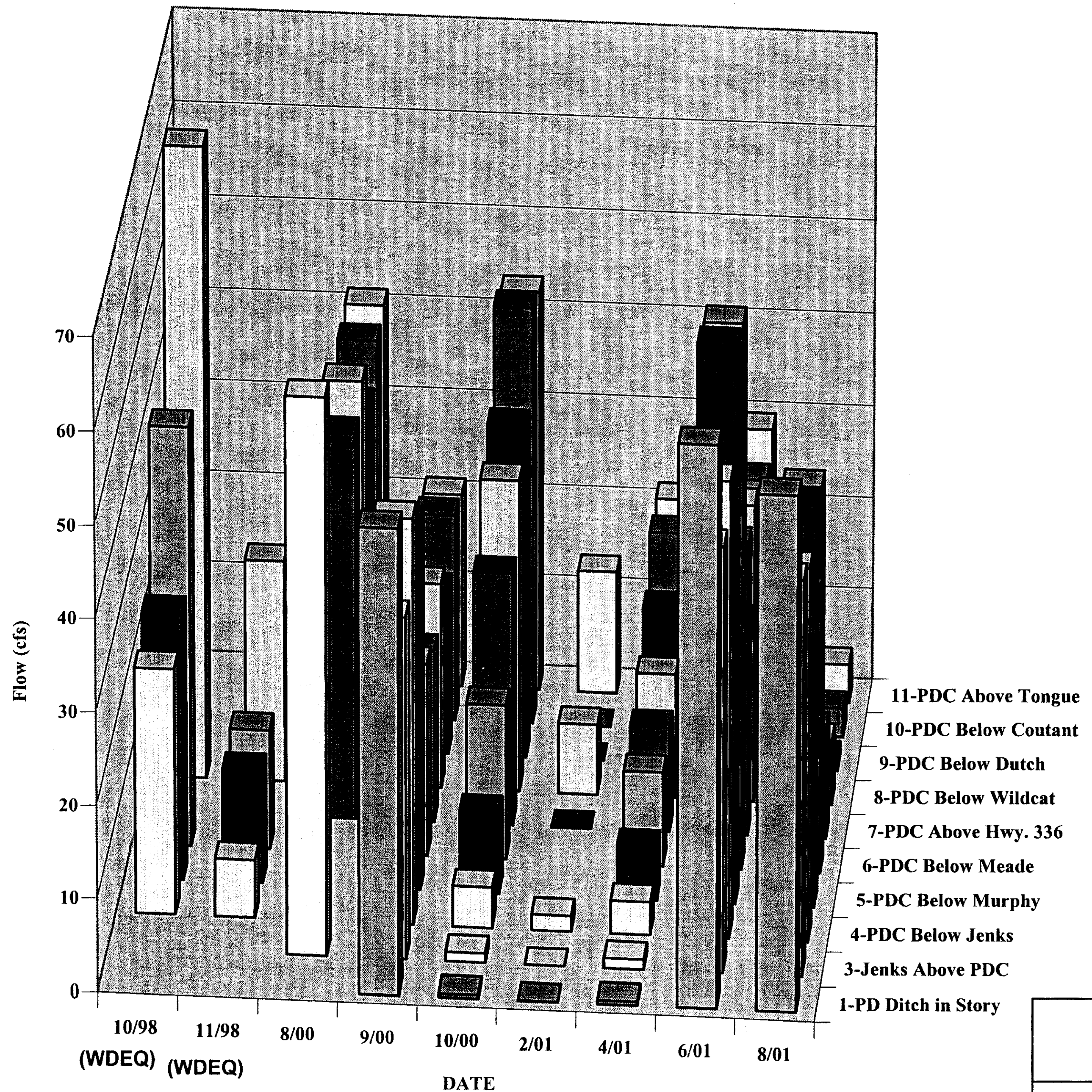
Flow rates measured for the seven sampling events are depicted in Figure 2-11. It is important to note the degree to which Jenks Creek and Prairie Dog Creek are regulated. Flows diverted from the Piney Creek watershed serve to increase flows substantially within these streams; however, the stream records also depict how irrigators divert this water for their agricultural needs.

WDEQ's 1998 testing was performed to be in compliance with Wyoming's "credible data" law, and met all quality control and quality assurance required of that law.

**Table 2.10**
**Locations of Water Quality Sampling Sites**

| Sampling Site No. | Location (1) | Distance Between Sites (miles) | Distance Downstream of Prairie Dog Creek Headwaters (miles) (2) |
|---|---|---|---|
| 1 | Prairie Dog Ditch in Story | | Not Applicable |
| | | 4.9 | |
| 3 | Jenks Ck. Above Prairie Dog Ck. | | Not Applicable |
| | | 0.1 | |
| 2 | Above U.S. Highway 87 | | 4.2 |
| | | 2.1 | |
| 4 | Below Jenks Creek(3) | | 6.3 |
| | | 3.6 | |
| 5 | Below Murphy Gulch(3) | | 9.9 |
| | | 4.3 | |
| 6 | Below Meade Creek(3) | | 14.2 |
| | | 8.8 | |
| 7 | Above State Highway 336 | | 23.0 |
| | | 3.3 | |
| 8 | Below Wildcat Creek(3) | | 26.3 |
| | | 2.7 | |
| 9 | Below Dutch Creek | | 29.0 |
| | | 9.4 | |
| 10 | Below Coutant Creek | | 38.4 |
| | | 2.3 | |
| 11 | At USGS gaging station, approx. 1 mile above confluence w/ Tongue River | | 40.7 |

(1) Sampling Site #1 is located on the Prairie Dog Ditch immediately upstream of the trans-basin diversion of irrigation water from the Piney Creek drainage, through Tunnel Hill, and into Jenks Creek.
Sampling Site #2 is located on Jenks Creek just above the confluence of Jenks Creek and Prairie Dog Creek.
Sampling Site #3 is located on Prairie Dog Creek just upstream of the U.S. Highway 87 crossing, which is approximately 1¼ mile upstream of the point that transbasin irrigation water enters Prairie Dog Creek via Jenks Creek).
All remaining sites are located on Prairie Dog Creek.




**Note: Sampling Point #2 (Prairie Dog Creek above Hwy 87) Not Shown.**

**Figure 2-11**

**Flow vs. Time and Distance Downstream**

(2) Headwaters' starting location is in Section 2, T53N, R84W.

(3) WDEQ sampling site as well. This additional data was originally collected by WDEQ in 1998 as part of its BURP assessment.

### 2.2.2 Results (By Parameter)

Laboratory data sheets containing results of the Prairie Dog Creek water quality monitoring are included in Appendix 2. The appendix includes WDEQ's water quality and biological data. Table 2.11 portrays a summary of the water quality information obtained, depicting the number of times samples were taken and the range of measured values. The range of measured values for all parameters were compared with WDEQ regulatory limits specified in Chapters 1 and 8 of the Wyoming Water Quality Regulations for uses that currently exist for Prairie Dog Creek, and with recommended limits for agricultural uses of water.[4][23][24]

**Table 2.11**
**Results of Water Quality Testing**

| Parameter | No. of Samples Taken | Range of Measured Values (mg/l unless noted) |
|---|---|---|
| Temperature | 77 | (0.6 – 23.1)°C |
| pH | 77 | 6.7 – 8.8 S.U. |
| Electrical Conductivity | 77 | 40 – 1820 μmho/cm |
| Dissolved Oxygen | 77 | 5.6 – 15.3 |
| Turbidity | 77 | 0.35 – 550 NTU |
| Total Settleable Solids | 22 | <0.5 |
| Total Dissolved Solids | 22 | 40 – 1700 |
| Total Suspended Solids | 22 | 5 - 132 |
| Alkalinity | 22 | 14 - 315 |
| Total Phosphorus | 22 | <0.05 – 0.14 |
| Nitrate + Nitrite | 22 | <0.01 – 0.84 |
| Total Chloride | 22 | <1.0 – 4.5 |
| Sulfate | 22 | 1.1 - 865 |
| Calcium | 22 | 5.5 - 154 |
| Magnesium | 22 | 1.4 - 122 |
| Sodium | 22 | 0.8 - 144 |
| Sodium Adsorption Ratio (SAR) | 22 | 0.1 – 2.1 S.U. |
| Potassium | 22 | 0.6 – 10.7 |
| Carbonate | 22 | 0 |
| Bicarbonate | 22 | 17.1 - 384 |
| Total Iron | 22 | <0.05 – 2.67 |
| Total Barium | 22 | <0.05 |
| Boron | 22 | <0.01 – 0.2 |
| Fecal Coliform Bacteria | 77 | 0 – 1100 groups/100ml |

Due to the number of parameters and sampling sites of interest, it is recognized that the amount of data that would be needed to make the results statistically valid was not within the scope of work that could be accomplished as part of this study. Nonetheless, the data collected represents a significant first step in providing some baseline conditions as well as assessing potential water quality problems that may loom within the PDCW. There are also definite trends that are visible in reviewing the data that will be discussed below.

The data suggests that the following parameters warrant possible further investigation.

### 2.2.2.1 Electrical Conductivity and Total Dissolved Solids

Electrical Conductivity (EC) and Total Dissolved Solids (TDS) are often discussed simultaneously due to their interrelationship. EC is a field measurement (measured in micromhos per centimeter, or µmho/cm) of how well water conducts an electrical current. TDS (measured in mg/l) is sometimes referred to as "salinity." Since it is the presence of dissolved solids that enable water to conduct electricity, EC usually correlates linearly with TDS and can be used to fairly accurately determine TDS once the mathematical relationship between the two parameters is determined.

From an irrigation perspective, waters high in EC or TDS can affect crop water availability and irrigation water distribution systems. EC values below 700 µmho/cm have been determined to not negatively impact crops. EC levels between 700 and 3000 µmho/cm, cause "slight to moderate" degrees of restriction on use[25], although WDEQ has placed a limit on CBM-produced waters of 2000 µmho/cm in some areas of the state, which is above all values in this study. There are currently no interstate compact regulations for TDS or EC for the Tongue River (of which Prairie Dog Creek is a tributary) as it flows into Montana.

Figure 2-12 depicts EC data collected for the sample period. Some values are in the 700 – 3,000 µmho/cm range, thus indicating some minor impact upon agricultural operations. Figure 2-13 depicts TDS data, which was collected as part of the "long list" of parameters and thus was taken during only two sampling events. In reviewing the data, some general trends are noted.

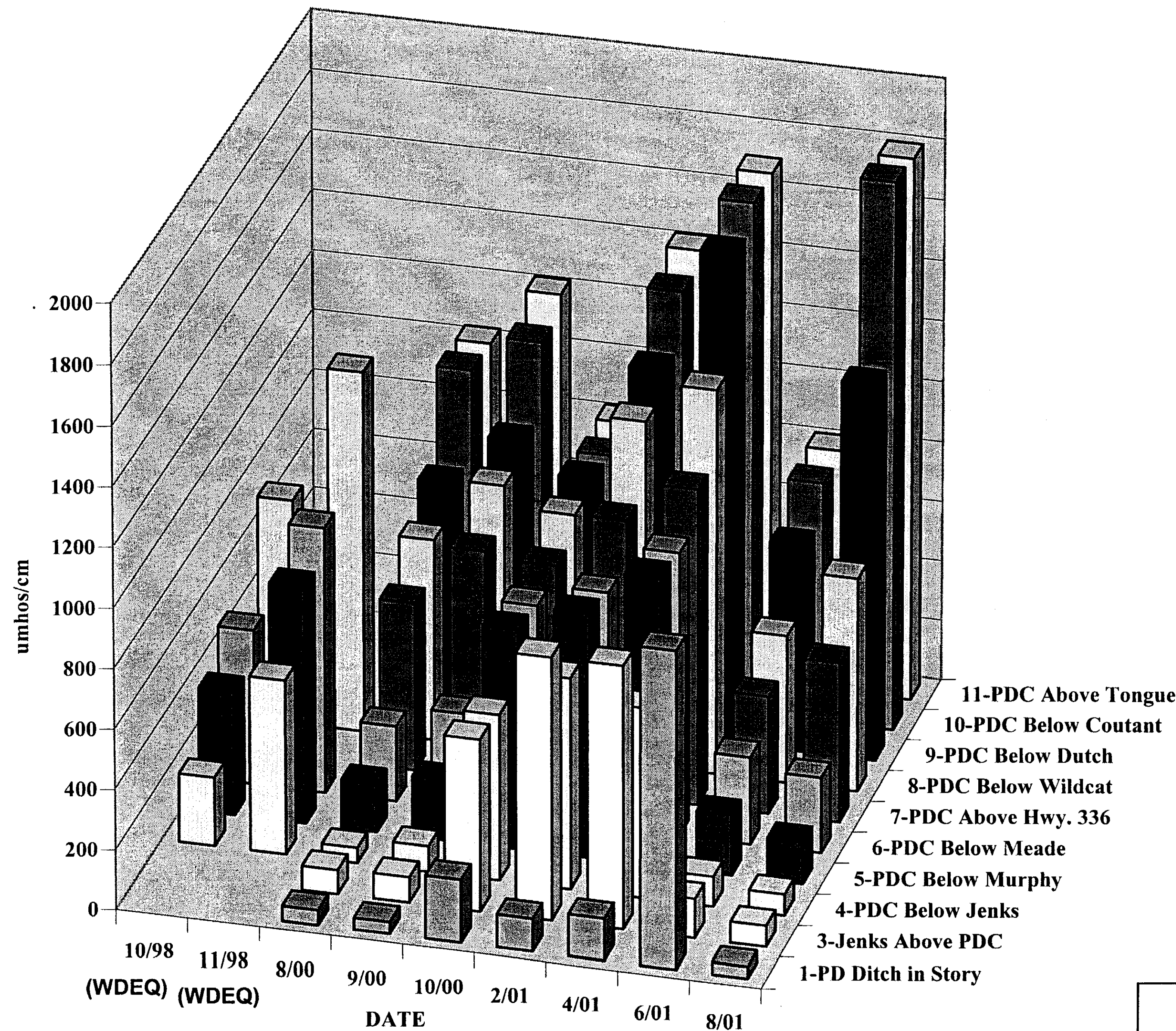
- EC and TDS values generally increase the further downstream the sample is taken. This phenomena holds particularly true during the months of August in both 2000 and 2001, where all values for both EC and TDS increase the further downstream the measurement is tested. Such increases may be due to return flows from irrigated lands.
- EC values appear to be somewhat higher in the winter months. This may be attributable to the transbasin water being of higher quality than that which originates in the PDCW, which would be primarily spring flow or groundwater seepage except for after precipitation events. Additionally, water originating within the PDCW has had more opportunity to leach constituents out of the soils. Still another possible reason includes water quality impacts due to agricultural practices.

### 2.2.2.2 Turbidity

Turbidity is a measurement of water's ability to scatter and/or reflect light. The higher the turbidity value, the more opaque (or less clear) the water. Figure 2-14 depicts turbidity levels measured throughout the study period.

WDEQ classifies Prairie Dog Creek as a Class 2AB stream, cold water fishery. The revised Chapter 1 Water Quality Rules and Regulations state that "in all cold water fisheries and drinking water supplies (classes 1, 2AB, 2A and 2B), the discharge of substances attributable to or influenced by the activities of man shall not be present in quantities which would result in a turbidity increase of more than 10 Nephthelometric Turbidity Units (NTU's)"[4]. However, turbidity can also increase due to naturally flowing streams through certain soil conditions.

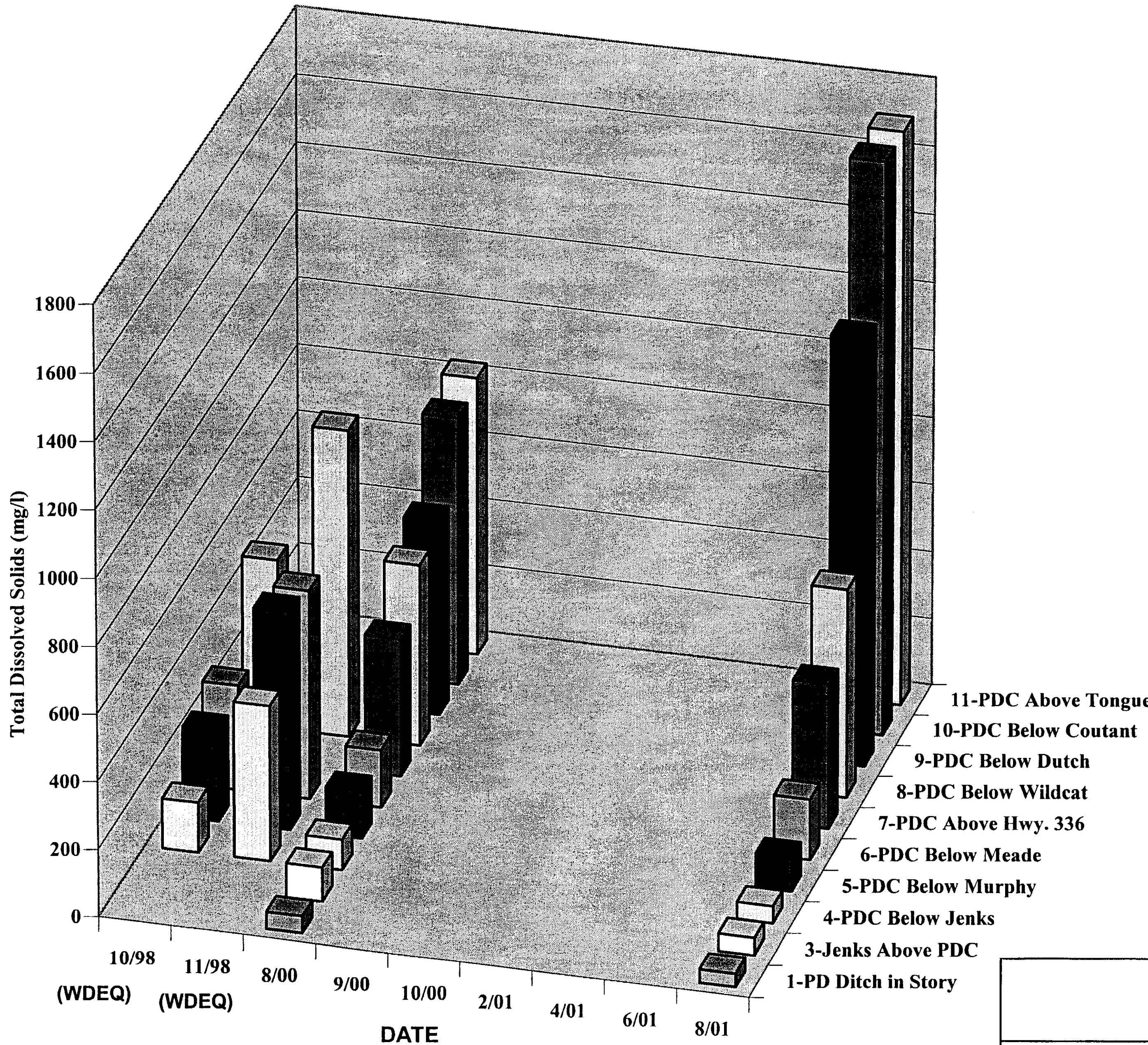
The data appears to reveal the following general trends.




Note: Sampling Point #2 (Prairie Dog Creek above Hwy 87) Not Shown.

Figure 2-12

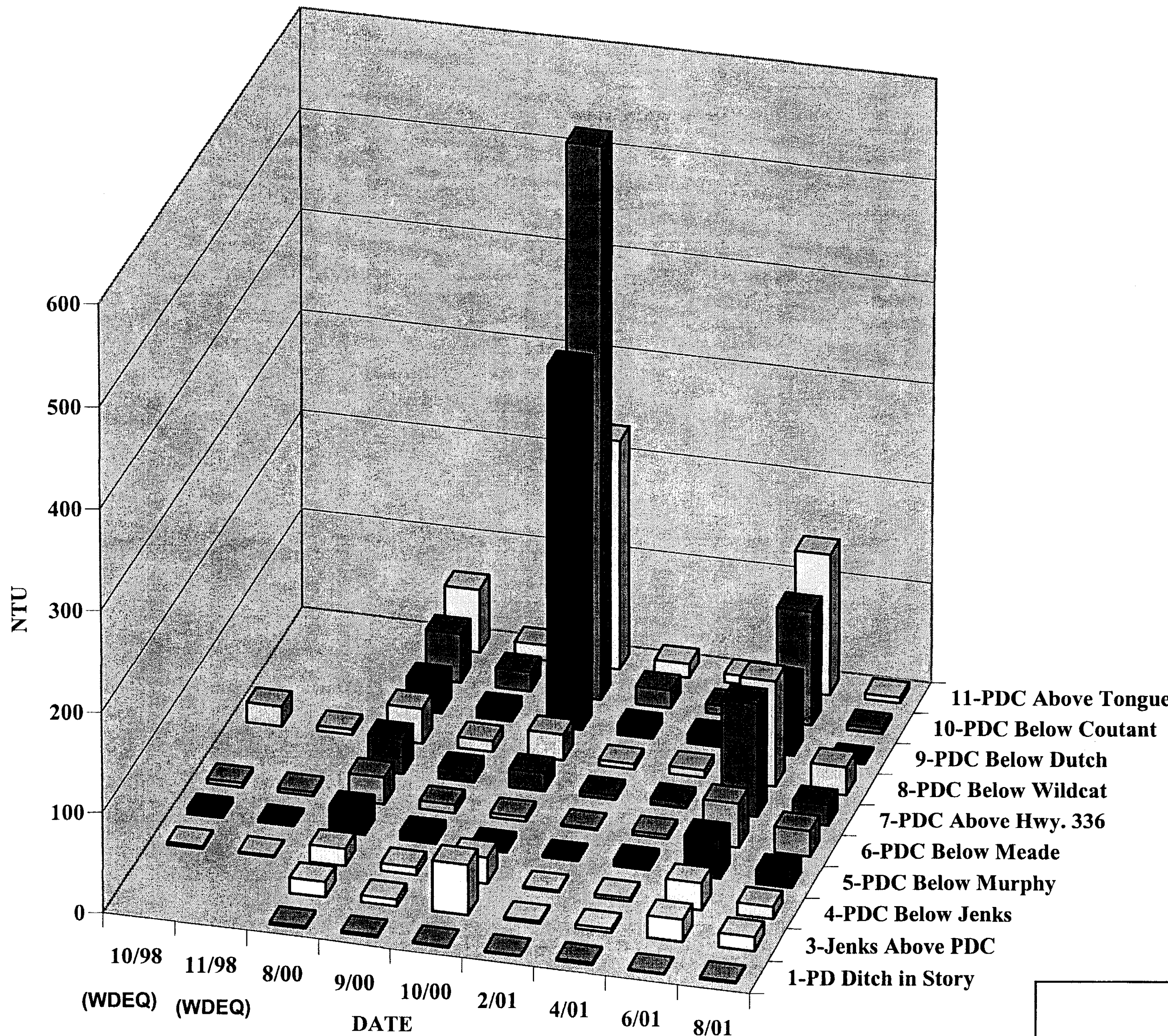
**Electrical Conductivity vs. Time and Distance Downstream**




Note: Sampling Point #2 (Prairie Dog Creek above Hwy 87) Not Shown.

**Figure 2-13**

**Total Dissolved Solids vs. Time and Distance Downstream**




Note: Sampling Point #2 (Prairie Dog Creek above Hwy 87) Not Shown.

**Figure 2-14**

**Turbidity vs. Time and Distance Downstream**

- Turbidity values in all cases were low in the Prairie Dog Ditch in Story, but generally increased the further downstream the sample was taken. Samples taken at Jenks Creek above the Prairie Dog Creek confluence showed increased turbidity levels during the irrigation season when compared to the Prairie Dog Ditch in Story values. However, the increases seen at this location did not always reflect the same level of increase seen at other locations downstream during the same time interval. Thus, while there may be increased turbidity levels due to stream channel erosion occurring through the steep Jenks Creek canyon from Tunnel Hill, there appear to be other factors downstream that are leading to increasing turbidity levels there as well.
- Turbidity values were generally lower in the winter than in the summer.

### 2.2.2.3 Total Suspended Solids (TSS)

Total suspended solids (TSS), as the name implies, is a physical measurement of the amount of suspended matter within the water. While there are no specific standards for TSS in WDEQ's water quality standards in Chapters 1 and 8, elevated TSS levels can be an indication that matter is being conveyed by the stream course, matter that will, with time, settle out to at least some degree.

TSS was measured on two different occasions – both during the irrigation seasons. Figure 2-15 depicts this data, which suggests the following.

- There is a general trend towards increased TSS levels as one moves downstream. However, in August 2001, TSS levels actually decreased markedly between Prairie Dog Creek's confluence with Wildcat Creek and its confluence with Dutch Creek.
- There is a marked increase in TSS levels between the water measured in the Prairie Dog Ditch near Story and that measured just above the Jenks Creek – Prairie Dog Creek confluence. As with turbidity, this may indicate that the erosion occurring through the steep Jenks Creek canyon from Tunnel Hill is causing material to become suspended as the water heads downstream.

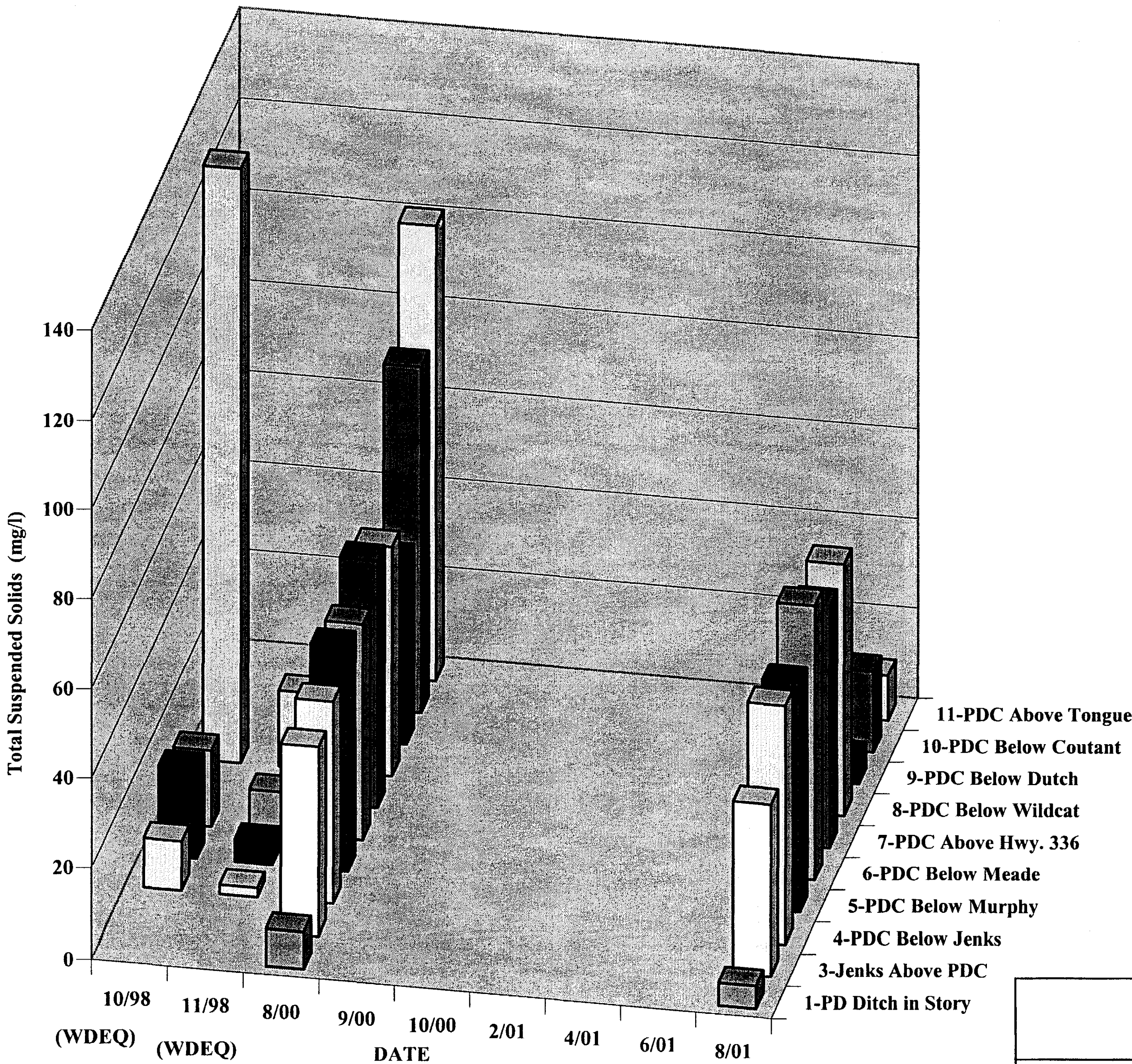
### 2.2.2.4 Sulfate

Chapter 8 of the WDEQ Water Quality Rules and Regulations limits sulfate concentrations for groundwater to be used for agricultural purposes to 200 mg/l. There is no MCL for sulfate established by the U.S. EPA for drinking water, although there is a "maximum contaminant level goal" for sulfate of 500 mg/l.

Figure 2-16 portrays sulfate levels measured as part of this study. As can be seen, the general trend is an increase in sulfate levels as one proceeds downstream. Higher downstream levels could be the result of many factors, including return flow, seepage from groundwater aquifers, or agricultural runoff.

### 2.2.2.5 Sodium Adsorption Ratio

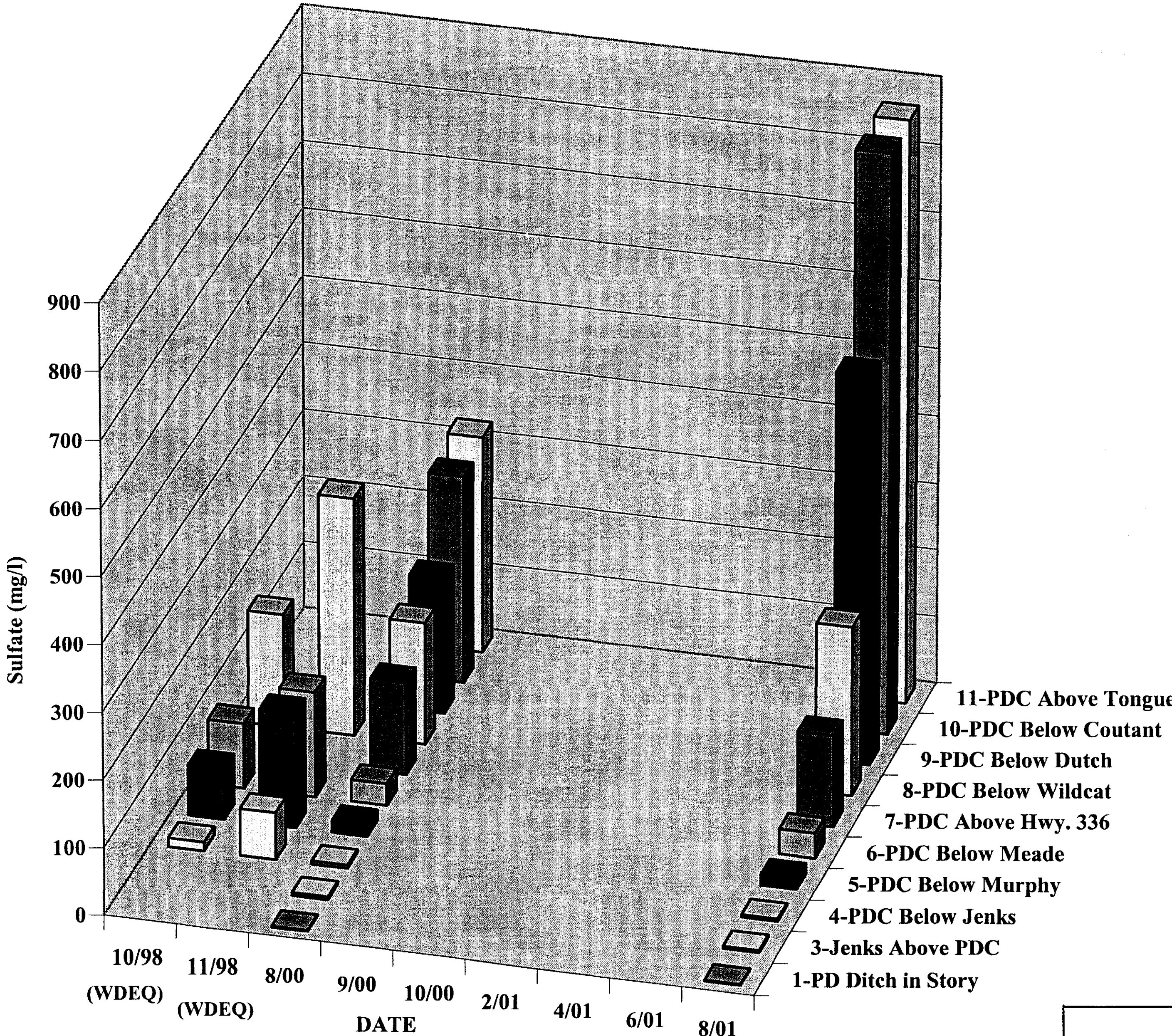
The Sodium Adsorption Ratio (SAR) is a calculated value obtained by comparing the amount of sodium in the water relative to the amount of calcium and magnesium. When sodium levels are relatively higher than calcium and magnesium levels, the SAR value is high, indicating that the sodium ions may adsorb onto soil sites and decrease soil permeability. If calcium and




Note: Sampling Point #2 (Prairie Dog Creek above Hwy 87) Not Shown.

**Figure 2-15**

**Total Suspended Solids vs. Time and Distance Downstream**




Note: Sampling Point #2 (Prairie Dog Creek above Hwy 87) Not Shown.

Figure 2-16

Sulfates vs.
Time and Distance Downstream

magnesium are also available in the water, the SAR value drops, because the calcium and magnesium prevent the sodium from adsorbing onto the soil and lowering water infiltration rates. SAR levels are currently of tremendous interest in the development of CBM in Wyoming and throughout the West.

Acceptable SAR values for agricultural irrigation use have been shown to depend upon the EC of the water and the characteristics of the soil onto which the water is being applied. (USDA reference) WDEQ is currently issuing permits in some areas of the state for CBM discharges that limit SAR and EC discharge values to 10 and 2,000 μmho/cm, respectively. Chapter 8 of the WDEQ water quality regulations for groundwater use for agricultural purposes defines the maximum value for SAR to be 8.[23]

SAR values found in Prairie Dog Creek in conjunction with this study are depicted in Figure 2-17. Measured values are well below the standards referenced above, as the peak value of just over 2 is considerably less than the aforementioned SAR limit of 8. It is important to note, however, that all measured SAR levels in Prairie Dog Creek below its confluence with Dutch Creek indicated substantial increases in 2001 when compared to 2000 levels. This may be related to the flow levels and related lack of "dilution water", as flows in Prairie Dog Creek in this vicinity during the 2001 measurements were substantially less than those measured in 2000.

#### 2.2.2.6 Bicarbonate

Bicarbonate ions occur naturally in combination with calcium and other cations. The bicarbonate anion may adversely affect overhead sprinkling to a slight/moderate degree when values are between 90 and 500 mg/l.[24]

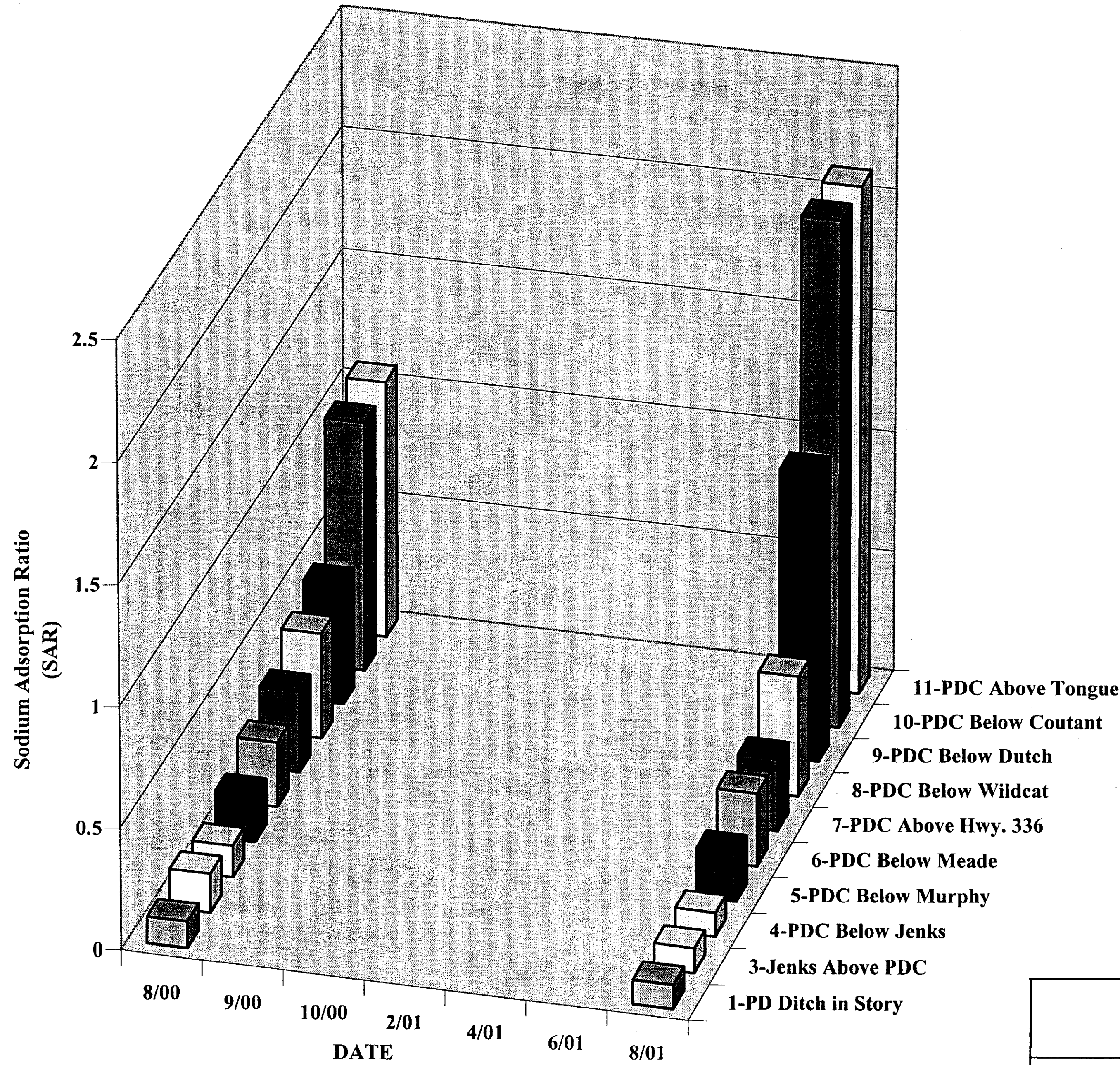
Concentrations in Prairie Dog Creek (see Figure 2-18) showed a steady, fairly uniform increase as one proceeds downstream during both years of measurement. The greatest concentration increases occurred in both years in the reach between Meade Creek and Wildcat Creek. Maximum values exceeded 300 mg/l.

#### 2.2.2.7 Iron

WDEQ regulates iron as a "non-priority pollutant." Chapter 1 of the WDEQ Water Quality Rules and Regulations limits concentrations for iron to 1 mg/l for aquatic life and 0.3 mg/l for human health. Groundwater use for agricultural use as defined in Chapter 8 places a maximum value on iron of 5.0 mg/l.

As with many other constituents, iron shows a general increase the further downstream measurements are taken, with a maximum value of 2.67 mg/l. For agricultural purposes, this should not pose a problem, other than red staining of equipment and structures.

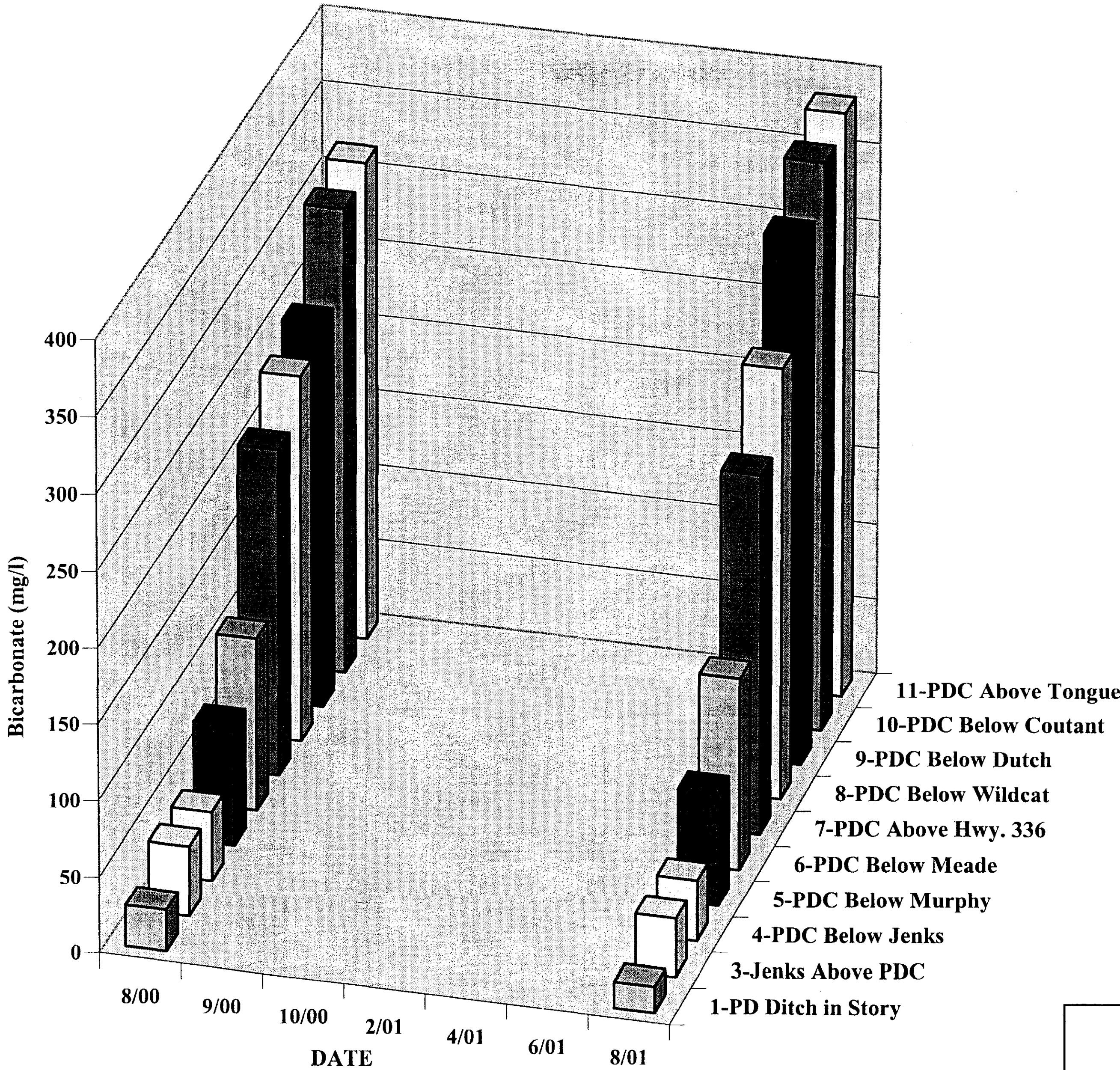
Figure 2-19 depicts measured iron levels in the Prairie Dog Canal. It is noteworthy that iron levels showed a significant increase between the Prairie Dog Ditch in Story sample (Sample #1) and the Jenks Creek-Prairie Dog Creek confluence (Sample #3). This increase could again be due to the erosion occurring and resulting sediment that might be transported in this reach, sediment that may contain iron. By contrast, Prairie Dog Creek just above U.S. Highway 87 (Sample #2) showed iron levels in both 2000 and 2001 to be less than 0.15 mg/l.




Note: Sampling Point #2 (Prairie Dog Creek above Hwy 87) Not Shown.

**Figure 2-17**

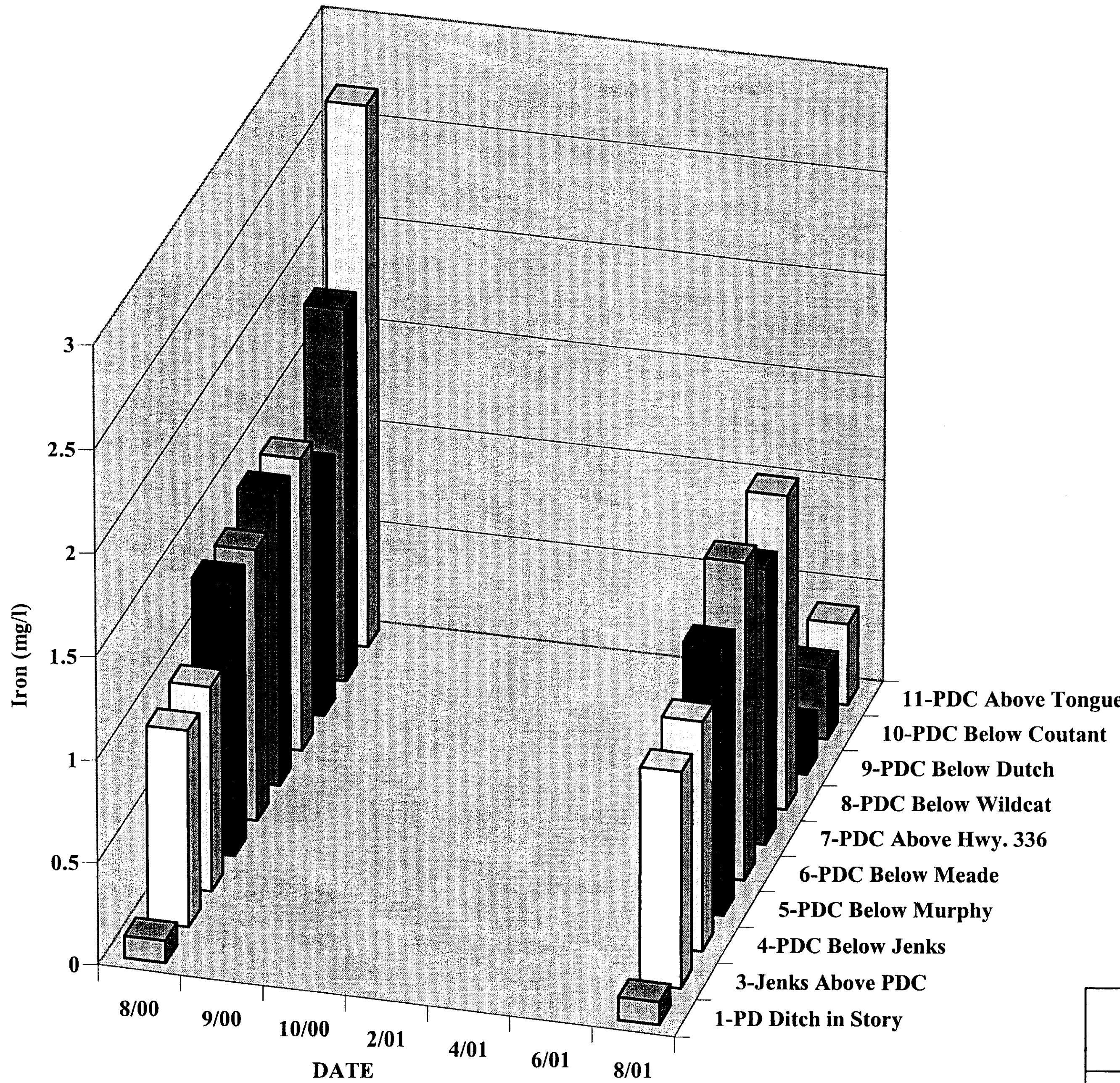
**Sodium Adsorption Ratio (SAR) vs. Time and Distance Downstream**




**Note: Sampling Point #2 (Prairie Dog Creek above Hwy 87) Not Shown.**

**Figure 2-18**

**Bicarbonate vs. Time and Distance Downstream**




Note: Sampling Point #2 (Prairie Dog Creek above Hwy 87) Not Shown.

**Figure 2-19**

**Iron vs. Time and Distance Downstream**

#### 2.2.2.8 Temperature

The data collected is portrayed in Figure 2-20 and depicts the gradual increase in temperature as water flows downstream. The revisions to Chapter 1 of the WDEQ Water Quality Rules and Regulations lowered the water temperature maximum allowable standard from $25.6^{0}C$ to $20^{0}C$. As can be seen, August 2001 data depicts all locations beginning at Site 7 (Prairie Dog Creek above Hwy. 336 crossing) downstream exceeding the $20^{0}C$ value (Site 7 was at $20.2^{0}C$.)

This data appears to reinforce previous opinion that it would be logical to reclassify the downstream portions of Prairie Dog Creek from a Class 2AB cold water stream to a Class 2ABww stream.

#### 2.2.2.9 Fecal Coliform

Fecal coliform (FC) bacteria are indicator organisms for the presence of feces from warm-blooded animals, including humans, livestock and wildlife. WDEQ regulates FC to prevent human contact with disease-causing bacteria, either through public drinking water supplies or through recreational contact with water. For Prairie Dog Creek, WDEQ regulations state that, during the recreational season (May 1 - September 30), the fecal coliform concentration shall not exceed 200 FC groups/100 ml. The concentration level is obtained by calculating the geometric mean of at least five samples, taken on five different days during the course of one month. Of those five or more samples taken in one month, the highest 10% of the values may not exceed 400 FC groups/100ml.

Since WDEQ regulations require that five samples be taken in one month, this data does not conclusively show that waters within Prairie Dog Creek violate the FC standard. However, it does appear that a potential problem may exist, and potential sources warrant further investigation.

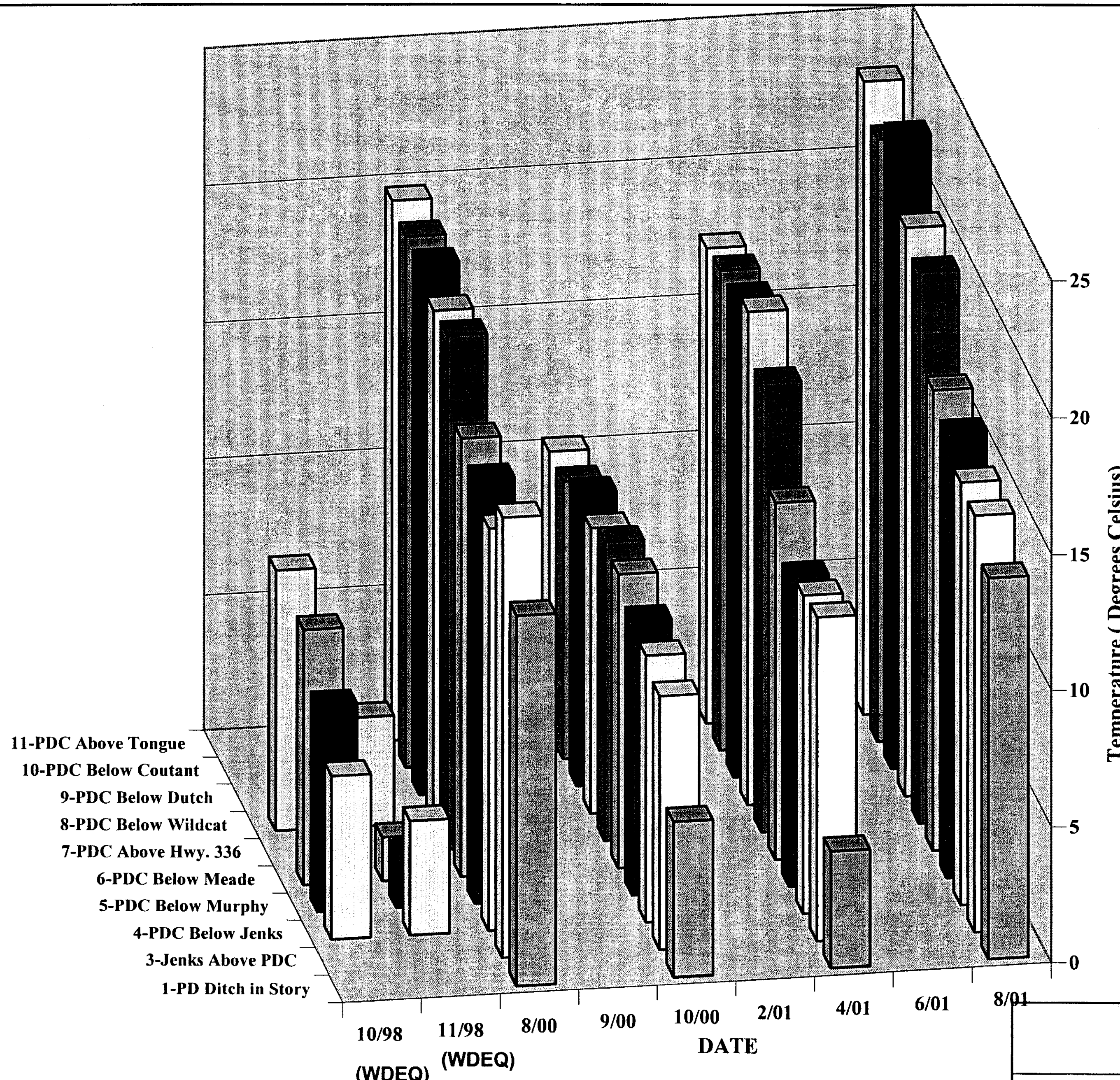
In reviewing the data collected (see Figure 2-21), certain segments of Prairie Dog Creek are shown to exhibit higher FC values than others. General trends portray the following.

- FC levels are as a general rule considerably less during the non-irrigation season than during the irrigation season. This could be a function of the water temperature, as warmer water may be more conducive to bacterial growth than cooler water.
- There were no elevated values for areas along Prairie Dog Creek above U.S. Highway 87. The first significant values appeared below the Prairie Dog Creek – Jenks Creek confluence. Immediately upstream of this confluence is an area of more significant residential development, indicating a possible FC source.
- Values generally increase the further downstream the samples are taken.

### 2.2.3 <u>Coal Bed Methane</u>

#### 2.2.3.1 General

As of September 15, 2001, the Wyoming Oil and Gas Conservation Commission (WO&GCC) had issued 859 permits for CBM wells in the PDCW. Of those wells, 37 had either been abandoned, the wells plugged, or the permits expired, leaving a total of 822 active gas permits.




Note: Sampling Point #2 (Prairie Dog Creek above Hwy 87) Not Shown.
Data for 9/00, 2/01, and 6/01 Not Shown for Clarity.

**Figure 2-20**

**Temperature vs.**
**Time and Distance Downstream**

The majority of these permits have been issued for CBM development in the Lower Prairie Dog Creek area, specifically in Townships 57 and 58 in Range 83.

The WO&GCC also reports that, of the active permits listed above, 207 wells have or are currently producing gas. All but nine of those wells are located in either T57N, R83W, or T58N, R83W. Of the permitted wells located in T58N, R83W, Section 36 contains 34 wells. Due to the 80-acre/coal seam spacing rule of the WO&GCC, this relatively high number of wells per section appears to indicate that multiple seams of the various coal-bearing formations are being developed for CBM.

Figure 2-22 depicts active well locations within the PDCW at the time of this report. To date, the maximum reported monthly production of CBM water in the PDCW was in April of 2001, when 1,907,386 barrels of water was reported produced. A volume of this amount over a 30-day period would equate to a discharge of 4.2 cfs.

There have been concerns expressed about the eventual quantity of water that might be produced from CBM operations in the entire PDCW. Obviously, if approximately 4.2 cfs of water was reportedly produced in April 2001 for the relatively few number of CBM wells developed thus far, such concerns are reasonable. However, due to the fact that the CBM wells have with time produced less water, and due to the fact that CBM wells will be developed with time, it is highly unlikely that flows in Prairie Dog Creek could reach extremely high rates. Actual amounts as of this date are therefore extremely difficult to forecast.

It is reasonable to assume that CBM growth will continue to occur. Coal seams are abundant in the area, and CBM is with time becoming more and more important to the nation as an energy source. Natural gas transmission mains have already been constructed within the PDCW that can convey this energy source to distant markets. The only question that remains is to what extent will this development will impact the overall watershed and its water resources in particular.

### 2.2.3.2 Water Quality Issues

In order for the CBM development companies to develop a gas well, they must receive a permit from the WO&GCC (discussed above), a groundwater permit from the WSEO, and an NPDES discharge or groundwater reinjection permit from the WDEQ. While permits from the first two agencies have been relatively easy to obtain, such has not been the case with WDEQ. Concerns about the quality of water discharged as a byproduct of CBM have arisen from WDEQ, affected landowners, and the downstream State of Montana. Some of the concern stems from reported high SAR values of the produce water, of which some have been reported to be in the vicinity of 25-60. These high values are due in part to the fact that many of the CBM wells have been developed thus far in the PDCW have been to the deeper coal seams of the Fort Union Formation which, because of its depth in this area, has poor water quality associated with it.

Based upon information provided by WDEQ, there have been nine NPDES discharge permits issued in the PDCW, of which only four permits have been issued that allow for surface water discharge of produced CBM water. Of those four permits, apparently only one has a current actual discharge from a CBM well directly into a stream which is tributary to Prairie Dog Creek. This permit (WY0040622, issued to SRW, Inc.) provides for a total of six outfalls and a total of 39 CBM wells, all located in Sections 31 and 32, T54N, R82W. Discharges are into tributaries of Murphy Gulch. The holder of the other three permits, J. M. Huber, has elected to not discharge directly to stream courses despite the fact that it has authorization to do so under the NPDES permits.

All other NPDES permits issued for CBM development have been either for stormwater or do not allow for the water to be discharged to a receiving stream. Those not allowing for direct discharge to a receiving stream require containment of all CBM waters in off-channel reservoirs, or containment of all CBM waters up to the 25-year, 24-hour storm event in on-channel reservoirs. It is likely that this current practice of WDEQ permit issuance will continue.

Some CBM companies have attempted to come up with alternative, innovative means of water disposal. J. M. Huber of Sheridan is currently applying or planning to apply CBM waters to lands within 18 different sections in T57N and T58N of R83W. This company has performed baseline soil sampling within portions of these sections and begun applying the water on both public and private lands. Huber pays for all mechanical equipment to disperse of the water via these means. According to Huber representatives, the water has been applied to existing native grasses and alfalfa hay. No runoff from these land application areas has yet occurred. According to Huber, this program has proven to be very successful, and plans are being made to continue this technique next irrigation season as well.

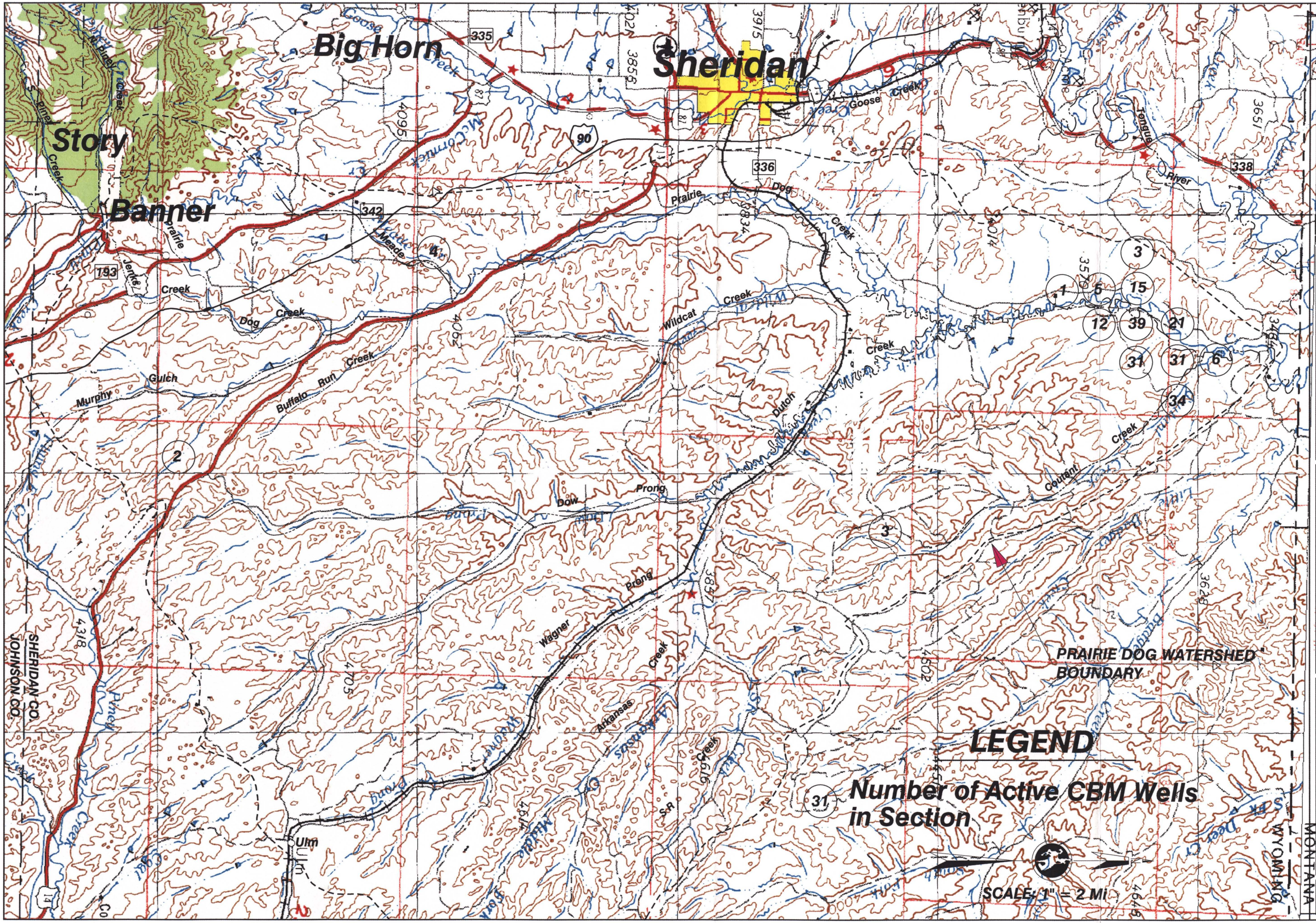
Another alternative means of water disposal is the reinjection of CBM water back into the ground. As of September 4, 2001, there were 30 wells within the PDCW authorized or soon to be authorized by WDEQ for re-injecting CBM water. Their permits authorized reinjection into any one of the following formations:

- Wasatch,
- Ft. Union,
- Lance, and
- Fox Hills.

Of the 30 reinjection permits, applications for 23 of them were submitted by J.M. Huber for their CBM activities in the Lower Prairie Dog Creek area, specifically in Township 57N, Range 83 West. Six applications were submitted by SRW, Inc. in the southeasterly area of the PDCW (Sections 30,31 and 35, T54, R82W). All of these reinjection permits have been developed over the last year, thus there appears to be a movement towards attempting reinjection vs. surface discharge of the CBM waters.

Despite these alternative techniques being investigated and applied, landowners in the Murphy Gulch area have nonetheless remained concerned about the effects of the potential CBM discharge water quality, should surface discharge be increased. Staff gages have been installed in the Murphy Gulch channel (with private citizens taking readings), and water quality samples have apparently been taken by private property owners to determine if currently CBM discharges are impacting water quality at this time. Based upon the SAR levels of the water quality tests taken at this time as part of this study, it appears that there is little current impact.

The BLM, through a contract with the USGS, has recently resurrected streamflow data collection at a gaging station on Prairie Dog Creek located just above the confluence with the Tongue River. Water quality and quantity data is being collected at this site on a regular basis. This data will allow for an evaluation of any changes to the Prairie Dog Creek water quality




ACTIVE CBM WELL LOCATIONS

PRAIRIE DOG WATERSHED MANAGEMENT PLAN WWDC LEVEL I STUDY

| DESIGN | MM |
| --- | --- |
| CHECK | DE |
| DATE | 9/2001 |

PROJECT NO. 00008

| NO. | AMENDMENT | DATE | INT. |
| --- | --- | --- | --- |


EnTech, Inc.
Consulting Engineers
Transportation · Municipal · Environmental · Water Resources
1980 Sugarland Drive, Suite 205
Sheridan, Wyoming 82801
Phone 307-673-1542
Fax 307-673-1547
E-mail entech@fiberpipe.net


Fig. 2-22

$DATES $TIMES $FILES

with time, particularly if surface water discharges are henceforth allowed, or groundwater reinjection activities produce seeping conditions from outcropping aquifers.

The water quality data that has been collected as part of this study should provide a substantial baseline to analyze the water quality and quantity impacts that occur as a result of any future CBM activities.

## 2.3 Channel Morphology

### 2.3.1 Inventory and Evaluation

#### 2.3.1.1 Channel Morphology Concepts

##### 2.3.1.1.1 Channel State

To determine the magnitude, direction, and consequence of channel adjustments for future flows in rivers such as Prairie Dog Creek and its tributaries, it is important to understand their current "state." The state of a river is a reflection of universal laws and constants such as gravity, as well as conditions unique to that location such as climatic history, landscape, watershed management, and direct channel disturbances. Within the context of these conditions, rivers balance erosion, transport and deposition of sediment to create a range of stream channel forms.[26]

Stream channels may be classified by eight variables: width, depth, slope, velocity, discharge, roughness, sediment load and size, and the resulting streamflows and sediment changes. These channel dimensions are directly related to other variables such as those of meander geometry: meander length, radius of curvature and amplitude. For example, in natural streams the meander length is generally 10 to 14 times the bankfull width, and the radius of curvature is 2.4 times the width.[27]

A change in any one of these variables will cause the others to adjust. The strongest variable is the flow of water (discharge). A river's form is determined and maintained by a frequently occurring flow that transports the majority of sediment produced in that watershed over time. The dimensions of a stream are directly related to this typical discharge rate, which is referred to as the "bankfull discharge".[28]

Each stream's particular combination of variables is an integration of the conditions and processes operating in that river system. These variables do not occur in random combinations: the physical and chemical processes that operate in rivers tend to produce certain "most probable forms." Such likely combinations of variables easily lend themselves to classification as specific stream types. The stream classification system developed by D.L. Rosgren sorts rivers into six broad types (A - G) at the large landscape level and breaks those stream types into 41 subtypes based on slope, dominant channel material particle size. Appendix 3 contains illustrations of the basic Rosgen stream classification scheme.

##### 2.3.1.1.2 Stream Channel Stability

Streams are always undergoing changes and making corresponding adjustments in their characteristics. Stream classification enables comparison of stream behavior between sites and has led to the understanding of how different stream types evolve. Since streams of similar types can be expected to behave similarly, the relationships between channel dimensions and stream types provide a way to predict a river's behavior and clarify a stable pattern of change for each stream type.

Given the expected stable pattern of change, it is possible to identify when and where a river's stable patterns have been interrupted by other factors. For example, a braided river tends to increase its width and continue to migrate laterally. To make these adjustments, bank erosion and other physical processes of the channel will be naturally altered over time, therefore a stream exhibiting these behaviors would be behaving in a "natural" and expected manner. Efforts to identify and address perceived channel problems by straightening, re-directing, steepening, and widening channels may lead rivers into instability if those efforts neglect to consider the following natural principles of stream stability.

A stable channel does not significantly change its dimension, pattern, or profile (elevation) during a given climate: the quantity of sediment supplied to the channel is generally balanced by the quantity transported. Stream variables adjust continuously and gradually both through time and along the channel, therefore stream types change gradually with distance downstream. Sharp boundaries between reaches of a stream (such as waterfalls) or in short periods of time are the exception rather than the rule.[26] At Tunnel Hill, location of the three trans-basin irrigation water diversions into Prairie Dog Creek watershed, the augmented flow has caused abrupt boundaries between stream types where the ditches' drop-structures cut the ridge down and back, creating gullies so abrupt as to be waterfalls. These streams continue working toward equilibrium, and this study begins to quantify the nature and direction of the equilibrium process. The gullies found in the upper ends of the irrigation ditches are only one aspect of the change. The channel dimension and pattern also changed, as will be seen by the results in the next section

In a natural stream system, bankfull width and cross sectional area typically increase with distance downstream, because the contributing drainage area increases and the corresponding frequent flows are larger. As described in the following paragraphs, several dynamic processes naturally influence this gradually changing equilibrium, though in some cases they may lead to unusually sharp changes or unstable patterns of change.

Channels are influenced not only by bankfull discharge, but also by naturally occurring higher flows. A natural stream typically experiences flows in excess of its bankfull discharge during two out of every three years. During those higher flows, the river builds several floodplains of varying elevations that are adapted to its current climate and stream types. The floodplains are not occupied at a constant frequency but only during times when flows exceed the bankfull discharge.

Channels are also influenced by natural alluvial events, such as the collapse of a terrace feature. These alluvial processes may change sediment supply and channel pattern. Such events trigger a series of characteristic rapid adjustments in dimension and profile to move the river back toward a dynamic equilibrium.

Channels are even more significantly influenced by climatic changes, since a new climate alters the magnitude and duration of the strongest variable, flow. When the frequent flows (bankfull discharge) change, the pattern, profile and dimensions of the stream channel adjust to maintain the balance between sediment supply and transport.

The trans-basin diversion of Piney Creek irrigation water into the PDCW beginning 115 years ago would be expected to have some of the same effect as a climatic change, because it augmented the total amount of water supplied to the system. If Prairie Dog Creek and its tributaries were behaving as if there had been a climatic change, they would make the same types of adjustments in pattern, profile and dimension.

Finally, channels are influenced by vertical containment (entrenchment). Entrenchment describes a particular relationship between the river and the surrounding valley and landforms. A highly entrenched (incised) river is vertically contained within its channel and has abandoned previous floodplains. Vertical containment is typically the result of a lowered local base level (that is, a decrease in elevation of the channel floor). One method for quantifying vertical containment is the *entrenchment ratio*, which is defined as the flood-prone area width: bankfull width. Flood-prone area width is measured at a height of twice the bankfull depth. The entrenchment ratio is inversely proportional to the amount of entrenchment. A river is generally considered to be entrenched when the ratio is less than 1.4 (with an error margin of 0.2); however, this is not a set limit, as other factors such as width, sinuosity and grade enter into consideration.

#### 2.3.1.1.3 Sediment Transport

Instability typically affects the river and downstream water users by accelerating bank erosion and increasing the sediment supply, even in the presence of normal flow and active depositional features. This additional sediment, primarily from channel-derived sources including bank erosion and bed scour, alters the sediment balance. The river's ability to transport this sediment is a function of streamflow, both in magnitude and duration. When streamflow increases, there is a corresponding increase in stream power. This results in an exponential increase in both transport rate and the size of sediment being transported.[29] Decreased flow has the opposite effect.

If creek instability leads to an increase in the width-to-depth ratio (W/D), the mean depth for a given flow decreases. This lower depth decreases both shear stress and stream power. These decreases add to the stream's instability in that a stream must be able to transport the erosional debris of its watershed in order to be considered as stable. In an "over-width" channel, instability not only creates land loss but also affects flooding. High flows generally cannot flush sediment when the sediment supply is in excess of the sediment transport capacity. Instead, flood flows in an unstable channel further accelerate bank erosion and increase sediment supply and flood hazard.

Conversely, if the W/D ratio decreases, the shear stress and stream power increase, as does the stream's ability to transport sediment. If this change is a result of an increase in water quantity, results can include downcutting and increased entrenchment.

### 2.3.1.2 Methods and Cross-section Locations

In order to determine the current state and stability of Prairie Dog Creek and its tributaries with respect to natural channel forms and patterns, this study initiated a basic inventory of the watershed. A Level I Rosgen Stream Channel Classification approach was utilized to determine basic geomorphic characteristics of the Prairie Dog Creek system.[28]

This channel classification includes permanent stream channel reference sites to establish baseline conditions and provide an accurate basis for measuring changes.

In a Level I inventory, the reference sites are mapped in cross-section to measure key bankfull variables: width, mean depth, maximum depth, cross-sectional area, wetted perimeter and hydraulic radius. This study followed the field techniques outlined by Harrelson, *et. al.* [26] for establishing reference sites and measuring bankfull dimensions at those sites. As described in that reference, bankfull elevation is determined by field indicators including depositional features, vegetation changes, slope breaks, change in particle size, undercuts and stain lines.

Thirty-four cross-section locations, shown in Figure 2-23, were established and mapped in the fall of 2000. The locations were selected by several factors: ease of access, proximity to areas of intense land use, proximity to irrigation structures and diversions, location within representative reaches of the watershed's drainage network, and location with respect to salient geologic features. Six of the cross-section sites were determined to be most representative, and they were mapped again in the late summer of 2001. Reference sites are named by drainage as follows:

| | |
|---|---|
| PDC# | Prairie Dog Creek sites |
| Jenks# | Jenks Creek sites |
| Murphy# | Murphy Creek sites |
| Meade# | Meade Creek sites |
| Dutch# | Dutch Creek sites |
| Cat# | Wildcat Creek sites |

In addition to channel classification and establishment of the 34 permanent cross-section sites, a field investigation of one critical tributary (Jenks Creek) was performed using photos and qualitative descriptions of the channel, vegetation, land use, irrigation systems, and geologic factors. These qualitative field descriptions were also performed at the cross-section sites. This field investigation is included as a part of Appendix 4.

### 2.3.2 Results

Three Level I stream types were found in the PDCW:

- C-type: Low gradient, meandering, point-bar, riffle/pool, alluvial channels with broad well-defined floodplains. Typically associated with broad valleys containing terraces and slight entrenchment.
- $B_C$-type: Steeper than a C-type, riffle dominated with infrequently spaced pools. Associated with moderate entrenchment.
- G-type: Entrenched "gully" step/pool on moderate gradients. Associated with narrow valleys or deeply incised alluvial/colluvial materials such as fans or deltas. Unstable, with grade control problems and high bank erosion rates.

These types represent broad categories, and many variations are present within each category.[29]


FIGURE 2-23
PRAIRIE DOG CREEK
WATERSHED
CROSS SECTION LOCATIONS

| REVISIONS | |
|---|---|
| Date | By |

Steady Stream Hydrology, Inc.
45 E. Loucks
Suite 205
Sheridan, Wyoming
82801
307-674-6010
Fax 307-674-4265

File: PDC18x36 | Drawn By: RAV | Checked By: | Date: 9-5-01 | Scale: 1" = 4000'

### 2.3.2.1 By Cross-section

Appendix 4 contains tabular and graphic data, quantitative summaries, and photographs of the cross-sectional surveys performed within the PDCW for this study. The quantitative summaries focus on the basic stream variables for bankfull conditions. Table 2.12 summarizes these data by cross-section for locations along Prairie Dog Creek, and Table 2.13 summarizes the data for locations along the tributaries. The sites that were mapped twice appear in bold print, with the fall of 2000 data preceding the fall of 2001 data. The sites marked with an asterisk coincide with water quality sampling points.

**Table 2.12**
**Geomorphic Channel Parameters - Prairie Dog Creek**

| Site Name | Bankfull Width (feet) | Bankfull Area (square feet) | Average Bankfull Depth (feet) | Max. Bankfull Depth (feet) | (W/D) Ratio | Entrenchment Ratio | Channel Type |
|---|---|---|---|---|---|---|---|
| PDC1* | 5.50 | 6.46 | 1.18 | 1.67 | 5 | >2.2 | C |
| PDC2 | 10.00 | 14.17 | 1.42 | 2.49 | 7 | >2.2 | C |
| **PDC3** | **30.50/30.50** | **55.63/57.05** | **1.82/1.87** | **3.05/2.72** | **17/16** | **1.8/1.6** | **C/C** |
| PDC4 | 21.50 | 33.18 | 1.54 | 2.21 | 14 | 1.6 | G |
| PDC5 | 15.30 | 26.57 | 1.74 | 2.39 | 9 | >2.2 | C |
| **PDC6** | **19.50/22.70** | **20.01/29.08** | **1.03/1.28** | **1.54/2.09** | **19/18** | **1.3/1.2** | **G/G** |
| **PDC7** | **18.00/17.50** | **39.65/32.00** | **2.20/1.83** | **2.88/2.09** | **8/10** | **1.9/1.9** | **$B_C$/ $B_C$** |
| PDC8* | 17.60 | 41.43 | 2.35 | 3.61 | 7 | >2.2 | C |
| PDC9 | 29.50 | 59.79 | 2.03 | 3.02 | 15 | 1.6 | G |
| PDC10* | 19.00 | 39.41 | 2.07 | 2.33 | 9 | 2.1 | C |
| **PDC11** | **12.50/13.00** | **19.78/17.32** | **1.58/1.33** | **1.95/1.64** | **8/10** | **>2.2/1.9** | **C/ C** |
| PDC12 | 26.00 | 49.87 | 1.92 | 3.27 | 14 | >2.2 | C |
| PDC13 | 26.50 | 56.88 | 2.15 | 3.24 | 12 | >2.2 | C |
| **PDC14** | **20.50/20.00** | **42.95/22.72** | **2.10/1.14** | **2.48/1.91** | **10/11** | **1.7/1.4** | **$B_C$/G** |
| PDC15* | 24.30 | 47.29 | 1.95 | 2.53 | 13 | 2.0 | $B_C$ |
| PDC16 | 23.00 | 52.74 | 2.29 | 3.42 | 10 | >2.2 | C |
| PDC17* | 14.50 | 32.46 | 2.24 | 2.40 | 7 | >2.2 | C |
| PDC18 | 13.00 | 22.75 | 1.75 | 2.84 | 7 | 2.0 | C |
| **PDC19*** | **14.80/15.40** | **44.40/40.80** | **3.00/2.65** | **3.92/3.24** | **5/6** | **1.9/1.8** | **$B_C$ / $B_C$** |
| PDC20 | 16.00 | 39.72 | 2.48 | 3.06 | 7 | >2.2 | C |
| PDC21 | 15.80 | 41.56 | 2.63 | 3.17 | 6 | >2.2 | C |
| PDC22 | 20.00 | 54.76 | 2.74 | 3.45 | 7 | 1.9 | $B_C$ |
| PDC23 | 20.00 | 56.29 | 2.81 | 4.21 | 7 | >2.2 | C |
| PDC24* | 15.40 | 34.61 | 2.25 | 3.07 | 7 | >2.2 | C |
| PDC25* | 20.00 | 33.51 | 1.68 | 1.99 | 12 | 1.8 | C |

* = WATER QUALITY SAMPLING SITES
**BOLD** = TWO YEARS OF DATA (FALL2000/LATE SUMMER2001)

### 2.3.2.2 Prairie Dog Creek

As indicated in Table 2.12, 25 of the cross-sections lie along Prairie Dog Creek. The following discussion of those sites is meant to be read while referring to the cross-section drawings shown in Appendix 4.

The first site (PDC1) is located above U.S. Highway 87, upstream of where the creek receives trans-basin irrigation water from Jenks Creek. This section of Prairie Dog Creek is not part of the Prairie Dog Creek Canal, as reflected in the small bankfull width of 5.5 feet and cross-sectional area of 6.5 square feet ($ft^2$) measured in 2000. The second site, PDC2, is located immediately above the Jenks Creek confluence. The bankfull width here was approximately double (10.0 feet) of that upstream, as was the cross-sectional area (14.2 $ft^2$). The intervening reach contains an increase in drainage area and intense land use including a subdivision and three road crossings. Both of these uppermost sites were type C channels, with healthy width:depth and entrenchment ratios.

Site PD3 is the first site on Prairie Dog Creek located downstream of Jenks Creek. This site was mapped twice. In fall 2000, the data shown increase in stream width (30.5 feet) and area (55.6 $ft^2$) compared to upstream of the confluence, reflecting the irrigation water influx from Jenks Creek (30.7 $ft^2$ cross-sectional area in 2000), as well as intense land use. In fall 2001, the dimensions showed slight trend toward increased entrenchment, but remained basically similar (30.5 feet width, 57.05 $ft^2$ area) as did the ratios and stream classification (C-type).

Site PDC4 lies approximately 0.5 miles downstream of the concrete diversion for the Prairie Dog Lateral #5, which has a 23 $ft^2$ cross-sectional area. The narrower stream width (21.5 feet) and decreased area (33.2 $ft^2$) show an entrenched channel that cannot utilize its flood plain. Field inspection in 2000 showed that the channel was not entrenched upstream of the Prairie Dog Lateral #5 diversion.

The next two survey sites are in areas where the well-vegetated riparian areas showed evidence of sound land management techniques. Site PDC5 lies immediately above the diversion for Prairie Dog Lateral #6 and in 2000 measured 15.3 feet wide with a cross-sectional area of 26.6 $ft^2$. The creek was not entrenched at this location. Site PDC6 lies immediately below the Prairie Dog Lateral #6 diversion, and in 2000, channel dimensions were already greater than those above the diversion (width 19.5 feet, area 20.0 $ft^2$). These dimensions, as well as the cross-section view drawn in Appendix 4, showed the channel was evolving from a C-type, in which the creek is able to utilize a large floodplain, to G-type, in which the creek is unable to escape its entrenched channel and access the floodplain during high flows. Because of the dramatic change between these two sites, the channel slope from downstream of the Prairie Dog Lateral #6 diversion to this site was surveyed and found to be 1.7 %. Such a steep slope is more characteristic of a mountain stream than of a C-type stream in an alluvial valley, thereby adding to channel instability. Based on this information, the site was chosen for re-mapping in 2001. All channel dimensions had increased slightly from the previous year (22.7 feet width, 29.1 $ft^2$ area), and the stream maintained the same gully type channel characteristics. This down-cutting is typical of gully channels.

Site PDC7 lies 0.5 miles downstream of the previous site. This location was selected as an example of the effects of intense land use: Both banks are actively eroding, and the channel is entrenched. In 2000, bankfull width (18.0 feet) and cross-sectional area (39.7 $ft^2$) were double that of the previous site. This location ($B_C$-type channel)is a potential candidate for bank stabilization through construction of natural-type structures and implementation of best management practices (BMP's) for land management. In 2001, the channel depth decreased and the channel filled, probably with the material cut from the gully channel immediately upstream.

Between sites PDC7 and PDC8, the creek undergoes several changes, with contributions from

Pompey Creek, diversion for Prairie Dog Lateral #5A (4 $ft^2$ cross-sectional area), contributions from Murphy Gulch (21 $ft^2$ area in 2000), and the bridge crossing for the county road. Lands surrounding site PDC8 are well vegetated, and the creek is not entrenched, perhaps in part because this land was unused for several years before its recent sale, as well as because the valley widens in this section. Although the bankfull dimensions were still relatively large (17.6 feet width, 41.4 $ft^2$ area), when considered together with the creek channel cross-section shape and the field observations, they show a stream in transition from an over-wide C-type channel to a more stable C-type, which could eventually transition into a meandering E-type stream. This site is immediately upstream of the take-out for Prairie Dog Lateral #7.

Sites PDC9 and PDC10 are located near Meade Creek about four miles downstream from PDC8. Between PDC8 and PDC9, the following activities most likely impact the channel: take-outs for Prairie Dog Lateral #7 (8 $ft^2$ area), Prairie Dog Lateral #7A (1.6 $ft^2$ area) and Prairie Dog Lateral #8 (2.8 $ft^2$ area); contributions from Buffalo Run Creek; and the County Road 131 bridge across Prairie Dog Creek. In 2000, cross-section site PDC9, which is upstream of Meade Creek and immediately downstream of the County Road 131 bridge, measured 29.5 feet wide at bankfull and had a cross-sectional bankfull area of 59.8 $ft^2$. The dimensions and cross-sectional shape show a G-type channel, which may be due to effects from the take-outs (which total 12.4 $ft^2$ area), their associated return flows, and the bridge. During construction of the bridge, it is possible that the creek was widened and straightened along this section.

Downstream of Meade Creek, PDC10 was less entrenched with a ratio of 2.1. Bankfull width was 19.0 feet and the cross-sectional area was 39.4 $ft^2$. This site had little vegetation and showed evidence of intense management impacts including use as a livestock crossing. However, the cross-section shows that because the channel has an active floodplain, it is not highly entrenched. Like the next four sites, the river in this location has a C-type channel.

Bankfull width and cross-sectional area continue to decrease in this reach as the creek moves downstream. In 2000, site PDC11 had a bankfull width of 12.5 feet and an area of 19.8 $ft^2$. The decreased cross-sectional area is probably due to the outflows to intervening irrigation diversions for Prairie Dog Lateral #9 (5 $ft^2$ area) and Nine Mile Ditch (Prairie Dog Lateral #10: 16.7 $ft^2$ area). Other potential impacts are the U.S. Highway 14 crossing and return flows from the two laterals. In 2001, the bankfull width barely changed from the previous year (13.00 feet), but depth decreased, so the area decreased to 17.32 $ft^2$ . It is not possible to determine the source or cause of this filling from the data available. Perhaps, as in site PDC7, there is down-cutting upstream that is depositing at this location. The channel remained a C-type, still able to utilize its floodplain.

Downstream of PDC11, the Prairie Dog Creek valley begins to broaden. In this section, the creek flows through a wide corridor of lands irrigated by the PDWSC lateral ditches. By the time the creek reaches site PDC12, all of Prairie Dog Lateral #9 return flows have entered the creek, as well as almost half of Prairie Dog Lateral #10's return flows. The 2000 data show the creek has a wider bankfull channel (26.0 feet) and larger cross-sectional area (49.9 $ft^2$). Land use techniques at this site are sound, and the riparian areas are well vegetated. The channel at this site is only slightly entrenched and has access to a limited floodplain.

The valley continues to widen as the creek moves downstream, and its large cross-sectional areas at the next four sites are probably due in part to the effects of return flow. Buffalo Run Creek flows into Prairie Dog Creek, and together they cross another road before reaching site PDC13, which had a width of 26.5 feet and an area of 56.9 $ft^2$ in 2000. The river remained a C-type channel at this location, with a healthy entrenchment ratio of more than 2.2.

Site PDC14 is immediately upstream of the first County Road 1211 bridge across Prairie Dog Creek. The Prairie Dog Lateral #11 diversion (7.5 $ft^2$ area) is upstream of this site. In 2000, bankfull width was 20.5 feet, the cross-sectional area decreased (compared to the previous site) to 43.0 $ft^2$, probably due to increased water diversion. The entrenchment ratio and cross-section view show a $B_C$-type channel. In 2001, the width was almost the same (20.0 feet), while the cross-sectional area decreased further to 22.7 $ft^2$. The W/D ratio increased to 11, and the entrenchment ratio dropped to 1.4, moving this site into a G-type classification. The entrenchment at this site is from a combination of intense land use and irrigation impacts, as well as geology since the valley begins to narrow slightly in this area.

The next two sites had dimensions similar to the previous site in 2000. Site PDC15 (24.3 feet width, 47.3 $ft^2$ area) is located after the second County Road 1211 bridge crossing, immediately upstream of the railroad track crossing. The creek crosses under the railway, State Highway 336 and County Road 1211 (for the third time) before reaching site PDC16 (23.0 feet width, 52.7 $ft^2$ area). The ratios for these locations indicate $B_C$ and C-type channels, respectively. By this point, all of the return flow from Prairie Dog Lateral #11, and almost half of that from Prairie Dog Lateral # 11-1, have probably re-entered the main channel. Prairie Dog Lateral #13 (12 $ft^2$) diverts water out of the creek upstream of this site as does Prairie Dog Lateral #12 (4 $ft^2$), though most of the latter's flow has been returned to the creek in this same reach.

The next two sites were also C-type channels, but with smaller dimensions. At site PDC17, the 2000 data show a width of 14.5 feet and an area of 32.5 $ft^2$. This location is downstream of Wildcat Creek (averaging approximately 10 $ft^2$ in cross-sectional area at its outlet). At site PDC18, bankfull width was 13.0 feet and bankfull cross-sectional area was 22.8 $ft^2$.

Although the 2000 width (14.8 feet) remained nearly the same downstream at site PDC19, the cross-sectional area increased significantly (44.4 $ft^2$). The 2001 results were similar (15.4 feet width, 40.8 $ft^2$ area). As with some of the other 2001 sites, the channel depth decreased, and this fill decreased the cross-sectional area to some degree, although the channel type remained the same. The creek is somewhat entrenched ($B_C$-type channel) and not fully able to utilize its floodplain in this reach, in large part due to geologic features (terrace interfaces). In addition, the cross-sectional area has probably been impacted by the diversion of water from Prairie Dog Creek into Prairie Dog Lateral #14 (6 $ft^2$ cross-sectional area), the inflow of Dutch Creek (approximately 20-30 $ft^2$ area), and return flows from Prairie Dog Lateral #13 and Prairie Dog Lateral #14.

Site PDC20 became less entrenched than the previous site according to the 2000 data (16.0 feet width, 39.7 $ft^2$ area). The creek returned to a C-type channel containing a floodplain within a larger gully feature, as did site PDC21, which is located on a steeply eroded meander. The latter site (15.8 feet width, 41.6 $ft^2$ area) is a good example of a channel that has undergone abrupt changes due to natural fluvial events. The channel walls appear to be undergoing accelerated erosion, but actually the process is a natural result of lateral movement against a high terrace. Only a small percentage of the meander length is actively contributing sediment to the channel. The majority of the meander is beginning to stabilize and re-vegetate along the high terrace.

Sites PDC22 and PDC23 both had a bankfull width of 20.0 feet and similar cross-sectional areas (54.8 and 56.3 $ft^2$, respectively) in 2000. The first location, PDC22, is immediately downstream of a new bridge built across Prairie Dog Creek by a CBM operator. The creek was slightly more entrenched than the previous site, primarily due to the geology and past climate regimes. Upstream of here, the creek has many potential sources of impact: the diversion for Prairie Dog Lateral #15 (1.3 $ft^2$ area), return flows from Prairie Dog Lateral #14, several new CBM road crossings (typically with culverts) and pipeline crossings, and inflows from Bar N Draw.

Site PDC23 lies adjacent to a CBM well. Between this site and the previous one, Ash Draw flows into Prairie Dog Creek. The 2000 graphical data (Appendix 4) showed this site to be a C-type channel, less entrenched than PDC22. Both sections of creek may be "gaining" streams that are being augmented by groundwater base flow because of the narrowing valley.

