Mailing Address:
Water Resources Data System
University of Wyoming, Dept 3943
1000 E University Avenue
Laramie, WY 82071

Physical Address:
Wyoming Hall, Room 249
University of Wyoming
Laramie, WY 82071

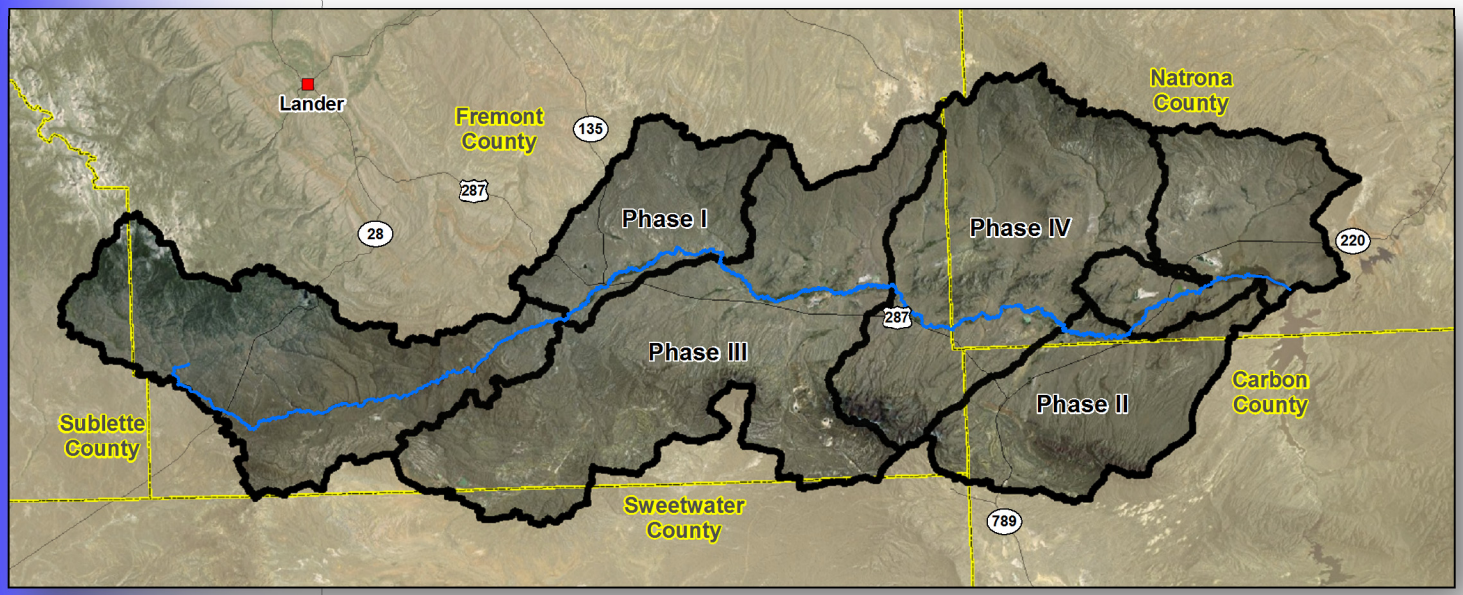
Phone: (307) 766-6651
Fax: (307) 766-3785

Funding for WRDS and the creation of this electronic document was provided by the Wyoming Water Development Commission (http://wwdc.state.wy.us)

FINAL REPORT
FOR THE
SWEETWATER RIVER WATERSHED STUDY
BASINWIDE WATERSHED MANAGEMENT PLAN

Prepared For:

Wyoming Water Development Commission
6920 Yellowtail Road
Cheyenne, WY 82002



Prepared By:

Anderson Consulting Engineers, Inc.
375 E. Horsetooth Rd. Bldg. 5
Fort Collins, CO 80525
(ACE Project No. WYWDC26)

ANDERSON CONSULTING ENGINEERS, INC.
Civil • Water Resources • Environmental

April 20, 2012

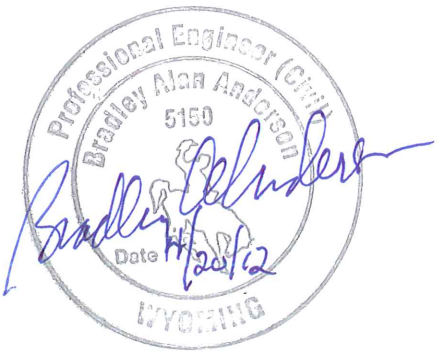
FINAL REPORT
FOR THE
SWEETWATER RIVER WATERSHED STUDY
BASINWIDE WATERSHED MANAGEMENT PLAN

Prepared for:

Wyoming Water Development Commission
6920 Yellowtail Road
Cheyenne, WY 82002

Prepared by:

Anderson Consulting Engineers, Inc.
375 E. Horsetooth Road, Bldg. #5
Fort Collins, CO 80525
(ACE Project No. WYWDC26)



April 20, 2012

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

LIST OF FIGURES

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

LIST OF TABLES

TABLE OF CONTENTS (continued)

LIST OF APPENDICES

I. INTRODUCTION AND OVERVIEW

I. INTRODUCTION AND OVERVIEW

1.1 Introduction

In 2005 the Popo Agie Conservation District (PACD) requested funding from the Wyoming Water Development Commission (WWDC) for the completion of a watershed management plan for the Sweetwater River watershed. The intent was to have a comprehensive watershed inventory completed which identified issues related to land use and water resources and to then develop a plan addressing those issues. The WWDC approved funding for the project and Anderson Consulting Engineers, Inc. (ACE) was ultimately contracted in June, 2006 to complete the project. Figure 1.1 shows the general location of the watershed within the State of Wyoming.

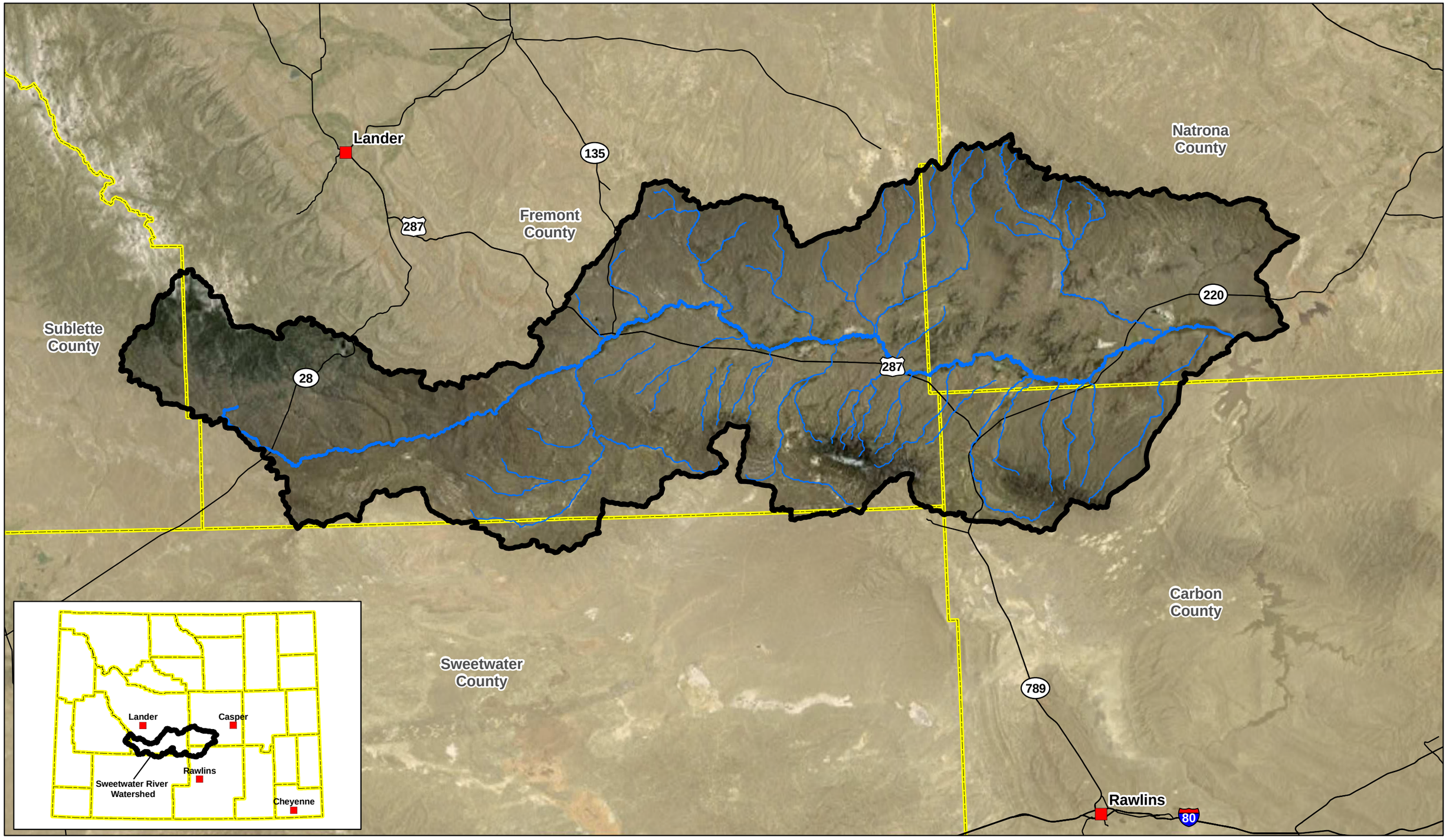
1.2 Project Overview

The term "watershed" may have been best defined by John Wesley Powell, scientist geographer, when he said that a watershed is:

> *"that area of land, a bounded hydrologic system, within which all living things are inextricably linked by their common water course and where, as humans settled, simple logic demanded that they become part of a community."*

The State of Wyoming recognizes the benefits of basin planning efforts on the basis of watershed areas which do not necessarily adhere to political boundaries such as counties or states. The WWDC describes the watershed planning process as follows:

> *"Today, conservation by watershed is an old concept with new horizons. Watersheds have long been recognized in the western United States for their significant natural resources and the interrelationships found contained in land areas connected by stream systems. These relationships were recognized by John Wesley Powell from his early expeditions of the west and resulted in proposed conservation, low density open grazing, irrigation systems and state boundaries based on watershed areas.*
>
> *The conservation concept developed over time to coalesce in the early 1930's with the formation of special districts whose boundaries were often based on watersheds. At that time the relationship between stream systems and landscape function was recognized. This relationship was broadened to embrace watershed condition and quality and its response to human influences. This further provided some understanding of the historic land use effect on watershed condition and how management and restoration needs to be based on local landscape characteristics.*



N
W E
S

Legend

- Sweetwater River Watershed
- Sweetwater River
- Streams
- Cities
- US / State Hwy
- County Boundary

0 10 20

Miles

Figure 1.1 Sweetwater River Watershed: Vicinity Map

Today, these relationships are embraced by the Wyoming Water Development Commission and Office through a watershed study program. On behalf of a local community sponsor, a watershed study can provide a comprehensive evaluation, analysis and description of the resources associated with a watershed and the watershed's water development opportunities. It is best stated that information related to the physical sciences is incorporated into a biological system.