Downstream approximately 1.3 miles, site PDC24 lies below the confluence of Prairie Dog and Coutant Creeks. Although Coutant Creek undoubtedly influenced the historical development of the Prairie Dog Creek channel, it is currently dammed in numerous locations by CBM development and stock reservoirs. These dams make it unlikely that Coutant Creek's natural flow will enter Prairie Dog Creek. In 2000, site PDC24 had dimensions (15.4 feet width, 34.6 $ft^2$ cross-sectional area) were smaller than the previous four sites, and the channel remained a C-type. It is likely that this site, as well as the areas downstream of here, have a more direct hydraulic connection with the Tongue River. Increased flows in the creek can travel through the buried delta material toward the Tongue River as groundwater base flow.

The final reference site, PDC25, lies approximately 100 feet downstream of the USGS stream gaging station, on state land. The channel (20.0 feet width, 33.5 $ft^2$ area in 2000) is a C-type with an active floodplain. As at site PDC24, the creek is directly affected by its hydraulic connection with the Tongue River.

### 2.3.2.3 Tributaries

The tributary data are from fall 2000 and appear in Table 2.13.

**Table 2.13**
**Geomorphic Channel Parameters - Prairie Dog Creek Tributaries**

| Site Name | Bankfull Width (feet) | Bankfull Area (square feet) | Average Bankfull Depth (feet) | Max. Bankfull Depth (feet) | (W/D) Ratio | Entrenchment Ratio | Channel Type |
|---|---|---|---|---|---|---|---|
| Jenks1* | 18.50 | 30.74 | 1.66 | 1.98 | 11 | 1.7 | $B_C$ |
| Murphy1 | 18.50 | 20.76 | 1.12 | 2.89 | 17 | >2.2 | C |
| Murphy2 | 10.00 | 13.79 | 1.38 | 2.53 | 7 | 2.2 | C |
| Murphy3 | 6.60 | 7.04 | 1.07 | 1.87 | 6 | 2.0 | $B_C$ |
| Meade1 | 16.50 | 22.17 | 1.34 | 3.29 | 12 | 2.2 | C |
| Meade2 | 12.50 | 13.11 | 1.05 | 1.59 | 12 | 1.7 | $B_C$ |
| Dutch1 | 30.00 | 49.10 | 1.64 | 2.71 | 18 | 2.2 | C |
| Dutch2 | 8.50 | 18.47 | 2.17 | 2.48 | 4 | 2.2 | C |
| Cat1 | 6.00 | 10.52 | 1.75 | 2.37 | 3 | 2.2 | C |

* = WATER QUALITY SAMPLING SITE

*Jenks Creek*
Jenks Creek carries PDWSC's irrigation water from Piney Creek to Prairie Dog Creek. Its dimensions immediately above Prairie Dog Creek (18.5 feet width, 30.7 $ft^2$ area) show a $B_C$-type channel. The creek is moderately entrenched and is occasionally able to utilize portions of its floodplain.

Due to the importance of this tributary's effect on Prairie Dog Creek, a field investigation was performed along the upper reaches of Jenks Creek. The photos and a summary of observations are included as part of Appendix 4.

*Murphy Gulch*
Fall 2000 data for three cross-sections in Murphy Gulch indicate stable C and $B_C$ channels that increase in cross-sectional area with distance downstream (Murphy3 is the most upstream site). This pattern as well as the size of the channels are indicative of streams operating in a more natural process than Prairie Dog Creek, or, in other words, without augmented flow. The most downstream site, near the confluence with Prairie Dog Creek, indicates by its cross-sectional area that Murphy Gulch's bankfull discharge contributes 21 $ft^2$ to Prairie Dog Creek.

*Meade Creek*
Two cross-sections were mapped in Meade Creek, and they exhibit the same pattern found in Murphy Gulch: C- and $B_C$-type channels, little entrenchment and cross-sectional area increasing downstream. The most downstream location indicates that Meade Creek can contribute 22 $ft^2$ of cross-sectional area to Prairie Dog Creek during bankfull discharge.

*Dutch Creek*
Sites Dutch1 and Dutch 2 indicate that this tributary has the largest cross-sectional area (49 $ft^2$ at the downstream site). Ratios and channel types are similar to the other natural tributaries (C-type).

*Wildcat Creek*
Commonly referred to as Cat Creek, this tributary contains one cross-section location. Site Cat1 (6.0 feet width, 10.5 $ft^2$ area) is a C-type channel with healthy entrenchment and W/D ratios.

#### 2.3.2.4 By Reach

The cross-sections in Table 2.12 may be organized into four distinct channel reaches characterized by unique channel morphology and geologic characteristics. These channel reaches can be identified when viewing Figure 2-23.

**Reach #1** contains the upper-most areas of the watershed and consists of **natural high order stream channels, before the introduction of the irrigation water** (Sites PDC1 – PDC2). High order streams are first- and second-order channels that are the headwaters for their basin and receive little or no contributing flow from tributaries. These channels are typically high gradient A and B type channels: steep, entrenched to moderately entrenched, step/pool streams. Reach #1 typically is dominated by structural relief: steep ridges between narrow, gently sloping valleys. Prairie Dog Creek before the introduction of irrigation water and the upper reaches of the non-augmented tributaries are examples of these channels.

**Reach #2** contains areas where **irrigation water inflows and diversions, as well as other particular land uses, strongly affect the channel characteristics** (Sites PDC3 – PDC11, Jenks1). In those sections of the creek where land management techniques are sound and vegetation is thriving, the reach is typically characterized by C-type channels with well-developed and accessible flood plains. In reaches below irrigation diversion structures and adjacent to intense land use, the C-type channels are evolving into more entrenched C-type channels and, as showed by the 2001 data, into G-type gullies in some cases. As a result, channel dimensions in this reach vary from site to site. Reach #2 sites include Jenks Creek and Prairie Dog Creek from the confluence of Jenks Creek to below the U.S. Highway 14 crossing.

**Reach #3** consists of a **wide, irrigated valley flanking the more consistently canal-like channel** of Prairie Dog Creek (Sites PDC14 – PDC16). This reach extends from a distance below U.S. Highway 14 to upstream of Prairie Dog Creek's confluence with Wildcat Creek. In this wide valley, the land uses, irrigation diversions, and geology create some variation in the degree of entrenchment. The open valley allows for a wide, active floodplain in areas where the channel has not become entrenched. The channel width (average 24 feet) and cross-sectional area (average 49 $ft^2$) are relatively large in this reach, probably due to return flows from the adjacent irrigated lands as well as any entrenchment.

**Reach #4** includes Prairie Dog Creek along Lower Prairie Dog Creek Road (County Road 1211), beginning with its confluence with Wildcat Creek (site PDC17) to its convergence with Tongue River (site PDC25). In this reach, the channel is more consistently in danger of becoming entrenched, in part this **danger of entrenchment is caused by natural geologic controls** as well as by Prairie Dog Creek's adjustment to the new "climate" created by the trans-basin diversion of irrigation water. Channel bankfull widths (average 16.6 feet) and cross-sectional area (average 40 $ft^2$) are less than in Reach #3. These dimensions are relatively consistent in the beginning of this reach (through site PDC21).

Sites PDC22 and PDC23 (between Bar N Draw and Coutant Creek) could be called **Reach #4A**, for this section of the creek has larger dimensions (averaging 20 feet width and 55.5 $ft^2$ area) than the rest of Reach #4. It could be that either return flows from Prairie Dog laterals or a positive groundwater base flow are supplementing the creek's flows and making this sub-reach act like **a "gaining" stream**. In this way, Reach #4A resembles Reach #3, and in fact the average dimensions are similar.

The final two sites could also be considered a sub-reach. **Reach #4B**, containing sites PDC24 and PDC25, have a more **direct hydraulic connection with the Tongue River**. Water from the creek can flow toward the Tongue River as groundwater base flow. Bankfull dimensions here are smaller (average 17.5 feet width and 33.8 $ft^2$ area) and the creek's floodplain is well developed and easily available.

### 2.3.2.5 Cumulative

The cross-sectional data reveals a significant result: Prairie Dog Creek's bankfull discharge and cross-sectional area are relatively consistent for its entire length. The average bankfull width is 19.7 feet and the average bankfull cross-sectional area is 37.9 $ft^2$. This consistency in bankfull area is not typical of a natural stream, which increases in area and changes stream types gradually as it moves downstream, and the contributing drainage area increases cumulatively. Rather, the results are those expected of a system dominated by a regulated, relatively constant, supply of water. In other words, Prairie Dog Creek's channel pattern, profile and dimension are most significantly affected by the irrigation flows through the trans-basin diversions. The effects of precipitation and runoff from the contributing watershed area then result in changes more typically associated with flood flows. Prairie Dog Creek could, in this way, be seen as behaving more like an irrigation canal than a natural stream. This finding is in keeping with the original irrigators' plans for this stream, as described in the 1893-4 Biennial Report of the State Engineer, which states that Prairie Dog Creek functions as the primary canal for the PDWSC with laterals and return flow exiting and entering the creek as they normally would a main canal.[30]

The consistency of channel characteristics throughout the creek's length probably indicates that the creek has completed most of its initial adjustment to the "climatic change" scenario that was created by flow augmentation 115 years ago. When the trans-basin diversions of Piney Creek irrigation water into the PDCW were first constructed, it is likely that Prairie Dog Creek had a more typical continuum of stream types and channel dimension changes along its length: less width and cross-sectional area in the upper reaches and increased width and area downstream. That this typical pattern is found in the tributaries (which do not receive augmented flow) supports this supposition. During the transitional years, the channel made adjustments in pattern, profile and dimension, some changes were probably abrupt: sudden erosion along channel walls, increased flooding, large active depositional features and head-cutting.

The obvious exceptions to this conclusion that the adjustment to augmented flow is complete are the three gullies located at the trans-basin diversion sites along Tunnel Hill. In these locations, the augmented flow has caused abrupt boundaries between stream types where the ditches' drop-structures cut the ridge down and back from their original locations which are documented in photos in the 1894 State Engineer's Report.[30] The cuts created gullies so abrupt as to be waterfalls. These streams continue working toward equilibrium. The PDWSC trans-basin drop into Jenks Creek has been remediated, though the second drop upstream of Prairie Dog Lateral #2 has not. The last part of Appendix 4 contains the results of a qualitative field investigation of Jenks Creek in this area, concluding that some artificial and natural narrowing of channel bottoms continues to contribute to channel instability. Neither of the other two ditches' (PCCDC and MCDC) drops have been stabilized, and it is in these ditches' conveyance system that gullies are found in the upper ends of the irrigation ditches and active deposition of sand has been noted during field investigations. This study did not survey cross-sections in the PCCDC or MCDC ditch systems, so it is not possible to evaluate conclusively their channel adjustments to the irrigation water flows.

The new surface water discharges expected from CBM well development may be expected to create yet another "climatic change" (flow augmentation) for the PDCW. Stream reaches immediately downstream of the new flows may experience down-cutting similar to that found below the Tunnel Hill trans-basin diversions. It is likely that the down-cutting adjustment in channel profile would also include areas of lateral channel migration and bank erosion similar to those processes documented along Prairie Dog Creek over the last 100 years. The data provided by this study establishes some baseline to which those effects can be compared in Prairie Dog Creek itself as well as in the tributaries, where much CBM development is occurring and where no previous flow augmentation has occurred.

# 3. WATERSHED MANAGEMENT AND IRRIGATION SYSTEM REHABILITATION PLAN

## 3.1 Analysis of Current Conditions and Problem Areas

Chapter 2 of this study provided a detailed review of the current conditions within the PDCW. In reviewing these current conditions, it can be concluded that the PDCW is in relatively good shape with respect to overall water quality and stream morphology. There are no catastrophic problems that loom as a threat to the watershed's existence. However, there are some significant problem areas within the PDCW that currently exist, or have the potential to be significant problems. Resolution of these problems will maintain or even improve the integrity of the PDCW. These problems are listed below in no particular order regarding importance.

Addressing these problems would be a significant step in the development of a plan for management of the watershed. As will be noted, these problems include in large part deficiencies in the current irrigation delivery system.

### 3.1.1 Problem Area #1 – Erosion of Jenks Creek due to PDWSC Transbasin Diversion

While improvements made in the 1990's at Tunnel Hill eliminated the hazardous drop at the point of transbasin delivery, the continual flow of transbasin water from the bottom of Tunnel Hill in the upper portions of Jenks Creek has created detrimental erosive conditions in the stream to approximately this creek's crossing of U.S. Highway 87. The Jenks Creek stream channel is undersized for the amount of transbasin flow it is attempting to deliver to PDWSC water users downstream. The erosive conditions have encroached upon channel walls and resulted in areas with a deeply incised channel and significant bottom degradation. Channel wall encroachment has led to massive slumping in some adjacent hillsides, and resulting loss of adjacent lands. Livestock have been lost due to the unstable conditions, and there are safety concerns for those who would attempt to walk along the stream banks in this area. The erosive conditions have also led to both negative visual impacts and considerable sand accumulation within downstream irrigation facilities and the stream itself, due to deposition of eroded mass within the more quiescent areas of the stream channel.

This Problem Area #1 includes the second drop structure along Jenks Creek (a near vertical pipe with a vertical drop of approximately 25 feet) approximately 2,000 feet downstream of the Tunnel Hill drop at the head of Stanley Creek. This second drop structure is located in SW1/4NE1/4, Section 8, T53N, R83W.

### 3.1.2 Problem Area #2 – Continued Erosion Associated with PCCDC and MCDC Transbasin Diversions

As noted in Sections 2.1.4.3.2 and 2.1.4.3.3, both the PCCDC and MCDC diversions at Tunnel Hill continue to exhibit problems related to the considerable elevation difference between the two feeder ditches and the bottom of Tunnel Hill. Due to the highly erosive conditions caused by the falling water from the Piney Creek watershed into the PDCW, there has been and it is anticipated that there will continue to be loss of the adjacent hillsides and valley floor unless improvements are made. Material suspended in the water due to these erosive conditions eventually is deposited in the downstream ditches, creating considerable maintenance problems. Suspended material may also exacerbate water quality problems by increasing TSS and turbidity values.

This problem includes the existing dangerous conditions at the site of the "second drop" of the PCCDC Ditch. As mentioned previously, this "second drop" consists of a wooden weir located in the NE1/4SW1/4 of Section 8, T53N, R84W. Ongoing erosion below this weir has created a gully that is approximately 1,000 feet long and 60 feet deep. The gully is now a safety hazard to livestock, wildlife and humans.

### 3.1.3 Problem Area #3 - Continued Erosion Associated with PCCDC and MCDC Delivery Systems

Previous discussions revealed the accumulation of sand and deposits in quiescent areas of the PCCDC and MCDC main ditches. In addition to the Tunnel Hill drops, the source of the sand and silt deposits appears to be within the channels themselves at locations of increased velocity or at bends in the channels. Also, some sloughing of upstream banks could provide sources for these sands and silts. These accumulations have created additional maintenance for the two ditch companies and potentially negatively affecting the use of mechanical irrigation equipment such as sprinkler systems. Continued degradation of the delivery systems could in the long run potentially threaten their integrity.

### 3.1.4 Problem Area #4 – Existing Condition of PDWSC Diversion from South Piney Creek

Section 2.1.4.2 (Diversion Dams and Feeder Ditches) identified the current problems associated with the existing diversion facility of the PDWSC on South Piney Creek, located in the NE1/4 of Section 17, T53N, R83W. As it now exists, this facility is beset with the following adverse conditions:

- Three dams are actually necessary to sufficiently divert water due to the channel configuration
- The dams consist of hand-placed rock that are moved during high flow, and must occasionally be returned to their needed location;
- The Little Piney Ditch diversion exists on the opposite side of the South Piney Creek channel, complicating stream diversions;
- Due to the channel's steep slopes, the downstream dam area is inaccessible by vehicles.

As a result of these adverse conditions, it is believed that improvements should be implemented that would alleviate these conditions.

### 3.1.5 Problem Area #5 – Channel Instability in Prairie Dog Creek

Section 2.3 (Channel Morphology) provided information on channel classification and cross-section data of Prairie Dog Creek and some of its tributaries. It also identified locations where channel instabilities have been caused by human interventions. While no means totally comprehensive of the entire stream course, two typical situations contributing to channel instability were evident.

- Irrigation diversion structures (typically check dam and straight weir types) were contributing to down-cutting and bank erosion immediately downstream of the structures. (Evident at Sites PDC4, PDC 6, PDC9, PDC11, PDC15). Typically the structure (rock, wire, concrete, wood or a combination of several materials) acts as a dam to raise water level and move the water into a pipe or ditch. Although these systems work, they require regular maintenance and can contribute to channel instability by acting as a grade control, increasing upstream width, decreasing upstream depth, and increasing lateral migration of the channel.
- There was a loss of bank line vegetation, which is contributing to bank erosion and increased sediment supply for the stream. (Evident at Sites PDC3, PDC7, PDC9 and PDC14). This appears to be the result of existing land use practices. As stated by Rosgen:

> "Improper grazing can change the composition of riparian vegetation communities, and in so doing, also change rooting depth, rooting character, surface protection, aquatic habitat and aesthetic values. Many of these changes cause adverse stream channel adjustments. These subsequent channel adjustments include: a) accelerated bank erosion, b) increased width:depth ratios, c) altered channel patterns, d) induced channel instability, e) increased sediment supply, f) decreased sediment transport, and g) damaged fisheries habitat."[28]

According to Steady Stream Hydrology, Inc. (SSH), the subconsultant which performed the geomorphological assessment as part of this study, the Level I inventory data indicate that further geomorphology inventories within the watershed are necessary to much more fully understand the system's dynamics, particularly:

- geomorphology of the PCCDC and MCDC ditches, as well as the upper reaches of Prairie Dog Creek's tributaries,
- locations of all unstable channels, and
- possible effects of the burgeoning CBM industry.

Per SSH, a Level II Geomorphology Inventory should be conducted for the PDCW to provide the following more detailed information:

- permanent cross-section sites to determine channel dimensions in other critical reaches, including the upper reaches of the major tributaries,
- bed and bank material characterization,
- stream slope, sinuosity and entrenchment ratio data, and
- long-term patterns of change.

These data would be used to more specifically determine the location, magnitude, and trend of channel instability. From this information, a site-specific restoration plan could be implemented.

### 3.1.6 Problem Area #6 – Fecal Coliform within Prairie Dog Creek

Section 2.2 (Water Quality) discussed the results of a water quality analysis conducted on Jenks Creek and Prairie Dog Creek. This section reported results of the water quality sampling performed and noted the presence of possible elevated fecal coliform bacteria levels in Prairie Dog Creek. Although sampling was not performed in the number and at a time to specifically coincide with WDEQ's water quality regulations for fecal coliform, there were "spikes" that seemed unusually high. Thus a problem potentially exists with the bacteriological quality in this area.

In reviewing the data, there appears to be no fecal coliform bacteria problem in Jenks Creek water. The first elevated levels appear at the sampling site labeled as Prairie Dog Creek below the Jenks Creek confluence. Elevated levels then appear randomly throughout the length of the creek to the confluence with the Tongue River, with a general increase in values the further downstream the samples were taken. While generally fecal coliform concentrations were higher in the summer months than in the fall, winter and spring, it is interesting to note that the highest measured valued (1050 groups/ml below Wildcat Creek) occurred in October, 2000.

### 3.1.7 Problem Area #7 - Surface Water Discharges from CBM Wells that Could Impact both the Quality and Quantity of the Waters within the PDCW

Section 2.2.3 (Coal Bed Methane) discussed the potentially large number of CBM wells to be located within the PDCW that, along with their associated surface water discharges, could present a significant water quality and quantity impact to the watershed. As stated in Section 2.2.3, however, at the present time there has been only one NPDES permit that appears to actually have been issued that allows for surface water discharge of produced CBM water and is actually being used. This permit (WY0040622) provides for a total of six outfalls and a total of 39 CBM wells, all located in Sections 31 and 32, T54N, R83W. All other NPDES permits issued for CBM development have been either for stormwater, do not allow for the water to be discharged to a receiving stream, or are not being utilized at the decision of the permittee. The most recent permits that have been issued do not allow for direct discharge to a receiving stream. Instead, they require containment of all CBM waters up to the 25-year, 24-hour storm event.

Water quality concerns relating to CBM discharges have been expressed about several drainage basins within Wyoming other than the PDCW. These drainage basins have included the Powder River and Little Powder River. The stakeholders expressing concern have included the State of Montana. As a result, and similar to WDEQ's procedures regarding CBM development in the PDCW, there have been few NPDES permits issued for surface water discharges directly to a receiving stream that ultimately flows to Montana. However, in August, 2001, the states of Wyoming and Montana announced a Memorandum of Cooperation (MOC) whereby "new CBM discharges are cautiously allowed" during an interim period within the Powder River and Little Powder River basins.[31] During this interim period, the MOC calls for the two states to do the following regarding the Powder River.

> "The two states will use the highest sampled monthly values of electrical conductivity (EC) from 1990 through 1999 for the Powder River at the Moorhead gauging station [state line] as interim upper threshold criteria. Montana shall monitor the Moorhead data and report to Wyoming the average monthly EC and its comparability to the appropriate monthly value. If in any given month the average EC exceeds the threshold criteria, as listed herein, Wyoming will use its ongoing monitoring of sodium levels to determine the potential source and cause of the exceedance. The results of this investigation will be reported to Montana in a timely manner. If the exceedance is found to be attributable to CBM discharges, Wyoming will initiate appropriate steps through its regulatory mechanisms to return salinity levels into conformity with this MOC.

> The two states recognize that sodium levels and the Sodium Adsorption Ratio (SAR) may have an effect on water uses. However, at this time no clear threshold can be developed due to a lack of data. The State of Wyoming will, through its monitoring program, track sodium concentrations in the Powder River above the state line, evaluate the source of changes through various modeling techniques and report the results."

At the conclusion of the interim period as defined in the MOC, the parties have agreed to negotiate a final MOC that will include recognition of protective water quality standards and allocation of any assimilative capacity.

Due to the historically high water quality of the Tongue River (to which Prairie Dog Creek is a tributary) when compared to the Powder River, it is likely that the applicable water quality parameters that would have to be met in a similar agreement regarding the **Tongue** River (such as EC, sodium, SAR) would be more stringent than those proposed for the **Powder** River in this MOC. However, due to the importance of CBM development to both Wyoming and the nation in general, it is probable that a similar agreement will eventually be negotiated between Montana and Wyoming for the PDCW and Tongue River drainage area. The extent to which such an agreement will allow for interim or permanent CBM direct surface discharges is currently unknown.

### 3.1.8 Problem Area #8 – Possible Water Quality Problems in the Meade Creek Drainage

The Meade Creek drainage is a tributary to Prairie Dog Creek and thus a sub-basin within the PDCW. It is not the largest sub-basin in the watershed, but it in many ways has the most diverse uses, including subdivisions, agricultural, commercial, and mining. Meade Creek is also the means of conveyance for many water rights under the PCCDC ditch.

The scope of this study did not provide for a complete evaluation of the total environmental health of this smaller watershed. With the focus of water quality sampling being on the main creek, no water quality samples were taken on Meade Creek, although one of the sampling sites on Prairie Dog Creek was immediately below the confluence of the two streams. Thus, there is some water quality information available on Meade Creek's impact upon Prairie Dog Creek, but no information specifically on Meade Creek.

During the course of this study, many residents within the Meade Creek drainage expressed concerns about water quality issues, particularly for the area east of I-90. They also desired to obtain more information about their particular drainage basin. The information in this report can serve to assist in carrying forward a future analysis of the Meade Creek area.

### 3.1.9 Problem Area #9 – Resolution of Kearney Lake Reservoir Supply Issues

As discussed in Section 2.1.4.1 (South Piney Creek and North Piney Creek Diversions), certain reservoir rights from Kearney Lake Reservoir were attached by permit in 1924 to particular irrigated lands in addition to the direct flow rights for these lands from South and North Piney Creeks. Discussions with representatives of the BOC indicate that requests have been made to change the method of regulation of this unadjudicated Kearney Lake Reservoir to allow the stored water to be applied to **any** lands within the PDCW, not just to those for which it was originally permitted. Correspondingly, it is reported that some shareholders in the reservoir company do not own the lands within the PDCW for which these rights were originally permitted, and instead sell their shares of reservoir water to others within the PDCW when there is such a demand.

The BOC representatives have stated that it can only grant the request to "detach" the secondary supply rights from the stated lands if notification is provided to all current affected owners, and that those who own the land to which the reservoir water was originally attached by permit agree to such detachment.

## 3.2 Recommended Solutions to Problem Areas

Solutions to existing problem areas must address the needs of the multitude of users of the PDCW. They must include reasonable alternatives to improve and maintain the quality of the watershed to best serve this diverse multitude of users. The diversity extends from ranching, farming and mining and development of natural resources within the watershed, to sustaining a viable wildlife habitat. It is also important that any proposed solutions consider the role of local, state and federal governments in the development of any solutions.

The previous section identified problems areas perceived to exist within the PDCW after analyzing the current conditions within the watershed. This study attempts to identify solutions to these problem areas. These solutions represent, in part, an irrigation system rehabilitation plan. Each solution will be discussed in detail below.

**It is important to note that these solutions have been developed at a reconnaissance level only. All elevation and distance data utilized was obtained merely from existing mapping that included both USGS topographic and NRCS mapping. Considerable further study should be conducted to determine their feasibility and associated cost.**

### 3.2.1 Recommended Solution to Problem Area #1 (Erosion of Jenks Creek due to PDWSC Transbasin Diversion)

In evaluating alternatives to mitigate or even eliminate Problem #1, it must be recognized that there has been a very important and historical use of transbasin diversion water within the PDCW. Previous landholders invested significant resources to develop the transbasin project and the facilities now in use within the PDCW, and Wyoming water law entitles them to continue to utilize the water that was appropriated for this use. Area ranchers depend heavily upon this water for irrigation of hay fields, which provide valuable forage for their livestock. Without the continuance of this transbasin diversion flow, there would be no sustenance of the vast majority of the ranches within the PDCW. As a result, it is important to identify solutions that can allow for the continual diversion of transbasin water, and not consider the cessation of this historical practice as a viable alternative.

Rosgren and others have advocated the use of "natural stability" materials in the design and construction of structures that are built for the purpose of stream restorations. Such "natural stability materials" include the use of natural stable materials comprised of boulders, root wads, and native riparian plants, and are a marked contrast to the historical use of "hard controls" such as concrete and rip rap.

Despite the approach recommended by Rosgren and others, there is a significant enough erosion problem along Jenks Creek from the bottom of Tunnel Hill to the westerly end of the Banner Ranch hay meadow in the SW1/4 of Section 4, T53N, R83W so as to warrant a "hard engineering" solution to this ongoing erosion. This solution is recommended to be the construction of a pipeline from the bottom of Tunnel Hill to the location stated above in Section 4. This pipeline would be approximately 5,500 feet in length, would be 48 inches in diameter, and would be located along a route shown generally in Figure 3-1. At the pipeline's point of terminus, an outlet works/energy dissipation structure similar to the one constructed at the base of Tunnel Hill in the 1990's would be constructed.

Although the scope of this study did not include a review of the possibility of the development of hydropower at this location, it is recommended that future studies explore this option in more detail. A 1980 study conducted by Tudor Engineering indicated that, based upon:

- a flow of 60 cfs for 153 days, and
- an elevation difference of 440 feet between the diversion point at Tunnel Hill and the location at the Banner Ranch stated in Section 4 above,

an 1800 kilowatt (KW) hydropower plant could be constructed that would generate 6,000,000 kilowatt-hours (KWh) of power annually. Such a plant would meet the power demand of the Story area.[32]

The WWDC also conducted a study of hydropower feasibility in the area in 1984.[33] This study concluded that it was not cost-effective to construct such a facility. This conclusion was based upon a sale rate of $.0147/KWh and a rate of return of 12%.

Preliminary discussions with representatives of Montana-Dakota Utilities, the power supplier for this area, indicate that a rough estimate of the revenue that could currently be obtained from such a facility would be:

- $9/KW per month of utilized capacity, and
- $.01557/KWh of produced power.

Although the sale rate for power is little different than the rate used in the 1984 WWDC analysis, the $9/KW/month of utilized capacity was **not** used in the equation in the prior study. Additionally, interest rates are much lower now, meaning that the required payback to make the project economically feasible would be less. Finally, with the array of possible water quality funding programs now available that could be used to offset some of the capital costs, the actual up-front capital costs would be less, possibly making the project now affordable.

For the above reasons, the feasibility of constructing a hydropower generating facility at the end of the proposed pipeline warrants further investigation.

### 3.2.2 Recommended Solution to Problem Area #2 (Continued Erosion Associated with PCCDC and MCDC Transbasin Diversions)

In the mid-1990's, the PDWSC constructed improvements to essentially eliminate ongoing erosion problems associated with the fall of transbasin water from the top to the base of Tunnel

Hill. These improvements consisted essentially of a conveyance pipeline and outlet works/energy dissipation structure. Although the PCCDC and MCDC individually do not convey as much water as does the PDWSC delivery system into the PDCW, there are nonetheless considerable erosion and erosion-related problems related to their two Tunnel Hill transbasin drops to warrant investigations into solutions to these problems.

In 1999, the NRCS prepared a report which outlined solutions to the PCCDC and MCDC Tunnel Hill transbasin drops.[10] Two solutions were proposed: one providing for combining the PCCDC and MCDC ditches into one system to divert water over Tunnel Hill, and the second one proposing essentially individual transbasin structures. Each is discussed in more detail below.

### 3.2.2.1 Combining PCCDC and MCDC Transbasin Facilities

Combining the PCCDC and MCDC ditches over the divide to the PDCW would not only alleviate the erosion problems at Tunnel Hill, but also solve similar erosion problems at the **second** drop of the PCCDC ditch. A design and field survey was completed for this work by the NRCS in 1999. Due, however, to a lack of support for the project from the two ditch companies, construction of the proposed improvements was not performed. This NRCS proposal is described as follows and is depicted in Figure 3-2.

Approximately 500 feet of the existing PCCDC feeder ditch is proposed for realignment in order to provide for the outlet of the ditch to be above the existing MCDC diversion dam in North Piney Creek. The location of this proposed "crossover" of the PCCDC ditch to a point above the MCDC diversion from North Piney Creek was preliminarily selected by the affected landowner and the NRCS in order to minimize excavation and cost. From there, an extension of the existing "combined" ditch to the proposed new Tunnel Hill divide would be required. The existing "combined" ditch and extension would have to be enlarged to convey a capacity of 100 cfs, and would be lined to prevent leakage now occurring in the existing MCDC ditch or anticipated to occur. Finally, at the base of Tunnel Hill, a new pipeline would be extended over the Tunnel Hill divide which would convey both PCCDC and MCDC ditch water.

Two outlet works/energy dissipation structures are also proposed in this proposed plan for the water that has been extended over the divide. The first structure would contain a westerly outlet to a new ditch that connects to the existing MCDC ditch, as well as an easterly pipeline to connect to an existing underground irrigation system at the Phillips ranch that currently uses PCCDC water. The second outlet works/energy dissipation structure would be located below the severe erosion of the second drop on the PCCDC ditch. Both structures are proposed to be constructed similar to the outlet works/energy dissipation structure currently utilized at the base of Tunnel Hill for the PDWSC ditch, which consists of two nested steel tanks with concrete placed between the tanks, with the inlet pipe entering near the bottom and water discharging over the rim of the structure.

The crossover and pipeline over Tunnel Hill would be located at a saddle that currently exists in the divide between the two existing cuts, and will require the procurement of new easements to allow for their construction and use. The NRCS proposal also includes reclaiming the existing cuts that now exist through the Tunnel Hill ridge. Three homes in the vicinity between the current PCCDC and MCDC transbasin diversions would require protection during construction to prevent temporary or permanent damage.

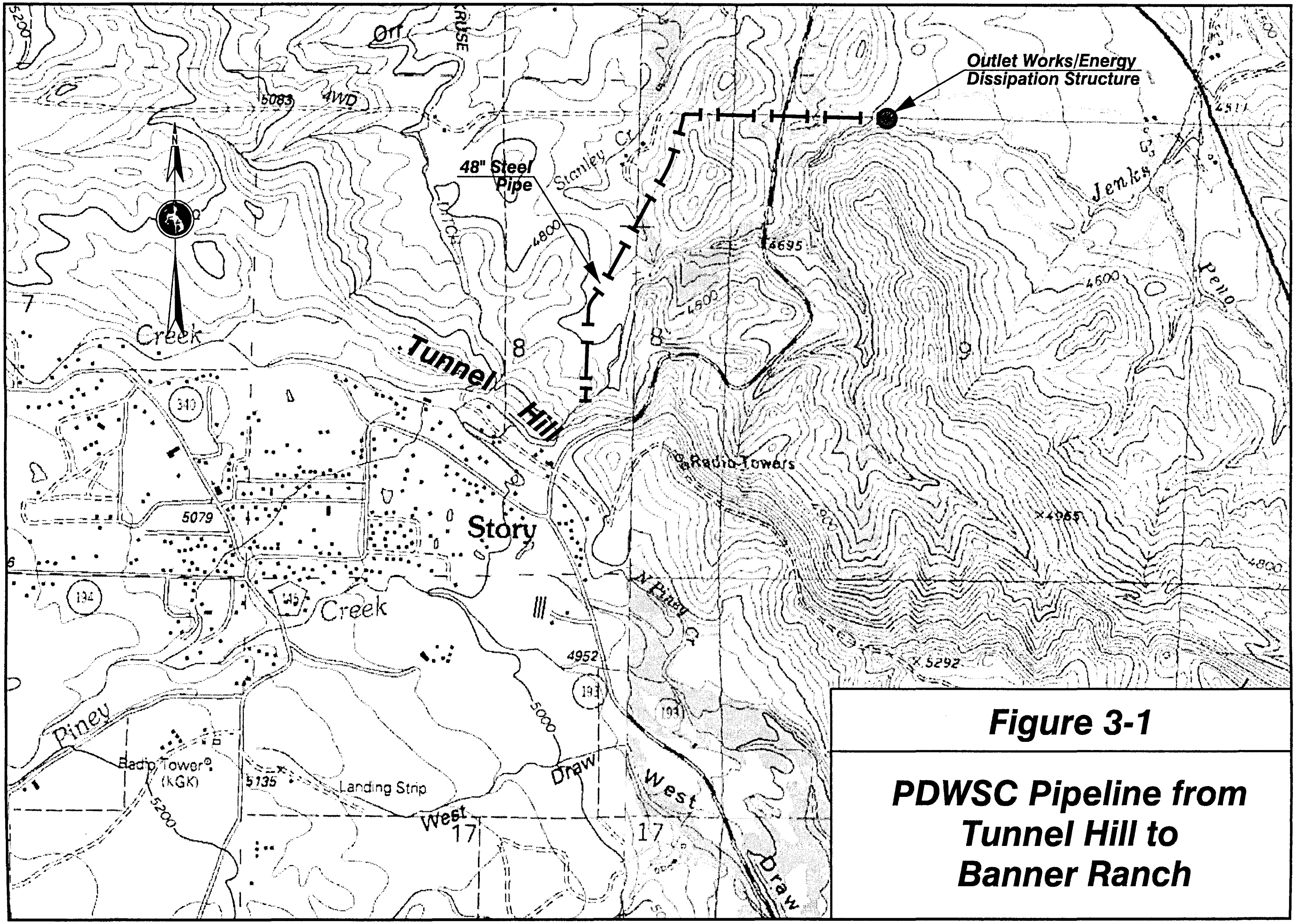
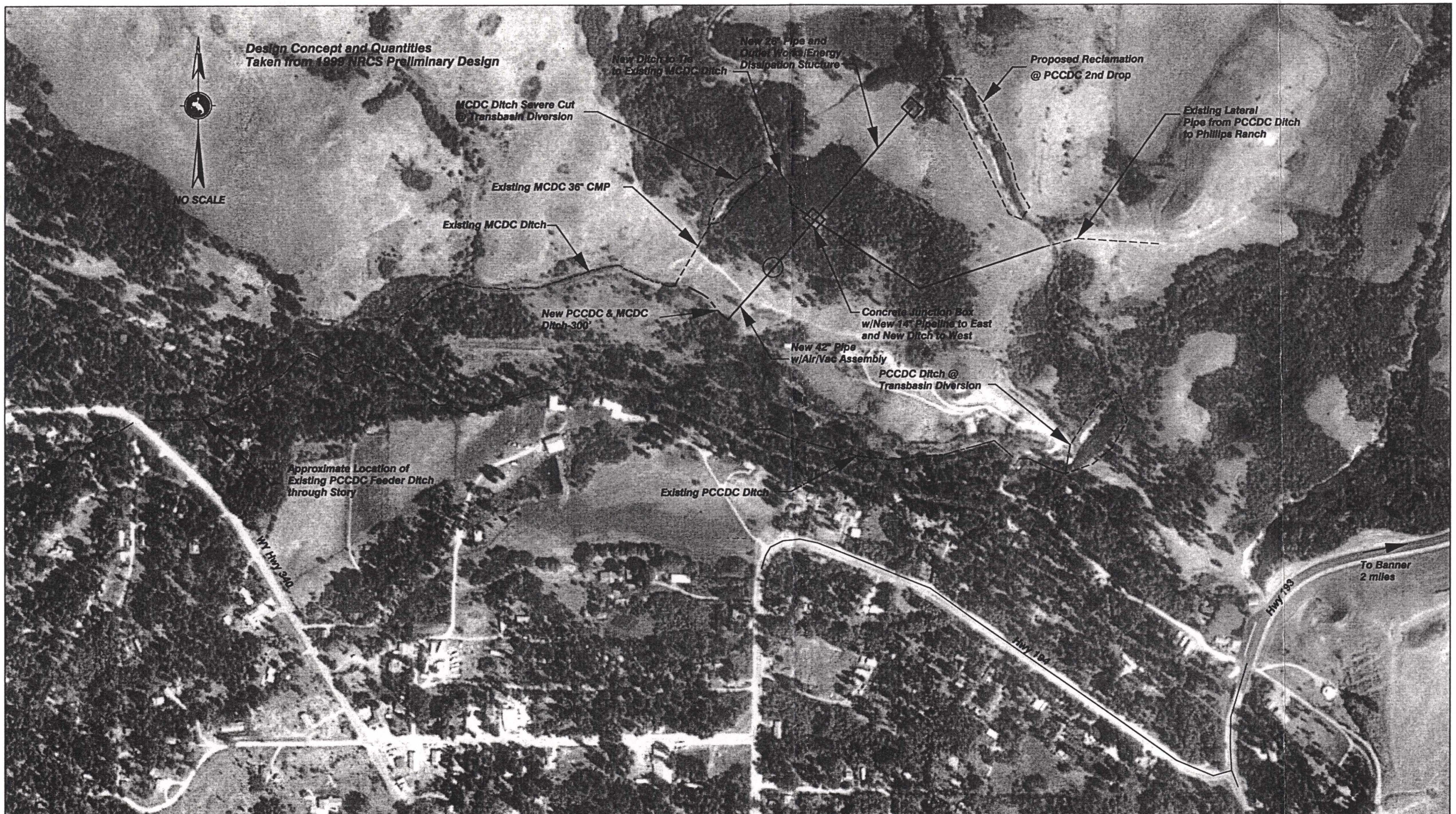



**Figure 3-1**

**PDWSC Pipeline from Tunnel Hill to Banner Ranch**

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**Combined PCCDC & MCDC Transbasin Facilities**

**PRAIRIE DOG WATERSHED MANAGEMENT PLAN WWDC LEVEL I STUDY**


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**Fig. 3-2**

Advantages that would be gained via implementation of this "combined" solution include the following:

- There would be elimination of further erosion and resulting environmental degradation.
- The current landowner is favorable to implementing this solution.
- The capital cost of constructing one transbasin facility in one pipe is less than constructing two individual systems (see Section 4 - Cost Estimates).
- Maintenance costs for one transbasin facility (vs. two) will be less expensive.
- Lining of the proposed combined ditch will reduce water loss.
- Maintenance of only one diversion facility (vs. two) will be required on North Piney Creek.

A possible disadvantage to this solution is that elimination of a portion of the PCCDC feeder ditch may negatively affect adjacent property owners to the proposed section of the feeder ditch through Story proposed for abandonment. These property owners have historically diverted water out of this ditch for limited irrigation of their lawns and gardens, even though they hold no water rights. Their concerns, however, could be alleviated by continuing to release small amounts of water through the to-be-abandoned feeder ditch to continue to meet their irrigation needs.

A second possible disadvantage is that the historical autonomy that has existed for the PCCDC and MCDC would no longer remain, as this would be a joint project involving both parties. Additional cooperation would be required to monitor and administer the water for both parties as it flows through the one facility.

### 3.2.2.2 Rehabilitate Existing Individual PCCDC and MCDC Transbasin Facilities

The 1999 NRCS report identified a second solution to stop the continued erosion problems from occurring due to the transbasin diversions of PCCDC and MCDC water. Under this second NRCS scenario, the existing diversion dam, headworks facilities, and feeder ditches that divert water from North Piney Creek and convey water to the Tunnel Hill basin divide would continue to be utilized. At this point, however, facilities similar to those constructed by the PDWSC in the mid-1990's to alleviate its problems (which consisted of a new inlet box with piping extended to the bottom of the drop terminating in a new concrete outlet works/energy dissipation structure) would be constructed.

For the existing PCCDC facility, the proposed new pipe conveying transbasin water could be installed in the existing channel of the PCCDC eroded drop area, currently lined in part with large rock. This rock would have to be removed in order to prevent damage to the new pipe, and could be placed near the bottom of the new pipe and outlet structure/energy dissipation structure to further reduce erosion. A 28-inch diameter pipe would be installed to the bottom of the Tunnel Hill ridge to convey water through the drop area, with an outlet works/energy dissipation structure at the bottom of this drop. From there, water would utilize the existing canal system until it reaches the area of the second drop, where a lateral would extend to convey water to the Phillips ranch, and a 24-inch pipe extended northwesterly through the second drop area. Reclamation would occur at both locations of historical erosion.

For the MCDC tranbasin proposal, a new 36-inch pipe would be installed in the area of the existing cut in the Tunnel Hill ridge, with an outlet works/energy dissipation structure installed at the bottom of the drop. In order for the MCDC ditch to stay fully within the existing right-of-way, it may be required to tunnel through the Tunnel Hill ridge to the ditch on the downhill side.

The advantages to improving the individual PCCDC and MCDC transbasin facilities individually are these.

- There is an elimination of the existing significant erosion problems.
- The PCCDC and MCDC could maintain their autonomy, which has historically been proven to be an important objective.
- There would be no requirement to realign the existing PCCDC feeder ditch from South Piney Creek to North Piney Creek, thus there would be no need to affect existing landowners' use of this water.

The disadvantages of this proposed alternative solution include the following.

- The proposed new transbasin pipe for the MCDC would require acquisition of additional lands for this purpose, as well as for access to the new site.
- There would be continued maintenance of two delivery systems from North Piney Creek to the point where the new facilities convey water to the two individual ditches in the PDCW.
- Water loss will continue from the MCDC ditch located between the North Piney Creek diversion and the inlet of the pipe at Tunnel Hill.
- The capital cost of the proposed two new installations is higher when compared to the "combined" system, resulting in greater costs to the water users of the PCCDC and MCDC.

This alternative is depicted in Figure 3-3.

### 3.2.3 Recommended Solution to Problem Area #3 (Continued Erosion Associated with PCCDC and MCDC Delivery Systems)

This study has discussed the problems associated with the continued erosion of the PCCDC and MCDC main ditches; which consist of the accumulation of sand and silt deposits resulting from channel erosion and sloughing of upstream banks. The scope of this study, however, did not allow for an extensive inventory of these problems, nor methods to alleviate them. Potential solutions could possibly include installation of energy dissipation/control devices and reshaping of upstream cut and embankment areas to minimize bank sloughing into channels.

It is recommended that a more extensive inventory of problem areas in the PCCDC and MCDC delivery systems be conducted (perhaps in a Level II study). After the inventory is completed, cost-effective solutions could be identified, examined and ultimately implemented.

### 3.2.4 Recommended Solution to Problem Area #4 (Existing Condition of PDWSC Diversion from South Piney Creek)

The proposed solution to this problem is to construct a new diversion dam in South Piney Creek. For purposes of this report, a new concrete diversion dam has been sited approximately 100 feet downstream of the PDWSC's existing diversion facilities. This will require that a new headgate and approximately 100 feet of new ditch be constructed from the new diversion dam to the


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**Rehabilitate Existing Individual PCCDC & MCDC Transbasin Diversions**

**PRAIRIE DOG WATERSHED MANAGEMENT PLAN WWDC LEVEL I STUDY**

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**Fig. 3-3**

existing feeder ditch. The proposed location is recommended due to the total width of South Piney Creek being much less at this point than the width at the current diversion dam location. Another benefit of this location is that it will only require one dam, as constructing a new dam in South Piney Creek at the existing diversion facilities will require additional diversion dams to be constructed upstream of the existing island that splits the flow in the creek.

It will be necessary as part of this solution to acquire an easement that will allow vehicular access to the proposed new site for construction and future maintenance purposes.

### 3.2.5 <u>Recommended Solution to Problem Area #5 (Channel Instability in Prairie Dog Creek)</u>

Problem Area #5 referenced channel instability conditions now evident along Prairie Dog Creek in the areas below the confluence with Jenks Creek. These two conditions are:

- down-cutting and bank erosion caused by existing irrigation diversion structures; and
- loss of bank line vegetation, which is contributing to bank erosion and increased sediment supply for the stream.

Rosgen has developed innovative methodologies for constructing the necessary irrigation diversion structures yet do not create the down-cutting and bank erosion associated with more typical structures.[28] These "natural" channel design techniques and natural material structures appropriate for a given stream type have been shown to improve channel stability on other streams similar in characteristics to Prairie Dog Creek. The structures recommended for Prairie Dog Creek include the following types:

- rock weirs,
- native material revetments with vegetation transplants, and
- cross vane and single vane.

In addition to offsetting the adverse effects of straight weirs and check dams (backwater and flat slopes), these new structures meet several objectives.

- They remove excess shear stress from "near bank" region and direct flow to the center of the stream in order to maintain lateral stability.
- They increase stream depth by decreasing width:depth ratios.
- They increase sediment transport capacity.
- They create grade control to prevent down-cutting.
- They protect stream bank from erosion.
- They break up secondary circulation cells (eddies) which increase bank stress.

The cost for construction of such "natural" types of structures are unique to each specific site. However, it is realistic to assume that such costs could range in the neighborhood of $10,000 - $15,000 for a stream such as Prairie Dog Creek.

In those areas where there has been a loss of bank line vegetation (contributing to bank erosion and increased stream sediment supply), land use practices could be improved by implementation of BMP's. BMP's can provide grazing management alternatives. Grazing strategies (especially pastures within riparian areas) could be modified to accommodate the inherent differences in stream types, such as their varying susceptibility to bank damage and vegetation changes. Grazing strategies that could provide considerable benefits include:

- identification of sensitive stream types/areas,
- recognition and protection of riparian species important for maintaining stability of particular stream types,
- rotation of grazing seasons that favor the key "riparian stability" species,
- developing utilization limits, along with a monitoring plan for such utilization, and
- constructing water systems that help distribute animals more effectively.

The NRCS Field Office Technical Guide specifies BMP's for various land uses and should be utilized as a resource for channel improvement along Prairie Dog Creek.[34]

As mentioned, it would be advantageous to conduct further geomorphology inventories within the PDCW in order to fully understand the system's dynamics. These more detailed inventories, to include Prairie Dog Creek, its major tributaries, and the PCCDC and MCDC ditches, would be an important tool in understanding and protecting the values of the watershed.

SSH, as stated in Section 3.1.5, also recommends that the following tasks be performed:

- installation of permanent cross-section sites to determine channel dimensions in other critical reaches, including the upper reaches of the major tributaries;
- characterization of bed and bank material;
- collection of stream slope, sinuosity and entrenchment ratio data; and
- an assessment of potential long term patterns of change.

### 3.2.6 Recommended Solution to Problem Area #6 (Fecal Coliform within Prairie Dog Creek)

The water quality data collected suggests that there are potentially high numbers of fecal coliform bacteria colonies within reaches of Prairie Dog Creek. The first relatively high numbers of colonies appear generally below the confluence of Prairie Dog Creek and Jenks Creek. All collected values on Jenks Creek have relatively low levels, thus it is assumed that Jenks Creek and its transbasin water being conveyed are not a source of fecal contamination.

Furthermore, samples taken on Prairie Dog Creek immediately below U.S. Highway 87 show relatively low numbers of colonies. As such, it can be concluded in reviewing the existing data set that, if there is indeed a source of fecal contamination on Prairie Dog Creek, it would be below U.S. Highway 87. Between U.S. Highway 87 and the confluence of Prairie Dog Creek and Jenks Creek, there exists fairly substantial rural residential development.

Based upon the data collected, it is evident that a more thorough study of potential contamination sources should be conducted. Efforts should focus more directly on Prairie Dog Creek downstream of U.S. Highway 87 than on Jenks Creek. The future study should include a visual inspection in suspected areas of contamination, such as livestock pens and feedlots, as well as in more highly developed areas of rural residences.

### 3.2.7 Recommended Solution to Problem Area #7 (Surface Water discharges from CBM Wells that Could Impact both the Quality and Quantity of the Waters within the PDCW)

The discussion in Problem Area #7 highlighted the fact that there were very few current surface water discharges into receiving streams of the PDCW relating to CBM-produced waters, and that WDEQ's procedures were **at this time** not allowing further direct surface water discharges. Due to high SAR and EC values, concern has been expressed by the WDEQ and State of Montana about the deleterious effect that these elevated levels may have upon crop production and riparian areas. It remains to be seen whether or not the states of Wyoming and Montana will reach an agreement for CBM surface water discharges within the Tongue River watershed (which includes the PDCW) similar to the MOC consummated for the adjacent Powder River and Little Powder River basins.

CBM producers, however, have not let the inability to discharge CBM-produced waters directly into stream courses prevent them from pursuing alternatives means of water disposal. Containment facilities have been constructed to retain and evaporate the waters produced as a result of their operations. It is unknown at this time if these containment facilities will be able to negate the need for future discharge, or if they will allow continual operations on a temporary basis.

Due to the lack of clarity of the future of CBM surface water discharges for both quality and quantity, at this time there are no absolute solutions proposed, as, indeed, there is no actual current problem. Once the ultimate fate of additional surface water discharge allowances are known, only then can a specific problem and potential solution be identified. Stakeholders should adopt a "wait-and-see" attitude on the future of CBM discharges, in lieu of following a specific plan at this time. Once decisions are reached by the appropriate regulatory agencies and CBM companies, only then will the potential for CBM impacts be much better understood.

### 3.2.8 Recommended Solution to Problem Area #8 (Possible Water Quality Problems in the Meade Creek Drainage)

Although water quality analyses were completed under this Level I study, the scope did not include a more in-depth review of water quality issues within the individual sub-basins. It may be that interested parties in the Meade Creek drainage should investigate the possibility of the WDEQ performing water quality testing and analysis in this area. Additionally, the residents of the Meade Creek sub-basin may wish to consider making separate application to the WWDC for a separate study of their area.

### 3.2.9 Recommended Solution to Problem Area #9 (Resolution of Kearney Lake Reservoir Secondary Supply Issues)

In order to alleviate the current problem of Kearney Lake Reservoir rights being attached by permit to lands which the reservoir shareholders do not necessarily own, BOC representatives have indicated that these rights be "detached" from their currently adjudicated lands. Discussions should commence among officials of the PDWSC, BOC and affected landowners to initiate the process whereby the "detachments" can be consummated.

# 4. COST ESTIMATES

The estimated costs to implement solutions to Problem Areas #1 - #4 as discussed in the previous section are provided in this section. Problem Areas #5 - #8 require further study and analysis, and the cost for Problem Area #9 (Resolution of Kearney Lake Reservoir Supply Issues) is dependent upon the level of interest in the PDWSC and existing landowners in resolving these issues.

All cost estimates portrayed in this section must be assumed to be at a reconnaissance level only. Further investigation and design should be conducted to more accurately forecast anticipated future capital as well as operational costs.

**Table 4.1**
**Cost Estimate**
**Recommended Solution to Problem Area #1**
**Erosion of Jenks Creek due to PDWSC Transbasin Diversion**

| | | | | | |
|---|---|---|---|---|---|
| Preparation of Final Designs & Specs | | | | | $106,055 |
| Permitting and Mitigation | | | | | $10,000 |
| Legal Fees | | | | | $5,000 |
| Acquisition of Access & ROW | LF | 5500 | $1 | | $5,500 |
| | | | | | |
| **Cost of Construction Components** | | | | | |
| Mobilization, Bond and Insurance | LS | 1 | $21,000 | $21,000 | |
| Diversion Structure at Tunnel Hill Base | LS | 1 | $25,000 | $25,000 | |
| Tree and Brush Removal | LS | 1 | $10,000 | $10,000 | |
| Excavation of Overburden @ Tunnel Hill | CY | 1800 | $10 | $18,000 | |
| 48" Steel Transmission Main | LF | 5500 | $140 | $770,000 | |
| 48" Air-Vacuum Release Valves | EA | 1 | $40,000 | $40,000 | |
| 48" Highway Crossing | LF | 130 | $500 | $65,000 | |
| 6" Drain (Blow-off) Valves | EA | 2 | $5,000 | $10,000 | |
| Cathodic Protection System | LS | 1 | $50,000 | $50,000 | |
| Rip Rap | CY | 40 | $50 | $2,000 | |
| Outlet Works/Energy Dissipation Structure | LS | 1 | $25,000 | $25,000 | |
| Reclamation | LF | 5500 | $4 | $22,000 | |
| Roadway Access to New Structure | CY | 170 | $15 | $2,550 | |
| Construction Cost Subtotal (#1) | | | | **$1,060,550** | |
| Engineering Costs @ 10% | | | | $106,055 | |
| Subtotal (#2) | | | | **$1,166,605** | |
| Contingency @ 15% | | | | $174,991 | |
| Construction Cost Total | | | | **$1,341,596** | **$1,341,596** |
| **Project Cost Total** | | | | | **$1,468,151** |

**Table 4.2**
**Cost Estimate**
**Recommended Solution to Problem Area #2**
**Continued Erosion Associated with PCCDC and MCDC Transbasin Diversions**

**Combined PCCDC and MCDC Alternative**

The following cost estimates are those depicted in the 1999 NCRS study with appropriate increases for inflation to portray 2002 costs.

| Item | Unit | Quantity | Unit Cost | Cost | Cost |
|---|---|---|---|---|---|
| Preparation of Final Designs & Specs | | | | | $57,439 |
| Permitting and Mitigation | | | | | $10,000 |
| Legal Fees | | | | | $5,000 |
| Acquisition of Access & ROW | | | | | $10,000 |
| | | | | | |
| **Cost of Construction Components** | | | | | |
| Mobilization, Bond and Insurance | LS | 1 | $12,000 | $12,000 | |
| Reinforced Concrete | CY | 15 | $475 | $7,125 | |
| Rebar | LBS | 1,450 | $1 | $870 | |
| Chambered Vent | LS | 1 | $1,000 | $1,000 | |
| Vent @ Break in Hill | LS | 1 | $1,000 | $1,000 | |
| 40" Diameter HDPE SDR 21 Pipe | LBS | 82,020 | $1.50 | $123,030 | |
| Outlet Works/Energy Dissipation Structure | LS | 2 | $25,000 | $50,000 | |
| Str. Concrete Walls (for weirs & checks) | LS | 1 | $6,000 | $6,000 | |
| Parshall Flumes | LS | 2 | $2,000 | $4,000 | |
| 48" Dia. Inlet to Piney Creek Pipeline | LS | 1 | $2,000 | $2,000 | |
| Excavation & Fill @ Ridge (42' Cut) | CY | 24,000 | $3.75 | $90,000 | |
| Control Density Backfill through Ridge | CY | 210 | $85 | $17,850 | |
| 14" Diameter HDPE SDR 21 Pipe | LBS | 14,400 | $1.50 | $21,600 | |
| 26" Diameter HDPE SDR 32.5 Pipe | LBS | 14,000 | $1.50 | $21,000 | |
| Outlet to PCCDC Ditch | LS | 1 | $20,000 | $20,000 | |
| Excavation @ MCDC Feeder Ditch | CY | 1,450 | $2 | $2,175 | |
| Excavation @ PCCDC Crossover | CY | 360 | $2 | $540 | |
| Earthfill MCDC Feeder Ditch | CY | 2,600 | $2 | $5,200 | |
| Liner MCDC Feeder Ditch | SY | 2,500 | $2.50 | $6,250 | |
| Check Structure in Crossover Ditch | LS | 1 | $1,250 | $1,250 | |
| 42" Diameter Ribbed HDPE Tunnel Sleeve | FT | 375 | $100 | $37,500 | |
| 15" Diameter Ribbed HDPE Tunnel Sleve | FT | 375 | $16 | $6,000 | |
| Reclamation @ Tunnel Hill Ridge | CY | 32,000 | $1.50 | $48,000 | |
| Reclamation @ Second Drop | CY | 60,000 | $1.50 | $90,000 | |
| Construction Cost Subtotal (#1) | | | | **$574,390** | |
| Engineering Costs @ 10% | | | | $57,439 | |
| Subtotal (#2) | | | | **$631,829** | |
| Contingency @ 15% | | | | $94,774 | |
| Construction Cost Total | | | | **$726,603** | **$726,603** |
| **Project Cost Total** | | | | | **$809,042** |

**Table 4.3**
**Cost Estimate**
**Alternative Solution to Problem Area #2**
**Continued Erosion Associated with PCCDC and MCDC Transbasin Diversions**
**Separate PCCDC and MCDC Alternative**

**PCCDC Alternative Only**

The following cost estimates are those depicted in the 1999 NCRS study with appropriate increases for inflation to portray 2002 costs.

| Item | Unit | Quantity | Unit Cost | Cost | Cost |
|---|---|---|---|---|---|
| Preparation of Final Designs & Specs | | | | | $30,933 |
| Permitting and Mitigation | | | | | $5,000 |
| Legal Fees | | | | | $2,500 |
| Acquisition of Access & ROW | | | | | $5,000 |
| | | | | | |
| **Cost of Construction Components** | | | | | |
| Mobilization, Bond & Insurance | LS | 1 | $6,000 | $6,000 | |
| Reinforced Concrete (2 Structures) | CY | 31 | $475 | $14,725 | |
| Rebar (2 Structures) | LBS | 1,650 | $1 | $1,650 | |
| Chambered Vents | LS | 2 | $1,500 | $3,000 | |
| 24" HDPE SDR 21 Pipe | LBS | 12,300 | $1.50 | $18,450 | |
| 28" HDPE SDR 21 Pipe | LBS | 48,000 | $1.50 | $72,000 | |
| Outlet Works/Energy Dissipation Structure | LS | 2 | $25,000 | $50,000 | |
| Reclamation @ Tunnel Hill Ridge | CY | 32,000 | $1.50 | $48,000 | |
| Reclamation @ 2nd Drop | CY | 60,000 | $1.50 | $90,000 | |
| Seeding & Mulching | AC | 4 | $125 | $500 | |
| Liner for PCCDC Feeder Ditch | SY | 2,000 | $2.50 | $5,000 | |
| Construction Cost Subtotal (#1) | | | | **$309,325** | |
| Engineering Costs @ 10% | | | | $30,933 | |
| Subtotal (#2) | | | | **$340,258** | |
| Contingency @ 15% | | | | $51,039 | |
| Construction Cost Total | | | | **$391,296** | **$391,296** |
| **Project Cost Total** | | | | | **$434,729** |

# Table 4.4
# Cost Estimate
# Alternative Solution to Problem Area #2
# Continued Erosion Associated with PCCDC and MCDC Transbasin Diversions
# Separate PCCDC and MCDC Alternative

## MCDC Alternative Only

The following cost estimates are those depicted in the 1999 NCRS study with appropriate increases for inflation to portray 2002 costs.

| Item | Unit | Quantity | Unit Cost | Cost | Cost |
|---|---|---|---|---|---|
| Preparation of Final Designs & Specs | | | | | $38,369 |
| Permitting and Mitigation | | | | | $3,000 |
| Legal Fees | | | | | $2,500 |
| Acquisition of Access & ROW | | | | | $5,000 |
| | | | | | |
| **Cost of Construction Components** | | | | | |
| Mobilization, Bond & Insurance | LS | 1 | $8,000 | $8,000 | |
| Reinforced Concrete | CY | 15 | $475 | $7,125 | |
| Rebar | LBS | 815 | $1 | $815 | |
| Chambered Vent | LS | 1 | $1,500 | $1,500 | |
| 36" Diameter 0.5" Metal Pipe w/ Tunnel | FT | 670 | $500 | $335,000 | |
| Liner for MCDC Feeder Ditch | SY | 2500 | $2.50 | $6,250 | |
| Outlet Works/Energy Dissipation Structure | LS | 1 | $25,000 | $25,000 | |
| Construction Cost Subtotal (#1) | | | | **$383,690** | |
| Engineering Costs @ 10% | | | | $38,369 | |
| Subtotal (#2) | | | | **$422,059** | |
| Contingency @ 15% | | | | $63,309 | |
| Construction Cost Total | | | | **$485,368** | **$485,368** |
| **Project Cost Total** | | | | | **$534,237** |

**Table 4.5**
**Cost Estimate**
**Recommended Solution to Problem Area #4**
**Existing Condition of PDWSC Diversion from South Piney Creek**

| Item | Unit | Quantity | Unit Cost | Cost | Cost |
|---|---|---|---|---|---|
| Preparation of Final Designs & Specs | | | | | $9,700 |
| Permitting and Mitigation | | | | | $1,000 |
| Legal Fees | | | | | $500 |
| Acquisition of Access & ROW | | | | | $1,000 |
| | | | | | |
| **Cost of Construction Components** | | | | | |
| Mobilization, Bond & Insurance | LS | 1 | | $2,000 | |
| Improve Access to Diversion | LS | 1 | $5,000 | $5,000 | |
| Stream Care and Diversion | LS | 1 | $10,000 | $10,000 | |
| Reinforced Concrete Diversion Dam | LS | 1 | $38,000 | $38,000 | |
| Reinf. Concrete Headgate Structure | LS | 1 | $20,000 | $20,000 | |
| Reinf. Concrete Measurement Struct. | LS | 1 | $12,000 | $12,000 | |
| Excavate New Ditch to Intersect Existing | CY | 150 | $20 | $3,000 | |
| Rip Rap | LS | 1 | $5,000 | $5,000 | |
| Reclamation | LS | 1 | $2,000 | $2,000 | |
| Construction Cost Subtotal (#1) | | | | **$97,000** | |
| Engineering Costs @ 10% | | | | $9,700 | |
| Subtotal (#2) | | | | **$106,700** | |
| Contingency @ 15% | | | | $16,005 | |
| Construction Cost Total | | | | **$122,705** | **$122,705** |
| **Project Cost Total** | | | | | **$134,905** |

# 5. REQUIRED PERMITS

The permits and approvals that are anticipated to be necessary to implement the recommended solutions identified in Section 3 are listed in tabular form below.

**Table 5.1**
**Permits Required for Recommended Solutions**

| # | RECOMMENDED SOLUTIONS FOR THE FOLLOWING IDENTIFIED PROBLEMS | AFFECTED PROPERTY OWNERS | CORPS OF ENGINEERS 404 PERMIT | WDEQ 401 PERMIT | WYO. G&F DEPT. | WYO.STATE BOARD OF CONTROL | WYO.DEPT. OF TRANS. |
|---|---|---|---|---|---|---|---|
| 1 | Erosion of Jenks Creek due to PDWSC Transbasin Diversions | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ |
| 2 | Continued Erosion Associated with PCCDC & MCDC Transbasin Diversions | ✔ | ✔ | ✔ | | ✔ | |
| 3 | Continued Erosion Associated with PCCDC & MCDC Delivery Systems* | | | | | | |
| 4 | Existing Condition of PDWSC Diversion from South Piney Creek | ✔ | ✔ | | ✔ | ✔ | |
| 5 | Channel Instability of Prairie Dog Creek | ✔ | ✔ | ✔ | ✔ | ✔ | |
| 6 | Fecal Coliform Levels within Prairie Dog Creek * | | | | | | |
| 7 | Surface Water Discharges From CBM Wells * | | | | | | |
| 8 | Possible Water Quality Problems in Meade Creek* | | | | | | |
| 9 | Resolution of Kearney Lake Reservoir Supply Issues | ✔ | | | | ✔ | |

* Considerable further study required before need for permits and approvals can be determined.

# 6. PROJECT FINANCING PLAN

In order to provide for possible future funding for the recommended solutions identified in Section 3, for which costs were portrayed in Section 4, it is necessary to compile a proposed project financing plan. Possible funding agencies for these solutions are identified and discussed in detail below.

## 6.1 Potential Funding Sources

There are many state and federal agencies that administer programs that fund the type of improvements proposed in the PDCW. The agencies from which grants and loans are typically requested for funding such improvement projects are described below.

### 6.1.1 WWDC

This state agency provides grants and loans to be utilized for the development of water within the State of Wyoming. Funding for the WWDC originates from a tax placed upon extracted minerals, including principally coal. Eligible projects include those associated with the development and transmission of water, but not the treatment or distribution of water.

Grants are usually available for 50% of the cost for project development, although sometimes – in cases of demonstrated hardship – higher percentages can be obtained. Loans for the non-grant share of project-eligible costs are available at a current rate of 6% (for agricultural loans only) and term of up to 30 years, although longer terms may also be considered.

The WWDC is recommended to be a major contributor of funding for the transmission aspects of this project.

### 6.1.2 Environmental Protection Agency - Section 319

The U.S. Environmental Protection Agency (EPA)'s Section 319 of the Clean Water Act program provides for design and construction funding for water quality improvement projects. The program is administered in Wyoming by WDEQ, and projects are prioritized by the Governor's non-point task force. Currently approximately $1.6-1.7 million is available annually for eligible projects, with grants available for up to 60% of project costs. The remaining 40% could be provided with in-kind services.

While there is an emphasis in this program upon non-point projects, it is certainly possible that several of the proposed recommended projects would be eligible for funding due to the strong likelihood of improved water quality in affected streams. Fund administrators preliminarily indicated that they would have an interest in participating in this project.

### 6.1.3 U.S. Department of Agriculture's 566 Program

The U.S. Department of Agriculture's (USDA) 566 program is another source of potential funding for the proposed recommended projects. Named after Public Law 566, which authorized its original federal funding, this program can fund projects for stream bank protection, stream stabilization, and resulting benefits to water quality, wildlife, and fisheries. It can offer assistance for both on-farm and off-farm improvements. Applicants compete nationwide (vs. statewide) for funding.

Receipt of funding under the 566 program is conditioned upon successful demonstration of a benefit/cost ratio of greater than one, as determined by a feasibility study conducted by USDA staff. This study is performed at no cost to the applicant, and takes approximately six (6) months to complete. There is an approximate two-year lag between the time of feasibility request and receipt of design and construction funding, assuming that the benefit/cost ratio makes receipt of the federal funding possible. It is recommended that a local sponsor apply for funding.

There is no maximum dollar allotment for a particular project, although projects requiring funding for amounts greater than $5 million require Congressional approval. The maximum on-farm improvement allocation is $100,000.

There is no set match; therefore, it is possible that up to 100% of the project costs could potentially be provided via this program. However, matching these monies with other sources can make the project more attractive to federal administrators reviewing applications.

Fund administrators of the 566 program had previously been contacted regarding possible funding of this project, thus these administrators are very familiar with the problems in the PDCW and the need for certain improvements.

### 6.1.4 Wyoming Department of Agriculture's Water Quality Grant Improvement Program

This state grant program provides grants for water quality monitoring, planning and improvements. It has received appropriations from the Wyoming Legislature in the last bienniums, for amounts of $379,000 and $197,000 respectively. The Department of Agriculture plans to approach the 2002 Legislature for a funding request of $675,000. If these monies are received, the Department plans to request proposals in the spring of 2002 for viable projects.

Historically, county conservation districts have been recipients of these funds; however, this practice is not mandatory.

### 6.1.5 WDEQ State Revolving Loan Fund – Clean Water Act

The WDEQ administers the State Revolving Loan Fund (SRF) for both the federal Safe Drinking Water Act and Clean Water Act (CWA) in Wyoming. Funding for the SRF originates from Congressional-supplied monies to the EPA, which in turn allocates a portion of these funds to each state.

Loans from the SRF are available at a current rate of 4% and term of 20 years. No grant monies are available from this funding source. WDEQ continually updates a ranking of projects eligible for the SRF. This project has not been ranked because there has been no request to do so.

Typically monies from this loan program are used to fund domestic water and sewer systems throughout the state. However, in discussions with WDEQ staff, and due to the abundance of loan monies currently available in the State's CWA SRF, it is possible that those recommended projects in this study that can provide for non-point source water quality improvements would be eligible for loans. In order to receive such funding, it may be necessary to have Sheridan County be the loan applicant due to certain rules of the WDEQ that disallow districts being loan recipients. In such a case, an agreement could be reached with the County to assure it that the district would be ultimately responsible for any loan repayments.[35]

## 6.2 Possible District Formation

In order for any prospective funding agency to have an entity with whom it may contract, it is necessary to establish an organization for such contracting purposes. Typically, this involves establishment of a district. Water conservancy districts, irrigation districts and watershed improvement districts are the usual types of districts utilized in Wyoming for these purposes.

It has been reported that there is some resistance to establishing a public entity such as the three types of districts listed above, perhaps because there is a fear that such establishment will supplant the authority of and need for the three existing ditch companies. While such districts could in fact obviate the need for the ditch companies, both ditch companies and public districts can also in fact co-exist if it is believed that it is in the best interests of all to do so.

Conversations have been held with numerous representatives of either districts or private companies (ditch and reservoir) throughout the state. **In all cases, the principal reason that these districts were formed was to benefit from the large number of state and federal funding programs available to public districts, programs that provide for both grants and loans. Similarly, in all cases, the ditch or reservoir companies that originally owned the facilities that required improvement or rehabilitation continued to exist after formation of the public districts. Lastly, and again in all cases, the affected ditch or reservoir companies had considerable representation on the board of directors of the public districts ultimately formed to secure the state and/or federal funds.**

Listed below are public districts and their corresponding ditch or reservoir companies formed over the last several years to obtain these types of grant and loan funds.

**Table 6.1**
**Listing of Wyoming Ditch or Reservoir Companies that Established Public Districts**

| Company (Ditch or Reservoir) | District | County | Need for Project |
|---|---|---|---|
| Park Reservoir Co. | Park Reservoir Irrigation District | Sheridan | Dam Rehabilitation and Improvements |
| Spring Draw Ditch Co. | Spring Draw Irrigation District | Sheridan | Ditch Rehabilitation and Improvements |
| North Fork Irrigation District (actually a public entity vs. private co.) | Crazy Woman Watershed Improvement District | Johnson | Reservoir Construction, Delivery system Improvements, Erosion Control |
| Shell Canal Co. | Shell Valley Watershed Improvement District | Big Horn | Dam and Canal Rehab. And Improvements |
| Highline Ditch Co. | Highline Watershed Improvement District | Carbon | Ditch Rehabilitation and Improvements |

Assuming that the three ditch companies would in fact desire to form one of the three types of districts listed above (water conservancy, watershed improvement, or irrigation district), it is important to determine which type of district would be most advantageous to the affected property owners in the PDCW. All three types are public entities that exhibit several characteristics. All three can incur indebtedness, have the power of eminent domain, and are eligible for funding assistance from state and federal agencies such as the WWDC and EPA. Some differences exist, however. They include the following.

- Water conservancy and irrigation districts are created by petitioning the district court, whereas watershed improvement districts are created by petitioning the board of supervisors of the local conservation district. The State Engineer is also involved in the establishment of the conservancy and irrigation districts, but is not with watershed improvement districts.
- Irrigation districts are focused almost exclusively on the irrigation of lands, whereas both conservancy and watershed improvement districts have additional powers related to erosion control, draining of lands, flood control and stream flow preservation. Conservancy districts can even provide water supplies for domestic use to municipalities; in fact, conservancy districts almost always deal with projects that provide water storage.
- Irrigation district assessments are made to those owning irrigated lands, whereas assessments from watershed improvement and conservancy districts can be made to those benefiting from the actions of the district.

Due to the diverse interests of the various beneficiaries of the recommended improvements, it seems logical to form either a water conservancy or watershed improvement district, vs. an irrigation district, in order to equitably allocate the local share of improvement costs. Notwithstanding the above, it is noteworthy that, of the various districts polled, they were either irrigation or watershed improvement districts. As these districts were formed for purposes very similar to those that require funding in the case of the PDCW, there may be reasons currently unknown as to why conservancy district formation would not be the most logical path forward.

Shareholders of the PDWSC, PCCDC and MCDC have expressed a strong desire to have any possible improvements installed by a future public district funded by the beneficiaries of such improvements. W.S. 41-8-101 through 41-8-126 provide that a watershed improvement district may levy assessments against only those lands that are benefited by particular improvements. **As such, it initially appears that a watershed improvement district would be the most suitable public entity to be formed for the purpose of jointly pursuing a plan to alleviate the problems identified in Section 3.**

# 7. SUMMARY AND PATH FORWARD

## Summary

This study has attempted to identify the existing conditions and associated problems in the PDCW. To summarize:

1. The PDCW is a watershed with no incorporated towns and limited residential development, thus it has retained many of its original qualities that existed at the time of its development in the 1880's.
2. Historical diversion of water from the Piney Creek drainage into the PDCW has created an important agricultural economy in Sheridan County, one that would not exist to nearly its present extent had this transbasin water not been delivered. The major delivery systems include those owned and operated by the PDWSC, the PCCDC and the MCDC, which were constructed in accordance with their original applications to appropriate water and in accordance with Wyoming water law. They deliver water through somewhat elaborate systems that utilize both man-made canals and ditches as well as natural stream courses. Some of the water delivered by the MCDC is also used to irrigate lands within the Little Goose Creek drainage.
3. This historical transbasin diversion water has with time, however, created its own unique set of problems. Most of the problems are not severe in nature. However, there are problems related to stream water quality and sediment transport resulting from erosion in the upper areas of the PDCW that should be addressed. Specific problems related to water quality include the following.
    - Transbasin drops for both the PCCDC and MCDC water flowing from the Piney Creek drainage into the PDCW have created erosive conditions at Tunnel Hill. Eroded sediment has continued downstream to impact existing irrigation delivery systems and streams.
    - Subsequent "second drops" for the PDWSC and PCCDC delivery systems have created similar erosive conditions and resulting impacts to downstream irrigation delivery systems and stream courses.
    - The amount of transbasin water being delivered downstream, associated with the steep gradient of Jenks Creek along the Prairie Dog Canal to the Banner Ranch, has resulted in similar erosive conditions and resulting impacts to downstream irrigation delivery systems and stream courses.
4. Although not of major concern at this time, irrigation diversion structures and existing land use practices are affecting channel stability along portions of Prairie Dog Creek.
5. Some of the facilities that are used to divert and convey transbasin water from the Piney Creek drainage into the PDCW are in need of repair or replacement, or may be of insufficient capacity. These facilities include the diversion facility for the PDWSC from South Piney Creek, the existing channel of the MCDC immediately south of Tunnel Hill, and the feeder ditches conveying water from South Piney Creek to North Piney Creek.
6. Although the PDCW has historically had little industrial development, the ultimate development of the CBM resource within the watershed may have a potential future impact upon the watershed. With that said, water quality impacts relating to the CBM development have thus far been essentially non-existent due to current WDEQ requirements which limit surface water discharge.
7. There is the possibility that water quality problems exist in the Meade Creek drainage (a subdrainage area of the PDCW) that were beyond the scope of this study. Additionally,

elevated levels of fecal coliform bacteria found in portions of Prairie Dog Creek warrant further investigation.

8. Certain Kearney Lake Reservoir water rights are owned by persons who do not own the lands to which they are legally attached. This dilemma has the potential to create significant legal problems for the future use of these rights.
9. There are several state and federal agencies that offer funding to address the problems now existing within the PDCW. Most of these agencies require the establishment of a public entity to act as the steward of these funds.
10. There are several types of public entities (for example, watershed improvement districts, irrigation districts, conservancy districts) that are statutorily available and have been utilized throughout Wyoming to obtain public funding from various state and federal agencies for improvements to existing irrigation ditches, canals and reservoirs. Such public entities have been utilized in conjunction with the various private ditch, canal and/or reservoir companies that originally constructed these irrigation improvements, and their co-existence has worked satisfactorily.

**Path Forward**

As stated in the Introduction, Prairie Dog Creek appeared on WDEQ's 1996 303(d) listing as being "impaired". Such listing meant that WDEQ was required to commence with an evaluation of the need to establish TMDL's for constituents in the creek. The creek was later removed from this list and is now on WDEQ's "Needs to be Monitored" list. Despite this listing removal, it is important to the users of the PDCW that it continue forward on a path that ultimately addresses the issues and concerns that led to the original placement of the stream on the 303(d) list.

At the request of the PDWSC, the PCCDC and the MCDC, the SCCD submitted an application and was successful in obtaining the funds necessary for this study. The SCCD's efforts demonstrate that grant and loan funds are certainly available to address the PDCW's issues and concerns.

In order to best address these issues and concerns within the PDCW, the following list provides a recommended path forward for the residents and users of the watershed. This recommended path represents a feasible, attainable management plan for the watershed.

1. Investigate the most feasible type of public entity that could be formed that would best address the myriad of issues and concerns within the PDCW. Preliminary investigations point to the formation of a watershed improvement district as being the most appropriate public entity; however, more research should be conducted to ascertain if an irrigation district or conservancy district would be the most suitable.
2. Determine if the best means of addressing the watershed's issues and concerns would be via establishment of one public entity, or if several independent public entities would best be formed.
3. Proceed forward in the establishment of the necessary public entity or entities.
4. Once the public entity (or entities) is formed, request that the USDA perform a feasibility study of eligible improvements under its 566 program. Improvements could potentially include those associated with erosion control (PDWSC/Jenks Creek pipeline, Tunnel Hill transbasin drop pipelines for PCCDC and MCDC, PCCDC "second drop" just

downstream of the Tunnel Hill drop, downstream improvements on Prairie Dog Creek, etc.) or stream diversion (diversion dam from South Piney Creek for PDWSC). This feasibility study can be performed at no cost to the applicant.

5. Submit an application to the WWDC for a Level II study. The objectives of the Level II study should include the following:
   a. Completion of a conceptual design of a PDWSC/Jenks Creek pipeline extending from the bottom of Tunnel Hill to the Banner Ranch. Included with this study should be a cursory review of the potential for a cost-effective hydropower generating facility.
   b. Completion of a conceptual design of the Tunnel Hill drop structures needed for the PCCDC and MCDC transbasin facilities. Included with this conceptual design should be an evaluation of the most feasible means of constructing these improvements: via construction of improvements at the current drop locations, or consolidation of PCCDC and MCDC water into one facility. This design would address the "second drop" of the PCCDC's current facilities that is located downstream of the main Tunnel Hill transbasin drop.
   c. Completion of a conceptual design of a new diversion dam and related facilities for the PDWSC for the South Piney Creek water.
   d. A thorough review of the PCCDC and MCDC main ditches to map the areas where ditch erosion and sloughing are occurring, and an analysis of the most cost-effective means to alleviate these problems.
   e. Completion of a conceptual design of improvements and more specific recommendations of BMP's for users of land adjacent to Prairie Dog Creek in areas where the various types of diversion structures and land use practices are affecting channel stability.
   f. Further investigations of Prairie Dog Creek, the PCCDC and MCDC ditches, and major tributaries to more accurately identify areas of channel instability and related causes, as well as to determine possible deficiencies in feeder ditch conveyance capacities in the Story area.
   g. Further investigations of possible water quality problems in the Meade Creek drainage.

   It is important that the WWDC Level II study and the USDA 566 feasibility study be closely coordinated so that information obtained from one study can be utilized in the subsequent study, vs. replicating efforts. To that end, it may be best to submit the Level II study application for consideration by the 2003 Wyoming State Legislature. This postponement will allow for possible district formation to be completed, as well as the USDA 566 feasibility study to be completed, which takes approximately six months.
6. Apply through the WDEQ for EPA Section 319 monies to perform further investigations on the extent and possible sources of elevated FC levels in Prairie Dog Creek below U.S. Highway 87. Included with these investigations should be a reconnaissance of possible source areas. Results of this study could eventually lead to relocating possible sources of bacteriological pollution, such as livestock pens or feed lots. At the same time that monies are requested for this purpose, investigate further the feasibility of utilizing funds from this program for the water quality improvements listed above associated with channel erosion and sediment transport.
7. Request that the PDCW be placed on WDEQ's SRF listing of possible projects to possibly secure future low-interest loan monies.

8. Apply for possible funding from the Wyoming Department of Agriculture's Water Quality Improvement Program once the projects that will potentially improve water quality within the PDCW are more accurately identified.
9. Continue to monitor CBM activities as they occur in the PDCW, specifically WDEQ policies and procedures relative to the discharge and/or disposal of CBM produced water. Should these policies and procedures change from what they are now; that is, surface water discharges are henceforth allowed, utilize data now being collected by the BLM (through its contract with the USGS), this study, and other sources to evaluate potential increases in water quality levels from the baseline numbers outlined in this study.
10. Investigate the water rights in the Kearney Lake Reservoir that have historically been attached to certain lands, and work with those water rights holders, the BOC, and the affected landowners to detach these water rights from the designated lands.

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# APPENDIX 1

## TABULATION OF SURFACE WATER PERMITS AND CURRENT SHAREHOLDERS LIST OF PDWSC, PCCDC & MCDC

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | **SPRING BRANCH, Tributary Bear Gulch or Creek** | | | | | | | | |
| 17015 | Beaver Dam........................ | Lucy G. Leach, et al.............. | 06-26-1925 | I | 0.53 | | 37.63 | 29-53-083 | |
| | *(Point of diversion within same section, township and range.)* | | | | | | | | |
| | **TAM DRAW, Tributary Piney Creek** | | | | | | | | |
| 6459SR | Tam Stock Res...................... | Harry E. Senff.................... | 11-03-1969 | S | 4.94 | a.f. | | 22-53-082 | |
| | **SONNAMAKER CREEK, Tributary Piney Creek** | | | | | | | | |
| 15635 | Sonnamaker No. 2.................. | George Sonnamaker................. | 08-12-1919 | I | 0.57 | | 40.00 | 17-53-083 | |
| | **WEST DRAW, Tributary Sonnamaker Creek** | | | | | | | | |
| 19444 | West.............................. | H. W. Hughey...................... | 09-05-1940 | D,I,S | 0.04 | | 3.00 | 18-53-083 | |
| 21384 | Hosburg........................... | Fred G. Hosburg................... | 03-17-1954 | I | 0.26 | | 17.70 | 17-53-083 | |
| | | | | | S.S. | | 93.55 | | |
| | *(Original supply for 97.8 acres is from South Piney Creek through the Mueller and Leitner Ditch, Territorial Appropriations. Voluntary abandonment of 26.8 acres (0.38 c.f.s.) from 44.5 acres (0.64 c.f.s.) original supply, February 26, 1991. Voluntary abandonment of 4.25 acres supplemental supply from 97.80 acres supplemental supply, February 14, 1996.)* | | | | | | | | |
| | **KRAFT SPRING, Tributary Sonnamaker Creek, Tributary West Draw** | | | | | | | | |
| 12085SR | Kraft Stock Res................... | Nick and Lauri Kraft.............. | 07-08-1994 | S | 0.01 | a.f. | | 18-53-083 | |
| | *(This stock reservoir is unadjudicated, but built within the terms of the permit. No certificate of construction will be issued.)* | | | | | | | | |
| | **SOUTH PINEY CREEK, Tributary Piney Creek** | | | | | | | | |
| Terr. | Big Piney No. 1................... | Christian J. Hepp................. | 05-05-1881 | I | 2.03 | | 142.00 | 13-53-084 | |
| | *(Point of diversion and means of conveyance changed to Piney Divide Ditch, 13-53-84.)* | | | | | | | | |
| Terr. | Big Piney No. 1................... | Christian J. Hepp................. | 05-05-1881 | I | 0.36 | | 25.00 | 26-53-083 | |
| Terr. | Lower Harvey...................... | Cleo Z. Spurrier.................. | 07-00-1883 | I | 0.11 | | 8.00 | 13-53-084 | |
| | *(Amended certificate issued to successor of W.W. Harvey, original appropriator, November 14, 1931.)* | | | | | | | | |
| Terr. | Lower Harvey, 2nd App............. | Cleo Z. Spurrier.................. | -1884 | I | 0.63 | | 44.00 | 13-53-084 | |
| | *(Amended certificate issued, in part, to successor of W.W. Harvey, original appropriator, November 14, 1931. Amended certificate issued, April 20, 1932.)* | | | | | | | | |
| Terr. | Lower Harvey, 2nd App............. | George P. Buckingham.............. | -1884 | I | 0.37 | | 26.00 | 13-53-084 | |
| | *(Amended certificate issued, in part, to successor of W.W. Harvey, original appropriator; point of diversion and means of conveyance changed to Upper Harvey Ditch, 13-53-84.)* | | | | | | | | |
| Terr. | Mueller & Leitner................. | Rudolph Mueller................... | 05-15-1885 | I | 0.19 | | 13.00 | 13-53-084 | |
| | *(Point of diversion and means of conveyance changed to Cleo Ditch, 13-53-83.)* | | | | | | | | |
| Terr. | Mueller & Leitner................. | Clarene Law....................... | 05-15-1885 | I | 0.86 | | 60.00 | 18-53-083 | |
| | *(Certificate issued to successor of John Leitner, original appropriator, change of point of use, and point of diversion and means of conveyance for 2.55 acres (0.04 c.f.s) changed to the Piney Divide Ditch (13-53-84), February 14, 1996.)* | | | | | | | | |
| Terr. | Piney Divide, 1st App............. | Cleo Z. Spurrier.................. | 05-01-1886 | I | 0.17 | | 12.00 | 13-53-084 | |
| | *(Amended certificate issued to successor of W.H. Harvey, original appropriator; point of diversion and means of conveyance changed to Lower Harvey Ditch, 13-53-84, April 19, 1929. Amended certificate issued, November 19, 1929.)* | | | | | | | | |
| Terr. | Piney Divide, 1st App............. | S. J. Brown....................... | 05-01-1886 | I | 0.57 | | 40.00 | 13-53-084 | |
| Terr. | Piney Divide, 1st App............. | Clarene Law....................... | 05-01-1886 | I | 0.86 | | 60.00 | 13-53-084 | |
| | *(Certificate issued to successor of Theodore Kutcher, original appropriator, and change of place of use, February 14, 1996.)* | | | | | | | | |
| Terr. | Piney Divide, 1st App............. | James R. Babcock.................. | 05-01-1886 | I | 0.24 | | 17.00 | 17-53-083 | |

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|
| Terr. | Sonnamaker........................ | G. A. Sonnamaker................. | 05-00-1887 | I | 0.86 | 60.00 | 18-53-083 | |
| | *(Amended certificate issued; point of diversion and means of conveyance changed to Mueller-Leitner Ditch, 18-53-83), November 15, 1928.)* | | | | | | | |
| Terr. | Sonnamaker........................ | Dave Fields...................... | 05-00-1887 | I | 0.36 | 25.00 | 17-53-083 | |
| | *(Amended certificate issued to successor of W.O. Goodhue, original appropriator; point of diversion and means of conveyance as changed to Mueller-Leitner Ditch, 18-53-83, November 15, 1928. Point of diversion and means of conveyance changed to the Snell Pump No. One, 17-53-83, May 12, 1965.)* | | | | | | | |
| Terr. | Upper Harvey...................... | George P. Buckingham............. | 06-01-1887 | I | 0.37 | 26.00 | 13-53-084 | |
| | *(Amended certificate issued to successor of W.W. Harvey, original appropriator, November 14, 1931.)* | | | | | | | |
| Terr. | Piney Divide, 2nd App............. | Cleo Z. Spurrier................. | -1887 | I | 0.40 | 28.00 | 13-53-084 | |
| | *(Amended certificate issued to successor of W.W. Harvey, original appropriator; point of diversion and means of conveyance changed to Lower Harvey Ditch, 13-53-84, April 19, 1929. Amended certificate issued, November 19, 1929.)* | | | | | | | |
| Terr. | Piney Divide, 2nd App............. | Mary J. Brown.................... | -1887 | I | 1.50 | 105.00 | 13-53-084 | |
| Terr. | Piney Divide, 2nd App............. | Rudolph Mueller.................. | -1887 | I | 0.86 | 60.00 | 13-53-084 | |
| Terr. | Piney Divide, 2nd App............. | James Babcock.................... | -1887 | I | 1.61 | 113.00 | 13-53-084 | |
| Terr. | Piney Divide, 2nd App............. | Horace Brown..................... | -1887 | I | 1.07 | 75.00 | 13-53-084 | |
| | *(Amended certificate issued.)* | | | | | | | |
| Terr. | Piney Divide, 2nd App............. | George C. Pilley................. | -1887 | I | 1.57 | 110.00 | 13-53-084 | |
| | *(Amended certificate issued to successor of T.M. Dodge, original appropriator, November 13, 1929.)* | | | | | | | |
| Terr. | Piney Divide, 2nd App............. | Clarene Law...................... | -1887 | I | 0.59 | 41.00 | 13-53-084 | |
| | *(Certificate issued to successor to Theodore Kutcher, original appropriator, and change of place of use, February 14, 1996.)* | | | | | | | |
| Terr. | Piney Divide, 2nd App............. | G. A. Sonnamaker................. | -1887 | I | 0.50 | 35.00 | 13-53-084 | |
| | *(Amended certificate issued, November 15, 1928.)* | | | | | | | |
| Terr. | Piney Divide, 2nd App............. | Lucy G. Leach, et al............. | -1887 | I | 2.35 | 165.00 | 13-53-084 | |
| | *(Amended certificate issued to successors of Fred Hosburgh, original appropriator of an 80-acre appropriation, and of Clara B. Hosburgh, original appropriator of an 85.0 acre appropriation.)* | | | | | | | |
| Terr. | Piney Divide, 2nd App............. | Howard A. West................... | -1887 | I | 0.14 | 10.00 | 13-53-084 | |
| Terr. | Piney Divide, 2nd App............. | Christian J. Hepp................ | -1887 | I | 3.57 | 250.00 | 13-53-084 | |
| Terr. | Piney Divide, 2nd App............. | Belle Scott...................... | -1887 | I | 1.43 | 100.00 | 13-53-084 | |
| | *(Amended certificate issued to successor of F.W. Strickert, original appropriator.)* | | | | | | | |
| Terr. | Piney Divide, 2nd App............. | S. J. Brown...................... | -1887 | I | 1.86 | 130.00 | 13-53-084 | |
| Terr. | Piney Divide, 2nd App............. | Gilbert H. Dodge................. | -1887 | I | 1.00 | 70.00 | 13-53-084 | |
| Terr. | Piney Divide, 2nd App............. | Robert W. Fullerton.............. | -1887 | I | 2.29 | 160.00 | 13-53-084 | |
| Terr. | Piney Divide, 2nd App............. | Moses Dodge...................... | -1887 | I | 0.58 | 40.00 | 13-53-084 | |
| Terr. | Mueller........................... | Rudolph Mueller.................. | 08-15-1888 | I | 0.21 | 15.00 | 18-53-083 | |
| Terr. | Mueller & Leitner, 2nd App......... | Alfred T. Bacon.................. | 05-15-1889 | I | 0.03 | 2.00 | 18-53-083 | |
| Terr. | Mueller & Leitner, 2nd App......... | Clarene Law...................... | 05-15-1889 | I | 0.58 | 40.00 | 18-53-083 | |
| | *(Certificate issued to successor of John Leitner, original appropriator, change of place of use, and point of diversion and means of conveyance for 1.70 acres (0.02 c.f.s.) changed to the Piney Divide Ditch (13-53-84), Feburary 14, 1996.)* | | | | | | | |
| Terr. | Doyle............................. | Alfred T. Bacon.................. | Spring 1889 | I | 0.50 | 35.00 | 17-53-083 | |
| Terr. | Mueller, 2nd App.................. | Rudolph Mueller.................. | 05-00-1891 | I | 0.07 | 5.00 | 18-53-083 | |
| 169E | Enl. Little Piney Divide.......... | Samuel J. Grinnell............... | 12-05-1895 | I | 4.71 | 330.00 | 13-53-084 | |
| 170E | Enl. Little Piney Divide.......... | Robert W. Fullerton.............. | 12-05-1895 | I | 1.81 | 127.00 | 13-53-084 | |
| 174E | Enl. Little Piney Divide.......... | Daniel J. Poole.................. | 12-23-1895 | I | 2.02 | 141.00 | 13-53-084 | |
| | *(Point of diversion and means of conveyance as changed to Lower Harvey Ditch, 13-53-84, changed to Big Piney Divide Ditch, 13-53-84.)* | | | | | | | |
| 1242 | Barlow (Piney & Cruse)............ | C. H. McCully.................... | 05-27-1896 | I | 0.57 | 40.00 | 13-53-084 | |
| 1330 | Rock Cr. & Piney Res.............. & Ditch Co.'s Canal | Fred L. Newton................... | 09-08-1896 | I | 1.91 | 134.00 | 13-52-085 | |
| | *(This appropriation diverted to Rock Creek and thence carried through the Beaver Dam Rounder Ditch.)* | | | | | | | |
| 1334 | Rock Cr. & Piney Res.............. & Ditch Co.'s Canal | Charles E. Huson, et al.......... | 09-28-1896 | I | 1.41 | 98.70 | 13-52-085 | |
| | *(This appropriation diverted to Rock Creek and thence carried through the Beaver Dam Rounder Ditch. Amended certificate issued to successors of Jennie Anderson, original appropriator.)* | | | | | | | |
| 1334 | Rock Cr. & Piney Res.............. & Ditch Co.'s Canal | Hamilton Wilcox.................. | 09-28-1896 | I | 1.04 | 73.30 | 13-52-085 | |
| | *(This appropriation diverted to Rock Creek and thence carried through the Beaver Dam Rounder Ditch.)* | | | | | | | |

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|
| 1323 | Rock Cr. & Piney Res & Ditch Co.'s Canal | J. B. Huggins | 10-01-1896 | I | 0.43<br>S.S. | 30.00<br>75.00 | 13-52-085 | |
| | *(Original supply for 75.0 acres is from Rock Creek through the Last Chance Ditch, Territorial Appropriation, with a priority of May 6, 1885.)* | | | | | | | |
| 1323 | Rock Cr. & Piney Res & Ditch Co.'s Canal | McRae Brothers | 10-01-1896 | I | S.S. | 310.00 | 13-52-085 | |
| | *(Original supply is from Rock Creek through Johnny Come Early and Russell Ditches, Territorial Appropriations, with priorities of March 1880 and November 1, 1883.)* | | | | | | | |
| 1323 | Rock Cr. & Piney Res & Ditch Co.'s Canal | I. C. Buell | 10-01-1896 | I | S.S. | 95.00 | 13-52-085 | |
| | *(Original supply is from Rock Creek through Hallie Ditch, Territorial Appropriation, with a priority of April 10, 1886.)* | | | | | | | |
| 1323 | Rock Cr. & Piney Res & Ditch Co.'s Canal | J. H. McDonald | 10-01-1896 | I | S.S. | 148.90 | 13-52-085 | |
| | *(Original supply is from South Fork Rock Creek through the Mowry Basin Ditch, 2nd App., Territorial Appropriation, with a priority of 1887 and the Enlarged Mowry Basin Ditch, Permit No. 2460 Enl., and from Sayles Creek through the Lorena Ditch, Permit No. 6257.)* | | | | | | | |
| 1323 | Rock Cr. & Piney Res & Ditch Co.'s Canal | George A. Buell | 10-01-1896 | I | S.S. | 144.10 | 13-52-085 | |
| | *(Original supply is from Rock Creek through Hallie Ditch, Territorial Appropriation, with a priority of April 10, 1886.)* | | | | | | | |
| 1323 | Rock Cr. & Piney Res & Ditch Co.'s Canal | John U. Barkey | 10-01-1896 | I | 0.37<br>S.S. | 26.00<br>322.00 | 13-52-085 | |
| | *(Original supply for 322.0 acres is from Rock Creek through the Lake DeSmet Ditch, Territorial Appropriation, with a priority of October 31, 1884.)* | | | | | | | |
| 1323 | Rock Cr. & Piney Res & Ditch Co.'s Canal | T. J. Haynes | 10-01-1896 | I | S.S. | 115.00 | 13-52-085 | |
| | *(Original supply is from South Fork Rock Creek through the South Fork Rock Creek Ditch, Territorial Appropriation, with a priority of May 1885 and from North Fork Rock Creek through the Sonnesberger Ditch, Territorial Appropriation, with a priority of June 1, 1883.)* | | | | | | | |
| 1323 | Rock Cr. & Piney Res & Ditch Co.'s Canal | Percival J. Gough | 10-01-1896 | I | S.S. | 260.60 | 13-52-085 | |
| | *(Original supply is from Rock Creek through the Enlarged Lake DeSmet Ditch, Permit No. 658 Enl.)* | | | | | | | |
| 1323 | Rock Cr. & Piney Res & Ditch Co.'s Canal | I. N. Lane | 10-01-1896 | I | 4.51<br>S.S. | 316.40<br>100.00 | 13-52-085 | |
| | *(Original supply for 100.0 acres is from Rock Creek through the Lake DeSmet Ditch, Territorial Appropriation, with a priority of October 31, 1884.)* | | | | | | | |
| 1323 | Rock Cr. & Piney Res & Ditch Co.'s Canal | J. W. Mooney | 10-01-1896 | I | 1.35<br>S.S. | 95.00<br>310.00 | 13-52-085 | |
| | *(Original supply for 310.0 acres is from Rock Creek through the Hallie Ditch, Territorial Appropriation, with a priority of April 10, 1886.)* | | | | | | | |
| 1323 | Rock Cr. & Piney Res & Ditch Co.'s Canal | Charles E. Buell | 10-01-1896 | I | S.S. | 155.00 | 13-52-085 | |
| | *(Original supply is from North Fork Shell Creek through the Mountain Ditch, Territorial Appropriation, with a priority of June 15, 1880 and from Little North Fork Shell Creek through the Pioneer Ditch, Territorial Appropriation, with a priority of April 15, 1879 and Spring Ditch, Territorial Appropriation, with a priority of July 1, 1885.)* | | | | | | | |
| 1323 | Rock Cr. & Piney Res & Ditch Co.'s Canal | A. C. Warburton | 10-01-1896 | I | S.S. | 174.70 | 13-52-085 | |
| | *(Original supply is from South Fork Rock Creek through the Mowry Basin Ditch and Mowry Basin Ditch, 2nd App., Territorial Appropriations, with priorities of October 20, 1884 and 1887; through the Enlarged Mowry Basin Ditch, Permit No. 2390 Enl.)* | | | | | | | |
| 1323 | Rock Cr. & Piney Res & Ditch Co.'s Canal | Geo. P. Hersey | 10-01-1896 | I | 3.62<br>S.S. | 254.20<br>5.00 | 13-52-085 | |
| | *(Original supply for 5.0 acres is from Rock Creek through the Hallie Ditch, Territorial Appropriation, with a priority of April 10, 1886.)* | | | | | | | |
| 1323 | Rock Cr. & Piney Res & Ditch Co.'s Canal | First National Bank of Buffalo | 10-01-1896 | I | 3.88<br>S.S. | 271.60<br>282.90 | 13-52-085 | |
| | *(Original supply for 282.90 acres is from Rock Creek through the Lake DeSmet Ditch, Territorial Appropriation, with a priority of October 31, 1884.)* | | | | | | | |
| 1323 | Rock Cr. & Piney Res & Ditch Co.'s Canal | Munkres & Mather | 10-01-1896 | I | 18.93<br>S.S. | 1,325.10<br>1,389.90 | 13-52-085 | |
| | *(Original supply for 1389.90 acres is from Rock Creek through the Lake DeSmet Ditch, Territorial Appropriation, with a priority of October 31, 1884.)* | | | | | | | |
| 248E | Enl. Piney Divide | Rudolph Mueller | 10-06-1896 | I | 1.30 | 91.50 | 13-53-084 | |
| 235E | Enl. Piney & Cruse | E. J. Brooks | 01-08-1897 | I | 0.28 | 20.00 | 13-53-084 | |
| | *(Adjudicated as Brook's Lateral. Diversion is from South Piney Creek through Piney & Cruse Ditch to Prairie Creek and thence through Barlow No. 1 Lateral.)* | | | | | | | |
| 1643E | Enl. Rock Creek & Piney Ditch Co. (Barkey Lat.) | Ida R. Barkey | 09-24-1906 | I | 0.98 | 69.00 | 13-52-085 | |
| | *(This appropriation is diverted to Rock Creek and thence carried through Barkey Lateral of Lake DeSmet Canal.)* | | | | | | | |
| 1852E | Enl. Sonnamaker | F. A. Senff | 03-30-1908 | I | 1.14 | 80.00 | 18-53-083 | |

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 2616E | Enl. Piney Divide.................. | William Diener.................... | 08-14-1911 | I | 1.46 | | 102.00 | 13-53-084 | |
| 4224E | Enl. Prairie Dog Cut-Off........... | S. H. Smith....................... | 07-30-1921 | Power | 9.60 | | | 18-53-083 | |
| 4225E | Enl. Prairie Dog Cut-Off........... | S. H. Smith....................... | 07-30-1921 | D | 0.46 | | | 18-53-083 | |
| 16791 | Prairie Dog Water.................. Supply Co. | John Hammond...................... | 05-15-1922 | I | 0.19 | | 13.20 | 18-53-083 | |
| 16791 | Prairie Dog Water.................. Supply Co. | J. F. Kirkpatrick................. | 05-15-1922 | I | 0.29 | | 20.70 | 18-53-083 | |
| 16791 | Prairie Dog Water.................. Supply Co. | George Sieweke.................... | 05-15-1922 | I | 0.14 | | 10.00 | 18-53-083 | |
| 16791 | Prairie Dog Water.................. Supply Co. | H. F. Headley, et al.............. | 05-15-1922 | I | 0.07 | | 5.00 | 18-53-083 | |
| 16791 | Prairie Dog Water.................. Supply Co. | H. A. McLimans, et al............. | 05-15-1922 | I | 0.11 | | 8.00 | 18-53-083 | |
| 16791 | Prairie Dog Water.................. Supply Co. | George A. Lucas................... | 05-15-1922 | I | 0.10 | | 6.80 | 18-53-083 | |
| 16791 | Prairie Dog Water.................. Supply Co. | Steve George, et al............... | 05-15-1922 | I | 0.11 | | 8.20 | 18-53-083 | |
| 16791 | Prairie Dog Water.................. Supply Co. | E. V. Newcomer, et al............. | 05-15-1922 | I | 0.10 | | 7.50 | 18-53-083 | |
| 16791 | Prairie Dog Water.................. Supply Co. | C. E. Stevenson................... | 05-15-1922 | I | 0.06 | | 4.00 | 18-53-083 | |
| 16791 | Prairie Dog Water.................. Supply Co. | G. W. Stroud...................... | 05-15-1922 | I | 0.18 | | 12.50 | 18-53-083 | |
| 16791 | Prairie Dog Water.................. Supply Co. | Weltner Brothers.................. | 05-15-1922 | I | 0.32 | | 22.60 | 18-53-083 | |
| 16791 | Prairie Dog Water.................. Supply Co. | A. B. Wiley....................... | 05-15-1922 | I | 0.02 | | 1.50 | 18-53-083 | |
| 16791 | Prairie Dog Water.................. Supply Co. | Bertha C. Kahn.................... | 05-15-1922 | I | 1.26 S.S. | | 88.40 31.00 | 18-53-083 | |
| | *(Original supply for 31.0 acres is from Wild Cat Creek through the Kahn Ditch, Permit No. 7502.)* | | | | | | | | |
| 16791 | Prairie Dog Water.................. Supply Co. | Arthur Dolan...................... | 05-15-1922 | I | 0.67 | | 47.00 | 18-53-083 | |
| 4364E | Enl. Piney Cruse Creek............. | S. J. Duncan...................... | 06-15-1923 | I | 0.97 | | 67.60 | 13-53-084 | |
| 4502E | Enl. Lower Harvey.................. | C. Z. Spurrier.................... | 08-21-1926 | I | 0.27 | | 19.00 | 13-53-084 | |
| 4504E | Enl. Coffeen....................... | Frank R. Spracklen................ | 11-19-1926 | I | 0.77 S.S. | | 54.10 50.00 | 23-53-084 | |
| | *(Original supply for 50.0 acres is from Rhiner Creek or Phil Rhiner Draw through the Rhiner Ditch, Permit No. 6513.)* | | | | | | | | |
| 4783E | Enl. Upper Harvey.................. | George P. Buckingham.............. | 11-12-1931 | I | 2.10 | | 147.00 | 13-53-084 | |
| 4784E | Enl. Lower Harvey.................. | Cleo Z. Spurrier.................. | 11-12-1931 | I | 0.37 | | 26.00 | 13-53-084 | |
| 19288 | Nelson Pipe........................ | E. B. Nelson...................... | 12-15-1939 | D | 0.03 | | | 18-53-083 | |
| 19477 | Cleo............................... | Cleo Z. Spurrier.................. | 11-12-1940 | I | 0.29 | | 20.00 | 13-53-084 | |
| | *(Adjudicated as from South Gulch, tributary South Piney Creek.)* | | | | | | | | |
| 20048 | Kusel.............................. | John Cover, et al................. | 04-17-1946 | I | 0.03 | | 2.10 | 17-53-083 | |
| 20254 | Gettys Pipe Line................... | Claude L. Gettys.................. | 01-04-1949 | D,I | 0.02 | | 1.19 | 17-53-083 | |
| 5795E | Enl. Piney Divide.................. | Lucy G. Leach, et al.............. | 01-07-1955 | I | 1.90 | | 133.00 | 13-53-084 | |
| 20615 | Prairie Dog Water.................. Supply Co. | William I. Moore, et al........... | 08-17-1950 | I | 100.00 Sec.Sup. | a.f. | 138.50 | 18-53-083 | |
| | *(The lands covered by the secondary supply are described under the Prairie Dog Water Supply Company Canal, Territorial Appropriations, with priorities of May 1, 1884, 2nd App. and August 3, 1885, 3rd App. This appropriation is to be from natural flow of South Piney Creek in exchange for water stored in Lake DeSmet Reservoir, Permit No. 973 Res., and released to supply prior rights below said reservoir at a rate of 1.0 c.f.s. for each 50.0 acre-feet of water stored.)* | | | | | | | | |
| 20616 | Piney Divide....................... | Lucy G. Leach, et al.............. | 10-10-1950 | I,S | 100.00 Sec.Sup. | a.f. | 320.00 | 13-53-084 | |
| | *(The lands covered by the secondary supply are described under the Piney Divide Ditch, Territorial Appropriation, with a priority of 1887. This appropriation is to be from natural flow of South Piney Creek in exchange for water stored in Lake DeSmet Reservoir, Permit No. 973 Res., and released to supply prior rights below said reservoir at a rate of 1.0 c.f.s. for each 50.0 acre-feet of water stored. Amended certificate issued reducing appropriation from 345.0 acres.)* | | | | | | | | |

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 21080 | Piney Divide...................... | Belle Scott..................... | 08-02-1951 | I | 50.00 Sec.Sup. | a.f. | 100.00 | 13-53-084 | |
| | *(The lands covered by secondary supply are described under the Piney Divide Ditch, Territorial Appropriation, with a priority of 1887. This appropriation is to be from natural flow of South Piney Creek in exchange for water stored in Lake DeSmet Reservoir, Permit No. 973 Res., and released to supply prior rights below said reservoir at a rate of 1.0 c.f.s. for each 50.0 acre-feet of water stored.)* | | | | | | | | |
| 5616E | Enl. Piney Divide................. | Lucy G. Leach, et al............. | 03-31-1952 | I | 50.00 Sec.Sup. | a.f. | 320.00 | 13-53-084 | |
| | *(The lands covered by secondary supply are described under the Piney Divide Ditch, Territorial Appropriation, with a priority of 1887. This appropriation is to be from natural flow of South Piney Creek in exchange for water stored in Lake DeSmet Reservoir, Permit No. 973 Res., and released to supply prior rights below said reservoir at a rate of 1.0 c.f.s. for each 50.0 acre-feet of water stored. Amended certificate issued reducing appropriation from 382.63 acres.)* | | | | | | | | |
| 5617E | Enl. Upper Harvey................. | Andrew Stager, et al............. | 04-15-1952 | I | 50.00 Sec.Sup. | a.f. | 201.00 | 13-53-084 | |
| | *(The lands covered by secondary supply are described in Territorial Appropriations, with priorities of July 1884, and June 6, 1887, through the Upper Harvey Ditch and Permit Nos. 4783 Enl. and 4502 Enl., through the Lower Harvey Ditch. This appropriation is to be from natural flow of South Piney Creek in exchange for water stored in Lake DeSmet Reservoir, Permit No. 973 Res., and released to supply prior rights below said reservoir at a rate of 1.0 c.f.s. for each 50.0 acre-feet of water stored.)* | | | | | | | | |
| 21032 | Piney & Cruse Creek............... | Houston Duncan................... | 09-02-1952 | I | 200.00 Sec.Sup. | a.f. | 599.60 | 13-53-084 | |
| | *(The lands covered by secondary supply are described under the Piney and Cruse Ditch from North and South Piney Creeks, Territorial Appropriations, with priorities of May 7, 1884 and 1891; under the Mead Ditch from Mead Creek, Territorial Appropriation, with a priority of 1880; under the West Duncan Ditch from Mead Creek, Permit 11380; under the East Duncan Ditch from Rifle Creek, Permit 11381. This appropriation is to be from the natural flow of South Piney Creek in exchange for water stored in Lake DeSmet Reservoir, Permit No. 973 Res., and released to supply prior rights below said reservoir at a rate of 1.0 c.f.s. for each 50.0 acre-feet of water stored.)* | | | | | | | | |
| 21210 | Mueller & Leitner................. | Clarene Law...................... | 06-30-1953 | I | 50.00 Sec.Sup. | a.f. | 100.00 | 18-53-083 | |
| | *(The lands covered by secondary supply are described under the Mueller and Leitner Ditch, Territorial Appropriations. This appropriation is not to exceed 50.0 acre-feet of water diverted from South Piney Creek in exchange for 50.0 acre-feet to be released into Clear Creek from water stored in Lake DeSmet Reservoir, Permit No. 973 Res. Amended certificate issued to successor of Fred G. and Nellie May Hosburg, original appropriator, change of place of use, and point of diversion and means of conveyance for 4.25 acres changed to the Piney Divide Ditch (13-53-84), February 14, 1996.)* | | | | | | | | |
| 21606 | Piney Divide...................... | D. Orrel Geier................... | 05-13-1955 | I | 50.00 Sec.Sup. | a.f. | 485.00 | 13-53-084 | |
| | *(Original supply for 483.0 acres is from Little Piney Creek for 140.0 acres through Lower Phil Kearney Ditch, Territorial Appropriation, with a priority of July 1879; 345.0 acres through the Upper Phil Kearney Ditch, Territorial Appropriation, with a priority of May 15, 1881 (as changed in part to Leitner, Foster, Geier No. 1 and Geier No. 2 Ditches). This appropriation is to be from the natural flow of South Piney Creek in exchange for water stored in Lake DeSmet Reservoir, Permit No. 973 Res., and released to supply prior rights below said reservoir at a rate of 1.0 c.f.s. for each 50.0 acre-feet of water stored.)* | | | | | | | | |
| 22280 | Prairie Dog Water................. Supply Co. | Joseph Pilch, et al.............. | 10-17-1955 | I | 50.00 Sec.Sup. | a.f. | 301.00 | 18-53-083 | |
| | *(Secondary supply for 45.0 acres having original supply from Piney Creek through the Prairie Dog Water Supply Company Ditch, 2nd App. Territorial Appropriation, with a priority of May 1, 1884, and supplemental supply from Prairie Dog Creek through the Pilch Ditch, Permit No. 21628, and through the Prairie Dog No. 15 Ditch, Permit No. 16789; 35.0 acres having original supply from Prairie Dog Creek through the Nash Ditch, Permit No. 5739; 82.50 acres having original supply from Prairie Dog Creek through the Pilch Ditch, Permit No. 21628; 112.0 acres having original supply from Prairie Dog Creek through the Pilch Pump Ditch, Permit No. 21629; and 26.5 acres having original supply from Prairie Dog Creek through the Pilch Pump No. Two Ditch, Permit No. 21630. This appropriation is to be supplied from the natural flow of South Piney Creek, above Lake DeSmet Reservoir, at a rate of 1.0 c.f.s., in exchange for water stored in Lake DeSmet Reservoir, Permit No. 973 Res.)* | | | | | | | | |
| 22782 | Piney-Cruse Creek................. | William J. Kirven................ | 10-18-1961 | I | 565.00 Sec.Sup. | a.f. | 564.60 | 13-53-084 | |
| | *(Additional secondary supply stored in Lake DeSmet Reservoir for lands which have an existing secondary supply from South Piney Creek through Piney and Cruse Creek Ditch, Permit No. 21032. Original supply is from Mead Creek for 8.0 acres through the Mead Creek Ditch, Territorial Appropriation, with a priority of 1880; for 66.0 acres through the West Duncan Ditch, Permit No. 11380. Original supply is from North and South Piney Creek for 120.0 acres through the Perry A. Duncan Piney and Cruse Ditch, 1st and 2nd appropriations, Territorial Appropriations, with priorities of July 20, 1885 and 1891; for 35.0 acres through the Robert J. Payne Piney and Cruse Ditch, 1st and 2nd appropriations, Territorial Appropriations, with priorities of July 20, 1885 and 1891; for 62.0 acres through the Pulaski Calvert Piney and Cruse Ditch, 2nd appropriation, Territorial Appropriation, with a priority of 1891; for 100.0 acres through the John F. Jenning Piney and Cruse Ditch, 2nd appropriation, Territorial Appropriation, with a priority of 1891; for 96.0 acres through the Piney and Cruse Ditch, Permit No. 359 Enl.; and for 67.6 acres through the Piney and Cruse Ditch, Permit No. 4364 Enl., with a supplemental supply from North Piney Creek through Enlarged Piney Cruse Creek Ditch, Permit No. 4365 Enl. Original supply for 10.0 acres is from Rifle Creek through East Duncan Ditch, Permit No. 11381. Under an exchange of water, as provided by Wyoming Statutes, this appropriation is supplied from the natural flow of South Piney Creek above Lake DeSmet Reservoir, at a rate not to exceed 5.0 c.f.s. in exchange for water stored in Lake DeSmet Reservoir, and released to supply prior rights below said reservoir. This water to be furnished from Lake DeSmet Reservoir, from excess stored water under the provisions of Wyoming Statutes. No exchange of water will be allowed under this permit except at such times as when water is legally available for such exchange and when it can be made without injury to other appropriators. The District Water Commissioner must be notified in writing each year in advance of the* | | | | | | | | |

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | *exchange granted by this permit, as provided by Wyoming Statutes, and delivery shall be under the direct supervision of the Water Commissioner. Amended certificate issued reducing the amount of stored water allocated from 600.0 acre-feet to 565.0 acre-feet)* | | | | | | | | |
| 22782 | Piney Cruse Creek.................. | Kirven Ranch, Ltd................ | 10-18-1961 | I | Sec.Sup. | | 35.00 | 13-53-084 | |
| | *(Secondary supply of 35.0 acre-feet of water stored in Lake DeSmet Reservoir, Permit No. 973 Res. Under an exchange of water, as provided in Section 41-42, Wyoming Statutes, 1957, this appropriation is to be supplied from the natural flow of South Piney Creek above Lake DeSmet Reservoir at a rate not to exceed 5.0 c.f.s. in exchange for water stored in Lake DeSmet Reservoir and released to supply prior rights below said reservoir. This water to be furnished from Lake DeSmet Reservoir from excess stored water under the provisions of Section 41-39, Wyoming Statutes, 1957. No exchange of water will be allowed under this permit except at such times as when water is legally available for such exchange and when it can be made without injury to other appropriators. The district water commissioner must be notified in writing each year in advance of the exchange granted by this permit, as provided by Section 41-29, Wyoming Statutes, 1957, and delivery of this water shall be under the direct supervision of the water commissioner. An additional secondary supply of excess water stored in Lake DeSmet Reservoir, Permit No. 973 Res., from Piney Creek, as provided by Section 41-39, Wyoming Statutes, 1957, is desired for the lands which have an existing secondary supply under Permit No. 21032 and with original direct flow rights from North and South Piney Creeks through the Piney-Cruse Creek Ditch 1st and 2nd appropriations, with priorities of July 20, 1885 and 1891, respectively.)* | | | | | | | | |
| 6801E | Texaco Enlargement................. | Texaco, Inc....................... | 12-20-1979 | Fish | 5.96 | | | 13-53-084 | |
| | *(This appropriation is limited to a combined total of 5.96 c.f.s. for fish spawning purposes. Water diverted from South Piney Creek under this appropriation, in combination with water diverted from Little Piney Creek, shall not exceed 5.96 c.f.s. and the diversion under this permit shall be limited to the period of September 15 through November 15 each year. If all storage rights in Lake DeSmet filled from Piney Creek and its tributaries under Permit Nos. 15779, 5550 Enl., 5551 Enl., 5789 Enl., and 6217 Enl. are full, water delivered under this permit and No. 6802 Enl. will be released through the North Outlet of Lake DeSmet.)* | | | | | | | | |
| 9408R | Spielman Fishing Preserve Res...... | Ann S. Spielman.................. | 07-08-1988 | Fish,Rec | 0.18 | a.f. | | 13-53-084 | |
| 6893E | Spielman Enl. Piney and Cruse...... Creek | Ann Spielman..................... | 07-08-1988 | Fish Res. Supply | 2.31 | | | 13-53-084 | |
| | *(Supply Ditch for the Spielman Fishing Preserve Reservoir, Permit No. 9408 Res., not to exceed 0.180 acre-feet from all sources in any one year and at a rate not to esxceed 2.31 c.f.s. A non-consumptive use of water for fish propagation is not to exceed 2.31 c.f.s. Water will be diverted from flow in the Piney and Cruse Creek Ditch, routed through the Spielman Fishing Preserve Reservoir, and returned to flow in the Piney and Cruse Creek Ditch.)* | | | | | | | | |
| 30885 | Story Fish Hatchery Cavern Intake.. | Wyoming Game & Fish Department..... | 06-16-1992 | GW Recharge | 10.00 | | | 23-53-084 | |
| | *(This appropriation is limited to ground water recharge purposes (to supply ground water to springs) at the Story Fish Hatchery, not to exceed 10.0 c.f.s.)* | | | | | | | | |

## VISCONTI SPRING NO. 1, Tributary South Piney Creek

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 24862 | Visconti Spring No. 1............. Pipeline | John E. and Helen L. Hanft......... and Larry E. and Vicki D. Hanft | 03-10-1975 | I | 0.07 S.S. | | 4.50 10.00 | 17-53-083 | |
| 10456R | Atherton Res...................... | Hugh A. Miller.................... | 12-11-1995 | S,Fish | 0.05 | a.f. | | 17-53-083 | |

## KESSLER SPRINGS DRAW, Tributary South Piney Creek

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 8755R | Kessler No. 1 Pond................ | Glen Kessler...................... | 12-08-1983 | D,I,Rec | 0.29 | a.f. | | 17-53-083 | |
| 8756R | Kessler No. 2 Pond................ | Glen Kessler...................... | 12-08-1983 | Rec | 0.32 | a.f. | | 17-53-083 | |
| 28405 | Kessler No. 1 Pump................ | Glen & Hazel E. Everett........... | 03-09-1984 | D,I | 0.05 | | 2.90 | 17-53-083 | |
| | *(This appropriation is also used for domestic purposes (watering of lawns, trees, shrubs and garden) at a point of use in the NE1/4NW1/4 of Section 17. The rate of diversion is not to exceed 0.052 c.f.s. for both irrigation and domestic purposes. The area of domestic use is 0.8 acres.)* | | | | | | | | |
| 30387 | Kessler Springs Draw Diversion..... | Glen and Hazel Kessler............ | 08-31-1989 | Fish | | | | 17-53-083 | |
| | *(The use of this appropriation is for reservoir flow-through for fish propagation purposes to maintain a fishery in the Kessler No. 2 Pond Reservoir, Permit No. 8756 Res., and is limited to the normal flow of Kessler Spring, not to exceed 2.96 c.f.s.)* | | | | | | | | |

## SPRING BRANCH SOUTH PINEY CREEK, Tributary South Piney Creek

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 20049 | Kusel............................. | John Cover, et al................. | 04-17-1946 | I | S.S. | | 2.10 | 17-53-083 | |
| | *(Original supply is from South Piney Creek through Kusel Ditch, Permit No. 20048.)* | | | | | | | | |

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | **WAGON BOX SPRING, Tributary South Piney Creek** | | | | | | | | |
| 20047 | Wagon Box Pipe Line | Edith Visconti di Modrone | 04-17-1946 | D,S | 0.07 | | | 18-53-083 | |
| | **BUSINGA SPRING CREEK, Tributary South Piney Creek** | | | | | | | | |
| 6998R | Businga No. 1 Res | Claude Businga | 12-10-1962 | Fish,Rec | 5.75 | a.f. | | 18-53-083 | |
| 6999R | Businga No. 2 Res | Claude Businga | 12-10-1962 | Fish,Rec | 1.26 | a.f. | | 18-53-083 | |
| 7000R | Businga No. 3 Res | Claude Businga | 12-10-1962 | Fish,Rec | 0.95 | a.f. | | 18-53-083 | |
| | **COOLEY SPRING, Tributary Cooley Draw, Tributary South Piney Creek** | | | | | | | | |
| 22925 | Cooley Pipeline | Chester R. Cooley, et al | 03-08-1968 | D | 0.04 | | | 18-53-083 | |
| | **HANFT SPRING NO. 1, Tributary South Piney Creek** | | | | | | | | |
| 29272 | Mueller & Leitner Ditch - Hanft Spring No. 1 Diversion | John E. and Helen L. Hanft | 05-28-1985 | I | S.S. | | 75.05 | 18-53-083 | |
| | *(Supplemental supply for 10.0 acres which have an original supply from South Piney Creek through the Mueller and Lietner Ditch, Territorial Appropriations; and secondary supply under Permit No. 21210 the Mueller and Leitner Ditch from South Pine Creek in exchange for water released from the Lake Desmet Reservoir (Permit No. 973 Res.); supplemental supply from West Draw, a tributary of South Piney Creek through the Hosburg Ditch, Permit No. 21384; and supplemental supply from Visconti Spring, a tributary of South Piney Creek through the Visconti Spring No. 1 Pipeline, Permit No. 24862. Supplemental supply for 69.3 acres which have an original supply from South Piney Creek through the Mueller and Leiner Ditch, Territorial Appropriations; and secondary supply under Permit No. 21210, the Mueller and Leitner Ditch from South Piney Creek in exchange for water released from Lake DeSmet Reservoir (Permit No. 973 Res.): and supplemental supply from West Draw, a tributary of South Piney Creek through the Hosburg Ditch, Permit No. 21384. Voluntary abandonment of 4.25 acres supplemental supply, February 14, 1996.)* | | | | | | | | |
| | **LEON SPRING NO. 1, Tributary South Piney Creek** | | | | | | | | |
| 22345 | Leon Pipe Line No. 1 | Maurice Leon, Jr., et al | 11-09-1962 | I | 0.12 | | 8.40 | 18-53-083 | |
| | **SOUTH FORK SOUTH PINEY CREEK, Tributary South Piney Creek** | | | | | | | | |
| 65R | Cloud Peak Res | Rock Creek & Piney Reservoir & Ditch Company | 07-13-1896 | I | 2,720.00 | a.f. | | 9-51-085 | |
| 6223R | Enl. Cloud Peak Res | Rock Creek & Piney Reservoir & Ditch Company | 09-28-1933 | I | 677.68 | a.f. | | 9-51-085 | |
| 6408R | Willow Park Res | Willow Park Reservoir Company | 08-26-1939 | D,I,S Fish | 4,457.00 | a.f. | | 24-52-085 | |
| | *(4132.0 acre-feet is for irrigation, stock, and domestic, 325.0 acre-feet is dead storage for fish.)* | | | | | | | | |
| 6906R | Enl. Cloud Peak Res | Rock Creek & Piney Reservoir & Ditch Company | 09-22-1961 | I | 172.72 | a.f. | | 9-51-085 | |
| 23403 | Buffalo Water Wagon Pipeline and Ditch | City of Buffalo | 11-21-1968 | Mun | 100.00 Sec.Sup. | a.f. | | 10-50-083 | |
| | *(Secondary supply stored in Willow Park Reservoir, Permit No. 6408 Res. The natural flow of Clear Creek will be diverted in exchange for an equal amount of stored water released from Willow Park Reservoir, Permit No. 6408 Res. This appropriation is limited to 100.0 acre-feet and the rate of diversion and exchange is limited to 2.0 c.f.s. Water in the Willow Park Reservoir, Permit No. 6408 Res., will be released into the South Fork South Piney Creek, thence diverted through Rock Creek and Piney Res. and Ditch Company Canal into Rock Creek, thence down Rock Creek into Clear Creek below the point of diversion and point of use by the City of Buffalo. Point of diversion and means of conveyance for 2.0 c.f.s. changed to 10-50-83, November 28, 1984. Additional means of conveyance added for 2.0 c.f.s., May 18, 1987. Alternate point of diversion allowed for 2.0 c.f.s., May 13, 1997.)* | | | | | | | | |

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | **NORTH FORK SOUTH PINEY CREEK OR KEARNEY CREEK, Tributary South Piney Creek** | | | | | | | | |
| 962R | Kearney Lake Res................... | Kearney Lake Land & Reservoir Co... | 11-22-1906 | D,I,S | 1,854.05 | a.f. | | 30-52-085 | |
| 6555R | Enl. Kearney Lake Res.............. | Kearney Lake Land & Reservoir Co... | 07-14-1950 | I | 4,276.50 | a.f. | | 29-52-085 | |
| 6826R | Enl. Kearney Lake Res.............. | Kearney Lake Land & Reservoir Co... | 12-31-1964 | I | 193.79 | a.f. | | 29-52-085 | |
| | **NORTH PINEY CREEK AND SOUTH PINEY CREEK, Tributary Piney Creek** | | | | | | | | |
| Terr. | Prairie Dog Water.................. Supply Co., 1st App. | Jas. W. Kirkpatrick............... | 10-01-1880 | D,I | 0.71 | | 50.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water.................. Supply Co., 1st App. | Evelyn N. Moore................... | 10-01-1880 | I | 1.14 | | 80.00 | 8,18-53-083 | |
| | *(Amended certificate issued to successor of James Terrll, original appropriator. Point of diversion and means of conveyance changed to Piney and Cruse Ditch from South Piney Creek, 18-53-83.)* | | | | | | | | |
| Terr. | Prairie Dog Water.................. Supply Co., 1st App. | Joseph Harper..................... | 10-01-1880 | D,I | 0.43 | | 30.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water.................. Supply Co., 1st App. | Sheridan Banking Company.......... | 10-01-1880 | I | 0.04 | | 3.00 | 8,18-53-083 | |
| | *(Amended certificate issued to successor of James H. Hopkins, original appropriator.)* | | | | | | | | |
| Terr. | Prairie Dog Water.................. Supply Co., 2nd App. | Alexander H. Robinson............. | 05-01-1884 | I | 1.43 | | 100.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water.................. Supply Co., 2nd App. | Estate Thos. M. Cotton............ | 05-01-1884 | I | 2.91 | | 203.70 | 8,18-53-083 | |
| Terr. | Prairie Dog Water.................. Supply Co., 2nd App. | Estate Mattie A. Stout............ | 05-01-1884 | I | 2.23 | | 156.30 | 8,18-53-083 | |
| Terr. | Prairie Dog Water.................. Supply Co., 2nd App. | Oscar Nelson, et al............... | 05-01-1884 | I | 0.64 | | 45.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water.................. Supply Co., 2nd App. | Clara Perkins..................... | 05-01-1884 | I | 1.19 | | 83.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water.................. Supply Co., 2nd App. | Horatio Burns..................... | 05-01-1884 | I | 1.95 | | 136.40 | 8,18-53-083 | |
| Terr. | Prairie Dog Water.................. Supply Co., 2nd App. | Daniel Harris..................... | 05-01-1884 | I | 1.00 | | 70.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water.................. Supply Co., 2nd App. | Alfred Bishop, Sr................. | 05-01-1884 | D,I | 2.14 | | 150.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water.................. Supply Co., 2nd App. | Hamilton S. Robertson............. | 05-01-1884 | I | 1.43 | | 100.60 | 8,18-53-083 | |
| Terr. | Prairie Dog Water.................. Supply Co., 2nd App. | Virginia V. Scrutchfield.......... | 05-01-1884 | I | 1.43 | | 100.00 | 818-53-083 | |
| Terr. | Prairie Dog Water.................. Supply Co., 2nd App. | John M. Calloway.................. | 05-01-1884 | D,I | 1.27 | | 89.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water.................. Supply Co., 2nd App. | Frederick H. Weltner.............. | 05-01-1884 | I | 1.79 | | 125.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water.................. Supply Co., 2nd App. | Stephen George.................... | 05-01-1884 | I | 2.50 | | 175.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water.................. Supply Co., 2nd App. | Jos. Harper....................... | 05-01-1884 | I | 1.00 | | 70.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water.................. Supply Co., 2nd App. | Jas. W. Kirkpatrick............... | 05-01-1884 | D,I | 0.71 | | 50.00 | 818-53-083 | |
| Terr. | Prairie Dog Water.................. Supply Co., 2nd App. | Evelyn N. Moore................... | 05-01-1884 | D,I | 0.29 | | 20.00 | 8,18-53-083 | |
| | *(Amended certificate issued to successor of James Terrll, original appropriator. Point of diversion and means of conveyance changed to Piney and Cruse Ditch from South Piney Creek, 18-53-83.)* | | | | | | | | |

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|
| Terr. | Prairie Dog Water Supply Co., 2nd App. | Sheridan Banking Company | 05-01-1884 | I | 3.86 | 270.70 | 8,18-53-083 | |
| | *(Amended certificate issued to successor of James H. Hopkins, original appropriator. Right reduced by 1.10 c.f.s. and 76.3 acres from 4.96 c.f.s. and 347.0 acres.)* | | | | | | | |
| Terr. | Prairie Dog Water Supply Co., 2nd App. | Matt Oser, et al. | 05-01-1884 | I | 1.29 | 90.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 2nd App. | Chas. P. P. Story | 05-01-1884 | I | 0.36 | 25.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 2nd App. | Jas. Kirkpatrick, Sr. | 05-01-1884 | I | 0.50 | 35.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 2nd App. | W. J. Stover | 05-01-1884 | D,I | 0.29 | 20.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 2nd App. | Jas. Carroll | 05-01-1884 | I | 0.57 | 40.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 2nd App. | Thos. A. Stout | 05-01-1884 | I | 0.86 | 60.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 2nd App. | C. Boulware | 05-01-1884 | I | 3.24 | 226.40 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 2nd App. | Cameron W. Garbutt | 05-01-1884 | I | 0.43 | 30.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 2nd App. | Frank P. Stout | 05-01-1884 | I | 0.36 | 25.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 2nd App. | L. Norah Burns | 05-01-1884 | I | 0.43 | 30.00 | 8,18-53-083 | |
| | *(Amended certificate issued to successor of Allen L. Willey, original appropriator.)* | | | | | | | |
| Terr. | Prairie Dog Water Supply Co., 2nd App. | William A. Roberts | 05-01-1884 | I | 0.36 | 25.00 | 8,18-53-083 | |
| | *(Amended certificate issued to successor of James Burns, original appropriator.)* | | | | | | | |
| Terr. | Prairie Dog Water Supply Co., 2nd App. | Marcellus L. Swain | 05-01-1884 | I | 0.36 | 25.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 2nd App. | Chas. George | 05-01-1884 | I | 1.14 | 80.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 2nd App. | Andy Downs | 05-01-1884 | I | 0.43 | 30.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 2nd App. | Ezekiel M. Weltner | 05-01-1884 | I | 2.86 | 200.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 2nd App. | John C. Weltner | 05-01-1884 | I | 2.86 | 200.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 2nd App. | James Thurmond | 05-01-1884 | I | 0.50 | 35.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 2nd App. | Geo. W. Hardin | 05-01-1884 | I | 0.07 | 5.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 2nd App. | Cornwall B. Stroud | 05-01-1884 | I | 0.21 | 15.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 2nd App. | T. A. Stout | 05-01-1884 | I | 0.29 | 20.00 | 8,18-53-083 | |
| | *(Clarification of record and change of means of conveyance through the Red Butte (P.D.-6) Ditch to a point where the Red Butte (P.D.-6) Ditch intersects with Murphy Gulch (23-54-83); thence down Murphy Gulch to a pumping point situate in 14-54-83; thence to the lands by a portable 4-inch diameter irrigation pipe and sprinklers.)* | | | | | | | |
| Terr. | Prairie Dog Water Supply Co., 2nd App. | John V. Rose | 05-01-1884 | D,I | 0.07 | 5.00 | 8,18-53-083 | |
| | *(Amended certificate issued to successor of John Rose, original appropriator. Also, means of conveyance from Prairie Dog Creek changed from P.D. 13 Ditch to Rose No. 1 Pump and Pipeline. During periods of high runoff the P.D. 13 Ditch, will be utilized but during periods of low runoff the Rose No. 1 Pump and Pipeline will be utilized. Rotation in the means of conveyance will be accomplished under direction of water administrative officials.)* | | | | | | | |
| Terr. | Prairie Dog Water Supply Co., 2nd App. | John F. Kirkpatrick | 05-01-1884 | I | 0.06 | 4.00 | 8,18-53-083 | |
| Terr. | Mead Creek or Coffeen | Mead Creek Ranch, Inc. | 05-07-1884 | I | 10.71 | 750.00 | 7-53-083<br>23-53-084 | |
| | *(Amended certificate issued to successor of H. A. Coffeen, original appropriator, April 15, 1931.)* | | | | | | | |

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|
| Terr. | Mead Creek or Coffeen............. | Mary Terrill...................... | 05-07-1884 | I | 1.14 | 80.00 | 7-53-083<br>23-53-084 | |
| | *(Point of diversion and means of conveyance for 54.3 acres changed to Piney and Cruse Creek Ditch from North Piney Creek, 8-53-83.)* | | | | | | | |
| Terr. | Mead Creek or Coffeen............. | Allen O. Fordyce, et al........... | 05-07-1884 | D,I | 4.55 | 318.50 | 7-53-083<br>23-53-084 | |
| | *(Amended certificate issued to successors, in part, of James Terrill, original appropriator.)* | | | | | | | |
| Terr. | Mead Creek or Coffeen............. | Allen O. Fordyce, et al........... | 05-07-1884 | D,I | 0.28 | 20.00 | 8-53-083 | |
| | *(Point of diversion and means of conveyance changed to Piney and Cruse Creek Ditch from North Piney Creek, 8-53-83. Amended certificate issued to successors, in part, of James Terrill, original appropriator.)* | | | | | | | |
| Terr. | Mead Creek or Coffeen............. | Evelyn N. Moore................... | 05-07-1884 | I | 0.88 | 61.50 | 8-53-083 | |
| | *(Point of diversion and means of conveyance changed to Piney and Cruse Creek Ditch from North Piney Creek, 8-53-83. Amended certificate issued to successors, in part, of James Terrill, original appropriator.)* | | | | | | | |
| Terr. | Mead Creek or Coffeen............. | John Reisch, et al................ | 05-07-1884 | I | 0.60 | 42.50 | 8-53-083<br>13-53-084 | |
| | *(The Reisch appropriation was reduced to 0.605 c.f.s. and 85.0 acres under provision of Chapter 97, Session Laws of Wyoming 1905. Amended certificate issued to successors, in part, to Pulaski Calvert, original appropriator; point of diversion and means of conveyance changed to Piney & Cruse Ditch, 8-53-83 & 13-53-84. The remainder of this appropriation or 0.605 c.f.s. is still conveyed through the Mead Creek or Coffeen Ditch and is used for the irrigation of 42.5 acres owned by Frank R. Spracklen, as successor, in part, to Pulaski Calvert, original appropriator.)* | | | | | | | |
| Terr. | Mead Creek or Coffeen............. | Frank R. Spracklen................ | 05-07-1884 | I | 0.60 | 42.50 | 7-53-083<br>23-53-084 | |
| | *(The Reisch appropriation was reduced to 0.605 c.f.s. and 85.0 acres under provision of Chapter 97, Session Laws of Wyoming 1905. Amended certificate issued to successors, in part, to Pulaski Calvert, original appropriator; point of diversion and means of conveyance changed to Piney & Cruse Ditch, 8-53-83 & 13-53-84. The remainder of this appropriation or 0.605 c.f.s. is still conveyed through the Mead Creek or Coffeen Ditch and is used for the irrigation of 42.5 acres owned by Frank R. Spracklen, as successor, in part, to Pulaski Calvert, original appropriator.)* | | | | | | | |
| Terr. | Mead Creek or Coffeen............. | Orvalle P. Snell.................. | 05-07-1884 | I | 0.36 | 25.00 | 7,8-53-083 | |
| | *(Amended certificate issued to successor of W. O. Goodhue, original appropriator. Point of diversion and means of conveyance changed to the Snell Pumps No. Two and No. Three, 7-53-83 and 8-53-83.)* | | | | | | | |
| Terr. | Mead Creek or Coffeen............. | Geo. C. Moose..................... | 05-07-1884 | I | 2.00 | 140.00 | 8-53-083<br>13-53-083 | |
| | *(Point of diversion and means of conveyance changed to Piney and Cruse Creek Ditch, 8-53-83 & 13-53-84.)* | | | | | | | |
| Terr. | Mead Creek or Coffeen............. | Joe Haratyk, et al................ | 05-07-1884 | I | 2.00 | 140.00 | 7-53-083<br>23-53-084 | |
| | *(Amended certificate issued to successors of Emma C. Toland, original appropriator, November 15, 1928.)* | | | | | | | |
| Terr. | Piney & Cruse, 1st App............ | Minnie M. Stover.................. | 07-20-1885 | I | 0.64 | 45.00 | 8-53-083<br>13-53-084 | |
| | *(Amended certificate issued to successor of George J. Harper, original appropriator.)* | | | | | | | |
| Terr. | Piney & Cruse, 1st App............ | Ethelbert Hollingsworth........... | 07-20-1885 | I | 1.00 | 70.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 1st App............ | Andrew Harper..................... | 07-20-1885 | I | 0.71 | 50.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 1st App............ | David J. Larison.................. | 07-20-1885 | I | 0.86 | 60.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 1st App............ | Geo. C. Moose..................... | 07-20-1885 | I | 1.00 | 70.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 1st App............ | Wm. F. Britian.................... | 07-20-1885 | I | 0.57 | 40.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 1st App............ | Margaret Hutsonpiller............. | 07-20-1885 | I | 0.53 | 37.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 1st App............ | Rebecca Orr....................... | 07-20-1885 | I | 0.57 | 40.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 1st App............ | Robt. J. Payne.................... | 07-20-1885 | I | 0.01 | 1.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 1st App............ | Henry Sollenbach.................. | 07-20-1885 | I | 0.86 | 60.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 1st App............ | Dell M. Ray....................... | 07-20-1885 | D,I,S | 0.29 | 20.00 | 8-53-083<br>13-53-084 | |

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|
| Terr. | Piney & Cruse, 1st App | Helen Hollingsworth | 07-20-1885 | I | 0.57 | 40.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 1st App | Campbell W. Stroud | 07-20-1885 | I | 0.36 | 25.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 1st App | Perry A. Duncan | 07-20-1885 | I | 0.14 | 10.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 1st App | William Sherman | 07-20-1885 | I | 1.29 | 90.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 1st App | John M. Burnside | 07-20-1885 | I | 0.60 | 42.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 1st App | Benjamin F. Perkins | 07-20-1885 | I | 0.57 | 40.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 1st App | Chas. W. Bard | 07-20-1885 | I | 1.43 | 100.00 | 8-53-083<br>13-53-084 | |
| Terr. | Prairie Dog Water Supply Co., 3rd App. | Jas. W. Kirkpatrick | 08-03-1885 | I | 1.81 | 127.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 3rd App. | Evelyn N. Moore | 08-03-1885 | D,I,S | 1.05 | 73.30 | 8,18-53-083 | |
| | *(Amended certificate issued to successor of James Terrill, original appropriator. Point of diversion and means of conveyance changed to Piney and Cruse Ditch from South Piney Creek, 13-53-84. Voluntary abandonment of 10.496 acres (0.15 c.f.s.) from 83.80 acres (1.20 c.f.s.), February 18, 1997. Actual amount of appropriation is 73.304 acres.)* | | | | | | | |
| Terr. | Prairie Dog Water Supply Co., 3rd App. | Evelyn N. Moore | 08-03-1885 | D,I,S | 1.51 | 36.20 | 8,18-53-083 | |
| | *(Amended certificate issued to successor of James Terrill, original appropriator.)* | | | | | | | |
| Terr. | Prairie Dog Water Supply Co., 3rd App. | Sheridan Banking Company | 08-03-1885 | I | 4.17 | 292.20 | 8,18-53-083 | |
| | *(Amended certificate issued to successor of James H. Hopkins, original appropriator. Right reduced by 0.12 c.f.s. and 7.80 acres from 4.29 c.f.s. and 300.0 acres.)* | | | | | | | |
| Terr. | Prairie Dog Water Supply Co. 3rd App. | Alexander H. Robinson | 08-03-1885 | I | 0.36 | 25.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co. 3rd App. | Matt Oser, et al | 08-03-1885 | I | 1.86 | 130.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 3rd App. | Chas. P. P. Story | 08-03-1885 | I | 2.24 | 157.10 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 3rd App. | James Kirkpatrick, Sr. | 08-03-1885 | I | 0.94 | 66.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 3rd App. | W. J. Stover | 08-03-1885 | D,I | 1.26 | 88.40 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 3rd App. | James Carroll | 08-03-1885 | I | 2.50 | 175.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 3rd App. | Thos. A. Stout | 08-03-1885 | I | 1.27 | 89.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 3rd App. | C. Boulware | 08-03-1885 | D,I | 1.57 | 110.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 3rd App. | Cameron W. Garbutt | 08-03-1885 | I | 1.86 | 130.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 3rd App. | Frank P. Stout | 08-03-1885 | I | 2.08 | 145.90 | 8,18-53-083 | |
| | *(Amended certificate issued to successor of Allen L. Willey, original appropriator.)* | | | | | | | |
| Terr. | Prairie Dog Water Supply Co., 3rd App. | L. Norah Burns | 08-03-1885 | I | 3.40 | 238.00 | 8,18-53-083 | |
| | *(Amended certificate issued to successor of James Burns, original appropriator.)* | | | | | | | |
| Terr. | Prairie Dog Water Supply Co., 3rd App. | Wm. A. Roberts | 08-03-1885 | I | 0.79 | 55.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 3rd App. | Marcellus L. Swain | 08-03-1885 | I | 1.50 | 105.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 3rd App. | Chas. George | 08-03-1885 | I | 0.78 | 54.40 | 8,18-53-083 | |

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| Terr. | Prairie Dog Water Supply Co., 3rd App. | Andy Downs | 08-03-1885 | I | 1.39 | | 97.30 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 3rd App. | Ezekial M. Weltner | 08-03-1885 | I | 1.79 | | 125.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 3rd App. | John C. Weltner | 08-03-1885 | I | 0.39 | | 27.20 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 3rd App. | John C. Weltner | 08-03-1885 | I | 0.47 | | 32.70 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 3rd App. | Jas. Thurmond | 08-03-1885 | I | 0.64 | | 45.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 3rd App. | Geo. W. Hardin | 08-03-1885 | I | 1.30 | | 91.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 3rd App. | Cornwall B. Stroud | 08-03-1885 | I | 1.93 | | 135.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 3rd App. | T. A. Stout | 08-03-1885 | I | 1.86 | | 130.00 | 8,18-53-083 | |
| | *(Clarification of record and change of means of conveyance through the Red Butte (P.D.-6) Ditch to a point where the Red Butte (P.D.-6) Ditch intersects with Murphy Gulch (23-54-83); thence down Murphy Gulch to a pumping point situate in 14-54-83; thence to the lands by a portabl 4-inch diameter irrigation pipe and sprinklers.)* | | | | | | | | |
| Terr. | Prairie Dog Water Supply Co., 3rd App. | John V. Rose | 08-03-1885 | I | 0.64 | | 45.00 | 8,18-53-083 | |
| | *(Amended certificate issued to successor of John Rose, original appropriator. Also means of conveyance from Prairie Dog Creek changed from P.D. 13 Ditch to Rose No. 1 Pump and Pipeline. During periods of high runoff the P.D. 13 Ditch will be utilized but during periods of low runoff the Rose No. 1 Pump and Pipeline will be utilized. Rotation in the means of conveyance will be accomplished under direction of water administrative officials.)* | | | | | | | | |
| Terr. | Prairie Dog Water Supply Co., 3rd App. | John F. Kirkpatrick | 08-03-1885 | I | 0.37 | | 26.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 3rd App. | Sidney P. Smith | 08-03-1885 | I | 0.71 | | 50.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 3rd App. | Robt. B. Robinson | 08-03-1885 | I | 1.65 | | 115.40 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 3rd App. | Elmer Surrena | 08-03-1885 | I | 1.07 | | 75.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 3rd App. | Fred F. Newcomer | 08-03-1885 | I | 1.29 | | 90.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 3rd App. | Chas. W. Morey | 08-03-1885 | I | 4.84 | | 339.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 3rd App. | Joseph Harper | 08-03-1885 | I | 1.29 | | 90.20 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 3rd App. | John W. Willey | 08-03-1885 | I | 1.29 | | 90.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 3rd App. | James Kirkpatrick | 08-03-1885 | I | 9.10 | | 637.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 3rd App. | Andrew Harper | 08-03-1885 | I | 0.36 | | 25.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 3rd App. | Wm. O'Neal | 08-03-1885 | I | 1.21 | | 85.20 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 3rd App. | Otto Hanschka | 08-03-1885 | I | 2.57 | | 180.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 3rd App. | Geo. L. Smith | 08-03-1885 | I | 3.93 | | 275.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply Co., 3rd App. | Cross Cattle Company | 08-03-1885 | I | 1.77 | | 124.00 | 8,18-53-083 | |
| Terr. | Piney & Cruse, 2nd App. | Chas. W. Bard | -1891 | I | 0.04 | | 5.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 2nd App. | Frank J. Wood | -1891 | I | 1.14 | | 80.00 | 8-53-084<br>13-53-084 | |

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|
| Terr. | Piney & Cruse, 2nd App............ | Levi Wood........................ | -1891 | I | 1.14 | 80.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 2nd App............ | John F. Robertson................ | -1891 | I | 3.14 | 220.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 2nd App............ | Rev. Clinton D. Day.............. | -1891 | I | 1.14 | 80.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 2nd App............ | Matt Oser, et al................. | -1891 | I | 0.58 | 40.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 2nd App............ | Pulaski Calvert.................. | -1891 | I | 1.14 | 80.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 2nd App............ | Minnie M. Stover................. | -1891 | I | 1.34 | 95.00 | 8-53-083<br>13-53-084 | |
| | *(Amended certificate issued to successor of George J. Harper, original appropriator.)* | | | | | | | |
| Terr. | Piney & Cruse, 2nd App............ | Ethelbert Hollingsworth.......... | -1891 | I | 1.00 | 70.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 2nd App............ | Martin L. Holcomb................ | -1891 | I | 0.86 | 60.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 2nd App............ | Joe Haratyk, et al............... | -1891 | I | 0.37 | 26.00 | 18-54-083<br>13-53-084 | |
| | *(Amended certificate issued to successors of Martin L. Holcomb, original appropriator; point of diversion and means of conveyance changed to Mead Creek or Coffeen Ditch, November 15, 1928.)* | | | | | | | |
| Terr. | Piney & Cruse, 2nd App............ | Andrew Harper.................... | -1891 | I | 1.07 | 75.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 2nd App............ | Sarah Anna Babione............... | -1891 | I | 2.00 | 140.00 | 7-54-083<br>18-54-084 | |
| | *(Amended certificate issued, November 26, 1923. Amended certificate issued to successor of W. H. Babione, original appropriation; and point of diversion and means of conveyance changed to Mead Creek or Coffeen Ditch, November 15, 1928.)* | | | | | | | |
| Terr. | Piney & Cruse, 2nd App............ | David J. Larison................. | -1891 | I | 1.14 | 80.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 2nd App............ | Harry C. Wilson.................. | -1891 | I | 2.29 | 160.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 2nd App............ | Geo. C. Moose.................... | -1891 | I | 2.21 | 155.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 2nd App............ | Amy F. Hopkins................... | -1891 | I | 0.71 | 50.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 2nd App............ | Wm. F. Brittian.................. | -1891 | I | 0.93 | 65.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 2nd App............ | M. E. Hutsonpiller............... | -1891 | I | 0.47 | 33.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 2nd App............ | Sidney P. Smith.................. | -1891 | I | 0.71 | 50.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 2nd App............ | Rebecca Orr...................... | -1891 | I | 0.58 | 40.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 2nd App............ | Mattie Starr..................... | -1891 | I | 1.14 | 80.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 2nd App............ | Robert J. Payne.................. | -1891 | I | 1.99 | 139.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 2nd App............ | Henry Sollenbach................. | -1891 | I | 1.14 | 80.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 2nd App............ | Dell M. Ray...................... | -1891 | D,I | 1.21 | 85.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 2nd App............ | Ellen Hollingsworth.............. | -1891 | I | 0.43 | 30.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 2nd App............ | Campbell W. Stroud............... | -1891 | I | 0.14 | 10.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 2nd App............ | John F. Jenning.................. | -1891 | I | 1.43 | 100.00 | 8-53-083<br>13-53-084 | |

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|
| Terr. | Piney & Cruse, 2nd App............ | Andrew J. Edwards................. | -1891 | I | 1.00 | 70.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 2nd App............ | Perry Surrena..................... | -1891 | I | 1.71 | 120.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 2nd App............ | Pinkney T. Barnes................. | -1891 | I | 1.79 | 125.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 2nd App............ | Robert B. Robinson................ | -1891 | I | 1.14 | 80.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 2nd App............ | Perry Duncan...................... | -1891 | I | 1.57 | 110.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 2nd App............ | John M. Burnside.................. | -1891 | I | 1.26 | 88.00 | 8-53-083<br>13-53-084 | |
| Terr. | Piney & Cruse, 2nd App............ | Benjamin F. Perkins............... | -1891 | I | 4.43 | 310.00 | 8-53-083<br>13-53-084 | |
| Terr. | Prairie Dog Water Supply..........<br>Co., 4th App. | Geo. Surrena...................... | -1894 | I | 1.14 | 80.00 | 8,18-53-083 | |
| Terr. | Prairie Dog Water Supply..........<br>Co., 4th App. | Wilbur King....................... | -1894 | I | 1.00 | 70.00 | 8,18-53-083 | |
| 234E | Enl. Mead Creek (Coffeen)..........<br>*(Adjudicated as Meanardi and White Ditch.)* | Chas. J. White.................... | 11-30-1896 | I | 2.28 | 160.00 | 7-53-083<br>23-53-084 | |
| 234E | Enl. Mead Creek (Coffeen)..........<br>*(Amended certificate issued to successor of Geo. P. Webster, original appropriator.)* | Catherine C. Hurlbutt............. | 11-30-1896 | I | 6.42 | 450.00 | 7-53-083<br>23-53-084 | |
| 264E | Enl. Prairie Dog..................<br>Water Supply Co.<br>*(Adjudicated as Enoch Laterals 1, 2 and 3.)* | J. M. Enoch....................... | 04-27-1897 | I | 0.78 | 55.00 | 8,18-53-083 | |
| 282E | Enl. Prairie Dog..................<br>Water Supply Co. | Mattie A. Stout................... | 10-18-1897 | I | 0.35 | 25.00 | 8,18-53-083 | |
| 298E | Enl. Mead Creek (Coffeen)..........<br>*(Adjudicated as West Side Enlargement.)* | W. H. Babione..................... | 12-27-1897 | I | 0.78 | 55.00 | 7-53-083<br>23-53-084 | |
| 328E | Enl. Mead Creek (Coffeen)..........<br>*(Point of diversion and means of conveyance for 60.0 acres changed to Piney and Cruse Ditch, 8-53-83 & 13-53-84. Adjudicated as from Piney Creek.)* | E. A. Whitney..................... | 03-28-1898 | I | 1.00 | 70.00 | 7-53-083<br>23-53-084 | |
| 346E | Enl. Prairie Dog Water............<br>Supply Co. & Nine Mile | Carrie Weltner.................... | 06-13-1898 | I | 2.14 | 150.00 | 8,18-53-083 | |
| 359E | Enl. Piney & Cruse................ | S. J. Duncan, et al............... | 08-12-1898 | I | 1.37 | 96.00 | 8-53-083<br>13-53-084 | |
| 891E | Enl. Piney & Dutch Cr.............<br>and Mead Creek<br>*(Adjudicated as Enlarged Mead and Coffeen Ditch.)* | Malcolm Moncreiffe................ | 08-02-1902 | I | 1.42 | 100.00 | 7-53-083<br>23-53-084 | |
| 1086E | Enl. Piney & Cruse................ | Clara P. Surrena.................. | 12-12-1902 | I | 0.50 | 35.00 | 8-53-083<br>13-53-084 | |
| 1064E | Enl. Prairie Dog Water............<br>Supply Co. & Nine Mile<br>Lateral | Jesse C. Weltner.................. | 01-02-1903 | I | 1.20 | 84.00 | 8,18-53-083 | |
| 991E | Enl. Piney & Cruse................ | Elias S. Leach.................... | 02-16-1903 | I | 1.04 | 73.00 | 8-53-083<br>13-53-084 | |
| 1113E | Enl. Piney & Cruse................ | Elizabeth Zullig.................. | 08-07-1903 | I | 1.88 | 132.00 | 8-53-083<br>13-53-084 | |
| 1370E | Enl. Prairie Dog Water............<br>Supply Co. & Nine Mile<br>Lateral | Walter N. True.................... | 01-24-1905 | I | 1.10 | 77.00 | 8,18-53-083 | |
| 1434E | Enl. Piney & Cruse Cr............. | A. W. Butterfield................. | 06-24-1905 | I | 0.52 | 37.00 | 8-53-083<br>13-53-[illegible] | |

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|
| 3098E | Enl. Mead Creek or Coffeen | Fay Green | 12-05-1914 | I | 1.70 | 119.00 | 7-53-083 23-53-084 | |
| 3927E | Enl. Piney & Cruse (Robinson-Zullig) | Herbert E. Zullig | 06-10-1918 | I | 1.14 | 80.00 | 8-53-083 13-53-084 | |

## NORTH PINEY CREEK, Tributary Piney Creek

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|
| Terr. | Mill Creek & Mill Race | C. W. Hine & Company | Spring 1881 | Mil | 37.30 | | 12-53-084 | |
| 16790 | Prairie Dog Water Supply Co. | John Hammond | 05-15-1922 | I | S.S. | 13.20 | 8-53-083 | |
| | *(Original supply is from South Piney Creek through Prairie Dog Water Supply Company Ditch, Permit No. 16791.)* | | | | | | | |
| 16790 | Prairie Dog Water Supply Co. | J. F. Kirkpatrick | 05-15-1922 | I | S.S. | 20.70 | 8-53-083 | |
| | *(Original supply is from South Piney Creek through Prairie Dog Water Supply Company Ditch, Permit No. 16791.)* | | | | | | | |
| 16790 | Prairie Dog Water Supply Co. | George Sieweke | 05-15-1922 | I | S.S. | 10.00 | 8-53-083 | |
| | *(Original supply is from South Piney Creek through Prairie Dog Water Supply Company Ditch, Permit No. 16791.)* | | | | | | | |
| 16790 | Prairie Dog Water Supply Co. | H. F. Hadley, et al | 05-15-1922 | I | S.S. | 5.00 | 8-53-083 | |
| | *(Original supply is from South Piney Creek through Prairie Dog Water Supply Company Ditch, Permit No. 16791.)* | | | | | | | |
| 16790 | Prairie Dog Water Supply Co. | H. A. McLimans, et al | 05-15-1922 | I | S.S. | 8.00 | 8-53-083 | |
| | *(Original supply is from South Piney Creek through Prairie Dog Water Supply Company Ditch, Permit No. 16791.)* | | | | | | | |
| 16790 | Prairie Dog Water Supply Co. | George A. Lucas | 05-15-1922 | I | S.S. | 6.80 | 8-53-083 | |
| | *(Original supply is from South Piney Creek through Prairie Dog Water Supply Company Ditch, Permit No. 16791.)* | | | | | | | |
| 16790 | Prairie Dog Water Supply Co. | Steve George, et al | 05-15-1922 | I | S.S. | 8.20 | 8-53-083 | |
| | *(Original supply is from South Piney Creek through Prairie Dog Water Supply Company Ditch, Permit No. 16791.)* | | | | | | | |
| 16790 | Prairie Dog Water Supply Co. | E. V. Newcomer, et al | 05-15-1922 | I | S.S. | 7.50 | 8-53-083 | |
| | *(Original supply is from South Piney Creek through Prairie Dog Water Supply Company Ditch, Permit No. 16791.)* | | | | | | | |
| 16790 | Prairie Dog Water Supply Co. | C. E. Stevenson | 05-15-1922 | I | S.S. | 4.00 | 8-53-083 | |
| | *(Original supply is from South Piney Creek through Prairie Dog Water Supply Company Ditch, Permit No. 16791.)* | | | | | | | |
| 16790 | Prairie Dog Water Supply Co. | G. W. Stroud | 05-15-1922 | I | S.S. | 12.50 | 8-53-083 | |
| | *(Original supply is from South Piney Creek through Prairie Dog Water Supply Company Ditch, Permit No. 16791.)* | | | | | | | |
| 16790 | Prairie Dog Water Supply Co. | Weltner Brothers | 05-15-1922 | I | S.S. | 22.60 | 8-53-083 | |
| | *(Original supply is from South Piney Creek through Prairie Dog Water Supply Company Ditch, Permit No. 16791.)* | | | | | | | |
| 16790 | Prairie Dog Water Supply Co. | A. B. Willey | 05-15-1922 | I | S.S. | 1.50 | 8-53-083 | |
| | *(Original supply is from South Piney Creek through Prairie Dog Water Supply Company Ditch, Permit No. 16791.)* | | | | | | | |
| 16790 | Prairie Dog Water Supply Co. | Arthur Dolan | 05-15-1922 | I | S.S. | 47.00 | 8-53-083 | |
| | *(Original supply is from South Piney Creek through Prairie Dog Water Supply Company Ditch, Permit No. 16791.)* | | | | | | | |
| 16790 | Prairie Dog Water Supply Co. | Bertha C. Kahn | 05-15-1922 | I | S.S. | 119.40 | 8-53-083 | |
| | *(Original supply for 31.0 acres is from Wild Cat Creek through the Kahn Ditch, Permit No. 7502, and for 88.4 acres from South Piney Creek through the Prairie Dog Water Supply Company Ditch, Permit No. 16791.)* | | | | | | | |
| 4365E | Enl. Piney Cruse Creek | S. J. Duncan | 06-25-1923 | I | S.S. | 67.60 | 8-53-083 | |
| | *(Original supply is from South Piney Creek through the Enlnlarged Piney Cruse Creek Ditch, Permit No. 4364 Enl.)* | | | | | | | |
| 4505E | Enl. Coffeen | Frank A. Spracklen | 11-19-1926 | I | S.S. | 104.10 | 7-53-083 | |
| | *(Original supply for 50.0 acres is from Rhiner Creek through the Rhiner Ditch, Permit No. 6513, and for 54.1 acres from South Piney Creek through the Enlnlarged Coffeen Ditch, Permit No. 4504 Enl.)* | | | | | | | |

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 18557 | Ernest............................ | Sarah A. Ernest.................. | 03-07-1935 | D,I,S | 0.03 | | 2.33 | 12-53-084 | |
| 19436 | Allen............................. | L. Allen.......................... | 09-05-1940 | D,I,S | 0.08 | | 5.40 | 12-53-084 | |
| 22714 | Maroon Sprinkler Irr. System....... | Sie P. Maroon, et al.............. | 10-02-1962 | I | 0.04 | | 2.90 | 12-53-084 | |
| 22740 | Metz Sprinkler Irr. System......... | Irma C. Metz...................... | 10-02-1962 | I | 0.07 | | 4.60 | 12-53-084 | |
| 22460 | Whitmire.......................... | Charles C. Lawrence, et al........ | 01-27-1964 | D,I,S Fish Supply Ditch | 0.03 | | 2.07 | 7-53-083 | |
| | *(Also supply ditch for Whitmire Reservoir, Permit No. 6760 Res.)* | | | | | | | | |
| 6760R | Whitmire Res...................... | Charles C. Lawrence, et al........ | 01-27-1964 | D,I,S Fish | 0.28 | a.f. | | 7-53-083 | |
| 22945 | Walters Pump...................... | Karl F. Walters, et al............ | 06-07-1968 | I | 0.03 | | 2.30 | 12-53-084 | |
| 23945 | Campbell Pipeline No. 1............ | Malcolm S. Campbell, et ux........ | 10-17-1972 | I | 0.09 | | 6.00 | 8-53-083 | |
| 24592 | Bennett Pipe Line................. | Orvin A. Bennett, et ux........... | 01-08-1975 | D | 0.02 | | | 11-53-084 | |
| 26950 | Harshfield Sprinkler.............. | William H. Quinette, Jr., et al.... | 11-06-1979 | I | 0.04 | | 3.45 | 7-53-083 | |
| 27592 | Nelson Sprinkler.................. | Leo C. Nelson, et al.............. | 03-03-1980 | Misc | 0.08 | | | 8-53-083 | |
| 27539 | Klepinger Pump & Pipeline.......... | Donis Klepinger................... | 10-01-1980 | D | 0.02 | | | 11-53-084 | |
| | *(Actual amount of appropriation is 0.026 c.f.s.)* | | | | | | | | |
| 27540 | Spiro Pump & Pipeline............. | Peggy C. Spiro.................... | 10-01-1980 | D | 0.03 | | | 11-53-084 | |
| 29157 | Thurman Pipeline No. 1............ | Thurman E. Decker................. | 02-04-1985 | I | S.S. | | 0.30 | 12-53-084 | |
| | *(Original supply is from Thurman Spring Draw, a tributary of North Piney Creek through the Thurman Pump No. 1, Permit No. 29156.)* | | | | | | | | |

## REDMAN DRAW, Tributary North Piney Creek

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 9670R | Sare No. 1 Recreation Res.......... | Keith Sare........................ | 09-14-1990 | Fish,Rec | 0.22 | a.f. | | 8-53-083 | |
| 9671R | Sare No. 2 Recreation Res.......... | Keith Sare........................ | 09-14-1990 | Fish,Rec | 0.19 | a.f. | | 8-53-083 | |
| 9672R | Sare No. 3 Recreation Res.......... | Keith Sare........................ | 09-14-1990 | Fish,Rec | 1.54 | a.f. | | 8-53-083 | |
| 10057R | Talley No. 1 Res.................. | Richard H. and Kim T. Talley....... | 06-23-1994 | Fish | 1.01 | a.f. | | 17-53-083 | |
| | *(Actual amount of appropriation is 1.012 acre-feet.)* | | | | | | | | |

## ARN SPRING, Tributary North Piney Creek

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 19939 | Arn............................... | Ethel E. Miller Arn............... | 11-09-1944 | I | 0.03 | | 1.81 | 8-53-083 | |

## STORY DRAW, Tributary North Piney Creek

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 19437 | Redman............................ | George Redman..................... | 09-05-1940 | D,I,S | 0.02 | | 1.20 | 8-53-083 | |
| 19818 | Redman No. 2...................... | George Redman..................... | 09-16-1943 | D,I,S | 0.01 | | 0.80 | 8-53-083 | |

## PETERS RIVULET, Tributary North Piney Creek, (Via Piney-Cruse Creek Ditch)

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 9266R | Hansen Fish Pond No. 1 Res......... | Gunder H. & Carole L. Hansen....... | 12-13-1982 | Rec | 0.08 | a.f. | | 7-53-083 | |
| 9267R | Hansen Fish Pond No. 2 Res......... | Gunder H. & Carole L. Hansen....... | 12-13-1982 | Rec | 0.16 | a.f. | | 7-53-083 | |
| 9268R | Held Fish Pond Res................ | John Schaal & D. B. Held.......... | 12-13-1982 | Rec | 0.90 | a.f. | | 7-53-083 | |
| 9269R | Stover Fish Pond Res.............. | Tom D. Newman..................... | 12-13-1982 | Rec | 0.13 | a.f. | | 7-53-083 | |
| 9852R | Apel Fish Pond Res................ | Howard L. & Roma J. Apel.......... | 04-08-1992 | Fish | 0.30 | a.f. | | 7-53-083 | |

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | **SOUTH FORK BIG BADGER CREEK, Tributary Big Badger Creek** | | | | | | | | |
| 7380 | Wulfjen | C. W. Wulfjen | 08-20-1906 | I | 0.37 | | 26.00 | 35-57-081 | |
| | *(Adjudicated as from Big Badger Creek.)* | | | | | | | | |
| 10083 | Upton-Peters | A. L. Peters | 08-17-1910 | I | 0.21 | | 14.50 | 14-56-081 | |
| | *(Adjudicated as from Big Badger Creek.)* | | | | | | | | |
| 8030SR | P G A No. 61 Stock Res | Peter's Grazing Association | 08-18-1975 | S | 3.10 | a.f. | | 36-56-081 | |
| | **4X DRAW, Tributary South Fork Big Badger Creek** | | | | | | | | |
| 6932R | 4X Res | Malcolm Hutton | 08-07-1961 | S | 20.00 | a.f. | | 35-57-081 | |
| 8992SR | Hutton No. 1 Stock Res | Malcolm Hutton | 06-24-1982 | S | 8.86 | a.f. | | T 40-57-081 | |
| | **PETERS FORK, Tributary South Fork Big Badger Creek** | | | | | | | | |
| 8126SR | P G A No. 82 Stock Res | Peter's Grazing Association | 06-23-1976 | S | 7.60 | a.f. | | 22-56-081 | |
| | **PETERS GULCH, Tributary South Fork Big Badger Creek** | | | | | | | | |
| 10082 | Peters | A. L. Peters | 08-17-1910 | I | 0.16 | | 11.00 | 23-56-081 | |
| | **MIDDLE FORK BIG BADGER CREEK, Tributary Big Badger Creek** | | | | | | | | |
| 8704 | Scrutchfield | Charles L. Scrutchfield | 10-07-1908 | I | 0.63 | | 44.00 | 31-57-080 | |
| | **MILE DRAW, Tributary Big Badger Creek** | | | | | | | | |
| 10808 | Mile | Ida J. Wulfjen | 06-17-1911 | I | 0.36 | | 25.00 | 32-57-080 | |
| 9531SR | Scrutchfield No. 2 Stock Res | Bertha Scrutchfield | 08-24-1984 | S | 5.50 | a.f. | | 28-57-080 | |
| | **PRAIRIE DOG CREEK, Tributary Tongue River** | | | | | | | | |
| Terr. | Terrill's (Prairie Dog) | Evelyn Moore | -1879 | D,I | 0.31 | | 25.00 | 32-54-083 | |
| | *(Amended certificate issued to successor of James Terrill, original appropriator.)* | | | | | | | | |
| Terr. | Hillsbury No. 1 | Matt Oser, et al | 05-16-1880 | I | 1.00 | | 70.00 | 22-54-083 | |
| Terr. | Willson & Symons | Wm. Symons | 11-00-1886 | I | 1.71 | | 120.00 | 35-58-083 | |
| Terr. | Willson & Symons | Chas. Willson | 11-00-1886 | I | 1.87 | | 131.00 | 35-58-083 | |
| 1034E | Enl. Bar N | Sheridan Sheep Company | 03-27-1903 | I | 1.95 | | 138.00 | 34-57-083 | |
| 5739 | Nash | Ira W. Nash | 12-15-1903 | I | 0.50 | | 35.00 | 3-57-083 | |
| 6404 | Walling No. 2 | Lena Nash Walling | 12-23-1904 | I | 0.21 | | 15.00 | 10-57-083 | |
| 15442 | Barlow | F. L. Clifford | 04-30-1919 | I | S.S. | | 27.00 | 8-55-083 | |
| | *(Original supply is from South Piney Creek through the Barlow Ditch, Permit No. 1242.)* | | | | | | | | |
| 15504 | Silas | Silas Miller | 06-13-1919 | I | S.S. | | 25.00 | 15-57-083 | |
| | *(Original supply is from North and South Piney Creek through the Prairie Dog Water Supply Ditch, 3rd App., Territorial Appropriation, with a priority of August 3, 1885.)* | | | | | | | | |
| 15504 | Silas | Silas Miller, et al | 06-13-1919 | I | 0.19 | | 13.00 | 15-57-083 | |
| | | | | | S.S. | | 12.00 | | |
| | *(Original supply for 12.0 acres is from Bar N Draw through the Walling No. 3 Ditch, Permit No. 6405.)* | | | | | | | | |
| 16770 | Piney Cruse Creek | W. S. Metz, et al | 12-06-1920 | I | S.S. | | 79.50 | 32-54-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 2nd and 3rd App., Territorial Appropriation, with priorities of May 1, 1884 and August 3, 1885.)* | | | | | | | | |

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|
| 16772 | P.D.-2 A | Peter Demple | 12-06-1920 | I | S.S. | 11.30 | 28-54-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 2nd and 3rd App., Territorial Appropriation, with priorities of May 1, 1884 and August 3, 1885.)* | | | | | | | |
| 16772 | P.D.-2 A | J. F. Kirkpatrick | 12-06-1920 | I | S.S. | 82.00 | 28-54-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Cocompany Ditch, 2nd and 3rd App., Territorial Appropriation, with priorities of May 1, 1884 and August 3, 1885 & 1891 and Piney and Cruse Ditch, 2nd App.)* | | | | | | | |
| 16773 | P.D.-2 B | J. F. Kirkpatrick | 12-06-1920 | I | S.S. | 38.50 | 28-54-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 2nd and 3rd App., Territorial Appropriation, with priorities of May 1, 1884 and August 3, 1885.)* | | | | | | | |
| 16773 | P.D.-2 B | Earl L. Mathew | 12-06-1920 | I | S.S. | 38.00 | 28-54-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 2nd and 3rd App., Territorial Appropriation, with priorities of May 1, 1884 and August 3, 1885.)* | | | | | | | |
| 16776 | P.D.-5 | Eva A. Newcomer | 12-06-1920 | I | S.S. | 55.20 | 27-54-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 2nd and 3rd App. and Piney and Cruse Ditch, 2nd App., Territorial Appropriations, with priorities of May 1, 1884, August 3, 1885, and 1891.)* | | | | | | | |
| 16776 | P.D.-5 | C. E. Stevenson | 12-06-1920 | I | S.S. | 10.30 | 27-54-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 2nd and 3rd App., Territorial Appropriation, with priorities of May 1, 1884 and August 3, 1885.)* | | | | | | | |
| 16777 | Red Butte (P.D.-6) | George Bethurem | 12-06-1920 | I | S.S. | 77.60 | 27-54-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 2nd and 3rd App., Territorial Appropriation, with priorities of May 1, 1884 and August 3, 1885. Clarification of record and change of means of conveyance through the Red Butte (P.D.-6) Ditch to a point where the Red Butte (P.D.-6) Ditch intersects with Murphy Gulch (23-54-83); thence down Murphy Gulch to a pumping point situate in 14-54-83; thence to the lands by a portable, 4-inch diameter irrigation pipe and sprinklers, February 13, 1990.)* | | | | | | | |
| 16777 | Red Butte (P.D.-6) | Pearl M. Snyder | 12-06-1920 | I | S.S. | 33.10 | 27-54-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 2nd and 3rd App., Territorial Appropriation, with priorities of May 1, 1884 and August 3, 1885.)* | | | | | | | |
| 16777 | Red Butte (P.D.-6) | C. E. Stevenson | 12-06-1920 | I | S.S. | 5.90 | 27-54-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 2nd and 3rd App., Territorial Appropriation, with priorities of May 1, 1884 and August 3, 1885.)* | | | | | | | |
| 16777 | Red Butte (P.D.-6) | G. W. Stroud | 12-06-1920 | I | S.S. | 86.90 | 27-54-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 2nd and 3rd App., Territorial Appropriation, with priorities of May 1,, 1884 and August 3, 1885; and from South Piney Creek through the Prairie Dog Water Supply Company Ditch, Permit No. 16791.)* | | | | | | | |
| 16779 | P.D.-7 | Arthur Dolan | 12-06-1920 | I | S.S. | 154.30 | 10-54-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 2nd and 3rd App., Territorial Appropriation, with priorities of May 1, 1884 and August 3, 1885.)* | | | | | | | |
| 16779 | P.D.-7 | Pearl M. Snyder | 12-06-1920 | I | S.S. | 11.00 | 10-54-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 2nd App., Territorial Appropriation, with a priority of May 1, 1884.)* | | | | | | | |
| 16779 | P.D.-7 | Frank P. Stout | 12-06-1920 | I | S.S. | 63.20 | 10-54-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 2nd and 3rd App., Territorial Appropriations, with priorities of May 1, 1884 and August 3, 1885.)* | | | | | | | |
| 16779 | P.D.-7 | Thomas A. Stout | 12-06-1920 | I | S.S. | 94.90 | 10-54-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 2nd and 3rd App., Territorial Appropriations, with priorities of May 1, 1884 and August 3, 1885 and from Murphy Gulch through the Stroud and Stout Ditch, Permit No. 1542.)* | | | | | | | |
| 16779 | P.D.-7 | A. B. Willey | 12-06-1920 | I | S.S. | 38.60 | 10-54-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 2nd and 3rd App., Territorial Appropriations, with priorities of May 1, 1884 and August 3, 1885; and from South Piney Creek through Prairie Dog Water Supply Company Ditch, Permit No. 16791.)* | | | | | | | |
| 16780 | P.D.-7 A | H. F. Headley, et al | 12-06-1920 | I | S.S. | 33.00 | 33-55-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 3rd App., Territorial Appropriation, with a priority of August 3, 1885 and from South Piney Creek through the Prairie Dog Water Supply Company Ditch, Permit No. 16791.)* | | | | | | | |
| 16780 | P.D.-7 A | A. B. Willey | 12-06-1920 | I | S.S. | 3.00 | 33-55-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 2nd App., Territorial Appropriation, with a priority of May 1, 1884.)* | | | | | | | |
| 16781 | P.D.-8 | Arthur Dolan | 12-06-1920 | I | S.S. | 46.70 | 3-54-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 2nd App., Territorial Appropriation, with a priority of May 1, 1884.)* | | | | | | | |

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|
| 16781 | P.D.-8 | Frank P. Stout | 12-06-1920 | I | S.S. | 47.20 | 3-54-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 2nd and 3rd App., Territorial Appropriations, with priorities of May 1, 1884 and August 3, 1885.)* | | | | | | | |
| 16781 | P.D.-8 | A. B. Willey | 12-06-1920 | I | S.S. | 75.70 | 3-54-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 2nd App., Territorial Appropriation, with a priority of May 1, 1884.)* | | | | | | | |
| 16782 | P.D.-9 | George W. Hardin | 12-06-1920 | I | S.S. | 33.00 | 33-55-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 3rd App., Territorial Appropriation, with a priority of August 3, 1885.)* | | | | | | | |
| 16782 | P.D.-9 | George A. Lucas | 12-06-1920 | I | S.S. | 47.20 | 33-55-083 | |
| | *(Original supply is from North and South Piney Creeks through Prairie Dog Water Supply Company Ditch, 2nd and 3rd App., Territorial Appropriations, Priorities May 1, 1884 and August 3, 1885; and from South Piney Creek through Prairie Dog Water Supply Company Ditch, Permit 16791.)* | | | | | | | |
| 16782 | P.D.-9 | W. A. Roberts | 12-06-1920 | I | S.S. | 19.80 | 33-55-083 | |
| | *(Original supply is from North and South Piney Creeks through Prairie Dog Water Supply Company Ditch, 2nd and 3rd App., Territorial Appropriations, Priorities May 1, 1884 and August 3, 1885.)* | | | | | | | |
| 16782 | P.D.-9 | George Sieweke | 12-06-1920 | I | S.S. | 28.50 | 33-55-083 | |
| | *(Original supply is from North and South Piney Creeks through Prairie Dog Water Supply Company Ditch, 2nd and 3rd App., Territorial Appropriations, Priorities May 1, 1884 and August 3, 1885; and from South Piney Creek through Prairie Dog Water Supply Company Ditch, Permit 16791.)* | | | | | | | |
| 16782 | P.D.-9 | J. W. Willey | 12-06-1920 | I | S.S. | 43.00 | 33-55-083 | |
| | *(Original supply is from North and South Piney Creeks through Prairie Dog Water Supply Company Ditch, 3rd App., Territorial Appropriation, Priority August 3, 1885.)* | | | | | | | |
| 16783 | Nine Mile (P.D.-10) | Sarah M. Allen | 12-06-1920 | I | S.S. | 82.00 | 28-55-083 | |
| | *(Original supply is from North and South Piney Creeks through Prairie Dog Water Supply Company Ditch, 2nd and 3rd App., Territorial Appropriations, Priorities May 1, 1884 and August 3, 1885.)* | | | | | | | |
| 16783 | Nine Mile (P.D.-10) | Sam Cox | 12-06-1920 | I | S.S. | 73.60 | 28-55-083 | |
| | *(Original supply is from North and South Piney Creeks through Prairie Dog Water Supply Company Ditch, 2nd and 3rd App., Territorial Appropriations, Priorities May 1, 1884 and August 3, 1885.)* | | | | | | | |
| 16783 | Nine Mile (P.D.-10) | Jessie Duncan | 12-06-1920 | I | S.S. | 63.90 | 28-55-083 | |
| | *(Original supply is from North and South Piney Creeks through Prairie Dog Water Supply Company Ditch, 2nd and 3rd App., Territorial Appropriations, Priorities May 1, 1884 and August 3, 1885.)* | | | | | | | |
| 16783 | Nine Mile (P.D.-10) | Steve George, et al | 12-06-1920 | I | S.S. | 159.50 | 28-55-083 | |
| | *(Original supply is from North and South Piney Creeks through Prairie Dog Water Supply Company Ditch, 2nd App., Territorial Appropriation, Priority May 1, 1884, and from South Piney Creek through Prairie Dog Water Supply Company Ditch, Permit 16791.)* | | | | | | | |
| 16783 | Nine Mile (P.D.-10) | Est. Philip Hamm | 12-06-1920 | I | S.S. | 90.20 | 28-55-083 | |
| | *(Original supply is from North and South Piney Creeks through Prairie Dog Water Supply Company Ditch, 2nd App., Territorial Appropriation, Priority May 1, 1884.)* | | | | | | | |
| 16783 | Nine Mile (P.D.-10) | George W. Hardin | 12-06-1920 | I | S.S. | 17.60 | 28-55-083 | |
| | *(Original supply is from North and South Piney Creeks through Prairie Dog Water Supply Company Ditch, 2nd and 3rd App., Territorial Appropriations, Priorities May 1, 1884 and August 3, 1885.)* | | | | | | | |
| 16783 | Nine Mile (P.D.-10) | H. F. Headley, et al | 12-06-1920 | I | S.S. | 6.50 | 28-55-083 | |
| | *(Original supply is from North and South Piney Creeks through Prairie Dog Water Supply Company Ditch, 3rd App., Territorial Appropriation, Priority August 3, 1885.)* | | | | | | | |
| 16783 | Nine Mile (P.D.-10) | George A. Lucas | 12-06-1920 | I | S.S. | 13.50 | 28-55-083 | |
| | *(Original supply is from North and South Piney Creeks through Prairie Dog Water Supply Company Ditch, 2nd and 3rd App., Territorial Appropriations, Priorities May 1, 1884 and August 3, 1885.)* | | | | | | | |
| 16783 | Nine Mile (P.D.-10) | W. A. Roberts | 12-06-1920 | I | S.S. | 72.50 | 28-55-083 | |
| | *(Original supply is from North and South Piney Creeks through Prairie Dog Water Supply Company Ditch, 2nd and 3rd App., Territorial Appropriations, Priorities May 1, 1884 and August 3, 1885.)* | | | | | | | |
| 16783 | Nine Mile (P.D.-10) | Weltner Brothers | 12-06-1920 | I | S.S. | 345.20 | 28-55-083 | |
| | *(Original supply is from North and South Piney Creeks through Prairie Dog Water Supply Company Ditch, 2nd and 3rd App., Territorial Appropriations, Priorities May 1, 1884 and August 3, 1885; and from South Piney Creek through Prairie Dog Water Supply Company Ditch, Permit 16791.)* | | | | | | | |
| 16784 | P.D.-11 | Clara D. Burns | 12-06-1920 | I | S.S. | 15.20 | 30-56-083 | |
| | *(Original supply is from North and South Piney Creeks through Prairie Dog Water Supply Company Ditch, 2nd App., Territorial Appropriation, Priority May 1, 1884.)* | | | | | | | |
| 16784 | P.D.-11 | John Hammond | 12-06-1920 | I | S.S. | 42.70 | 30-56-083 | |
| | *(Original supply is from North and South Piney Creeks through Prairie Dog Water Supply Company Ditch, 2nd and 3rd App., Territorial Appropriations, Priorities May 1, 1884 and August 3, 1885; and from South Piney Creek through Prairie Dog Water Supply Company Ditch, Permit 16791.)* | | | | | | | |
| 16784 | P.D.-11 | Est. Mattie A. Stout | 12-06-1920 | I | S.S. | 68.60 | 30-56-083 | |
| | *(Original supply is from North and South Piney Creeks through Prairie Dog Water Supply Company Ditch, 2nd App., Territorial Appropriation, Priority May 1, 1884.)* | | | | | | | |
| 16785 | P.D.-11-1 | Clara D. Burns | 12-06-1920 | I | S.S. | 1.00 | 30-56-083 | |
| | *(Original supply is from North and South Piney Creeks through Prairie Dog Water Supply Company Ditch, 2nd App., Territorial Appropriation, Priority May 1, 1884.)* | | | | | | | |