There are three prominent issues that are important considerations in a watershed information review and study. The first is surface water storage. Surface water storage is often of significant interest to a watershed community in order to address seasonal and/or annual shortages of water supply, augment late season stream flow to benefit riparian habitat, fisheries and wildlife, address flood impacts, enhance recreation opportunities, improve water quality and steam channel stability.

Second is the evaluation of irrigation infrastructure and development of information necessary to guide its rehabilitation and conservation. Of interest to local water users are ways to improve water delivery and on-farm irrigation efficiencies often timed to address annual or seasonal shortages of water supply or irrigation water delivery issues.

Third is the enhancement of upland water resources and distribution for livestock and wildlife that allows grazing management adjustments for range resource improvement. Benefits to the watershed, through plant community invigoration, reduction of erosion and stream channel stabilization, can be achieved from water development projects being strategically implemented over the watershed. Other issues and opportunities such as making beneficial use of produced water and removal of high water demand invasive species can also be important.

A watershed study, providing management and rehabilitation plans for water storage, irrigation systems and upland water development, can help empower a community to proactively enhance their watershed. Conservation by watershed can be an effective holistic approach to embracing the natural resource challenges and opportunities facing a community. A watershed study can provide the information to meet those challenges."

The Sweetwater River Watershed Study is one of several watershed planning studies completed on behalf of the WWDC and the Wyoming Water Development Office (WWDO). Watershed investigations either completed or in the process of being completed include the following:

Prairie Dog Creek Watershed Study
Popo Agie River Watershed Study
Cottonwood Creek / Grass Creek Watershed Study
Sweetwater River Watershed Study
Buffalo Creek Watershed Study
Clear Creek Watershed Study
Kirby Creek Watershed Study
Shell Valley Watershed Study
Thunder Basin Watershed Study
Little Snake River Watershed Study

As a direct result of these efforts, numerous additional studies have been initiated and multiple projects have been constructed.

1.3 Project Issues and Understanding

The study culminates in the delivery of a Watershed Management and Rehabilitation Plan (the Plan). It is the goal and objective of the sponsor and the WWDC to generate a plan that is not only technically sound, but also one that is practical and economically feasible. The formulated plan also includes development of a database to facilitate the planning process and the evaluation/implementation of watershed improvements. In order to accomplish this task, the PACD, the Advisory Committee, WWDC, and the consultant addressed several key issues.

- *Utilization of grazing allotments*
- *Water availability*
- *Channel stability/riparian restoration/enhancement*
- *Irrigation system assessment (to promote rehabilitation of existing facilities and provide opportunities for water conservation that would support an increase in water availability)*
- *Public participation and acceptance (intent is to focus on solutions, not compliance issues)*

1.4 Project Purpose and Objectives

The primary goal of this Level I Study is to combine all existing data with data collected and generated from this study to form a comprehensive Watershed Management and Rehabilitation Plan. The purpose and objectives of the project are itemized below:

- *Facilitate consensus building among the Advisory Committee, the Conservation District, landowners and the Wyoming Water Development Commission.*

- *Facilitate public participation.*

- *Conduct an evaluation and description of the Sweetwater River watershed, including quantity and quality of surface water resources, and riparian/upland conditions.*

- *Conduct a geomorphic investigation of the primary channels within the watershed and identify potential mitigation measures to improve impaired channel reaches.*

- *Conduct an irrigation system inventory and develop a rehabilitation plan for those ditches expressing an interest to participate.*

- *Conduct an evaluation of water storage needs and opportunities to augment water available for livestock and wildlife.*

- *Develop a watershed management plan which identifies problem areas within the watershed and proposes practical economic solutions.*

- *Identify permits easements and clearances necessary for plan implementation.*

- *Develop cost estimates for improvements.*

- *Complete an economic Analysis and evaluate alternative sources of funding.*

1.5 Project Management

Due to the vast extent of the Sweetwater watershed and the range of conditions found within it, as well as varying level of interest and willingness to participate among stakeholders, it was determined that ACE would focus upon the development of watershed management plans at the subwatershed level. This strategy was selected to promote stakeholder participation and the development of plans more detailed and practical than would be afforded at the larger scale.

Following a series of initial public meetings, landowners and stakeholders within the Long Creek basin expressed high levels of interest and participation. For these reasons, and at the direction of the Steering Committee, the Popo Agie Conservation District (PACD) and the Wyoming Water Development Office (WWDO), Long Creek watershed was selected for the first phase of this effort.

Four phases of the project were ultimately completed which focused a subwatershed approach that ranged in areal extent from one to three of the 10th order Hydrologic Units defined by the United States Geologic Survey (USGS). (The hydrologic units delineated by the USGS are designated a hydrologic unit code, or HUC as discussed at the following website: http://water.usgs.gov/GIS/huc.html).

Upon completion of the four phases addressing subwatersheds within the Sweetwater River basin, a fifth phase entitled "Sweetwater River Watershed Study: Basin-wide Summary" was completed which summarizes the results of the individual phases as well as providing a description of the entire Sweetwater River Watershed. Table 1.1 summarizes the various phases of the project and Figure 1.2 displays their locations. Each of the five phases have been published as separate and stand-alone documents.

This report presents the results of the Basinwide Investigation.

Table 1.1 Sweetwater River Watershed Investigation, Level 1: Project Phases.

Phase	Hydrologic Unit Code	HUC Order	Watershed Name
Phase I:	HUC 1018000604	10th Order	Long Creek
Phase II:	HUC 1018000609	10th Order	Muddy Creek
	HUC 1018000611	10th Order	Horse Creek (Arkansas Creek subbasin only)
Phase III:	HUC 1018000603	10th Order	Alkali Creek
	HUC 1018000606	10th Order	Crooks Creek
	HUC 1018000605	10th Order	Buffalo Creek
Phase IV:	HUC 1018000607	10th Order	Sage Hen Creek
	HUC 1018000610	10th Order	Dry Creek
	HUC 1018000608	10th Order	Willow Creek
Basinwide	**HUC 10180006**	**8th Order**	**Sweetwater River Watershed**

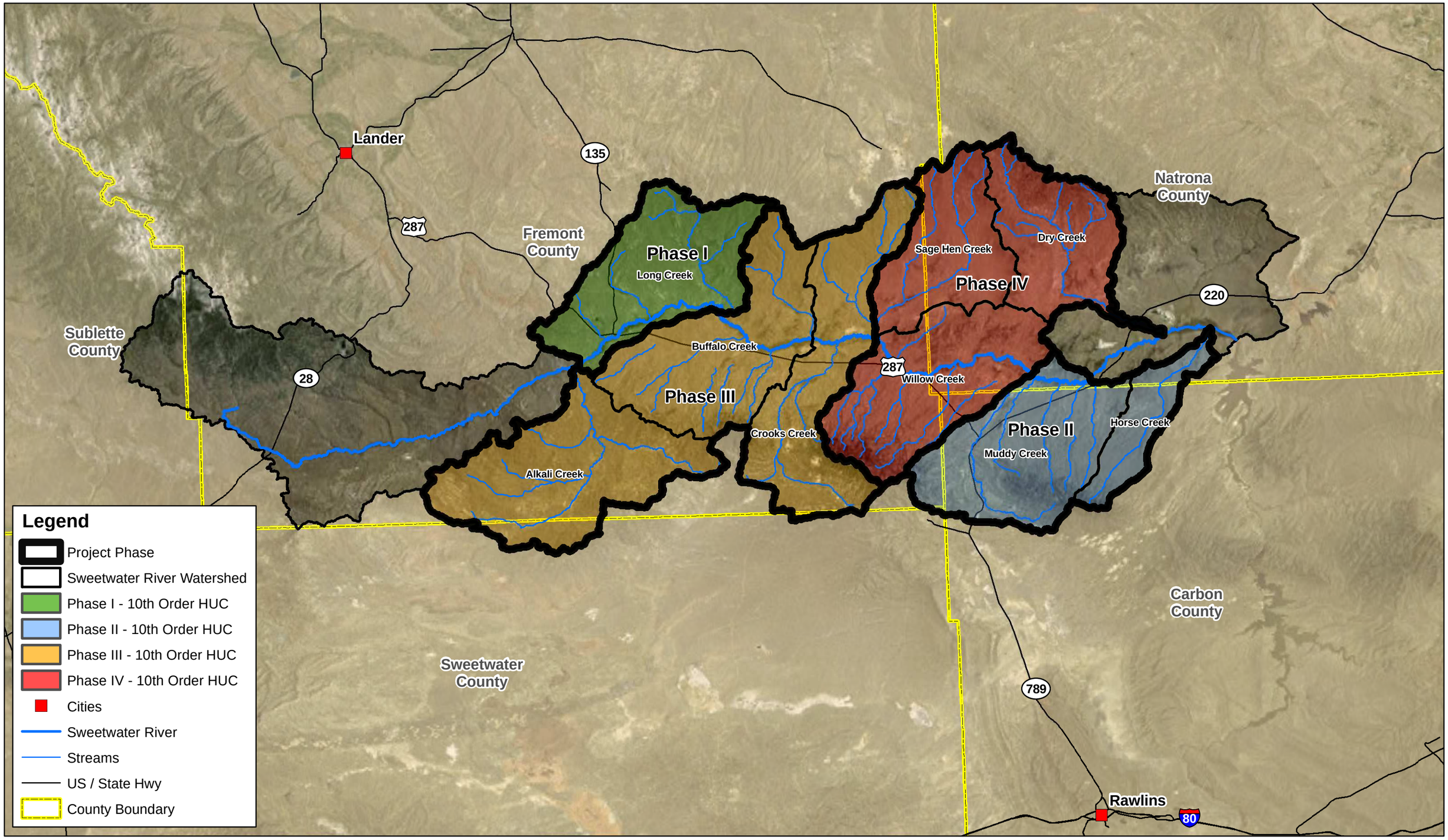


Figure 1.2 Sweetwater River Watershed: Location Map

II. PROJECT MEETINGS

II. PROJECT MEETINGS

2.1 Introduction

An integral part of the Sweetwater River Watershed Study was the public outreach and involvement effort. This effort was initiated by the WWDO prior to Anderson Consulting Engineers, Inc. (ACE) being awarded the contract in June 2006.

Meetings were orchestrated by Anderson Consulting Engineers (ACE) and typically included informal presentations conducted by ACE staff and the Wyoming Water Development Office (WWDO). The objectives of the meetings were to:

- Obtain direction from landowners pertaining to the project;
- Obtain information and opinions of the public regarding their perspective on the watershed planning process;
- Provide guidance to landowners with respect to setting of goals; and
- Keep landowners informed of initial results and project progress.

At each of the meetings, ACE representatives typically made presentations summarizing the status of the project and the next steps to be accomplished. The project GIS was demonstrated when appropriate to keep landowners up to date on the information which would ultimately be incorporated within it. Following each meeting, discussions and question and answer sessions were held.

Meetings with landowners were frequently scheduled at their residences and consisted of informal discussions revolving around their specific land and water resources-related concerns and issues. Frequently, the landowner would tour their land or allotment with members of the project team. At these meetings, many of the conceptual designs for irrigation and upland livestock / wildlife water supply projects were initiated.

Table 2.1 tabulates the meetings held in conjunction with this project.

2.2 Field Trips and "Tailgate Talks"

Field investigation efforts generally were held in coordination with scheduled meetings for efficiency. Specific field efforts targeted irrigation inventory, upland livestock/wildlife water opportunities, stream channel conditions, and hydrologic investigations.

“Tailgate Talks” were informal discussions held whenever the opportunity arose. It is apparent that regardless of our familiarity with the area, local ranchers, irrigators, and residents generally have the best knowledge of the watershed. Through the interviewing process, the project team incorporated this knowledge and experience directly into the study. These informal interviews, often held

spontaneously while in the field, have become dubbed "tailgate talks" and provide valuable insight into the overall assessment of the watershed.

Table 2.1 Tabulation of Meetings.

Number	Date	Type	Location
1	7/11/2006	Scoping Meeting	Jeffrey City
2	5/3/2007	Project Status/Update	PACD Lander Office
3	5/3/2007	Project Coordination Meeting	BLM Lander Field Office
4	7/9/2007	Project Status/Update	Jeffrey City
5	4/21/2008	Landowner Meeting	Graham Ranch
6	5/12/2008	Landowner Meeting	Croft Ranch
7	5/12/2008	Landowner Meeting	Graham Ranch
8	6/3/2008	Project Status/Update	Jeffrey City
9	10/5/2008	Landowner Meeting	Bairoil Cafe
10	10/6/2008	Landowner Meeting	Sun Ranch
11	10/7/2008	Landowner Meeting	Split Rock Ranch
12	10/7/2008	Landowner Meeting	Ferris Mountain Ranch
13	10/15/2008	Landowner Meeting	Annis Ranch
14	10/16/2008	Landowner Meeting	Ferris Mountain Ranch
15	2/23/2009	Project Status/Update	Mormon Handcart Ranch
16	6/29/2010	Project Status/Update	Jeffrey City
17	10/25/2010	Landowner Meeting	Abernathy Ranch
18	11/2/2010	Landowner Meeting	Croft Ranch
19	11/3/2010	Landowner Meeting	Myers Land and Cattle Co.
20	1/26/2011	Project Coordination Meeting	PACD Lander Office
21	1/27/2011	Project Coordination Meeting	BLM Lander Field Office
22	6/28/2011	Field Tour	Jeffrey City
23	6/28/2011	Landowner Meeting	Jeffrey City
24	6/29/2011	Landowner Meeting	PACD Lander Office
25	6/29/2011	Field Tour	Jeffrey City
26	6/30/2011	Landowner Meeting	Abernathy Ranch
27	8/23/2011	Project Status/Update	Mormon Handcart Ranch
28	6/31/2011	Landowner Meeting	Split Rock Ranch

III. WATERSHED DESCRIPTION AND INVENTORY

III. WATERSHED DESCRIPTION AND INVENTORY

3.1 Introduction and Purpose

A considerable amount of information exists pertaining to the Sweetwater River watershed and its resources. The data spans a wide variety of disciplines and includes basin hydrology, water quality, land use and ownership, geology and soils, and agricultural practices as typical examples. The primary objective of the watershed inventory phase of this project was to accomplish the following objectives:

1. collect, review, and compile pertinent information regarding the study area;
2. collate the data in a single database; and
3. assess the data to characterize the watershed and facilitate identification of existing issues and development of improvements to the watershed.

3.2 Data Collection and Management

3.2.1 Collection of Existing Information

A significant amount of information and pertinent data were available from existing sources at the time this project was initiated. In an effort to collect and incorporate as much of this information as possible, the following sources were either contacted directly or information and documents procured via websites, libraries, or personal contacts:

- U.S. Bureau of Land Management (BLM) – Lander and Rawlins Field Offices
- U.S. Geological Survey (USGS)
- U.S. Department of Agriculture/Natural Resources Conservation Service (NRCS)
- U.S. Department of Agriculture/Farm Service Agency (FSA)
- U.S. Environmental Protection Agency (EPA)
- U.S. Fish and Wildlife Service (FWS)
- Wyoming Water Development Commission (WWDC)
- Wyoming Department of Environmental Quality (WDEQ)
- Wyoming Game and Fish Department (WGFD)
- Wyoming State Engineer's Office (WSEO)
- Wyoming Oil and Gas Conservation Commission (WOGCC)
- Wyoming State Geological Survey (WSGS)
- Wyoming Board of Land Commissioners/State Lands and Investments Board (WBLC/SLIB)

- Wyoming Wildlife and Natural Resources Trust (WWNRT)
- Wyoming Geographic Information Science Center (WyGISC)
- Fremont, Sweetwater, Natrona and Carbon Counties Assessor's Office
- Popo Agie Conservation District
- Natrona County Conservation District
- Fremont County Weed and Pest District

3.2.2 Geographic Information System

The results of the data collection efforts were incorporated into a comprehensive Geographic Information System (GIS). A GIS can be thought of as a powerful three- dimensional mapping tool that can be used to evaluate and compare spatial data pertaining to a wide range of topics. Numerous maps can be "stacked" to overlay information; each map, or "theme", incorporates data, or "attributes" pertaining to the theme. For instance, a theme showing location of irrigation ditches could also include numerical data pertaining to each ditch's irrigated acreage, improvements, problems, etc.

Data within the project GIS were collected throughout the course of this study. Consequently, there are themes which specifically describe each of the four individual phases of the investigation. Where pertinent, these themes were merged to simplify the GIS structure. For example, during each phase of the investigation, recommendations were made for upland water development projects. In lieu of a separate theme for each phase, the four phase-specific themes were merged into a single theme spanning all four phases. Attributes within the combined theme describe which phase an individual record was created in. Other coverages describe the watershed as a whole (ex. Bedrock geology).

Within the GIS environment, users have the ability to turn individual layers on or off, modify the zoom extent of the view, reorganize the layer structure, or change symbology to meet their needs. The GIS was developed using ArcGIS version 9.3 software. No customized tools were developed for this GIS project; it relies solely upon features incorporated within the standard software package "out of the box". Because of this simplicity, the GIS should be fully functional as future versions of the software become available.

The project GIS was developed with the "clearinghouse" strategy in mind. The GIS is intended to incorporate not only the spatial data pertaining to the watershed, but also analytical spreadsheets and documents. Figure 3.1 displays this approach graphically. The user can evaluate spatial data with the conventional GIS tools as well as linking to photographs, spreadsheets containing analytical tools and graphical representation of the various data, and the various documents prepared or collected in the course of this investigation. The following examples are presented to describe the project GIS:

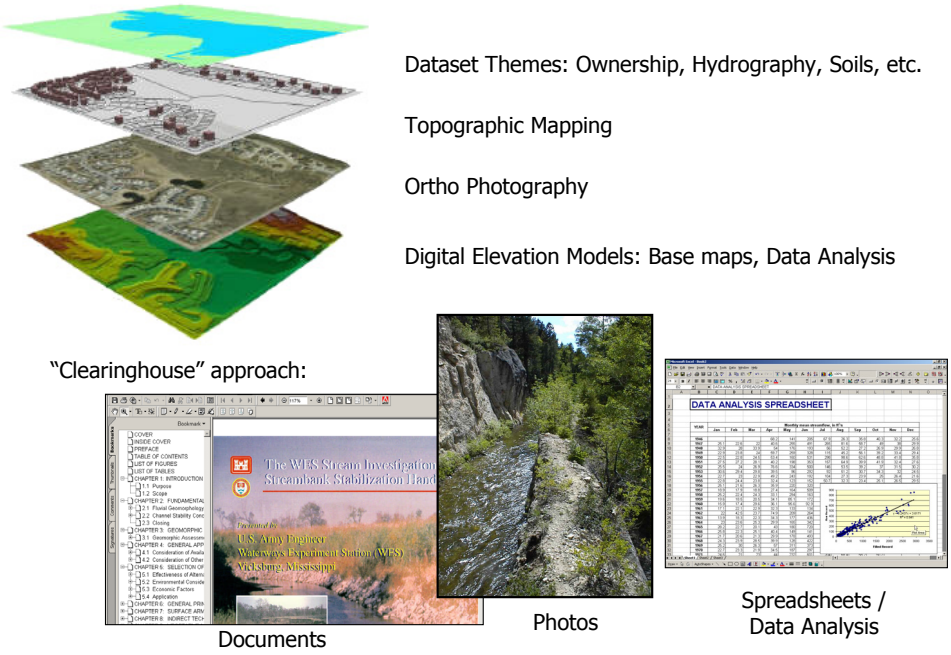


Figure 3.1 Example of the Sweetwater River Watershed Study GIS Structure and "Clearinghouse" Capabilities.

- **External Data:** As an example of external data incorporation, by "clicking" on a climate station (ex. Jeffrey City), a spreadsheet is automatically accessed which contains historic climate data and corresponding graphs. Within the spreadsheet, there is also a link to the Western Regional Climate Center website where data can be downloaded or updated.

- **External Documents:** As an example of the incorporation of external documents, the user can "click" on the Green Mountain Common Allotment and a menu of document choices will be presented. From the menu the user can then access the Green Mountain Common Allotment Environmental Assessment (BLM, 2011), records of decision, etc.

Spatial data pertaining to the Sweetwater River study area was collected from a wide range of sources. Agencies providing information included the State of Wyoming, Wyoming Game and Fish Department, Hot Springs County, the USDA Natural Resources Conservation Service, and others. Of specific importance to this project are data made available by both the Lander and Rawlins Districts of the BLM. Both of these offices provided valuable and pertinent data describing watershed resources such as existing range improvement projects, proper functioning condition data, fences, allotment boundaries, etc.