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|
| 16785 | P.D.-11-1 | James Burns | 12-06-1920 | I | S.S. | 96.80 | 30-56-083 | |
| | *(Original supply is from North and South Piney Creeks through Prairie Dog Water Supply Company Ditch, 2nd and 3rd App., Territorial Appropriation, Priorities May 1, 1884 and August 3, 1885.)* | | | | | | | |
| 16785 | P.D.-11-1 | Bertha C. Kahn | 12-06-1920 | I | S.S. | 200.80 | 30-56-083 | |
| | *(Original supply is from North and South Piney Creeks through Prairie Dog Water Supply Company Ditch, 3rd App., Territorial Appropriation, Priority August 3, 1885 and from Wild Cat Creek through Kahn Ditch, Permit 7502; and from South Piney Creek through Prairie Dog Water Supply Company Ditch, Permit 16791.)* | | | | | | | |
| 16785 | P.D.-11-1 | H. A. McLimans, et al | 12-06-1920 | I | S.S. | 40.50 | 30-56-083 | |
| | *(Original supply is from North and South Piney Creeks through Prairie Dog Water Supply Company Ditch, 2nd App., Territorial Appropriation, Priority May 1, 1884, and from South Piney Creek through Prairie Dog Water Supply Company Ditch, Permit 16791.)* | | | | | | | |
| 16785 | P.D.-11-1 | Est. Mattie A. Stout | 12-06-1920 | I | S.S. | 29.50 | 30-56-083 | |
| | *(Original supply is from North and South Piney Creeks through Prairie Dog Water Supply Company Ditch, 2nd App., Territorial Appropriation, Priority May 1, 1884.)* | | | | | | | |
| 16785 | P.D.-11-1 | William Watson, et al | 12-06-1920 | I | S.S. | 45.80 | 30-56-083 | |
| | *(Original supply is from North and South Piney Creeks through Prairie Dog Water Supply Company Ditch, 2nd and 3rd App., Territorial Appropriations, Priorities May 1, 1884 and August 3, 1885.)* | | | | | | | |
| 16786 | P.D.-12 | Clara D. Burns | 12-06-1920 | I | S.S. | 130.10 | 18-56-083 | |
| | *(Original supply is from North and South Piney Creeks through Prairie Dog Water Supply Company Ditch, 2nd App., Territorial Appropriation, Priority May 1, 1884.)* | | | | | | | |
| 16786 | P.D.-12 | James Burns | 12-06-1920 | I | S.S. | 22.50 | 18-56-083 | |
| | *(Original supply is from North and South Piney Creeks through Prairie Dog Water Supply Company Ditch, 2nd and 3rd App., Territorial Appropriations, Priorities May 1, 1884 and August 3, 1885.)* | | | | | | | |
| 16787 | P.D.-13 | J. M. Enochs | 12-06-1920 | I | S.S. | 41.00 | 8-56-083 | |
| | *(Original supply is from North and South Piney Creeks through Prairie Dog Water Supply Company Ditch, 2nd App., Territorial Appropriation, Priority May 1, 1884 and through Enoch Laterals Nos. 1, 2 and 3, (Enl. Prairie Dog Water Supply Company Ditch), Permit 264 Enl.)* | | | | | | | |
| 16787 | P.D.-13 | H. S. Robertson | 12-06-1920 | I | S.S. | 40.00 | 8-56-083 | |
| | *(Original supply is from North and South Piney Creeks through Prairie Dog Water Supply Company Ditch, 2nd App., Territorial Appropriation, Priority May 1, 1884.)* | | | | | | | |
| 16787 | P.D.-13 | Margaret Rodgers | 12-06-1920 | I | S.S. | 81.20 | 8-56-083 | |
| | *(Original supply is from North and South Piney Creeks through Prairie Dog Water Supply Company Ditch, 2nd App., Territorial Appropriation, Priority May 1, 1884.)* | | | | | | | |
| 16787 | P.D.-13 | John Rose | 12-06-1920 | I | S.S. | 38.90 | 8-56-083 | |
| | *(Original supply is from North and South Piney Creeks through Prairie Dog Water Supply Company Ditch, 2nd and 3rd App., Territorial Appropriations, Priorities May 1, 1884 and August 3, 1885; point of diversion and means of conveyance changed to the Rose No. 1 Pump and Pipeline, 27-57-83. During periods of high runoff, the P.D. 13 Ditch, will be utilized but during periods of low runoff the Rose No. 1 Pump and Pipeline will be utilized. Rotation in the means of conveyance will be accomplished under direction of water administrative officials.)* | | | | | | | |
| 16787 | P.D.-13 | Est. H. H. Teich | 12-06-1920 | I | S.S. | 82.70 | 8-56-083 | |
| | *(Original supply is from North and South Piney Creeks through Prairie Dog Water supply Company Ditch, 2nd and 3rd App., Territorial Appropriations, Priorities May 1, 1884 and August 3, 1885.)* | | | | | | | |
| 16787 | P.D.-13 | Est. E. M. Weltner | 12-06-1920 | I | S.S. | 166.50 | 8-56-083 | |
| | *(Original supply is from North and South Piney Creeks through Prairie Dog Water Supply Company Ditch, 2nd and 3rd App., Territorial Appropriations, Priorities May 1, 1884 and August 3, 1885.)* | | | | | | | |
| 16788 | P.D.-14 | Drake-Ballard Company | 12-06-1920 | I | S.S. | 46.50 | 34-57-083 | |
| | *(Original supply is from North and South Piney Creeks through Prairie Dog Water Supply Company Ditch, 3rd App., Territorial Appropriation, Priority August 3, 1885.)* | | | | | | | |
| 16788 | P.D.-14 | T. J. Hanson, et al | 12-06-1920 | I | S.S. | 39.70 | 34-57-083 | |
| | *(Original supply is from North and South Piney Creeks through Prairie Dog Water supply Company Ditch, 2nd and 3rd App., Territorial Appropriations, Priorities May 1, 1884 and August 3, 1885.)* | | | | | | | |
| 16789 | P.D.-15 | Joe Pilch, et al | 12-06-1920 | I | 0.17 | 11.60 | 3-57-083 | |
| 17142 | Maxwell | Slater A. Maxwell | 09-25-1926 | I | 0.50 | 34.50 | 1-53-084 | |
| 19393 | Evans No. 2 | James R. Perkins, et al | 06-17-1940 | I | 0.89 | 62.40 | 35-58-083 | |
| 19393 | Evans No. 2 | Willis S. Perkins, et al | 06-17-1940 | I | 0.55 | 38.60 | 35-58-083 | |
| 19393 | Evans No. 2 | Willis S. Perkins | 06-17-1940 | I | 2.04 | 143.00 | 35-58-083 | |
| 5318E | Enl. Bar N | Thomas J. Hanson, et al | 09-02-1941 | I | S.S. | 140.30 | 34-57-083 | |
| | *(Original supply is from North and South Piney Creeks through Prairie Dog Water Supply Company Ditch, 3rd App., Territorial Appropriation, Priority August 3, 1885.)* | | | | | | | |
| 5401E | Enl. Prairie Dog Water Supply No. 13 | W. J. Switzer | 12-10-1945 | I | 1.39 | 97.00 | 8-56-083 | |
| 21628 | Pilch | Joseph Pilch, et al | 08-08-1955 | I | 1.18 | 82.50 | 3-57-083 | |
| | | | | | S.S. | 45.00 | | |
| | *(Original supply for 45.0 acres is from Piney Creek through Prairie Dog Water Supply Company Ditch, Territorial Appropriation, Priority May 1, 1884.)* | | | | | | | |
| 21629 | Pilch Pump | Joseph Pilch, et al | 08-08-1955 | I | 1.62 | 113.50 | 3-57-083 | |
| 21630 | Pilch Pump No. 2 | Joseph Pilch, et al | 08-08-1955 | I | 0.38 | 26.50 | 3-57-083 | |

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 22803 | Trembath Pump...................... | Fred E. and Shirley A. Trembath.... | 01-20-1967 | I | 0.34 | | 24.00 | 26-58-083 | |
| 23158 | Rose Pump.......................... | John Rose.......................... | 04-21-1967 | I | 0.47 | | 33.00 | 27-57-083 | |
| 10365R | Sorenson Duck Pond................. | Brett Sorenson..................... | 07-11-1996 | Wildlife | 0.16 | a.f. | | 28-54-083 | |
| | *(Actual capacity is 0.165 acre feet.)* | | | | | | | | |
| 12881SR | Christophersen Stock Res........... | Warren Christophersen.............. | 04-14-1997 | S | 0.78 | a.f. | | 28-54-083 | |
| | *(This stock reservoir is unadjudicated, but built within the terms of the permit. No certificate of construuction will be issued.)* | | | | | | | | |

## COUTANT CREEK, Tributary Prairie Dog Creek

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 6393 | Voiles............................. | John M. Voiles..................... | 12-23-1904 | I | 0.31 | | 22.00 | 6-57-082 | |
| 22802 | Trembath Sprinkler................. | Fred E. and Shirley A. Trembath.... | 01-20-1967 | I | 0.66 | | 46.00 | 35-58-083 | |

## SONNY DRAW, Tributary Gorman Draw, Tributary Coutant Creek

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 8560SR | Sonny No. 1 Stock Res.............. | Joe Pilch.......................... | 10-10-1978 | S | 9.84 | a.f. | | 2-57-083 | |

## BARNEY GULCH, Tributary Coutant Creek, Tributary Prairie Dog Creek

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 7852SR | 320 Stock Res...................... | Fred Trembath...................... | 09-18-1974 | S | 5.00 | a.f. | | 31-58-082 | |
| | *(This stock reservoir is unadjudicated, but built within the terms of the permit. No certificate of construction will be issued.)* | | | | | | | | |

## CEDAR DRAW, Tributary Coutant Creek

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 11303 | Carney............................. | Lottie E. Carney................... | 06-13-1912 | I | 0.69 | | 48.00 | 13-57-083 | |

## ROCK DRAW, Tributary Coutant Creek

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 8964 | Red Rock........................... | Minnie Nash........................ | 03-20-1909 | I | 1.86 | | 130.00 | 8-57-082 | |

## HICKEY DRAW, Tributary Coutant Creek

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 2654SR | Burgess No. 1 Stock Res............ | Henry A. Burgess................... | 02-04-1959 | S | 3.19 | a.f. | | 18-57-082 | |
| 7248R | Hickey Draw Stockwater Res......... | Lyle Bentzen....................... | 07-24-1969 | S | 9.60 | a.f. | | 17-57-082 | |
| | *(Total capacity is for 12.4 acre-feet; 9.6 acre-feet for stock purposes and 2.8 acre-feet for flood control capacity between the principal spillway and the emergency spillway for which no apropriation is granted.)* | | | | | | | | |

## HEPPNER DRAW, Tributary Coutant Creek

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 3981R | Spear No. 3 Res.................... | Wils Ridgeway...................... | 01-22-1925 | S | 4.75 | a.f. | | 8-56-082 | |
| | *(Adjudicated as from Draw. Amended certificate issued correcting name of appropriator from Nils Ridgeway, November 10, 1927. Amended certificate issued, April 20, 1928.)* | | | | | | | | |

## DRAW, Tributary Heppner Draw

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 3980R | Spear No. 2 Res.................... | Roy Bedford........................ | 01-22-1925 | S | 1.81 | a.f. | | 32-57-082 | |

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | **DRAW, Tributary Coutant Creek (4-56-82)** | | | | | | | | |
| 3979R | Spear No. 1 Res.................... | Marie Lonabaugh.................... | 01-22-1925 | S | 8.06 | a.f. | | 9-56-082 | |
| | **ASH DRAW, Tributary Prairie Dog Creek** | | | | | | | | |
| 6394 | Walling............................ | Lulu Evans......................... | 12-23-1904 | I | 1.07 | | 75.00 | 11-57-083 | |
| 6395 | Walling No. 1...................... | Lulu Evans......................... | 12-23-1904 | I | 0.24 | | 17.00 | 11-57-083 | |
| | *(Erroneously adjudicated with priority of December 24, 1904.)* | | | | | | | | |
| | **BAR N DRAW, Tributary Prairie Dog Creek** | | | | | | | | |
| 6405 | Walling No. 3...................... | Lena Nash Walling.................. | 12-23-1904 | I | 0.47 | | 33.00 | 15-57-083 | |
| | **THOMAS DRAW, Tributary Bar N Draw** | | | | | | | | |
| 6423SR | Thomas Stock Res................... | Lyle Bentzen....................... | 08-21-1969 | S | 2.19 | a.f. | | 14-57-083 | |
| | **BENTZEN DRAW, Tributary Old Home Draw, Tributary Prairie Dog Creek** | | | | | | | | |
| 6382SR | Bentzen No. 3 Stock Res............ | Lyle Bentzen....................... | 06-19-1969 | S | 4.81 | a.f. | | 20-57-083 | |
| | **KRENZIEN DRAW, Tributary Prairie Dog Creek** | | | | | | | | |
| 5493 | Krenzien........................... | Julius Krenzien.................... | 05-28-1903 | I | 0.28<br>Sec.Sup. | | 20.00 | 26-57-083 | |
| | *(Secondary supply stored in Krenzien Reservoir, Permit 407 Res.)* | | | | | | | | |
| 407R | Krenzien Res....................... | Julius Krenzien.................... | 05-28-1903 | I | 12.50 | a.f. | | 26-57-083 | |
| | *(Stored water is for Krenzien Ditch, Permit 5493.)* | | | | | | | | |
| | **A.M.J. CREEK, Tributary Prairie Dog Creek** | | | | | | | | |
| 7020SR | A.M.J. Stock Res................... | A. M. Johnston..................... | 06-10-1971 | S | 9.94 | a.f. | | 29-57-083 | |
| | **DUTCH CREEK, Tributary Prairie Dog Creek** | | | | | | | | |
| Terr. | Dow No. 1.......................... | A. P. Dow.......................... | Summer 1885 | | | | | | |
| | *(Actually diverts from Dow Prong.)* | | | | | | | | |
| 1476 | Dutch Creek........................ | J. M. Enochs....................... | 04-27-1897 | I | 1.00 | | 70.00 | 34-57-083 | |
| 1659 | Arno............................... | Wm. Symons, et al.................. | 11-11-1897 | I | 1.92 | | 135.00 | 13-56-083 | |
| 6650 | N. D. Jones........................ | N. D. Jones........................ | 03-29-1905 | | | | | | |
| | *(Actually diverts from Jones Draw or Lonabaugh No. 4 Draw.)* | | | | | | | | |
| 9632 | O. A. No. 2........................ | Otto A. Coleman.................... | 02-28-1910 | | | | | | |
| | *(Actually diverts from Wagner Prong.)* | | | | | | | | |
| 17879 | Lonabaugh Pump..................... | E. E. Lonabaugh.................... | 03-18-1931 | I | 0.63 | | 43.80 | 29-56-082 | |
| 5603E | Enl. Lonabaugh Pump................ | A. W. Lonabaugh.................... | 12-24-1951 | I | 0.50 | | 34.70 | 29-56-082 | |
| 5909R | Channel Res........................ | A. W. Lonabaugh.................... | 12-24-1951 | I | 45.50 | a.f. | | 30-56-082 | |

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 22206 | Burgess | Henry A. Burgess, et al | 07-13-1961 | I | 54.40<br>Sec.Sup. | a.f. | 13.60 | 34-57-083 | |
| | *(Secondary supply stored in Burgess No. 2 Reservoir, Permit 6564 Res.)* | | | | | | | | |
| 6563R | Burgess No. 1 Res | Henry A. Burgess | 07-13-1961 | I,S | 90.90 | a.f. | | 34-57-083 | |
| 6564R | Burgess No. 2 Res | Henry A. Burgess | 07-13-1961 | I,S | 141.90 | a.f. | | 34-57-083 | |
| | *(Stored water is for Burgess Ditch, Permit 22206.)* | | | | | | | | |
| 24022 | Brownell Sprinkler | Lenard M. Brownell, et ux | 02-02-1973 | I | S.S. | | 11.50 | 19-56-082 | |
| | *(Original supply is from Coyota Draw or Creek, tributary Wood Draw No. 1 and from Badger Draw or Creek, tributary Dutch Creek through Wood No. 1 Ditch, Permit No. 6514.)* | | | | | | | | |
| 29697 | Hardesty Pump Stations 2-7 | James E. & Kathleen I. Hardesty | 02-12-1987 | I | 1.94<br>S.S. | O.S. | 135.90<br>17.90 | 33-56-082 | |
| | *(Supplemental supply for lands which have an original supply from Lanters Gulch or Willow Road Draw, tributary Dutch Creek through the Bell Ditch, Permit No. 6010. This pump station has six points of diversion; only one to be used at any given time.)* | | | | | | | | |
| | **WELTNER DRAW. Tributary Dutch Creek** | | | | | | | | |
| 249SR | Lonabaugh No. 1 Stock Res | A. W. Lonabaugh | 05-18-1953 | S | 7.05 | a.f. | | 6-56-082 | |
| | **HAPE DRAW, Tributary Weltner Draw** | | | | | | | | |
| 7337R | Hape Res | Chester Hape | 06-18-1970 | S | 16.09 | a.f. | | 36-57-083 | |
| | *(Total capacity is for 26.89 acre-feet. The storage capacity for stock purposes is 16.09 acre-feet. The remaining 10.80 acre-feet provides a flood control capacity between the principal spillway and the emergency spillway. There is no appropriation allowed for this additional 10.80 acre-feet.)* | | | | | | | | |
| | **WOOD DRAW NO. ONE, Tributary Dutch Creek** | | | | | | | | |
| 3982R | Spear No. 4 Res | E. E. Lonabaugh | 01-22-1925 | S | 6.52 | a.f. | | 18-56-082 | |
| | *(Adjudicated as from Draw, tributary Dutch Creek.)* | | | | | | | | |
| | **HOLDING POND IN THE DRAINAGE OF DUTCH CREEK, Tributary Prairie Dog Creek** | | | | | | | | |
| 29696 | Hardesty Pump Station No. 1 | James E. and Kathleen I. Hardesty | 02-12-1987 | I | 0.67 | | | 29-56-082 | |
| | *(Original supply of 46.6 acres, supplemental supply for 70.9 acres which have an original supply from Lanters Gulch or Willow Road Draw, tributary Dutch Creek through the Bell Ditch, Permit No. 6010, with a priority of May 3, 1904.)* | | | | | | | | |
| | **COYOTA DRAW OR CREEK, Tributary Wood Draw No. One AND BADGER DRAW OR CREEK, Tributary Dutch Creek** | | | | | | | | |
| 6514 | Wood No. 1 | Thompson Wood | 02-27-1905 | I | 1.42 | | 100.00 | 18-56-082 | |
| | **EYCHANER DRAW, Tributary Dutch Creek** | | | | | | | | |
| 11073 | Eychaner | Etta M. Eychaner | 11-13-1911 | I | 0.43 | | 30.00 | 24-56-083 | |
| | **WOOD DRAW NO. 2, Tributary Dutch Creek** | | | | | | | | |
| 6515 | Wood No. 2 | Thompson Wood | 02-27-1905 | I | 0.22<br>Sec.Sup. | | 16.00 | 19-56-082 | |
| | *(Secondary supply stored in Wood No. 2 Reservoir, Permit 629 Res.)* | | | | | | | | |
| 629R | Wood Res | Thompson Wood | 02-27-1905 | I | 21.00 | a.f. | | 19-56-082 | |
| | *(Stored water is for Wood No. 2 Ditch, Permit 6515.)* | | | | | | | | |

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | **DOW PRONG, Tributary Dutch Creek** | | | | | | | | |
| Terr. | Dow No. 1 | A. P. Dow | Summer 1885 | D,I,S | 0.83 | | 58.00 | 28-55-082 | |
| | *(Adjudicated as from Dutch Creek.)* | | | | | | | | |
| 5649 | Bethurem No. 1 | May Bethurem | 10-26-1903 | I | 0.14 Sec.Sup. | | 10.00 | 20-54-082 | |
| | *(Adjudicated as from West Fork Dutch Creek. Secondary supply stored in Bethurem Reservoir, Permit 440 Res.)* | | | | | | | | |
| 440R | Bethurem Res | May Bethurem | 10-26-1903 | I | 13.00 | a.f. | | 20-54-082 | |
| | *(Stored water is for Bethurem No. 1 Ditch, Permit 5649. Adjudicated as from West Fork Dutch Creek.)* | | | | | | | | |
| 6677 | Bethurem | W. M. Bethurem | 05-04-1905 | I | 4.28 | | 300.00 | 17-55-082 | |
| | *(Adjudicated as from Dows Fork.)* | | | | | | | | |
| 7499 | Stephenson No. 2 | C. O. Stephenson, et al | 11-02-1906 | I | 0.95 | | 67.00 | 9-54-082 | |
| | *(Adjudicated as from West Prong Dutch Creek.)* | | | | | | | | |
| 7500 | Stephenson No. 1 | Charles O. Stephenson | 11-02-1906 | I | 1.37 | | 96.00 | 9-54-082 | |
| | *(Adjudicated as from West Prong Dutch Creek.)* | | | | | | | | |
| 3734R | Parker Res | Frank Parker | 03-15-1921 | I | 2.13 | a.f. | | 29-54-082 | |
| | *(Adjudicated as from West Prong Dutch Creek.)* | | | | | | | | |
| 16237 | Bocek | Frank Bocek, et ux | 09-01-1921 | I | 0.31 | | 22.00 | 29-55-082 | |
| 8076SR | Fordyce No. 79 Stock Res | Allen O. Fordyce | 01-16-1976 | S | 2.58 | a.f. | | 28-54-082 | |
| 8207SR | Kobielusz No. 5 Stock Res | George Kobielusz | 08-09-1976 | S | 2.29 | a.f. | | 4-54-082 | |
| | **NELSON DRAW, Tributary Dow Prong** | | | | | | | | |
| 1253SR | Nelson No. 1 Stock Res | Andrew Nelson | 10-05-1955 | S | 2.92 | a.f. | | 4-55-082 | |
| | **HELVEY DRAW, Tributary Dow Prong** | | | | | | | | |
| 5366R | Helvey Res | R. T. Helvey | 11-20-1940 | S | 13.50 | a.f. | | 6-55-082 | |
| | **EAST FORK DOW PRONG, Tributary Dow Prong** | | | | | | | | |
| 3211 | Dow No. 2 | A. P. Dow | 04-13-1901 | I | 0.71 | | 50.00 | 21-55-082 | |
| 12687 | Lone | Goelet Gallatin | 09-05-1914 | I | 0.33 Sec.Sup. | | 23.00 | 6-54-081 | |
| | *(Secondary supply stored in Supply Reservoir, Permit 2728 Res. Adjudicated as from Prong of Dutch Creek.)* | | | | | | | | |
| 2728R | Supply Res | Goelet Gallatin | 09-05-1914 | I | 4.50 | a.f. | | 6-54-081 | |
| | *(Adjudicated as from Prong of Dutch Creek. Stored water is for Lone Ditch, Permit 12687.)* | | | | | | | | |
| | **BOJKO DRAW, Tributary Tibbetts Gulch, Tributary East Fork Dow Prong** | | | | | | | | |
| 12765SR | Nancy K. Herdt Stock Res | Nancy K. Herdt | 04-04-1996 | S | 1.62 | a.f. | | 26-55-082 | |
| | *(Acutal amount of appropriation is 1.629 acre-feet. This stock reservoir is unadjudicated, but built within the terms of the permit. No certificate of construction will be issued.)* | | | | | | | | |
| | **DRAW, Tributary East Fork Dow Prong** | | | | | | | | |
| 14901 | Gallatin | Goelet Gallatin | 10-18-1917 | I | 0.09 | | 6.00 | 1-54-082 | |
| | *(Adjudicated as from Prong of Dutch Creek.)* | | | | | | | | |

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | **DRY CREEK OR VAUGHT DRAW, Tributary Dow Prong** | | | | | | | | |
| 7269 | Dow No. 3 | A. P. Dow | 07-07-1906 | I | S.S. Sec.Sup. | | 58.00 | 20-55-082 | |
| | *(Secondary supply stored in Dow No. 3 Reservoir, Permit 870 Res. Original supply is from Dow Prong through Dow No. 1 Ditch, Territorial Appropriation, Priority Summer 1885.)* | | | | | | | | |
| 870R | Dow No. 3 Res | A. P. Dow | 07-07-1906 | I | 20.00 | a.f. | | 20-55-082 | |
| | *(Stored water is for Dow No. 3 Ditch, Permit 7269.)* | | | | | | | | |
| | **SPRING CREEK, Tributary Dow Prong** | | | | | | | | |
| 10090 | Evans No. 1 | H. H. Evans | 08-31-1910 | I | 0.74 | | 52.00 | 6-54-082 | |
| | **IDA DRAW, Tributary Spring Creek** | | | | | | | | |
| 7423SR | Ida Stock Res | Paul Belus | 12-13-1972 | S | 0.42 | a.f. | | 19-54-082 | |
| 7424SR | Peggy Stock Res | Paul Belus | 12-13-1972 | S | 0.58 | a.f. | | 19-54-082 | |
| | **BELUS DRAW, Tributary Ida Draw** | | | | | | | | |
| 7425SR | Rose Stock Res | Paul Belus; State Board of Land Commissioners | 12-13-1972 | S | 0.33 | a.f. | | 18-54-082 | |
| | **PARKER DRAW, Tributary Dow Prong** | | | | | | | | |
| 8075SR | Fordyce No. 58 Stock Res | Allen O. Fordyce | 01-16-1976 | S | 2.76 | a.f. | | 34-54-082 | |
| 8191SR | Fordyce No. 15 Stock Res | Allen O. Fordyce | 10-15-1976 | S | 16.75 | a.f. | | 28-54-082 | |
| | **SOUTH FORK PARKER DRAW, Tributary Parker Draw** | | | | | | | | |
| 8664SR | Fordyce No. 21 Stock Res | Allen O. Fordyce | 01-30-1978 | S | 19.20 | a.f. | | 33-54-082 | |
| | **JAMES DRAW, Tributary East Fork Parker Draw, Tributary Parker Draw** | | | | | | | | |
| 8077SR | Fordyce No. 81 Stock Res | Allen O. Fordyce | 01-16-1976 | S | 1.41 | a.f. | | 27-54-082 | |
| | **STOUT DRAW, Tributary Dow Prong** | | | | | | | | |
| 5647 | Stout | Mattie A. Stout | 10-26-1903 | I | 0.28 | | 20.00 | 28-54-082 | |
| 438R | Stout Res | Mattie A. Stout | 10-26-1903 | I | 30.00 | a.f. | | 28-54-082 | |
| | **LANTERS GULCH OR WILLOW ROAD DRAW, Tributary Dutch Creek** | | | | | | | | |
| 6010 | Bell | Mary S. Bell | 05-03-1904 | I | 0.92 | | 65.00 | 28-56-082 | |
| 1323SR | Nelson No. 2 Stock Res | Andrew Nelson | 12-15-1955 | S | 14.80 | a.f. | | 28-56-082 | |
| 1955SR | Nelson No. 3 Stock Res | Andrew Nelson, et al | 01-27-1958 | S | 16.70 | a.f. | | 28-56-082 | |

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | **BUCKINGHAM DRAW, Tributary Dutch Creek** | | | | | | | | |
| 12740 | Green No. 5........................ | E. C. Green...................... | 09-28-1914 | I | 0.24 | | 17.00 | 28-56-082 | |
| 12741 | Green No. 6........................ | E. C. Green...................... | 09-28-1914 | I | 0.26 | | 18.00 | 28-56-082 | |
| | **NELSON DRAW, Tributary Dutch Creek** | | | | | | | | |
| 2080SR | Nelson No. 2 Stock Res............ | Andrew Nelson.................... | 09-12-1957 | S | 6.07 | a.f. | | 27,34-56-082 | |
| | **WINDMILL DRAW, Tributary Dutch Creek** | | | | | | | | |
| 12823 | Green No. 7........................ | Ed C. Green...................... | 09-28-1914 | I | 0.11 | | 8.00 | 27-56-082 | |
| | **WAGNER PRONG, Tributary Dutch Creek** | | | | | | | | |
| 1261 | Sickler............................ | H. E. Sickler.................... | 06-10-1896 | I,S | 0.64 | | 45.00 | 11-55-082 | |
| 9632 | O. A. No. 2........................ | Otto A. Coleman.................. | 02-28-1910 | I | 0.43 | | 30.00 | 10-54-081 | |
| | *(Adjudicated as from Dutch Creek.)* | | | | | | | | |
| 21965 | Dodd Pump Station No. One.......... & Sprinkler Line No. One | P. J. Dodd & Son, Inc............ | 01-20-1958 | I | 0.34 | | 24.00 | 34-56-082 | |
| 21966 | Dodd Pump Station No. 2............ & Sprinkler Line No. 2 | P. J. Dodd & Sons, Inc........... | 01-20-1958 | I | 0.47 | | 33.00 | 3-55-082 | |
| 21967 | Dodd Pump Station No. 3............ & Sprinkler Line No. 3 | P. J. Dodd & Son, Inc............ | 01-20-1958 | I | 0.84 | | 59.00 | 3-55-082 | |
| 21968 | Dodd Pump Station No. 4............ & Sprinkler Line No. 4 | P. J. Dodd & Son, Inc............ | 01-20-1958 | I | 0.33 | | 23.00 | 11-55-082 | |
| 29698 | Hardesty Pump...................... | Janes E. & Kathleen I. Hardesty.... | 02-12-1987 | I | 0.19 | | 12.60 | 34-56-082 | |
| | **GROUSE DRAW, Tributary Wagner Prong (34-56-82)** | | | | | | | | |
| 12738 | Green No. 8........................ | Della Green...................... | 09-28-1914 | I | 0.14 | | 10.00 | 34-56-082 | |
| 12739 | Green No. 9........................ | Della Green...................... | 09-28-1914 | I | 0.02 | | 2.00 | 34-55-082 | |
| | **SPRING, Tributary Roode Draw, Tributary Wagner Prong** | | | | | | | | |
| 10838 | Roode Pipe Line.................... | O. A. Roode...................... | 06-19-1911 | D,I,S | 0.01 | | 1.00 | 18-55-081 | |
| | **BEAVER CREEK, Tributary Wagner Prong** | | | | | | | | |
| 851R | Verona Res......................... | George Scales.................... | 05-19-1906 | D,I | 322.50 | a.f. | | 19-55-081 | |
| | *(Amended certificate issued to successor of Grand Island & Northern Wyoming R. R. Co., original appropriator, for change in use from steam engines to irrigation.)* | | | | | | | | |
| | **SPRING DRAW, Tributary Wagner Prong** | | | | | | | | |
| 10283 | Hampton No. 1...................... | Walter J. Hampton................ | 11-14-1910 | I | 0.11 Sec.Sup. | | 8.00 | 20-55-081 | |
| | *(Secondary supply stored in Hampton Reservoir, Permit 2021 Res.)* | | | | | | | | |
| 2021R | Hampton Res........................ | Walter J. Hampton................ | 11-14-1910 | I,S | 10.00 | a.f. | | 20-55-081 | |
| | *(Stored water is for Hampton No. 1 Ditch, Permit 10283.)* | | | | | | | | |

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | **GROUSE DRAW, Tributary Wagner Prong (20-55-81)** | | | | | | | | |
| 10279 | Hampton No. 2...................... | Hannah M. Hampton.................. | 11-14-1910 | I | 0.28 | | 20.00 | 29-55-081 | |
| | **PK DRAW, Tributary Wagner Prong** | | | | | | | | |
| 6786SR | Demple No. 1 Stock Res............ | Robert Demple...................... | 08-06-1970 | S | 9.85 | a.f. | | T 37-55-081 | |
| | **SOUTH FORK P. K. DRAW, Tributary P. K. Draw** | | | | | | | | |
| 8151SR | Niedringhaus No. 25................ Stock Res. | T-T Ranch.......................... | 09-14-1976 | S | 1.63 | a.f. | | 1-54-081 | |
| | **WEST DRAW, Tributary Nigger Draw, Tributary Wagner Prong** | | | | | | | | |
| 7041SR | Demple No. 2 Stock Res............ | Robert Demple...................... | 07-27-1971 | S | 6.80 | a.f. | | 2-54-081 | |
| 7878SR | Demple No. 6 Stock Res............ | Robert E. Demple................... | 12-09-1974 | S | 5.54 | a.f. | | 2-54-081 | |
| 8015SR | Niedringhaus No. 17 (ULM).......... Stock Res. | Lambert Niedringhaus............... | 08-12-1975 | S | 8.70 | a.f. | | 2-54-081 | |
| | **JACOBS DRAW, Tributary West Draw** | | | | | | | | |
| 8018SR | Niedringhaus No. 27 Stock Res...... | Lambert Niedringhaus............... | 10-15-1975 | S | 3.65 | a.f. | | 12-54-081 | |
| | **COTTONWOOD DRAW OR DRY CREEK, Tributary Wagner Prong** | | | | | | | | |
| 7207 | McLimans No. 1..................... | Sophia L. McLimans................. | 04-30-1906 | I | 0.75 Sec.Sup. | | 53.00 | 11-54-081 | |
| | *(Secondary supply stored in McLimans Reservoir, Permit 849 Res.)* | | | | | | | | |
| 849R | McLimans Res....................... *(Stored water is for McLimans No. 1 Ditch, Permit 7207.)* | Sophia L. McLimans................. | 04-30-1906 | I | 37.50 | a.f. | | 11-54-081 | |
| | **DRAW (COLEMAN), Tributary Wagner Prong** | | | | | | | | |
| 9631 | O. A. No. 1........................ *(Adjudicated as from Draw, tributary Dutch Creek.)* | Otto A. Coleman.................... | 02-07-1910 | I | 0.14 | | 10.00 | 10-54-081 | |
| | **BRANCH, Tributary Wagner Prong (10-54-81)** | | | | | | | | |
| 7040 | Coleman No. 2...................... | Niler R. Coleman................... | 01-20-1906 | I | 0.02 | | 2.00 | 15-54-081 | |
| | **S. R. CREEK, Tributary Dutch Creek** | | | | | | | | |
| 9452 | Reid-Hereford...................... | Walter C. Reid, et al.............. | 10-27-1909 | I | 0.50 | | 35.00 | 34-56-081 | |
| 11379 | Kuhl No. 3......................... | N. P. Kuhl......................... | 07-15-1912 | I | 0.57 Sec.Sup. | | 40.00 | 29-56-081 | |
| | *(Secondary supply stored in Kuhl No. 3 Reservoir, Permit 2355 Res.)* | | | | | | | | |
| 2355R | Kuhl No. 3 Res..................... *(Stored water is for Kuhl No. 3 Ditch, Permit 11379.)* | N. P. Kuhl......................... | 07-15-1912 | I | 1.30 | a.f. | | 29-56-081 | |

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 5963R | Nelson Res......................... | Andrew Nelson..................... | 09-29-1952 | D,I,S | 14.90 | a.f. | | 34-56-082 | |
| | *(Adjudicated as from Arkansas Creek.)* | | | | | | | | |
| 6775SR | Wagner No. 1 Stock Res............ | Rodger D. Wagner.................. | 06-29-1970 | S | 3.50 | a.f. | | 29-56-081 | |
| 6776SR | Wagner No. 2 Stock Res............ | Rodger D. Wagner.................. | 06-29-1970 | S | 1.75 | a.f. | | 29-56-081 | |
| 7155SR | Rudisill No. 1 Stock Res.......... | LeRoy S. Ruddisill................ | 10-28-1971 | S | 2.23 | a.f. | | 19-56-081 | |
| 8125SR | P G A No. 62 Stock Res............ | Peter's Grazing Association........ | 06-23-1976 | S | 7.00 | a.f. | | 34-56-081 | |
| | **TRUMAN DRAW, Tributary S. R. Creek** | | | | | | | | |
| 1956SR | Nelson No. 4 Stock Res............ | Andrew Nelson..................... | 01-27-1958 | S | 9.36 | a.f. | | 26-56-082 | |
| | **GARNER DRAW, Tributary S. R. Creek** | | | | | | | | |
| 8145 | Garner No. 1...................... | J. E. Garner, et al............... | 11-02-1907 | I,S | 0.54 Sec.Sup. | | 38.00 | 26-56-082 | |
| | *(Secondary supply stored in Garner Reservoir, Permit 1175 Res.)* | | | | | | | | |
| 8146 | Garner No. 2...................... | J. E. Garner, et al............... | 11-02-1907 | I,S | 0.17 Sec.Sup. | | 12.00 | 26-56-082 | |
| | *(Secondary supply stored in Garner Reservoir, Permit 1175 Res.)* | | | | | | | | |
| 1175R | Garner Res........................ | J. E. Garner, et al............... | 11-02-1907 | I,S | 22.00 | a.f. | | 26-56-082 | |
| | *(Stored water is for Garner No. 1 and Garner No. 2 Ditches, Permit Nos. 8145 and 8146.)* | | | | | | | | |
| | **SIGNAL BUTTE DRAW, Tributary S. R. Creek** | | | | | | | | |
| 11361 | Garner No. 2...................... | John E. Garner.................... | 07-08-1912 | I | 0.44 Sec.Sup. | | 31.00 | 35-56-082 | |
| | *(Secondary supply stored in Garner No. 2 Reservoir, Permit 2352 Res.)* | | | | | | | | |
| 2352R | Garner No. 2 Res.................. | John E. Garner.................... | 07-08-1912 | I | 13.50 | a.f. | | 35-56-082 | |
| | *(Stored water is for Garner No. 2 Ditch, Permit 11361.)* | | | | | | | | |
| | **ARKANSAS CREEK, Tributary S. R. Creek** | | | | | | | | |
| 10025 | Field No. 2....................... | Byrtie Fields..................... | 08-01-1910 | | | | | | |
| | *(Actually diverts from Middle Fork Arkansas Creek.)* | | | | | | | | |
| 11485 | Upton............................. | W. J. Switzer..................... | 09-23-1912 | I | 0.45 | | 31.30 | 8-55-081 | |
| 5963R | Nelson Res........................ | Andrew Nelson..................... | 09-29-1952 | | | | | | |
| | *(Actually diverts from S. R. Creek.)* | | | | | | | | |
| | **SHEPS DRAW, Tributary Arkansas Creek** | | | | | | | | |
| 8556SR | Sheps Best Stock Res.............. | John Paul Dodd & Son, Inc......... | 05-18-1979 | S | 5.90 | a.f. | | 1-55-082 | |
| | **NORTH PRONG ARKANSAS CREEK, Tributary Arkansas Creek** | | | | | | | | |
| 9023 | Kuhl.............................. | Nicholas P. Kuhl.................. | 05-01-1909 | I | 0.64 | | 45.00 | 11-55-081 | |

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | **SALT DRAW, Tributary North Prong Arkansas Creek** | | | | | | | | |
| 8124SR | P G A No. 45 Stock Res............ | Peter's Grazing Association....... | 06-23-1976 | S | 2.43 | a.f. | | 14-55-081 | |
| | **MIDDLE FORK ARKANSAS CREEK, Tributary Arkansas Creek** | | | | | | | | |
| 10024 | Fields No. 1...................... | Byrtie Fields..................... | 08-01-1910 | I | 0.34 | | 24.00 | 25-55-081 | |
| 10025 | Fields No. 2...................... | Byrtie Fields..................... | 08-01-1910 | I | 0.26 | | 18.00 | 30-56-080 | |
| | *(Adjudicated as from Arkansas Creek.)* | | | | | | | | |
| | **LANCE DRAW, Tributary Middle Fork Arkansas Creek** | | | | | | | | |
| 8764SR | Fletcher No. 5 Stock Res........... | Wyoming Pinzgaur Ranch............ | 12-08-1980 | S | 6.50 | a.f. | | 24-55-081 | |
| | **NO NAME DRAW, Tributary S. R. Creek** | | | | | | | | |
| 10983 | Jones No. 3....................... | Nellie B. Jones................... | 09-14-1911 | I | 0.14 | | 10.00 | 25-56-082 | |
| | **JONES DRAW OR LONABAUGH NO. 4 DRAW, Tributary S. R. Creek (25-56-82)** | | | | | | | | |
| 6650 | N. D. Jones....................... | N. D. Jones....................... | 03-29-1905 | I | 0.63 | | 44.00 | 24-56-082 | |
| | *(Adjudicated as from Dutch Creek.)* | | | | | | | | |
| 10981 | Jones No. 1....................... | N. D. Jones....................... | 09-14-1911 | I | 0.64 | | 45.00 | 23-56-082 | |
| 10981 | Jones No. 1....................... | Nellie B. Jones................... | 09-14-1911 | I | 0.21 | | 15.00 | 23-56-082 | |
| | **RUDISILL SPRING NO. 1, Tributary Jones Draw or Lonabaugh No. 4 Draw** | | | | | | | | |
| 23715 | Rudisill Spring Pipeline No. 1..... | LeRoy S. Rudisill, et al.......... | 10-28-1971 | S | 0.06 | | | 24-56-082 | |
| | **BAXTER DRAW, Tributary Jones Draw or Lonabaugh No. 4 Draw** | | | | | | | | |
| 10982 | Jones No. 2....................... | N. D. Jones....................... | 09-14-1911 | I | 0.07 | | 5.00 | 24-56-082 | |
| | **GROUSE DRAW, Tributary Jones Draw, Tributary S.R. Creek (24-56-82)** | | | | | | | | |
| 10256 | Grouse............................ | Elmer J. Kuhl..................... | 10-15-1910 | I | 0.28<br>Sec.Sup. | | 20.00 | 24-56-082 | |
| | *(Secondary supply stored in Grouse Reservoir, Permit 2006 Res.)* | | | | | | | | |
| 2006R | Grouse Res........................ | Elmer J. Kuhl..................... | 10-15-1910 | I | 20.00 | a.f. | | 24-56-082 | |
| | *(Stored water is for Grouse Ditch, Permit 10256.)* | | | | | | | | |
| | **ASH DRAW, Tributary Jones Draw, Tributary S. R. Creek (24-56-82)** | | | | | | | | |
| 10257 | Ash............................... | Elmer J. Kuhl..................... | 05-15-1910 | I | 1.34 | | 94.00 | 13-56-082 | |

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | **HAY CREEK, Tributary S. R. Creek** | | | | | | | | |
| 8212SR | Peter's Grazing Association - ..... Eddy Stock Res. | Peter's Grazing Association....... | 01-12-1977 | S | 4.35 | a.f. | | 30-56-081 | |
| | **NORTH PRONG S. R. CREEK, Tributary S. R. Creek** | | | | | | | | |
| 9024 | Kuhl No. 2........................ | Flora M. Kuhl.................... | 05-01-1909 | I | 0.52 | | 37.00 | 29-56-081 | |
| | **RUDISILL SPRING NO. 2, Tributary Roy Draw, Tributary North Prong S. R. Creek** | | | | | | | | |
| 23716 | Rudisill Spring 2 Pipeline No. 2... | LeRoy S. Rudisill, et al.......... | 10-28-1971 | S | 0.06 | | | 21-56-081 | |
| | **RUDISILL DRAW, Tributary North Prong S. R. Creek** | | | | | | | | |
| 7156SR | Rudisill No. 2 Stock Res.......... | LeRoy S. Rudisill................ | 10-28-1971 | S | 0.93 | a.f. | | 21-56-081 | |
| | **SPEAR DRAW, Tributary S. R. Creek** | | | | | | | | |
| 11254 | Reid-Hereford No. 2............... (West Prong) | W. C. Reid....................... | 06-17-1912 | I | 0.57 | | 40.00 | 28-56-081 | |
| 11255 | Reid-Hereford No. 2............... (East Prong) | W. C. Reid....................... | 06-17-1912 | I | 0.07 | | 5.00 | 28-56-081 | |
| 11255 | Reid-Hereford No. 2............... (East Prong) | Frank Hereford................... | 06-17-1912 | I | 0.07 | | 5.00 | 28-56-081 | |
| | **JOHNSTON DRAW, Tributary Prairie Dog Creek** | | | | | | | | |
| 12364SR | Taylor No. 2 Stock Res............ | Doug Taylor...................... | 05-10-1995 | S | 1.10 | a.f. | | 33-57-083 | |
| | *(This stock reservoir is unadjudicated, but built within the terms of the permit. No certificate of construction will be issued.)* | | | | | | | | |
| 12808SR | Taylor No. 1 Stock Res............ | Doug Taylor...................... | 05-17-1996 | S | 2.60 | a.f. | | 34-57-083 | |
| | *(This stock reservoir is unadjudicated, but built within the terms of the permit. No certificate of construction will be issued.)* | | | | | | | | |
| | **BATES DRAW, Tributary Prairie Dog Creek** | | | | | | | | |
| 1443SR | Bates No. 2 Stock Res............. | Floyd Bates...................... | 10-01-1956 | S | 12.00 | a.f. | | 32-57-083 | |
| 1444SR | Bates No. 3 Stock Res............. | Floyd Bates...................... | 10-01-1956 | S | 1.60 | a.f. | | 32-57-083 | |
| | **DRY DRAW, Tributary Bates Draw** | | | | | | | | |
| 1442SR | Bates No. 1 Stock Res............. | Floyd Bates...................... | 10-01-1956 | S | 2.40 | a.f. | | 33-57-083 | |

## WILD CAT OR CAT CREEK, Tributary Prairie Dog Creek

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 5336 | Kahn & Roberts | Dave Kahn | 02-21-1903 | I | 2.26 Sec.Sup. | | 158.00 | 16-56-083 | |
| | *(Secondary supply stored in Kahn & Roberts Reservoir, Permit No. 384 Res. Point of diversion and means of conveyance changed to the KN Pump Ditch, 16-56-83 from 21-56-083.)* | | | | | | | | |
| 384R | Kahn & Roberts Res | Dave Kahn | 02-21-1903 | I | 57.50 | a.f. | | 21-56-083 | |
| | *(Stored water is for Kahn & Roberts Ditch, Permit No. 5336.)* | | | | | | | | |
| 749R | Kahn Res | Dave Kahn | 08-18-1905 | I | 50.40 | a.f. | | 16-56-083 | |
| | *(Stored water is for Kahn Ditch, Permit No. 7502.)* | | | | | | | | |
| 7502 | Kahn | Dave Kahn | 11-19-1906 | I Supply Ditch | 0.78 Sec.Sup. | | 55.00 | 16-56-083 | |
| | *(Secondary supply stored in Kahn Reservoir, Permit No. 749 Res. Also supply ditch for Kahn Reservoir, Permit No. 749 Res.)* | | | | | | | | |
| 11622 | Teich | H. H. Teich | 12-02-1912 | I | 1.71 Sec.Sup. | | 120.00 | 16-56-083 | |
| | *(Adjudicated as from Cat Creek. Secondary supply is from Teich Brothers Reservoir, Permit No. 2432 Res.)* | | | | | | | | |
| 2432R | Teich Bros. Res | H. H. Teich | 12-02-1912 | I | 25.00 | a.f. | | 16-56-083 | |
| | *(Stored water is for Teich Ditch, Permit No. 11622. Adjudicated as from Cat Creek.)* | | | | | | | | |
| 5910R | Paul No. 1 Res | Paul Koltiska, Jr | 12-24-1951 | | | | | | |
| | *(Actually diverts from West Cat Creek or West Fork Wild Cat Creek.)* | | | | | | | | |
| 5911R | Paul No. 2 Res | Paul Koltiska, Jr | 12-24-1951 | | | | | | |
| 5903R | Paul No. 3 Res | George Koltiska | 01-02-1952 | I,S | 55.00 | a.f. | | 34-56-083 | |
| | *(Stored water is for Koltiska Pumping Station and Pipe Line No. 3, Permit No. 21680.)* | | | | | | | | |
| 21680 | Koltiska Pumping Station and Pipe Line No. 3 | George Koltiska, et al | 10-14-1955 | I | 53.50 Sec.Sup. | a.f. | 31.60 | 34-56-083 | |
| | *(Secondary supply stored in Paul Reservoir No. 3, Permit No. 5903 Res.)* | | | | | | | | |
| 23152 | Koltiska Pump Station No. 4 | George Koltiska, et al | 03-31-1967 | I | 0.35 | | 24.50 | 28-56-083 | |
| 23153 | Koltiska Pump Station No. 5 | George Koltiska, et al | 03-31-1967 | I | 0.53 | | 36.90 | 28-56-083 | |
| 23154 | Koltiska Pump Station No. 6 | George Koltiska, et al | 03-31-1967 | I | 0.78 | | 54.50 | 28-56-083 | |
| 23155 | Koltiska Pump Station No. 7 | George Koltiska, et al | 03-31-1967 | I | 0.41 | | 28.70 | 28-56-083 | |
| 23156 | Koltiska Pump Station No. 8 | George Koltiska, et al | 03-31-1967 | I | 0.82 | | 57.20 | 28-56-083 | |
| 23157 | Koltiska Pump Station No. 9 | George Koltiska, et al | 03-31-1967 | I | 0.28 | | 19.60 | 28-56-083 | |
| 23085 | KN Pump | Paul Koltiska, et al | 04-01-1969 | I | 1.47 | | 103.00 | 16-56-083 | |

## KOLTISKA SPRING NO. ONE, Tributary Wild Cat or Cat Creek

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 21678 | Koltiska Pumping Station and Pipe Line No. 1 | George Koltiska, et al | 10-14-1955 | I | 0.43 | | 30.00 | 34-56-083 | |

## KOLTISKA SPRING NO. TWO, Tributary Wild Cat or Cat Creek

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 21679 | Koltiska Pumping Station and Pipe Line No. 2 | George Koltiska, et al | 10-14-1955 | I | 0.21 | | 14.50 | 34-56-083 | |

## EAST CAT CREEK OR EAST FORK WILD CAT CREEK, Tributary Wild Cat or Cat Creek

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 263R | Maxwell Res | H. M. Weltner, et al | 12-05-1901 | I | 80.00 | a.f. | | 12-55-083 | |
| | *(Stored water is for Maxwell No. 1, 2, and 3 Ditches, Permit Nos 7349, 7351 and 7352.)* | | | | | | | | |
| 7349 | Maxwell No. 1 | H. M. Weltner, et al | 01-17-1906 | I | 1.02 | | 72.00 | 12-55-083 | |
| 7351 | Maxwell No. 2 | H. M. Weltner, et al | 01-17-1906 | I | 0.40 | | 28.00 | 12-55-083 | |
| 7352 | Maxwell No. 3 | H. M. Weltner, et al | 01-17-1906 | I | 0.42 | | 30.00 | 12-55-083 | |
| 8594 | Devor No. 1 | Nellie Devor | 07-21-1908 | I | 0.38 | | 27.00 | 2-55-083 | |
| 7820SR | Kerbel No. 3 Stock Res | Ivan Kerbel | 07-24-1974 | S | 7.50 | a.f. | | 13-55-083 | |

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | **RUBY DRAW, Tributary East Cat Creek or East Fork Wild Cat Creek** | | | | | | | | |
| 6807SR | Ruby Draw Stock Res................ | John Koltiska...................... | 08-26-1970 | S | 3.34 | a.f. | | 25-55-083 | |
| | **WEST CAT CREEK OR WEST FORK WILD CAT CREEK, Tributary Wild Cat or Cat Creek** | | | | | | | | |
| 257R | Wright Res......................... *(Stored water is for Wright Ditch, Permit No. 7350.)* | Julia W. Weltner................... | 11-06-1901 | I | 15.00 | a.f. | | 10-55-083 | |
| 7350 | Wright............................ *(Secondary supply stored in Wright Reservoir, Permit No. 257 Res.)* | Julia W. Weltner................... | 01-17-1906 | I | 1.08 Sec.Sup. | | 76.00 | 10-55-083 | |
| 5910R | Paul No. 1 Res..................... *(Adjudicated as from Wild Cat Creek.)* | Paul Koltiska, Jr.................. | 12-24-1951 | I,S | 18.50 | a.f. | | 10-55-083 | |
| 5911R | Paul No. 2 Res..................... *(Adjudicated as from Wild Cat Creek.)* | Paul Koltiska, Jr.................. | 12-24-1951 | I,S | 15.00 | a.f. | | 10-55-083 | |
| 3007SR | Ralph Willey No. 1 Stock Res....... *(Adjudicated as from West Cat Creek, tributary West Fork Wild Cat Creek.)* | Ralph Willey....................... | 06-24-1962 | S | 11.34 | a.f. | | 22-55-083 | |
| | **DEER DRAW, Tributary West Cat Creek or West Fork Wild Cat Creek** | | | | | | | | |
| 3010SR | Brundage Stock Res................. | Ralph H. Brundage.................. | 12-02-1959 | S | 4.40 | a.f. | | 9-55-083 | |
| | **IKE DRAW, Tributary Deer Draw** | | | | | | | | |
| 7834SR | Bee Hive Stock Res................. | J. M. Pierce....................... | 09-04-1974 | S | 4.19 | a.f. | | 3-55-083 | |
| | **SANDY DRAW, Tributary West Cat Creek or West Fork Wild Cat Creek** | | | | | | | | |
| 2296SR | Ralph Willey No. 1 Stock Res....... | Ralph Willey....................... | 05-27-1959 | S | 5.12 | a.f. | | 22-55-083 | |
| 4960SR | Willey No. 3 Stock Res............. | Ralph Willey....................... | 01-19-1965 | S | 18.75 | a.f. | | 27-55-083 | |
| | **WELTNER DRAW, Tributary Prairie Dog Creek** | | | | | | | | |
| 18174 | Watson............................ | William Watson, et al.............. | 07-16-1932 | I | 0.36 S.S. | | 25.00 25.00 | 19-56-083 | |
| | *(Original supply for 25.0 acres is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 2nd and 3rd App., Territorial Appropriations.)* | | | | | | | | |
| | **DEMPLE DRAW, Tributary Prairie Dog Creek** | | | | | | | | |
| 1098R | Two Forks Res...................... | Peter Demple....................... | 08-02-1907 | S | 7.20 | a.f. | | 24-56-084 | |
| | **BRUNDAGE DRAW, Tributary Prairie Dog Creek** | | | | | | | | |
| 5376SR | Brundage No. 2 Stock Res........... | Ralph H. Brundage.................. | 09-20-1965 | S | 2.93 | a.f. | | 7-55-083 | |

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | **CORRAL DRAW, Tributary Prairie Dog Creek** | | | | | | | | |
| 7839SR | Mohan No. 1 Stock Res............. | Dona M. Mohan.................... | 09-25-1974 | S | 5.04 | a.f. | | 18-55-083 | |
| | **LOUIS DRAW, Tributary Prairie Dog Creek** | | | | | | | | |
| 7385SR | Ruby No. 1 Stock Res.............. | Louis J. Ruby.................... | 10-26-1972 | S | 3.52 | a.f. | | 18-55-083 | |
| 7707SR | Ruby No. 3 Stock Res.............. | Louis J. Ruby.................... | 04-05-1974 | S | 4.76 | a.f. | | 18-55-083 | |
| | **NUGENT DRAW, Tributary Prairie Dog Creek** | | | | | | | | |
| 6919R | Nugent No. 3 Stock Res............ | C. Pardee Erdman and.............. Lynn E. de Almeida | 12-30-1960 | S | 12.17 | a.f. | | 19-55-083 | |
| 7708SR | Matthew-Lori Stock Res............ | Emery E. Matthews, et al.......... | 04-30-1974 | S | 2.40 | a.f. | | 19-55-083 | |
| | **HIDDEN HILLS DRAW, Tributary Nugent Draw** | | | | | | | | |
| 7709SR | Brian-Kelli Stock Res............. | Emery E. Matthews................. | 04-30-1974 | S | 1.60 | a.f. | | 30-55-083 | |
| | **MATTHEWS DRAW, Tributary Hidden Hills Draw** | | | | | | | | |
| 7710SR | Chris-Jodi Stock Res.............. | Emery E. Matthews................. | 04-30-1974 | S | 1.70 | a.f. | | 30-55-083 | |
| | **DEER DRAW, Tributary Coal Draw, Tributary Prairie Dog Creek** | | | | | | | | |
| 8267SR | Moody No. 2 Stock Res............. | Karen M. Moody.................... | 06-07-1977 | S | 3.66 | a.f. | | 30-55-083 | |
| | **BUCK DRAW, Tributary Coal Draw, Tributary Prairie Dog Creek** | | | | | | | | |
| 8266SR | Moody No. 1 Stock Res............. | Karen M. Moody.................... | 06-07-1977 | S | 5.13 | a.f. | | 30-55-083 | |
| | **MEAD CREEK, Tributary Prairie Dog Creek** | | | | | | | | |
| Terr. | Mead Creek........................ | Perry Duncan...................... | -1880 | I | 0.11 | | 8.00 | 18-54-083 | |
| Terr. | Calloway.......................... | John M. Calloway.................. | 04-00-1881 | I | 0.31 | | 25.00 | 33-55-083 | |
| 722 | Odell............................. | Edward R. Odell................... | 05-17-1894 | I | 0.57 | | 40.00 | 33-55-083 | |
| 10658 | Willey & Hardin Lateral............ Prairie Dog Water Supply Co. | George W. Hardin.................. | 04-20-1911 | I | S.S. | | 75.00 | 33-55-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 3rd App., Territorial Appropriation.)* | | | | | | | | |
| 10658 | Willey & Hardin Lateral............ Prairie Dog Water Supply Co. | John W. Willey.................... | 04-20-1911 | I | S.S. | | 80.00 | 33-55-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 3rd App., Territorial Appropriation.)* | | | | | | | | |
| 11380 | West Duncan....................... | Perry A. Duncan................... | 06-17-1912 | I | 0.94 | | 66.00 | 18-54-083 | |
| 11481 | Holcomb No. 1..................... | Ellen M. Holcomb.................. | 09-07-1912 | I | 0.17 | | 11.80 | 19-54-083 | |
| 14929 | Bard.............................. | Charles W. Bard................... | 08-22-1917 | I | S.S. | | 91.40 | 5-54-083 | |
| | *(Original supply is from North and South Piney Creeks through the Piney and Cruse Ditch, 2nd Appropriation, Territorial Appropriation.)* | | | | | | | | |
| 15173 | Bard.............................. | B. K. West........................ | 07-29-1918 | I | S.S. | | 77.80 | 5-54-083 | |
| | *(Original supply is from North and South Piney Creeks through the Piney and Cruse Ditch, 2nd Appropriation, Territorial Appropriation.)* | | | | | | | | |

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 17513 | Robinson-Zullig Lateral of......... Piney-Cruse Creek | Robinson-Zullig Ditch Company, on.. behalf of individual land owners | 06-15-1928 | I | S.S. | | 642.70 | 18-54-083 | |
| | *(Supplemental supply of these lands under the Piney Cruse Ditch from Piney Creek under Permit Nos. Territorial Appropriation, 1434 Enl., 1113 Enl., 3927 Enl., 991 Enl., and also for lands under the Mead Creek Ditch from Piney Creek, Permit No. 328 Enl., and also for lands under East Side Ditch, from Little Goose Creek, also for lands under Last Chance Ditch, from Little Goose Creek and also for lands under Permit Nos. 4019, 15171, and 15172, from Cruse Creek and West Cruse Creek, and also for lands under Permit Nos. 17045 and 17130 from Cruse Creek, and also for land under Permit Nos. 16980 and 16981 from Stanko Draws No. 1 and 2, August 23, 1992.)* | | | | | | | | |
| 17513 | Robinson-Zullig Lateral of......... Piney-Cruse Creek | William A. Springer............... | 06-15-1928 | I | S.S. | | 245.00 | 18-54-083 | |
| | *(Original supply is from North and South Piney Creeks for 40.0 acres through the Enlarged Mead Creek-Coffeen Ditch, Permit 328 Enl; 118.0 acres through Piney and Cruse Ditch, 1st Appropriation, Territorial Appropriation, Piney and Cruse Ditch, 2nd Appropriation, 1891 and Mead Creek-Coffeen Ditch, Territorial Appropriation; for 37.0 acres through the Piney and Cruse Ditch, 1st Appropriation, Territorial Appropriation, and Piney and Cruse Ditch, 2nd Appropriation, Territorial Appropriation; and for 50.0 acres through the Mead Creek-Coffeen Ditch, Territorial Appropriation.)* | | | | | | | | |
| 17738 | West Side......................... | Sarah Annie Babione............... | 07-14-1930 | I | S.S. | | 200.00 | 19-54-083 | |
| | *(Original supply for 140.0 acres is from North and South Piney Creeks through the Mead Creek-Coffeen Ditch, Territorial Appropriation, and for 55.0 acres through the Enlarged Mead Creek Ditch, Permit 298 Enl.; and for 5.0 acres from Rhiner Creek through the Babione No. 2 Ditch, Permit 6654.)* | | | | | | | | |
| 17738 | West Side......................... | Mary Haratyk...................... | 07-14-1930 | I | S.S. | | 166.00 | 19-54-083 | |
| | *(Original supply is from North and South Piney Creeks through the Mead Creek-Coffeen Ditch, Territorial Appropriation.)* | | | | | | | | |
| | **MOOSE DRAW, Tributary Mead Creek** | | | | | | | | |
| 7554 | Floyd............................. | Floyd C. Bard..................... | 12-12-1906 | I | 0.21 | | 15.00 | 7-54-083 | |
| | **JENNINGS GULCH, Tributary Mead Creek** | | | | | | | | |
| 2418 | Bard.............................. | Minerva E. Bard................... | 12-14-1899 | I | 1.07 | | 75.00 | 8-54-083 | |
| | *(Erroneously adjudicated with a priority of January 9, 1900.)* | | | | | | | | |
| 2682E | Enl. Bard......................... | Florence G. Bard.................. | 10-28-1912 | I | 0.09 | | 6.00 | 8-54-083 | |
| 4854R | Duncan Res........................ | S. J. Houston Duncan, et al....... | 04-21-1938 | Fish | 29.00 | a.f. | | 17-54-083 | |
| 9109SR | Summers No. 1 Stock Res........... | Richard L. Summers................ | 07-18-1983 | S | 4.20 | a.f. | | 8-54-083 | |
| | **LARISON SWALE, Tributary Jennings Gulch** | | | | | | | | |
| 11074 | Larison........................... | F. C. Hunter...................... | 11-13-1911 | I | 0.23 | | 16.00 | 8-54-083 | |
| | **RHINER CREEK OR PHIL RHINER DRAW, Tributary Mead Creek** | | | | | | | | |
| 6513 | Rhiner............................ | Frank R. Spracklen................ | 02-21-1905 | I | 0.71 | | 50.00 | 24-54-084 | |
| 6653 | Babione No. 1..................... | Sarah Anna Babione................ | 03-08-1905 | I | S.S. | | 15.00 | 18-53-084 | |
| | *(Amended certificate issued to successor of W.H. Babione, original appropriator, changing right from original supply. To be used only when water from North and South Piney Creeks under original appropriation cannot be obtained, November 15, 1928.)* | | | | | | | | |
| 6654 | Babione No. 2..................... | W. H. Babione..................... | 03-08-1905 | I | 0.07 | | 5.00 | 18-53-084 | |
| 4002R | Spracklen No. 1 Res............... | Frank R. Spracklen................ | 01-23-1926 | D,I,S Fish | 2.60 | a.f. | | 24-54-084 | |
| 4003R | Spracklen No. 2 Res............... | Frank R. Spracklen................ | 01-23-1926 | D,I,S Fish | 2.05 | a.f. | | 24-54-084 | |
| 4004R | Spracklen No. 3 Res............... | Frank R. Spracklen................ | 01-23-1926 | D,I,S Fish | 0.39 | a.f. | | 24-54-084 | |
| 4005R | Spracklen No. 4 Res............... | Frank R. Spracklen................ | 01-23-1926 | D,I,S Fish | 0.96 | a.f. | | 24-54-084 | |
| 4006R | Spracklen No. 5 Res............... | Frank R. Spracklen................ | 01-23-1926 | D,I,S Fish | 1.84 | a.f. | | 24-54-084 | |

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 4007R | Spracklen No. 6 Res | Frank R. Spracklen | 01-23-1926 | D,I,S Fish | 1.08 | a.f. | | 24-54-084 | |
| 4008R | Spracklen No. 7 Res | Frank R. Spracklen | 01-23-1926 | D,I,S Fish | 2.97 | a.f. | | 24-54-084 | |
| 4009R | Spracklen No. 8 Res | Frank R. Spracklen | 01-23-1926 | D,I,S Fish | 1.64 | a.f. | | 24-54-084 | |
| 4010R | Spracklen No. 9 Res | Frank R. Spracklen | 01-23-1926 | D,I,S Fish | 0.69 | a.f. | | 24-54-084 | |
| 4011R | Spracklen No. 10 Res | Frank R. Spracklen | 01-23-1926 | D,I,S Fish | 0.93 | a.f. | | 24-54-084 | |
| 4012R | Spracklen No. 11 Res | Frank R. Spracklen | 01-23-1926 | D,I,S Fish | 0.72 | a.f. | | 24-54-084 | |
| 17515 | Robinson-Zullig Lateral, Piney-Cruse Creek | William A. Springer | 06-28-1928 | I | S.S. | | 235.00 | 18-54-083 | |
| | *(Original supply is from North and South Piney Creeks for 40.0 acres through the Enlarged Mead Creek-Coffeen Ditch, Permit No. 328 Enl., 118.0 acres through the Piney and Cruse Ditch, 1st Appropriation, Territorial Appropriation; Piney and Cruse Ditch, 2nd Appropriation, Territorial Appropriation, and Mead Creek-Coffeen Ditch, Territorial Appropriation; 37.0 acres through the Piney and Cruse Ditch, 1st Appropriation, Territorial Appropriation, and Piney and Cruse Ditch, 2nd Appropriation, Territorial Appropriation; 40.0 acres through the Mead Creek-Coffeen Ditch, Territorial Appropriation.)* | | | | | | | | |
| 17515 | Robinson-Zullig Lateral, Piney-Cruse Creek | Robinson-Zullig Ditch Company (on behalf of individual land owners) | 06-28-1928 | I | S.S. | | 652.70 | 18-54-083 | |
| | *(Supplemental supply of lands under Piney-Cruse Creek Ditch from Piney Creek under Territorial Appropriation, and Permit Nos. 1434 Enl., 1113 Enl., 3927 Enl., 991 Enl.; also for lands under Mead Creek Ditch from Piney Creek, Permit No. 328 Enl., also for lands under the East Side Ditch from Little Goose Creek; also for lands under the Last Chance Ditch from Little Goose Creek; also for lands under Permit Nos. 4019, 15171, and 15172 from Cruse and West Cruse Creeks, also for lands under Permit Nos. 17045 and 17130 from Cruse Creek, and also for lands under Permit Nos. 16980 and 16981 from Stanko Draw Nos. 1 and 2, August 23, 1992.)* | | | | | | | | |
| 5831R | Enl. Spracklen No. 1 Res | Frank R. Spracklen | 08-22-1950 | Ind | 2.60 | a.f. | | 24-54-084 | |
| 5832R | Enl. Spracklen No. 2 Res | Frank R. Spracklen | 08-22-1950 | Ind | 2.05 | a.f. | | 24-54-084 | |
| 5833R | Enl. Spracklen No. 3 Res | Frank R. Spracklen | 08-22-1950 | Ind | 0.39 | a.f. | | 24-54-084 | |
| 5834R | Enl. Spracklen No. 4 Res | Frank R. Spracklen | 08-22-1950 | Ind | 0.96 | a.f. | | 24-54-084 | |
| 5835R | Enl. Spracklen No. 5 Res | Frank R. Spracklen | 08-22-1950 | Ind | 1.84 | a.f. | | 24-54-084 | |
| 5836R | Enl. Spracklen No. 6 Res | Frank R. Spracklen | 08-22-1950 | Ind | 1.08 | a.f. | | 24-54-084 | |
| 5837R | Enl. Spracklen No. 7 Res | Frank R. Spracklen | 08-22-1950 | Ind | 2.97 | a.f. | | 24-54-084 | |
| 5838R | Enl. Spracklen No. 8 Res | Frank R. Spracklen | 08-22-1950 | Ind | 1.64 | a.f. | | 24-54-084 | |
| 5839R | Enl. Spracklen No. 9 Res | Frank R. Spracklen | 08-22-1950 | Ind | 0.69 | a.f. | | 24-54-084 | |
| 5840R | Enl. Spracklen No. 10 Res | Frank R. Spracklen | 08-22-1950 | Ind | 0.93 | a.f. | | 24-54-084 | |
| 5841R | Enl. Spracklen No. 11 Res | Frank R. Spracklen | 08-22-1950 | Ind | 0.72 | a.f. | | 24-54-084 | |

## RIFLE CREEK OR PARKER FORK OF MEAD CREEK, Tributary Mead Creek

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 8731 | Parker | Malcolm Moncreiffe | 08-05-1908 | I | 0.43 | | 30.00 | 19-54-083 | |
| 11381 | East Duncan | Perry A. Duncan | 06-17-1912 | I | 0.14 | | 10.00 | 18-54-083 | |
| 11482 | Holcomb No. 2 (as changed to the Kawulok Pump Point) | Ellen M. Holcomb | 09-07-1912 | I | 0.13 | | 9.30 | 18-54-083 | |
| | *(Change of point of diversion and means of conveyance from 19- 54-83, to 18-54-83, a new facility, the Kawulok Pump, and change place of use of 0.3 acre changed, August 20, 1992.)* | | | | | | | | |
| 10198R | Kawulok Res | Paul J. & Barbara K. Kawulok | 05-09-1994 | Fish | 2.67 | a.f. | | 18-54-083 | |

## HANES FORK OR BRANCH OF MEAD CREEK, Tributary Rifle Creek or Parker Fork of Mead Creek, Tributary Mead Creek

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 71R | Menardi & White Res | M. Moncreiffe, et al | 11-30-1896 | I | 182.00 | a.f. | | 24-54-084 | |
| | *(Adjudicated as from Dry Creek.)* | | | | | | | | |
| 8730 | Hanes | Malcolm Moncreiffe | 08-05-1908 | D,I,S | 1.00 | | 70.00 | 24-54-084 | |
| 1418R | Moncreiffe Res | Mead Creek Ranch, Inc | 11-25-1908 | S | 5.00 | a.f. | | 25-54-084 | |
| | *(Adjudicated as from East Fork Cruse Creek. This reservoir also receives a supply from East Fork Cruse or Kruse Creek through the Moncreiffe Reservoir Supply Ditch, Permit No. 8784. Amended certificate issued to successor of Malcolm Moncreiffe, original appropriator, changing use from irrigation and stock purposes, to use for stock purposes only, November 17, 1933.)* | | | | | | | | |

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 4007R | Spracklen No. 6 Res................ | Frank R. Spracklen................ | 01-23-1926 | D,I,S Fish | 1.08 | a.f. | | 24-54-084 | |
| 4008R | Spracklen No. 7 Res................ | Frank R. Spracklen................ | 01-23-1926 | D,I,S Fish | 2.97 | a.f. | | 24-54-084 | |
| 4009R | Spracklen No. 8 Res................ | Frank R. Spracklen................ | 01-23-1926 | D,I,S Fish | 1.64 | a.f. | | 24-54-084 | |
| 4010R | Spracklen No. 9 Res................ | Frank R. Spracklen................ | 01-23-1926 | D,I,S Fish | 0.69 | a.f. | | 24-54-084 | |
| 4011R | Spracklen No. 10 Res............... | Frank R. Spracklen................ | 01-23-1926 | D,I,S Fish | 0.93 | a.f. | | 24-54-084 | |
| 4012R | Spracklen No. 11 Res............... | Frank R. Spracklen................ | 01-23-1926 | D,I,S Fish | 0.72 | a.f. | | 24-54-084 | |
| 17515 | Robinson-Zullig Lateral,........... Piney-Cruse Creek | William A. Springer............... | 06-28-1928 | I | S.S. | | 235.00 | 18-54-083 | |
| | *(Original supply is from North and South Piney Creeks for 40.0 acres through the Enlarged Mead Creek-Coffeen Ditch, Permit No. 328 Enl., 118.0 acres through the Piney and Cruse Ditch, 1st Appropriation, Territorial Appropriation; Piney and Cruse Ditch, 2nd Appropriation, Territorial Appropriation, and Mead Creek-Coffeen Ditch, Territorial Appropriation; 37.0 acres through the Piney and Cruse Ditch, 1st Appropriation, Territorial Appropriation, and Piney and Cruse Ditch, 2nd Appropriation, Territorial Appropriation; 40.0 acres through the Mead Creek-Coffeen Ditch, Territorial Appropriation.)* | | | | | | | | |
| 17515 | Robinson-Zullig Lateral,........... Piney-Cruse Creek | Robinson-Zullig Ditch Company (on.. behalf of individual land owners) | 06-28-1928 | I | S.S. | | 652.70 | 18-54-083 | |
| | *(Supplemental supply of lands under Piney-Cruse Creek Ditch from Piney Creek under Territorial Appropriation, and Permit Nos. 1434 Enl., 1113 Enl., 3927 Enl., 991 Enl.; also for lands under Mead Creek Ditch from Piney Creek, Permit No. 328 Enl., also for lands under the East Side Ditch from Little Goose Creek; also for lands under the Last Chance Ditch from Little Goose Creek; also for lands under Permit Nos. 4019, 15171, and 15172 from Cruse and West Cruse Creeks, also for lands under Permit Nos. 17045 and 17130 from Cruse Creek, and also for lands under Permit Nos. 16980 and 16981 from Stanko Draw Nos. 1 and 2, August 23, 1992.)* | | | | | | | | |
| 5831R | Enl. Spracklen No. 1 Res........... | Frank R. Spracklen................ | 08-22-1950 | Ind | 2.60 | a.f. | | 24-54-084 | |
| 5832R | Enl. Spracklen No. 2 Res........... | Frank R. Spracklen................ | 08-22-1950 | Ind | 2.05 | a.f. | | 24-54-084 | |
| 5833R | Enl. Spracklen No. 3 Res........... | Frank R. Spracklen................ | 08-22-1950 | Ind | 0.39 | a.f. | | 24-54-084 | |
| 5834R | Enl. Spracklen No. 4 Res........... | Frank R. Spracklen................ | 08-22-1950 | Ind | 0.96 | a.f. | | 24-54-084 | |
| 5835R | Enl. Spracklen No. 5 Res........... | Frank R. Spracklen................ | 08-22-1950 | Ind | 1.84 | a.f. | | 24-54-084 | |
| 5836R | Enl. Spracklen No. 6 Res........... | Frank R. Spracklen................ | 08-22-1950 | Ind | 1.08 | a.f. | | 24-54-084 | |
| 5837R | Enl. Spracklen No. 7 Res........... | Frank R. Spracklen................ | 08-22-1950 | Ind | 2.97 | a.f. | | 24-54-084 | |
| 5838R | Enl. Spracklen No. 8 Res........... | Frank R. Spracklen................ | 08-22-1950 | Ind | 1.64 | a.f. | | 24-54-084 | |
| 5839R | Enl. Spracklen No. 9 Res........... | Frank R. Spracklen................ | 08-22-1950 | Ind | 0.69 | a.f. | | 24-54-084 | |
| 5840R | Enl. Spracklen No. 10 Res.......... | Frank R. Spracklen................ | 08-22-1950 | Ind | 0.93 | a.f. | | 24-54-084 | |
| 5841R | Enl. Spracklen No. 11 Res.......... | Frank R. Spracklen................ | 08-22-1950 | Ind | 0.72 | a.f. | | 24-54-084 | |

## RIFLE CREEK OR PARKER FORK OF MEAD CREEK, Tributary Mead Creek

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 8731 | Parker............................. | Malcolm Moncreiffe................ | 08-05-1908 | I | 0.43 | | 30.00 | 19-54-083 | |
| 11381 | East Duncan........................ | Perry A. Duncan................... | 06-17-1912 | I | 0.14 | | 10.00 | 18-54-083 | |
| 11482 | Holcomb No. 2 (as changed to....... the Kawulok Pump Point) | Ellen M. Holcomb.................. | 09-07-1912 | I | 0.13 | | 9.30 | 18-54-083 | |
| | *(Change of point of diversion and means of conveyance from 19- 54-83, to 18-54-83, a new facility, the Kawulok Pump, and change place of use of 0.3 acre changed, August 20, 1992.)* | | | | | | | | |
| 10198R | Kawulok Res........................ | Paul J. & Barbara K. Kawulok...... | 05-09-1994 | Fish | 2.67 | a.f. | | 18-54-083 | |

## HANES FORK OR BRANCH OF MEAD CREEK, Tributary Rifle Creek or Parker Fork of Mead Creek, Tributary Mead Creek

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 71R | Menardi & White Res................ | M. Moncreiffe, et al.............. | 11-30-1896 | I | 182.00 | a.f. | | 24-54-084 | |
| | *(Adjudicated as from Dry Creek.)* | | | | | | | | |
| 8730 | Hanes.............................. | Malcolm Moncreiffe................ | 08-05-1908 | D,I,S | 1.00 | | 70.00 | 24-54-084 | |
| 1418R | Moncreiffe Res..................... | Mead Creek Ranch, Inc............. | 11-25-1908 | S | 5.00 | a.f. | | 25-54-084 | |
| | *(Adjudicated as from East Fork Cruse Creek. This reservoir also receives a supply from East Fork Cruse or Kruse Creek through the Moncreiffe Reservoir Supply Ditch, Permit No. 8784. Amended certificate issued to successor of Malcolm Moncreiffe, original appropriator, changing use from irrigation and stock purposes, to use for stock purposes only, November 17, 1933.)* | | | | | | | | |

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | **S. JENNIE DUNCAN DRAW OR DUNCAN DRAW, Tributary Prairie Dog Creek** | | | | | | | | |
| 7942 | Blane | John Blane, et al | 08-28-1907 | I | 1.15 | | 81.00 | 17-54-083 | |
| 9811 | Baker-Johnson | Orr A. Baker | 05-18-1910 | I | 0.34 | | 24.00 | 9-54-083 | |
| 6223SR | Duncan No. 4 Stock Res | Kirven Ranch, Ltd | 08-22-1968 | S | 1.00 | a.f. | | 17-54-083 | |
| 7040SR | Kirven Ranch Corporation No. One Stock Res. | Kirven Ranch Corporation | 07-19-1971 | S | 1.96 | a.f. | | 16-54-083 | |
| | **SMITH DRAW, Tributary S. Jennie Duncan Draw or Duncan Draw** | | | | | | | | |
| 8229SR | Smith No. 1 Stock Res | Steve R. Smith | 04-20-1977 | S | 0.68 | a.f. | | 8-54-083 | |
| | **SHERMAN COVE DRAW, Tributary Prairie Dog Creek** | | | | | | | | |
| 6771 | Cove | Cornell B. Stroud | 06-23-1905 | I | 0.31 | | 22.00 | 15-54-083 | |
| | **MURPHY GULCH, Tributary Prairie Dog Creek** | | | | | | | | |
| 1542 | Stroud & Stout | T. A. Stout | 06-19-1897 | I | 0.50 | | 35.00 | 14-54-083 | |
| 1542 | Stroud & Stout | C. B. Stroud | 06-19-1897 | I | 0.50 | | 35.00 | 14-54-083 | |
| 16766 | M. G. 1 | George Surrena | 12-06-1920 | I | S.S. | | 42.20 | 2-53-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 4th Appropriation, Territorial Appropriation.)* | | | | | | | | |
| 16766 | M. G. 1 | Zack Burris | 12-06-1920 | I | S.S. | | 61.90 | 2-53-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 3rd Apprpriation, Territorial Appropriation.)* | | | | | | | | |
| 16767 | M. G. 2 | Minnie Carroll | 12-06-1920 | I | S.S. | | 40.20 | 36-54-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 3rd Appropriation, Territorial Appropriation.)* | | | | | | | | |
| 16767 | M. G. 2 | Wilber King | 12-06-1920 | I | S.S. | | 30.00 | 36-54-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 4th Appropriation, Territorial Appropriation.)* | | | | | | | | |
| 16768 | M. G. 3 | Wilber King | 12-06-1920 | I | S.S. | | 11.00 | 25-54-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 4th Appropriation, Territorial Appropriation.)* | | | | | | | | |
| 16768 | M. G. 3 | Viola Mooney | 12-06-1920 | I | S.S. | | 39.20 | 25-54-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 3rd Appropriation, Territorial Appropriation.)* | | | | | | | | |
| 16778 | P. D. 6 A | Pearl M. Snyder | 12-06-1920 | I | S.S. | | 31.30 | 25-54-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 2nd Appropriation, Territorial Appropriation, and Prairie Dog Water Supply Company Ditch, 3rd Appropriation, Territorial Appropriation.)* | | | | | | | | |
| | **JIM CREEK, Tributary Murphy Gulch** | | | | | | | | |
| 9037SR | Jim Creek Stock Res | Paul J. and Julia T. Gerlach | 04-16-1982 | S | 4.60 | a.f. | | 14-54-083 | |
| 10259SR | Duchess Stock Res | Gregory G. and Margaret G. Kuszynski | 08-10-1987 | S | 4.16 | a.f. | | 14-54-083 | |
| 29874 | Gallo Pipeline | Ralph Gallo | 10-01-1987 | D | 0.06 | | | 24-54-083 | |
| | *(Actual amount of appropriation is 0.0602 c.f.s.)* | | | | | | | | |

## COAL BANK GULCH, Tributary Murphy Gulch

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 7021 | Lone Star | Lily A. McCully | 12-21-1905 | I | 0.41<br>Sec.Sup. | | 29.00 | 5-53-082 | |
| | *(Secondary supply stored in Lone Star No. 1 and No. 2 Reservoir, Permit No. 783 Res. and 784 Res.)* | | | | | | | | |
| 783R | Lone Star No. 1 Res | Lily A. McCully | 12-21-1905 | I,S | 10.50 | a.f. | | 5-53-082 | |
| | *(Stored water is for Lone Star Ditch, Permit No. 7021.)* | | | | | | | | |
| 784R | Lone Star No. 2 Res | Lily A. McCully | 12-21-1905 | I,S | 4.50 | a.f. | | 5-53-082 | |
| | *(Stored water is for Lone Star Ditch, Permit No. 7021.)* | | | | | | | | |

## HARPER DRAW, Tributary Spring Draw, Tributary Murphy Gulch

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 9022SR | Harper No. 2 Stock Res | George Harper | 09-07-1982 | S | 1.09 | a.f. | | 7-53-082 | |

## MIDDLE FORK MURPHY GULCH, Tributary Murphy Gulch

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 4947SR | Nelson No. 3 Stock Res | Arthur E. Nelson | 12-16-1964 | S | 2.63 | a.f. | | 13-53-083 | |

## NELSON DRAW, Tributary Murphy Gulch

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 3117SR | Nelson Stock Res | Arthur E. Nelson | 03-07-1960 | S | 1.17 | a.f. | | 13-53-083 | |

## POMPEY CREEK, Tributary Prairie Dog Creek

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| Terr. | Pompey Creek | Ethelbert Hollingsworth | -1883 | I | 0.14 | | 10.00 | 29-54-083 | |
| 2169E | Enl. Pompey | E. W. Scott | 03-14-1910 | I | 0.57 | | 40.00 | 29-54-083 | |
| 9652 | Scott | E. W. Scott | 03-14-1910 | I | 0.71 | | 50.00 | 52-54-083 | |
| 10023 | S. S. No. 1 | C. W. Stroud | 08-01-1910 | I,S | S.S. | | 88.00 | 22-54-083 | |
| | *(Original supply is from North and South Piney Creeks through the Piney and Cruse Ditch, 1st Appropriation, Territorial Appropriation. 85.0 acres adjudicated from Pompa Creek but the detailed description covers 88.0 acres.)* | | | | | | | | |
| 10023 | S. S. No. 1 | C. E. Stevenson | 08-01-1910 | I | S.S. | | 15.00 | 22-54-083 | |
| | *(Original supply is from North and South Piney Creeks through the Piney and Cruse Ditch, 1st Appropriation, Territorial Appropriation. Adjudicated as from Pompa Creek.)* | | | | | | | | |
| 19146 | Stover or Lateral of Piney & Cruse Creek | Minnie M. Stover | 03-13-1939 | I,S | S.S. | | 102.00 | 28-54-083 | |
| | *(Original supply is from North and South Piney Creeks through the Piney and Cruse Ditch, 1st Appropriation, Territorial Appropriation, and Piney and Cruse Ditch, 2nd Appropriation Territorial Appropriation. Point of diversion and partial means of conveyance changed to the Harper Pump and Pipeline No. 1 and No. 2, 28-54-83.)* | | | | | | | | |

## BRITTON DRAW, Tributary Pompey Creek

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 6594R | Britton Res | Ebben W. Morris, et al | 05-23-1960 | I,S | 1.40 | a.f. | | 21-54-083 | |

## POST SPRING, Tributary Pompey Creek

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 20118 | Post Pipe Line | William F. Post, et al | 06-04-1947 | D,S | 0.01 | | | 21-54-083 | |

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|
| | **JOHNSON CREEK, Tributary Pompey Creek** | | | | | | | |
| 11888 | Johnson No. 1 | Karl Johnson | 06-19-1913 | I | S.S. | 6.00 | 29-54-083 | |
| | *(Original supply is from North and South Piney Creeks through the Piney and Cruse Ditch, 2nd Appropriation, Territorial Appropriation.)* | | | | | | | |
| | **LARISON CREEK, Tributary Johnson Creek** | | | | | | | |
| 11889 | Johnson No. 2 | Karl Johnson | 06-19-1913 | I | S.S. | 4.00 | 29-54-083 | |
| | *(Original supply is from North and South Piney Creeks through the Piney and Cruse Ditch, 2nd Appropriation, Territorial Appropriation.)* | | | | | | | |
| | **STOREY CREEK, Tributary Prairie Dog Creek** | | | | | | | |
| 7821 | Newcomer No. 1 | B. A. Newcomer | 07-01-1907 | I | 0.35 | 25.00 | 27-54-083 | |
| 7822 | Newcomer No. 2 | B. A. Newcomer | 07-01-1907 | I | 0.28 | 20.00 | 27-54-083 | |
| 3049E | Enl. Newcomer No. 1 | Est. F. F. Newcomer | 09-30-1914 | I | 0.86 | 60.00 | 27-54-083 | |
| | **JENKS CREEK, Tributary Prairie Dog Creek** | | | | | | | |
| 16771 | P. D. 2 | Sheridan Banking Company | 12-06-1920 | I | S.S. | 244.60 | 8-53-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 2nd and 3rd Appropriation, Territorial Appropriations.)* | | | | | | | |
| 16771 | P. D. 2 | Joseph Harper | 12-06-1920 | I | S.S. | 89.70 | 8-53-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 1st, 2nd and 3rd Appropriation, Territorial Appropriations.)* | | | | | | | |
| 16771 | P. D. 2 | J. F. Kirkpatrick | 12-06-1920 | I | S.S. | 20.70 | 8-53-083 | |
| | *(Original supply is from South Piney Creek through the Prairie Dog Water Supply Company Ditch, Permit No. 16791.)* | | | | | | | |
| 16771 | P. D. 2 | E. Elmer Surrena | 12-06-1920 | I | S.S. | 35.00 | 8-53-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 3rd Appropriation, Territorial Appropriation.)* | | | | | | | |
| 16771 | P. D. 2 | W. S. Metz, et al | 12-06-1920 | I | S.S. | 27.20 | 8-53-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 1st, 2nd, and 3rd Appropriation, Territorial Appropriations.)* | | | | | | | |
| 16771 | P. D. 2 | W. H. Goodill | 12-06-1920 | I | S.S. | 160.10 | 8-53-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 1st, 2nd, and 3rd Appropriation, Territorial Appropriations.)* | | | | | | | |
| 16774 | P. D. 3 | Peter Demple | 12-06-1920 | I | S.S. | 68.00 | 3-53-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 3rd Appropriation, Territorial Appropriation.)* | | | | | | | |
| 16774 | P. D. 3 | J. F. Kirkpatrick | 12-06-1920 | I | S.S. | 88.50 | 3-53-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 3rd Appropriation, Territorial Appropriation, and Piney and Cruse Ditch, 2nd Appropriation, Territorial Appropriation, and from South Piney Creek through the Prairie Dog Water Supply Company Ditch, Permit No. 16791.)* | | | | | | | |
| 16774 | P. D. 3 | E. V. Newcomer, et al | 12-06-1920 | I | S.S. | 27.20 | 3-53-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 3rd Appropriation, Territorial Appropriation, and from South Piney Creek through Prairie Dog Water Supply Company Ditch, Permit No. 16791.)* | | | | | | | |
| 16774 | P. D. 3 | Estella Newcomer | 12-06-1920 | I | S.S. | 20.90 | 3-53-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 2nd and 3rd Appropriation, Territorial Appropriations.)* | | | | | | | |
| 16775 | P. D. 4 | Peter Demple | 12-06-1920 | I | S.S. | 35.70 | 34-54-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 2nd and 3rd Appropriation, Territorial Appropriations.)* | | | | | | | |
| 16775 | P. D. 4 | E. V. Newcomer, et al | 12-06-1920 | I | S.S. | 33.80 | 34-54-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 3rd Appropriation, Territorial Appropriation.)* | | | | | | | |
| 16775 | P. D. 4 | Estella Newcomer | 12-06-1920 | I | S.S. | 67.60 | 34-54-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 2nd and 3rd Appropriation, Territorial Appropriations.)* | | | | | | | |