Finally, a significant amount of the information was also specifically developed during the course of this investigation. Table 3.1 presents a list of the individual themes, maps, and aerial photographs which have been incorporated into the project GIS.

Table 3.1 Generalized GIS Contents.

Hydrology
Streams - Statewide
Geomorphology: Rosgen Classifications Basinwide
Lakes
WYPDES Permits
Watershed Boundary
12th Order HUCs: Subwatershed Boundaries
SEO Wells 2009
Upland Water Sources and Related Structures (Lander BLM)
USGS Streamgages - Nationwide
National Wetlands Inventory (NWI) - Statewide
LANDFIRE - Wetland Classifications
Ace Fieldwork
Field Investigations - points
Field Investigations - tracks
Political
Cities - Statewide
County Boundaries - Statewide
Public Land Survey System (PLSS)
UTM Zones
Ownership
Private Ownership Database
BLM Data
Miscellaneous regional data layers: leases, Rights of Way, etc.
Fences
Springs
Proper Functioning Condition Data (PFC)
Oil and Gas
Oil and Gas Wells-Wyoming Oil and Gas Conservation Commission (WOGCC)
BLM Oil/Gas Leases
Gas Fields - Energy Information Administration (EIA)
Infrastructure
Antenna - Countrywide
Cellular Tower - Countrywide
Microwave Tower - Countrywide
Roads
Railroads
Transmission Lines -Statewide
Cultural and Historic
Cultural Sites Wyoming State Historic Preservation Office (SHPO)
Historic Points- National Parks Service
Historic Monuments and Markers
Pioneer Trails
Landcover
Landfire -Existing Vegetation Type
Weeds - Fremont County
Wyoming GAP Analysis - Statewide
Backgrounds
Countywide Topographic Map mosaics: Fremont, Sweetwater, Natrona, Carbon, Sublette
2009 NAIP Color Infra-red Imagery: Fremont, Sweetwater, Natrona, Carbon, Sublette Counties
2009 NAIP True Color Imagery: Fremont, Sweetwater, Natrona, Carbon, Sublette Counties
USGS 30M DEM - Study Area

Climate
Weather Stations - Western Regional Climatic Data Center
Average Annual Precipitation - PRISM Data
Irrigation
2005 Point of Diversion (POD)
Irrigated Land 2005 - Statewide
Ditches- ACE Generated
Irrigation Districts
Land Management
Land Management - BLM Surface Mangement - Statewide
BLM Allotments 2009 intersected to watershed area
Wild Horse Management Areas
WY BLM Field Office Boundary- Statewide
State Improvement Districts
State Conservation Districts
Wilderness Study Areas - Statewide
Mine Permit Boundaries - Statewide
Fish and Wildlife
Aquatic Habitat Priorities 2009 - Statewide
Terrestrial Habitat Priorities 2009 - Statewide
Combined Habitat Priorities 2009 - Statewide
Migration Barrier - Statewide (Antelope, Elk, Moose, Mule Deer, White Tail Deer)
Crucial Range - Statewide (Antelope, Elk, Moose, Mule Deer, White Tail Deer)
Migration Routes - Statewide (Antelope, Elk, Moose, Mule Deer, White Tail Deer)
Seasonal Range - Statewide (Antelope, Elk, Moose, Mule Deer, White Tail Deer)
Hunt Area Herd Unit Boundaries - Statewide (Antelope, Elk, Moose, Mule Deer, White Tail Deer)
Parturition Area - Statewide (Antelope, Elk, Moose, Mule Deer, White Tail Deer)
Sage Grouse Leks - Statewide
Sage Grouse Core Areas - Statewide
Sage Grouse Connectivity - Statewide
Wyoming Natural Diversity Database
Geology and soils
Surficial Geology - Statewide
Bedrock Geology - Statewide
Landslide Data WSGS - Statewide
Dikes - Statewide
Faults - Statewide
250,000 Scale Soils - Statewide
24K Scale Soils - Natrona and Fremont Counties
Watershed Management Plan
Existing Upland Water Supply
Proposed Upland Water Supply Project Points
Existing Pipeline Systems
Proposed Upland Water Supply Project Pipelines
Linked Data Resources
Photo points
Upland Projects Conceptual Designs
Jeffrey City, Muddy Gap Climatic Data Spreadsheets
Ecological Site Descriptions

The project GIS was used in the generation of a majority of the figures included in this report. It will be available as a resource for future investigations and a tool for watershed stakeholders to use during pursuit of permits, environmental analyses, mapping projects, etc. GIS software (ArcView) is required to view and utilize the data to the maximum of its potential. However, free 'shareware' data viewers (ArcExplorer) are available which enable the user limited capabilities to view the data. It must be kept in mind when using the shareware versions of the GIS software that certain data layers symbology will vary from what is presented in this report. Also, the shareware software may not be capable of simultaneously presenting data layers which were generated in different coordinate systems. Consequently, it may not be possible to view certain layers in the same field of view.

It is also important to note that data presented in the project GIS and within this report are subject to change with time as the agencies creating them continually update their databases. The user is encouraged to obtain the most current data available to meet the needs of future endeavors utilizing the project GIS.

3.2.3 Digital Library

The Digital Library is a collection of documents, plats, maps, figures, spreadsheets, etc., pertaining to the project. Documents reviewed during the completion of this project were scanned and included in the Digital Library to the extent possible. Copyright protected documents were not included in the Library; however documents published by public agencies were included where feasible. The Digital Library consists of a spreadsheet listing the available documents and links to each; it can be searched or sorted depending upon the user's needs. Individual document files can be accessed via the Digital Library or directly by "browsing". Documents included in the Digital Library were obtained from the agencies listed in Table 3.2.

Table 3.2 Sources of Information Included in the Digital Library.

USDI Bureau of Land Management
USDA Natural Resource Conservation Service
United States Environmental Protection Agency
USDI United States Geologic Survey
Hot Springs Conservation District
Wyoming Department of Environmental Quality
Wyoming Department of Game and Fish
Wyoming Natural Diversity Database
Wyoming State Engineers Office
Wyoming Water Development Office
Miscellaneous

3.3 Land Uses and Activities

3.3.1 Land Ownership

The total land area within the project study area is over 1.858 million acres (2,904 square miles) and spans five counties as indicated in Figure 3.2. In order of descending areal extent, the counties are:

- Fremont County (1,754 square miles / 60.4 percent),
- Natrona County (766 square miles / 26.4 percent),
- Carbon County (293 square miles / 10.1 percent),
- Sublette County (56 square miles / 1.9 percent), and
- Sweetwater County (35 square miles / 1.2 percent).

Figure 3.3 displays a pie chart which graphically shows the distribution of the watershed among the five counties.

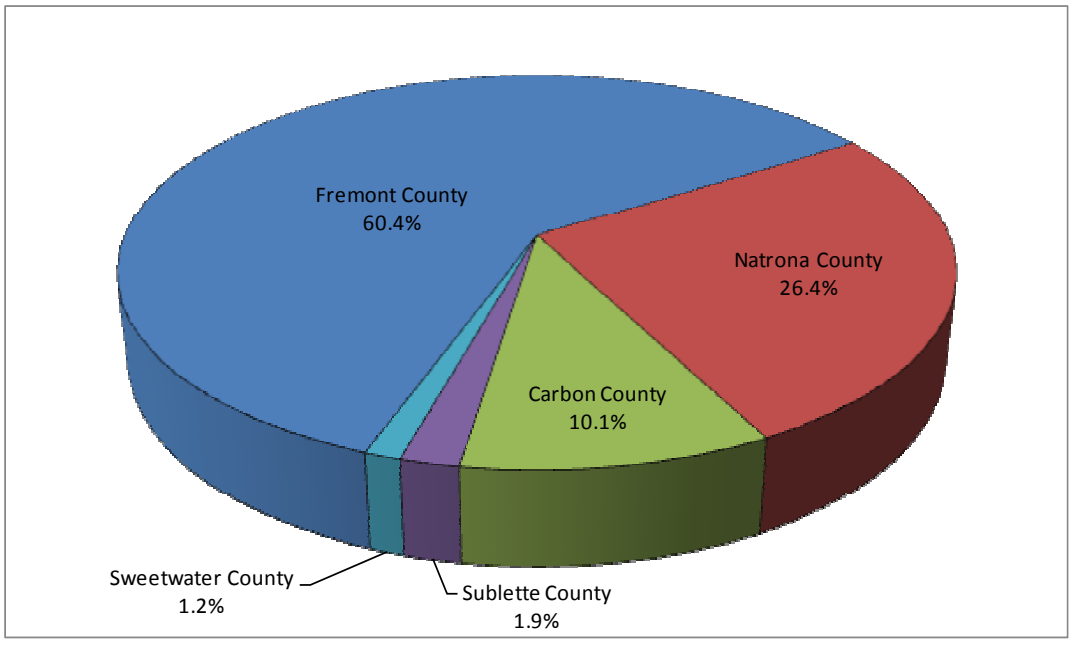


Figure 3.3 Distribution of Sweetwater River Watershed Study Area among Counties.

BLM Field Office Boundary
BLM
Private
State
Forest Service
Fish and Wildlife
Water

LANDER FIELD OFFICE
CASPER FIELD OFFICE
PINEDALE FIELD OFFICE
ROCK SPRINGS FIELD OFFICE
RAWLINS FIELD OFFICE

Lander
Natrona County
Fremont County
Sublette County
Sweetwater County
Carbon County

135
287
28
220

N
W
E
S

Legend

Cities
Sweetwater River
Streams
US / State Hwy
Sweetwater River Watershed
County Boundary

0 10 20
Miles

Figure 3.2 Sweetwater River Watershed: Land Ownership and Management

Land ownership information was obtained from the respective County Assessor's offices and incorporated into the project GIS. The following breakdown of land ownership is presented in decreasing order of magnitude:

- **Federal Lands:** Federally administered lands comprise the majority of the watershed area. The total surface area of federally administered lands is over 1.468 million acres (2,294 square miles). This total comprises approximately 78.6 percent of the total area. The federally administered lands are broken down as follows:

    - BLM: the BLM manages over 1.393 million acres (2,176 square miles) of the entire watershed. This area constitutes over 74.5 percent of the study area.
    - Shoshone National Forest (USFS): the USFS administers over 68,249 acres (107 square miles) of the watershed (3.7 percent). These lands are located in the western portion of the watershed at higher altitudes in the Wind River Mountains.
    - United States Fish and Wildlife Service (USFWS): the USFWS administers approximately 7,350 acres (11 square miles) surrounding Pathfinder Reservoir in the extreme eastern portion of the watershed. Consequently the USFWS administers approximately 0.4 percent of the watershed.