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | **HIGHWAY SPRING, Tributary Jenks Creek** | | | | | | | | |
| 19524 | Pierce Pipe Line.................. | Alice Pierce McIlvain............. | 02-12-1941 | D,I,S | S.S. | | 1.40 | 9-53-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 1st, 2nd, and 3rd Appropriation, Territorial Appropriations.)* | | | | | | | | |
| | **PURDY SPRING, Tributary Purdy Spring Creek, Tributary Prairie Dog Creek** | | | | | | | | |
| 10426R | Purdy's Silver Lake Res........... | James R. & LaDonna K. Purdy....... | 10-23-1996 | D,Fish,Rec,S | 45.41 | a.f. | | 33-54-083 | |
| | *(26.57 acre-feet is for fishing preserve, domestic, stock and recreation purposes; and 18.84 acre-feet is for fishing preserve purposes.)* | | | | | | | | |
| | **STANLEY CREEK, Tributary Prairie Dog Creek, Tributary Tongue River** | | | | | | | | |
| 9729R | Phillips Res...................... | James Reed Phillips & Kimberly..... Jane Phillips | 05-23-1991 | Fish | 2.41 | a.f. | | 33-54-083 | |
| | **SPRING DRAW, Tributary Stanley Creek** | | | | | | | | |
| 12061 | Harper............................ | Jos. Harper...................... | 10-06-1913 | D,I | 0.15 | | 13.00 | 5-53-083 | |
| | **ORR GULCH, Tributary Stanley Creek** | | | | | | | | |
| 11360 | Loman............................. | E. H. Loman...................... | 07-08-1912 | I | 0.05 | | 4.00 | 5-53-083 | |
| | **DAVIS SPRING NO. 2, Tributary Davis Spring No. 2 Draw, Tributary Orr Gulch** | | | | | | | | |
| 22372 | Davis Spring No. 2................ | George A. Nugent, et al........... | 03-24-1961 | I | S.S. | | 43.30 | 5-53-083 | |
| | *(Original supply is from North and South Piney through the Piney and Cruse Ditch, 2nd Appropriation, Territorial Appropriation.)* | | | | | | | | |
| | **PRATHER NO. 2 DRAW, Tributary Orr Gulch** | | | | | | | | |
| 24204 | Prather Pipeline No. 2............ | Prather Enterprises.............. | 08-13-1973 | S | 0.06 | | | 7-53-083 | |
| | **MEADE CREEK, Tributary Stanley Creek** | | | | | | | | |
| 6963R | G. N. No. 1 Res................... | E. L. Phillips, Jr............... | 07-17-1968 | I,Rec | 11.95 | a.f. | | 5-53-083 | |
| | **DAVIS SPRING NO. 1, Tributary Davis Draw, Tributary Meade Creek** | | | | | | | | |
| 22371 | Davis Spring No. 1................ | George A. Nugent, et al........... | 03-24-1961 | I | S.S. | | 46.40 | 8-53-083 | |
| | *(Original supply is from North and South Piney Creeks through the Piney and Cruse Ditch, 2nd Appropriation, Territorial Appropriation.)* | | | | | | | | |

| PERMIT NO. | DITCH | APPROPRIATOR | PRIORITY | USE | C.F.S. | | ACRES | HG LOC. | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | **MEAD-BANNER SPRING NO. TWO, Tributary Prairie Dog Creek** | | | | | | | | |
| 19442 | Mead-Banner Pipe Line Extension.... | Evelyn N. Thompson Moore.......... | 09-12-1940 | D,I | S.S. | | 11.30 | 32-54-083 | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 1st Appropriation, Territorial Appropriation.)* | | | | | | | | |
| | **SPRINGS (MEAD-BANNER), Tributary Prairie Dog Creek** | | | | | | | | |
| 18517 | Mead-Banner Pipe Line............. | Evelyn N. Thompson Moore.......... | 10-29-1934 | D | 0.25 | | | 32-54-083 | |
| | | | | I | S.S. | | 9.30 | | |
| | *(Original supply is from North and South Piney Creeks through the Prairie Dog Water Supply Company Ditch, 1st Appropriation, Territorial Appropriation.)* | | | | | | | | |
| | **SOUTH FORK PRAIRIE DOG CREEK, Tributary Prairie Dog Creek** | | | | | | | | |
| 11607 | Eldred No. 2...................... | J. W. Eldred...................... | 12-03-1912 | I | 0.35 | | 24.30 | 6-53-083 | |
| | **CANON CREEK, Tributary South Fork Prairie Dog Creek** | | | | | | | | |
| 11606 | Eldred No. 1...................... | Est. Julia A. Eldred.............. | 12-03-1912 | I | 0.08 | | 5.30 | 6-53-083 | |
| | *(Amended certificate issued to successor to J. W. Eldred, original appropriator, April 20, 1933.)* | | | | | | | | |
| | **FOSS DRAW, Tributary Tongue River** | | | | | | | | |
| 7531SR | Barbula-Turley No. 1.............. Stock Res. | Barbula-Turley Ranch, Inc......... | 03-23-1973 | S | 3.40 | a.f. | | 19-58-083 | |
| | **VERLEY DRAW, Tributary Tongue River** | | | | | | | | |
| 7532SR | Barbula-Turley No. 2.............. Stock Res. | Barbula-Turley Ranch, Inc......... | 03-23-1973 | S | 0.50 | a.f. | | 20-58-083 | |
| | **MIKE'S DRAW, Tributary Tongue River** | | | | | | | | |
| 6716SR | M. E. Kukuchka No. 1.............. Stock Res. | M. E. Kukuchka.................... | 04-27-1970 | S | 2.42 | a.f. | | 28-58-083 | |
| | **FRISBIE DRAW, Tributary Tongue River** | | | | | | | | |
| 7538SR | Kukuchka No. 2.................... Stock Res. | M. E. Kukuchka.................... | 04-03-1973 | S | 0.60 | a.f. | | 33-58-083 | |
| | **YOUNG'S CREEK, Tributary Tongue River** | | | | | | | | |
| Terr. | Glade Water....................... | John D. Adams..................... | 04-15-1884 | I | 1.71 | | 120.00 | 25-58-084 | |
| | *(These rights are as fixed by decree of the District Court of Sheridan County, dated February 16, 1894, on appeal from the State Board of Control.)* | | | | | | | | |
| Terr. | Glade Water....................... | Foss & Verley..................... | 04-15-1884 | I | 1.40 | | 98.00 | 25-58-084 | |
| | *(These rights are as fixed by decree of the District Court of Sheridan County, dated February 25, 1904.)* | | | | | | | | |
| Terr. | Glade Water....................... | John W. Boyle..................... | 04-15-1884 | I | 1.11 | | 78.00 | 25-58-084 | |
| | *(These rights are as fixed by decree of the District Court of Sheridan County, dated February 25, 1904.)* | | | | | | | | |

**PRAIRIE DOG WATER SUPPLY COMPANY**

SHAREHOLDERS

March 10, 2001

| | No. of Certificate | | No. of Shares |
|---|---|---|---|
| AC RANCH, INC. | 180 | 7.50000 | |
| 538 Wyarno Road | 215 | 4.00000 | 11.50000 |
| Sheridan, WY 82801 | | | |
| JOHN F., JR. ARAMBEL | 306 | 0.62500 | |
| 501 U.S. Highway 14 | 307 | 0.62500 | 1.25000 |
| Sheridan, WY 82801 | | | |
| JAMES F. & SHARRON M. AURAND | 197 | | 0.03975 |
| 429 Wyarno Road | | | |
| Sheridan, WY 82801 | | | |
| LARRY D. BACCARI | 242 | | 0.75000 |
| P.O. Box 6208 | | | |
| Sheridan, WY 82801 | | | |
| STELLA M. BARKER & MARY V. HUTTON | 240 | | 1.85000 |
| P.O. Box 888 | | | |
| Sheridan, WY 82801 | | | |
| WILLIAM M. BARNHART REVOCABLE TRUST | 334 | | 0.11000 |
| Box 325 | | | |
| Banner, WY 82832 | | | |
| BENJAMIN A. & PAMELA R. BELUS | 285 | | 1.00000 |
| 198 Murphy Gulch Road | | | |
| Banner, WY 82832 | | | |
| ARTHUR K. & PATRICIA A. BERGSTROM | 249 | | 0.50000 |
| P.O. Box 4 | | | |
| Sheridan, WY 82801 | | | |
| BETTY E. BOCEK TRUST | 310 | | 0.75000 |
| JOHN J. BOCEK TRUST | 309 | | 0.75000 |
| P.O. Box 30 | | | |
| Wyarno, WY 82845 | | | |
| KYLE BRINKERHOFF, INC., A MONTANA CORP. | 338 | | 0.50000 |
| 477 Lower Prairie Dog Road | | | |
| Sheridan, WY 82801 | | | |
| BUCK, WAYNE & SHERRYL | 347 | | 0.27100 |
| RONALD & TAMMY BURR | 327 | | 0.08400 |
| 9 Burr Drive | | | |
| Sheridan, WY 82801 | | | |
| BRETT M. & MARCY K. BUSZKIEWIC & ERNEST J. KOIS | 349 | | 0.16670 |
| 454 Upper Prairie Dog Road | | | |

| | | No. of Certificate | | No. of Shares |
|---|---|---|---|---|
| | Banner, WY 82832 | | | |
| | | | | |
| | | | | |
| | RONALD D. & MARILYN K. BUTCHER | 190 | | 0.92000 |
| | 231 Upper Prairie Dog Road | | | |
| | Banner, WY 82832 | | | |
| | JOSEPH CHERNI, ET AL | 182 | | 0.50000 |
| | 518 U.S. Highway 14 | | | |
| | Sheridan, WY 82801 | | | |
| | CORLIES & MARIE CLAYBURGH | 253 | | 0.25000 |
| | P.O. Box 177 | | | |
| | Sheridan, WY 82801 | | | |
| | ROBERT A. & GEORGIA L. DOUGLAS | 153 | | 0.21100 |
| | 46 Wakeley Road | | | |
| | Sheridan, WY 82801 | | | |
| | JOHN GABLE | 138 | | 0.13800 |
| | 36 Lower Prairie Dog Road | | | |
| | Sheridan, WY 82801 | | | |
| | JOHN & HILLARY GAVIOTIS | 345 | | 0.50000 |
| | 497 Upper Prairie Dog Creek Road | | | |
| | Banner, WY 82832 | | | |
| | HELEN M. GILSON | 292 | | 0.37500 |
| | P.O. Box 586 | | | |
| | Sheridan, WY 82801 | | | |
| | DOUGLAS C. & MELINDA M. GREENOUGH | 308 | | 0.50000 |
| | 81 Wakeley Road | | | |
| | Sheridan, WY 82801 | | | |
| | MELINDA M. GREENOUGH TRUST | 332 | | 0.40000 |
| | 81 Wakeley Road | | | |
| | Sheridan, WY 82801 | | | |
| | BLAIR W. & SHELLY A. GUSTAFSON | 346 | | 0.52000 |
| | 1748 Zuni Drive | | | |
| | Sheridan, WY 82801 | | | |
| | WILLIAM L. & JACQUELINE HAMILTON | 255 | | 0.11000 |
| | 319 Upper Prairie Dog Road | | | |
| | Banner, WY 82832 | | | |
| | GEORGE F. HARPER REVOCABLE TRUST, UNDIVIDED | 290 | | 0.75000 |
| | ONE HALF INTEREST, AND MARY L. HARPER | | | |
| | REVOCABLE TRUST, UNDIVIDED ONE HALF INTEREST | | | |
| | Box 33 | | | |
| | Banner, WY 82832 | | | |
| | TOM C. HARPER & JAMES R. HARPER | 289 | | 0.25000 |
| | 6021 Oakhill Road | | | |
| | Watruga, TX 76148 | | | |

| | | No. of | | No. of |
|---|---|---|---|---|
| | | Certificate | | Shares |
| | DALE E. HEATH TRUST | 302 | | 0.06250 |
| | DIANA L. HEATH TRUST | 303 | | 0.06250 |
| | 584 U.S. Highway 14 | | | |
| | Sheridan, WY 82801 | | | |
| | | | | |
| | CLINT R. HOAGLAND | 348 | | 1.00000 |
| | P.O. Box 400 | | | |
| | Banner, WY 82832 | | | |
| | CLINT R. & JANET L. HOAGLAND | 304 | 2.95000 | |
| | 4003 Highway 87 | 320 | 2.34200 | 5.29200 |
| | P.O. Box 400 | | | |
| | Banner, WY 82832 | | | |
| | ROBERT D. HUFF | 305 | | 0.05000 |
| | Box 25 | | | |
| | Banner, WY 82832 | | | |
| | JOCK HUTTON | 228 | | 1.44000 |
| | 132 Bellevue | | | |
| | Sheridan, WY 82801 | | | |
| | MALCOLM HUTTON | 232 | | 1.30200 |
| | Box 4007 | | | |
| | Sheridan, WY 82801 | | | |
| | KAWULOK ENTERPRISES, LLC | 342 | | 2.00000 |
| | P.O. Box 3055 | | | |
| | Sheridan, WY 82801 | | | |
| | MAUDE & BECKEY KELTY | 298 | | 1.00000 |
| | 824 U.S. Highway 14 | | | |
| | Sheridan, WY 82801 | | | |
| | ALAN JOHN KOBIELUSZ | 324 | | 1.01200 |
| | 818 U.S. Highway 14 | | | |
| | Sheridan, WY 82801 | | | |
| | FRANK MARTIN KOBIELUSZ | 326 | | 0.55200 |
| | 811 U.S. Highway 14 | | | |
| | Sheridan, WY 82801 | | | |
| | L.J. & MARGUERITE LESCH | 220 | | 0.05000 |
| | 678 U.S. Highway 14 | | | |
| | Sheridan, WY 82801 | | | |
| | LIGHT FAMILY 1991 TRUST DATED JULY 25, 1991 | 316 | | 0.45000 |
| | 330 Murphy Gulch Road | | | |
| | Banner, WY 82832 | | | |
| | KENNETH K. & JEAN A. LUPLOW | 188 | | 0.04000 |
| | 181 Upper Prairie Dog Creek Road | | | |
| | Banner, WY 82832 | | | |
| | KAYLEEN PELESKY MCKINZIE | 234 | | 0.25000 |
| | 150 Peno Road | | | |

| | | No. of Certificate | | No. of Shares |
|---|---|---|---|---|
| | Sheridan, WY 82801 | | | |
| | SCOTT N. & JESSICA L. MEAD | 301 | | 0.75000 |
| | 254 Upper Prairie Dog Road | | | |
| | Banner, WY 82832 | | | |
| | | | | |
| | | | | |
| | | | | |
| | DOROTHY E. MOONEY | 230 | | 0.50000 |
| | 134 Peno Road | | | |
| | Sheridan, WY 82801 | | | |
| | ARTHUR E. NELSON | 275 | | 0.12500 |
| | Box 478 Murphy Gulch Road | | | |
| | Banner, WY 82832 | | | |
| | MIKE & JULIA NICKEL 1/2 | 276 | | 0.50000 |
| | MARK & RANDI NICKEL 1/2 | | | |
| | P.O. Box 801 | | | |
| | Sheridan, WY 82801 | | | |
| | PERRY RANCH, INC. | 335 | | 0.50000 |
| | 377 Lower Prairie Dog Road | | | |
| | Sheridan, WY 82801 | | | |
| | ALVIN W. & INA J. PETERSON & ROSS PETERSON | 237 | | 0.50000 |
| | 461 Lower Prairie Dog Road | | | |
| | Sheridan, WY 82801 | | | |
| | ANNA PILCH | 299 | | 1.00000 |
| | 897 Lower Prairie Dog Road | | | |
| | Sheridan, WY 82801 | | | |
| | SUSAN A. PUCKET | 328 | | 2.00000 |
| | 82 Peno Road | | | |
| | Sheridan, WY 82801 | | | |
| | JAMES R. PURDY | 267 | | 1.00000 |
| | 384 Billy Creek Road | | | |
| | Buffalo, WY 82834 | | | |
| | RED BUTTE DITCH CO., INC. | 241 | | 3.00000 |
| | c/o Bruce Davidson 514 Upper Prairie Dog Road | | | |
| | Banner, WY 82832 | | | |
| | MARK A. REE & MELINDA W. REE | 331 | | 0.44400 |
| | 432 Falcon Ridge Drive | | | |
| | Sheridan, WY 82801 | | | |
| | MRS. T.J. RISDALL | 270 | | 0.42000 |
| | 195 Prairie Dog Creek Road | | | |
| | Banner, WY 82832 | | | |
| | T.J. & DORIS RISDALL | 226 | | 0.08000 |
| | 195 Prairie Dog Creek Road | | | |
| | Banner, WY 82832 | | | |

| | | No. of | | No. of |
|---|---|---|---|---|
| | | Certificate | | Shares |
| | ROBERT R. & MURRAY LOU M. ROGERS | 313 | | 0.04000 |
| | P.O. Box 6791 | | | |
| | Sheridan, WY 82801 | | | |
| | CLYDE M. ROSS | 223 | | 0.50000 |
| | c/o LPD Ranch Partnership | | | |
| | 1920 Riverview Drive N.E. | | | |
| | Auburn, WA 98002 | | | |
| | | | | |
| | | | | |
| | JOHN A. & JUDITH A. RUEB | 271 | 0.46650 | 1.66628 |
| | 291 U.S. Highway 14 | 291 | 0.26650 | |
| | Sheridan, WY 82801 | 323 | 0.93328 | |
| | WILLIAM G. SCHMID & CLAUDIA G. SCHMID, husband | 346 | | 0.16670 |
| | and wife as tenants by the entirety | | | |
| | 3130 Estates Drive | | | |
| | Midland, MI 48642 | | | |
| | MICHAEL R. & MARIA E. SHANLEY | 282 | | 0.12500 |
| | 222 Murphy Golch Road | | | |
| | Banner, WY 82832 | | | |
| | BERNETT SIEWEKE TRUST | 280 | | 0.16666 |
| | HARVY SIEWEKE TRUST | 277 | | 0.16666 |
| | 325 U.S. Highway 14 East | | | |
| | Sheridan, WY 82801 | | | |
| | STEPHEN E. & KUYLER M. SMITH | 288 | | 0.50000 |
| | 59 Wildcat Road | | | |
| | Sheridan, WY 82801 | | | |
| | TERESA STEPHENSEN | 273 | | 0.50000 |
| | 558 U.S. Highway 14 | | | |
| | Sheridan, WY 82801 | | | |
| | THREE SISTERS RANCH | 343 | | 0.85200 |
| | c/o Brett Buszkiewic | | | |
| | 454 Upper Prairie Dog Road | | | |
| | Banner, WY 82832 | | | |
| | TEXACO INC. | 248 | | 2.50000 |
| | P.O. Box 980 | | | |
| | Buffalo, WY 82834 | | | |
| | JAMES S. & SALLY C. WAGNER | 224 | | 0.42000 |
| | 159 Upper Prairie Dog Road | | | |
| | Banner, WY 82832 | | | |
| | THOMAS B. & LOIS A. WALKER | 341 | | 0.11925 |
| | 2325 Lincoln Road | | | |
| | Las Vegas, NV 89115 | | | |
| | HAZEL WELTON TRUST | 213 | | 0.20000 |
| | c/o Linda Wood | | | |

| | | No. of Certificate | | No. of Shares |
|---|---|---|---|---|
| | 650 U.S. Highway | | | |
| | Sheridan, WY 82801 | | | |
| | MICHAEL W. WEST & MARIE J. WELLHOFF | 350 | | 0.20000 |
| | 5771 E. 112th Ave. | | | |
| | Thorton, CO 80233 | | | |
| | ALLEN WILLEY | 269 | | 0.25000 |
| | 442 Meade Creek Road | | | |
| | Sheridan, WY 82801 | | | |
| | | | | |
| | | | | |
| | | | | |
| | RALPH B. & BARBARA C. WILLEY | 295 | | 1.00000 |
| | 442 Meade Creek Road | | | |
| | Sheridan, WY 82801 | | | |
| | RALPH B. & BARBARA C. WILLEY TRUST | 294 | | 0.50000 |
| | 442 Meade Creek Road | | | |
| | Sheridan, WY 82801 | | | |
| | | | | |
| | Total | | | 60.20000 |

**KEARNEY LAKE LAND AND RESERVOIR COMPANY**

SHAREHOLDERS

March 10, 2001

| NAME OF SHAREHOLDER | No. of Shares Class A | No. of Shares Class B | Total |
|---|---|---|---|
| AC RANCH INC | 275.00 | 1,879.80 | 2,154.80 |
| 538 Wyarno Road | | | |
| Sheridan, WY 82801 | | | |
| A.D. & ELIZABETH M. ACHELS | | 10.00 | 10.00 |
| 305 Lower Prairie Dog Rd | | | |
| Sheridan, WY 82801 | | | |
| JOHN F ARAMBEL, JR | 100.00 | 40.00 | 140.00 |
| 501 U.S. Highway 14 | | | |
| Sheridan, WY 82801 | | | |
| JAMES F & SHARRON M AURAND | 2.25 | 5.50 | 7.75 |
| 429 Wyarno Road | | | |
| Sheridan, WY 82801 | | | |
| LARRY D BACCARI | 50.00 | 90.00 | 140.00 |
| P. O. Box 6208 | | | |
| Sheridan, WY 82801 | | | |
| STELLA BARKER/MARY HUTTON | 100.00 | 180.00 | 280.00 |
| P.O. Box 888 | | | |
| Sheridan, WY 82801 | | | |
| WILLIAM M BARNHART REVOCABLE TRUST | | 10.00 | 10.00 |
| Box 325 | | | |
| Banner, WY 82832 | | | |
| BENJAMIN A & PAMELA R BELUS | 50.00 | 50.00 | 100.00 |
| 198 Murphy Gulch Road | | | |
| Banner, WY 82832 | | | |
| ARTHUR K & PATRICIA A BERGSTROM | | 50.00 | 50.00 |
| P.O. Box 4 | | | |
| Sheridan, WY 82801 | | | |
| ARNOLD FAY & KIP MICHAEL BETHUREM | 10.00 | | 10.00 |
| 309 U.S. Highway 14 | | | |
| Sheridan, WY 82801 | | | |
| BETTY E BOCEK TRUST | 50.00 | 50.00 | 100.00 |
| JOHN J BOCEK TRUST | 50.00 | 50.00 | 100.00 |
| P. O. Box 30 | | | |
| Wyarno, WY 82845 | | | |
| WAYNE M. BUCK & SHERRYL A. BUCK | 50.00 | | 50.00 |
| | | | |
| | | | |
| RONALD C & TAMMY D BURR | | 6.00 | 6.00 |
| 9 Burr Drive | | | |

| NAME OF SHAREHOLDER | No. of Shares Class A | No. of Shares Class B | Total |
|---|---|---|---|
| Sheridan, WY 82801 | | | |
| | | | |
| | | | |
| BRETT M & MARCY K BUSZKIEWIC & | | 20.00 | 20.00 |
| ERNEST J KOIS | | | |
| 454 Upper Prairie Dog Road | | | |
| Banner, WY 82832 | | | |
| RONALD & MARILYN BUTCHER | | 20.00 | 20.00 |
| 231 Upper Prairie Dog Road | | | |
| Banner, WY 82832 | | | |
| ALICE JUNE CARNES | 50.00 | | 50.00 |
| 57 Meade Creek Road | | | |
| Sheridan, WY 82801 | | | |
| JOSEPH CHERNI ET AT | 50.00 | 90.00 | 140.00 |
| 518 U.S. Highway 14 | | | |
| Sheridan, WY 82801 | | | |
| CARL A AND/OR CHARLENE A CHURCH | | 20.00 | 20.00 |
| Box 325 | | | |
| Story, WY 82842 | | | |
| DAVID T CLARENDON | | 65.00 | 65.00 |
| Box 13 | | | |
| Banner, WY 82832 | | | |
| CORLIES & MARIE CLAYBURGH | 25.00 | 25.00 | 50.00 |
| P.O. Box 177 | | | |
| Sheridan, WY 82801 | | | |
| EDWIN A COSTER AND/OR VIRGINIA KAY HIPPE | | 10.00 | 10.00 |
| P. O. Box 338 | | | |
| Story, WY 82842 | | | |
| BRUCE L & TERESA DAVIDSON | 9.00 | 21.00 | 30.00 |
| 514 Upper Prairie Dog Road | | | |
| Banner, WY 82832 | | | |
| WILLIAM J. DOENZ, REAL ESTATE TRUST | 43.00 | 37.00 | 80.00 |
| c/o P.O. Box H | | | |
| Sheridan, WY 82801 | | | |
| ROBERT A & GEORGIA L DOUGLAS | 21.00 | 53.00 | 74.00 |
| 46 Wakeley Road | | | |
| Sheridan, WY 82801 | | | |
| EARL OR MARGARET ELLENWOOD | 100.00 | 100.00 | 200.00 |
| 2165 U.S. Highway 14 East | | | |
| Banner, WY 82832 | | | |
| ALICE EYCHANER TRUST | | 10.00 | 10.00 |
| C/O Box 235 | | | |
| Story, WY 82842 | | | |
| JOHN GABLE | 9.00 | 9.00 | 18.00 |
| 36 Lower Prairie Dog Road | | | |
| Sheridan, WY 82801 | | | |
| JOHN & HILLARY GAVIOTIS | 12.60 | 46.70 | 46.70 |

| NAME OF SHAREHOLDER | No. of Shares Class A | No. of Shares Class B | Total |
|---|---|---|---|
| P.O. Box 400 | | | |
| Banner, WY 82832 | | | |
| LEE HORNER & ANNE BLOOMBERG | | 6.00 | 6.00 |
| c/o Art Farm P.O. Box 596 | | | |
| Story, WY 82842 | | | |
| | | | |
| | | | |
| RICHARD HOOVER | | 10.00 | 10.00 |
| P.O. Box 190 | | | |
| Story, WY 82842 | | | |
| MAX T. HOWREY REVOCABLE TRUST | | | |
| AND ODETTA J. HOWREY REV TRUST | | 1.00 | 1.00 |
| P.O. Box 68 | | | |
| Story, WY 82842 | | | |
| JOCK HUTTON | 135.00 | 142.50 | 277.50 |
| 132 Bellevue | | | |
| Sheridan, WY 82801 | | | |
| MALCOLM HUTTON | 126.00 | 133.50 | 259.50 |
| Box 4007 | | | |
| Sheridan, WY 82801 | | | |
| L. DENNIS IRWIN & SHERRI HICKMAN | | 2.00 | 2.00 |
| PO Box 637 | | | |
| Story, WY 82842 | | | |
| KATHLEEN JOHNSON | | 38.00 | 38.00 |
| 219 Cleveland | | | |
| Laramie, WY 82070 | | | |
| S K JOHNSTON, JR FLYING H RANCH | 600.00 | | 600.00 |
| c/o Johnston Southern Co. | | | |
| 600 Krystal Building, Union Square | | | |
| Chattanooga, TN 37402 | | | |
| KAWULOK ENTERPRISES | 200.00 | 545.00 | 745.00 |
| P.O. Box 563 | | | |
| Sheridan, WY 82801 | | | |
| MAUDE & BECKEY KELTY | 7.00 | 8.00 | 15.00 |
| 824 U.S. Highway 14 | | | |
| Sheridan, WY 82801 | | | |
| JOHN A KING | 5.00 | | 5.00 |
| 3345 U.S. Highway 87 | | | |
| Sheridan, WY 82801 | | | |
| KIRVEN RANCH LLC | 100.00 | 180.00 | 280.00 |
| Box 640 | | | |
| Buffalo, WY 82834 | | | |
| ALAN JOHN KOBIEUSZ | | 40.00 | 40.00 |
| 818 U.S. Highway 14 | | | |
| Sheridan, WY 82801 | | | |
| CONCETTA KOBIELUSZ | | 38.00 | 38.00 |
| 4775 So. Galapago | | | |

| | NAME OF SHAREHOLDER | No. of Shares Class A | No. of Shares Class B | Total |
|---|---|---|---|---|
| | 497 Upper Prairie Dog Creek Road | | | |
| | Banner, WY 82832 | | | |
| | | | | |
| | | | | |
| | | | | |
| | LEE C & DELPHINE S GILSON | | 5.00 | 5.00 |
| | P. O. Box 586 | | | |
| | Sheridan, WY 82801 | | | |
| | C WILLIAM & JEANNE M GLESSNER | 3.00 | 7.00 | 10.00 |
| | 1080 U.S. Highway 14 East | | | |
| | Banner, WY 82832 | | | |
| | CARL GLOVER | | 15.00 | 15.00 |
| | P. O. Box 127 | | | |
| | Story, WY 82842 | | | |
| | JAY L & CAROL L GODLEY | | 125.00 | 125.00 |
| | 125 Pompey Creek Road | | | |
| | Banner, WY 82832 | | | |
| | MELINDA M GREENOUGH TRUST DATED 4/18/93 | 50.00 | | 50.00 |
| | 81 Wakely Road | | | |
| | Sheridan, WY 82801 | | | |
| | BLAIR & SHELLY GUSTAFSON | | 25.00 | 25.00 |
| | 1748 Zuni Drive | | | |
| | Sheridan, WY 82801 | | | |
| | H2O PARTNERSHIP | 35.20 | | 35.20 |
| | c/o Joel Gates | | | |
| | Box 309 | | | |
| | Story, WY 82842 | | | |
| | JOHN E & HELEN L HANFT | | 150.00 | 150.00 |
| | HC 64-192 Beckton Road | | | |
| | Dayton, WY 82836 | | | |
| | HARMONY RANCH, INC | | 400.00 | 400.00 |
| | 1949 Sugarland Drive, Suite 250 | | | |
| | Sheridan, WY 82801 | | | |
| | GEORGE HARPER ET AL | | 200.00 | 200.00 |
| | Box 33 | | | |
| | Banner, WY 82832 | | | |
| | CHARLES R HART | 50.00 | | 50.00 |
| | 493 Bird Farm Road | | | |
| | Sheridan, WY 82801 | | | |
| | DAINIS HAZNERS & Kathleen MULLANEY | | 6.00 | 6.00 |
| | P.O. Box 442 | | | |
| | Story, WY 82842 | | | |
| | DALE HEATH TRUST UNDER AGREE DATED 5/2/95 | | 17.50 | 17.50 |
| | DIANA HEATH TRUST UNDER AGREE DATED 5/2/95 | | 17.50 | 17.50 |
| | 584 U.S. Highway 14 | | | |
| | Sheridan, WY 82801 | | | |
| | CLINT R HOAGLAND & JANET L HOAGLAND | | 50.00 | 50.00 |

| | NAME OF SHAREHOLDER | No. of Shares Class A | No. of Shares Class B | Total |
|---|---|---|---|---|
| | Englewood, CO 80110 | | | |
| | FRANK MARTIN KOBIELUSZ | | 40.00 | 40.00 |
| | 811 US Highway 14 | | | |
| | Sheridan, WY 82801 | | | |
| | DANIEL W KOLTISKA | 25.00 | 45.00 | 70.00 |
| | 346 Cat Creek | | | |
| | Sheridan, WY 82801 | | | |
| | | | | |
| | | | | |
| | THOMAS KUIPER TRUST | | 1.00 | 1.00 |
| | Box 238 | | | |
| | Story, WY 82842 | | | |
| | CLYDE & RENEE LARKINS, as tenants by the | | 2.00 | 2.00 |
| | entireties | | | |
| | P.O. Box 322 | | | |
| | Story, WY 82842 | | | |
| | L J LESCH | 3.00 | 7.00 | 10.00 |
| | 678 U.S. Highway 14 | | | |
| | Sheridan, WY 82801 | | | |
| | LIGHT FAMILY TRUST DATED JULY 25, 1991 | 50.00 | | 50.00 |
| | 330 Murphy Gulch Road | | | |
| | Banner, WY 82832 | | | |
| | TERESA A. LITTLE | 22.00 | 18.00 | 40.00 |
| | P.O. Box 6356 | | | |
| | Sheridan, WY 82801 | | | |
| | CHARLES L & MARY JANE LONSINGER | | 5.00 | 5.00 |
| | P.O. Box 413 | | | |
| | Story, WY 82842 | | | |
| | JANET N & R SCOTT LUDWIG | 15.00 | 35.00 | 50.00 |
| | P.O. Box 6043 | | | |
| | Sheridan, WY 82801 | | | |
| | GEORGE A & SUSAN L LUNBECK | 12.00 | | 12.00 |
| | Box 255 | | | |
| | Story, WY 82842 | | | |
| | KENNETH KURT & THERESA L LUPLOW | 15.00 | 35.00 | 50.00 |
| | 181 Upper Prairie Dog Road | | | |
| | Banner, WY 82832 | | | |
| | LEONARD MCEWAN | | 6.00 | 6.00 |
| | P.O. Box 460 | | | |
| | Story, WY 82842 | | | |
| | JAMES F MCKINZIE, JR | | 2.00 | 2.00 |
| | 150 Peno Road | | | |
| | Sheridan, WY 82801 | | | |
| | KAYLEEN PELESKY MCKINZIE | 25.00 | | 25.00 |
| | 150 Peno Road | | | |
| | Sheridan, WY 82801 | | | |
| | DOUGLAS & ANDREA MADISON, as tenants by | | 5.00 | 5.00 |

| | NAME OF SHAREHOLDER | No. of Shares Class A | No. of Shares Class B | Total |
|---|---|---|---|---|
| | the entiries | | | |
| | P.O. Box 69 | | | |
| | Story, WY 82842 | | | |
| | SAM PAUL MAVRAKIS & CAROL R. SEIDLER | 50.00 | | 50.00 |
| | MAVRAKIS | | | |
| | P.O. Box 200 | | | |
| | Banner, WY 82832 | | | |
| | GARY B MEFFORD | 22.00 | 19.00 | 41.00 |
| | 39 Meade Creek Road | | | |
| | Sheridan, WY 82801 | | | |
| | | | | |
| | RICHARD R. & CAROL A METCALF | 6.00 | | 6.00 |
| | Box 374 | | | |
| | Story, WY 82842 | | | |
| | GARY & CONNIE MEYER | 20.00 | 20.00 | 40.00 |
| | P.O. Box 650 | | | |
| | Story, WY 82842 | | | |
| | HUGH A MILLER | 26.00 | 21.00 | 47.00 |
| | Box 266 | | | |
| | Story, WY 82842 | | | |
| | THAD & INA MITCHELL | | 10.00 | 10.00 |
| | Box 9 | | | |
| | Story, WY 82842 | | | |
| | DOROTHY E. MOONEY | 50.00 | 50.00 | 100.00 |
| | 134 Peno Road | | | |
| | Sheridan, WY 82801 | | | |
| | CAROLE MORGAN | | 38.00 | 38.00 |
| | 4775 So. Galapago | | | |
| | Englewood, CO 80110 | | | |
| | NELTJE REVOCABLE TRUST | 60.00 | 140.00 | 200.00 |
| | 11 Lower Piney Creek Road | | | |
| | Banner, WY 82832 | | | |
| | MIKE D & JULIE A NICKEL & MARK S & RANDY L | 17.40 | 33.00 | 50.40 |
| | NICKEL | | | |
| | c/o Mike Nickel P.O. Box 801 | | | |
| | Sheridan, WY 82801 | | | |
| | DONALD R & GERALDINE M PALMER | | 10.00 | 10.00 |
| | P.O. Box 425 | | | |
| | Story, WY 82842 | | | |
| | PERRY RANCH, INC | 50.00 | 50.00 | 100.00 |
| | 638 Soldier Creek Road | | | |
| | Sheridan, WY 82801 | | | |
| | ALVIN W , INA J & ROSS PETERSON | 50.00 | 50.00 | 100.00 |
| | 461 Lower Prairie Dog Road | | | |
| | Sheridan, WY 82801 | | | |
| | ROSS & MARIA SMITH PETERSON | 32.00 | 42.00 | 74.00 |
| | 446 Lower Prairie Dog Road | | | |

| | NAME OF SHAREHOLDER | No. of Shares Class A | No. of Shares Class B | Total |
|---|---|---|---|---|
| | Sheridan, WY 82801 | | | |
| | BOB PHILLIPS | 26.00 | 34.00 | 60.00 |
| | 3614 US Highway 87, Box 54 | | | |
| | Banner, WY 82832 | | | |
| | PINEY & CRUSE CREEK DITCH CO | | 475.00 | 475.00 |
| | c/o Bill Shackelford, Treasurer | | | |
| | 3320 U.S. Highway 87 | | | |
| | Sheridan, WY 82801 | | | |
| | ELWIN W. & PAMELA G. PHILLIPS | 8.00 | 14.00 | 22.00 |
| | P.O. Box 150 | | | |
| | Banner, WY 82832 | | | |
| | | | | |
| | | | | |
| | SUSAN A. PUCKET | 200.00 | 90.00 | 290.00 |
| | 82 Peno Road | | | |
| | Sheridan, WY 82801 | | | |
| | JAMES R PURDY | 100.00 | | 100.00 |
| | 384 Billy Creek Road | | | |
| | Buffalo, WY 82834 | | | |
| | LENORA REDMAN & KELLY REDMAN, as tenants | 1.00 | | 1.00 |
| | with full right of survivorship | | | |
| | P.O. Box 164 | | | |
| | Story, WY 82842 | | | |
| | MARK A REE & MELINDA W. REE | | 50.00 | 50.00 |
| | 432 Falcon Ridge Drive | | | |
| | Sheridan, WY 82801 | | | |
| | DORIS L RISDALL | | 10.00 | 10.00 |
| | 195 Upper Prairie Dog Road | | | |
| | Banner, WY 82832 | | | |
| | ROBERT R ROGERS & MURRAY LOU M ROGERS | | 5.00 | 5.00 |
| | P.O. Box 6791 | | | |
| | Sheridan, WY 82801 | | | |
| | BENJAMIN A ROMAN TRUST | | 4.00 | 4.00 |
| | P.O. Box 279 | | | |
| | Story, WY 82842 | | | |
| | JOHN A & JUDITH A RUEB | 140.00 | 135.00 | 275.00 |
| | 291 U.S. Highway 14 | | | |
| | Sheridan, WY 82801 | | | |
| | CHRIS SARE, a single person | | 3.00 | 3.00 |
| | P.O. Box 575 | | | |
| | Story, WY 82842 | | | |
| | JOHN A. SAROKON | | 10.00 | 10.00 |
| | Box 436 | | | |
| | Story, WY 82842 | | | |
| | WILLIAM M. SCHMID & CLAUDIA G. SCHMID, | 21.60 | 18.40 | 40.00 |
| | husband and wife, as tenants by the entirety | | | |
| | 3130 Estates Drive | | | |

| | NAME OF SHAREHOLDER | No. of Shares Class A | No. of Shares Class B | Total |
|---|---|---|---|---|
| | Midland, MI 48642 | | | |
| | BERNETT SIEWEKE TRUST | 25.00 | 65.00 | 90.00 |
| | HARVEY SIEWEKE TRUST | 25.00 | 65.00 | 90.00 |
| | 325 U.S. Highway 14 | | | |
| | Sheridan, WY 82801 | | | |
| | SCOTT SIMPSON | | 2.00 | 2.00 |
| | PO Box 406 | | | |
| | Story, WY 82842 | | | |
| | FRANK P & D LORENE SMEDLEY | | 20.00 | 20.00 |
| | Box 128 Jim Creek Road | | | |
| | Banner, WY 82832 | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | FRANCIS T SMITH | 2.00 | | 2.00 |
| | P.O. Box 72 | | | |
| | Story, WY 82842 | | | |
| | ROBERT & MARY SOUTH, as tenants by the | 4.00 | | 4.00 |
| | entireties | | | |
| | P.O. Box 643 | | | |
| | Story, WY 82842 | | | |
| | TERESA STEPHENSON | 50.00 | 90.00 | 140.00 |
| | 558 U.S. Highway 14 | | | |
| | Sheridan, WY 82801 | | | |
| | DONA L STINE TRUST | | 10.00 | 10.00 |
| | Box 342 | | | |
| | Story, WY 82842 | | | |
| | MARC RANDAL STRAHN & KATHI HANSON | | 12.00 | 12.00 |
| | PO Box 3020 | | | |
| | Cheyenne, WY 82003-3020 | | | |
| | TEXACO INC | 200.00 | 300.00 | 500.00 |
| | P.O. Box 980 | | | |
| | Buffalo, WY 82834 | | | |
| | JAMES S & SALLY C WAGNER | 30.00 | 55.00 | 85.00 |
| | 159 Upper Prairie Dog Road | | | |
| | Banner, WY 82832 | | | |
| | THOMAS B WALKER & LOIS A WALKER | 6.75 | 16.50 | 23.25 |
| | 2325 Lincoln Rd. | | | |
| | Las Vegas, NV 89115 | | | |
| | KATHRYN I & BILLY WATSON | 50.00 | 102.00 | 152.00 |
| | 1213 3rd Avenue East | | | |
| | Sheridan, WY 82801 | | | |
| | HAZEL WELTON TRUST | 25.00 | 45.00 | 70.00 |
| | c/o Linda Wood | | | |
| | 3904 Houk Way | | | |
| | Stevensville, MT 59870 | | | |

| NAME OF SHAREHOLDER | No. of Shares Class A | No. of Shares Class B | Total |
|---|---|---|---|
| MICHAEL W. WEST & MARIE J. WELLHOFF | 6.20 | 16.70 | 22.90 |
| 5771 E. 112th Avenue | | | |
| Thornton, CO 80233 | | | |
| ALLEN WILLEY | | 100.00 | 100.00 |
| 442 Meade Creek Road | | | |
| Sheridan, WY 82801 | | | |
| RALPH & BARBARA WILLEY TR DATED 5/27/83 | 125.00 | 385.00 | 510.00 |
| 442 Meade Creek Road | | | |
| Sheridan, WY 82801 | | | |
| WINFIELD RANCH | 36.00 | 84.00 | 120.00 |
| P.O. Box 150 | | | |
| Banner, WY 82832 | | | |
| DAVID J & MARILYN N WITHROW | | 10.00 | 10.00 |
| 1963 Papago Drive | | | |
| Sheridan, WY 82801 | | | |
| | | 8,020.60 | 12,008.00 |
| | | | |
| TREASURY STOCK | | 192.00 | 192.00 |
| | | | |
| | | | |
| | 4,000.00 | 8,200.00 | 12,200.00 |

# Piney and Cruse Creek Ditch Company

| Customer | Bill to | City | State | Zip |
|---|---|---|---|---|
| Albrecht, Richard & Carol | Richard and Carol Albrecht 216 Meade Creek Road Sheridan, WY 82801 | Sheridan | WY | 82801 |
| Atter, Norman & Delores | Norman T and Dolores Atter 3483 US Highway 87 Sheridan, WY 82801 | Sheridan | WY | 82801 |
| Bangerter, Kim & Dorothy | Kim and Dorothy Bangerter 3652 US Highway 87 Sheridan, WY 82801 | Sheridan | WY | 82801 |
| Belus Trust, James | James J Belus Trust 3300 US Highway 87 Sheridan, WY 82801 | Sheridan | WY | 82801 |
| Belus Trust, Sandra | Sandra M Belus Trust 3300 US Highway 87 Sheridan, WY 82801 | Sheridan | WY | 82801 |
| Burton, Eva | Eva Burton PO Box 261 Glendo, WY 82213 | Glendo | WY | 82213 |
| Cady, Keith & Fairan Barnett | Fairan Barnett and Keith Cady PMB 204 1842 Sugarland Drive #108 Sheridan, WY 82801 | Sheridan | WY | 82801 |
| Carnes, R.F. | Alice J Carnes 57 Meade Creek Road Sheridan, WY 82801 | Sheridan | WY | 82801 |
| Clarendon, David T. | David T Clarendon PO Box 13 Banner, WY 82832 | Banner | WY | 82832 |
| Clayton, John & Barbara Keiter | Barbara Keiter and John Clayton PO Box 6204 Sheridan, WY 82801 | Sheridan | WY | 82801 |
| Cropper, Lela | Lela T Cropper PO Box 6585 Bloomindale, IL 60108 | Bloomindale | IL | 60108 |
| Cude, Kenneth W. & Donna C. | Kenneth W. & Donna C. Cude 7 Big Four Road Sheridan, WY 82801 | Sheridan | WY | 82801 |
| Cummins, Phillip Wayne & Kimberly Anne | Phillip W. & Kimberly A. Cummins 3647 US Hwy 87 Sheridan, WY 82801 | Sheridan | WY | 82801 |
| Cunningham, Patrick & Linda S. | Linda S and Patrick W Cunningham 503 N Kendrick Glendive, MT 59330-1812 | Glendive | MT | 59330-1812 |
| Dalton Ditch Company | Dalton Ditch Company c/o Jack Johns PO Box 32 Story, WY 82842 | Story | WY | 82842 |
| Deam, Dale & Jacqueline | Dale A & Jacqueline Deam 209 Pompey Creek Road Banner, WY 82832 | Banner | WY | 82832 |
| Diefenderfer, RLT of Maxine | Maxine Diefenderfer Trust 18 Circle 8 Drive Sheridan, WY 82801 | Sheridan | WY | 82801 |
| Doenz, William Real Estate Trust | Wm Doenz Real Estate Trust c/o Willam J Doenz PO Box 6474 Sheridan, WY 82801 | Sheridan | WY | 82801 |
| Durante, Lawrence | Lawrence A and Mary A Durante PO Box 6126 Sheridan, WY 82801 | Sheridan | WY | 82801 |
| Eagle Stone Ranch | Eagle Stone Ranch 1949 Sugarland Drive Sheridan, WY 82801 | Sheridan | WY | 82801 |
| Flying H Ranch | Flying H Ranch PO Box 247 Big Horn, WY 82833 | Big Horn | WY | 82833 |
| Gaviotis, John & Hillary | John and Hillary Gaviotis PO Box 6087 Sheridan, WY 82801 | Sheridan | WY | 82801 |
| George, Thomas | Thomas W George 2310 Westgate Building 1122 Colorado Austin, TX 78701-2184 | Austin | TX | 78701-2184 |
| Godley, Jay & Carole | Jay L and Carole Godley 125 Pompey Creek Banner, WY 82832 | Banner | WY | 82832 |
| Gorman, John & Myrna | John and Myrna Gorman 3678 US Highway 87 Sheridan, WY 82801 | Sheridan | WY | 82801 |
| Grimmer, Robert & Joyce | Robert E and Joyce M Grimmer 379 Meade Creek Road Sheridan, WY 82801 | Sheridan | WY | 82801 |
| Harper Trust, George | George and Mary Harper Revocable Trust PO Box 33 Banner, WY 82832 | Banner | WY | 82832 |
| Harper, Tom C. & James R. | Tom C and James R Harper c/o George Harper PO Box 33 Banner, WY 82832 | Banner | WY | 82832 |
| Held, Barry & Melinda Sweet | Melinda Sweet and Barry T Held P.O. Box 1735 Sharon, Connecticut 06069 | Sharon | CT | 06069 |
| Hutson, Rusty & Julie | Rusty L and Julie A Hutson 87 Meade Creek Road Sheridan, WY 82801 | Sheridan | WY | 82801 |
| Johnston III, S.K. | S K Johnston III PO Box 247 Big Horn, WY 82833 | Big Horn | WY | 82833 |
| Kane, John & Janice | John H and Janice K Kane 312 Meade Creek Road Sheridan, WY 82801 | Sheridan | WY | 82801 |
| King, Bucky | Matilda (Bucky) King 3102 US Highway 87 Sheridan, WY 82801 | Sheridan | WY | 82801 |
| King, Don & Dorothy | Don & Dorothy King 1515 Hillcrest Sheridan, WY 82801 | Sheridan | WY | 82801 |
| King, John Alexander | John Alexander King 3345 US Highway 87 Sheridan, WY 82801 | Sheridan | WY | 82801 |
| Kirven Ranch | Kirven Ranch Dennis Kirven PO Box 640 Buffalo, WY 82834 | Buffalo | WY | 82834 |
| Little, Teresa | Teresa A Little PO Box 6356 Sheridan, WY 82801 | Sheridan | WY | 82801 |
| Luplow, K. Kurt & Theresa | K Kurt and Theresa Luplow 181 Upper Prairie Dog Road Banner, WY 82832 | Banner | WY | 82832 |
| Mavrakis, Sam P. & Carol | Sam Paul & Carol Seidler Mavrakis PO Box 200 Banner, WY 82832 | Banner | WY | 82832 |
| McClintock, David B. & Suzanne M. | David B. & Suzanne M. McClintock 1723 Silver Spur Road Cheyenne, WY 82009 | Cheyenne | WY | 82009 |
| Mefford, Gary | Gary Mefford 39 Meade Creek Road Sheridan, WY 82801 | Sheridan | WY | 82801 |
| Mickelson aka Lower Bard | Nancy Mickelson Lower Bard Ditch 360 Meade Creek Sheridan, WY 82801 | Sheridan | WY | 82801 |
| Monk, Monna | Monna E Monk 1 Meade Creek Road Sheridan, WY 82801 | Sheridan | WY | 82801 |
| Morris, Elton | Elton Morris PO Box 94 Banner, WY 82832 | Banner | WY | 82832 |
| Nickel, Mike & Julia | Mike and Julia Nickel PO Box 801 Sheridan, WY 82801 | Sheridan | WY | 82801 |
| Noecker (Minor), Deeann | Deeann and Tom Noecker 41 Pompey Creek Road Banner, WY 82832 | Banner | WY | 82832 |
| Norwood, David L. & Ruth M. | David Lee & Ruth M. Norwood 3651 US Hwy 87 Sheridan, WY 82801 | Sheridan | WY | 82801 |
| Olson, Roy | Roy L Olson 321 Bryant Sheridan, WY 82801 | Sheridan | WY | 82801 |
| Otsuka, Alvin | Alvin L and Diane M Otsuka 5786 S Garland Way Littleton, CO 80123-2334 | Littleton | CO | 80123-2334 |
| Panetta Trust, Veronica R. | Veronica R Panetta Trust c/o Joseph W Panetta 1736 Coffeen Avenue, Apt 6 Sheridan, WY 82801 | Sheridan | WY | 82801 |
| Phillips, Elwin W and Pamela G | Win W and Pamela G Phillips PO Box 150 Banner, WY 82832 | Banner | WY | 82832 |

| Customer | Bill to | City | State | Zip |
| --- | --- | --- | --- | --- |
| Phillips, Mr. & Mrs. E.L. | E L Phillips Jr c/o Win Phillips Box 150 Banner, WY 82832 | Banner | WY | 82832 |
| Phillips, Teresa | Teresa Phillips PO Box 54 Banner, WY 82832 | Banner | WY | 82832 |
| Reimers, Jerry & Rebecca | Jerry Ray and Rebecca Ann Reimers 124 Upper Prairie Dog Creek Road Banner, WY 82832 | Banner | WY | 82832 |
| Robertson-Zullig Ditch Co | Robertson-Zullig Ditch Co 3320 US Highway 87 Sheridan, WY 82801 | Sheridan | WY | 82801 |
| Robinson, Ernest & Monika | Ernest M and Monika S Robinson 13 Meade Creek Road Sheridan, WY 82801-9546 | Sheridan | WY | 82801-9546 |
| Sams, Jack & Vicki L. | Jack & Vicki Sams 11 Pompey Creek Road Banner, WY 82832 | Banner | WY | 82832 |
| Schmid, William & Claudia | William M and Claudia G Schmid PO Box 450 Banner, WY 82832 | Banner | WY | 82832 |
| Schunk, Darlene | Darlene Schunk 3421 US Highway 87 Sheridan, WY 82801 | Sheridan | WY | 82801 |
| Scott Trust, James M. | James M. Scott Trust c/o First Int. Bank Trust PO Box 2007 Sheridan, WY 82801 | Sheridan | WY | 82801 |
| Shackelford, William | William B Shackelford 3320 US Highway 87 Sheridan, WY 82801 | Sheridan | WY | 82801 |
| Spaulding, Joan | Joan L Spaulding 841 E Hughes Lane Highlands Ranch, CO 80126-4746 | Highlands Ranch | CO | 80126-4746 |
| Speilman, Ann | Ann S Speilman c/o Bernard Speilman 9 Pleasant View Lane Sheridan, WY 82801 | Sheridan | WY | 82801 |
| Springer, C.A. (Dick) & Sally | C A (Dick) and Sally T Springer 15 Meade Creek Road Sheridan, WY 82801 | Sheridan | WY | 82801 |
| Stender, Jay & Millicent | Jay O and Millicent E H Stender PO Box 6312 Sheridan, WY 82801 | Sheridan | WY | 82801 |
| Stevenson, Warren & Jacque | Warren and Jacque Stevenson 90 Tisdale Road Buffalo, WY 82834 | Buffalo | WY | 82834 |
| Tabor, Gordon | Gordon L Tabor 29 Upper Prairie Dog Road Banner, WY 82832 | Banner | WY | 82832 |
| Voogd Jr., Clarence, Caterina & Homer E. | Clarence E. Voogd 1206 Emerson Sheridan, WY 82801 | Sheridan | WY | 82801 |
| Water Users Group | Water Users Group Robert W Wheeler, Secretary 86 N Piney Road PO Box 488 Story, WY 82842 | Story | WY | 82842 |
| Williams, Harry | Harry Williams 5 Upper Prairie Dog Road Banner, WY 82832 | Banner | WY | 82832 |
| Williamson, Marlon & Wanda | Marlon M and Wanda M Williamson 138 Kruse Creek Road Sheridan, WY 82801 | Sheridan | WY | 82801 |
| Williamson, Myrl & Cleo | Myrl and Cleo Williamson 158 Kruse Creek Road Sheridan, WY 82801 | Sheridan | WY | 82801 |
| Wilson, James & Janet | James M and Janet L Wilson 325 Bird Farm Road Sheridan, WY 82801 | Sheridan | WY | 82801 |
| Wilson, John A. & Jane F. | John Wilson, DVM & Jane Wilson 638 Bird Farm Road Sheridan, WY 82801 | Sheridan | WY | 82801 |
| Yapuncich, Victor & Kathleen | Drs. Victor P & Kathleen Yapuncich 162 Kruse Creek Road Sheridan, WY 82801 | Sheridan | WY | 82801 |
| Zullig, Alan & Denise | Alan and Denise Zullig 749 South 25th Street Renton, WA 98055-5052 | Renton | WA | 98055-5052 |
| Zullig, John & Conrad | John W and Conrad A Zullig 86 Kruse Creek Road Sheridan, WY 82801 | Sheridan | WY | 82801 |

MEADE CREEK DITCH COMPANY
SHAREHOLDERS
(2001)

| NAME | ADDRESS | SHARES |
|---|---|---|
| Bill Babione | 3466 U.S. Highway 87<br>Sheridan, WY 82801 | 3 |
| James R. & LaDonna Purdy<br>C/o S.K. Johnston, Jr. | Box 247<br>Big Horn, WY 82833 | 2 |
| Paul Denison | Box 42<br>Big Horn, WY 82833 | 2 |
| John W. Drake | Box 100<br>Big Horn, WY 82833 | 3 |
| Charles Hart | P.O. Box 641<br>Sheridan, WY 82833 | 2 |
| Eaglestone Ranch | c/o Kelso & Company<br>1949 Sugarland Drive<br>Sheridan, WY 82801 | 3 |
| E.L. Phillips | Box 275<br>Banner, WY 82832 | 2 |
| Burns Industries, Inc. | P.O. Box 6027<br>Sheridan, WY 82801 | 2 |
| Equestrian Hills<br>Homeowner's Association | c/o Beverly Anderson<br>354 Bird Farm Road<br>Sheridan, WY 82801 | 1 |
| D. Bruce Burns<br>Trustee, A-1 Trust | P.O. Box 6027<br>Sheridan, WY 82801 | 2 |
| S.K. Johnston, Jr.<br><br><br>c/o Martin MacCarty<br>Box 247<br>Big Horn, WY 82833 | Flying H Ranch<br>C/o Johnston Southern Co.<br>600 Krystal Building<br>Union Square<br>Chattanooga, TN 37402 | 15 |

# APPENDIX 2

## WDEQ AND IML WATER QUALITY LABORATORY DATA SHEETS

Table 1. Site information for Prairie Dog Creek and tributaries.

| Station name (ID code) | Section/ Town/Range | North Latitude | West Longitude | USGS $7^1/_2$' Quadrangle | 1:100,000 BLM Map |
|---|---|---|---|---|---|
| Prairie Dog Creek above Jenks Creek (PD-1) | SESW Sec 27 T54N/R83W | 44° 37' 08.43" | 106° 50' 35.39" | Banner | Sheridan |
| Jenks Creek (JC-1) | SESW Sec 27 T54N/R83W | 44° 37' 02.76" | 106° 50' 33.36" | Banner | Sheridan |
| Prairie Dog Creek below Jenks Creek (PD-2) | NESW Sec. 27 T54N/R83W | 44° 37' 11.70" | 106° 50' 37.41" | Banner | Sheridan |
| Prairie Dog Creek above Murphy Gulch (PD-3) | NENE Sec 27 T54/R83W | 44°37'47.98" | 106° 50' 06.08" | Buffalo Run Creek | Sheridan |
| Murphy Gulch (MG-1) | NWSW Sec. 14 T54N/R83W | 44° 39' 13.94" | 106°49' 42.27" | Buffalo Run Creek | Sheridan |
| Prairie Dog Creek below Murphy Gulch (PD-4) | SWSE Sec. 10 T54N/R83W | 44° 39' 34.76" | 106° 50' 12.34" | Buffalo Run Creek | Sheridan |
| Prairie Dog Creek above Meade Creek (PD-5) | NESE Sec 33 T55N/R83W | 44° 41' 40.91" | 106° 51' 09.75" | Buffalo Run Creek | Sheridan |
| Meade Creek (MC-1) | SWSE Sec 28 T55N/R83W | 44° 42' 16.15" | 106° 51' 27.69" | Buffalo Run Creek | Sheridan |
| Prairie Dog Creek below Meade Creek (PD-6) | SWSE Sec28 T55N/R83W | 44° 42' 18.91" | 106°51' 30.40" | Buffalo Run Creek | Sheridan |
| Prairie Dog Creek below Hwy 14 (PD-7) | NWSE Sec 17 T55N/R83W | 44° 44' 20.07" | 106° 52' 43.38" | Big Horn | Sheridan |

| Station name (ID code) | Section/ Town/Range | North Latitude | West Longitude | USGS $7^1/_2$' Quadrangle | 1:100,000 BLM Map |
|---|---|---|---|---|---|
| Prairie Dog Creek above Wildcat Creek (PD-8) | NENW Sec 9 T56N/R83W | 44° 50' 50.96" | 106° 51' 51.70" | Wyarno | Sheridan |
| Wildcat Creek (WC-1) | NENW Sec 9 T56N/R83W | 44° 50' 52.90" | 106° 51' 49.28" | Wyarno | Sheridan |
| Prairie Dog Creek below Wildcat Creek (PD-9) | SESW Sec 4 T56N/R83W | 44° 51' 50.96" | 106° 51' 51.70" | Wyarno | Sheridan |

Table 2: Streamflow and drainage area for Prairie Dog Creek and tributaries, October 6, 1998 and November 23, 1998

| Station | Discharge (cfs) October 6, 1998 | Discharge (cfs) November 23, 1998 | Drainage area ($Mi^2$) |
|---|---|---|---|
| PD-1 | 4.45 | 3.82 | 5.9 |
| JC-1 | 22.1 | 2.42 | 4.0 |
| PD-2 | 26.5 | 6.24 | 9.9 |
| PD-3 | 23.7 | 5.12 | 11.7 |
| MG-1 | 5.57 | 1.13 | 18.1 |
| PD-4 | 28.9 | 12.2 | 34.1 |
| PD-5 | 36.1 | 7.16 | 45.5 |
| MC-1 | 9.28 | 5.79 | 12.1 |
| PD-6 | 45.4 | 12.9 | 48.6 |
| PD-7 | 44.4 | 14.6 | 70.5 |
| PD-8 | 64.9 | 21.8 | 89.6 |
| WC-1 | 3.49 | 2.14 | 25.9 |
| PD-9 | 68.3 | 24.0 | 116 |

Table 3: Water quality sampling results for Prairie Dog Creek and tributaries, October 6, 1998.

| Parameter (Units) | PD-1 | JC-1 | PD-2 | PD-3 | MG-1 | PD-4 | PD-5 | MC-1 | PD-6 | PD-7 | PD-8 | WC-1 | PD-9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Time (hours) | 0935 | 0836 | 0904 | 1049 | 1210 | 1120 | 1435 | 1355 | 1335 | 1525 | 1700 | 1710 | 1615 |
| Temperature (C°) | 7.4 | 5.5 | 6.0 | 7.0 | 8.1 | 7.6 | 9.4 | 9.6 | 9.4 | 9.3 | 9.7 | 9.7 | 9.6 |
| pH (Standard Units) | 7.5 | 7.2 | 7.4 | 7.5 | 7.5 | 7.5 | 8.0 | 7.9 | 8.0 | 7.9 | 7.8 | 7.5 | 7.8 |
| Conductivity (μS/cm) | 474 | 192 | 227 | 310 | 493 | 411 | 472 | 590 | 515 | 569 | 750 | 1940 | 748 |
| Dissolved Oxygen (mg/L) | 11.0 | 11.2 | 11.2 | 11.1 | 10.7 | 11.0 | 11.0 | 10.6 | 10.9 | 10.8 | 10.3 | 9.7 | 10.2 |
| Turbidity (NTU) | 1.2 | 4.0 | 2.7 | 2.6 | 14 | 5.4 | 5.2 | 3.6 | 4.5 | 5.2 | 23 | 5.9 | 20 |
| Total Suspended Solids (mg/L) | <2 | 10 | 11 | 9 | 20 | 20 | 17 | 8 | 17 | 29 | 117 | 8 | 132 |
| Total Dissolved Solids (mg/L) | 276 | 120 | 148 | 208 | 328 | 268 | 304 | 380 | 312 | 356 | 496 | 1636 | 504 |
| Alkalinity (mg/L) | 250 | 75 | 100 | 120 | 150 | 140 | 170 | 235 | 180 | 180 | 225 | 370 | 245 |
| Chlorides (mg/L) | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | 8 | <5 |
| Sulfate (mg/L) | <10 | 14 | 13 | 40 | 98 | 75 | 96 | 79 | 97 | 108 | 145 | 780 | 168 |
| Total Hardness (mg/L) | 269 | 91 | 115 | 158 | 226 | 202 | 238 | 321 | 265 | 289 | 384 | 1085 | 408 |
| Total Phosphorus (mg/L) | 0.1 | <0.1 | <0.1 | <0.1 | 0.1 | <0.1 | <0.1 | 0.1 | 0.1 | 0.1 | 0.3 | 0.1 | 0.3 |
| Nitrate Nitrogen (mg/L) | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.3 | <0.1 | <0.1 | <0.1 | 5.0 | 0.4 |

Table 4. Water quality sampling results for Prairie Dog Creek and tributaries, November 23, 1998.

| **Parameter (Units)** | **PD-1** | **JC-1** | **PD-2** | **PD-3** | **MG-1** | **PD-4** | **PD-5** | **MC-1** | **PD-6** | **PD-7** | **PD-8** | **WC-1** | **PD-9** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Time (hours) | 1225 | 1254 | 1200 | 1138 | 1000 | 1045 | 1112 | 1120 | 1105 | 1258 | 1412 | 1435 | 1355 |
| Temperature (C°) | 5.0 | 4.7 | 4.2 | 3.3 | 2.0 | 2.0 | 1.2 | 1.6 | 1.6 | 3.2 | 3.9 | 2.9 | 4.0 |
| pH (Standard Units) | 8.0 | 7.9 | 8.0 | 8.0 | 8.3 | 7.9 | 8.2 | 8.4 | 7.9 | 8.6 | 8.6 | 8.2 | 8.6 |
| Conductivity (μS/cm) | 450 | 775 | 579 | 664 | 1137 | 787 | 925 | 803 | 884 | 917 | 1076 | 2060 | 1203 |
| Dissolved Oxygen (mg/L) | 12.4 | 11.9 | 12.5 | 13.0 | 12.3 | 127 | 11.3 | 11.6 | 11.3 | 10.5 | 10.6 | 10.1 | 10.7 |
| Turbidity (NTU) | 1.4 | 3.6 | 1.5 | 1.5 | 3.0 | 2.6 | 3.7 | 4.2 | 3.9 | 1.9 | 5.4 | 5.2 | 5.2 |
| Total Suspended Solids (mg/L) | <2 | <2 | <2 | <2 | <2 | 5 | 14 | 11 | 9 | <2 | 18 | 6 | 17 |
| Total Dissolved Solids (mg/L) | 356 | 624 | 460 | 532 | 1002 | 648 | 660 | 552 | 620 | 664 | 796 | 1800 | 916 |
| Alkalinity (mg/L) | 290 | 355 | 312 | 335 | 425 | 360 | 350 | 350 | 355 | 310 | 320 | 365 | 325 |
| Chlorides (mg/L) | <5 | <5 | <5 | <5 | 7 | <5 | 5 | <5 | <5 | <5 | <5 | 6 | <5 |
| Sulfate (mg/L) | <10 | 132 | 69 | 109 | 354 | 170 | 182 | 105 | 156 | 180 | 277 | 789 | 355 |
| Total Hardness (mg/L) | 320* | 480 | 380 | 420 | 640 | 500 | 500 | 420 | 500 | 520 | 620 | 1160 | 680 |
| Total Phosphorus (mg/L) | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Nitrate Nitrogen (mg/L) | <0.1* | <0.1 | 0.1 | <0.1 | 0.2 | <0.1 | <0.1 | 0.2 | 0.1 | <0.1 | 0.1 | 5.2 | 0.8 |

| | | |
|---|---|---|
| **APPENDIX A-1:** Prairie Dog Cr.abv.Jenks Cr., 279-4MR, Oct. 6, 1998 | | |
| WY: DEQ-Water Quality Division. Deter. by Aquatic Biology Associates, Inc. | | |
| Benthic invertebrate biomonitoring. Composite 8 Surbers (500 micron). | | |
| Abundance per square meter, 500+ organism subsample. FILE: 98WD160 | | |
| IDENTIFICATION CODE | 98WD160 | |
| CORRECTION FACTOR | 2.37 | |
| | | |
| Taxon | Abundance | % |
| Turbellaria | 2 | 0.17 |
| *Physella* | 17 | 1.21 |
| *Gammarus* | 2 | 0.17 |
| Acari | 12 | 0.87 |
| TOTAL: NON INSECTS | 33 | 2.43 |
| *Baetis tricaudatus* | 7 | 0.52 |
| *Heptagenia/Nixe* | 2 | 0.17 |
| *Rhithrogena* | 2 | 0.17 |
| *Paraleptophlebia* | 40 | 2.95 |
| TOTAL: EPHEMEROPTERA | 52 | 3.81 |
| Chloroperlidae | 5 | 0.35 |
| *Malenka* | 2 | 0.17 |
| *Isoperla* | 7 | 0.52 |
| TOTAL: PLECOPTERA | 14 | 1.04 |
| *Brachycentrus occidentalis* | 88 | 6.41 |
| *Micrasema* | 9 | 0.69 |
| *Helicopsyche borealis* | 114 | 8.32 |
| *Hydropsyche* | 190 | 13.86 |
| *Oecetis* | 7 | 0.52 |
| Limnephilidae | 2 | 0.17 |
| TOTAL: TRICHOPTERA | 410 | 29.98 |
| *Petrophila* | 2 | 0.17 |
| TOTAL: LEPIDOPTERA | 2 | 0.17 |
| *Cleptelmis* | 159 | 11.61 |
| *Microcylloepus* | 2 | 0.17 |
| *Optioservus* | 583 | 42.63 |
| *Zaitzevia* | 88 | 6.41 |
| TOTAL: COLEOPTERA | 832 | 60.83 |
| *Dixa* | 2 | 0.17 |
| *Simulium* | 2 | 0.17 |
| Stratiomyiidae | 2 | 0.17 |
| *Dicranota* | 5 | 0.35 |
| *Hexatoma* | 12 | 0.87 |
| TOTAL: DIPTERA | 24 | 1.73 |
| GRAND TOTAL | 1367 | 100.00 |

**APPENDIX A-2:** Jenks Creek, 279-2MR, October 6, 1998

WY: DEQ-Water Quality Division. Deter. by Aquatic Biology Associates, Inc.

Benthic invertebrate biomonitoring. Composite 8 Surbers (500 micron).

Abundance per square meter, 500+ organism subsample. FILE: 98WD116

| | | |
|---|---|---|
| IDENTIFICATION CODE | 98WD116 | |
| CORRECTION FACTOR | 4.75 | |
| | | |
| Taxon | Abundance | % |
| Lumbriculidae | 5 | 0.18 |
| Acari | 24 | 0.90 |
| TOTAL: NON INSECTS | 28 | 1.08 |
| *Acentrella insignificans* | 38 | 1.45 |
| *Baetis tricaudatus* | 109 | 4.16 |
| *Ephemerella inermis/infrequens* | 81 | 3.07 |
| *Heptagenia/Nixe* | 43 | 1.63 |
| TOTAL: EPHEMEROPTERA | 271 | 10.31 |
| Capniidae | 5 | 0.18 |
| *Pteronarcella* | 57 | 2.17 |
| Taeniopterygidae | 5 | 0.18 |
| TOTAL: PLECOPTERA | 66 | 2.53 |
| *Brachycentrus occidentalis* | 57 | 2.17 |
| *Culoptila* | 1226 | 46.65 |
| *Glossosoma* | 10 | 0.36 |
| *Hydropsyche* | 551 | 20.98 |
| *Lepidostoma-sand case larvae* | 19 | 0.72 |
| Limnephilidae | 5 | 0.18 |
| *Psychomyia* | 100 | 3.80 |
| TOTAL: TRICHOPTERA | 1966 | 74.86 |
| *Optioservus* | 114 | 4.34 |
| *Zaitzevia* | 5 | 0.18 |
| TOTAL: COLEOPTERA | 119 | 4.52 |
| *Atherix* | 43 | 1.63 |
| *Chelifera* | 5 | 0.18 |
| *Simulium* | 38 | 1.45 |
| *Antocha* | 10 | 0.36 |
| TOTAL: DIPTERA | 95 | 3.62 |
| Chironomidae-pupae | 24 | 0.90 |
| *Cardiocladius* | 14 | 0.54 |
| *Cladotanytarsus* | 5 | 0.18 |
| *Lopescladius* | 5 | 0.18 |
| *Orthocladius Complex* | 33 | 1.27 |
| TOTAL: CHIRONOMIDAE | 81 | 3.07 |
| GRAND TOTAL | 2627 | 100.00 |

| | | |
|---|---|---|
| **APPENDIX A-3:** Prairie Dog Cr. blw. Jenks, 279-3MR, October 6, 1998 | | |
| WY: DEQ-Water Quality Division. Deter. by Aquatic Biology Associates, Inc. | | |
| Benthic invertebrate biomonitoring. Composite 8 Surbers (500 micron). | | |
| Abundance per square meter, 500+ organism subsample. FILE: 98WD159 | | |
| IDENTIFICATION CODE | 98WD159 | |
| CORRECTION FACTOR | 5.04 | |
| | | |
| Taxon | Abundance | % |
| Nematoda | 5 | 0.18 |
| Enchytraeidae | 10 | 0.37 |
| TOTAL: NON INSECTS | 15 | 0.55 |
| *Acentrella turbida* | 111 | 4.02 |
| *Baetis tricaudatus* | 186 | 6.76 |
| *Ephemerella inermis/infrequens* | 40 | 1.46 |
| *Heptagenia/Nixe* | 35 | 1.28 |
| TOTAL: EPHEMEROPTERA | 373 | 13.53 |
| *Zapada cinctipes* | 5 | 0.18 |
| *Isoperla* | 5 | 0.18 |
| *Pteronarcella* | 15 | 0.55 |
| Taeniopterygidae | 5 | 0.18 |
| TOTAL: PLECOPTERA | 30 | 1.10 |
| *Brachycentrus occidentalis* | 141 | 5.12 |
| *Culoptila* | 968 | 35.10 |
| *Glossosoma* | 15 | 0.55 |
| *Helicopsyche borealis* | 5 | 0.18 |
| *Hydropsyche* | 716 | 25.96 |
| *Lepidostoma-sand case larvae* | 30 | 1.10 |
| *Psychomyia* | 101 | 3.66 |
| TOTAL: TRICHOPTERA | 1976 | 71.66 |
| *Petrophila* | 5 | 0.18 |
| TOTAL: LEPIDOPTERA | 5 | 0.18 |
| *Cleptelmis* | 5 | 0.18 |
| *Optioservus* | 131 | 4.75 |

Appendix A-3: Continued

| | | |
|---|---|---|
| *Zaitzevia* | 20 | 0.73 |
| TOTAL: COLEOPTERA | 156 | 5.67 |
| *Atherix* | 71 | 2.56 |
| *Simulium* | 15 | 0.55 |
| *Dicranota* | 5 | 0.18 |
| *Hexatoma* | 5 | 0.18 |
| TOTAL: DIPTERA | 96 | 3.47 |
| Chironomidae-pupae | 30 | 1.10 |
| *Cardiocladius* | 15 | 0.55 |
| *Cricotopus Trifascia Gr.* | 5 | 0.18 |
| *Eukiefferiella* | 10 | 0.37 |
| *Orthocladius Complex* | 45 | 1.65 |
| TOTAL: CHIRONOMIDAE | 106 | 3.84 |
| GRAND TOTAL | 2757 | 100.00 |

| | | |
|---|---|---|
| WY: DEQ-Water Quality Division. Deter. by Aquatic Biology Associates, Inc. | | |
| Benthic invertebrate biomonitoring. Composite 8 Surbers (500 micron). | | |
| Abundance per square meter, 500+ organism subsample. FILE: 98WD162 | | |
| IDENTIFICATION CODE | 98WD162 | |
| CORRECTION FACTOR | 7.69 | |
| | | |
| Taxon | Abundance | % |
| Imma. Tubificid w/o cap. setae | 8 | 0.18 |
| *Physella* | 8 | 0.18 |
| Acari | 23 | 0.54 |
| TOTAL: NON INSECTS | 38 | 0.90 |
| *Acentrella insignificans* | 85 | 1.98 |
| *Baetis tricaudatus* | 46 | 1.08 |
| *Ephemerella inermis/infrequens* | 192 | 4.50 |
| TOTAL: EPHEMEROPTERA | 323 | 7.57 |
| Chloroperlidae | 8 | 0.18 |
| *Isoperla* | 46 | 1.08 |
| *Pteronarcella* | 15 | 0.36 |
| TOTAL: PLECOPTERA | 69 | 1.62 |
| *Brachycentrus occidentalis* | 1922 | 45.05 |
| *Glossosoma* | 23 | 0.54 |
| *Protoptila* | 185 | 4.32 |
| *Hydropsyche* | 177 | 4.14 |
| *Lepidostoma-sand case larvae* | 1054 | 24.68 |
| Limnephilidae | 15 | 0.36 |
| *Psychomyia* | 31 | 0.72 |
| TOTAL: TRICHOPTERA | 3407 | 79.82 |
| *Optioservus* | 85 | 1.98 |
| *Zaitzevia* | 8 | 0.18 |
| TOTAL: COLEOPTERA | 92 | 2.16 |
| *Atherix* | 15 | 0.36 |
| *Hexatoma* | 15 | 0.36 |

Appendix A-4: Continued

| | | |
|---|---|---|
| *Tipula* | 8 | 0.18 |
| TOTAL: DIPTERA | 38 | 0.90 |
| Chironomidae-pupae | 15 | 0.36 |
| *Cladotanytarsus* | 8 | 0.18 |
| *Micropsectra* | 31 | 0.72 |
| *Odontomesa* | 15 | 0.36 |
| *Orthocladius Complex* | 208 | 4.86 |
| *Robackia* | 23 | 0.54 |
| TOTAL: CHIRONOMIDAE | 300 | 7.03 |
| GRAND TOTAL | 4268 | 100.00 |

| | | |
|---|---|---|
| **APPENDIX A-5:** Prairie Dog Cr. blw. Murphy Gulch, 280-1MK, Oct. 7, 1998 | | |
| WY: DEQ-Water Quality Division. Deter. by Aquatic Biology Associates, Inc. | | |
| Benthic invertebrate biomonitoring. Composite 8 Surbers (500 micron). | | |
| Abundance per square meter, 500+ organism subsample. FILE: 98WD161 | | |
| IDENTIFICATION CODE | 98WD161 | |
| CORRECTION FACTOR | 13.45 | |
| | | |
| Taxon | Abundance | % |
| Turbellaria | 27 | 0.37 |
| Nematoda | 13 | 0.19 |
| *Nais variabilis* | 54 | 0.75 |
| Imma. Tubificid w/o cap. setae | 13 | 0.19 |
| Acari | 27 | 0.37 |
| TOTAL: NON INSECTS | 134 | 1.87 |
| *Ophiogomphus* | 27 | 0.37 |
| TOTAL: ODONATA | 27 | 0.37 |
| *Acentrella insignificans* | 13 | 0.19 |
| *Baetis tricaudatus* | 67 | 0.93 |
| *Ephemerella inermis/infrequens* | 148 | 2.05 |
| *Heptagenia/Nixe* | 27 | 0.37 |
| TOTAL: EPHEMEROPTERA | 256 | 3.54 |
| *Zapada cinctipes* | 13 | 0.19 |
| Perlodidae-early instar | 13 | 0.19 |
| *Isoperla* | 40 | 0.56 |
| *Skwala* | 13 | 0.19 |
| *Pteronarcella* | 202 | 2.80 |
| Taeniopterygidae | 27 | 0.37 |
| TOTAL: PLECOPTERA | 309 | 4.29 |
| *Brachycentrus occidentalis* | 915 | 12.69 |
| *Culoptila* | 13 | 0.19 |
| *Hydropsyche* | 4156 | 57.65 |
| *Lepidostoma-sand case larvae* | 27 | 0.37 |
| *Psychomyia* | 13 | 0.19 |

Appendix A-5: Continued

| | | |
|---|---|---|
| TOTAL: TRICHOPTERA | 5124 | 71.08 |
| *Microcylloepus* | 40 | 0.56 |
| *Optioservus* | 901 | 12.50 |
| TOTAL: COLEOPTERA | 942 | 13.06 |
| *Atherix* | 215 | 2.99 |
| *Antocha* | 13 | 0.19 |
| *Dicranota* | 27 | 0.37 |
| *Hexatoma* | 13 | 0.19 |
| TOTAL: DIPTERA | 269 | 3.73 |
| Chironomidae-pupae | 27 | 0.37 |
| *Cricotopus* | 27 | 0.37 |
| *Cricotopus Trifascia Gr.* | 13 | 0.19 |
| *Eukiefferiella* | 27 | 0.37 |
| *Orthocladius Complex* | 40 | 0.56 |
| *Rheotanytarsus* | 13 | 0.19 |
| TOTAL: CHIRONOMIDAE | 148 | 2.05 |
| GRAND TOTAL | 7209 | 100.00 |

| **APPENDIX A-6:** Prairie Dog Creek abv. Meade Cr., 281-1MR, Oct. 8, 1998 | | |
|---|---|---|
| WY: DEQ-Water Quality Division. Deter. by Aquatic Biology Associates, Inc. | | |
| Benthic invertebrate biomonitoring. Composite 8 Surbers (500 micron). | | |
| Abundance per square meter, 500+ organism subsample. FILE: 98WD165 | | |
| IDENTIFICATION CODE | 98WD165 | |
| CORRECTION FACTOR | 5.98 | |
| | | |
| Taxon | Abundance | % |
| Acari | 72 | 2.22 |
| TOTAL: NON INSECTS | 72 | 2.22 |
| *Acentrella insignificans* | 179 | 5.56 |
| *Baetis tricaudatus* | 96 | 2.96 |
| *Ephemerella aurivillii* | 6 | 0.19 |
| *Ephemerella inermis/infrequens* | 449 | 13.89 |
| *Tricorythodes minutus* | 6 | 0.19 |
| TOTAL: EPHEMEROPTERA | 736 | 22.78 |
| *Isoperla* | 30 | 0.93 |
| *Pteronarcella* | 12 | 0.37 |
| Taeniopterygidae | 24 | 0.74 |
| TOTAL: PLECOPTERA | 66 | 2.04 |
| *Amiocentrus aspilus* | 36 | 1.11 |
| *Brachycentrus occidentalis* | 263 | 8.15 |
| *Helicopsyche borealis* | 6 | 0.19 |
| *Hydropsyche* | 1250 | 38.70 |
| *Hydroptila* | 12 | 0.37 |
| *Lepidostoma-sand case larvae* | 30 | 0.93 |
| *Nectopsyche* | 6 | 0.19 |
| *Oecetis* | 12 | 0.37 |
| *Psychomyia* | 96 | 2.96 |
| TOTAL: TRICHOPTERA | 1710 | 52.96 |
| *Petrophila* | 42 | 1.30 |
| TOTAL: LEPIDOPTERA | 42 | 1.30 |
| *Microcylloepus* | 12 | 0.37 |

Appendix A-6: Continued

| | | |
|---|---|---|
| *Optioservus* | 161 | 5.00 |
| *Zaitzevia* | 6 | 0.19 |
| TOTAL: COLEOPTERA | 179 | 5.56 |
| *Atherix* | 18 | 0.56 |
| *Chelifera* | 12 | 0.37 |
| *Hemerodromia* | 6 | 0.19 |
| *Simulium* | 24 | 0.74 |
| *Dicranota* | 12 | 0.37 |
| TOTAL: DIPTERA | 72 | 2.22 |
| Chironomidae-pupae | 48 | 1.48 |
| *Cardiocladius* | 24 | 0.74 |
| *Cricotopus* | 72 | 2.22 |
| *Cricotopus Trifascia Gr.* | 36 | 1.11 |
| *Eukiefferiella* | 48 | 1.48 |
| *Orthocladius Complex* | 96 | 2.96 |
| *Polypedilum* | 6 | 0.19 |
| *Rheotanytarsus* | 24 | 0.74 |
| TOTAL: CHIRONOMIDAE | 353 | 10.93 |
| GRAND TOTAL | 3229 | 100.00 |

| | | |
|---|---|---|
| **APPENDIX A-7:** Meade Creek, 280-2MK, October 7, 1998 | | |
| WY: DEQ-Water Quality Division. Deter. by Aquatic Biology Associates, Inc. | | |
| Benthic invertebrate biomonitoring. Composite 8 Surbers (500 micron). | | |
| Abundance per square meter, 500+ organism subsample. FILE: 98WD120 | | |
| IDENTIFICATION CODE | 98WD120 | |
| CORRECTION FACTOR | 5.76 | |
| | | |
| Taxon | Abundance | % |
| Acari | 63 | 1.93 |
| TOTAL: NON INSECTS | 63 | 1.93 |
| *Acentrella turbida* | 167 | 5.09 |
| *Baetis tricaudatus* | 179 | 5.44 |
| *Ephemerella inermis/infrequens* | 17 | 0.53 |
| *Heptagenia/Nixe* | 17 | 0.53 |
| *Tricorythodes minutus* | 98 | 2.98 |
| TOTAL: EPHEMEROPTERA | 478 | 14.56 |
| *Isoperla* | 17 | 0.53 |
| TOTAL: PLECOPTERA | 17 | 0.53 |
| *Brachycentrus occidentalis* | 213 | 6.49 |
| *Helicopsyche borealis* | 23 | 0.70 |
| *Cheumatopsyche* | 92 | 2.81 |
| *Hydropsyche* | 1964 | 59.82 |
| *Hydroptila* | 17 | 0.53 |
| TOTAL: TRICHOPTERA | 2310 | 70.35 |
| *Petrophila* | 98 | 2.98 |
| TOTAL: LEPIDOPTERA | 98 | 2.98 |
| *Optioservus* | 52 | 1.58 |
| TOTAL: COLEOPTERA | 52 | 1.58 |
| *Simulium* | 109 | 3.33 |
| TOTAL: DIPTERA | 109 | 3.33 |
| Chironomidae-pupae | 86 | 2.63 |
| *Cardiocladius* | 6 | 0.18 |
| *Cricotopus Trifascia Gr.* | 29 | 0.88 |
| *Eukiefferiella* | 35 | 1.05 |

Appendix A-7: Continued

| | | |
|---|---|---|
| TOTAL: CHIRONOMIDAE | 156 | 4.74 |
| GRAND TOTAL | 3283 | 100.00 |

**APPENDIX A-8:** Prairie Dog Cr. blw. Meade Cr., 280-3MR, Oct. 7, 1998

WY: DEQ-Water Quality Division. Deter. by Aquatic Biology Associates, Inc.

Benthic invertebrate biomonitoring. Composite 8 Surbers (500 micron).

Abundance per square meter, 500+ organism subsample. FILE: 98WD163

| IDENTIFICATION CODE | 98WD163 | |
|---|---|---|
| CORRECTION FACTOR | 2.52 | |
| | | |
| Taxon | Abundance | % |
| *Ferrissia* | 8 | 0.59 |
| Acari | 25 | 1.97 |
| TOTAL: NON INSECTS | 33 | 2.56 |
| Baetidae | 3 | 0.20 |
| *Acentrella insignificans* | 10 | 0.79 |
| *Baetis tricaudatus* | 30 | 2.37 |
| *Ephemerella inermis/infrequens* | 116 | 9.07 |
| *Heptagenia/Nixe* | 13 | 0.99 |
| *Tricorythodes minutus* | 40 | 3.16 |
| TOTAL: EPHEMEROPTERA | 212 | 16.57 |
| Perlodidae-early instar | 5 | 0.39 |
| *Isoperla* | 20 | 1.58 |
| *Pteronarcella* | 5 | 0.39 |
| Taeniopterygidae | 18 | 1.38 |
| TOTAL: PLECOPTERA | 48 | 3.75 |
| *Amiocentrus aspilus* | 8 | 0.59 |
| *Brachycentrus occidentalis* | 171 | 13.41 |
| *Hydropsyche* | 418 | 32.74 |
| *Hydroptila* | 35 | 2.76 |
| *Lepidostoma-sand case larvae* | 3 | 0.20 |
| *Nectopsyche* | 5 | 0.39 |
| *Oecetis* | 13 | 0.99 |
| *Triaenodes* | 3 | 0.20 |
| *Psychomyia* | 141 | 11.05 |
| TOTAL: TRICHOPTERA | 796 | 62.33 |

Appendix A-8: Continued

| | | |
|---|---|---|
| *Petrophila* | 20 | 1.58 |
| TOTAL: LEPIDOPTERA | 20 | 1.58 |
| *Microcylloepus* | 3 | 0.20 |
| *Optioservus* | 10 | 0.79 |
| TOTAL: COLEOPTERA | 13 | 0.99 |
| *Atherix* | 3 | 0.20 |
| *Chelifera* | 5 | 0.39 |
| *Simulium* | 10 | 0.79 |
| *Hexatoma* | 3 | 0.20 |
| TOTAL: DIPTERA | 20 | 1.58 |
| Chironomidae-pupae | 40 | 3.16 |
| *Cardiocladius* | 3 | 0.20 |
| *Cricotopus* | 8 | 0.59 |
| *Cricotopus Trifascia Gr.* | 20 | 1.58 |
| *Eukiefferiella* | 3 | 0.20 |
| *Orthocladius Complex* | 58 | 4.54 |
| *Rheotanytarsus* | 5 | 0.39 |
| TOTAL: CHIRONOMIDAE | 136 | 10.65 |
| GRAND TOTAL | 1278 | 100.00 |

| **APPENDIX A-9:** Prairie Dog Creek blw. HWY 14, 281-1MK, Oct. 8, 1998 | | |
|---|---|---|
| WY: DEQ-Water Quality Division. Deter. by Aquatic Biology Associates, Inc. | | |
| Benthic invertebrate biomonitoring. Composite 8 Surbers (500 micron). | | |
| Abundance per square meter, 500+ organism subsample. FILE: 98WD164 | | |
| IDENTIFICATION CODE | 98WD164 | |
| CORRECTION FACTOR | 3.1 | |
| | | |
| Taxon | Abundance | % |
| Enchytraeidae | 6 | 0.39 |
| *Ophidonais serpentina* | 3 | 0.20 |
| Lymnaeidae | 3 | 0.20 |
| Acari | 50 | 3.16 |
| TOTAL: NON INSECTS | 62 | 3.94 |
| *Ophiogomphus* | 6 | 0.39 |
| TOTAL: ODONATA | 6 | 0.39 |
| *Acentrella insignificans* | 189 | 12.03 |
| *Baetis tricaudatus* | 96 | 6.11 |
| *Ephemerella inermis/infrequens* | 53 | 3.35 |
| *Cinygmula* | 3 | 0.20 |
| *Heptagenia/Nixe* | 3 | 0.20 |
| *Tricorythodes minutus* | 50 | 3.16 |
| TOTAL: EPHEMEROPTERA | 394 | 25.05 |
| *Isoperla* | 31 | 1.97 |
| Taeniopterygidae | 43 | 2.76 |
| TOTAL: PLECOPTERA | 74 | 4.73 |
| *Amiocentrus aspilus* | 3 | 0.20 |
| *Brachycentrus occidentalis* | 161 | 10.26 |
| *Hydropsyche* | 360 | 22.88 |
| *Hydroptila* | 12 | 0.79 |
| *Ochrotrichia* | 16 | 0.99 |
| *Nectopsyche* | 12 | 0.79 |
| *Psychomyia* | 25 | 1.58 |
| TOTAL: TRICHOPTERA | 589 | 37.48 |

Appendix A-9: Continued

| | | |
|---|---|---|
| *Petrophila* | 12 | 0.79 |
| TOTAL: LEPIDOPTERA | 12 | 0.79 |
| *Microcylloepus* | 6 | 0.39 |
| *Optioservus* | 6 | 0.39 |
| TOTAL: COLEOPTERA | 12 | 0.79 |
| *Atherix* | 9 | 0.59 |
| *Chelifera* | 3 | 0.20 |
| *Hemerodromia* | 9 | 0.59 |
| *Simulium* | 71 | 4.54 |
| *Dicranota* | 3 | 0.20 |
| TOTAL: DIPTERA | 96 | 6.11 |
| Chironomidae-pupae | 22 | 1.38 |
| *Brillia* | 3 | 0.20 |
| *Cardiocladius* | 37 | 2.37 |
| *Cladotanytarsus* | 3 | 0.20 |
| *Cricotopus* | 16 | 0.99 |
| *Cricotopus Trifascia Gr.* | 99 | 6.31 |
| *Diamesa* | 6 | 0.39 |
| *Eukiefferiella* | 28 | 1.78 |
| *Orthocladius Complex* | 102 | 6.51 |
| *Rheotanytarsus* | 9 | 0.59 |
| TOTAL: CHIRONOMIDAE | 326 | 20.71 |
| GRAND TOTAL | 1572 | 100.00 |

| APPENDIX A-10: Prairie Dog Creek abv. Cat Cr., 296-1MK, Oct. 23, 1998 | | |
|---|---|---|
| WY: DEQ-Water Quality Division. Deter. by Aquatic Biology Associates, Inc. | | |
| Benthic invertebrate biomonitoring. Composite 8 Surbers (500 micron). | | |
| Abundance per square meter, 500+ organism subsample. FILE: 98WD166 | | |
| IDENTIFICATION CODE | 98WD166 | |
| CORRECTION FACTOR | 1.35 | |
| | | |
| Taxon | Abundance | % |
| Enchytraeidae | 3 | 0.58 |
| *Nais variabilis* | 3 | 0.58 |
| Imma. Tubificid w/o cap. setae | 1 | 0.29 |
| *Hyalella azteca* | 15 | 3.20 |
| TOTAL: NON INSECTS | 22 | 4.65 |
| Baetidae | 5 | 1.16 |
| *Acentrella* | 8 | 1.74 |
| *Baetis tricaudatus* | 62 | 13.37 |
| *Caenis* | 1 | 0.29 |
| *Ephemerella inermis/infrequens* | 35 | 7.56 |
| *Stencron* | 8 | 1.74 |
| *Leptophlebia* | 8 | 1.74 |
| *Tricorythodes minutus* | 27 | 5.81 |
| TOTAL: EPHEMEROPTERA | 155 | 33.43 |
| Capniidae | 3 | 0.58 |
| *Acroneuria* | 1 | 0.29 |
| Taeniopterygidae | 47 | 10.17 |
| TOTAL: PLECOPTERA | 51 | 11.05 |
| *Brachycentrus occidentalis* | 5 | 1.16 |
| *Hydropsyche* | 14 | 2.91 |
| *Oecetis* | 1 | 0.29 |
| *Triaenodes* | 1 | 0.29 |
| TOTAL: TRICHOPTERA | 22 | 4.65 |
| *Petrophila* | 3 | 0.58 |
| TOTAL: LEPIDOPTERA | 3 | 0.58 |

Appendix A-10: Continued

| | | |
|---|---|---|
| *Dubiraphia* | 3 | 0.58 |
| *Microcylloepus* | 15 | 3.20 |
| TOTAL: COLEOPTERA | 18 | 3.78 |
| *Hemerodromia* | 5 | 1.16 |
| *Simulium* | 103 | 22.09 |
| TOTAL: DIPTERA | 108 | 23.26 |
| Chironomidae-pupae | 3 | 0.58 |
| *Cricotopus* | 1 | 0.29 |
| *Cricotopus Bicinctus Gr.* | 7 | 1.45 |
| *Cricotopus Trifascia Gr.* | 54 | 11.63 |
| *Diamesa* | 8 | 1.74 |
| *Eukiefferiella* | 1 | 0.29 |
| *Orthocladius Complex* | 8 | 1.74 |
| *Pagastia* | 1 | 0.29 |
| *Parametriocnemus* | 1 | 0.29 |
| *Thienemanniella* | 1 | 0.29 |
| TOTAL: CHIRONOMIDAE | 86 | 18.60 |
| GRAND TOTAL | 464 | 100.00 |

**APPENDIX A-11:** Prairie Dog Creek blw. Cat Cr., 296-2MK, October 23, 1998

WY: DEQ-Water Quality Division. Deter. by Aquatic Biology Associates, Inc.