- **State lands:** The State of Wyoming (State) owns approximately 145,517 acres (227 square miles) are owned by the State. This comprises approximately 7.8 percent of the total watershed area. These lands consist primarily of "school sections" but include additional scattered parcels throughout the watershed.

- **Deeded Lands:** Privately owned lands consist of approximately 244,236 acres (382 square miles). This area comprises approximately 13.1 percent of the watershed.

- **Surface Water:** Surface water makes up the remainder of the watershed comprising 7,915 acres (12 square miles) or 0.4 percent of the total area.

Figure 3.4 displays a pie chart which graphically displays the relationship discussed above. Figure 3.5 displays a map of the watershed and indicates the areal distribution of these land ownership classes.

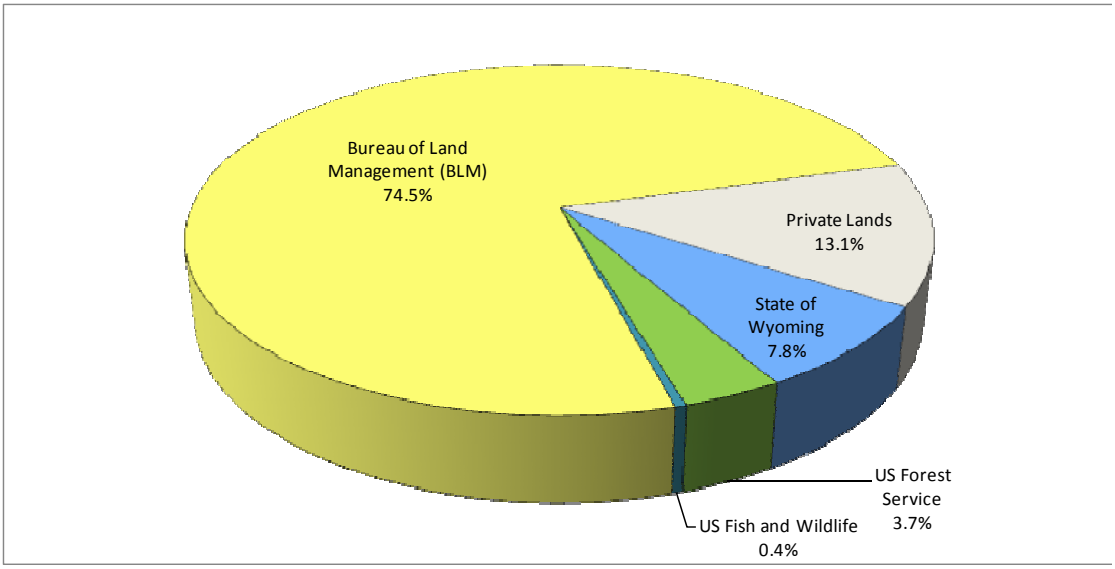


Figure 3.4 Distribution of Land Ownership within the Sweetwater River Study Area.

3.3.2 Transportation, Energy and Communications Infrastructure

Primary paved transportation routes traversing the study area are shown on Figure 3.5. Highway 287 is the main east/west route, generally following the Sweetwater River through much of the watershed. State Highways 220, 135, and 28 all also traverse the watershed. These represent the principal arterials within the study area. In addition to these primary arterials, there are numerous additional improved (unpaved) and "two-track" roads throughout the watershed. Major electric transmission lines are also shown on Figure 3.5.

3.3.3 Irrigation

Irrigation activities within the watershed are limited primarily to the floodplain of the Sweetwater River, however, there are scattered irrigated parcels located along smaller watercourses throughout the area (Figure 3.6).

According to mapping of irrigated lands provided by the Wyoming Water Development Office (WWDO), there are approximately 12,424 acres of irrigated lands within the study area. Irrigated crops are generally limited to irrigated pasture and grass hay operations for livestock feed. Irrigators depend on irrigated lands to provide winter feed and summer grazing. Irrigation systems typically consist of simple unlined earthen ditches and flood irrigation. A limited number of sprinkler irrigation systems have been installed; particularly along the Sweetwater River near Jeffrey City.

Water rights tabulations provided by the Wyoming State Engineers Office are included as Appendix A of this report.

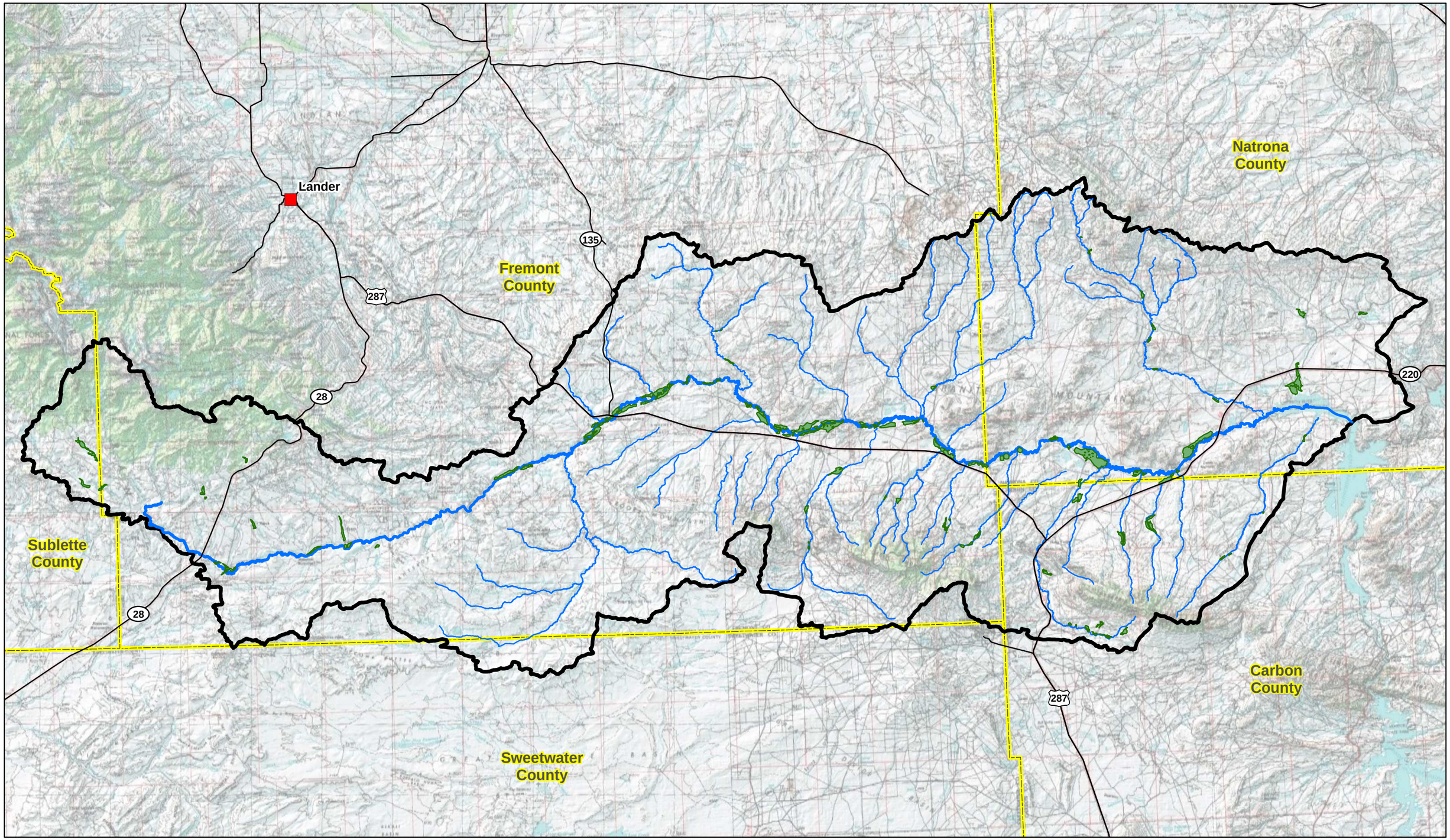
Lander
Fremont County
Natrona County
Sublette County
Sweetwater County
Carbon County
135
287
28
220

Legend

- Antenna
- Cellular Tower
- Microwave Tower
- Cities
- Electric Transmission Corridors
- US / State Hwy
- Sweetwater River
- Streams
- Sweetwater River Watershed
- County Boundary

0 10 20
Miles

Figure 3.5 Sweetwater River Watershed: Commuications and Transportation



N
W E
S

Legend

Irrigated Lands
Cities
Sweetwater River
Streams
US / State Hwy
Sweetwater River Watershed
County Boundary

0 10 20
Miles

Figure 3.6 Sweetwater River Watershed: Irrigated Lands

3.3.4 Range Conditions/Grazing Practices

3.3.4.1 Grazing Administration

Grazing on federal lands within the study area is administered by the Bureau of Land Management. The BLM-administered allotments typically include intermingled private, state, and federally-administered lands used for grazing. Figure 3.7 displays the grazing allotments found within the study area. As indicated in this figure, the Sweetwater River watershed is broad enough to span five BLM district boundaries: the Lander, Rawlins, Rock Springs, Casper, and Pinedale Districts all have jurisdiction of portions of the watershed. The majority of the area falls within the jurisdictional boundaries of the Lander District while the area east of Highway 287 lays within the management boundaries of the Rawlins District. Table 3.3 summarizes pertinent information about the allotments. The Lander Field Office's administrative boundaries would therefore incorporate the areas described in Phase I, III and IV of the Sweetwater River watershed study. The Rawlins Field office boundaries incorporate the Phase II study area.

Under the umbrella of the pertinent Resource Management Plan (Lander Resource Management Plan or the Rawlins Resource Management Plan), management of grazing allotments are prioritized based on the classification of the allotments into one of three management categories: Improve (I), Maintain (M), and Custodial (C). These categories broadly define management objectives of the BLM administered public lands in the allotment (BLM, 2008).

Livestock grazing is managed is accordance with the principles of multiple use and sustained yield embodied in the Federal Land Policy and Management Act (1976) and the Taylor Grazing Act (1934). BLM's specific objectives and procedures for managing livestock grazing are contained in the agency's grazing regulations. BLM's grazing regulations were revised in 1995 to ensure that livestock grazing is conducted in a manner that will sustain or improve the fundamental ecological health of public rangelands.

Grazing on BLM lands to meet these requirements is managed under the Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for the Public Lands Administered by the BLM in the State of Wyoming (BLM, 2007). Among the full suite of grazing management guidelines, those most applicable to this watershed study are summarized as follows:

- Ensure that conditions after grazing use will support infiltration, maintain soil moisture storage, stabilize soils, release sufficient water to maintain overall system function, and maintain soil permeability rates and other appropriate processes.
- Restore, maintain, or improve riparian plant communities to sustain adequate residual plant cover for sediment capture and groundwater recharge.

2 Casper Field Office Allotments

8 Lander Field Office Allotments

6 Rawlins Field Office Allotments

9 Rock Springs Field Office Allotments

Lander

Fremont County

Natrona County

Sublette County

Sweetwater County

Carbon County

135 287 28 220

Reference Table3.3 for detailed information related to Grazing Allotments

N W E S

Legend

Cities

Sweetwater River

Streams

US / State Hwy

Sweetwater River Watershed

County Boundary

0 10 20

Miles

Figure 3.7 Sweetwater River Watershed: Grazing Allotments

Table 3.3 Listing of BLM Grazing Allotments and Field Offices.

Lander Field Office	
ID	Allotment Name
1	CONANT CREEK COMM
2	MUSKRAT OPEN
3	CIRCLE BAR ALLOTM
4	NORTH OF DRIFT FE
5	SAND DRAW AMP
6	LONG CREEK PASTUR
7	#19 VINEGAR HILL
8	#20 CALF PASTURE
9	#21 HORSE PASTURE
10	#18 HORSE CREEK P
11	BUG MEADOWS PASTU
12	LITTLE BUG PASTUR
13	BIG ROCK PASTURE
14	#22 BULL PASTURE
15	HAY MEADOW PASTUR
16	LONG CRK SWEETWAT
17	RED CANYON
18	DECKER PASTURE
19	HAMILTON ROCK PAS
20	KEESTER
21	BEAVER AMP
22	WHITLOCK FENCED
23	SAGE HEN
24	SCARLETT PASTURE
25	FENCED INDIVIDUAL
26	MYERS FENCED PAST
27	SCHOOL PASTURE
28	BEEF GAP PASTURE
29	BREEDING PASTURE
30	GAP PASTURE
31	ELLIS UPPER BEAVE
32	STAMPEDE BOG
33	HAY MEADOW PASTUR
34	GRAHAM RANCH PAST
35	FLAGG AMP
36	ICE SLOUGH
37	HORSE PASTURE
38	FLAGG INDIVIDUAL
39	MCGRAW FLAT COMMO
40	NORTH ALLOTMENT
41	CLAYTOR HOMESTEAD
42	HIGHWAY ALLOTMENT
43	NORTH HAT PASTURE
44	LOWER ELLIS RANCH
45	MITCHELL PASTURE
46	SALISBURY AMP
47	MC GRAW FLAT INDI
48	SOUTH ALLOTMENT
49	SOUTH HAT PASTURE
50	CROSS L PASTURES
51	UPPER ELLIS RANCH
52	SOUTH CROSS L
53	HOME,SOUTH OF HIG
54	STATE-71 MEADOWS

Lander Field Office	
ID	Allotment Name
55	HOME,NORTH OF HIG
56	LECKINBY PASTURE
57	FENCED ALLOTMENT
58	COTTONWOOD PASTUR
59	RIGBY PASTURE
60	SILVER CREEK COMM
61	UNKNOWN
62	46 PASTURE
63	EAST ALLOTMENT
64	GASPAR
65	WILLOW CREEK ALLO
66	COOPER CREEK
67	ATL.CTY.LOWER FEN
68	ATL.CTY.UPPER FEN
69	DIAMOND HOOK
70	ALMA GRIEVE PASTU
71	ALKALI PASTURE
72	CROOKS GAP
73	GRANITE MT OPEN
74	BASIN PASTURE
75	DIAMOND SPRINGS
76	BLACKJACK RANCH
77	NORTH DOBIE FLAT
78	SOUTH DOBIE FLAT
79	UNKNOWN
80	HARRIS SLOUGH PAS
81	HADSELL PASTURE
82	EAST BEAVER COMMO
83	#17 HORSE HEAVEN
84	UNKNOWN
85	COTTONWOOD BASIN
86	DISHPAN BUTTE
87	BIG PASTURE
88	#16 PHILLIPS PAST
89	MURPHREE PASTURES
90	TRENT&HOME PLACE
91	GREEN MT.FENCED
92	JAMERMAN PASTURES
93	WINTER PASTURES
94	WINTER ALLOTMENT
95	WINTER PASTURES
96	HAT RANCH
97	LEVEL MEADOWS
98	UNKNOWN
99	WHISKEY PEAK INCO
100	WINTER PASTURES
101	TRAM ROAD PASTURE
102	RIM PASTURE
103	MILLER SPRINGS PA
104	RIDDLE PASTURE
105	ATLANTIC CITY COM
106	UNKNOWN
107	GREEN MOUNTAIN CM

Casper Field Office	
ID	Allotment Name
1	GRANITE RIDGE
2	BENTON BASIN
3	RATTLESNAKE
4	SUB-DIVISION
5	GAS HILLS
6	MATADOR
7	CEDAR RIDGE LRA
8	OSCAR T ANNIS
9	STEAMBOAT LAKE
10	PATHFINDER
11	UC RANCH
12	F.L. RANCH

Rawlins Field Office	
ID	Allotment Name
1	BAR ELEVEN
2	STATION 8
3	CHERRY CREEK
4	WEST BLACK MOUNTA
5	DESERT CLAIM
6	POLE CANYON
7	FERRIS MOUNTAIN
8	STONE
9	STEWART CREEK
10	CYCLONE RIM
11	ORDWAY POCKET
12	NORTH WILLOW CREE
13	LITTLE CAMP CREEK
14	BUZZARD
15	DEVILS GATE

Rock Springs Field Office	
ID	Allotment Name
1	GOLD CREEK
2	JENSEN MEADOWS
3	JUEL PLACE
4	JACK RANCH
5	FISH CREEK
6	PINE CREEK
7	SWEETWATER
8	BAR X
9	LITTLE SANDY
10	WHITE ACORN
11	LITTLE PROSPECT
12	CONTINENTAL PEAK
13	PACIFIC CREEK
14	BUSH RIM

- Implement riparian improvements (e.g., instream structures, water troughs, etc.) to maintain or enhance appropriate stream channel morphology; develop springs, seeps, reservoirs, wells or other water development projects in a manner protective of watershed ecological and hydrological functions; and implement range improvements away from riparian areas to avoid conflicts in achieving or maintaining riparian function.
- Adopt management practices and implement range improvements that protect vegetative cover and thereby maintain, restore or enhance water quality. A set of six standards have been established to meet the above guidelines (BLM, 2007). Each standard sets a specific objective, explains the function and importance of the objective, and provides indicators to assess the attainment of the objective.
- Implementation of appropriate range management practices and/or improvements is carried out under an activity or implementation plan, including allotment management plans (AMPs).

Within the Lander District's administrative boundaries, the Green Mountain Common Allotment (GMCA) dominates the physical and management landscape of the study area and consequently will have significant affects upon the Phase III study area. The GMCA is a common allotment located in the central portion of the study area and covers over 522,000 acres as indicated in Figure 3.7. The GMCA is the focal point of a lengthy legal battle between the BLM and private interest groups regarding the BLM's management of the allotment. Events pertaining to the GMCA and decisions affecting its management have received a considerable amount of attention. The BLM's decisions regarding the GMCA and its future management objectives may affect management of other allotments within the district. Therefore, the following brief discussion of the GMCA and BLM management decisions regarding it are included as background information.

At the time this report is being written, the BLM has recently completed the revised Final Environmental Assessment Green Mountain Common Allotment Proposed Grazing Management WY-050-EA11-5 (BLM, 2011). The decision was made by the BLM to split (without fencing) the existing GMCA into four new allotments:

- Antelope Hills,
- Arapahoe Creek,
- Alkali Creek Sheep and
- Mountain.

Final Decision documents were prepared by the Lander Field Manager for each of the three main subdivided allotments (a final decision is not yet prepared for the Mountain allotment). In each, the Lander Field Office manager describes the decision to implement the Proposed Action (Alternative Two) of the Environmental Assessment (EA). The following text was extracted from the Alkali Allotment

Final Decision and is included herein for its description of the decision. James Cagney, the Lander Field Office Acting Manager at the time of the decision, wrote:

"My final decision is to implement the Proposed Action (Alternative Two) described in EA No. WY-050-EA11-5. Specifically, my final decision is described below:

The 2011 livestock grazing use and management for the GMCA will be governed by the Lander Field Manager's Final Decision of August 31,1999 (1999 Decision) until such time as my Final Decision is implemented.

1. *This decision will split the existing GMCA into four smaller allotments with a total of 19 pastures. The four new allotments are: Antelope Hills, Arapahoe Creek, Alkali Creek Sheep and Mountain using the 1999 Decision use area boundaries. These allotments will not be separated by fences.*

2. *The 2011-2020 livestock (cattle and sheep) grazing use and management will be governed by this proposed plan which implements spring and fall seasonal grazing on the new Alkali Creek Sheep Allotment (ACSA).*

3. *Upland vegetation goals for the allotment relate primarily to maintaining the vigor and health of cool season bunchgrasses such as needle-and-thread, Indian ricegrass, bluebunch wheatgrass, and squirreltail. The livestock grazing management is designed to avoid a shift in the herbaceous vegetation from cool season bunchgrasses to smaller but more grazing resistant species such as threadleaf or needleleaf sedge, Sandberg bluegrass, or rhizomatous wheatgrasses. In riparian areas, the goals relate to maintaining or increasing the abundance, vigor and health of wetland sedges. The livestock grazing management is designed to avoid a shift in the vegetation community from wetland sedges to more grazing resistant species such as Kentucky bluegrass, mat muhly, and rose pussytoes. Measurable objectives will be developed cooperatively once a comprehensive monitoring program is established, and baseline data is available.*

4. *Prior to the implementation of riparian fences on the adjacent Antelope Hills and Arapahoe Creek Allotments, management will be based on rigid adherence to stubble heights standards measured at key areas (Table 2.8* [Table 3.4 of this report]*). The observation of stubble heights will be used to determine the appropriate time to move livestock. If use levels are heavy (61%-80%), or the stubble heights are not met, the Authorized Officer will close portions of the allotment or the entire allotment if necessary. Prior to the beginning of the next grazing season, permitted use numbers will be re-evaluated and reduced to meet stubble height objectives.*

The rotation indicator requires a minimum of 6 full inches. That means the average of the heights measured within the key area must be at least 6.0 inches.

Residual cover standards shown in the above Table will apply to all pastures at the end of grazing season. The actual cover measurements will be presented and discussed at the post season BLM meeting to be held before January 31st each year.

5. *In addition to the stubble height criteria shown in Table 2.8* [Table 3.4 of this report]*, the use levels on willows and stream bank trampling will also be observed. Table 2.9* [Table 3.5 of this report] *summarizes the monitoring protocol that will be used under this final decision:*

   In addition to stubble height, willow utilization and stream bank stability the BLM will monitor trend, actual use and precipitation data, in cooperation and consultation with the grazing permittees and interested publics.