Benthic invertebrate biomonitoring. Composite 8 Surbers (500 micron).

Abundance per square meter, 500+ organism subsample. FILE: 98WD167

| IDENTIFICATION CODE | 98WD167 | |
|---|---|---|
| CORRECTION FACTOR | 1.345 | |
| | | |
| Taxon | Abundance | % |
| Enchytraeidae | 3 | 0.53 |
| *Hyalella azteca* | 1 | 0.26 |
| Acari | 4 | 0.79 |
| TOTAL: NON INSECTS | 8 | 1.59 |
| *Ophiogomphus* | 3 | 0.53 |
| TOTAL: ODONATA | 3 | 0.53 |
| Baetidae | 5 | 1.06 |
| *Acentrella* | 13 | 2.65 |
| *Baetis tricaudatus* | 98 | 19.31 |
| *Ephemerella inermis/infrequens* | 69 | 13.49 |
| *?Stenacron* | 4 | 0.79 |
| *Leptophlebia* | 1 | 0.26 |
| *Tricorythodes minutus* | 56 | 11.11 |
| TOTAL: EPHEMEROPTERA | 247 | 48.68 |
| *Acroneuria* | 3 | 0.53 |
| *Isoperla* | 12 | 2.38 |
| Taeniopterygidae | 36 | 7.14 |
| TOTAL: PLECOPTERA | 51 | 10.05 |
| *Brachycentrus occidentalis* | 1 | 0.26 |
| *Cheumatopsyche* | 3 | 0.53 |
| *Hydropsyche* | 24 | 4.76 |
| *Nectopsyche* | 1 | 0.26 |
| *Oecetis* | 1 | 0.26 |
| TOTAL: TRICHOPTERA | 31 | 6.08 |
| *Petrophila* | 3 | 0.53 |

Appendix A-11, continued

| | | |
|---|---|---|
| TOTAL: LEPIDOPTERA | 3 | 0.53 |
| Dytiscidae | 1 | 0.26 |
| *Microcylloepus* | 24 | 4.76 |
| TOTAL: COLEOPTERA | 26 | 5.03 |
| *Hemerodromia* | 1 | 0.26 |
| *Simulium* | 74 | 14.55 |
| TOTAL: DIPTERA | 75 | 14.81 |
| Chironomidae-pupae | 1 | 0.26 |
| *Cricotopus* | 1 | 0.26 |
| *Cricotopus Trifascia Gr.* | 28 | 5.56 |
| *Diamesa* | 7 | 1.32 |
| *Eukiefferiella* | 1 | 0.26 |
| *Orthocladius Complex* | 26 | 5.03 |
| TOTAL: CHIRONOMIDAE | 65 | 12.70 |
| GRAND TOTAL | 508 | 100.00 |

Inter-Mountain Laboratories Inc.

1633 Terra Avenue
Sheridan, WY 82801

**Client:** EnTech, Inc.
**Project:** Prairie Dog Creek
**Sample ID:** Prairie Dog Ditch
**Lab ID:** 0100W15192
**Matrix:** Water
**Condition:** Cool/Intact
GPS Location: N44.57769 W106.88318

**Date Received:** 08/23/00
**Date Reported:** 09/06/00
**Date Sampled:** 08/23/00
**Time Sampled:** 0940

| Parameter | Analytical Result | Units | | Units |
|---|---|---|---|---|
| **Field Parameters** | | | | |
| Field pH | 7.8 | s.u. | | |
| Field Conductivity | 50 | µmhos/cm | | |
| Field Temperature | 13.6 | °C | | |
| Field Dissolved Oxygen | 6.8 | mg/L | | |
| **General Parameters** | | | | |
| Total Dissolved Solids @ 180°C | 50 | mg/L | | |
| Total Suspended Solids | 8 | mg/L | | |
| Solids - Settleable | <0.5 | mL/L | | |
| Total Alkalinity as CaCO3 | 22.5 | mg/L | | |
| Boron | <0.01 | mg/L | | |
| Fecal Coliform | 37 | Coliform/100mL | | |
| Total Phosphorus | <0.05 | mg/L | | |
| Turbidity | 2.3 | N.T.U. | | |
| **Anions** | | | | |
| Bicarbonate as HCO3 | 27.5 | mg/L | 0.45 | meq/L |
| Carbonate as CO3 | 0.00 | mg/L | 0.00 | meq/L |
| Chloride | <1.0 | mg/L | <0.03 | meq/L |
| Nitrate + Nitrite as N | <0.01 | mg/L | <0.01 | meq/L |
| Sulfate | 1.2 | mg/L | 0.03 | meq/L |
| **Cations** | | | | |
| Calcium | 7.1 | mg/L | 0.35 | meq/L |
| Magnesium | 2.2 | mg/L | 0.18 | meq/L |
| Potassium | 0.6 | mg/L | 0.02 | meq/L |
| Sodium | 1.3 | mg/L | 0.06 | meq/L |
| Cations | | | 0.61 | meq/L |
| Anions | | | 0.48 | meq/L |
| Cation-Anion Difference | | | 0.13 | meq/L |
| **Total Metals** | | | | |
| Barium | <0.5 | mg/L | | |
| Iron | 0.11 | mg/L | | |

Reference: U.S.E.P.A 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination of Water and Wastewater", 19th ed., 1995.
EPA 600/R94/111, "Methods for the Determination of Metals in Environmental Samples-Supplement I", May 1994
EPA 600/R93/100, "Methods for the Determination of Inorganic Substances in Environmental Samples", Aug. 1993.

Reviewed By: WN

Wade Nieuwsma, Water Lab Supervisor

Inter-Mountain Laboratories Inc.

1633 Terra Avenue
Sheridan, WY 82801

**Client:** EnTech, Inc.
**Project:** Prairie Dog Creek
**Sample ID:** Prairie Dog Creek Above HWY 87
**Lab ID:** 0100W15193
**Matrix:** Water
**Condition:** Cool/Intact
GPS Location: N44.60975 W106.86821

**Date Received:** 08/23/00
**Date Reported:** 09/06/00
**Date Sampled:** 08/23/00
**Time Sampled:** 1005

| Parameter | Analytical Result | Units | | Units |
|---|---|---|---|---|
| **Field Parameters** | | | | |
| Field pH | 8.1 | s.u. | | |
| Field Conductivity | 390 | µmhos/cm | | |
| Field Temperature | 13.1 | °C | | |
| Field Dissolved Oxygen | 6.6 | mg/L | | |
| **General Parameters** | | | | |
| Total Dissolved Solids @ 180°C | 260 | mg/L | | |
| Total Suspended Solids | 6 | mg/L | | |
| Solids - Settleable | <0.5 | mL/L | | |
| Total Alkalinity as CaCO3 | 235 | mg/L | | |
| Boron | 0.01 | mg/L | | |
| Fecal Coliform | 187 | Coliform/100mL | | |
| Total Phosphorus | 0.06 | mg/L | | |
| Turbidity | 0.5 | N.T.U. | | |
| **Anions** | | | | |
| Bicarbonate as HCO3 | 287 | mg/L | 4.70 | meq/L |
| Carbonate as CO3 | 0.00 | mg/L | 0.00 | meq/L |
| Chloride | <1.0 | mg/L | <0.03 | meq/L |
| Nitrate + Nitrite as N | 0.20 | mg/L | 0.01 | meq/L |
| Sulfate | 5.1 | mg/L | 0.11 | meq/L |
| **Cations** | | | | |
| Calcium | 59.0 | mg/L | 2.94 | meq/L |
| Magnesium | 17.9 | mg/L | 1.47 | meq/L |
| Potassium | 4.0 | mg/L | 0.10 | meq/L |
| Sodium | 3.9 | mg/L | 0.17 | meq/L |
| Cations | | | 4.68 | meq/L |
| Anions | | | 4.82 | meq/L |
| Cation/Anion Balance | | | 1.47 | % |
| **Total Metals** | | | | |
| Barium | <0.5 | mg/L | | |
| Iron | <0.05 | mg/L | | |

Reference: U.S.E.P.A 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination of Water and Wastewater", 19th ed., 1995.
EPA 600/R94/111, "Methods for the Determination of Metals in Environmental Samples-Supplement I", May 1994
EPA 600/R93/100, "Methods for the Determination of Inorganic Substances in Environmental Samples", Aug. 1993.

Reviewed By: WN

Wade Nieuwsma, Water Lab Supervisor

## Inter-Mountain Laboratories, Inc.

1633 Terra Avenue
Sheridan, WY 82801

**Client:** EnTech, Inc.
**Project:** Prairie Dog Creek
**Sample ID:** Jenks Creek
**Lab ID:** 0100W15275
**Matrix:** Water
**Condition:** Cool/Intact
GPS Location: N44.61870 W106.84408

**Date Received:** 08/25/00
**Date Reported:** 09/06/00
**Date Sampled:** 08/25/00
**Time Sampled:** 1130

| Parameter | Analytical Result | Units | | Units |
|---|---|---|---|---|
| **Field Parameters** | | | | |
| Field pH | 8.0 | s.u. | | |
| Field Conductivity | 80 | µmhos/cm | | |
| Field Temperature | 16.2 | °C | | |
| Field Dissolved Oxygen | 8.4 | mg/L | | |
| **General Parameters** | | | | |
| Total Dissolved Solids @ 180°C | 100 | mg/L | | |
| Total Suspended Solids | 42 | mg/L | | |
| Solids - Settleable | <0.5 | mL/L | | |
| Total Alkalinity as CaCO3 | 37.5 | mg/L | | |
| Boron | 0.03 | mg/L | | |
| Fecal Coliform | 30 | Coliform/100mL | | |
| Total Phosphorus | <0.05 | mg/L | | |
| Turbidity | 15 | N.T.U. | | |
| **Anions** | | | | |
| Bicarbonate as HCO3 | 45.8 | mg/L | 0.75 | meq/L |
| Carbonate as CO3 | 0.00 | mg/L | 0.00 | meq/L |
| Chloride | <1.0 | mg/L | <0.03 | meq/L |
| Nitrate + Nitrite as N | <0.01 | mg/L | <0.01 | meq/L |
| Sulfate | 4.3 | mg/L | 0.09 | meq/L |
| **Cations** | | | | |
| Calcium | 10.5 | mg/L | 0.52 | meq/L |
| Magnesium | 3.5 | mg/L | 0.29 | meq/L |
| Potassium | 1.9 | mg/L | 0.05 | meq/L |
| Sodium | 2.3 | mg/L | 0.10 | meq/L |
| Cations | | | 0.96 | meq/L |
| Anions | | | 0.84 | meq/L |
| Cation-Anion Difference | | | 0.12 | meq/L |
| **Total Metals** | | | | |
| Barium | <0.5 | mg/L | | |
| Iron | 0.96 | mg/L | | |

Reference: U.S.E.P.A 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination of Water and Wastewater", 19th ed., 1995.
EPA 600/R94/111, "Methods for the Determination of Metals in Environmental Samples-Supplement I", May 1994
EPA 600/R93/100, "Methods for the Determination of Inorganic Substances in Environmental Samples", Aug. 1993.

Reviewed By: WN

Wade Nieuwsma, Water Lab Supervisor

Inter-Mountain Laboratories Inc.

1633 Terra Avenue
Sheridan, WY 82801

**Client:** EnTech, Inc.
**Project:** Prairie Dog Creek
**Sample ID:** PDC Below Confluence Jenks Creek
**Lab ID:** 0100W15195
**Matrix:** Water
**Condition:** Cool/Intact
GPS Location: N44.61967 W106.84321

**Date Received:** 08/23/00
**Date Reported:** 09/06/00
**Date Sampled:** 08/23/00
**Time Sampled:** 1045

| Parameter | Analytical Result | Units | | Units |
|---|---|---|---|---|
| **Field Parameters** | | | | |
| Field pH | 8.1 | s.u. | | |
| Field Conductivity | 50 | µmhos/cm | | |
| Field Temperature | 14.8 | °C | | |
| Field Dissolved Oxygen | 6.0 | mg/L | | |
| **General Parameters** | | | | |
| Total Dissolved Solids @ 180°C | 90 | mg/L | | |
| Total Suspended Solids | 45 | mg/L | | |
| Solids - Settleable | <0.5 | mL/L | | |
| Total Alkalinity as CaCO3 | 37.0 | mg/L | | |
| Boron | <0.01 | mg/L | | |
| Fecal Coliform | 62 | Coliform/100mL | | |
| Total Phosphorus | <0.05 | mg/L | | |
| Turbidity | 17 | N.T.U. | | |
| **Anions** | | | | |
| Bicarbonate as HCO3 | 45.1 | mg/L | 0.74 | meq/L |
| Carbonate as CO3 | 0.00 | mg/L | 0.00 | meq/L |
| Chloride | <1.0 | mg/L | <0.03 | meq/L |
| Nitrate + Nitrite as N | <0.01 | mg/L | <0.01 | meq/L |
| Sulfate | 4.7 | mg/L | 0.10 | meq/L |
| **Cations** | | | | |
| Calcium | 10.6 | mg/L | 0.53 | meq/L |
| Magnesium | 3.9 | mg/L | 0.32 | meq/L |
| Potassium | 1.1 | mg/L | 0.03 | meq/L |
| Sodium | 2.0 | mg/L | 0.09 | meq/L |
| Cations | | | 0.97 | meq/L |
| Anions | | | 0.84 | meq/L |
| Cation-Anion Difference | | | 0.13 | meq/L |
| **Total Metals** | | | | |
| Barium | <0.5 | mg/L | | |
| Iron | 1.00 | mg/L | | |

Reference: U.S.E.P.A 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination of Water and Wastewater", 19th ed., 1995.
EPA 600/R94/111, "Methods for the Determination of Metals in Environmental Samples-Supplement I", May 1994
EPA 600/R93/100, "Methods for the Determination of Inorganic Substances in Environmental Samples", Aug. 1993.

Reviewed By: WN

Wade Nieuwsma, Water Lab Supervisor

Inter-Mountain Laboratories Inc.

1633 Terra Avenue
Sheridan, WY 82801

**Client:** EnTech, Inc.
**Project:** Prairie Dog Creek
**Sample ID:** PDC Below Confluence Murphy Gulch
**Lab ID:** 0100W15196
**Matrix:** Water
**Condition:** Cool/Intact
GPS Location: N44.5866 W106.83671

**Date Received:** 08/23/00
**Date Reported:** 09/06/00
**Date Sampled:** 08/23/00
**Time Sampled:** 1120

| Parameter | Analytical Result | Units | | Units |
|---|---|---|---|---|
| **Field Parameters** | | | | |
| Field pH | 8.0 | s.u. | | |
| Field Conductivity | 160 | µmhos/cm | | |
| Field Temperature | 15.6 | °C | | |
| Field Dissolved Oxygen | 5.8 | mg/L | | |
| **General Parameters** | | | | |
| Total Dissolved Solids @ 180°C | 140 | mg/L | | |
| Total Suspended Solids | 50 | mg/L | | |
| Solids - Settleable | <0.5 | mL/L | | |
| Total Alkalinity as CaCO3 | 64.5 | mg/L | | |
| Boron | <0.01 | mg/L | | |
| Fecal Coliform | 350 | Coliform/100mL | | |
| Total Phosphorus | 0.06 | mg/L | | |
| Turbidity | 25 | N.T.U. | | |
| **Anions** | | | | |
| Bicarbonate as HCO3 | 78.7 | mg/L | 1.29 | meq/L |
| Carbonate as CO3 | 0.00 | mg/L | 0.00 | meq/L |
| Chloride | <1.0 | mg/L | <0.03 | meq/L |
| Nitrate + Nitrite as N | <0.01 | mg/L | <0.01 | meq/L |
| Sulfate | 16.9 | mg/L | 0.35 | meq/L |
| **Cations** | | | | |
| Calcium | 18.9 | mg/L | 0.94 | meq/L |
| Magnesium | 8.1 | mg/L | 0.67 | meq/L |
| Potassium | 1.1 | mg/L | 0.03 | meq/L |
| Sodium | 4.0 | mg/L | 0.17 | meq/L |
| Cations | | | 1.81 | meq/L |
| Anions | | | 1.64 | meq/L |
| Cation-Anion Difference | | | 0.17 | meq/L |
| **Total Metals** | | | | |
| Barium | <0.5 | mg/L | | |
| Iron | 1.34 | mg/L | | |

Reference: U.S.E.P.A 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination of Water and Wastewater", 19th ed., 1995.
EPA 600/R94/111, "Methods for the Determination of Metals in Environmental Samples-Supplement I", May 1994
EPA 600/R93/100, "Methods for the Determination of Inorganic Substances in Environmental Samples", Aug. 1993.

Reviewed By: WN

Wade Nieuwsma, Water Lab Supervisor

Inter-Mountain Laboratories Inc.

1633 Terra Avenue
Sheridan, WY 82801

**Client:** EnTech, Inc.
**Project:** Prairie Dog Creek
**Sample ID:** PDC Below Confluence Meade Creek
**Lab ID:** 0100W15197
**Matrix:** Water
**Condition:** Cool/Intact
GPS Location: N44.70498 W106.85803

**Date Received:** 08/23/00
**Date Reported:** 09/06/00
**Date Sampled:** 08/23/00
**Time Sampled:** 1145

| Parameter | Analytical Result | Units | | Units |
|---|---|---|---|---|
| **Field Parameters** | | | | |
| Field pH | 8.0 | s.u. | | |
| Field Conductivity | 250 | µmhos/cm | | |
| Field Temperature | 16.1 | °C | | |
| Field Dissolved Oxygen | 5.8 | mg/L | | |
| **General Parameters** | | | | |
| Total Dissolved Solids @ 180°C | 170 | mg/L | | |
| Total Suspended Solids | 48 | mg/L | | |
| Solids - Settleable | <0.5 | mL/L | | |
| Total Alkalinity as CaCO3 | 93.0 | mg/L | | |
| Boron | 0.03 | mg/L | | |
| Fecal Coliform | 470 | Coliform/100mL | | |
| Total Phosphorus | 0.07 | mg/L | | |
| Turbidity | 27 | N.T.U. | | |
| **Anions** | | | | |
| Bicarbonate as HCO3 | 114 | mg/L | 1.86 | meq/L |
| Carbonate as CO3 | 0.00 | mg/L | 0.00 | meq/L |
| Chloride | <1.0 | mg/L | <0.03 | meq/L |
| Nitrate + Nitrite as N | 0.05 | mg/L | <0.01 | meq/L |
| Sulfate | 32.2 | mg/L | 0.67 | meq/L |
| **Cations** | | | | |
| Calcium | 26.9 | mg/L | 1.34 | meq/L |
| Magnesium | 12.5 | mg/L | 1.03 | meq/L |
| Potassium | 1.8 | mg/L | 0.05 | meq/L |
| Sodium | 6.8 | mg/L | 0.30 | meq/L |
| Cations | | | 2.72 | meq/L |
| Anions | | | 2.53 | meq/L |
| Cation-Anion Difference | | | 0.19 | meq/L |
| **Total Metals** | | | | |
| Barium | <0.5 | mg/L | | |
| Iron | 1.33 | mg/L | | |

Reference: U.S.E.P.A 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination of Water and Wastewater", 19th ed., 1995.
EPA 600/R94/111, "Methods for the Determination of Metals in Environmental Samples-Supplement I", May 1994
EPA 600/R93/100, "Methods for the Determination of Inorganic Substances in Environmental Samples", Aug. 1993.

Reviewed By: WN

Wade Nieuwsma, Water Lab Supervisor

Inter-Mountain Laboratories Inc.

1633 Terra Avenue
Sheridan, WY 82801

**Client:** EnTech, Inc.
**Project:** Prairie Dog Creek
**Sample ID:** PDC Above Hwy 336
**Lab ID:** 0100W15198
**Matrix:** Water
**Condition:** Cool/Intact
GPS Location: N44.82041 W106.90114

**Date Received:** 08/23/00
**Date Reported:** 09/06/00
**Date Sampled:** 08/23/00
**Time Sampled:** 1245

| Parameter | Analytical Result | Units | | Units |
|---|---|---|---|---|
| **Field Parameters** | | | | |
| Field pH | 8.2 | s.u. | | |
| Field Conductivity | 560 | µmhos/cm | | |
| Field Temperature | 18.9 | °C | | |
| Field Dissolved Oxygen | 5.6 | mg/L | | |
| **General Parameters** | | | | |
| Total Dissolved Solids @ 180°C | 410 | mg/L | | |
| Total Suspended Solids | 55 | mg/L | | |
| Solids - Settleable | <0.5 | mL/L | | |
| Total Alkalinity as CaCO3 | 177 | mg/L | | |
| Boron | 0.06 | mg/L | | |
| Fecal Coliform | 400 | Coliform/100mL | | |
| Total Phosphorus | <0.05 | mg/L | | |
| Turbidity | 35 | N.T.U. | | |
| **Anions** | | | | |
| Bicarbonate as HCO3 | 216 | mg/L | 3.54 | meq/L |
| Carbonate as CO3 | 0.00 | mg/L | 0.00 | meq/L |
| Chloride | 1.2 | mg/L | 0.03 | meq/L |
| Nitrate + Nitrite as N | 0.07 | mg/L | 0.01 | meq/L |
| Sulfate | 137 | mg/L | 2.86 | meq/L |
| **Cations** | | | | |
| Calcium | 60.0 | mg/L | 2.99 | meq/L |
| Magnesium | 31.5 | mg/L | 2.59 | meq/L |
| Potassium | 3.7 | mg/L | 0.09 | meq/L |
| Sodium | 13.2 | mg/L | 0.57 | meq/L |
| Cations | | | 6.24 | meq/L |
| Anions | | | 6.44 | meq/L |
| Cation/Anion Balance | | | 1.58 | % |
| **Total Metals** | | | | |
| Barium | <0.5 | mg/L | | |
| Iron | 1.44 | mg/L | | |

Reference: U.S.E.P.A 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination of Water and Wastewater", 19th ed., 1995.
EPA 600/R94/111, "Methods for the Determination of Metals in Environmental Samples-Supplement I", May 1994
EPA 600/R93/100, "Methods for the Determination of Inorganic Substances in Environmental Samples", Aug. 1993.

Reviewed By: WN

Wade Nieuwsma, Water Lab Supervisor

Inter-Mountain Laboratories, Inc.

1633 Terra Avenue
Sheridan, WY 82801

| | | | |
|---|---|---|---|
| **Client:** | **EnTech, Inc.** | | |
| **Project:** | **Prairie Dog Creek** | | |
| **Sample ID:** | PDC Below Confluence Wildcat Creek | **Date Received:** | 08/23/00 |
| **Lab ID:** | 0100W15199 | **Date Reported:** | 09/06/00 |
| **Matrix:** | Water | **Date Sampled:** | 08/23/00 |
| **Condition:** | Cool/Intact | **Time Sampled:** | 1310 |

GPS Location: N44.85370 W106.86276

| Parameter | Analytical Result | Units | | Units |
|---|---|---|---|---|
| **Field Parameters** | | | | |
| Field pH | 7.5 | s.u. | | |
| Field Conductivity | 670 | µmhos/cm | | |
| Field Temperature | 18.8 | °C | | |
| Field Dissolved Oxygen | 5.6 | mg/L | | |
| **General Parameters** | | | | |
| Total Dissolved Solids @ 180°C | 540 | mg/L | | |
| Total Suspended Solids | 51 | mg/L | | |
| Solids - Settleable | <0.5 | mL/L | | |
| Total Alkalinity as CaCO3 | 199 | mg/L | | |
| Boron | 0.06 | mg/L | | |
| Fecal Coliform | 310 | Coliform/100mL | | |
| Total Phosphorus | <0.05 | mg/L | | |
| Turbidity | 35 | N.T.U. | | |
| **Anions** | | | | |
| Bicarbonate as HCO3 | 242 | mg/L | 3.97 | meq/L |
| Carbonate as CO3 | 0.00 | mg/L | 0.00 | meq/L |
| Chloride | 1.4 | mg/L | 0.04 | meq/L |
| Nitrate + Nitrite as N | 0.38 | mg/L | 0.03 | meq/L |
| Sulfate | 181 | mg/L | 3.76 | meq/L |
| **Cations** | | | | |
| Calcium | 75.9 | mg/L | 3.79 | meq/L |
| Magnesium | 38.8 | mg/L | 3.19 | meq/L |
| Potassium | 3.8 | mg/L | 0.10 | meq/L |
| Sodium | 18.9 | mg/L | 0.82 | meq/L |
| Cations | | | 7.90 | meq/L |
| Anions | | | 7.80 | meq/L |
| Cation/Anion Balance | | | 0.64 | % |
| **Total Metals** | | | | |
| Barium | <0.5 | mg/L | | |
| Iron | 1.44 | mg/L | | |

Reference: U.S.E.P.A 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination of Water and Wastewater", 19th ed., 1995.
EPA 600/R94/111, "Methods for the Determination of Metals in Environmental Samples-Supplement I", May 1994
EPA 600/R93/100, "Methods for the Determination of Inorganic Substances in Environmental Samples", Aug. 1993.

Reviewed By: WN

Wade Nieuwsma, Water Lab Supervisor

## Inter-Mountain Laboratories Inc.

1633 Terra Avenue
Sheridan, WY 82801

**Client:** EnTech, Inc.
**Project:** Prairie Dog Creek
**Sample ID:** PDC Below Confluence Dutch Creek
**Lab ID:** 0100W15200
**Matrix:** Water
**Condition:** Cool/Intact
GPS Location: N44.8197 W106.84748

**Date Received:** 08/23/00
**Date Reported:** 09/06/00
**Date Sampled:** 08/23/00
**Time Sampled:** 1345

| Parameter | Analytical Result | Units | | Units |
|---|---|---|---|---|
| **Field Parameters** | | | | |
| Field pH | 8.3 | s.u. | | |
| Field Conductivity | 760 | µmhos/cm | | |
| Field Temperature | 19.5 | °C | | |
| Field Dissolved Oxygen | 5.7 | mg/L | | |
| **General Parameters** | | | | |
| Total Dissolved Solids @ 180°C | 580 | mg/L | | |
| Total Suspended Solids | 41 | mg/L | | |
| Solids - Settleable | <0.5 | mL/L | | |
| Total Alkalinity as CaCO3 | 208 | mg/L | | |
| Boron | 0.08 | mg/L | | |
| Fecal Coliform | 380 | Coliform/100mL | | |
| Total Phosphorus | <0.05 | mg/L | | |
| Turbidity | 31 | N.T.U. | | |
| **Anions** | | | | |
| Bicarbonate as HCO3 | 254 | mg/L | 4.16 | meq/L |
| Carbonate as CO3 | 0.00 | mg/L | 0.00 | meq/L |
| Chloride | 1.5 | mg/L | 0.04 | meq/L |
| Nitrate + Nitrite as N | 0.39 | mg/L | 0.03 | meq/L |
| Sulfate | 201 | mg/L | 4.19 | meq/L |
| **Cations** | | | | |
| Calcium | 81.3 | mg/L | 4.06 | meq/L |
| Magnesium | 41.0 | mg/L | 3.37 | meq/L |
| Potassium | 4.1 | mg/L | 0.10 | meq/L |
| Sodium | 22.0 | mg/L | 0.96 | meq/L |
| Cations | | | 8.49 | meq/L |
| Anions | | | 8.42 | meq/L |
| Cation/Anion Balance | | | 0.41 | % |
| **Total Metals** | | | | |
| Barium | <0.5 | mg/L | | |
| Iron | 1.21 | mg/L | | |

Reference: U.S.E.P.A 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination of Water and Wastewater", 19th ed., 1995.
EPA 600/R94/111, "Methods for the Determination of Metals in Environmental Samples-Supplement I", May 1994
EPA 600/R93/100, "Methods for the Determination of Inorganic Substances in Environmental Samples", Aug. 1993.

Reviewed By: WN

Wade Nieuwsma, Water Lab Supervisor

# Inter-Mountain Laboratories Inc.

1633 Terra Avenue
Sheridan, WY 82801

**Client:** EnTech, Inc.
**Project:** Prairie Dog Creek
**Sample ID:** PDC Below Confluence Coutant Creek
**Lab ID:** 0100W15202
**Matrix:** Water
**Condition:** Cool/Intact
GPS Location: N44.97251 W106.83927

**Date Received:** 08/23/00
**Date Reported:** 09/06/00
**Date Sampled:** 08/23/00
**Time Sampled:** 1435

| Parameter | Analytical Result | Units | | Units |
|---|---|---|---|---|
| **Field Parameters** | | | | |
| Field pH | 8.3 | s.u. | | |
| Field Conductivity | 1,040 | µmhos/cm | | |
| Field Temperature | 19.5 | °C | | |
| Field Dissolved Oxygen | 5.7 | mg/L | | |
| **General Parameters** | | | | |
| Total Dissolved Solids @ 180°C | 800 | mg/L | | |
| Total Suspended Solids | 77 | mg/L | | |
| Solids - Settleable | <0.5 | mL/L | | |
| Total Alkalinity as CaCO3 | 253 | mg/L | | |
| Boron | 0.11 | mg/L | | |
| Fecal Coliform | 106 | Coliform/100mL | | |
| Total Phosphorus | <0.05 | mg/L | | |
| Turbidity | 49 | N.T.U. | | |
| **Anions** | | | | |
| Bicarbonate as HCO3 | 308 | mg/L | 5.05 | meq/L |
| Carbonate as CO3 | 0.00 | mg/L | 0.00 | meq/L |
| Chloride | 2.2 | mg/L | 0.06 | meq/L |
| Nitrate + Nitrite as N | 0.25 | mg/L | 0.02 | meq/L |
| Sulfate | 310 | mg/L | 6.46 | meq/L |
| **Cations** | | | | |
| Calcium | 95.8 | mg/L | 4.78 | meq/L |
| Magnesium | 54.8 | mg/L | 4.51 | meq/L |
| Potassium | 5.1 | mg/L | 0.13 | meq/L |
| Sodium | 51.7 | mg/L | 2.25 | meq/L |
| Cations | | | 11.67 | meq/L |
| Anions | | | 11.59 | meq/L |
| Cation/Anion Balance | | | 0.34 | % |
| **Total Metals** | | | | |
| Barium | <0.5 | mg/L | | |
| Iron | 1.84 | mg/L | | |

Reference: U.S.E.P.A 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination of Water and Wastewater", 19th ed., 1995.
EPA 600/R94/111, "Methods for the Determination of Metals in Environmental Samples-Supplement I", May 1994
EPA 600/R93/100, "Methods for the Determination of Inorganic Substances in Environmental Samples", Aug. 1993.

Reviewed By: WN

Wade Nieuwsma, Water Lab Supervisor

Inter-Mountain Laboratories, Inc.

1633 Terra Avenue
Sheridan, WY 82801

**Client:** EnTech, Inc.
**Project:** Prairie Dog Creek
**Sample ID:** PDC Above Confluence Tongue River
**Lab ID:** 0100W15201
**Matrix:** Water
**Condition:** Cool/Intact
GPS Location: N44.9815 W106.83899

**Date Received:** 08/23/00
**Date Reported:** 09/06/00
**Date Sampled:** 08/23/00
**Time Sampled:** 1415

| Parameter | Analytical Result | Units | | Units |
|---|---|---|---|---|
| **Field Parameters** | | | | |
| Field pH | 8.2 | s.u. | | |
| Field Conductivity | 1,030 | µmhos/cm | | |
| Field Temperature | 19.8 | °C | | |
| Field Dissolved Oxygen | 5.6 | mg/L | | |
| **General Parameters** | | | | |
| Total Dissolved Solids @ 180°C | 830 | mg/L | | |
| Total Suspended Solids | 101 | mg/L | | |
| Solids - Settleable | <0.5 | mL/L | | |
| Total Alkalinity as CaCO3 | 259 | mg/L | | |
| Boron | 0.11 | mg/L | | |
| Fecal Coliform | 400 | Coliform/100mL | | |
| Total Phosphorus | <0.05 | mg/L | | |
| Turbidity | 63 | N.T.U. | | |
| **Anions** | | | | |
| Bicarbonate as HCO3 | 316 | mg/L | 5.18 | meq/L |
| Carbonate as CO3 | 0.00 | mg/L | 0.00 | meq/L |
| Chloride | 2.4 | mg/L | 0.07 | meq/L |
| Nitrate + Nitrite as N | 0.26 | mg/L | 0.02 | meq/L |
| Sulfate | 325 | mg/L | 6.76 | meq/L |
| **Cations** | | | | |
| Calcium | 101 | mg/L | 5.04 | meq/L |
| Magnesium | 55.3 | mg/L | 4.55 | meq/L |
| Potassium | 5.9 | mg/L | 0.15 | meq/L |
| Sodium | 53.8 | mg/L | 2.34 | meq/L |
| Cations | | | 12.08 | meq/L |
| Anions | | | 12.03 | meq/L |
| Cation/Anion Balance | | | 0.21 | % |
| **Total Metals** | | | | |
| Barium | <0.5 | mg/L | | |
| Iron | 2.67 | mg/L | | |

Reference: U.S.E.P.A 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination of Water and Wastewater", 19th ed., 1995.
EPA 600/R94/111, "Methods for the Determination of Metals in Environmental Samples-Supplement I", May 1994
EPA 600/R93/100, "Methods for the Determination of Inorganic Substances in Environmental Samples", Aug. 1993.

Reviewed By: WN

Wade Nieuwsma, Water Lab Supervisor

# Entech, Inc.

Prairie Dog Creek Project

| Site | Field pH s.u. | Field EC umhos/cm | Field Temp. C | Dissolved Oxygen mg/L | Turbidity NTU | Flow cfs |
|---|---|---|---|---|---|---|
| Prairie Dog Ditch | 7.3 | 40 | 10.0 | 8.2 | 1.8 | 50.0 |
| Prairie Dog Creek above Highway 87 | 7.8 | 420 | 11.0 | 6.9 | 0.35 | 0.17 |
| Jenks Creek above confluence with Prairie Dog Creek | 7.7 | 85 | 11.1 | 8.0 | 6.7 | 36.8 |
| Prairie Dog Creek below confluence with Jenks Creek | 7.8 | 85 | 11.3 | 8.2 | 7.5 | 43.8 |
| Prairie Dog Creek below confluence with Murphy Gulch | 8.0 | 200 | 12.2 | 7.9 | 8.1 | 39.8 |
| Prairie Dog Creek below confluence with Meade Creek | 7.9 | 320 | 13.5 | 7.8 | 8.3 | 20.8 |
| Prairie Dog Creek above Highway 336 | 8.0 | 760 | 16.4 | 7.3 | 11 | 18.5 |
| Prairie Dog Creek below confluence with Wildcat Creek | 8.3 | 880 | 16.1 | 7.4 | 11 | 22.2 |
| Prairie Dog Creek below confluence with Dutch Creek | 8.4 | 930 | 17.1 | 7.4 | 10 | 17.9 |
| Prairie Dog Creek below confluence with Coutant Creek | 8.0 | 1,160 | 16.7 | 8.0 | 19 | 22.5 |
| Prairie Dog Creek above confluence with Tongue River | 8.3 | 1,220 | 17.4 | 8.1 | 15 | 21.1 |

Sampled 9/12/00

Inter-Mountain Laboratories
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Sheridan, WY 82801

# Entech, Inc.

Prairie Dog Creek Project

| Site | Field pH s.u. | Field EC umhos/cm | Field Temp. C | DO mg/L | Flow cfs | Turbidity NTU | Fecal Col. colonies/100mL |
|---|---|---|---|---|---|---|---|
| Prairie Dog Ditch | 7.1 | 210 | 5.7 | 8.5 | 0.43 | 0.6 | 9 |
| Prairie Dog Creek above Highway 87 | 7.6 | 390 | 8.9 | 6.4 | 0.26 | 0.6 | 5 |
| Jenks Creek above confl. with Prairie Dog Creek | 8.5 | 570 | 9.3 | 7.2 | 1.0 | 50 | 21 |
| Prairie Dog Creek below confl. with Jenks Creek | 8.4 | 550 | 9.8 | 7.6 | 4.4 | 26 | 26 |
| Prairie Dog Creek below confl. with Murphy Gulch | 8.6 | 730 | 10.1 | 6.9 | 8.8 | 4.8 | 24 |
| Prairie Dog Creek below confl. with Meade Creek | 8.6 | 710 | 10.8 | 7.1 | 16.7 | 4.7 | 62 |
| Prairie Dog Creek above Highway 336 | 8.5 | 740 | 11.0 | 6.4 | 27.3 | 18 | 15 |
| Prairie Dog Creek below confl. with Wildcat Creek | 8.6 | 810 | 10.5 | 7.0 | 33.8 | 26 | 1,050 |
| Prairie Dog Creek below confl. with Dutch Creek | 8.5 | 830 | 10.8 | 6.6 | 36.1 | 360 | 116 |
| Prairie Dog Creek below confl. with Coutant Creek | 8.5 | 810 | 10.2 | 7.0 | 45.3 | 550 | 148 |
| Prairie Dog Creek above confl. with Tongue River | 8.4 | 820 | 10.3 | 6.9 | 43.4 | 230 | 183 |

Sampled 10/11/00

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Sheridan, WY 82801

# Entech, Inc.

Prairie Dog Creek Project

| Site | Field pH s.u. | Field EC umhos/cm | Field Temp. C | DO mg/L | Flow cfs | Turbidity NTU | Fecal Col. colonies/100mL |
|---|---|---|---|---|---|---|---|
| Prairie Dog Ditch | 6.7 | 110 | 0.6 | 11.6 | NA* | 0.86 | 1 |
| Prairie Dog Creek above Highway 87 | 7.5 | 410 | 1.2 | 11.5 | 0.03 | 0.35 | 1 |
| Jenks Creek above confl. with Prairie Dog Creek | 8.3 | 870 | 0.7 | 11.9 | NA* | 2.6 | 5 |
| Prairie Dog Creek below confl. with Jenks Creek | 8.5 | 700 | 0.7 | 12.2 | 1.7 | 1.7 | 0 |
| Prairie Dog Creek below confl. with Murphy Gulch | 8.6 | 810 | 0.8 | 12.2 | NA* | 1.5 | 98 |
| Prairie Dog Creek below confl. with Meade Creek | 8.6 | 780 | 0.7 | 11.8 | NA* | 1.4 | 18 |
| Prairie Dog Creek above Highway 336 | 8.5 | 920 | 0.7 | 11.9 | NA* | 4.7 | 6 |
| Prairie Dog Creek below confl. with Wildcat Creek | 8.5 | 1,150 | 0.6 | 12.2 | 7.6 | 5.2 | 6 |
| Prairie Dog Creek below confl. with Dutch Creek | 8.4 | 1,220 | 0.6 | 12.0 | NA* | 10.3 | 8 |
| Prairie Dog Creek below confl. with Coutant Creek | 8.4 | 1,380 | 0.6 | 11.7 | NA* | 17.9 | 13 |
| Prairie Dog Creek above confl. with Tongue River | 8.4 | 1,420 | 0.6 | 11.7 | 13.3 | 13.8 | 1 |

Sampled 2/1/01

*No flow determined due to ice and snow in stream channel

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Sheridan, WY 82801

# Entech, Inc.

## Prairie Dog Creek Project

| Site | Field pH s.u. | Field EC umhos/cm | Field Temp. C | DO mg/L | Flow cfs | Turbidity NTU | Fecal Col. colonies/100mL |
|---|---|---|---|---|---|---|---|
| Prairie Dog Ditch | 7.8 | 140 | 4.3 | 12.0 | 0.41 | 2.1 | 2 |
| Prairie Dog Creek above Highway 87 | 8.5 | 350 | 7.7 | 10.1 | 0.36 | 2.6 | <1 |
| Jenks Creek above confl. with Prairie Dog Creek | 8.5 | 870 | 11.9 | 9.9 | 1.1 | 4.0 | 91 |
| Prairie Dog Creek below confl. with Jenks Creek | 8.5 | 630 | 11.7 | 9.6 | 3.6 | 3.3 | 79 |
| Prairie Dog Creek below confl. with Murphy Gulch | 8.4 | 960 | 11.4 | 10.7 | 5.8 | 5.7 | 2 |
| Prairie Dog Creek below confl. with Meade Creek | 8.6 | 940 | 13.1 | 10.5 | 10.2 | 3.9 | 99 |
| Prairie Dog Creek above Highway 336 | 8.5 | 1,050 | 16.5 | 9.8 | 11.3 | 5.8 | 15 |
| Prairie Dog Creek below confl. with Wildcat Creek | 8.6 | 1,280 | 18.1 | 9.7 | 13.4 | 7.5 | 2 |
| Prairie Dog Creek below confl. with Dutch Creek | 8.7 | 1,630 | 17.6 | 9.8 | 16.9 | 9.1 | 7 |
| Prairie Dog Creek below confl. with Coutant Creek | 8.6 | 1,700 | 17.6 | 12.4 | 21.7 | 8.8 | 2 |
| Prairie Dog Creek above confl. with Tongue River | 8.8 | 1,700 | 17.4 | 13.6 | 21.6 | 8.2 | 5 |

Sampled 4/26/01

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# Entech, Inc.

Prairie Dog Creek Project

| Site | Field pH s.u. | Field EC umhos/cm | Field Temp. C | DO mg/L | Flow cfs | Turbidity NTU | Fecal Col. colonies/100mL |
|---|---|---|---|---|---|---|---|
| Prairie Dog Ditch | 7.5 | 1050 | 10.5 | 9.6 | 60.2 | 0.9 | 22 |
| Prairie Dog Creek above Highway 87 | 7.9 | 4420 | 10.0 | 8.8 | 0.61 | 5.4 | 88 |
| Jenks Creek above confl. with Prairie Dog Creek | 7.7 | 130 | 12.7 | 9.2 | 45.9 | 22.0 | 27 |
| Prairie Dog Creek below confl. with Jenks Creek | 7.6 | 100 | 13.0 | 9.7 | 49.2 | 26.8 | 32 |
| Prairie Dog Creek below confl. with Murphy Gulch | 7.7 | 200 | 14.4 | 9.0 | 60.1 | 39.7 | 1100 |
| Prairie Dog Creek below confl. with Meade Creek | 7.5 | 290 | 15.5 | 8.7 | 58.8 | 44.3 | 490 |
| Prairie Dog Creek above Highway 336 | 7.8 | 390 | 19.3 | 7.7 | 31.7 | 113 | 390 |
| Prairie Dog Creek below confl. with Wildcat Creek | 7.8 | 490 | 20.6 | 7.7 | 32.2 | 105 | 390 |
| Prairie Dog Creek below confl. with Dutch Creek | 7.8 | 690 | 19.9 | 7.2 | 27.2 | 71.4 | 224 |
| Prairie Dog Creek below confl. with Coutant Creek | 8.0 | 800 | 21.2 | 6.5 | 27.7 | 114 | 330 |
| Prairie Dog Creek above confl. with Tongue River | 8.0 | 810 | 21.6 | 7.3 | 29.6 | 141 | 510 |

Sampled 6/21/01

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Sheridan, WY 82801

# Entech, Inc.

Prairie Dog Creek Project

| Site | Field pH s.u. | Field EC umhos/cm | Field Temp. C | DO mg/L | Flow cfs | Turbidity NTU | Fecal Col. colonies/100mL |
|---|---|---|---|---|---|---|---|
| Prairie Dog Ditch | 7.0 | 40 | 14.0 | 11.1 | 55.2 | 1.6 | 86 |
| Prairie Dog Creek above Highway 87 | 7.3 | 430 | 12.4 | 10.6 | 0.15 | 1.3 | 80 |
| Jenks Creek above confl. with Prairie Dog Creek | 7.4 | 70 | 15.3 | 11.4 | 42.6 | 13.2 | 52 |
| Prairie Dog Creek below confl. with Jenks Creek | 7.4 | 70 | 15.5 | 11.3 | 40.2 | 12.3 | 520 |
| Prairie Dog Creek below confl. with Murphy Gulch | 7.5 | 140 | 16.3 | 11.3 | 43.4 | 14.0 | 360 |
| Prairie Dog Creek below confl. with Meade Creek | 7.4 | 250 | 16.9 | 10.8 | 41.7 | 25.6 | 590 |
| Prairie Dog Creek above Highway 336 | 7.6 | 530 | 20.2 | 10.2 | 11.9 | 21.1 | 210 |
| Prairie Dog Creek below confl. with Wildcat Creek | 7.9 | 710 | 20.8 | 10.5 | 7.0 | 27.9 | 310 |
| Prairie Dog Creek below confl. with Dutch Creek | 7.8 | 1,250 | 23.1 | 15.3 | 1.4 | 1.8 | 161 |
| Prairie Dog Creek below confl. with Coutant Creek | 8.0 | 1,820 | 22.0 | 13.2 | 3.1 | 5.0 | 82 |
| Prairie Dog Creek above confl. with Tongue River | 8.0 | 1,800 | 23.1 | 12.3 | 4.2 | 5.8 | 59 |

Sampled 8/16/01

Inter-Mountain Laboratories
555 Absaraka Ave.
Sheridan, WY 82801

# Inter-Mountain Laboratories, Inc.

1633 Terra Avenue
Sheridan, WY 82801

**Client:** EnTech, Inc.
**Project:** Prairie Dog Creek
**Sample ID:** Prairie Dog Ck. Above Hwy. 87
**Lab ID:** 0101W15137
**Matrix:** Water
**Condition:** Cool/Intact

**Date Received:** 08/16/01
**Date Reported:** 09/04/01
**Date Sampled:** 08/16/01
**Time Sampled:** 0835

| Parameter | Analytical Result | Units | | Units |
|---|---|---|---|---|
| **Field Parameters** | | | | |
| Field pH | 7.3 | s.u. | | |
| Field Conductivity | 430 | µmhos/cm | | |
| Field Temperature | 12.4 | °C | | |
| Field Dissolved Oxygen | 10.6 | mg/L | | |
| **General Parameters** | | | | |
| Total Dissolved Solids @ 180°C | 290 | mg/L | | |
| Total Suspended Solids | 5 | mg/L | | |
| Solids - Settleable | <0.5 | mL/L | | |
| Total Alkalinity as CaCO3 | 255 | mg/L | | |
| Boron | <0.01 | mg/L | | |
| Total Phosphorus | <0.05 | mg/L | | |
| Fecal Coliform | 80 | Coliform/100mL | | |
| Turbidity | 1.3 | N.T.U. | | |
| Sodium Adsorption Ratio | 0.1 | | | |
| **Anions** | | | | |
| Bicarbonate as HCO3 | 311 | mg/L | 5.10 | meq/L |
| Carbonate as CO3 | 0.00 | mg/L | 0.00 | meq/L |
| Chloride | <1.0 | mg/L | <0.03 | meq/L |
| Nitrate + Nitrite as N | 0.84 | mg/L | 0.06 | meq/L |
| Sulfate | 5.8 | mg/L | 0.12 | meq/L |
| **Cations** | | | | |
| Calcium | 64.7 | mg/L | 3.23 | meq/L |
| Magnesium | 21.8 | mg/L | 1.80 | meq/L |
| Potassium | 1.2 | mg/L | 0.03 | meq/L |
| Sodium | 3.9 | mg/L | 0.17 | meq/L |
| Cations | | | 5.23 | meq/L |
| Anions | | | 5.28 | meq/L |
| Cation/Anion Balance | | | 0.48 | % |
| **Total Metals** | | | | |
| Barium | <0.5 | mg/L | | |
| Iron | 0.14 | mg/L | | |

Reference: U.S.E.P.A 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination of Water and Wastewater", 19th ed., 1995.
EPA 600/R94/111, "Methods for the Determination of Metals in Environmental Samples-Supplement I", May 1994
EPA 600/R93/100, "Methods for the Determination of Inorganic Substances in Environmental Samples", Aug. 1993.

Reviewed By: WN

Wade Nieuwsma, Water Lab Supervisor

## Inter-Mountain Laboratories, Inc.

1633 Terra Avenue
Sheridan, WY 82801

**Client:** EnTech, Inc.
**Project:** Prairie Dog Creek
**Sample ID:** Jenk's Ck. Above Prairie Dog Ck.
**Lab ID:** 0101W15138
**Matrix:** Water
**Condition:** Cool/Intact

**Date Received:** 08/16/01
**Date Reported:** 09/04/01
**Date Sampled:** 08/16/01
**Time Sampled:** 0910

| Parameter | Analytical Result | Units | | Units |
|---|---|---|---|---|
| **Field Parameters** | | | | |
| Field pH | 7.4 | s.u. | | |
| Field Conductivity | 70 | µmhos/cm | | |
| Field Temperature | 15.3 | °C | | |
| Field Dissolved Oxygen | 11.4 | mg/L | | |
| **General Parameters** | | | | |
| Total Dissolved Solids @ 180°C | 50 | mg/L | | |
| Total Suspended Solids | 38 | mg/L | | |
| Solids - Settleable | <0.5 | mL/L | | |
| Total Alkalinity as CaCO3 | 31.5 | mg/L | | |
| Boron | <0.01 | mg/L | | |
| Total Phosphorus | 0.06 | mg/L | | |
| Fecal Coliform | 52 | Coliform/100mL | | |
| Turbidity | 13 | N.T.U. | | |
| Sodium Adsorption Ratio | 0.1 | | | |
| **Anions** | | | | |
| Bicarbonate as HCO3 | 38.4 | mg/L | 0.63 | meq/L |
| Carbonate as CO3 | 0.00 | mg/L | 0.00 | meq/L |
| Chloride | <1.0 | mg/L | <0.03 | meq/L |
| Nitrate + Nitrite as N | 0.02 | mg/L | <0.01 | meq/L |
| Sulfate | 3.4 | mg/L | 0.07 | meq/L |
| **Cations** | | | | |
| Calcium | 10.0 | mg/L | 0.50 | meq/L |
| Magnesium | 3.5 | mg/L | 0.29 | meq/L |
| Potassium | <1.0 | mg/L | <0.03 | meq/L |
| Sodium | 1.7 | mg/L | 0.07 | meq/L |
| Cations | | | 0.86 | meq/L |
| Anions | | | 0.70 | meq/L |
| Cation-Anion Difference | | | 0.16 | meq/L |
| **Total Metals** | | | | |
| Barium | <0.5 | mg/L | | |
| Iron | 1.06 | mg/L | | |

Reference: U.S.E.P.A 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination of Water and Wastewater", 19th ed., 1995.
EPA 600/R94/111, "Methods for the Determination of Metals in Environmental Samples-Supplement I", May 1994
EPA 600/R93/100, "Methods for the Determination of Inorganic Substances in Environmental Samples", Aug. 1993.

Reviewed By: WN

Wade Nieuwsma, Water Lab Supervisor

## Inter-Mountain Laboratories, Inc.

1633 Terra Avenue
Sheridan, WY 82801

**Client:** EnTech, Inc.
**Project:** Prairie Dog Creek
**Sample ID:** Prairie Dog Ck. Below Jenk's Ck.
**Lab ID:** 0101W15139
**Matrix:** Water
**Condition:** Cool/Intact

**Date Received:** 08/16/01
**Date Reported:** 09/04/01
**Date Sampled:** 08/16/01
**Time Sampled:** 0935

| Parameter | Analytical Result | Units | | Units |
|---|---|---|---|---|
| **Field Parameters** | | | | |
| Field pH | 7.4 | s.u. | | |
| Field Conductivity | 70 | µmhos/cm | | |
| Field Temperature | 15.5 | °C | | |
| Field Dissolved Oxygen | 11.3 | mg/L | | |
| **General Parameters** | | | | |
| Total Dissolved Solids @ 180°C | 50 | mg/L | | |
| Total Suspended Solids | 53 | mg/L | | |
| Solids - Settleable | <0.5 | mL/L | | |
| Total Alkalinity as CaCO3 | 32.5 | mg/L | | |
| Boron | <0.01 | mg/L | | |
| Total Phosphorus | 0.07 | mg/L | | |
| Fecal Coliform | 520 | Coliform/100mL | | |
| Turbidity | 12 | N.T.U. | | |
| Sodium Adsorption Ratio | 0.1 | | | |
| **Anions** | | | | |
| Bicarbonate as HCO3 | 39.7 | mg/L | 0.65 | meq/L |
| Carbonate as CO3 | 0.00 | mg/L | 0.00 | meq/L |
| Chloride | <1.0 | mg/L | <0.03 | meq/L |
| Nitrate + Nitrite as N | 0.02 | mg/L | <0.01 | meq/L |
| Sulfate | 3.4 | mg/L | 0.07 | meq/L |
| **Cations** | | | | |
| Calcium | 10.2 | mg/L | 0.51 | meq/L |
| Magnesium | 3.1 | mg/L | 0.26 | meq/L |
| Potassium | <1.0 | mg/L | <0.03 | meq/L |
| Sodium | 1.7 | mg/L | 0.07 | meq/L |
| Cations | | | 0.84 | meq/L |
| Anions | | | 0.72 | meq/L |
| Cation-Anion Difference | | | 0.12 | meq/L |
| **Total Metals** | | | | |
| Barium | <0.5 | mg/L | | |
| Iron | 1.12 | mg/L | | |

Reference: U.S.E.P.A 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination of Water and Wastewater", 19th ed., 1995.
EPA 600/R94/111, "Methods for the Determination of Metals in Environmental Samples-Supplement I", May 1994
EPA 600/R93/100, "Methods for the Determination of Inorganic Substances in Environmental Samples", Aug. 1993.

Reviewed By: WN

Wade Nieuwsma, Water Lab Supervisor

## Inter-Mountain Laboratories, Inc.

1633 Terra Avenue
Sheridan, WY 82801

**Client:** **EnTech, Inc.**
**Project:** **Prairie Dog Creek**
**Sample ID:** Prairie Dog Ck. Below Murphy Gulch
**Lab ID:** 0101W15140
**Matrix:** Water
**Condition:** Cool/Intact

**Date Received:** 08/16/01
**Date Reported:** 09/04/01
**Date Sampled:** 08/16/01
**Time Sampled:** 1000

| Parameter | Analytical Result | Units | | Units |
|---|---|---|---|---|
| **Field Parameters** | | | | |
| Field pH | 7.5 | s.u. | | |
| Field Conductivity | 140 | µmhos/cm | | |
| Field Temperature | 16.3 | °C | | |
| Field Dissolved Oxygen | 11.3 | mg/L | | |
| **General Parameters** | | | | |
| Total Dissolved Solids @ 180°C | 100 | mg/L | | |
| Total Suspended Solids | 51 | mg/L | | |
| Solids - Settleable | <0.5 | mL/L | | |
| Total Alkalinity as CaCO3 | 60.0 | mg/L | | |
| Boron | <0.01 | mg/L | | |
| Total Phosphorus | 0.12 | mg/L | | |
| Fecal Coliform | 360 | Coliform/100mL | | |
| Turbidity | 14 | N.T.U. | | |
| Sodium Adsorption Ratio | 0.2 | | | |
| **Anions** | | | | |
| Bicarbonate as HCO3 | 73.2 | mg/L | 1.20 | meq/L |
| Carbonate as CO3 | 0.00 | mg/L | 0.00 | meq/L |
| Chloride | <1.0 | mg/L | <0.03 | meq/L |
| Nitrate + Nitrite as N | 0.01 | mg/L | <0.01 | meq/L |
| Sulfate | 16.0 | mg/L | 0.33 | meq/L |
| **Cations** | | | | |
| Calcium | 18.7 | mg/L | 0.93 | meq/L |
| Magnesium | 7.4 | mg/L | 0.61 | meq/L |
| Potassium | <1.0 | mg/L | <0.03 | meq/L |
| Sodium | 3.7 | mg/L | 0.16 | meq/L |
| | | | | |
| Cations | | | 1.70 | meq/L |
| Anions | | | 1.53 | meq/L |
| Cation-Anion Difference | | | 0.17 | meq/L |
| **Total Metals** | | | | |
| Barium | <0.5 | mg/L | | |
| Iron | 1.31 | mg/L | | |

Reference: U.S.E.P.A 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination of Water and Wastewater", 19th ed., 1995.
EPA 600/R94/111, "Methods for the Determination of Metals in Environmental Samples-Supplement I", May 1994
EPA 600/R93/100, "Methods for the Determination of Inorganic Substances in Environmental Samples", Aug. 1993.

Reviewed By: WN

Wade Nieuwsma, Water Lab Supervisor

## Inter-Mountain Laboratories, Inc.

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Sheridan, WY 82801

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|---|---|---|---|
| **Client:** | **EnTech, Inc.** | | |
| **Project:** | **Prairie Dog Creek** | | |
| **Sample ID:** | Prairie Dog Ck. Below Meade Ck. | **Date Received:** | 08/16/01 |
| **Lab ID:** | 0101W15141 | **Date Reported:** | 09/04/01 |
| **Matrix:** | Water | **Date Sampled:** | 08/16/01 |
| **Condition:** | Cool/Intact | **Time Sampled:** | 1025 |

| Parameter | Analytical Result | Units | | Units |
|---|---|---|---|---|
| **Field Parameters** | | | | |
| Field pH | 7.4 | s.u. | | |
| Field Conductivity | 250 | µmhos/cm | | |
| Field Temperature | 16.9 | °C | | |
| Field Dissolved Oxygen | 10.8 | mg/L | | |
| **General Parameters** | | | | |
| Total Dissolved Solids @ 180°C | 180 | mg/L | | |
| Total Suspended Solids | 61 | mg/L | | |
| Solids - Settleable | <0.5 | mL/L | | |
| Total Alkalinity as CaCO3 | 104 | mg/L | | |
| Boron | <0.01 | mg/L | | |
| Total Phosphorus | 0.14 | mg/L | | |
| Fecal Coliform | 590 | Coliform/100mL | | |
| Turbidity | 26 | N.T.U. | | |
| Sodium Adsorption Ratio | 0.3 | | | |
| **Anions** | | | | |
| Bicarbonate as HCO3 | 126 | mg/L | 2.07 | meq/L |
| Carbonate as CO3 | 0.00 | mg/L | 0.00 | meq/L |
| Chloride | <1.0 | mg/L | 0.03 | meq/L |
| Nitrate + Nitrite as N | 0.10 | mg/L | 0.01 | meq/L |
| Sulfate | 36.9 | mg/L | 0.77 | meq/L |
| **Cations** | | | | |
| Calcium | 29.6 | mg/L | 1.48 | meq/L |
| Magnesium | 14.1 | mg/L | 1.16 | meq/L |
| Potassium | 2.1 | mg/L | 0.05 | meq/L |
| Sodium | 7.0 | mg/L | 0.30 | meq/L |
| Cations | | | 2.99 | meq/L |
| Anions | | | 2.85 | meq/L |
| Cation-Anion Difference | | | 0.14 | meq/L |
| **Total Metals** | | | | |
| Barium | <0.5 | mg/L | | |
| Iron | 1.55 | mg/L | | |

Reference: U.S.E.P.A 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination of Water and Wastewater", 19th ed., 1995.
EPA 600/R94/111, "Methods for the Determination of Metals in Environmental Samples-Supplement I", May 1994
EPA 600/R93/100, "Methods for the Determination of Inorganic Substances in Environmental Samples", Aug. 1993.

Reviewed By: WN

Wade Nieuwsma, Water Lab Supervisor

## Inter-Mountain Laboratories, Inc.

1633 Terra Avenue
Sheridan, WY 82801

**Client:** **EnTech, Inc.**
**Project:** **Prairie Dog Creek**
**Sample ID:** Prairie Dog Ck. Above Hwy. 336
**Lab ID:** 0101W15202
**Matrix:** Water
**Condition:** Cool/Intact

**Date Received:** 08/16/01
**Date Reported:** 09/04/01
**Date Sampled:** 08/16/01
**Time Sampled:** 1135

| Parameter | Analytical Result | Units | | Units |
|---|---|---|---|---|
| **Field Parameters** | | | | |
| Field pH | 7.6 | s.u. | | |
| Field Conductivity | 530 | µmhos/cm | | |
| Field Temperature | 20.2 | °C | | |
| Field Dissolved Oxygen | 10.2 | mg/L | | |
| **General Parameters** | | | | |
| Total Dissolved Solids @ 180°C | 430 | mg/L | | |
| Total Suspended Solids | 54 | mg/L | | |
| Solids - Settleable | <0.5 | mL/L | | |
| Total Alkalinity as CaCO3 | 194 | mg/L | | |
| Boron | 0.10 | mg/L | | |
| Total Phosphorus | <0.05 | mg/L | | |
| Fecal Coliform | 210 | Coliform/100mL | | |
| Turbidity | 21 | N.T.U. | | |
| Sodium Adsorption Ratio | 0.3 | | | |
| **Anions** | | | | |
| Bicarbonate as HCO3 | 237 | mg/L | 3.88 | meq/L |
| Carbonate as CO3 | 0.00 | mg/L | 0.00 | meq/L |
| Chloride | 1.2 | mg/L | 0.03 | meq/L |
| Nitrate + Nitrite as N | 0.09 | mg/L | 0.01 | meq/L |
| Sulfate | 136 | mg/L | 2.83 | meq/L |
| **Cations** | | | | |
| Calcium | 65.2 | mg/L | 3.25 | meq/L |
| Magnesium | 34.3 | mg/L | 2.82 | meq/L |
| Potassium | 4.3 | mg/L | 0.11 | meq/L |
| Sodium | 13.2 | mg/L | 0.57 | meq/L |
| Cations | | | 6.75 | meq/L |
| Anions | | | 6.75 | meq/L |
| Cation/Anion Balance | | | 0.00 | % |
| **Total Metals** | | | | |
| Barium | <0.5 | mg/L | | |
| Iron | 1.35 | mg/L | | |

Reference: U.S.E.P.A 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination of Water and Wastewater", 19th ed., 1995.
EPA 600/R94/111, "Methods for the Determination of Metals in Environmental Samples-Supplement I", May 1994
EPA 600/R93/100, "Methods for the Determination of Inorganic Substances in Environmental Samples", Aug. 1993.

Reviewed By: WN

Wade Nieuwsma, Water Lab Supervisor

# Inter-Mountain Laboratories, Inc.

1633 Terra Avenue
Sheridan, WY 82801

**Client:** **EnTech, Inc.**
**Project:** **Prairie Dog Creek**
**Sample ID:** Prairie Dog Ck. Below Wildcat Ck.
**Lab ID:** 0101W15203
**Matrix:** Water
**Condition:** Cool/Intact

**Date Received:** 08/16/01
**Date Reported:** 09/04/01
**Date Sampled:** 08/16/01
**Time Sampled:** 1210

| Parameter | Analytical Result | Units | | Units |
|---|---|---|---|---|
| **Field Parameters** | | | | |
| Field pH | 7.9 | s.u. | | |
| Field Conductivity | 710 | µmhos/cm | | |
| Field Temperature | 20.8 | °C | | |
| Field Dissolved Oxygen | 10.5 | mg/L | | |
| **General Parameters** | | | | |
| Total Dissolved Solids @ 180°C | 620 | mg/L | | |
| Total Suspended Solids | 56 | mg/L | | |
| Solids - Settleable | <0.5 | mL/L | | |
| Total Alkalinity as CaCO3 | 233 | mg/L | | |
| Boron | 0.10 | mg/L | | |
| Total Phosphorus | 0.06 | mg/L | | |
| Fecal Coliform | 310 | Coliform/100mL | | |
| Turbidity | 28 | N.T.U. | | |
| Sodium Adsorption Ratio | 0.5 | | | |
| **Anions** | | | | |
| Bicarbonate as HCO3 | 284 | mg/L | 4.65 | meq/L |
| Carbonate as CO3 | 0.00 | mg/L | 0.00 | meq/L |
| Chloride | 1.8 | mg/L | 0.05 | meq/L |
| Nitrate + Nitrite as N | 0.08 | mg/L | 0.01 | meq/L |
| Sulfate | 251 | mg/L | 5.23 | meq/L |
| **Cations** | | | | |
| Calcium | 91.0 | mg/L | 4.54 | meq/L |
| Magnesium | 53.1 | mg/L | 4.37 | meq/L |
| Potassium | 4.4 | mg/L | 0.11 | meq/L |
| Sodium | 21.7 | mg/L | 0.94 | meq/L |
| Cations | | | 9.96 | meq/L |
| Anions | | | 9.94 | meq/L |
| Cation/Anion Balance | | | 0.10 | % |
| **Total Metals** | | | | |
| Barium | <0.5 | mg/L | | |
| Iron | 1.54 | mg/L | | |

Reference: U.S.E.P.A 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination of Water and Wastewater", 19th ed., 1995.
EPA 600/R94/111, "Methods for the Determination of Metals in Environmental Samples-Supplement I", May 1994
EPA 600/R93/100, "Methods for the Determination of Inorganic Substances in Environmental Samples", Aug. 1993.

Reviewed By: WN

Wade Nieuwsma, Water Lab Supervisor

**Inter-Mountain Laboratories, Inc.**

1633 Terra Avenue
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|---|---|---|---|
| **Client:** | **EnTech, Inc.** | | |
| **Project:** | **Prairie Dog Creek** | | |
| **Sample ID:** | Prairie Dog Ck. Below Dutch Ck. | **Date Received:** | 08/16/01 |
| **Lab ID:** | 0101W15204 | **Date Reported:** | 09/04/01 |
| **Matrix:** | Water | **Date Sampled:** | 08/16/01 |
| **Condition:** | Cool/Intact | **Time Sampled:** | 1230 |

| Parameter | Analytical Result | Units | | Units |
|---|---|---|---|---|
| **Field Parameters** | | | | |
| Field pH | 7.8 | s.u. | | |
| Field Conductivity | 1,250 | µmhos/cm | | |
| Field Temperature | 23.1 | °C | | |
| Field Dissolved Oxygen | 15.3 | mg/L | | |
| **General Parameters** | | | | |
| Total Dissolved Solids @ 180°C | 1,270 | mg/L | | |
| Total Suspended Solids | 6 | mg/L | | |
| Solids - Settleable | <0.5 | mL/L | | |
| Total Alkalinity as CaCO3 | 284 | mg/L | | |
| Boron | 0.16 | mg/L | | |
| Total Phosphorus | <0.05 | mg/L | | |
| Fecal Coliform | 161 | Coliform/100mL | | |
| Turbidity | 1.8 | N.T.U. | | |
| Sodium Adsorption Ratio | 1.2 | | | |
| **Anions** | | | | |
| Bicarbonate as HCO3 | 347 | mg/L | 5.68 | meq/L |
| Carbonate as CO3 | 0.00 | mg/L | 0.00 | meq/L |
| Chloride | 4.2 | mg/L | 0.12 | meq/L |
| Nitrate + Nitrite as N | 0.08 | mg/L | 0.01 | meq/L |
| Sulfate | 578 | mg/L | 12.03 | meq/L |
| **Cations** | | | | |
| Calcium | 145 | mg/L | 7.24 | meq/L |
| Magnesium | 94.0 | mg/L | 7.74 | meq/L |
| Potassium | 7.8 | mg/L | 0.20 | meq/L |
| Sodium | 76.2 | mg/L | 3.31 | meq/L |
| Cations | | | 18.49 | meq/L |
| Anions | | | 17.84 | meq/L |
| Cation/Anion Balance | | | 1.79 | % |
| **Total Metals** | | | | |
| Barium | <0.5 | mg/L | | |
| Iron | 0.23 | mg/L | | |

Reference: U.S.E.P.A 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination of Water and Wastewater", 19th ed., 1995.
EPA 600/R94/111, "Methods for the Determination of Metals in Environmental Samples-Supplement I", May 1994
EPA 600/R93/100, "Methods for the Determination of Inorganic Substances in Environmental Samples", Aug. 1993.

Reviewed By: WN

Wade Nieuwsma, Water Lab Supervisor

## Inter-Mountain Laboratories, Inc.

1633 Terra Avenue
Sheridan, WY 82801

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|---|---|---|---|---|
| **Client:** | **EnTech, Inc.** | | | |
| **Project:** | **Prairie Dog Creek** | | | |
| **Sample ID:** | Prairie Dog Ck. Below Coutant Ck. | | **Date Received:** | 08/16/01 |
| **Lab ID:** | 0101W15205 | | **Date Reported:** | 09/04/01 |
| **Matrix:** | Water | | **Date Sampled:** | 08/16/01 |
| **Condition:** | Cool/Intact | | **Time Sampled:** | 1255 |

| Parameter | Analytical Result | Units | | Units |
|---|---|---|---|---|
| **Field Parameters** | | | | |
| Field pH | 8.0 | s.u. | | |
| Field Conductivity | 1,820 | µmhos/cm | | |
| Field Temperature | 22.0 | °C | | |
| Field Dissolved Oxygen | 13.2 | mg/L | | |
| **General Parameters** | | | | |
| Total Dissolved Solids @ 180°C | 1,700 | mg/L | | |
| Total Suspended Solids | 18 | mg/L | | |
| Solids - Settleable | <0.5 | mL/L | | |
| Total Alkalinity as CaCO3 | 307 | mg/L | | |
| Boron | 0.20 | mg/L | | |
| Total Phosphorus | <0.05 | mg/L | | |
| Fecal Coliform | 82 | Coliform/100mL | | |
| Turbidity | 5.0 | N.T.U. | | |
| Sodium Adsorption Ratio | 2.1 | | | |
| **Anions** | | | | |
| Bicarbonate as HCO3 | 374 | mg/L | 6.13 | meq/L |
| Carbonate as CO3 | 0.00 | mg/L | 0.00 | meq/L |
| Chloride | 4.5 | mg/L | 0.13 | meq/L |
| Nitrate + Nitrite as N | 0.22 | mg/L | 0.02 | meq/L |
| Sulfate | 860 | mg/L | 17.91 | meq/L |
| **Cations** | | | | |
| Calcium | 154 | mg/L | 7.68 | meq/L |
| Magnesium | 121 | mg/L | 9.96 | meq/L |
| Potassium | 10.7 | mg/L | 0.27 | meq/L |
| Sodium | 144 | mg/L | 6.26 | meq/L |
| Cations | | | 24.17 | meq/L |
| Anions | | | 24.19 | meq/L |
| Cation/Anion Balance | | | 0.04 | % |
| **Total Metals** | | | | |
| Barium | <0.5 | mg/L | | |
| Iron | 0.35 | mg/L | | |

Reference: U.S.E.P.A 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination of Water and Wastewater", 19th ed., 1995.
EPA 600/R94/111, "Methods for the Determination of Metals in Environmental Samples-Supplement I", May 1994
EPA 600/R93/100, "Methods for the Determination of Inorganic Substances in Environmental Samples", Aug. 1993.

Reviewed By: WN

Wade Nieuwsma, Water Lab Supervisor

## Inter-Mountain Laboratories, Inc.

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|---|---|---|---|
| **Client:** | **EnTech, Inc.** | | |
| **Project:** | **Prairie Dog Creek** | | |
| **Sample ID:** | Prairie Dog Ck. Above Tongue River | **Date Received:** | 08/16/01 |
| **Lab ID:** | 0101W15206 | **Date Reported:** | 09/04/01 |
| **Matrix:** | Water | **Date Sampled:** | 08/16/01 |
| **Condition:** | Cool/Intact | **Time Sampled:** | 1320 |

| Parameter | Analytical Result | Units | | Units |
|---|---|---|---|---|
| **Field Parameters** | | | | |
| Field pH | 8.0 | s.u. | | |
| Field Conductivity | 1,800 | µmhos/cm | | |
| Field Temperature | 23.1 | °C | | |
| Field Dissolved Oxygen | 12.3 | mg/L | | |
| **General Parameters** | | | | |
| Total Dissolved Solids @ 180°C | 1,700 | mg/L | | |
| Total Suspended Solids | 10 | mg/L | | |
| Solids - Settleable | <0.5 | mL/L | | |
| Total Alkalinity as CaCO3 | 315 | mg/L | | |
| Boron | 0.19 | mg/L | | |
| Total Phosphorus | <0.05 | mg/L | | |
| Fecal Coliform | 59 | Coliform/100mL | | |
| Turbidity | 5.8 | N.T.U. | | |
| Sodium Adsorption Ratio | 2.1 | | | |
| **Anions** | | | | |
| Bicarbonate as HCO3 | 384 | mg/L | 6.29 | meq/L |
| Carbonate as CO3 | 0.00 | mg/L | 0.00 | meq/L |
| Chloride | 4.4 | mg/L | 0.13 | meq/L |
| Nitrate + Nitrite as N | 0.04 | mg/L | <0.01 | meq/L |
| Sulfate | 865 | mg/L | 18.01 | meq/L |
| **Cations** | | | | |
| Calcium | 149 | mg/L | 7.44 | meq/L |
| Magnesium | 122 | mg/L | 10.04 | meq/L |
| Potassium | 10.5 | mg/L | 0.27 | meq/L |
| Sodium | 144 | mg/L | 6.26 | meq/L |
| Cations | | | 24.01 | meq/L |
| Anions | | | 24.43 | meq/L |
| Cation/Anion Balance | | | 0.87 | % |
| **Total Metals** | | | | |
| Barium | <0.5 | mg/L | | |
| Iron | 0.40 | mg/L | | |

Reference: U.S.E.P.A 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination of Water and Wastewater", 19th ed., 1995.
EPA 600/R94/111, "Methods for the Determination of Metals in Environmental Samples-Supplement I", May 1994
EPA 600/R93/100, "Methods for the Determination of Inorganic Substances in Environmental Samples", Aug. 1993.

Reviewed By: WN

Wade Nieuwsma, Water Lab Supervisor

## Inter-Mountain Laboratories, Inc.

1633 Terra Avenue
Sheridan, WY 82801

# Quality Control Report - Duplicate Analysis

**Client:** EnTech, Inc.
**Project:** Prairie Dog Creek
**Sample ID:** Prairie Dog Ck. Below Wildcat Ck.
**Lab ID:** 0101W15203
**Matrix:** Water
**Condition:** Cool/Intact

**Date Received:** 08/16/01
**Date Reported:** 09/04/01
**Date Sampled:** 08/16/01
**Time Sampled:** 1210

| Parameter | Original Result | Duplicate Result | RPD | Detection Limit | Units |
|---|---|---|---|---|---|
| ***General Parameters*** | | | | | |
| Total Dissolved Solids @ 180°C | 620 | 620 | 0 | 10 | mg/L |
| Total Suspended Solids | 56 | 64 | 13 | 5 | mg/L |
| Total Alkalinity as CaCO3 | 233 | 232 | 0 | 1.0 | mg/L |
| Boron | 0.10 | 0.11 | 10 | 0.01 | mg/L |
| Total Phosphorus | 0.06 | <0.05 | NC* | 0.05 | mg/L |
| Turbidity | 28 | 28 | 0 | 0.1 | N.T.U. |
| Sodium Adsorption Ratio | 0.5 | 0.5 | 0 | | |
| ***Anions*** | | | | | |
| Bicarbonate as HCO3 | 284 | 282 | 1 | | mg/L |
| Carbonate as CO3 | 0.00 | 0.00 | 0 | | mg/L |
| Chloride | 1.8 | 1.6 | 0.2 ** | 1.0 | mg/L |
| Nitrate + Nitrite as N | 0.08 | 0.07 | 13 | 0.01 | mg/L |
| Sulfate | 251 | 252 | 0 | 1.0 | mg/L |
| ***Cations*** | | | | | |
| Calcium | 91.0 | 91.1 | 0 | 1.0 | mg/L |
| Magnesium | 53.1 | 51.8 | 2 | 1.0 | mg/L |
| Potassium | 4.4 | 4.6 | 4 | 0.2 | mg/L |
| Sodium | 21.7 | 21.5 | 1 | 0.2 | mg/L |
| Cations | 9.96 | 9.87 | 1 | | meq/L |
| Anions | 9.94 | 9.92 | 0 | | meq/L |
| Cation/Anion Balance | 0.10 | 0.25 | | | % |
| ***Total Metals*** | | | | | |
| Barium | <0.5 | <0.5 | NC* | 0.5 | mg/L |
| Iron | 1.54 | 1.57 | 2 | 0.05 | mg/L |

*NC - Non-Calculable RPD due to value(s) less than DL ** - Difference used for results < 5 X Detection Limit

Reference: "Standard Methods For The Examination of Water and Wastewater", 19th ed., 1995.
EPA 600/R94/111, "Methods for the Determination of Metals in Environmental Samples-Supplement I", May 1994
EPA 600/R93/100, "Methods for the Determination of Inorganic Substances in Environmental Samples", Aug. 1993.

Reviewed By: WN

Wade Nieuwsma, Water Lab Supervisor

## Inter-Mountain Laboratories, Inc.

1633 Terra Avenue
Sheridan, WY 82801

| | | | |
|---|---|---|---|
| **Client:** | **EnTech, Inc.** | | |
| **Project:** | **Prairie Dog Creek** | | |
| **Sample ID:** | Prairie Dog Ditch | **Date Received:** | 08/16/01 |
| **Lab ID:** | 0101W15136 | **Date Reported:** | 09/04/01 |
| **Matrix:** | Water | **Date Sampled:** | 08/16/01 |
| **Condition:** | Cool/Intact | **Time Sampled:** | 0810 |

| Parameter | Analytical Result | Units | | Units |
|---|---|---|---|---|
| **Field Parameters** | | | | |
| Field pH | 7.0 | s.u. | | |
| Field Conductivity | 40 | μmhos/cm | | |
| Field Temperature | 14.0 | °C | | |
| Field Dissolved Oxygen | 11.1 | mg/L | | |
| **General Parameters** | | | | |
| Total Dissolved Solids @ 180°C | 40 | mg/L | | |
| Total Suspended Solids | <5 | mg/L | | |
| Solids - Settleable | <0.5 | mL/L | | |
| Total Alkalinity as CaCO3 | 14.0 | mg/L | | |
| Boron | 0.03 | mg/L | | |
| Total Phosphorus | <0.05 | mg/L | | |
| Fecal Coliform | 86 | Coliform/100mL | | |
| Turbidity | 1.6 | N.T.U. | | |
| Sodium Adsorption Ratio | 0.1 | | | |
| **Anions** | | | | |
| Bicarbonate as HCO3 | 17.1 | mg/L | 0.28 | meq/L |
| Carbonate as CO3 | 0.00 | mg/L | 0.00 | meq/L |
| Chloride | <1.0 | mg/L | <0.03 | meq/L |
| Nitrate + Nitrite as N | 0.03 | mg/L | <0.01 | meq/L |
| Sulfate | 1.1 | mg/L | 0.02 | meq/L |
| **Cations** | | | | |
| Calcium | 5.5 | mg/L | 0.27 | meq/L |
| Magnesium | 1.4 | mg/L | 0.12 | meq/L |
| Potassium | <1.0 | mg/L | <0.03 | meq/L |
| Sodium | 0.8 | mg/L | 0.03 | meq/L |
| Cations | | | 0.42 | meq/L |
| Anions | | | 0.30 | meq/L |
| Cation-Anion Difference | | | 0.12 | meq/L |
| **Total Metals** | | | | |
| Barium | <0.5 | mg/L | | |
| Iron | 0.11 | mg/L | | |

Reference: U.S.E.P.A 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination of Water and Wastewater", 19th ed., 1995.
EPA 600/R94/111, "Methods for the Determination of Metals in Environmental Samples-Supplement I", May 1994
EPA 600/R93/100, "Methods for the Determination of Inorganic Substances in Environmental Samples", Aug. 1993.

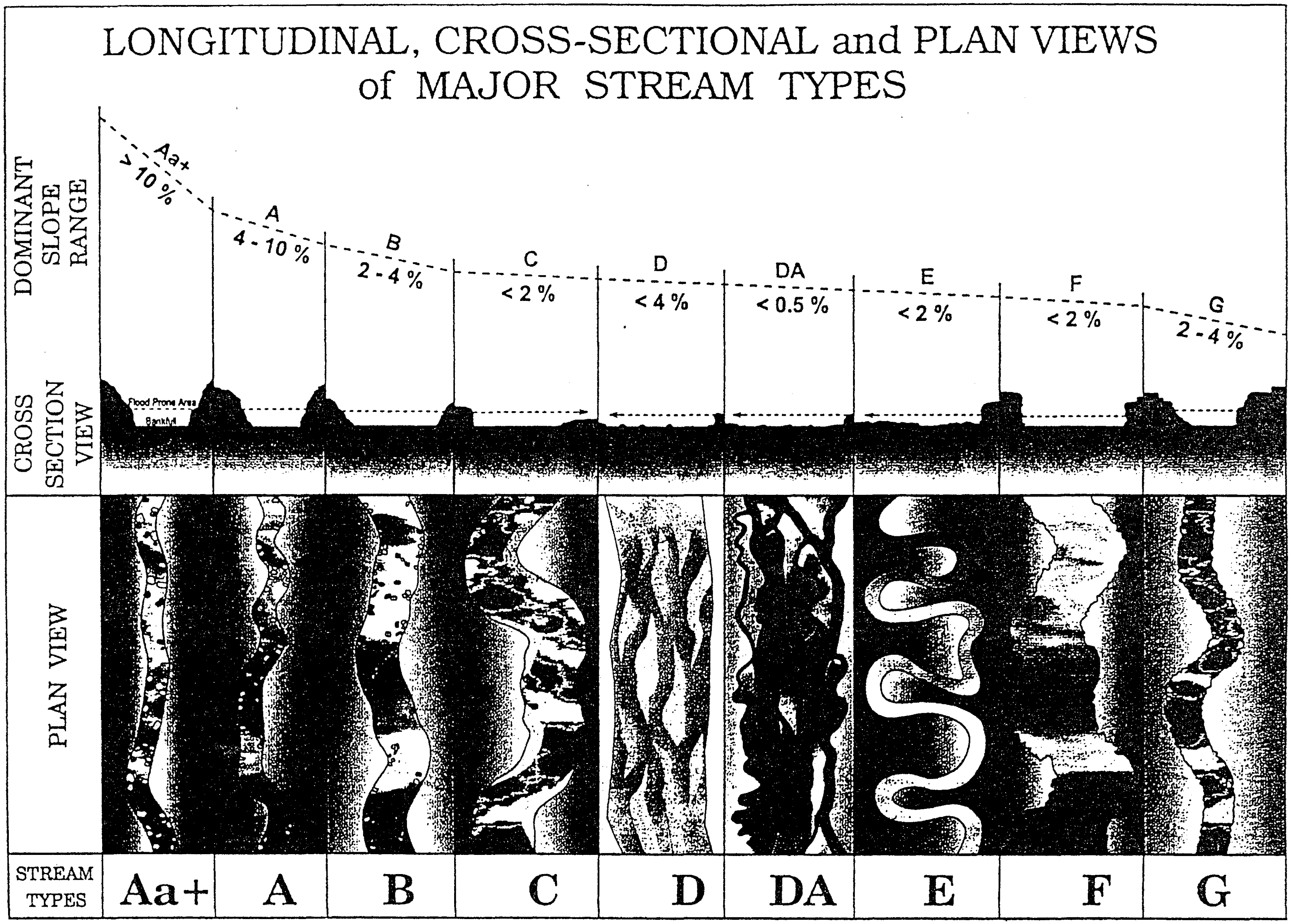
Reviewed By: WN

Wade Nieuwsma, Water Lab Supervisor

# APPENDIX 3

## ILLUSTRATIONS OF ROSGEN STREAM CLASSIFICATION SCHEME

| Stream Type | General Description | Entrenchment Ratio | W/D Ratio | Sinuosity | Slope | Landform/ Soils/Features |
|---|---|---|---|---|---|---|
| Aa+ | Very steep, deeply entrenched, debris transport, torrent streams. | <1.4 | <12 | 1.0 to 1.1 | >10 | Very high relief. Erosional, bedrock or depositional features; debris flow potential. Deeply entrenched streams. Vertical steps with deep scour pools; waterfalls. |
| A | Steep, entrenched, cascading, step/pool streams. High energy/debris transport associated with depositional soils. Very stable if bedrock or boulder dominated channel. | <1.4 | <12 | 1.0 to 1.2 | .04 to .10 | High relief. Erosional or depositional and bedrock forms. Entrenched and confined streams with cascading reaches. Frequently spaced, deep pools in associated step/pool bed morphology. |
| B | Moderately entrenched, moderate gradient, riffle dominated channel, with infrequently spaced pools. Very stable plan and profile. Stable banks. | 1.4 to 2.2 | >12 | >1.2 | .02 to .039 | Moderate relief, colluvial deposition, and/or structural. Moderate entrenchment and W/D ratio. Narrow, gently sloping valleys. Rapids predominate w/scour pools. |
| C | Low gradient, meandering, point-bar, riffle/pool, alluvial channels with broad, well defined floodplains. | >2.2 | >12 | >1.4 | <.02 | Broad valleys w/terraces, in association with floodplains, alluvial soils. Slightly entrenched with well-defined meandering channels. Riffle/pool bed morphology. |
| D | Braided channel with longitudinal and transverse bars. Very wide channel with eroding banks. | n/a | >40 | n/a | <.04 | Broad valleys with alluvium, steeper fans. Glacial debris and depositional features. Active lateral adjustment, w/abundance of sediment supply. Convergence/divergence bed features, aggradational processes, high bedload and bank erosion. |
| DA | Anastomosing (multiple channels) narrow and deep with extensive, well vegetated floodplains and associated wetlands., Very gentle relief with highly variable sinuosities and width/depth ratios. Very stable streambanks. | >2.2 | Highly variable | Highly variable | <.005 | Broad, low-gradient valleys with fine alluvium and/or lacustrine soils. Anastomosed (multiple channel) geologic control creating fine deposition w/well-vegetated bars that are laterally stable with broad wetland floodplains. Very low bedload, high wash load sediment. |
| E | Low gradient, meandering riffle/pool stream with low width/depth ratio and little deposition. Very efficient and stable. High meander width ratio. | >2.2 | <12 | >1.5 | <.02 | Broad valley/meadows. Alluvial materials with floodplains. Highly sinuous with stable, well-vegetated banks. Riffle/pool morphology with very low width/depth ratios. |
| F | Entrenched meandering riffle/pool channel on low gradients with high width/depth ratio. | <1.4 | >12 | >1.4 | <.02 | Entrenched in highly weathered material. Gentle gradients, with a high width/depth ratio. Meandering, laterally unstable with high bank erosion rates. Riffle/pool morphology. |
| G | Entrenched "gully" step/pool and low width/depth ratio on moderate gradients. | <1.4 | <12 | >1.2 | .02 to .039 | Gullies, step/pool morphology w/moderate slopes and low width/depth ratio. Narrow valleys, or deeply incised in alluvial or colluvial materials, i.e., fans or deltas. Unstable, with grade control problems and high bank erosion rates. |


LONGITUDINAL, CROSS-SECTIONAL and PLAN VIEWS of MAJOR STREAM TYPES
DOMINANT SLOPE RANGE
Aa+ > 10 %
A 4 - 10 %
B 2 - 4 %
C < 2 %
D < 4 %
DA < 0.5 %
E < 2 %
F < 2 %
G 2 - 4 %
CROSS SECTION VIEW
Flood Prone Area
Bankfull
PLAN VIEW
STREAM TYPES
Aa+
A
B
C
D
DA
E
F
G

# APPENDIX 4

## FIELD INVESTIGATION OF JENKS CREEK, CROSS-SECTIONS OF GEOMORPHIC STUDY

# Field Investigation of Jenks Creek

The length of Jenks Creek from Hwy 193 downstream to the Texaco (Banner) Ranch was reviewed in the spring of 2001. The following common channel characteristics were observed.

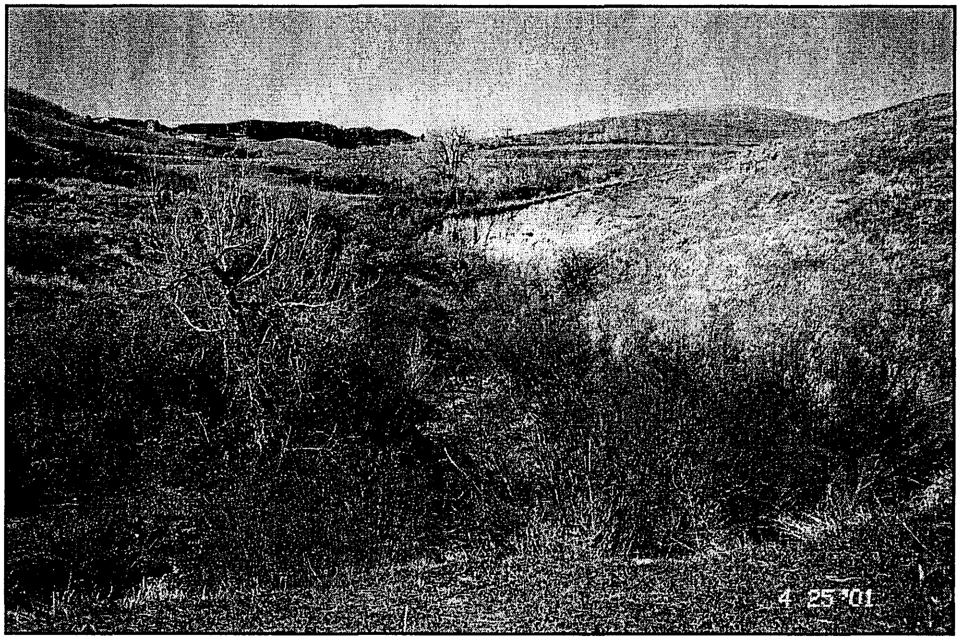



**Photo 1, Jenks Creek: looking downstream toward State Hwy 193 crossing**
(026)

Photo 1 shows the location where Prairie Dog Water Supply Company irrigation water from Piney Creek is introduced to Jenks Creek through a pipe crossing under the road. The stream in this reach has a gully-type channel, with down-cutting caused by the flow augmentation.

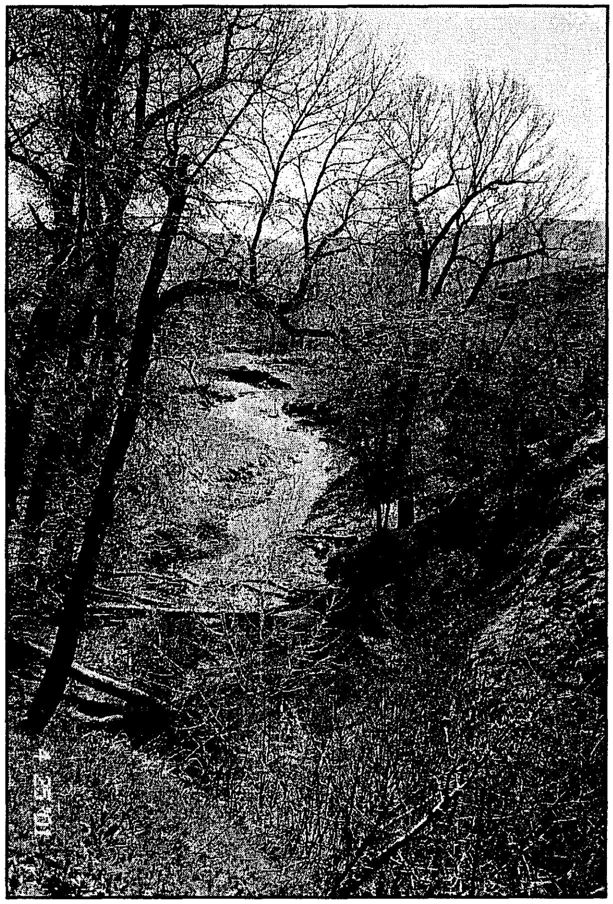
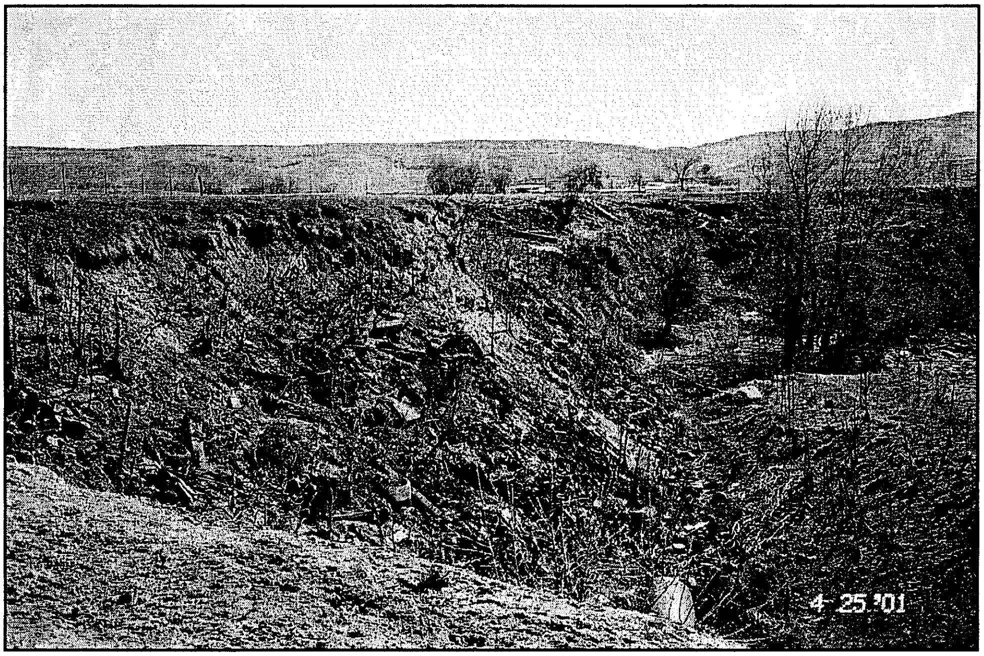
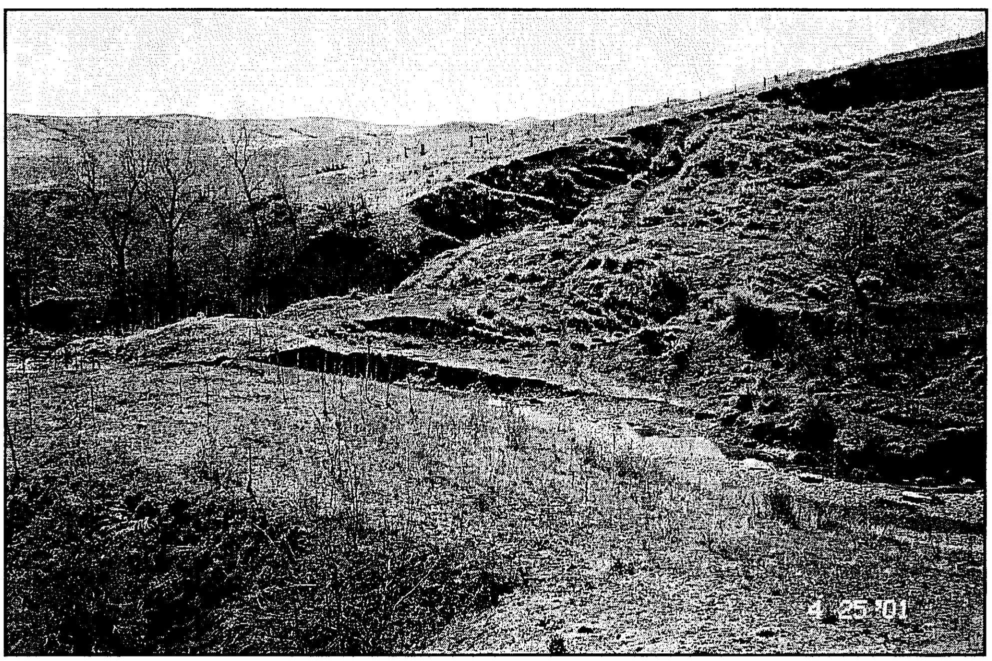


**Photo 2, Jenks Creek: detail at Photo 1 location**
(027)

A more detailed view of the area within Jenks Creek's larger gully system is shown in Photo 2. The channel has laterally migrated at the new base level and has re-established as a C-type channel within the larger G-type (gully) channel. Vegetation is established in the gully bottom, and depositional bars are present, indicating the floodplain is becoming established in the upper reaches.





**Photos 3 and 4, Jenks Creek: narrowing gully bottoms**
(030 and 032)

In Photo 3, Jenks Creek's gully has been artificially filled with waste material. Photo 4 shows the gully filled by mass wasting associated with slope movement. Such mass movement of slopes is common throughout the upper reaches of Jenk and Prairie Dog Creeks. Both artificial and natural filling actions have narrowed the gully bottom, and thereby increased instability and sediment contribution.

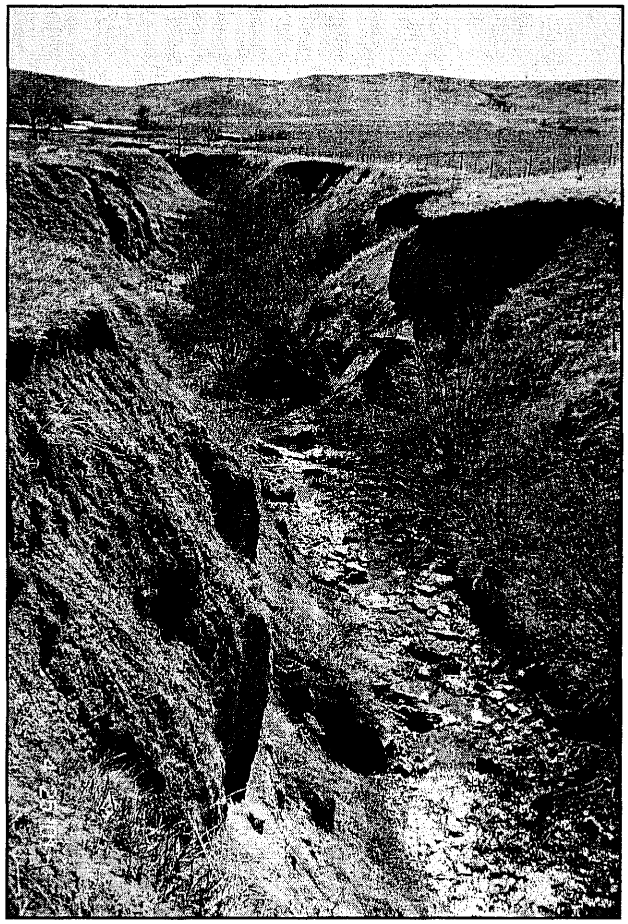


**Photo5, Jenks Creek: downstream of the narrowed gully bottoms**
(034)

Downstream of the narrowed section, as shown in Photo 5, the creek has nearly cut to bedrock and continues to laterally migrate.

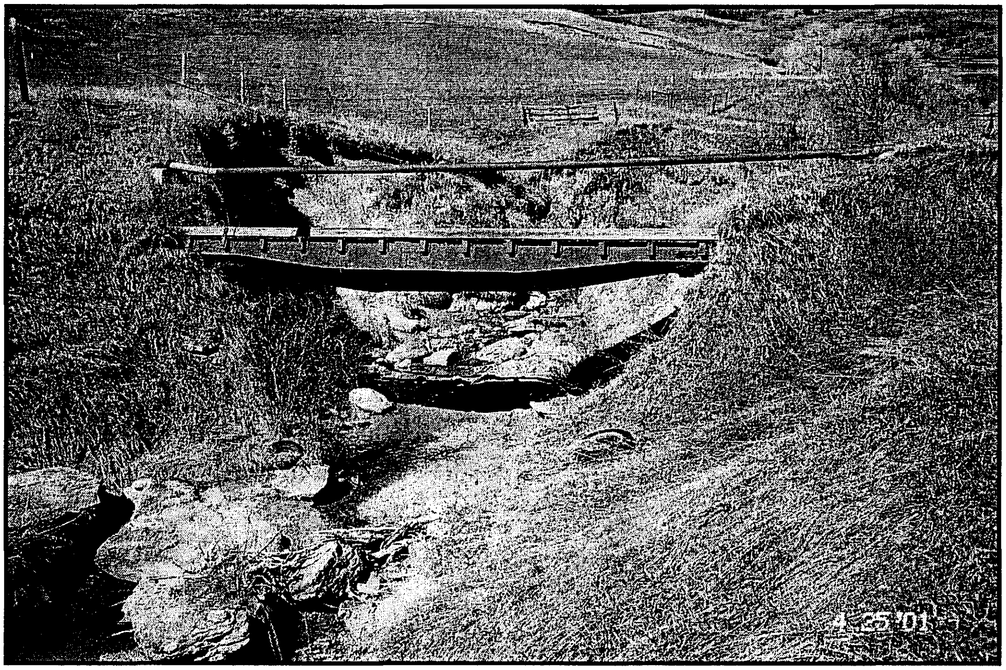



**Photo 6, Jenks Creek: widening channel**
(039)

In Photo 6, a bridge can be seen to have fallen deeper into the widening channel, demonstrating the degree of erosion of the gully system.

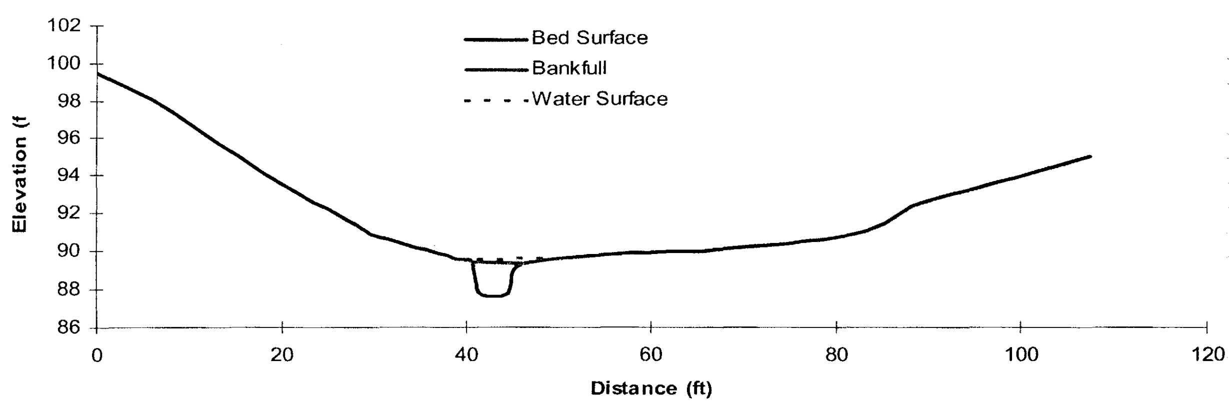
After Jenks Creek passes the Banner Ranch, the valley slope lessens and the degree of entrenchment decreases. At the location of cross-section Site Jenks1, just above the confluence with Prairie Dog Creek, the channel is moderately entrenched and occasionally utilizes portions of the floodplain. The vegetation density along the banks also increases as the valley flattens, adding to the increased channel stability.

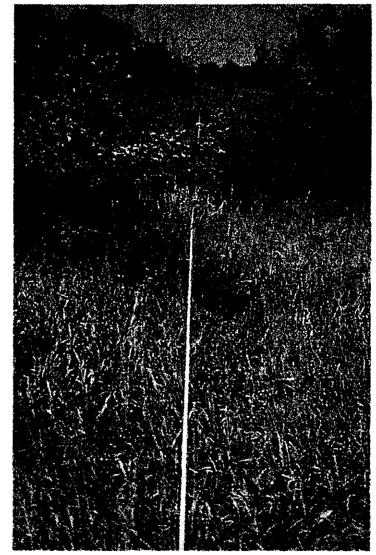
# Prairie Dog Creek - Level I Geomorphologic Study    Site PDC 1*

STREAM: Praire Dog Creek    CREW: Harrelson, Pearson, Starkey
ID NUMBER: XS-PDC 1*
DATE 8/23/00

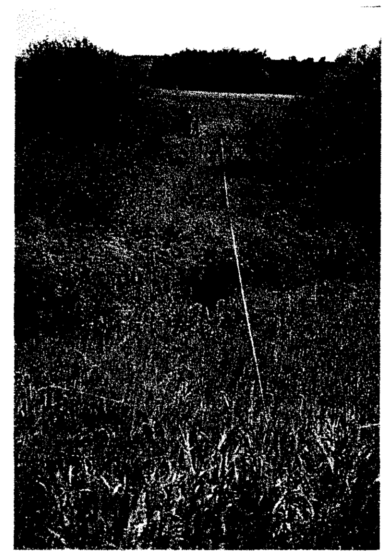
| Width (ft) | Cross-Sectional Area (Sq.ft) | Mean Depth (ft) | Maximum Depth (ft) | Wetted Perimeter (ft) | Hydraulic Radius (ft) | |
|---|---|---|---|---|---|---|
| 5.50 | 6.46 | 1.18 | 1.67 | 7.20 | 0.90 | Bankfull |
| 11.00 | 8.32 | 0.76 | 1.89 | 12.73 | 0.65 | Water Surface |

| Identifier | Distance (ft) | Elevation (ft) | Identifier | Distance (ft) | Elevation (ft) |
|---|---|---|---|---|---|
| L. Pin | 0.0 | 99.45 | | 67.0 | 90.07 |
| | 8.0 | 97.45 | | 82.0 | 90.86 |
| | 18.0 | 94.04 | | 89.0 | 92.54 |
| | 28.0 | 91.37 | | 97.0 | 93.62 |
| | 30.0 | 90.77 | | 107.5 | 95.09 |
| | 36.0 | 89.95 | | | |
| LEW | 39.0 | 89.52 | | | |
| LBF | 40.5 | 89.33 | | | |
| | 41.2 | 87.89 | | | |
| | 43.0 | 87.64 | | | |
| | 44.5 | 87.76 | | | |
| | 45.0 | 88.84 | | | |
| RBF | 46.0 | 89.27 | | | |
| REW | 50.0 | 89.60 | | | |
| | 58.0 | 89.90 | | | |



**Across Stream View**



**Across Stream View**

# Prairie Dog Creek - Level I Geomorphologic Study Site PDC 2

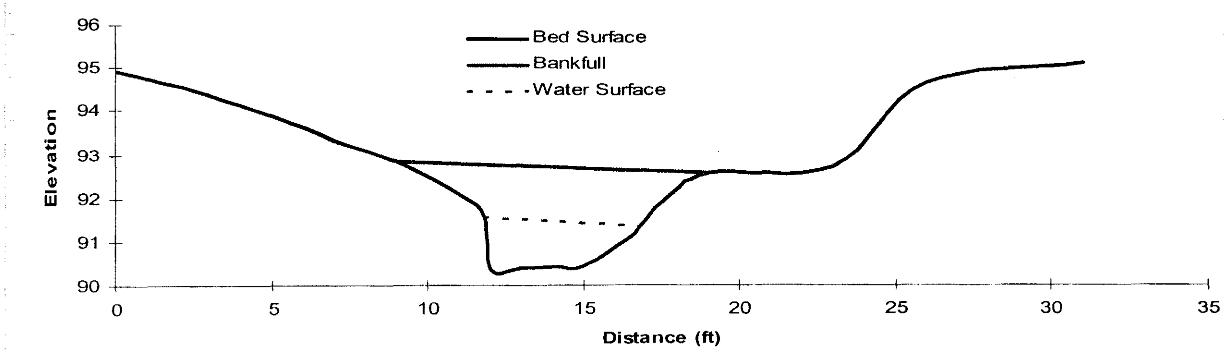
**Upstream View**

**Downstream View**

| Width (ft) | Cross-Sectional Area (Sq.ft) | Mean Depth (ft) | Maximum Depth (ft) | Wetted Perimeter (ft) | Hydraulic Radius (ft) | |
|---|---|---|---|---|---|---|
| 10.00 | 14.17 | 1.42 | 2.49 | 11.89 | 1.19 | Bankfull |
| 5.00 | 4.67 | 0.93 | 1.21 | 6.27 | 0.75 | Water Surface |

| | | | |
|---|---|---|---|
| STREAM: | PDC Creek | CREW: | Harrelson, Starkey |
| ID NUMBER: | XS-PDC 2 | | |
| DATE | 10/23/00 | | |

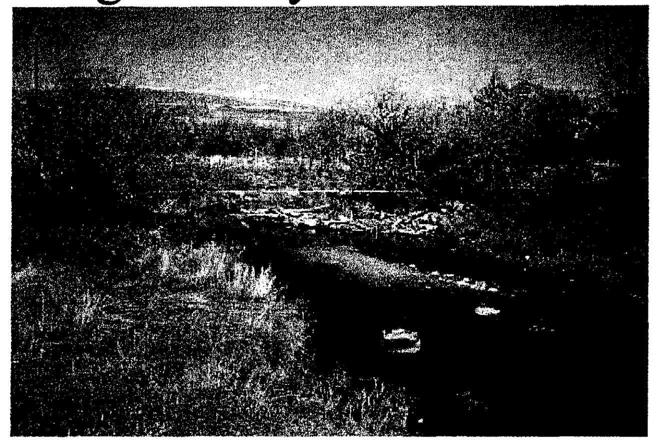
| Identifier | Distance (ft) | Elevation (ft) | Identifier | Distance (ft) | Elevation (ft) |
|---|---|---|---|---|---|
| L PIN | 0.0 | 94.91 | | 26.0 | 94.67 |
| | 3.0 | 94.36 | R PIN | 31.0 | 95.15 |
| | 7.0 | 93.36 | | | 89.40 |
| LBF | 9.0 | 92.84 | | | 90.27 |
| | 11.0 | 92.08 | | | 92.74 |
| LEW | 11.8 | 91.57 | | | 93.84 |
| | 12.0 | 90.35 | | | 94.40 |
| | 13.0 | 90.39 | | | |
| | 14.0 | 90.42 | | | |
| | 15.0 | 90.45 | | | |
| | 16.4 | 91.06 | | | |
| REW | 16.8 | 91.36 | | | |
| | 17.5 | 91.90 | | | |
| RBF | 19.0 | 92.60 | | | |
| | 23.0 | 92.74 | | | |




**Across Stream View**

# Prairie Dog Creek - Level I Geomorphologic Study Site PDC 3

**Upstream View**



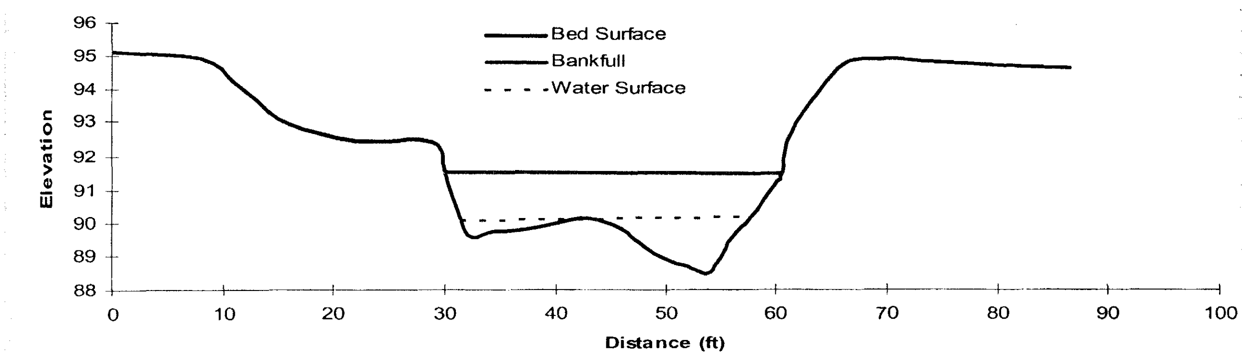
**Downstream View**

**Across Stream View**

STREAM: Prairie Dog Creek  CREW: Harrelson, Starkey
ID NUMBER: XS-PDC 3
DATE: 10/23/00

| Width (ft) | Cross-Sectional Area (Sq.ft) | Mean Depth (ft) | Maximum Depth (ft) | Wetted Perimeter (ft) | Hydraulic Radius (ft) | |
|---|---|---|---|---|---|---|
| 30.50 | 55.63 | 1.82 | 3.05 | 32.12 | 1.73 | Bankfull |
| 26.20 | 14.12 | 0.54 | 1.58 | 26.91 | 0.52 | Water Surface |

| Identifier | Distance (ft) | Elevation (ft) | Identifier | Distance (ft) | Elevation (ft) | Identifier | Distance (ft) | Elevation (ft) |
|---|---|---|---|---|---|---|---|---|
| L PIN | 0.0 | 95.10 | | 46.0 | 89.82 | R PIN | | |
| | 8.0 | 94.91 | | 48.0 | 89.30 | | | |
| | 11.0 | 94.20 | | 50.0 | 88.88 | | | |
| | 13.0 | 93.67 | | 52.0 | 88.71 | | | |
| | 16.0 | 92.93 | | 54.0 | 88.50 | | | |
| | 22.0 | 92.46 | | 56.0 | 89.50 | | | |
| | 29.0 | 92.42 | REW | 57.7 | 90.18 | | | |
| LBF | 30.0 | 91.55 | | 60.0 | 91.20 | | | |
| LEW | 31.5 | 90.07 | RBF | 60.5 | 91.50 | | | |
| | 32.0 | 89.62 | | 61.0 | 92.44 | | | |
| | 33.0 | 89.56 | | 63.0 | 93.60 | | | |
| | 34.0 | 89.72 | | 66.0 | 94.74 | | | |
| | 37.0 | 89.80 | | 69.0 | 94.96 | | | |
| | 40.0 | 89.98 | | 78.0 | 94.79 | | | |
| | 43.0 | 90.14 | | 86.5 | 94.69 | | | |



# Prairie Dog Creek - Level I Geomorphologic Study Site PDC 4

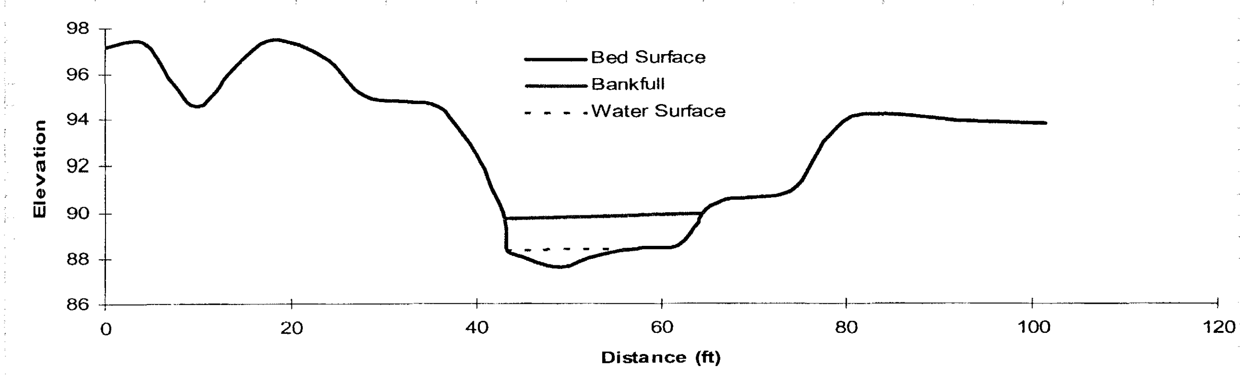
**Upstream View**

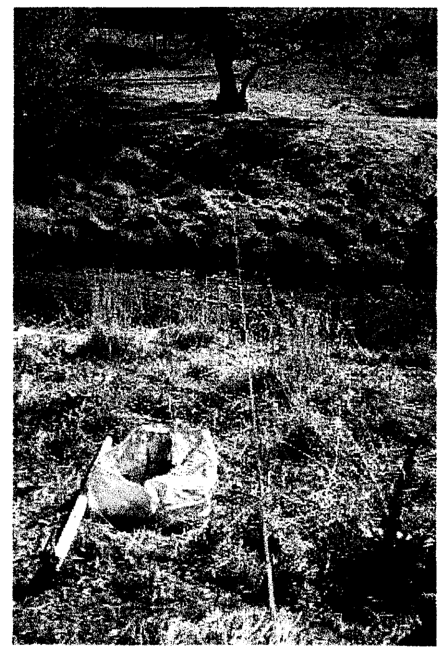
**Downstream View**

| STREAM: | Prairie Dog Creek | CREW: | Harrelson, Starkey |
|---|---|---|---|
| ID NUMBER: | XS-PDC 4 | | |
| DATE | 10/23/00 | | |

| Width (ft) | Cross-Sectional Area (Sq.ft) | Mean Depth (ft) | Maximum Depth (ft) | Wetted Perimeter (ft) | Hydraulic Radius (ft) | |
|---|---|---|---|---|---|---|
| 21.50 | 33.18 | 1.54 | 2.21 | 23.19 | 1.43 | Bankfull |
| 17.80 | 5.13 | 0.29 | 0.78 | 17.89 | 0.29 | Water Surface |

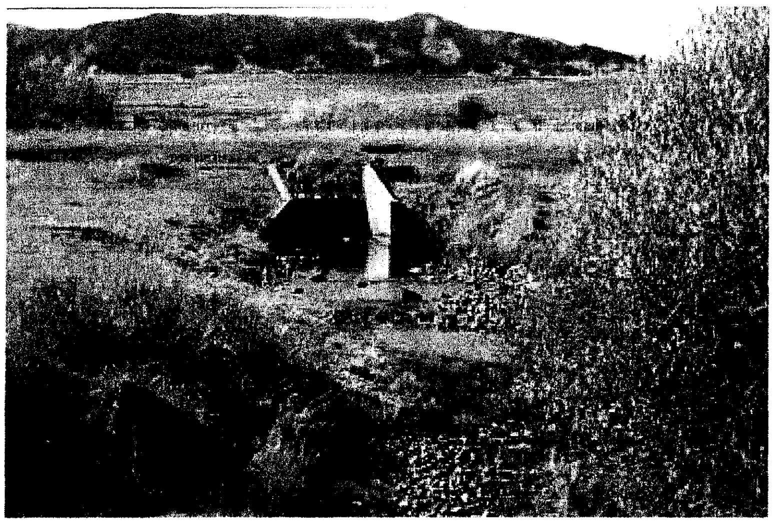
| Identifier | Distance (ft) | Elevation (ft) | Identifier | Distance (ft) | Elevation (ft) |
|---|---|---|---|---|---|
| | 0.0 | 97.15 | | 53.0 | 88.06 |
| | 4.0 | 97.38 | | 58.0 | 88.40 |
| | 7.0 | 95.71 | REW | 61.0 | 88.41 |
| | 10.0 | 94.54 | | 62.5 | 88.77 |
| | 14.0 | 96.25 | | 64.0 | 89.52 |
| | 18.0 | 97.47 | RBF | 64.5 | 89.95 |
| | 24.0 | 96.62 | | 67.0 | 90.55 |
| | 28.0 | 95.03 | | 74.0 | 90.95 |
| | 35.0 | 94.67 | | 78.0 | 93.26 |
| | 37.0 | 94.11 | | 82.0 | 94.29 |
| | 40.0 | 92.44 | | 92.0 | 94.02 |
| LBF | 43.0 | 89.73 | | 101.5 | 93.86 |
| LEW | 43.2 | 88.33 | | | |
| | 44.0 | 88.16 | | | |
| | 49.0 | 87.57 | | | |



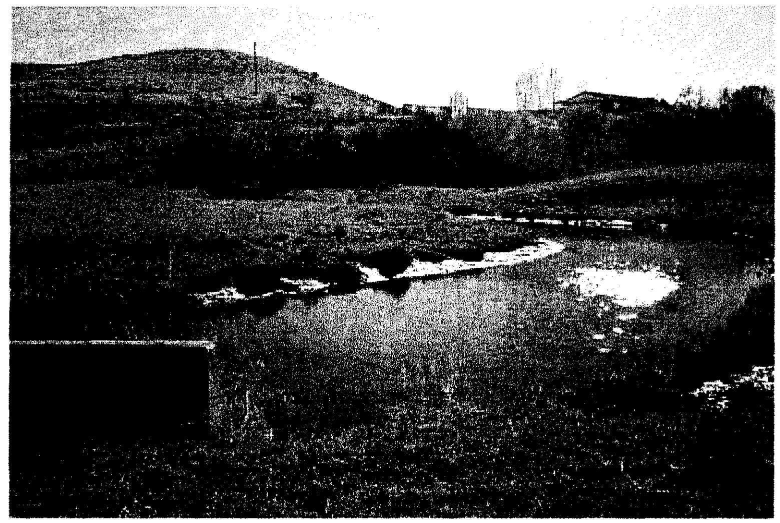



**Across Stream View**

# Prairie Dog Creek - Level I Geomorphologic Study Site PDC 4



**View of diversion**



**View of upstream diversion**

# Prairie Dog Creek - Level I Geomorphologic Study Site PDC 5

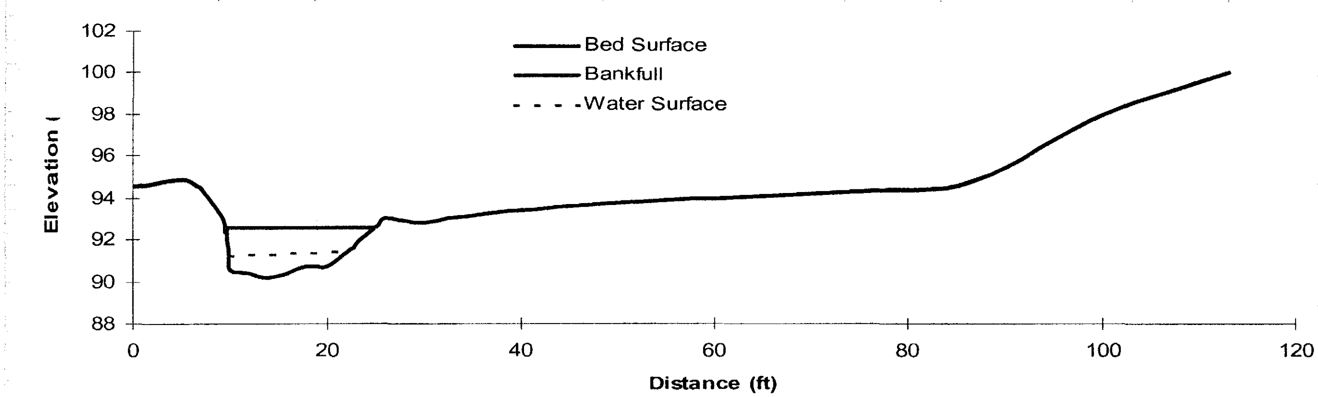
**Downstream View**

| STREAM: | Prairie Dog Creek | CREW: | Harrelson, Starkey |
|---|---|---|---|
| ID NUMBER: | XS-PDC 5 | | |
| DATE | 10/23/00 | | |

| Width (ft) | Cross-Sectional Area (Sq.ft) | Mean Depth (ft) | Maximum Depth (ft) | Wetted Perimeter (ft) | Hydraulic Radius (ft) | |
|---|---|---|---|---|---|---|
| 15.30 | 26.57 | 1.74 | 2.39 | 17.45 | 1.52 | Bankfull |
| 12.20 | 8.23 | 0.67 | 1.04 | 12.84 | 0.64 | Water Surface |

| Identifier | Distance (ft) | Elevation (ft) | Identifier | Distance (ft) | Elevation (ft) |
|---|---|---|---|---|---|
| | 0.0 | 94.53 | | 26.0 | 93.05 |
| | 6.0 | 94.77 | | 29.0 | 92.83 |
| | 9.0 | 93.25 | | 34.0 | 93.13 |
| | 9.5 | 92.35 | | 44.0 | 93.63 |
| LBF | 9.7 | 92.60 | | 53.0 | 93.85 |
| LEW | 9.8 | 91.22 | | 63.0 | 94.09 |
| | 10.0 | 90.56 | | 75.0 | 94.36 |
| | 12.0 | 90.40 | | 87.0 | 94.82 |
| | 14.0 | 90.21 | | 100.0 | 97.98 |
| | 16.0 | 90.42 | | 113.0 | 100.00 |
| | 18.0 | 90.71 | | | |
| | 20.0 | 90.75 | | | |
| REW | 22.0 | 91.39 | | | |
| | 23.0 | 91.73 | | | |
| RBF | 25.0 | 92.59 | | | |

**Across Stream View**



# Prairie Dog Creek - Level I Geomorphologic Study Site PDC 5

**Upstream View**

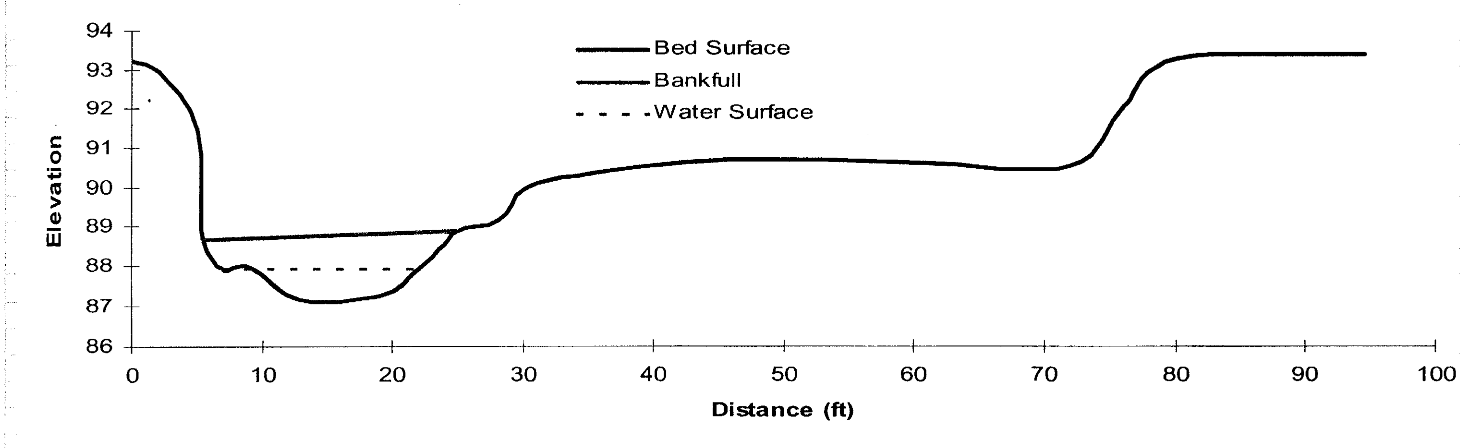
**View of diversion**

# Prairie Dog Creek - Level I Geomorphologic Study Site PDC 6

| Width (ft) | Cross-Sectional Area (Sq.ft) | Mean Depth (ft) | Maximum Depth (ft) | Wetted Perimeter (ft) | Hydraulic Radius (ft) | |
|---|---|---|---|---|---|---|
| 19.50 | 20.01 | 1.03 | 1.54 | 19.97 | 1.00 | Bankfull |
| 15.00 | 6.39 | 0.43 | 0.74 | 15.13 | 0.42 | Water Surface |

| | | | |
|---|---|---|---|
| STREAM: | Prairie Dog Creek | CREW: | Harrelson, Starkey |
| ID NUMBER: | XS-PDC 6 | | |
| DATE | 10/23/00 | | |

| Identifier | Distance (ft) | Elevation (ft) | Identifier | Distance (ft) | Elevation (ft) |
|---|---|---|---|---|---|
| | 0.0 | 93.21 | | 60.0 | 90.66 |
| | 2.0 | 92.93 | | 72.0 | 90.57 |
| | 5.0 | 91.45 | | 76.0 | 92.08 |
| LBF | 5.5 | 88.67 | | 80.0 | 93.30 |
| LEW | 7.0 | 87.92 | | 94.5 | 93.40 |
| | 9.0 | 87.94 | | | |
| | 13.0 | 87.18 | | | |
| | 19.0 | 87.30 | | | |
| REW | 22.0 | 87.91 | | | |
| | 24.0 | 88.53 | | | |
| RBF | 25.0 | 88.90 | | | |
| | 28.0 | 89.16 | | | |
| | 30.0 | 89.95 | | | |
| | 33.0 | 90.26 | | | |
| | 46.0 | 90.73 | | | |




Across Stream View

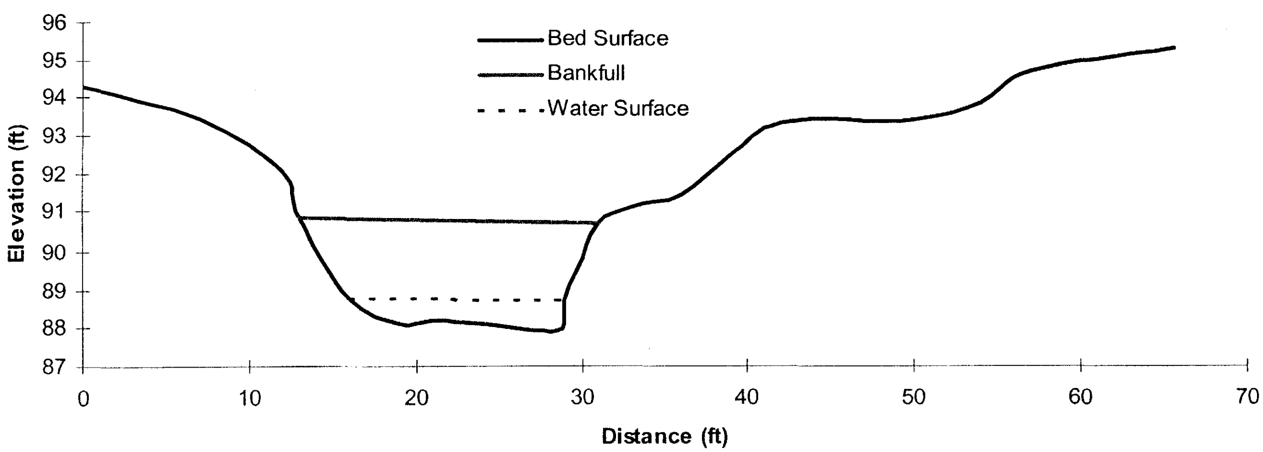
# Prairie Dog Creek - Level I Geomorphologic Study Site PDC 6

**Downstream View**

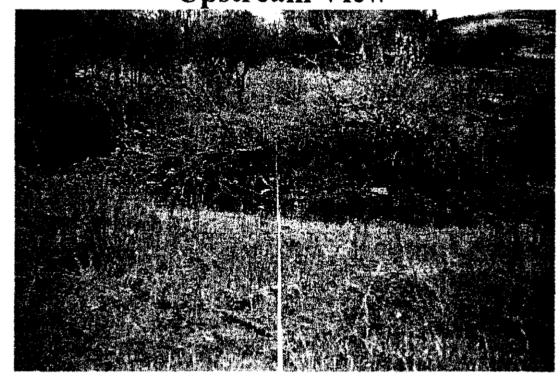
**Upstream View**

# Prairie Dog Creek - Level I Geomorphologic Study Site PDC 7

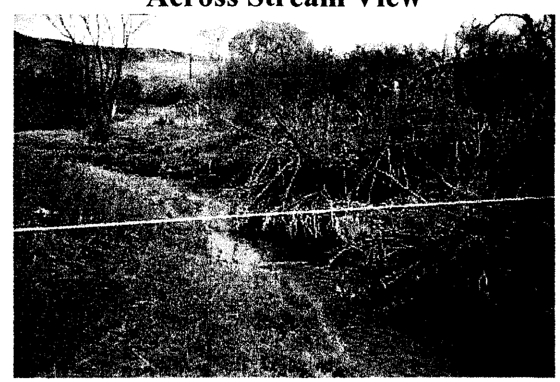
| Width (ft) | Cross-Sectional Area (Sq.ft) | Mean Depth (ft) | Maximum Depth (ft) | Wetted Perimeter (ft) | Hydraulic Radius (ft) | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | STREAM: | Prairie Dog Creek | CREW: | Harrelson, Mitchell |
| | | | | | | ID NUMBER: | XS-PDC 7 | | |
| | | | | | | DATE | 10/24/00 | | |
| 18.00 | 39.65 | 2.20 | 2.88 | 20.15 | 1.97 | Bankfull | | | |
| 12.90 | 7.84 | 0.61 | 0.83 | 13.62 | 0.58 | Water Surface | | | |
| Identifier | Distance (ft) | Elevation (ft) | Identifier | Distance (ft) | Elevation (ft) | | | | |
| | 0.0 | 94.27 | | 39.0 | 92.51 | | | | |
| | 7.0 | 93.46 | | 42.0 | 93.36 | | | | |
| | 12.0 | 92.06 | | 50.0 | 93.45 | | | | |
| LBF | 13.0 | 90.85 | | 54.0 | 93.90 | | | | |
| LEW | 16.0 | 88.78 | | 57.0 | 94.71 | | | | |
| | 19.0 | 88.11 | | 65.6 | 95.35 | | | | |
| | 21.0 | 88.17 | | | | | | | |
| | 24.0 | 88.11 | | | | | | | |
| | 27.0 | 87.94 | | | | | | | |
| | 28.8 | 87.99 | | | | | | | |
| REW | 28.9 | 88.72 | | | | | | | |
| | 29.7 | 89.57 | | | | | | | |
| RBF | 31.0 | 90.70 | | | | | | | |
| | 33.0 | 91.14 | | | | | | | |
| | 36.0 | 91.45 | | | | | | | |




Upstream View



Across Stream View

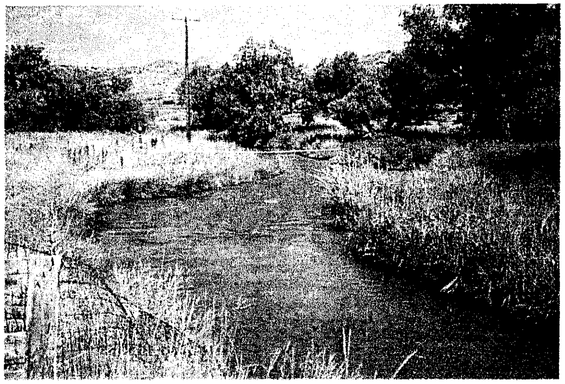


Downstream View

# Prairie Dog Creek - Level I Geomorphologic Study Site PDC 7

**Upstream view of confluence**

# Prairie Dog Creek - Level I Geomorphologic Study     Site PDC 8*



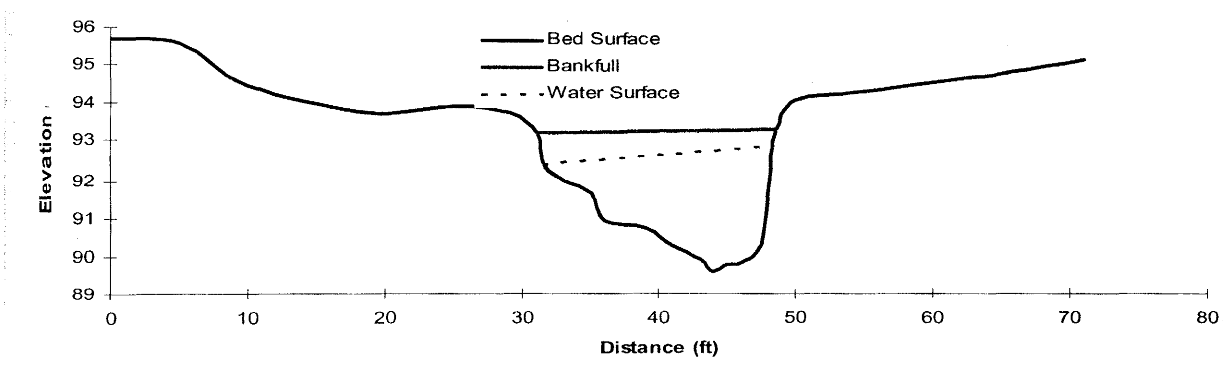
**Downstream View**

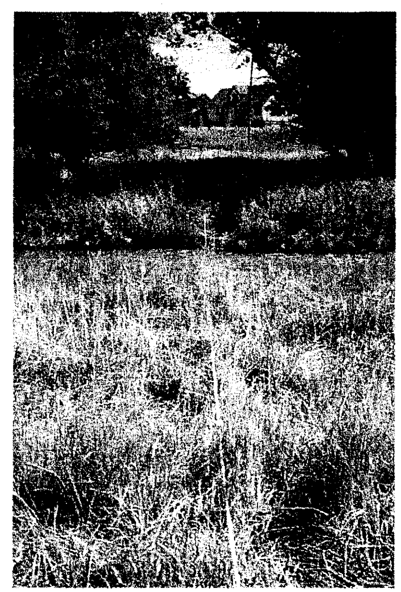
**Upstream View**

| STREAM: | Praire Dog Creek | CREW: | Harrelson, Pearson |
|---|---|---|---|
| ID NUMBER: | XS-PDC 3* | | |
| DATE | 8/23/00 | | |

| Width (ft) | Cross-Sectional Area (Sq.ft) | Mean Depth (ft) | Maximum Depth (ft) | Wetted Perimeter (ft) | Hydraulic Radius (ft) | |
|---|---|---|---|---|---|---|
| 17.60 | 41.43 | 2.35 | 3.61 | 20.73 | 2.00 | Bankfull |
| 16.80 | 28.02 | 1.67 | 2.80 | 19.21 | 1.46 | Water Surface |

| Identifier | Distance (ft) | Elevation (ft) | Identifier | Distance (ft) | Elevation (ft) |
|---|---|---|---|---|---|
| L PIN | 0.0 | 95.69 | | 45.0 | 89.77 |
| | 5.0 | 95.56 | | 46.0 | 89.81 |
| | 10.0 | 94.44 | | 47.5 | 90.28 |
| | 19.0 | 93.71 | REW | 48.3 | 92.83 |
| | 25.0 | 93.90 | RBF | 48.6 | 93.29 |
| | 29.0 | 93.73 | | 50.0 | 94.05 |
| LBF | 31.0 | 93.18 | | 55.0 | 94.29 |
| LEW | 31.5 | 92.35 | | 65.0 | 94.76 |
| | 33.0 | 91.99 | | 71.0 | 95.15 |
| | 35.0 | 91.65 | | | |
| | 36.0 | 90.94 | | | |
| | 39.0 | 90.73 | | | |
| | 41.0 | 90.27 | | | |
| | 43.0 | 89.93 | | | |
| | 44.0 | 89.58 | | | |



**Across Stream View**

**L-R**

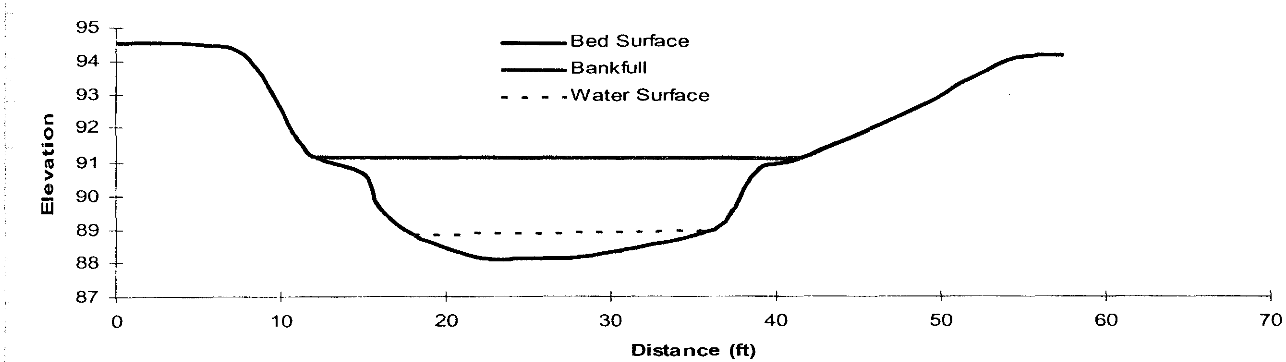
# Prairie Dog Creek - Level I Geomorphologic Study Site PDC 9

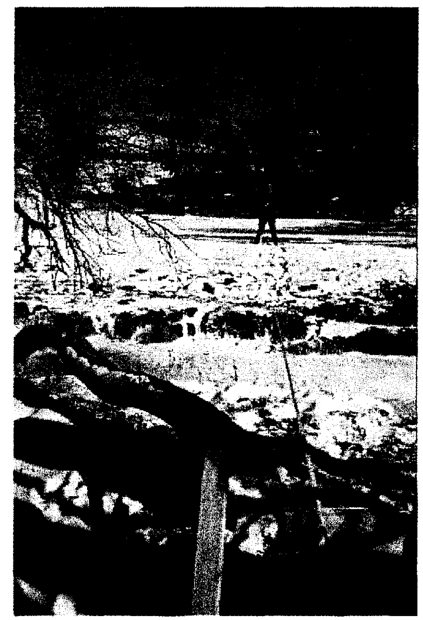
**Upstream View**

**Downstream View**

| Width (ft) | Sectional Area (Sq.ft) | Depth (ft) | Depth (ft) | Perimeter (ft) | Radius (ft) | ID NUMBER: | XS-PDC 9 |
|---|---|---|---|---|---|---|---|
| | | | | | | DATE | 11/13/00 |
| 29.50 | 59.79 | 2.03 | 3.02 | 30.82 | 1.94 | Bankfull | |
| 18.00 | 8.35 | 0.46 | 0.71 | 18.10 | 0.46 | Water Surface | |

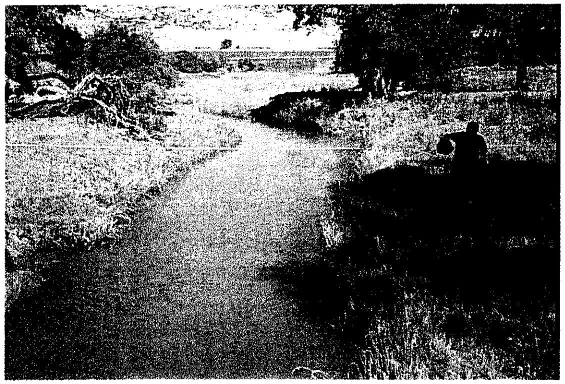
| Identifier | Distance (ft) | Elevation (ft) | Identifier | Distance (ft) | Elevation (ft) |
|---|---|---|---|---|---|
| | 0.0 | 94.54 | | 48.0 | 92.46 |
| | 5.0 | 94.51 | | 54.0 | 94.01 |
| | 8.0 | 94.01 | | 57.3 | 94.19 |
| | 11.0 | 91.63 | | | |
| LBF | 12.0 | 91.15 | | | |
| | 15.0 | 90.66 | | | |
| | 16.0 | 89.65 | | | |
| LEW | 18.0 | 88.81 | | | |
| | 22.0 | 88.13 | | | |
| | 24.5 | 88.13 | | | |
| | 28.7 | 88.20 | | | |
| REW | 36.0 | 88.95 | | | |
| | 37.4 | 89.51 | | | |
| | 39.0 | 90.82 | | | |
| RBF | 41.5 | 91.13 | | | |



**Across Stream View**

# Prairie Dog Creek - Level I Geomorphologic Study     Site PDC 10*



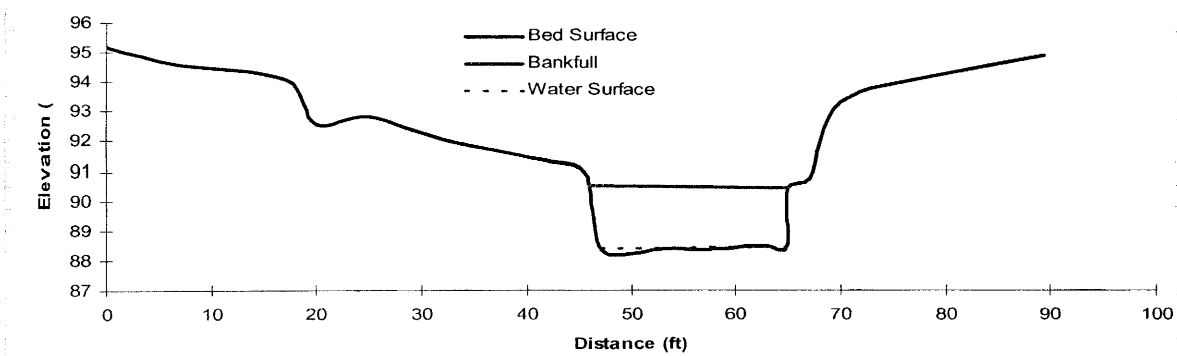
**Downstream View**

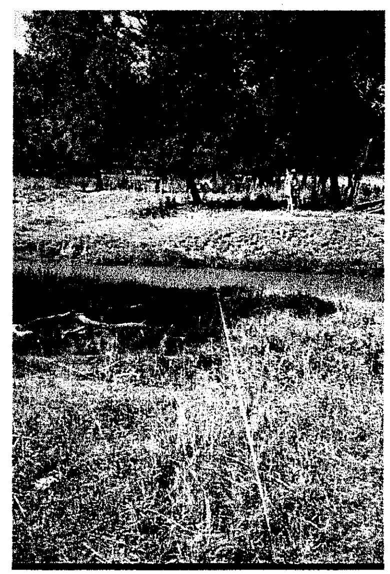
**Upstream View**

| STREAM: | Praire Dog Creek | CREW: | Harrelson, Pearson |
|---|---|---|---|
| ID NUMBER: | XS-PDC 10* | | |
| DATE | 8/23/00 | | |

| Width (ft) | Cross-Sectional Area (Sq.ft) | Mean Depth (ft) | Maximum Depth (ft) | Wetted Perimeter (ft) | Hydraulic Radius (ft) | |
|---|---|---|---|---|---|---|
| 19.00 | 39.41 | 2.07 | 2.33 | 22.21 | 1.77 | Bankfull |
| 17.80 | 0.68 | 0.04 | 0.23 | 17.82 | 0.04 | Water Surface |

| Identifier | Distance (ft) | Elevation (ft) | Identifier | Distance (ft) | Elevation (ft) |
|---|---|---|---|---|---|
| L PIN | 0.0 | 95.15 | | 63.0 | 88.50 |
| | 7.0 | 94.55 | REW | 64.8 | 88.43 |
| | 17.0 | 94.08 | RBF | 65.0 | 90.45 |
| | 20.0 | 92.55 | | 67.0 | 90.80 |
| | 25.0 | 92.82 | | 70.0 | 93.33 |
| | 32.0 | 92.03 | | 79.0 | 94.26 |
| | 41.0 | 91.36 | | 89.4 | 94.95 |
| | 45.0 | 91.09 | | | |
| LBF | 46.0 | 90.52 | | | |
| | 46.2 | 89.70 | | | |
| LEW | 47.0 | 88.41 | | | |
| | 49.0 | 88.18 | | | |
| | 53.0 | 88.40 | | | |
| | 57.0 | 88.35 | | | |
| | 61.0 | 88.47 | | | |

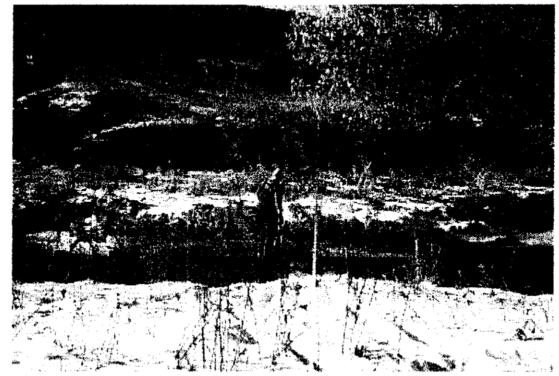


**Across Stream View**

**L-R**

# Prairie Dog Creek - Level I Geomorphologic Study     Site PDC 11

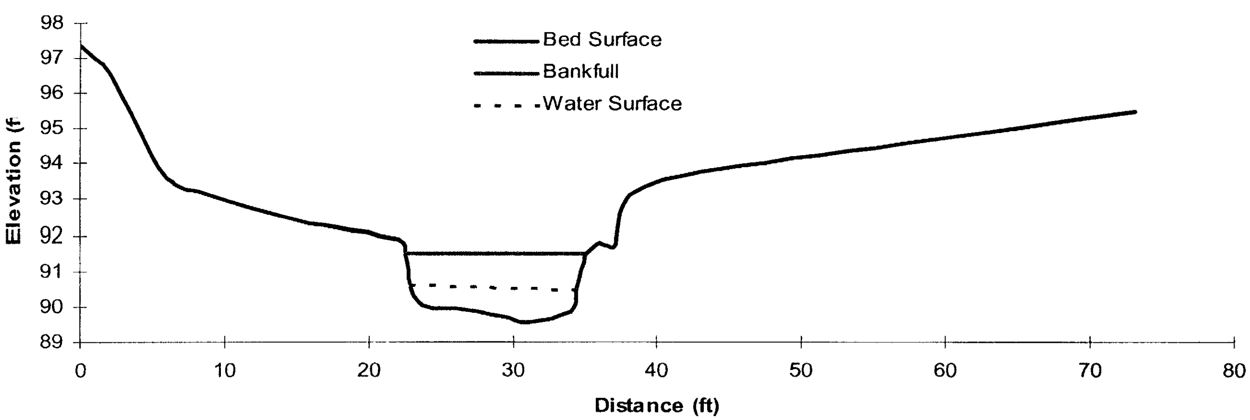


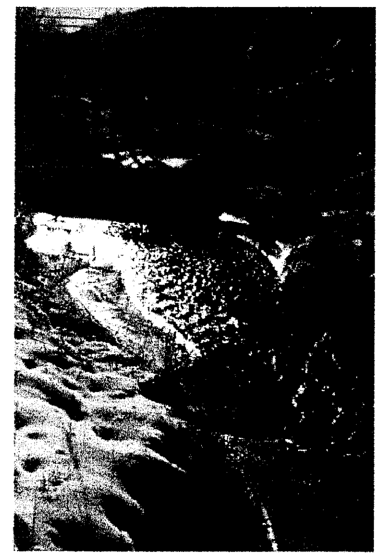
**Upstream View**

| Width (ft) | Cross-Sectional Area (Sq.ft) | Mean Depth (ft) | Maximum Depth (ft) | Wetted Perimeter (ft) | Hydraulic Radius (ft) | |
|---|---|---|---|---|---|---|
| 12.50 | 19.78 | 1.58 | 1.95 | 14.36 | 1.38 | Bankfull |
| 11.50 | 8.43 | 0.73 | 1.01 | 12.15 | 0.69 | Water Surface |

| | | | |
|---|---|---|---|
| STREAM: | Prairie Dog Creek | CREW: | Harrelson, Wiggs |
| ID NUMBER: | XS-PDC 11 | | |
| DATE | 11/13/00 | | |

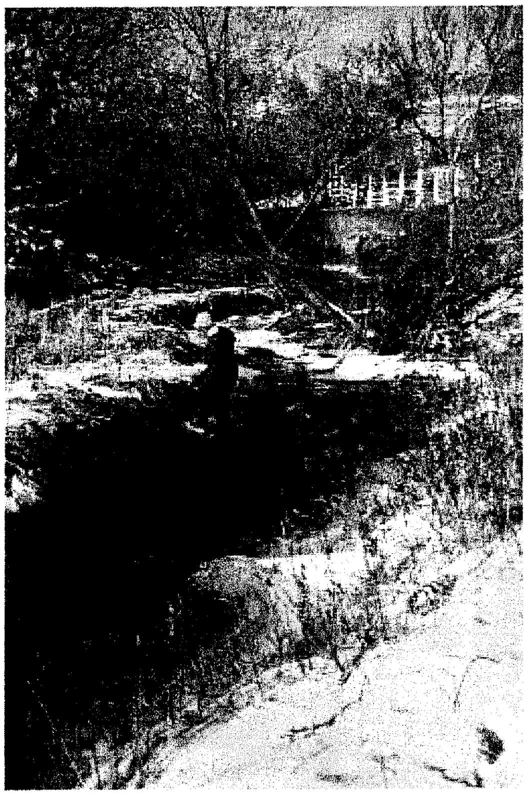
| Identifier | Distance (ft) | Elevation (ft) | Identifier | Distance (ft) | Elevation (ft) |
|---|---|---|---|---|---|
| | 0.0 | 97.35 | REW | 34.3 | 90.48 |
| | 2.0 | 96.57 | | 34.8 | 91.18 |
| | 4.0 | 95.00 | RBF | 35.0 | 91.51 |
| | 6.0 | 93.57 | | 36.0 | 91.82 |
| | 9.0 | 93.07 | | 37.0 | 91.73 |
| | 15.0 | 92.40 | | 37.6 | 92.84 |
| | 22.0 | 91.93 | | 39.0 | 93.36 |
| LBF | 22.5 | 91.53 | | 43.0 | 93.77 |
| LEW | 22.8 | 90.61 | | 57.0 | 94.61 |
| | 23.0 | 90.29 | | 73.0 | 95.53 |
| | 24.0 | 89.99 | | | |
| | 26.0 | 89.96 | | | |
| | 29.0 | 89.76 | | | |
| | 31.0 | 89.58 | | | |
| | 34.0 | 89.85 | | | |



**Downstream View**

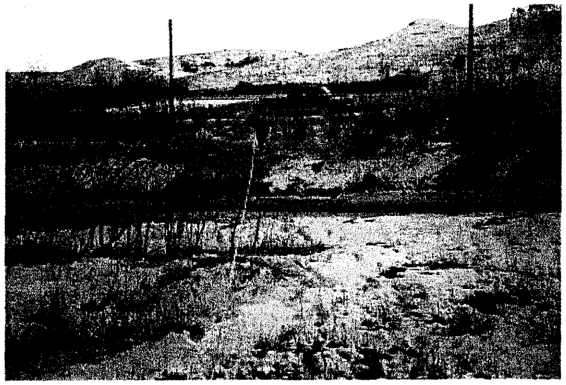
# Prairie Dog Creek - Level I Geomorphologic Study Site PDC 11



**Across Stream View**

**View of bridge**

# Prairie Dog Creek - Level I Geomorphologic Study Site PDC 12



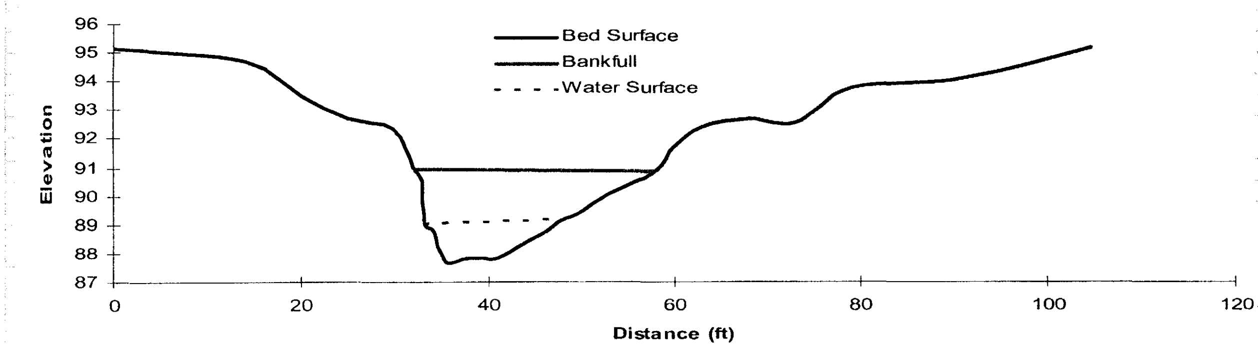
**Across Stream View**

**Upstream View**

| Width (ft) | Cross-Sectional Area (Sq.ft) | Mean Depth (ft) | Maximum Depth (ft) | Wetted Perimeter (ft) | Hydraulic Radius (ft) | |
|---|---|---|---|---|---|---|
| 26.00 | 49.87 | 1.92 | 3.27 | 28.09 | 1.78 | Bankfull |
| 14.80 | 12.28 | 0.83 | 1.35 | 15.34 | 0.80 | Water Surface |

| | |
|---|---|
| STREAM: | Prairie Dog Creek |
| ID NUMBER: | XS-PDC 12 |
| DATE | 11/13/00 |
| CREW: | Harrelson, Wiggs |

| Identifier | Distance (ft) | Elevation (ft) | Identifier | Distance (ft) | Elevation (ft) |
|---|---|---|---|---|---|
| | 0.0 | 95.12 | | 49.5 | 89.36 |
| | 14.0 | 94.67 | | 53.0 | 90.09 |
| | 20.0 | 93.45 | RBF | 58.0 | 90.91 |
| | 25.0 | 92.70 | | 60.0 | 91.70 |
| | 30.0 | 92.29 | | 63.0 | 92.36 |
| LBF | 32.0 | 90.97 | | 68.0 | 92.68 |
| | 33.0 | 90.53 | | 73.0 | 92.54 |
| LEW | 33.2 | 89.04 | | 79.0 | 93.78 |
| | 34.0 | 88.85 | | 91.0 | 94.12 |
| | 35.5 | 87.70 | | 104.6 | 95.20 |
| | 38.0 | 87.81 | | | |
| | 41.0 | 87.85 | | | |
| | 43.0 | 88.21 | | | |
| | 45.5 | 88.68 | | | |
| REW | 48.0 | 89.17 | | | |




**Downstream View**

# Prairie Dog Creek - Level I Geomorphologic Study    Site PDC 13

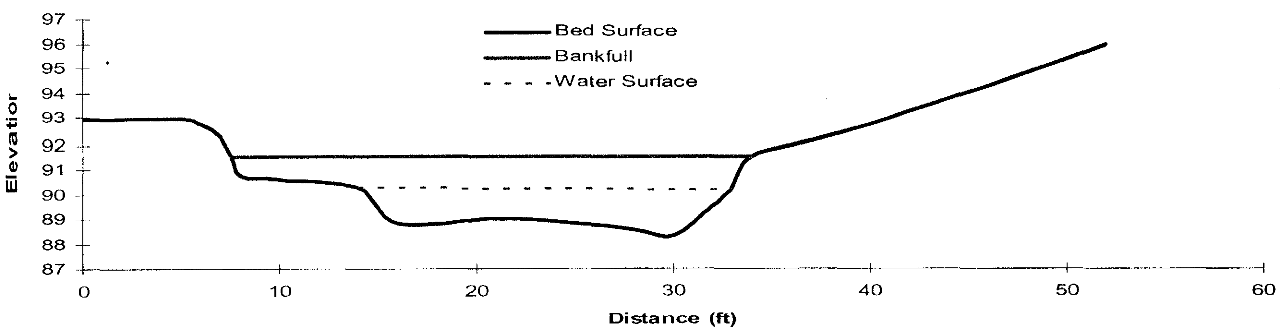
**Downstream View**

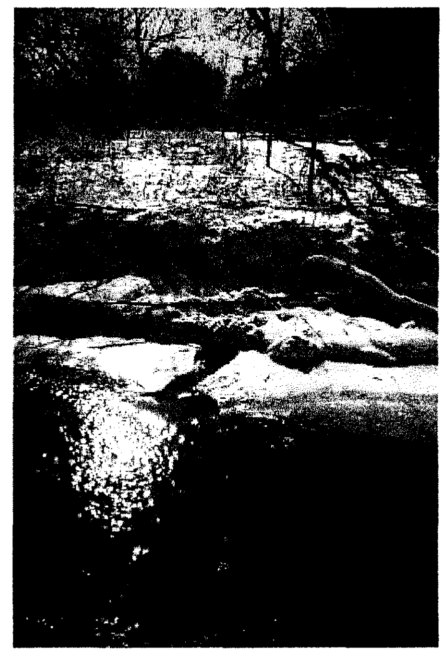
**Upstream View**

| Width (ft) | Cross-Sectional Area (Sq.ft) | Mean Depth (ft) | Maximum Depth (ft) | Wetted Perimeter (ft) | Hydraulic Radius (ft) | |
|---|---|---|---|---|---|---|
| 26.50 | 56.88 | 2.15 | 3.24 | 28.75 | 1.98 | Bankfull |
| 19.00 | 25.35 | 1.33 | 1.96 | 20.07 | 1.26 | Water Surface |

| | | | | | |
|---|---|---|---|---|---|
| STREAM: | Prairie Dog Creek | CREW: | Delk, Starkey | | |
| ID NUMBER: | XS-PDC 13 | | | | |
| DATE | 11/13/00 | | | | |

| Identifier | Distance (ft) | Elevation (ft) | Identifier | Distance (ft) | Elevation (ft) |
|---|---|---|---|---|---|
| | 0.0 | 92.90 | RBF | 34.0 | 91.56 |
| | 5.0 | 92.96 | | 38.0 | 92.32 |
| | 6.0 | 92.69 | | 42.0 | 93.31 |
| | 7.0 | 92.28 | | 47.0 | 94.60 |
| LBF | 7.5 | 91.56 | | 52.0 | 96.02 |
| | 8.0 | 90.74 | | | |
| | 10.0 | 90.63 | | | |
| LEW | 14.0 | 90.29 | | | |
| | 16.0 | 88.79 | | | |
| | 21.0 | 89.02 | | | |
| | 25.0 | 88.80 | | | |
| | 28.0 | 88.55 | | | |
| | 30.0 | 88.32 | | | |
| | 32.0 | 89.50 | | | |
| REW | 33.0 | 90.19 | | | |



**Across Stream View**

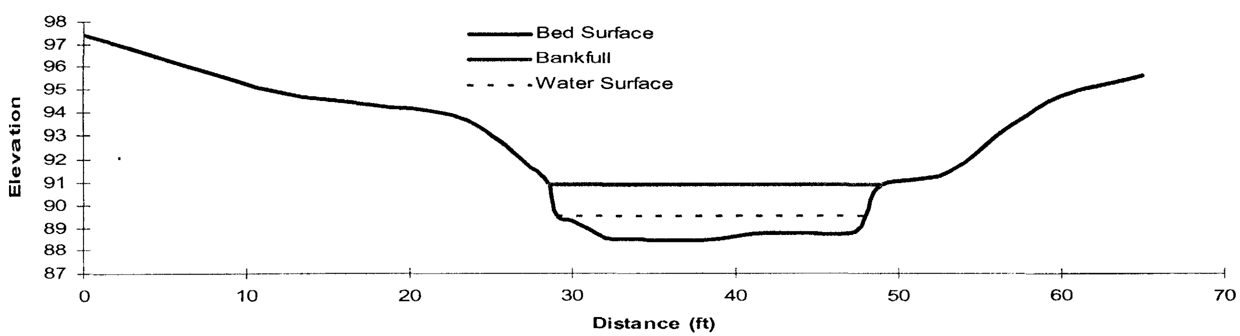
# Prairie Dog Creek - Level I Geomorphologic Study Site PDC 14

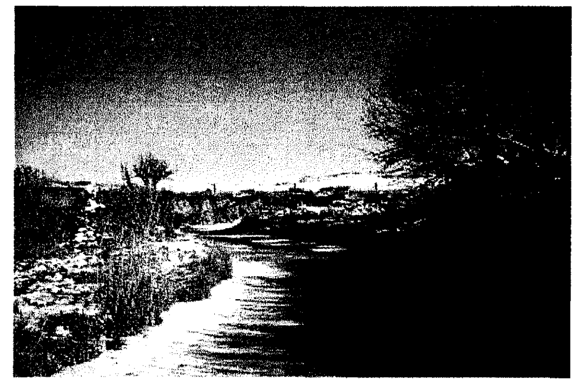
View of culvert

Across Stream View

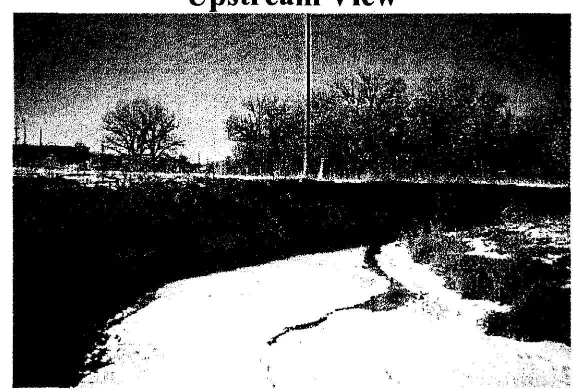
| Width (ft) | Cross-Sectional Area (Sq.ft) | Mean Depth (ft) | Maximum Depth (ft) | Wetted Perimeter (ft) | Hydraulic Radius (ft) | |
|---|---|---|---|---|---|---|
| 20.50 | 42.95 | 2.10 | 2.48 | 22.65 | 1.90 | Bankfull |
| 19.00 | 15.11 | 0.80 | 1.07 | 19.43 | 0.78 | Water Surface |
| Identifier | Distance (ft) | Elevation (ft) | Identifier | Distance (ft) | Elevation (ft) | |
| | 0.0 | 97.41 | | 53.0 | 91.43 | |
| | 12.0 | 94.90 | | 57.0 | 93.50 | |
| | 22.0 | 94.00 | | 60.0 | 94.79 | |
| | 25.0 | 92.99 | | 65.0 | 95.71 | |
| | 28.0 | 91.35 | | | | |
| LBF | 28.5 | 90.91 | | | | |
| LEW | 29.0 | 89.50 | | | | |
| | 30.0 | 89.29 | | | | |
| | 32.0 | 88.55 | | | | |
| | 33.0 | 88.49 | | | | |
| | 38.0 | 88.43 | | | | |
| | 42.0 | 88.78 | | | | |
| | 47.0 | 88.74 | | | | |
| REW | 48.0 | 89.50 | | | | |
| RBF | 49.0 | 90.91 | | | | |

| | | | |
|---|---|---|---|
| STREAM: | Prairie Dog Creek | CREW: | Delk, Starkey |
| ID NUMBER: | XS-PDC 14 | | |
| DATE | 11/13/00 | | |



Upstream View



Downstream View

# Prairie Dog Creek - Level I Geomorphologic Study Site PDC 15*

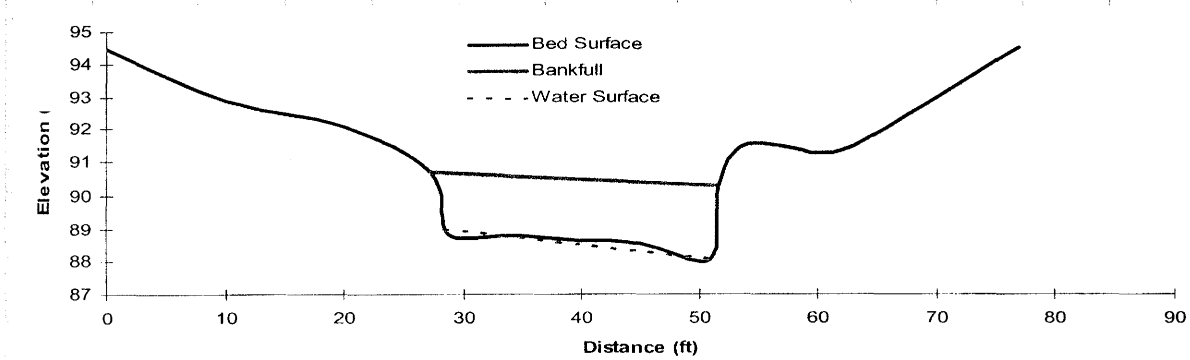
**Upstream View**

**Downstream View**

| STREAM: | Praire Dog Creek | CREW: | Harrelson, Pearson |
|---|---|---|---|
| ID NUMBER: | XS-PDC 15* | | |
| DATE | 8/24/00 | | |

| Width (ft) | Cross-Sectional Area (Sq.ft) | Mean Depth (ft) | Maximum Depth (ft) | Wetted Perimeter (ft) | Hydraulic Radius (ft) | |
|---|---|---|---|---|---|---|
| 24.30 | 47.29 | 1.95 | 2.53 | 26.98 | 1.75 | Bankfull |
| 22.60 | 2.95 | 0.13 | 0.24 | 22.65 | 0.13 | Water Surface |

| Identifier | Distance (ft) | Elevation (ft) | Identifier | Distance (ft) | Elevation (ft) |
|---|---|---|---|---|---|
| L PIN | 0.0 | 94.47 | | | 87.95 |
| | 10.0 | 92.86 | | | 87.87 |
| | 20.0 | 92.08 | | | 89.40 |
| LBF | 27.3 | 90.68 | | | 90.27 |
| LEW | 28.4 | 89.00 | | | 92.74 |
| | 30.0 | 88.71 | | | 93.84 |
| | 35.0 | 88.77 | | | 94.40 |
| | 40.0 | 88.63 | | | |
| | 45.0 | 88.55 | | | |
| REW | 51.0 | 88.05 | | | |
| RBF | 51.6 | 90.29 | | | |
| | 54.0 | 91.55 | | | |
| | 60.0 | 91.31 | | | |
| | 63.0 | 91.49 | | | |
| | 76.9 | 94.55 | | | |




**Across Stream View**

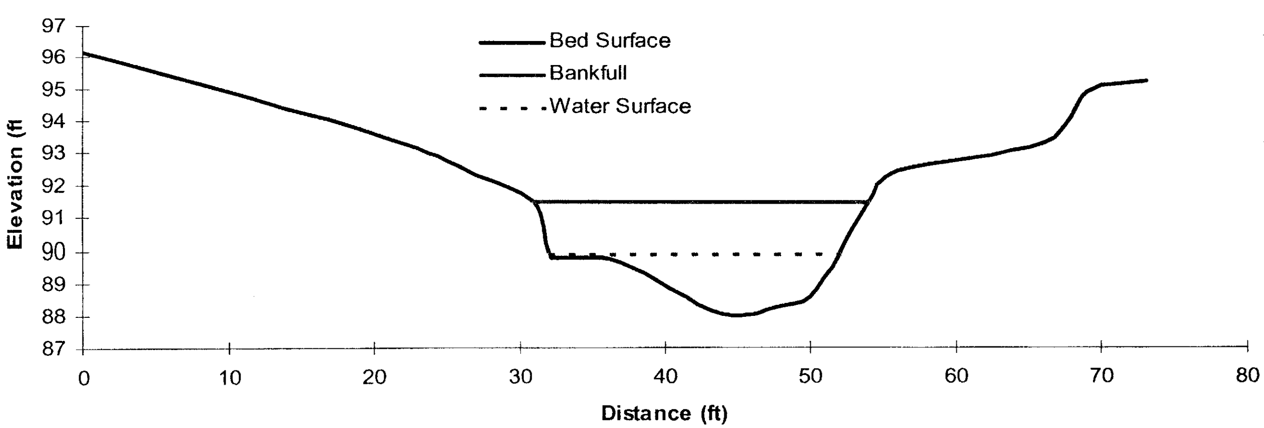
**L-R**

# Prairie Dog Creek - Level I Geomorphologic Study     Site PDC 16

| Width (ft) | Cross-Sectional Area (Sq.ft) | Mean Depth (ft) | Maximum Depth (ft) | Wetted Perimeter (ft) | Hydraulic Radius (ft) | |
|---|---|---|---|---|---|---|
| 23.00 | 52.74 | 2.29 | 3.42 | 24.99 | 2.11 | Bankfull |
| 20.00 | 19.85 | 0.99 | 1.89 | 20.64 | 0.96 | Water Surface |

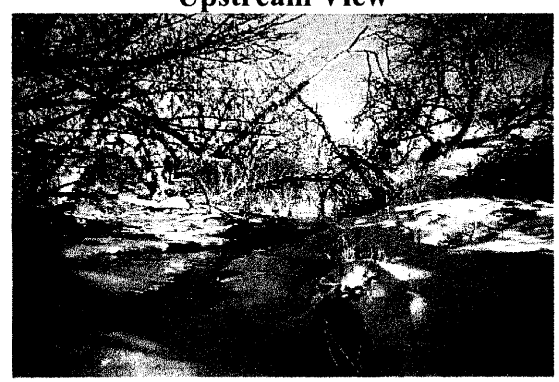
| | |
|---|---|
| STREAM: | Prairie Dog Creek |
| ID NUMBER: | XS-PDC 16 |
| DATE | 11/13/00 |
| CREW: | Delk, Starkey |

| Identifier | Distance (ft) | Elevation (ft) | Identifier | Distance (ft) | Elevation (ft) |
|---|---|---|---|---|---|
| | 0.0 | 96.16 | | 69.0 | 94.92 |
| | 11.0 | 94.77 | | 73.0 | 95.29 |
| | 22.0 | 93.33 | | | |
| | 27.0 | 92.33 | | | |
| LBF | 31.0 | 91.46 | | | |
| LEW | 32.0 | 89.93 | | | |
| | 33.0 | 89.83 | | | |
| | 37.0 | 89.65 | | | |
| | 44.0 | 88.04 | | | |
| | 48.0 | 88.29 | | | |
| | 50.0 | 88.56 | | | |
| REW | 52.0 | 89.93 | | | |
| RBF | 54.0 | 91.46 | | | |
| | 56.0 | 92.49 | | | |
| | 66.0 | 93.35 | | | |




**Across Stream View**

**Upstream View**



**Downstream View**

# Prairie Dog Creek - Level I Geomorphologic Study Site PDC 17*

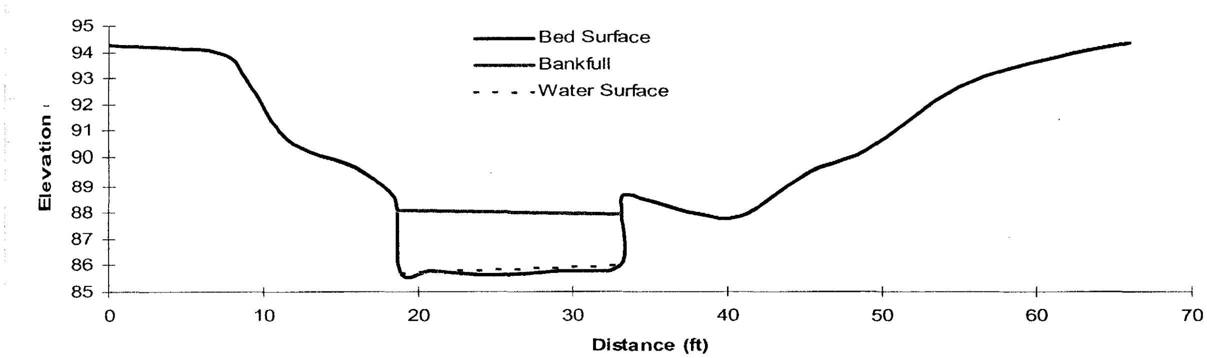
**Upstream View**

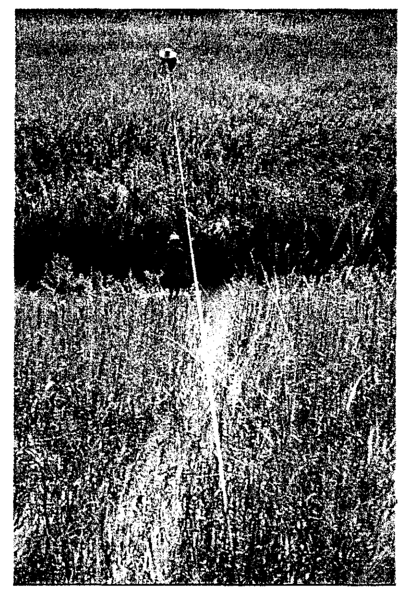
**Downstream View**

| Width (ft) | Cross-Sectional Area (Sq.ft) | Mean Depth (ft) | Maximum Depth (ft) | Wetted Perimeter (ft) | Hydraulic Radius (ft) | |
|---|---|---|---|---|---|---|
| 14.50 | 32.46 | 2.24 | 2.40 | 18.55 | 1.75 | Bankfull |
| 14.20 | 0.09 | 0.01 | 0.12 | 14.21 | 0.01 | Water Surface |

| | | |
|---|---|---|
| STREAM: | Praire Dog Creek | |
| ID NUMBER: | XS-PDC 17* | |
| DATE | 8/24/00 | |
| CREW: | Harrelson, Pearson | |

| Identifier | Distance (ft) | Elevation (ft) | Identifier | Distance (ft) | Elevation (ft) |
|---|---|---|---|---|---|
| L PIN | 0.0 | 94.29 | | 38.0 | 87.95 |
| | 7.0 | 93.97 | | 41.0 | 87.87 |
| | 9.0 | 92.88 | | 45.0 | 89.40 |
| | 11.0 | 90.99 | | 49.0 | 90.27 |
| | 13.0 | 90.18 | | 55.0 | 92.74 |
| | 16.0 | 89.65 | | 61.0 | 93.84 |
| | 18.0 | 88.84 | | 66.0 | 94.40 |
| LBF | 18.6 | 88.06 | | | |
| LEW | 18.8 | 85.66 | | | |
| | 21.0 | 85.78 | | | |
| | 25.0 | 85.63 | | | |
| | 29.0 | 85.80 | | | |
| REW | 33.0 | 85.99 | | | |
| RBF | 33.1 | 87.91 | | | |
| | 33.5 | 88.66 | | | |