Table 2.8 [Table 3.4 of this report] ***Forage Utilization Levels/Rotation Indicators.***

Plant Community Type and Monitoring Method	***Forage Utilization Standard***	***When Will Standard be Implemented?***
Riparian Vegetation (Stubble Height Method)	*6 inch greenline stubble height within key areas*	*At the end of the season of use for each pasture. Monitoring will occur periodically throughout the grazing season to ensure use levels do not exceed acceptable limits.*
Riparian Vegetation (Stubble Height Method)	*4 inch first terrace stubble height within key areas*	*At the end of the season of use for each pasture. Monitoring will occur periodically throughout the grazing season to ensure use levels do not exceed acceptable limits.*
Upland Vegetation (Stubble Height Method)	*6 inch residual herbaceous cover** within key areas*	*At the end of the season of use for each pasture. Monitoring will occur periodically throughout the grazing season to ensure use levels do not exceed acceptable limits.*

***The rotation indicator for the residual herbaceous cover will be measured as "droop height"; the highest naturally growing portion of the plant (Connelly, et.al. 2000) for the key management grass species. The key species are bluebunch wheatgrass, Indian rice grass, squirreltail and needle-and-thread grass. This means that the "droop height" includes leaves, culms, and/or seed heads (seed stalks) of these four key management species. (Connelly, et. al. 2003).*

6. *Upon construction of the riparian pastures and the implementation of the grazing strategies, stubble height measurements will be taken at the end of the grazing season for each pasture. Monitoring will occur throughout the grazing season to ensure that use levels do not exceed acceptable levels. The objective is to observe stubble height levels over 3-5 years and determine an average stubble height over the analysis period rather than attempt to address every pasture*

- every year - while the cattle are still present. If use levels are heavy (61-81%), and there is no longer reason to believe that stubble height objectives will be achieved over the analysis period, the Authorized Officer will accelerate the evaluation schedule to revise the long term management, including reductions in season of use, numbers, or grazing management strategies to occur no later than the next grazing season.

Table 2.9 [Table 3.5 of this report] ***Monitoring Protocol To Be Used Until Fences and Water Developments Are Completed.***

Key Site	***Monitoring Timeframe***	***Protocol Used***	***Trigger Point***
Willows	*Approximately Every 15 days*	*Browse Method*	*35% use on leader growth*
Stream Bank Trampling	*Approximately Every 15 days*	*Stream Bank Alteration Method*	*When stream bank alteration exceeds 15%*

7. *These 12 decision points and the "additional terms and conditions" listed later in this decision will become terms and conditions on this new permit. They will serve as the functional equivalent of an allotment management plan (AMP) in accordance with 43 CFR subpart 4120.2(e). A separate AMP will not be developed as part of this decision. The grazing management is based on this decision and will be implemented through the annual operating plan. This decision is designed to meet the letter and spirit of the BLM's commitment to develop an allotment management plan.*

8. *The new Alkali Creek Sheep Allotment (ACSA) will be authorized for one sheep permit only. Please refer to the attached Final Permitted Use Summary for the Alkali Creek Grazing Association, LLC's final permitted use. The Table reflects a 45 percent reduction of the current permitted use to accelerate attainment of the rangeland health standards.*

9. *In the Alkali Creek Sheep Allotment (ACSA) sheep will graze in the spring and fall, for 30 days each season, generally in April and October. This use period does not include the hot season where riparian issues are important. It does include use in late April where, in some years, the critical growing season for cool season bunchgrasses such as needle & thread begins. Health of the large cool season bunchgrasses is the primary goal in upland environments. However, in most cases this critical season is only beginning in this allotment by the end of April, and the cool season bunchgrasses will be able to complete their growth cycle in the absence of livestock grazing beginning May 1st. The majority of livestock use will occur on grass species such as Sandberg bluegrass that green up prior to the cool season bunchgrasses. Early season forbs will also be utilized.*

10. *The proposed sheep grazing plan will require that lambing areas on East Alkali Creek be rotated each year with camps located a minimum of 1.5 miles from water sources. Sheep camps will be moved every seven days to prevent overutilization of the vegetation in any given location.*

11. *This decision will be implemented for at least three years following completion of the riparian pasture fences and water developments proposed for the adjacent Antelope Hills and Arapahoe Creek Allotments, and then evaluated. The grazing plan will be adjusted as necessary. Increasing sheep permitted use depends on permittee commitment to stewardship including, meeting rangeland health standards, effective control of the sheep"*

3.3.4.2 Existing Water Supply

Within the Sweetwater River watershed, there are numerous sources of upland water supply for wildlife and livestock use. With the exception of the Sweetwater River and several tributary streams, the majority of drainages within the basin are either intermittent or ephemeral. In addition, numerous upland water supply sources currently exist within the study area.

Range improvement projects have been completed by the BLM and local ranchers which utilize perennial stream reaches, intermittent/ephemeral streams, wells, or springs as natural water sources. Typical projects include livestock/wildlife water tanks with pipeline conveyance systems, livestock/wildlife reservoirs, spring developments, water gaps, and other methods. Based upon the LANDFIRE analysis discussed above, riparian zones comprise approximately 2.5 percent of the watershed and therefore are subjected to heavier usage by both wildlife and livestock. Consequently, mapping and understanding the distribution of alternate sources provides valuable insight into potential range improvement strategies.

Mapping of existing sources excluding riparian zones was completed to provide valuable information for completion of the watershed management plan. Mapping of stock reservoirs, stock tanks, wells, spring developments, and guzzlers was initially obtained from the Lander and Rawlins Field Offices of the BLM. This information was augmented with information obtained in the field during the completion of this project, data collected from the Wyoming State Engineers Office (WSEO), and information obtained from local ranchers and landowners. Mapping of springs was augmented with digitized locations from USGS topographic mapping.

This mapping indicated the presence of approximately 276 stock reservoirs. Field inspection of the sites was beyond the scope and budget of this project; however, a reasonable estimate of the viability of the reservoirs was needed. Based upon those reservoirs which were encountered in the field and interviews with landowners, it is obvious that many of the reservoirs have either failed or have filled with sediment and are no longer viable sources of livestock and wildlife water.

Using the project GIS, mapping of the reservoirs sites was overlain on recent high resolution aerial photography. Each reservoir was examined in the GIS to determine its status at the time of the photography (2009). Those containing water were classified as viable sources. Physical breaches were visible on many of the reservoirs resulting in a classification of "non-viable". Likewise, many were visibly filled with sediment and also classified as "non-viable". Others were simply empty and firm conclusions could not be drawn. These sites could have been dry at the time of the photography but remain viable sources following precipitation events. Figure 3.8 displays an example of this process.

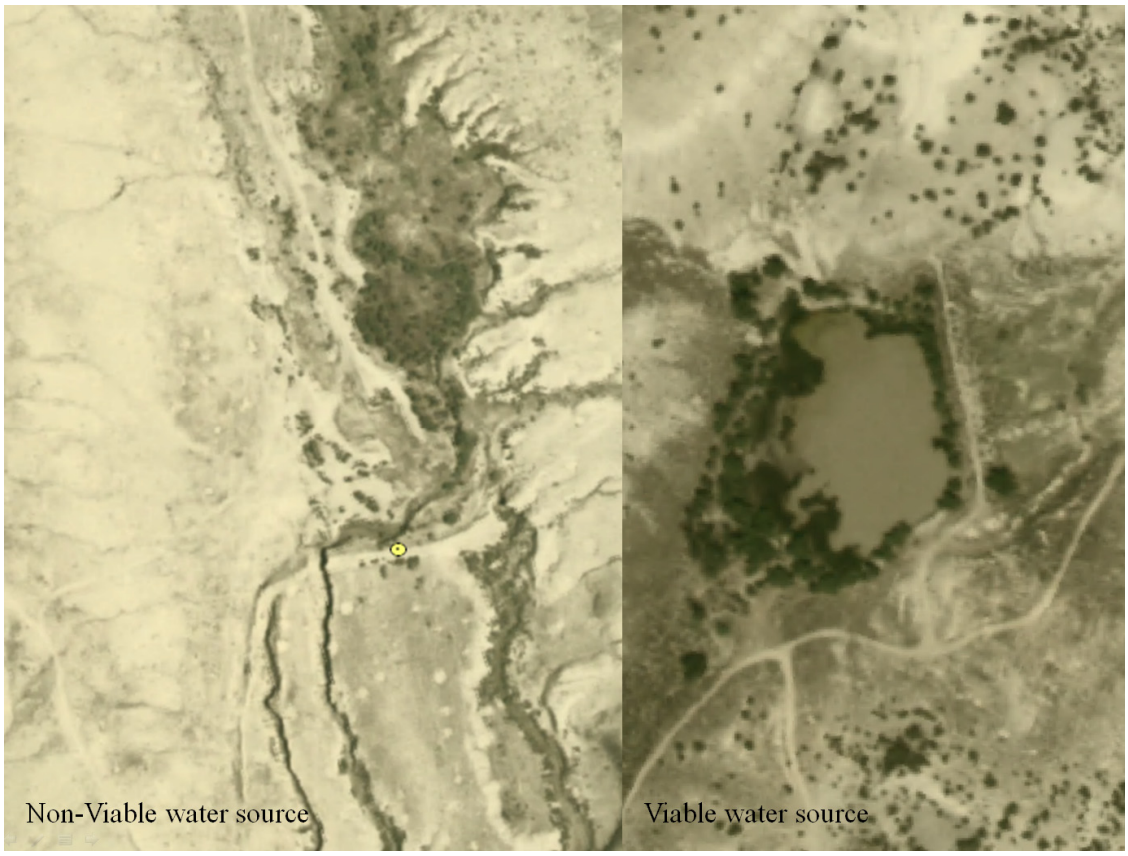
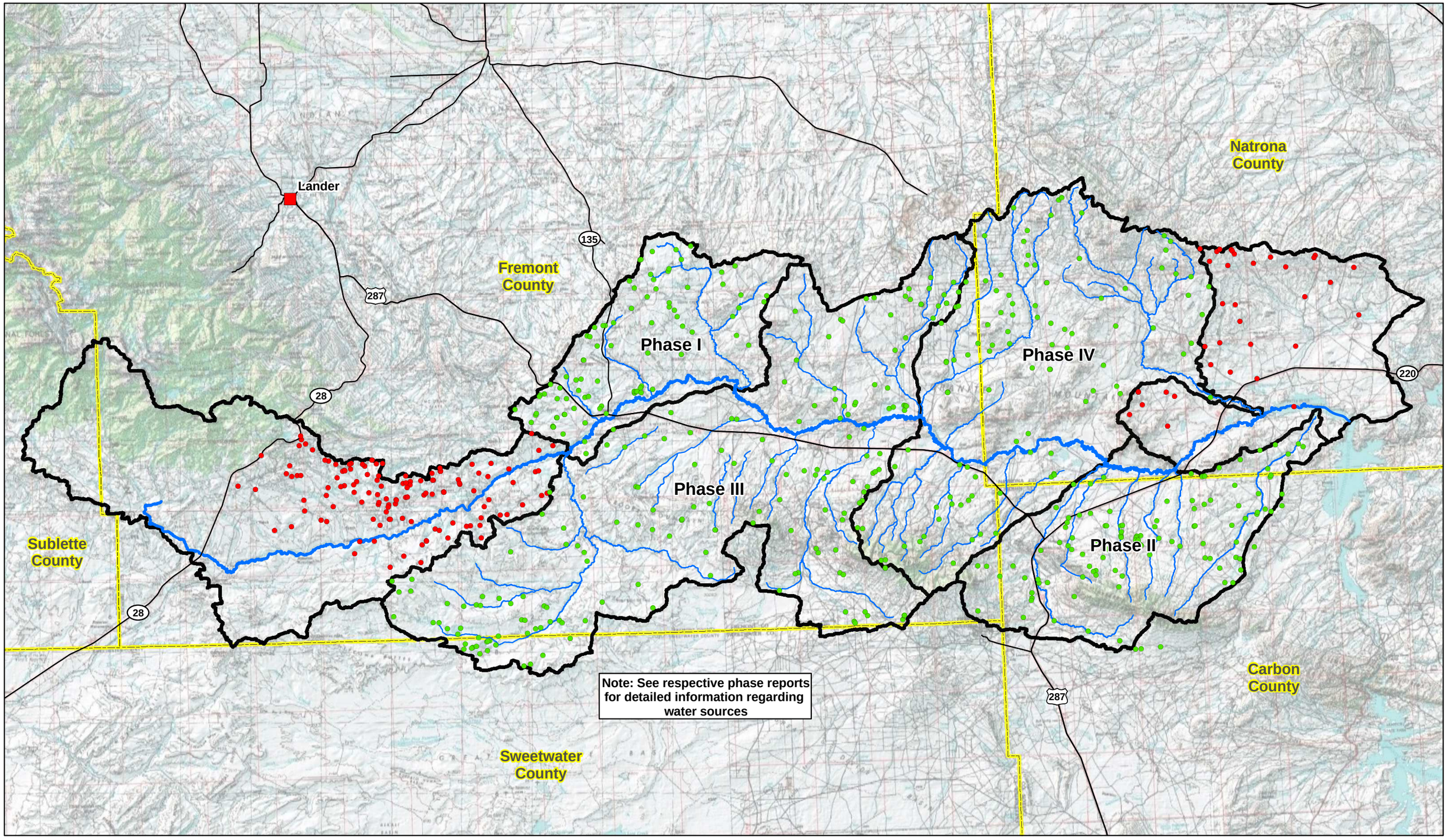