**Across Stream View**

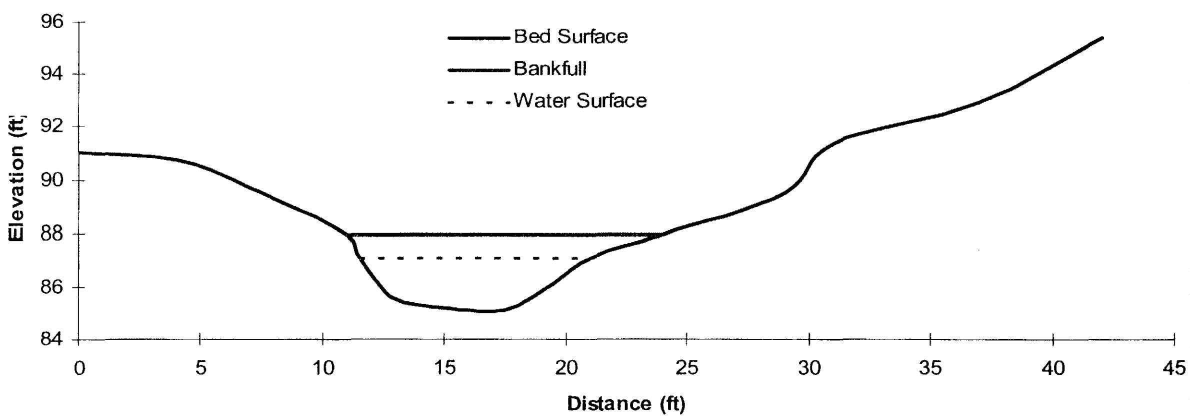
**L-R**

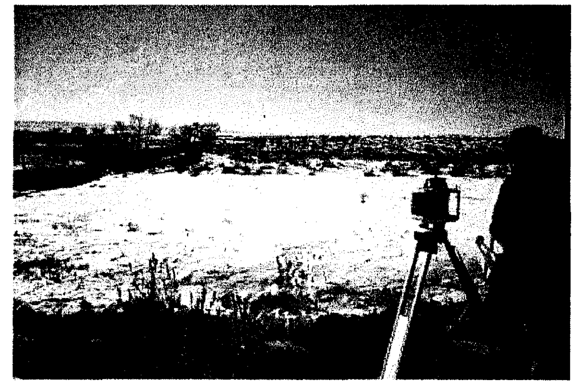
# Prairie Dog Creek - Level I Geomorphologic Study Site PDC 18

| Width (ft) | Cross-Sectional Area (Sq.ft) | Mean Depth (ft) | Maximum Depth (ft) | Wetted Perimeter (ft) | Hydraulic Radius (ft) | |
|---|---|---|---|---|---|---|
| 13.00 | 22.75 | 1.75 | 2.84 | 14.82 | 1.54 | Bankfull |
| 9.50 | 12.74 | 1.34 | 1.95 | 10.67 | 1.19 | Water Surface |

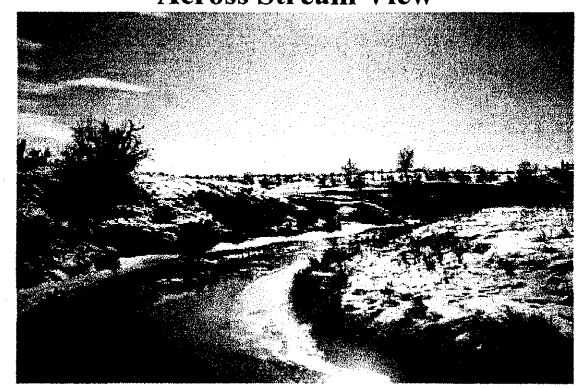
| | |
|---|---|
| STREAM: | Prairie Dog Creek |
| CREW: | Delk, Starkey |
| ID NUMBER: | XS-PDC 18 |
| DATE | 11/14/00 |

| Identifier | Distance (ft) | Elevation (ft) | Identifier | Distance (ft) | Elevation (ft) |
|---|---|---|---|---|---|
| | 0.0 | 91.01 | | | |
| | 4.0 | 90.71 | | | |
| | 7.0 | 89.69 | | | |
| LBF | 11.0 | 87.94 | | | |
| LEW | 11.5 | 87.05 | | | |
| | 13.0 | 85.50 | | | |
| | 16.0 | 85.10 | | | |
| | 18.0 | 85.30 | | | |
| REW | 21.0 | 87.05 | | | |
| RBF | 24.0 | 87.94 | | | |
| | 29.0 | 89.49 | | | |
| | 31.0 | 91.35 | | | |
| | 37.0 | 92.93 | | | |
| | 42.0 | 95.42 | | | |

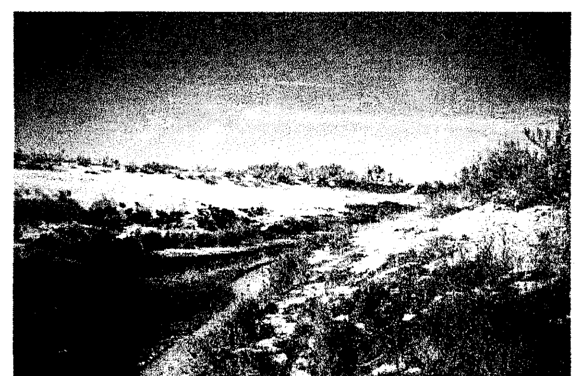


Across Stream View



Upstream View



Downstream View

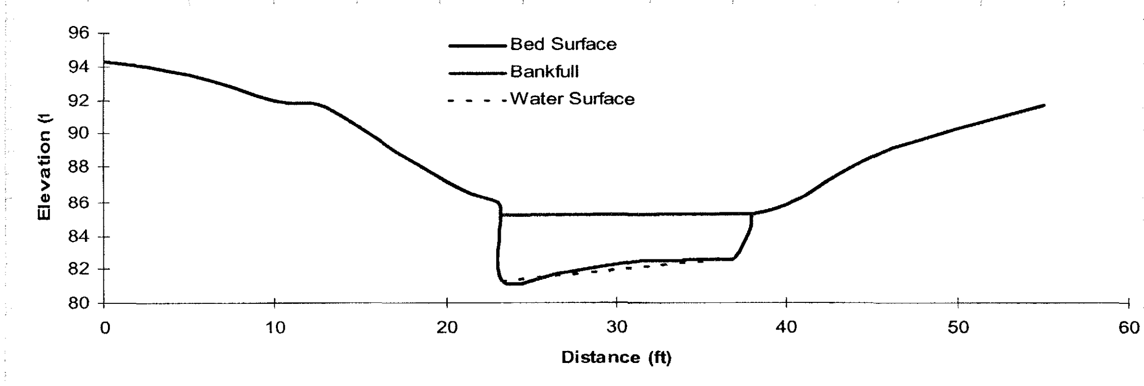
# Prairie Dog Creek - Level I Geomorphologic Study    Site PDC 19*

**Downstream View**

**Upstream View**

| STREAM: | Praire Dog Creek | CREW: | Harrelson, Pearson |
|---|---|---|---|
| ID NUMBER: | XS-PDC 17* | | |
| DATE | 8/24/00 | | |

| Width (ft) | Cross-Sectional Area (Sq.ft) | Mean Depth (ft) | Maximum Depth (ft) | Wetted Perimeter (ft) | Hydraulic Radius (ft) | |
|---|---|---|---|---|---|---|
| 14.80 | 44.40 | 3.00 | 3.92 | 20.58 | 2.16 | Bankfull |
| 13.70 | -5.96 | -0.43 | -0.11 | 13.79 | -0.43 | Water Surface |
| **Identifier** | **Distance (ft)** | **Elevation (ft)** | **Identifier** | **Distance (ft)** | **Elevation (ft)** | |
| L PIN | 0.0 | 94.33 | | 40.0 | 85.85 | |
| | 5.0 | 93.53 | | 45.0 | 88.60 | |
| | 10.0 | 92.00 | | 50.0 | 90.31 | |
| | 13.0 | 91.59 | | 55.1 | 91.74 | |
| | 17.0 | 88.93 | | | 92.74 | |
| | 20.7 | 86.84 | | | 93.84 | |
| | 23.0 | 85.97 | | | 94.40 | |
| LBF | 23.2 | 85.20 | | | | |
| LEW | 23.3 | 81.28 | | | | |
| | 27.0 | 81.75 | | | | |
| | 31.0 | 82.39 | | | | |
| | 36.0 | 82.55 | | | | |
| REW | 37.0 | 82.63 | | | | |
| | 37.9 | 84.60 | | | | |
| RBF | 38.0 | 85.30 | | | | |




**Across Stream View**

**L-R**

# Prairie Dog Creek - Level I Geomorphologic Study    Site PDC 20

**Upstream View**

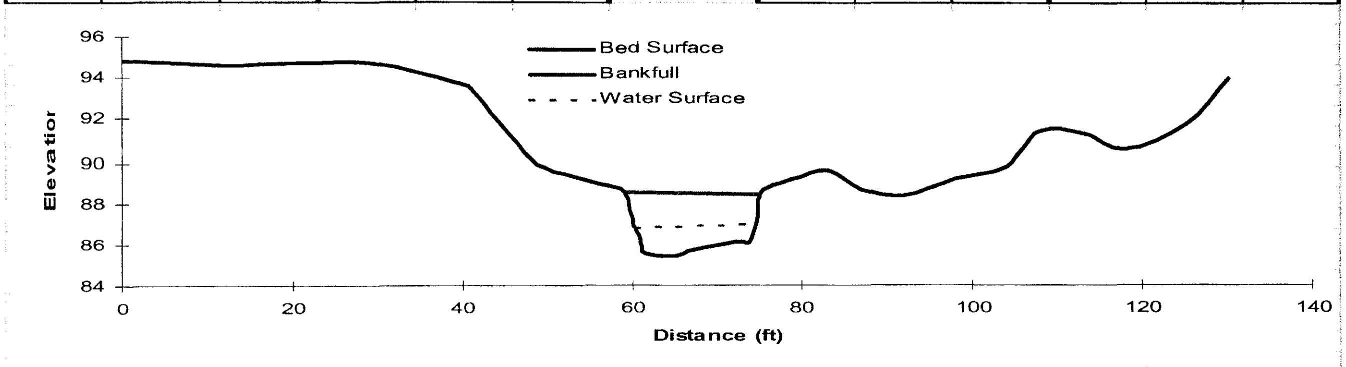
**Across Stream View**

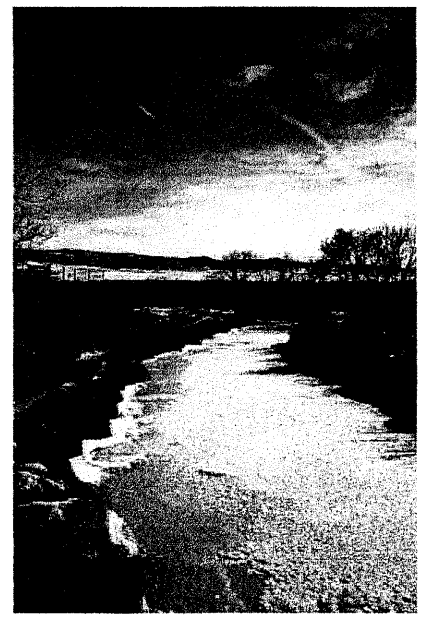
| Width (ft) | Cross-Sectional Area (Sq.ft) | Mean Depth (ft) | Maximum Depth (ft) | Wetted Perimeter (ft) | Hydraulic Radius (ft) | |
|---|---|---|---|---|---|---|
| 16.00 | 39.72 | 2.48 | 3.06 | 18.89 | 2.10 | Bankfull |
| 14.20 | 14.03 | 0.99 | 1.38 | 15.17 | 0.93 | Water Surface |

| | | | |
|---|---|---|---|
| STREAM: | Prairie Dog Creek | CREW: | Harrelson, Wiggs |
| ID NUMBER: | XS-PDC 20 | | |
| DATE | 11/14/00 | | |

| Identifier | Distance (ft) | Elevation (ft) | Identifier | Distance (ft) | Elevation (ft) |
|---|---|---|---|---|---|
| | 0.0 | 94.83 | | 72.8 | 86.08 |
| | 12.0 | 94.57 | | 73.7 | 86.02 |
| | 29.0 | 94.69 | REW | 74.5 | 86.93 |
| | 39.0 | 93.78 | RBF | 75.0 | 88.38 |
| | 41.0 | 93.45 | | 76.0 | 88.74 |
| | 48.0 | 90.08 | | 79.0 | 89.13 |
| | 53.0 | 89.24 | | 83.0 | 89.54 |
| | 57.0 | 88.83 | | 87.0 | 88.65 |
| LBF | 59.0 | 88.52 | | 92.0 | 88.36 |
| LEW | 60.3 | 86.77 | | 98.0 | 89.17 |
| | 60.8 | 86.25 | | 104.0 | 89.75 |
| | 61.5 | 85.53 | | 108.0 | 91.45 |
| | 65.0 | 85.43 | | 113.0 | 91.30 |
| | 67.0 | 85.70 | | 118.0 | 90.54 |
| | 70.0 | 85.91 | | 125.0 | 91.77 |

| Identifier | Distance (ft) | Elevation (ft) |
|---|---|---|
| | 130.0 | 93.99 |



**Downstream View**

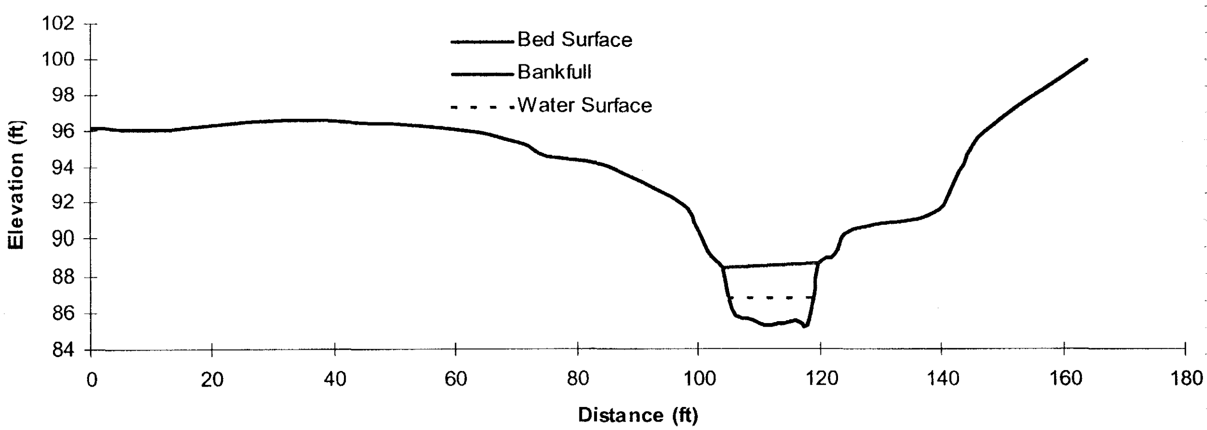
# Prairie Dog Creek - Level I Geomorphologic Study Site PDC 21

**Across Stream View**

| Width (ft) | Cross-Sectional Area (Sq.ft) | Mean Depth (ft) | Maximum Depth (ft) | Wetted Perimeter (ft) | Hydraulic Radius (ft) | |
|---|---|---|---|---|---|---|
| 15.80 | 41.56 | 2.63 | 3.17 | 19.23 | 2.16 | Bankfull |
| 14.00 | 16.87 | 1.20 | 1.51 | 15.24 | 1.11 | Water Surface |

STREAM: Prairie Dog Creek CREW: Harrelson, Wiggs
ID NUMBER: XS-PDC 21
DATE: 11/14/00

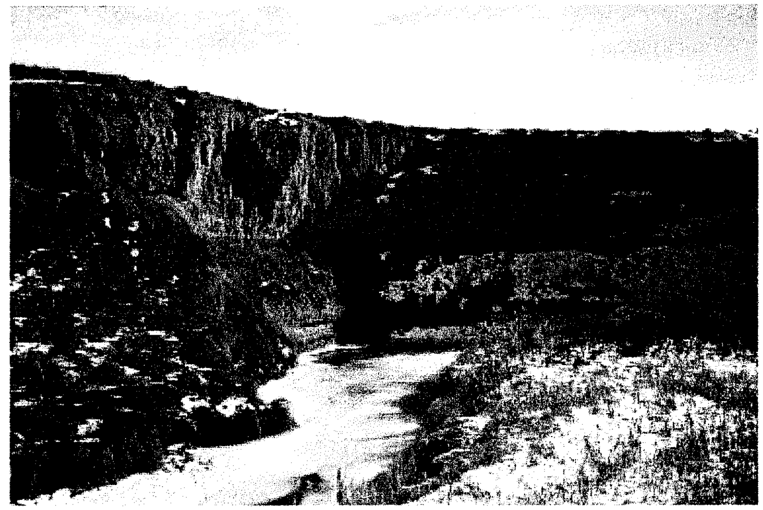
| Identifier | Distance (ft) | Elevation (ft) | Identifier | Distance (ft) | Elevation (ft) |
|---|---|---|---|---|---|
| | 0.0 | 96.18 | | 113.0 | 85.40 |
| | 11.0 | 96.02 | | 114.0 | 85.37 |
| | 32.0 | 96.56 | | 116.0 | 85.60 |
| | 58.0 | 96.17 | | 118.0 | 85.28 |
| | 70.0 | 95.40 | REW | 119.0 | 86.76 |
| | 75.0 | 94.56 | RBF | 119.8 | 88.68 |
| | 84.0 | 94.16 | | 122.6 | 89.28 |
| | 97.0 | 92.03 | | 124.0 | 90.26 |
| | 100.0 | 90.59 | | 128.0 | 90.74 |
| | 102.0 | 89.17 | | 139.0 | 91.50 |
| LBF | 104.0 | 88.42 | | 143.0 | 93.83 |
| LEW | 105.0 | 86.80 | | 147.0 | 96.00 |
| | 106.0 | 85.83 | | 164.0 | 100.00 |
| | 109.0 | 85.53 | | | |
| | 111.0 | 85.35 | | | |




**Downstream View**

# Prairie Dog Creek - Level I Geomorphologic Study Site PDC 21


**Upstream View**


**View of bank**

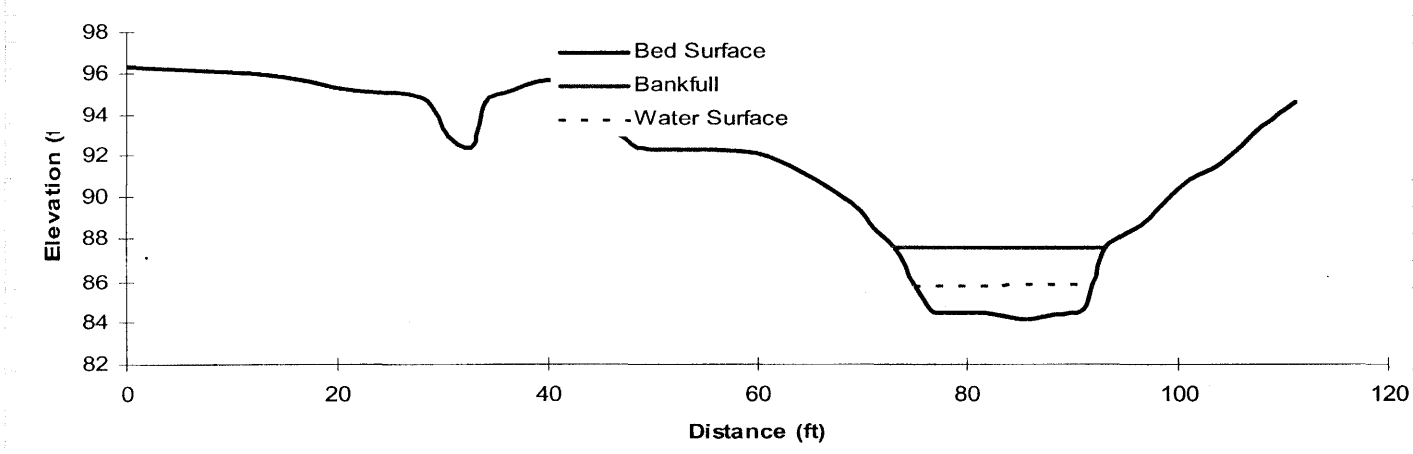
# Prairie Dog Creek - Level I Geomorphologic Study

# Site PDC 22

| Width (ft) | Cross-Sectional Area (Sq.ft) | Mean Depth (ft) | Maximum Depth (ft) | Wetted Perimeter (ft) | Hydraulic Radius (ft) | |
|---|---|---|---|---|---|---|
| 20.00 | 54.76 | 2.74 | 3.45 | 22.77 | 2.41 | Bankfull |
| 16.80 | 21.99 | 1.31 | 1.67 | 17.96 | 1.22 | Water Surface |

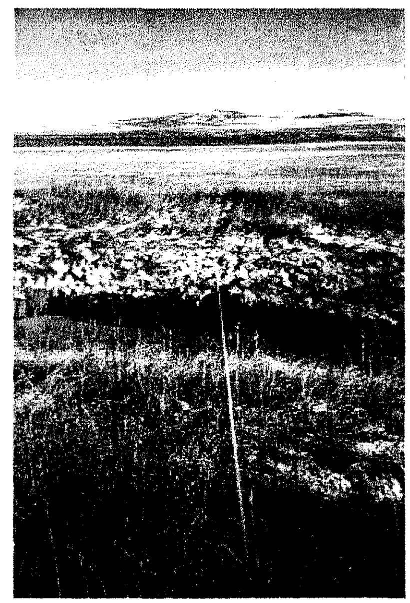
STREAM: Prairie Dog Creek
CREW: Harrelson, Wiggs
ID NUMBER: XS-PDC 22
DATE: 11/14/00

| Identifier | Distance (ft) | Elevation (ft) | Identifier | Distance (ft) | Elevation (ft) | Identifier | Distance (ft) | Elevation (ft) |
|---|---|---|---|---|---|---|---|---|
| | 0.0 | 96.26 | | 71.0 | 88.52 | | 108.0 | 93.52 |
| | 12.0 | 95.99 | LBF | 73.0 | 87.61 | | 111.1 | 94.64 |
| | 22.0 | 95.14 | LEW | 75.0 | 85.82 | | | |
| | 28.0 | 94.83 | | 76.5 | 84.59 | | | |
| | 30.4 | 92.93 | | 78.0 | 84.48 | | | |
| | 32.0 | 92.42 | | 81.7 | 84.50 | | | |
| | 33.0 | 92.59 | | 85.0 | 84.16 | | | |
| | 34.0 | 94.56 | | 88.2 | 84.37 | | | |
| | 36.0 | 95.01 | | 91.0 | 84.62 | | | |
| | 40.0 | 95.70 | REW | 91.8 | 85.87 | | | |
| | 43.0 | 94.94 | RBF | 93.0 | 87.62 | | | |
| | 48.0 | 92.58 | | 95.0 | 88.30 | | | |
| | 52.0 | 92.32 | | 97.0 | 88.92 | | | |
| | 61.0 | 92.00 | | 101.0 | 90.95 | | | |
| | 69.0 | 89.78 | | 104.0 | 91.68 | | | |





Across Stream View


Across Stream View

# Prairie Dog Creek - Level I Geomorphologic Study     Site PDC 22

**Upstream View**

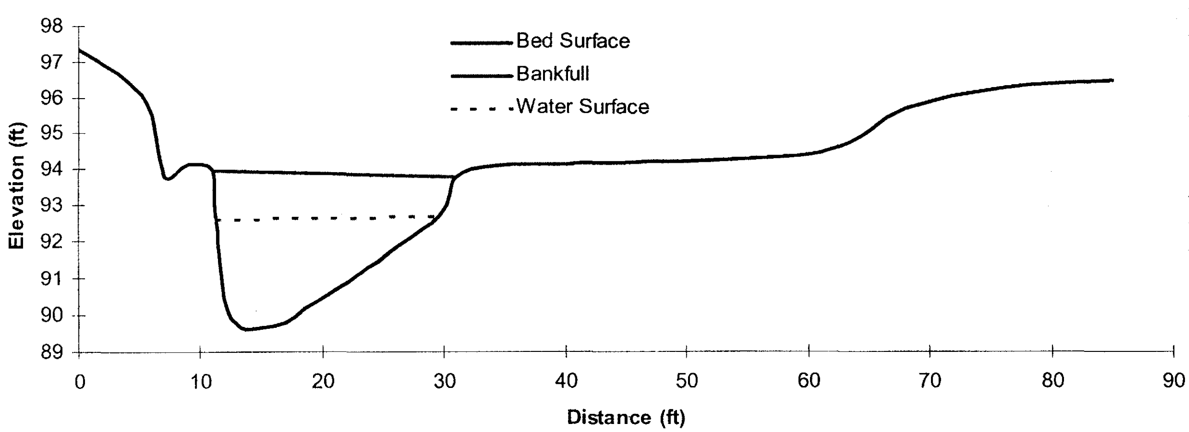
**Downstream View**

# Prairie Dog Creek - Level I Geomorphologic Study Site PDC 23

| Width (ft) | Cross-Sectional Area (Sq.ft) | Mean Depth (ft) | Maximum Depth (ft) | Wetted Perimeter (ft) | Hydraulic Radius (ft) | |
|---|---|---|---|---|---|---|
| 20.00 | 56.29 | 2.81 | 4.21 | 23.50 | 2.40 | Bankfull |
| 18.20 | 31.69 | 1.74 | 2.91 | 20.26 | 1.56 | Water Surface |

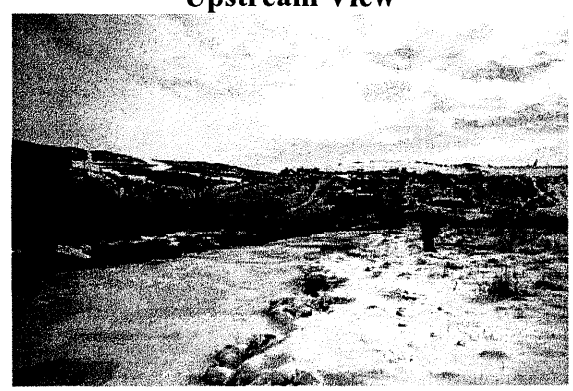
| | |
|---|---|
| STREAM: | Prairie Dog Creek |
| ID NUMBER: | XS-G25 @ CBM Well |
| DATE | 11/15/00 |
| CREW: | Delk, Harrelson |

| Identifier | Distance (ft) | Elevation (ft) | Identifier | Distance (ft) | Elevation (ft) |
|---|---|---|---|---|---|
| | 0.0 | 97.35 | | 61.0 | 94.49 |
| | 4.0 | 96.45 | | 68.0 | 95.71 |
| | 6.0 | 95.56 | | 76.0 | 96.30 |
| | 7.0 | 93.78 | | 85.0 | 96.51 |
| | 9.0 | 94.13 | | | |
| LBF | 11.0 | 93.95 | | | |
| LEW | 11.3 | 92.60 | | | |
| | 12.5 | 89.94 | | | |
| | 16.0 | 89.71 | | | |
| | 19.5 | 90.35 | | | |
| | 23.0 | 91.16 | | | |
| REW | 29.5 | 92.70 | | | |
| RBF | 31.0 | 93.80 | | | |
| | 34.0 | 94.09 | | | |
| | 43.0 | 94.17 | | | |




**Across Stream View**

**Upstream View**



**Downstream View**

# Prairie Dog Creek - Level I Geomorphologic Study     Site PDC 24*

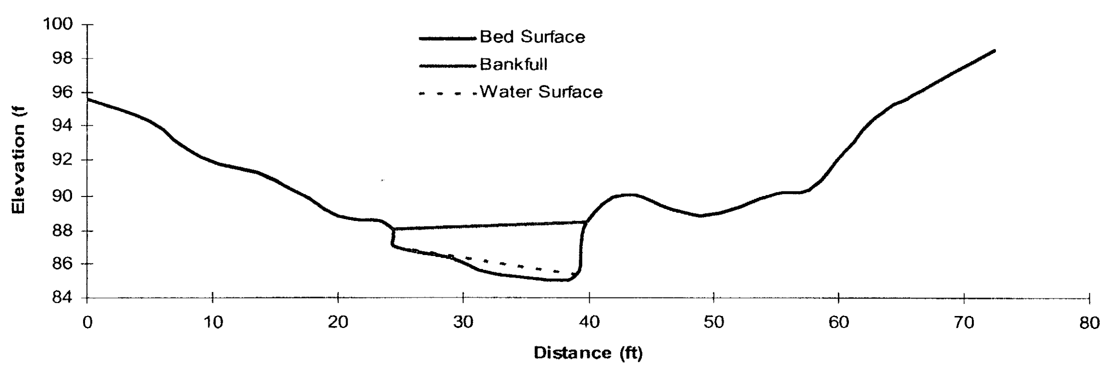
**Downstream View**

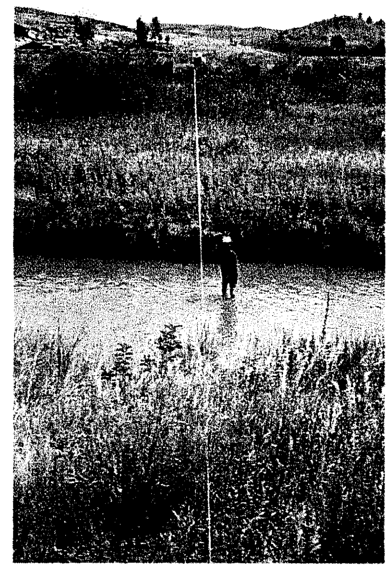
**Upstream View**

| Width (ft) | Cross-Sectional Area (Sq.ft) | Mean Depth (ft) | Maximum Depth (ft) | Wetted Perimeter (ft) | Hydraulic Radius (ft) | |
|---|---|---|---|---|---|---|
| 15.40 | 34.61 | 2.25 | 3.07 | 18.92 | 1.83 | Bankfull |
| 14.40 | 9.31 | 0.65 | 1.42 | 14.59 | 0.64 | Water Surface |

| | | | |
|---|---|---|---|
| STREAM: | Praire Dog Creek | CREW: | Harrelson, Pearson |
| ID NUMBER: | XS-PDC 24* | | |
| DATE | 8/24/00 | | |

| Identifier | Distance (ft) | Elevation (ft) | Identifier | Distance (ft) | Elevation (ft) |
|---|---|---|---|---|---|
| L PIN | 0.0 | 95.57 | | 55.0 | 90.13 |
| | 5.0 | 94.23 | | 58.0 | 90.64 |
| | 9.0 | 92.14 | | 63.0 | 94.58 |
| | 15.0 | 90.91 | | 66.0 | 95.85 |
| | 20.0 | 88.84 | | 72.4 | 98.54 |
| | 23.0 | 88.55 | | | 93.84 |
| LBF | 24.4 | 88.05 | | | 94.40 |
| LEW | 24.6 | 86.94 | | | |
| | 29.0 | 86.34 | | | |
| | 32.0 | 85.48 | | | |
| | 36.0 | 85.08 | | | |
| REW | 39.0 | 85.34 | | | |
| RBF | 39.8 | 88.44 | | | |
| | 43.0 | 90.03 | | | |
| | 49.0 | 88.79 | | | |



**Across Stream View**

**L-R**

# Prairie Dog Creek - Level I Geomorphologic Study Site PDC 25*

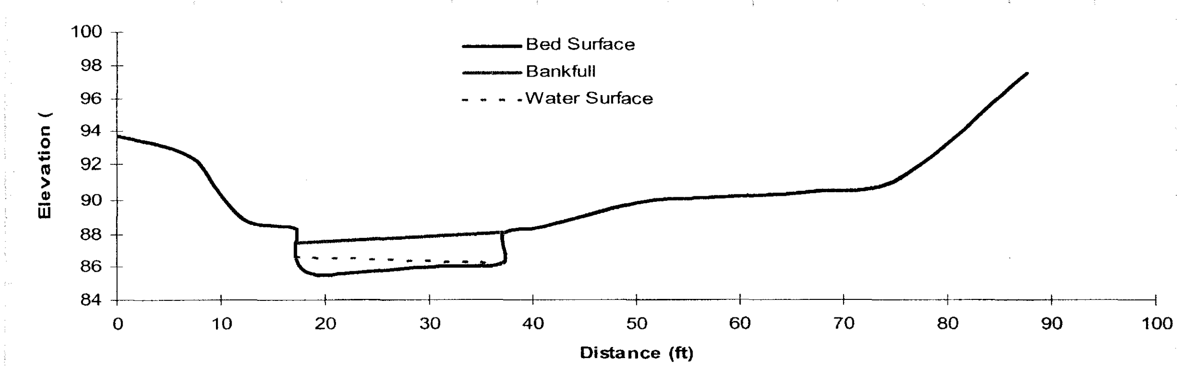
**Downstream View**

**Upstream View**

| Width (ft) | Cross-Sectional Area (Sq.ft) | Mean Depth (ft) | Maximum Depth (ft) | Wetted Perimeter (ft) | Hydraulic Radius (ft) | |
|---|---|---|---|---|---|---|
| 20.00 | 33.51 | 1.68 | 1.99 | 22.89 | 1.46 | Bankfull |
| 19.80 | 11.88 | 0.60 | 1.07 | 20.23 | 0.59 | Water Surface |

| | |
|---|---|
| STREAM: | Praire Dog Creek |
| ID NUMBER: | XS-PDC 25* |
| DATE | 8/24/00 |
| CREW: | Harrelson, Pearson |

| Identifier | Distance (ft) | Elevation (ft) | Identifier | Distance (ft) | Elevation (ft) |
|---|---|---|---|---|---|
| L PIN | 0.0 | 93.73 | | 67.0 | 90.51 |
| | 7.0 | 92.43 | | 76.0 | 91.43 |
| | 12.0 | 88.98 | | 87.6 | 97.61 |
| | 17.0 | 88.37 | | | 90.27 |
| LBF | 17.1 | 87.40 | | | 92.74 |
| LEW | 17.2 | 86.58 | | | 93.84 |
| | 18.0 | 85.68 | | | 94.40 |
| | 20.0 | 85.47 | | | |
| | 26.0 | 85.75 | | | |
| | 31.0 | 86.03 | | | |
| REW | 37.0 | 86.18 | | | |
| RBF | 37.1 | 88.01 | | | |
| | 41.0 | 88.45 | | | |
| | 50.0 | 89.85 | | | |
| | 57.0 | 90.13 | | | |



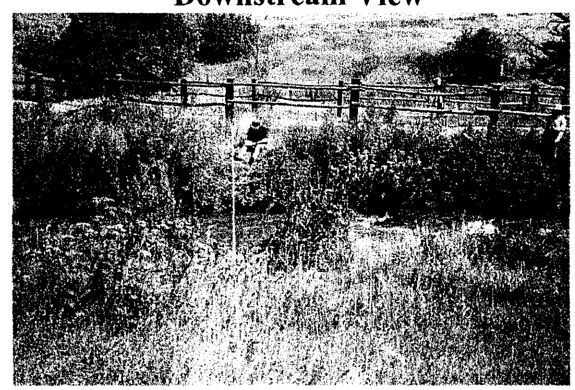

**Across Stream View**

**L-R**

# Prairie Dog Creek - Level I Geomorphologic Study   Site JENKS 1*

**Upstream View**

**Downstream View**

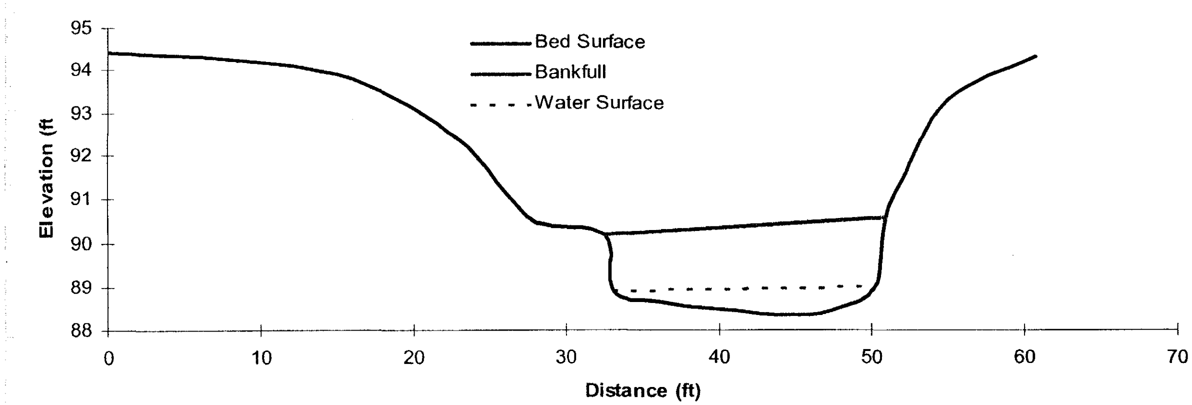


**Across Stream View**

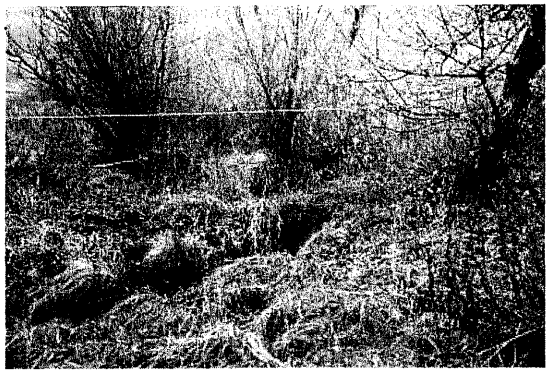
**L-R**

| Width (ft) | Cross-Sectional Area (Sq.ft) | Mean Depth (ft) | Maximum Depth (ft) | Wetted Perimeter (ft) | Hydraulic Radius (ft) | STREAM: | Jenks Creek | CREW: | Harrelson, Pearson |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | ID NUMBER: | XS-JENKS 1* | | |
| | | | | | | DATE | 8/23/00 | | |
| 18.50 | 30.74 | 1.66 | 1.98 | 20.48 | 1.50 | Bankfull | | | |
| 17.20 | 6.17 | 0.36 | 0.57 | 17.27 | 0.36 | Water Surface | | | |

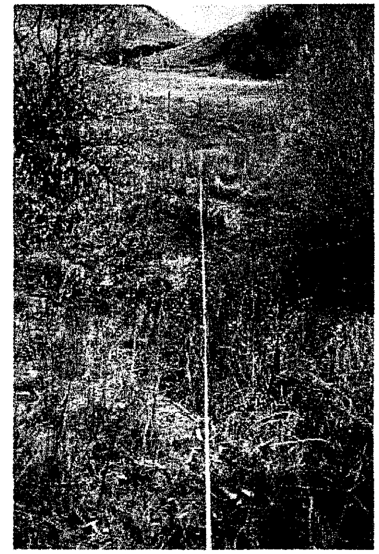
| Identifier | Distance (ft) | Elevation (ft) | Identifier | Distance (ft) | Elevation (ft) |
|---|---|---|---|---|---|
| L PIN | 0.0 | 94.42 | | 55.0 | 93.32 |
| | 8.0 | 94.26 | R PIN | 60.7 | 94.36 |
| | 16.0 | 93.80 | | | |
| | 23.0 | 92.37 | | | |
| | 26.0 | 91.13 | | | |
| | 28.0 | 90.49 | | | |
| LBF | 32.5 | 90.21 | | | |
| LEW | 33.0 | 88.87 | | | |
| | 36.0 | 88.63 | | | |
| | 40.0 | 88.46 | | | |
| | 45.0 | 88.33 | | | |
| | 48.0 | 88.50 | | | |
| REW | 50.2 | 88.98 | | | |
| RBF | 51.0 | 90.57 | | | |
| | 52.0 | 91.42 | | | |



# Prairie Dog Creek - Level I Geomorphologic Study    Site Murphy 1



**Upstream View**

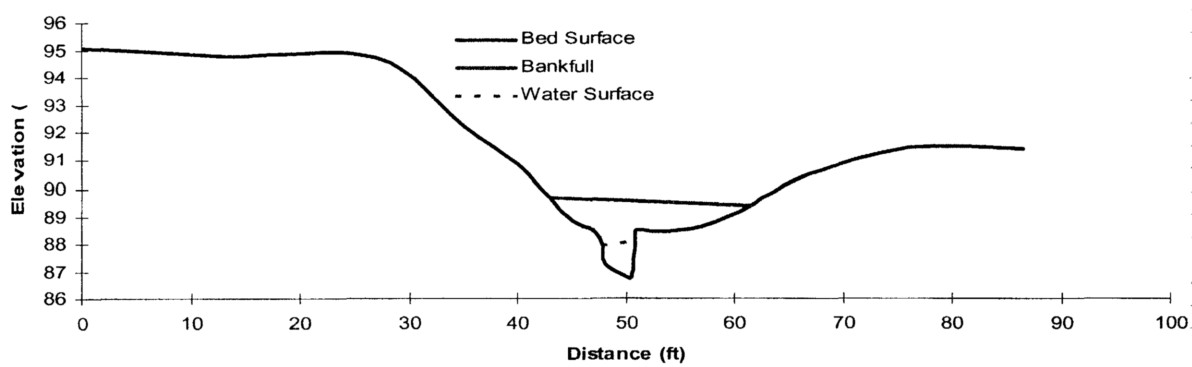


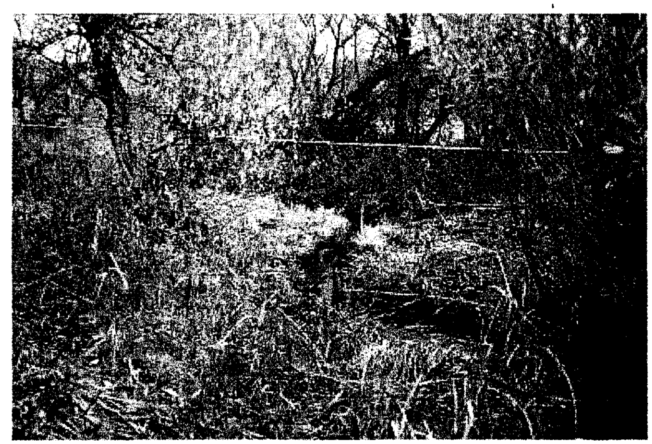
**Across Stream View**

| Width (ft) | Cross-Sectional Area (Sq.ft) | Mean Depth (ft) | Maximum Depth (ft) | Wetted Perimeter (ft) | Hydraulic Radius (ft) | |
|---|---|---|---|---|---|---|
| 18.50 | 20.76 | 1.12 | 2.89 | 20.76 | 1.00 | Bankfull |
| 3.00 | 2.76 | 0.92 | 1.23 | 4.60 | 0.60 | Water Surface |

| | | | | |
|---|---|---|---|---|
| STREAM: | Murphy Gulch | CREW: | Harrelson, Mitchell | |
| ID NUMBER: | XS-PDC 8 | | | |
| DATE | 10/24/00 | | | |

| Identifier | Distance (ft) | Elevation (ft) | Identifier | Distance (ft) | Elevation (ft) |
|---|---|---|---|---|---|
| | 0.0 | 95.06 | | 53.0 | 88.45 |
| | 13.0 | 94.78 | | 57.0 | 88.65 |
| | 27.0 | 94.75 | RBF | 61.5 | 89.35 |
| | 35.0 | 92.26 | | 63.0 | 89.78 |
| | 40.0 | 90.83 | | 67.0 | 90.50 |
| LBF | 43.0 | 89.67 | | 76.0 | 91.45 |
| | 45.0 | 88.82 | | 86.5 | 91.43 |
| | 47.0 | 88.50 | | | |
| LEW | 47.8 | 87.92 | | | |
| | 48.0 | 87.30 | | | |
| | 49.0 | 87.00 | | | |
| | 50.0 | 86.76 | | | |
| | 50.5 | 86.78 | | | |
| REW | 50.8 | 88.12 | | | |
| | 51.0 | 88.49 | | | |



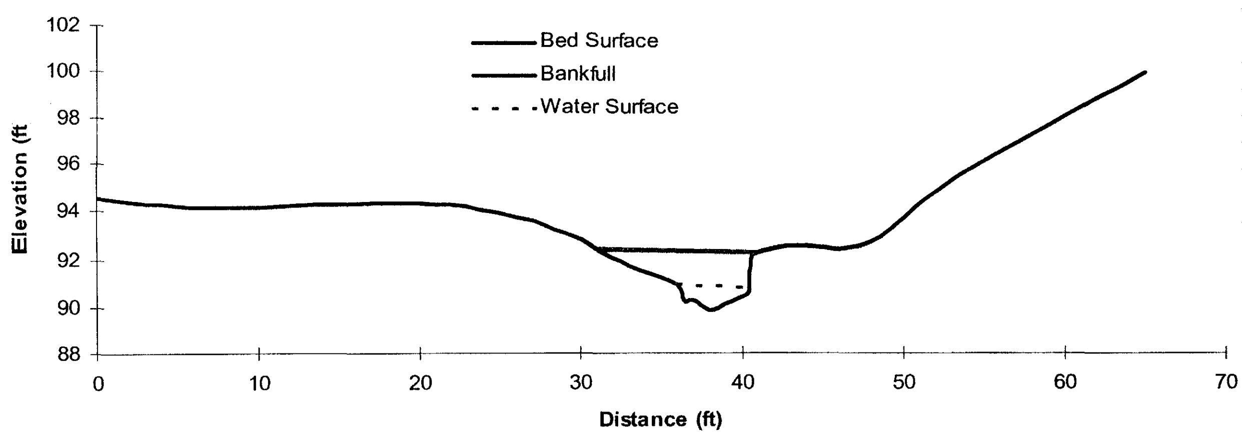
**Downstream Views**

# Prairie Dog Creek - Level I Geomorphologic Study     Site Murphy 2

| Width (ft) | Cross-Sectional Area (Sq.ft) | Mean Depth (ft) | Maximum Depth (ft) | Wetted Perimeter (ft) | Hydraulic Radius (ft) | |
|---|---|---|---|---|---|---|
| 10.00 | 13.79 | 1.38 | 2.53 | 12.18 | 1.13 | Bankfull |
| 4.50 | 3.05 | 0.68 | 1.01 | 5.24 | 0.58 | Water Surface |

| | |
|---|---|
| STREAM: | Murphy Gulch |
| ID NUMBER: | XS-Murphy 2 |
| DATE | 10/24/00 |
| CREW: | Harrelson, Mitchell |

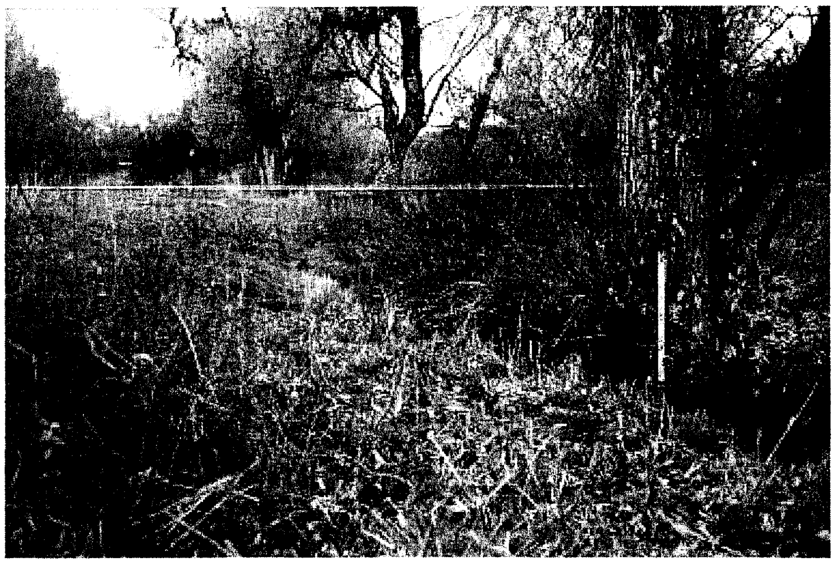
| Identifier | Distance (ft) | Elevation (ft) | Identifier | Distance (ft) | Elevation (ft) |
|---|---|---|---|---|---|
| | 0.0 | 94.50 | RBF | 41.0 | 92.29 |
| | 7.0 | 94.10 | | 43.0 | 92.53 |
| | 20.0 | 94.31 | | 48.0 | 92.69 |
| | 26.0 | 93.72 | | 53.3 | 95.45 |
| | 29.0 | 93.04 | | 65.0 | 100.00 |
| LBF | 31.0 | 92.40 | | | |
| | 33.0 | 91.76 | | | |
| LEW | 36.0 | 90.90 | | | |
| | 36.4 | 90.22 | | | |
| | 37.0 | 90.24 | | | |
| | 38.0 | 89.86 | | | |
| | 39.0 | 90.11 | | | |
| | 40.4 | 90.50 | | | |
| REW | 40.5 | 90.78 | | | |
| | 40.6 | 92.00 | | | |




Across Stream View

Upstream View

# Prairie Dog Creek - Level I Geomorphologic Study     Site Murphy 2



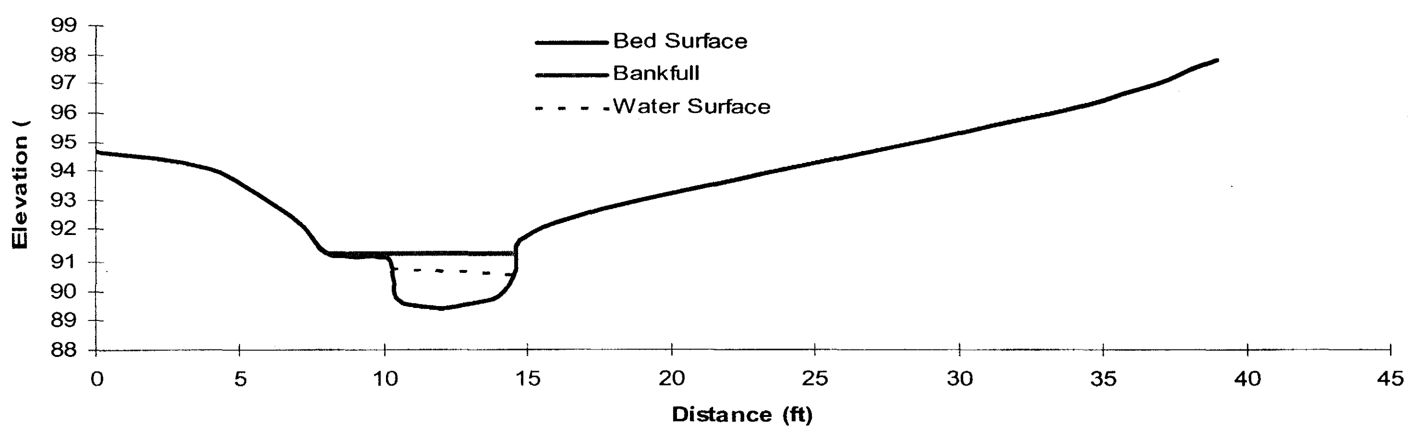
**Downstream View**

**View of gouge**

# Prairie Dog Creek - Level I Geomorphologic Study Site Murphy 3

| Width (ft) | Cross-Sectional Area (Sq.ft) | Mean Depth (ft) | Maximum Depth (ft) | Wetted Perimeter (ft) | Hydraulic Radius (ft) | STREAM: | Murphy Gulch | CREW: | Harrelson, Wiggs |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | ID NUMBER: | XS-Murphy 3 | | |
| | | | | | | DATE | 11/10/00 | | |
| 6.60 | 7.04 | 1.07 | 1.87 | 8.83 | 0.80 | Bankfull | | | |
| 4.20 | 4.30 | 1.02 | 1.28 | 5.53 | 0.78 | Water Surface | | | |

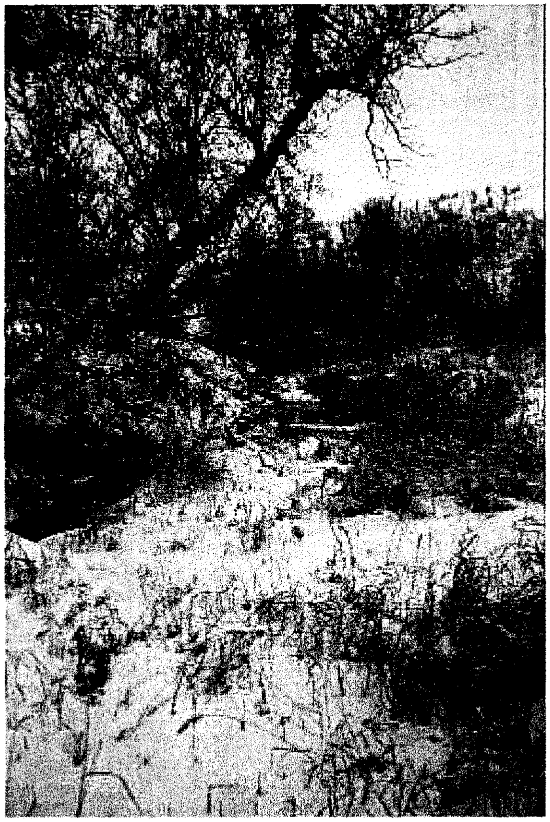
| Identifier | Distance (ft) | Elevation (ft) | Identifier | Distance (ft) | Elevation (ft) |
|---|---|---|---|---|---|
| | 0.0 | 94.63 | | 20.0 | 93.28 |
| | 4.0 | 94.05 | | 27.0 | 94.69 |
| | 7.0 | 92.24 | | 35.0 | 96.46 |
| LBF | 8.0 | 91.26 | | 39.0 | 97.85 |
| | 10.0 | 91.15 | | | |
| LEW | 10.3 | 90.72 | | | |
| | 10.4 | 89.75 | | | |
| | 11.0 | 89.50 | | | |
| | 12.0 | 89.39 | | | |
| | 13.0 | 89.58 | | | |
| | 14.0 | 89.80 | | | |
| REW | 14.5 | 90.50 | | | |
| RBF | 14.6 | 91.26 | | | |
| | 14.7 | 91.67 | | | |
| | 16.0 | 92.25 | | | |




**Downstream View**

**Upstream View**

# Prairie Dog Creek - Level I Geomorphologic Study Site Murphy 3



**Across Stream Views**

# Prairie Dog Creek - Level I Geomorphologic Study     Site Meade 1

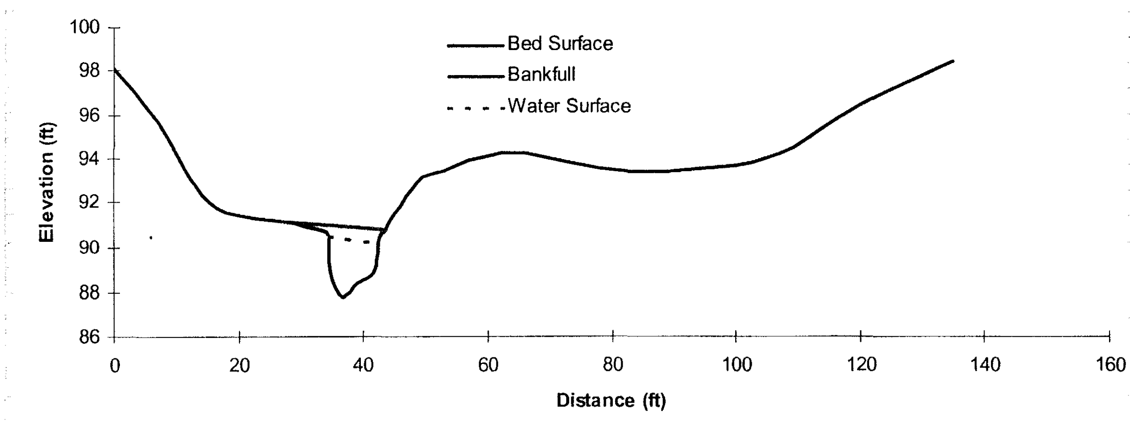
| Width (ft) | Cross-Sectional Area (Sq.ft) | Mean Depth (ft) | Maximum Depth (ft) | Wetted Perimeter (ft) | Hydraulic Radius (ft) | |
|---|---|---|---|---|---|---|
| 16.50 | 22.17 | 1.34 | 3.29 | 19.40 | 1.14 | Bankfull |
| 7.90 | 15.34 | 1.94 | 2.65 | 10.57 | 1.45 | Water Surface |

STREAM: Meade Creek    CREW: Harrelson, Wiggs

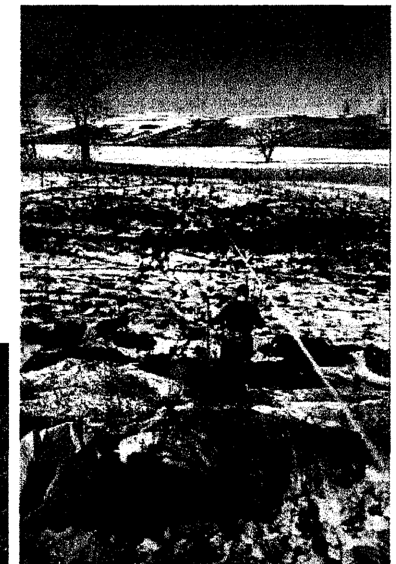
ID NUMBER: XS-Meade 1

DATE 11/13/00

| Identifier | Distance (ft) | Elevation (ft) | Identifier | Distance (ft) | Elevation (ft) |
|---|---|---|---|---|---|
| | 0.0 | 98.10 | | 45.0 | 91.43 |
| | 7.0 | 95.71 | | 49.0 | 93.05 |
| | 13.0 | 92.83 | | 52.0 | 93.35 |
| | 18.0 | 91.56 | | 64.0 | 94.26 |
| LBF | 27.0 | 91.09 | | 83.0 | 93.44 |
| | 33.0 | 90.75 | | 105.0 | 94.04 |
| LEW | 34.5 | 90.49 | | 120.0 | 96.50 |
| | 34.6 | 88.94 | | 135.0 | 98.48 |
| | 36.5 | 87.77 | | | |
| | 39.0 | 88.37 | | | |
| | 40.8 | 88.69 | | | |
| | 42.0 | 89.19 | | | |
| REW | 42.4 | 90.20 | | | |
| | 43.0 | 90.72 | | | |
| RBF | 43.5 | 90.80 | | | |




**Downstream View**

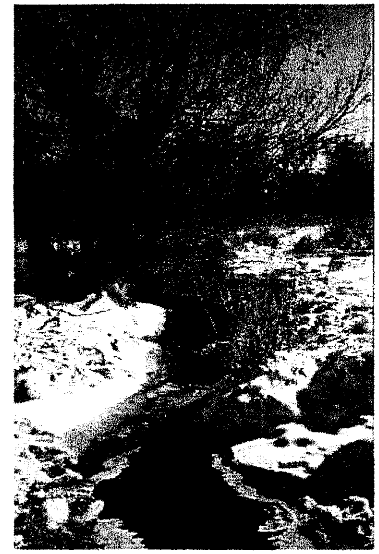


**Across Stream View**

**Upstream View**

# Prairie Dog Creek - Level I Geomorphologic Study     Site Meade 2

**Across Stream View**

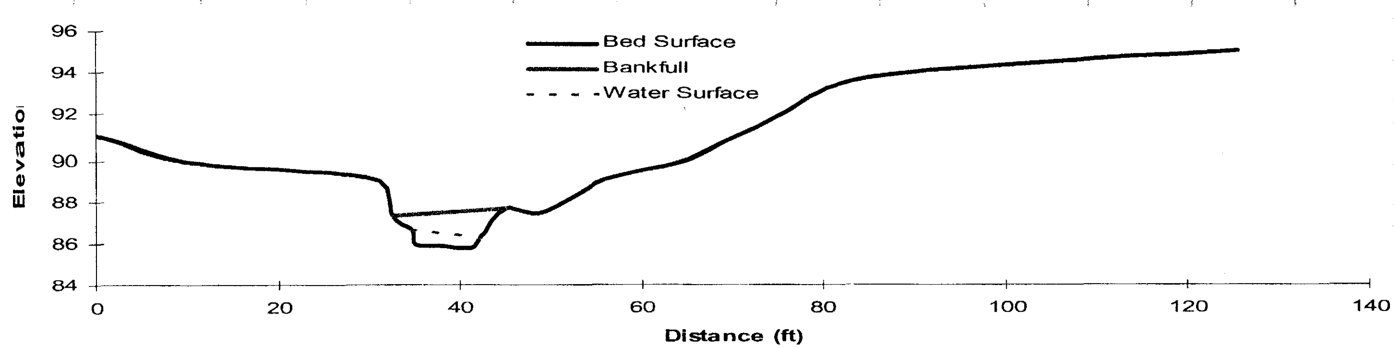


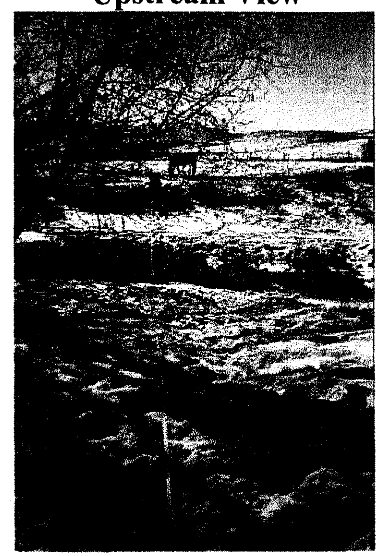
**Upstream View**

| Width (ft) | Cross-Sectional Area (Sq.ft) | Mean Depth (ft) | Maximum Depth (ft) | Wetted Perimeter (ft) | Hydraulic Radius (ft) | |
|---|---|---|---|---|---|---|
| 12.50 | 13.11 | 1.05 | 1.59 | 13.37 | 0.98 | Bankfull |
| 7.50 | 4.38 | 0.58 | 0.70 | 7.96 | 0.55 | Water Surface |

| | | | |
|---|---|---|---|
| STREAM: | Meade Creek | CREW: | Harrelson, Wiggs |
| ID NUMBER: | XS-Meade 2 | | |
| DATE | 11/13/00 | | |

| Identifier | Distance (ft) | Elevation (ft) | Identifier | Distance (ft) | Elevation (ft) |
|---|---|---|---|---|---|
| | 0.0 | 90.96 | | 83.0 | 93.66 |
| | 10.0 | 89.94 | | 102.0 | 94.52 |
| | 23.0 | 89.46 | | 125.5 | 95.20 |
| | 31.0 | 88.98 | | | |
| LBF | 32.5 | 87.28 | | | |
| LEW | 34.5 | 86.61 | | | |
| | 35.0 | 85.92 | | | |
| | 38.0 | 85.86 | | | |
| | 41.0 | 85.77 | | | |
| REW | 42.0 | 86.25 | | | |
| RBF | 45.0 | 87.62 | | | |
| | 49.0 | 87.48 | | | |
| | 56.0 | 89.03 | | | |
| | 65.0 | 89.96 | | | |
| | 75.0 | 91.96 | | | |



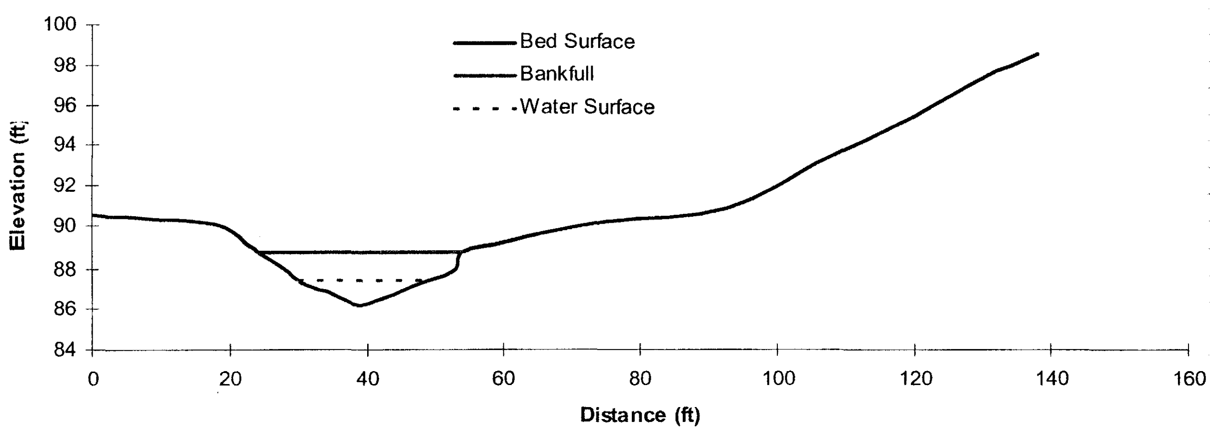
**Downstream View**

# Prairie Dog Creek - Level I Geomorphologic Study Site Dutch 1

| Width (ft) | Cross-Sectional Area (Sq.ft) | Mean Depth (ft) | Maximum Depth (ft) | Wetted Perimeter (ft) | Hydraulic Radius (ft) | |
|---|---|---|---|---|---|---|
| 30.00 | 49.10 | 1.64 | 2.71 | 30.73 | 1.60 | Bankfull |
| 19.00 | 13.35 | 0.70 | 1.31 | 19.19 | 0.70 | Water Surface |

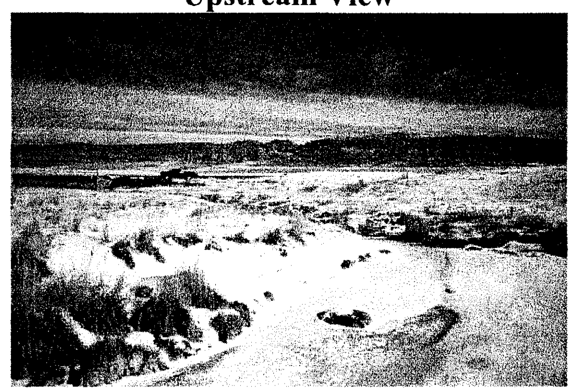
STREAM: Dutch Creek
ID NUMBER: XS-Dutch 1
DATE: 11/14/00
CREW: Delk, Starkey

| Identifier | Distance (ft) | Elevation (ft) | Identifier | Distance (ft) | Elevation (ft) |
|---|---|---|---|---|---|
| | 0.0 | 90.54 | | 93.0 | 90.90 |
| | 18.0 | 90.02 | | 106.0 | 93.18 |
| | 22.0 | 89.25 | | 120.0 | 95.52 |
| LBF | 24.0 | 88.85 | | 130.0 | 97.37 |
| | 27.0 | 88.18 | | 138.0 | 98.58 |
| LEW | 30.0 | 87.45 | | | |
| | 31.0 | 87.19 | | | |
| | 35.0 | 86.70 | | | |
| | 39.0 | 86.14 | | | |
| | 44.0 | 86.69 | | | |
| REW | 49.0 | 87.45 | | | |
| | 53.0 | 87.95 | | | |
| RBF | 54.0 | 88.85 | | | |
| | 61.0 | 89.27 | | | |
| | 75.0 | 90.19 | | | |




Across Stream View

Upstream View



Downstream View

# Prairie Dog Creek - Level I Geomorphologic Study Site Dutch 2

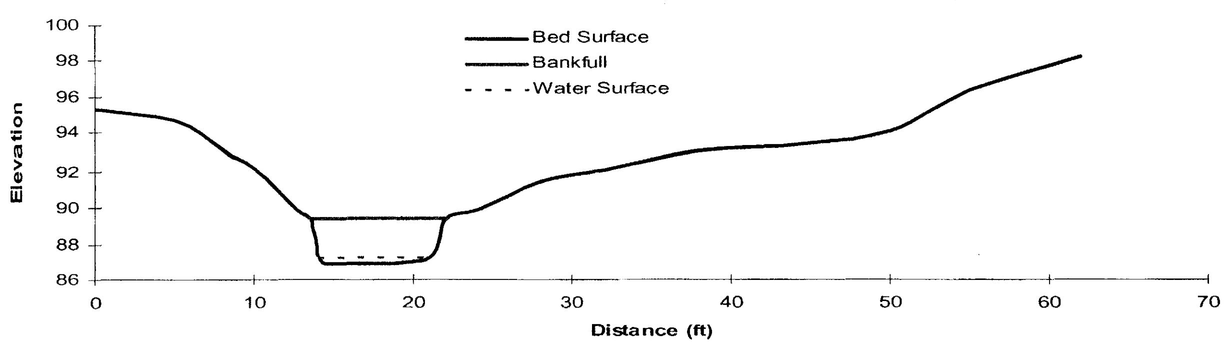
**Downstream View**

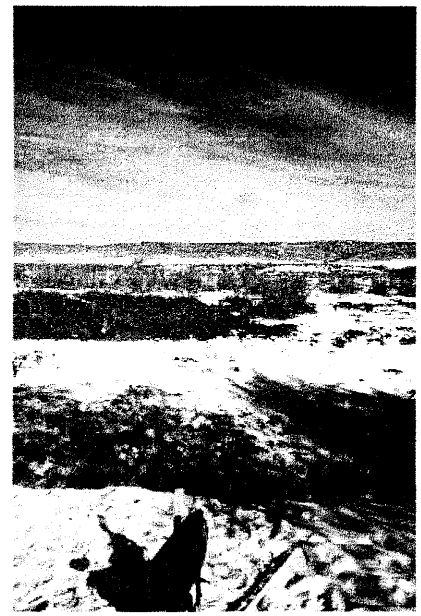
**Upstream View**

| Width (ft) | Cross-Sectional Area (Sq.ft) | Mean Depth (ft) | Maximum Depth (ft) | Wetted Perimeter (ft) | Hydraulic Radius (ft) | |
|---|---|---|---|---|---|---|
| 8.50 | 18.47 | 2.17 | 2.48 | 11.73 | 1.57 | Bankfull |
| 7.00 | 1.57 | 0.22 | 0.30 | 7.10 | 0.22 | Water Surface |

STREAM: Dutch Creek
ID NUMBER: XS-Dutch 2
DATE: 11/14/00
CREW: Delk, Starkey

| Identifier | Distance (ft) | Elevation (ft) | Identifier | Distance (ft) | Elevation (ft) |
|---|---|---|---|---|---|
| | 0.0 | 95.33 | | 38.0 | 93.10 |
| | 5.0 | 94.68 | | 45.0 | 93.50 |
| | 8.0 | 93.11 | | 50.0 | 94.16 |
| | 10.0 | 92.21 | | 55.0 | 96.48 |
| | 13.0 | 89.66 | | 62.0 | 98.35 |
| LBF | 13.5 | 89.38 | | | |
| LEW | 14.0 | 87.20 | | | |
| | 14.5 | 86.90 | | | |
| | 16.0 | 86.90 | | | |
| | 18.0 | 86.90 | | | |
| REW | 21.0 | 87.20 | | | |
| RBF | 22.0 | 89.38 | | | |
| | 24.0 | 89.85 | | | |
| | 28.0 | 91.42 | | | |
| | 32.0 | 92.04 | | | |



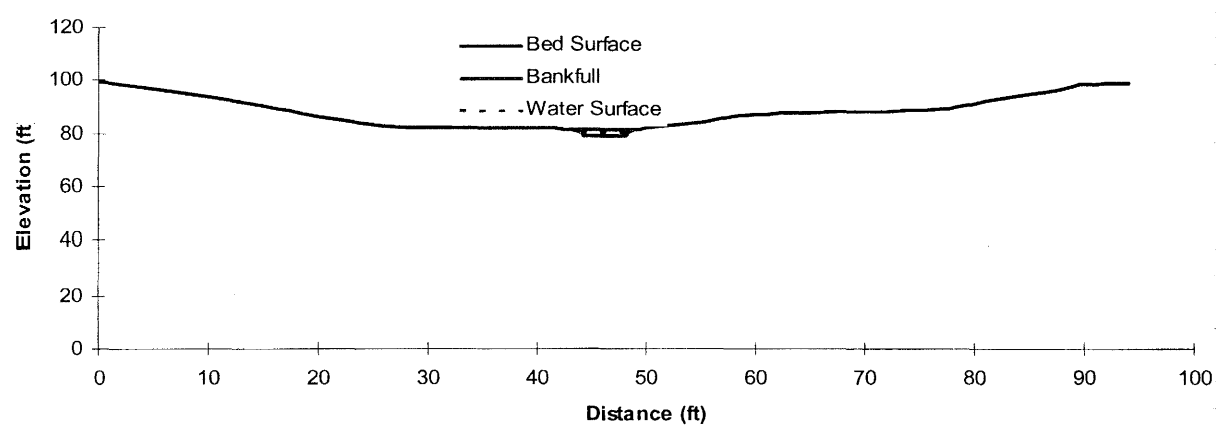
**Across Stream View**

# Prairie Dog Creek - Level I Geomorphologic Study    Site CAT 1

| | |
|---|---|
| STREAM: | Wildcat Creek |
| CREW: | Delk, Starkey |
| ID NUMBER: | XS-CAT1 |
| DATE | 11/14/00 |

| Width (ft) | Cross-Sectional Area (Sq.ft) | Mean Depth (ft) | Maximum Depth (ft) | Wetted Perimeter (ft) | Hydraulic Radius (ft) | |
|---|---|---|---|---|---|---|
| 6.00 | 10.52 | 1.75 | 2.37 | 8.80 | 1.20 | Bankfull |
| 4.20 | 3.53 | 0.84 | 1.00 | 5.52 | 0.64 | Water Surface |

| Identifier | Distance (ft) | Elevation (ft) | Identifier | Distance (ft) | Elevation (ft) |
|---|---|---|---|---|---|
| | 0.0 | 99.58 | RBF | 49.0 | 81.51 |
| | 5.0 | 96.74 | | 54.0 | 83.80 |
| | 10.0 | 93.75 | | 60.0 | 87.41 |
| | 15.0 | 90.05 | | 70.0 | 88.36 |
| | 20.0 | 86.27 | | 77.0 | 89.54 |
| | 28.0 | 81.86 | | 81.0 | 92.58 |
| | 39.0 | 81.89 | | 88.0 | 97.51 |
| LBF | 43.0 | 81.51 | | 90.0 | 99.15 |
| LEW | 44.0 | 80.14 | | 94.0 | 99.65 |
| | 44.2 | 79.40 | | | |
| | 45.0 | 79.34 | | | |
| | 46.0 | 79.14 | | | |
| | 47.0 | 79.24 | | | |
| | 48.0 | 79.24 | | | |
| REW | 48.2 | 80.14 | | | |




**Across Stream View**

**Across Stream View**

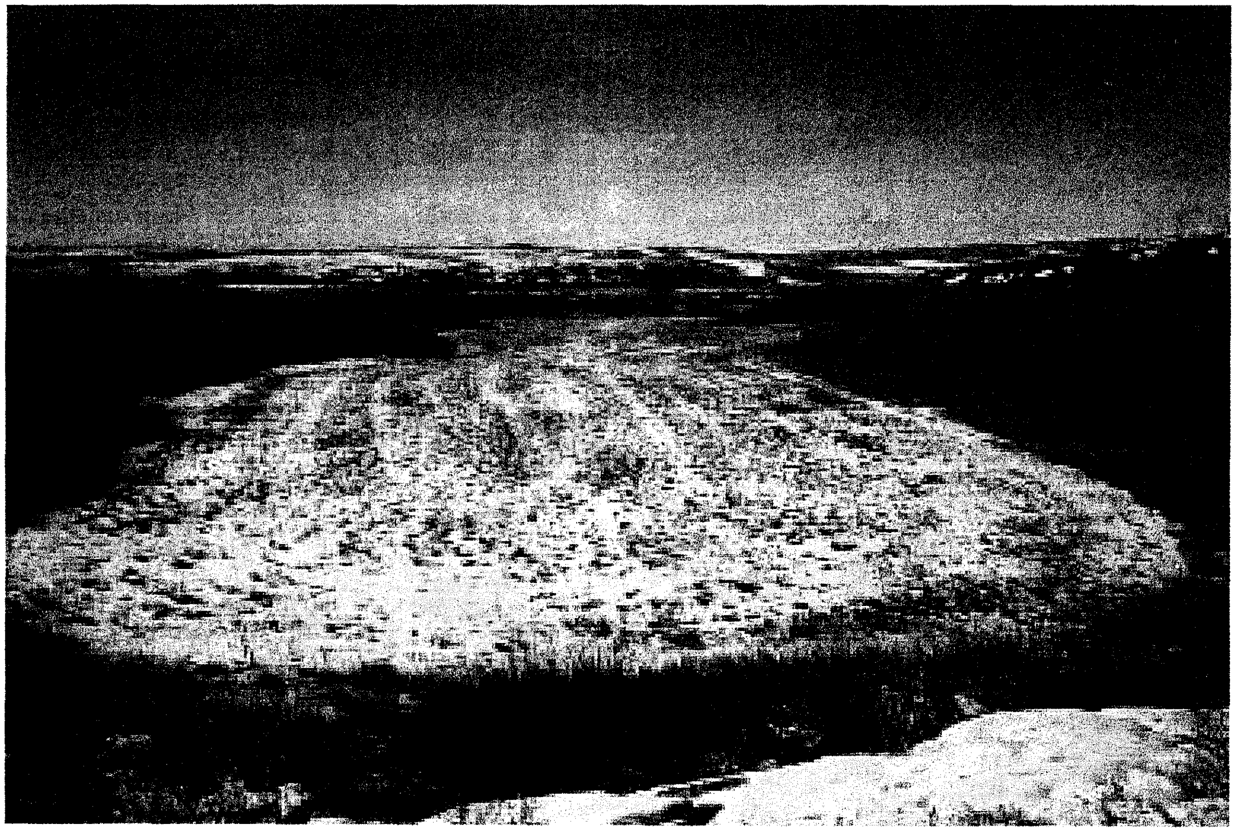
# Prairie Dog Creek - Level I Geomorphologic Study Site CAT 1

**Upstream View**

**Downstream View**

# Prairie Dog Creek - Level I Geomorphologic Study

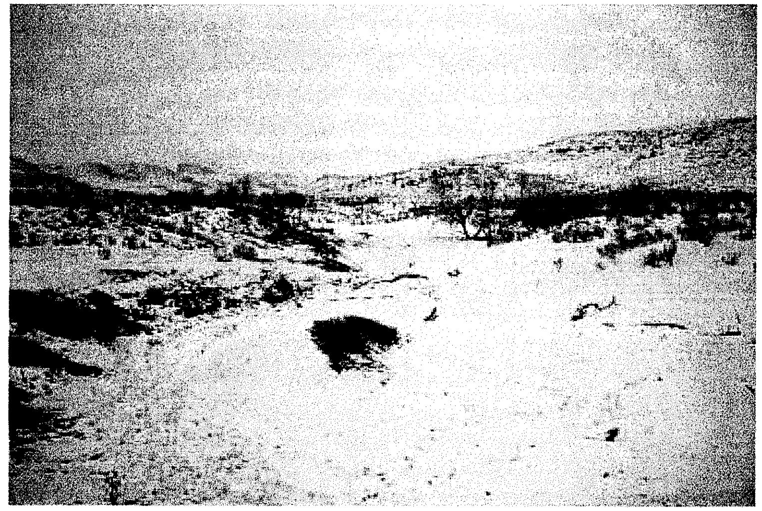
## Photo Point on Bar N Draw



**View of Bar N**

# Prairie Dog Creek - Level I Geomorphologic Study     Site Cat Creek

**Downstream View**



**Upstream View**

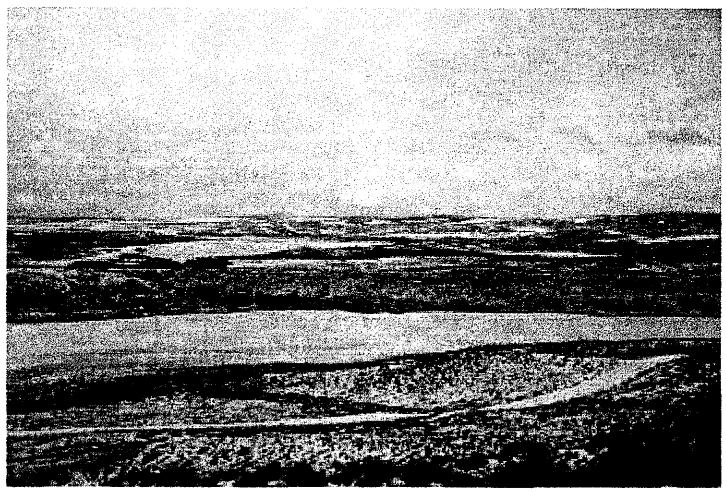
**Downstream View**

**Upstream View**

# Prairie Dog Creek - Level I Geomorphologic Study     Site Coutant Creek

**Downstream View**

**Upstream View**



**View of creek at RR fill**

# APPENDIX 5

## COMMENTS RECEIVED ON OCTOBER, 2001 DRAFT REPORT AND RESPONSES TO THOSE COMMENTS

# COMMENTS RECEIVED ON OCTOBER, 2001 DRAFT REPORT AND RESPONSES TO THOSE COMMENTS

1. **Comments made in the November 11, 2001 Letter from the Piney and Cruse Creek Ditch Company.**

**Comment:** "The Hidden Hills project is a separate issue and should not be included in the scope of this study."

**Response:** The Wyoming Water Development Commission has agreed to separate the final reports for the Prairie Dog Creek watershed master plan and the Hidden Hills domestic water study.

**Comment:** "The Board does not agree with the National Resources Conservation Service proposal to reclaim existing Tunnel Hill cuts. The Board does not feel it is the responsibility of this ditch company to correct this age-old erosion. The Board's present position on the Tunnel Hill cut for the Piney and Cruse Creek Ditch is that it is the Ditch Company's responsibility to stabilize this cut as it currently exists. Further reclamation is not the responsibility of the Ditch Company. The current plan holders were aware of the condition when they acquired the adjoining properties."

**Response:** The NRCS proposals to address Problem Area #2 (Continued Erosion Associated with PCCDC and MCDC Transbasin Diversions) includes $48,000 for reclamation of the Tunnel Hill Ridge. The PDWSC performed some reclamation on the Tunnel Hill Ridge when it installed the 48" steel pipeline in the mid-1990's; e.g., grading, manure spreading and reseeding. Shaping and smoothing of slopes to transition of adjacent property, however, was not performed

The actual extent of reclamation ultimately be required would best be determined after negotiations have taken place with affected landowners. Meanwhile, it is conservative to include some reclamation costs in the estimates at this level of study.

**Comment:** "The Board feels there are inaccuracies in the report (i.e., adjudicated water rights from 1993). The Board feels that the reduction of water being diverted is not due to less irrigation usage rather is due to the limits of the BOC of 14 - 15 cfs".

**Response:** In attempting to address the first part of this comment, contact was made with George Harper, President of PCCDC. Mr. Harper indicated that the inaccuracies relate to a water right with an original priority date of **1880** (i.e., not 1993). He was concerned that the record did not correctly show the Evelyn N. Moore appropriation from North Piney Creek and South Piney Creek for the Prairie Dog Water Supply Company's 1$^{st}$ Appropriation, with a priority date of October 1, 1880. This water right had its point of diversion and means of conveyance changed to the Piney & Cruse Ditch. A review of Appendix 1: Tabulation of Adjudicated Water Rights, however, did show that this change in point of diversion and means of conveyance had taken place and was properly documented.

In an attempt to have the most recent information provided within the final report, the 1999 edition of the Board of Control's Tabulation of Adjudicated Water Rights and the most current list of shareholders within the PDWSC, PCCDC, MCDC and Kearney Lake Reservoir Company have been included in Appendix 1.

Regarding the second part of this comment, the text was modified in Section 2.1.5.4.2 to state that the reasons for a reduction in the amount of water being diverted could possibly be attributed to more efficient irrigation techniques (e.g., sprinklers), less direct flow or storage water being available, or timely precipitation decreasing the need for diversions. We have also included information on the most recent 10-year average of diversions in comparison to the historical record of diversions. It is correct that there has been less water diverted over the last ten years by PCCDC and MCDC.

**Comment:** "The Board would like Problem Area No. 6 Fecal Coliform within Prairie Dog Creek and Problem No. 8 - Possible Water Quality Problems in the Meade Creek Drainage justified. The Board would like to see justification for Problem Area No. 8 and what differentiates this sub-drainage from any other in the watershed in terms of water quality. (Figure 2.21 demonstrates there is a fecal coliform problem in the watershed as a whole and thus probably justifies Problem #6.)"

**Response:** During one of the public meetings, which were held during the course of the project, two landowners on Meade Creek between the I-90 crossing and the confluence with Prairie Dog Creek complained about an excessive amount of sand and turbidity in Meade Creek. This situation seemed unusual due to the relatively flat grade and sinuosity of Meade Creek in the area between U.S. Highway 87 and of I-90.

Because the original scope did not include a detailed investigation of the tributaries to Prairie Dog Creek, yet there may be a potential water quality problem in the Meade Creek drainage, it was believe that the best method of addressing the potential problem would be to include it in a possible future Level II study. This was recommended as the solution to Problem Area #8.

The last sentence of the comment appears to address the reason why fecal coliform is listed as a problem in the PDCW.

2. **Comments made in the November 13, 2001 Letter from the Meade Creek Ditch Company**

**Comment:** "There seems to be no consideration given to lining the existing pipeline through [Tunnel H]ill and extending it down the fall line to the concrete box rather than digging a new tunnel."

**Response:** Section 3.2.2.2 – Rehabilitate Existing Individual PCCDC and MCDC Transbasin Facilities proposes installing a new 36" pipe from the end of the existing tunnel down the hill to an outlet works/energy dissipation structure. It does not propose digging a new tunnel.

The NRCS evaluation did not include a review of the present condition of the interior of the existing tunnel pipe. This evaluation should be conducted if this alternative is pursued further.

**Comment:** "Prairie Dog Ditch Company's cross transfer ditch from South Piney Creek to North Piney Creek doesn't have enough capacity to carry the amount of water needed for their diversion down Tunnel Hill. This adds stress, wear and tear to the other two ditches to make up for the shortfall. This is an ongoing problem not mentioned in the draft report."

**Response:** The situation addressed in this comment was not made known to EnTech until the draft report comments were received. It was not mentioned in any of the public meetings or discussions with the ditch riders or representatives of the BOC. Since the comment was made, however, discussions have been held with an existing and previous ditch rider to better understand the situation, as well as with representatives of the BOC.

A new section 2.1.5.2.4 entitled Feeder Ditch Conveyance Capacities has been included in the final report to discuss this situation, and it has been listed in the recommendations of the Path Forward as an area possibly requiring further investigation

**Comment:** "Problem #3 is mentioned as a problem but no research has been done to find the extent nor source of the problem much less a solution."

**Response:** Problem #3 (Continued Erosion Associated with PCCDC and MCDC Delivery Systems) is listed due to the investigations, which took place through the course of this study, which identified the considerable accumulation of sand behind diversion dams and other quiescent areas. Unfortunately, the budget provided in the study did not include sufficient resources to inventory the existing conveyance systems and determine the major sources of this sand. As recommended in the study, further investigation is warranted to identify the extent of the problem and potential solutions. That is why there are no cost estimates provided for a solution to this problem.

**Comment:** "The complications involved in combining the North Piney diversions of Piney-Cruse and Meade Creek Ditches have probably been understated both in operations and the disruptions to Story residents that would be caused by altering the course of Piney-Cruse's transfer ditch."

**Response:** Section 3.2.2.1 – Combining PCCDC and MCDC Transbasin Facilities proposes combining the PCCDC and MCDC ditches over the divide to the PDCW. This alternative solution was developed by NRCS with Story residents in mind to both minimize impacts to these citizens and continue to provide water for irrigation and aesthetic purposes to those who have historically received these benefits, even though they have no legal right to use this water. The proposed alternative alignments were developed in cooperation with affected landowners.

This alternative to combine portions of the feeder ditch and transbasin facilities will undoubtedly require an increased level of cooperation between PCCDC and MCDC. However, cost estimates show that this alternative will be less expensive than rehabilitating existing systems, and it is likely that possible funding agencies will look more favorably upon a joint project that reduces capital construction costs.

3. **Comments made in the November 7, 2001 Letter from the Prairie Dog Water Supply Company and Kearney Lake Land & Reservoir**

**Comment:** "The reference to the PDWSC Drop Structure lawsuit is incorrect in that the structure has been designed and funded and was in the construction phase when the lawsuit was brought against PDWSC. We would like to see the mitigation clause omitted as it has no basis."

**Response:** Section 2.1.5.3.1 – PDWSC Drop Structure has been modified to correctly reflect the history behind the drop structure lawsuit.

**Comment:** "The list of shareholders is not current and therefore incorrect."

**Response:** The PDWSC has provided a current list of shareholders that will be incorporated into Appendix 1 of the final report.

**Comment:** "The WDEQ water samples need to be verified and included in the report and we feel that the weather conditions prior to and at the time of the samples need to be included as they were a large factor in what the samples contained."

**Response:** EnTech has finally been able to obtain the results of the 1998 WDEQ water quality sampling that took place on portions of Prairie Dog Creek. This information has been included in the final report.

Information has been provided in the final report that portrays precipitation events that occurred on the day of water quality sampling, as well as the two days prior to the sampling. Precipitation data has been included from the Sheridan County Airport, the Sheridan Field Station (located approximately two miles upstream of the Prairie Dog Creek – Dutch Creek confluence), and in Story.

**Comment:** "The lack of on-site investigations should be addressed."

**Response:** As much time was put into field reconnaissance as was possible. Active participants in this project included EnTech personnel Rick Estes, Betsy Pearson and Dave Engels, Cheryl Harrelson of Steady Stream Hydrology and personnel from Intermountain Laboratories (IML). Mr. Estes visited the project site on 15-20 occasions, with a similar number of visits being conducted by Betsy Pearson. These personnel visitations to the project site included field reconnaissance and discussions with ditch riders and board members of the respective ditch companies, as well as several individual visits to important locations within the project area. Ms. Harrelson's work included the establishment of 32 cross-sections along Prairie Dog Creek and its tributaries, photo documentation of these sites, subsequent visitations to determine changes to some of these cross-sections, and a separate on-site analysis performed on Jenks Creek. IML personnel performed seven individual sampling events at each of the eleven sampling sites.

**Comment:** "The correct appropriations through each of the lateral ditches should be corrected."

**Response:** The most recent information from the Board of Control's Tabulation of Adjudicated Water Rights has been included in Appendix 1.

**Comment:** "Justification for the Class 2 classification of Prairie Dog Creek."

**Response:** Due to changes made in July 2001 to its Chapter 1 Water Quality Rules and Regulations, WDEQ now categorizes Prairie Dog Creek as a Class 2AB stream. This information has been included in the final report.

**Comment:** "The original scope of services of the study was deviated from in that the Hidden Hills study in no way meet the objective of our study. We would request that the Hidden Hills information be bound separately as a study that stands alone."

**Response:** See response to the first comment.