Figure 3.8 Evaluation of Stock Ponds in the Project GIS Environment.

This effort was completed for each of the four individual phases of the project and the results are presented in the respective reports. Figure 3.9 displays a map of the Sweetwater River watershed showing the composite results of these efforts. Stock reservoirs and water sources located outside the boundaries of the Phase I – IV efforts are shown as well, however, budget constraints precluded the evaluation of these sites as discussed above.

Based upon this analysis, it appears that within the Phase I through Phase IV study areas, a minimum of 196 remain viable water sources. This analysis also indicates that 80 are either breached, sediment filled, or in need of site visits to determine their status.



N
W E
S

Legend

- Viable Upland Water Source
- Unevaluated Potential Upland Water Source
- Project Phase
- Cities
- Sweetwater River
- Streams
- US / State Hwy
- Sweetwater River Watershed
- County Boundary

0 10 20

Miles

Figure 3.9 Sweetwater River Watershed: Existing Upland Water Sources

3.3.4.3 Ecological Site Descriptions

The concept of "Ecological Sites" is described by the NRCS as follows:

"A *distinctive kind of land with specific soil and physical characteristics that differs from other kinds of land in its ability to produce distinctive kinds and amounts of vegetation, and in its ability to respond similarly to management actions and natural disturbances."*

Ecological Site Descriptions (ESDs) are reports available from the NRCS that describe the following for each Ecological Site:

- **Site Characteristics:** Identifies the site and describes the physiographic, climate, soil, and water features associated with the site.
- **Plant Communities**: Describes the ecological dynamics and the common plant communities comprising the various vegetation states of the site. The disturbances that cause a shift from one state to another are also described.
- **Site Interpretations:** Interpretive information pertinent to the use and management of the site and its related resources.
- **Supporting Information**: Provides information on sources of information and data utilized in developing the site description and the relationship of the site to other ecological sites (NRCS, 2009).

More information regarding ESDs and their application is available at: http://esis.sc.egov.usda.gov/ESIS/About.aspx.

The ESDs can be used to compare what is growing on the rangeland with what each site is capable of growing. By comparing the present vegetative composition to the potential compositions, the relative health of the range resource can be evaluated. Production of each site is closely related to the ecological condition of the site. Ecological Sites are defined based upon their location within defined Ecological Precipitation Zones and soil characteristics. Figure 3.10 displays the ecological precipitation zones found in the Study Area.

Within each of the Phase I through Phase IV investigations, ESDs were described and mapped using the best methods appropriate to the respective geographic area based upon the availability of NRCS soils mapping data. For areas where detailed soils mapping were available (1:24,000), attributes in the database define the ESD and were subsequently used for analysis. The detailed mapping was available for Phase I, III and IV of the project. In the Phase II study area, detailed mapping was not available. Consequently, ESDs were mapped based upon the broader scale general soils mapping (1:250,000) was attributed with anticipated ESDs based upon soils encountered.

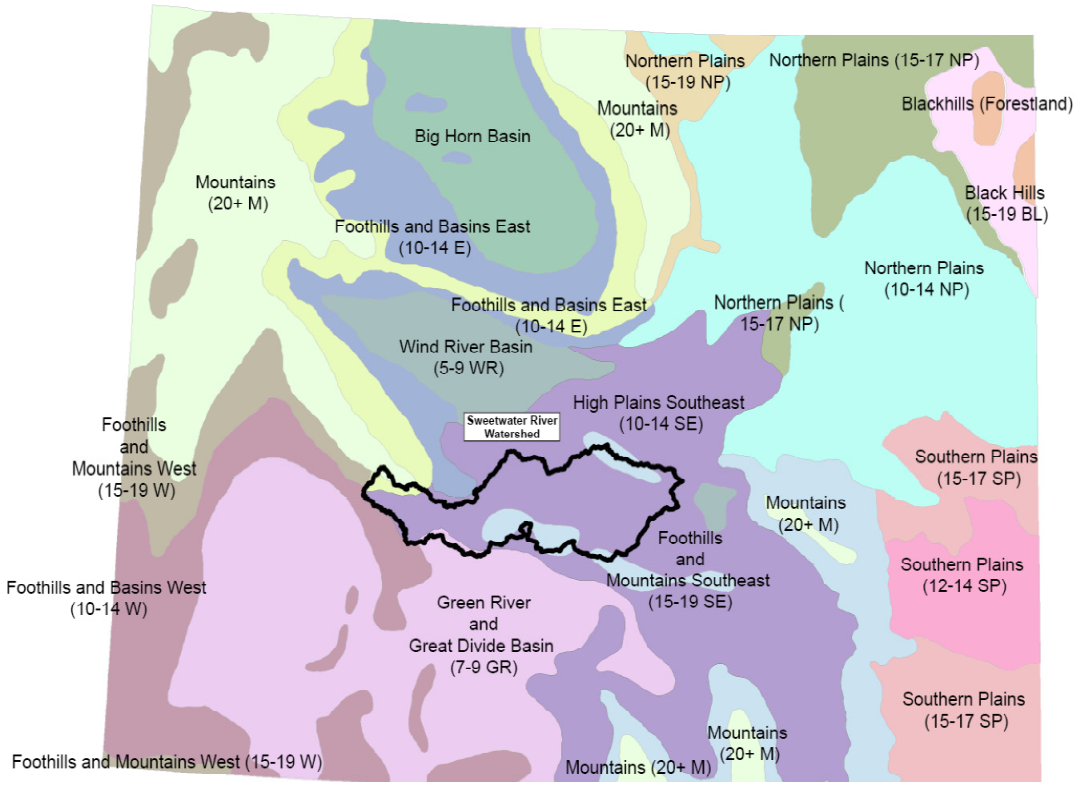


Figure 3.10 Ecological Precipitation Zones.

Ecological Sites are defined based upon their location within defined Ecological Precipitation Zones and soil characteristics. Using database tools provided by the NRCS, and the soils mapping discussed above, Ecological Sites were defined within the study area (Figure 3.11).

Table 3.6 lists the various Ecological Sites which are found within each of the three precipitation zones which encountered within the study area. Figure 3.12 displays their relative distribution.

- Sandy 10-14 inch precipitation zone, Southeast
- Shallow loamy 15-19 inch Southeast
- Loamy 15-19 inch Southeast

Note that approximately 10.3 percent of the study area has not had Ecological Sites assigned. This area is that portion of the watershed located within Sweetwater or Sublette Counties where the appropriate soils mapping was not available.

The following descriptions of the Historic Climax Plant Communities (HCPC) associated with these ESDs are extracted from the NRCS descriptions (NRCS, 2008).

1 - SANDY (10-14SE)
2 - UNCLASSIFIED
3 - SHALLOW LOAMY (10-14 SE)
4 - LOAMY (10-14SE)
5 - SHALLOW SANDY (10-14SE)
6 - GRAVELLY (10-14SE)
7 - LOAMY OVERFLOW (10-14SE)
25 ESD's EACH <3% OF WATERSHED

Lander
Fremont County
Natrona County
Sublette County
Sweetwater County
Carbon County
135
287
28
220

Legend

Cities
Sweetwater River
Streams
US / State Hwy
Sweetwater River Watershed
County Boundary

N
W
E
S

0 10 20
Miles

Figure 3.11 Sweetwater River Watershed: Predominant Ecological Sites of Management Relevance

Table 3.6 Analysis of Ecological Site Distribution in the Sweetwater River Watershed.

Identifier	Site ID	Acres	Description	Percent of Watershed
1	R034XY350WY	671,048.8	ESD 1: SANDY (10-14SE)	36.1%
2	UNCLASS	191,403.0	ESD 2: UNCLASSIFIED	10.3%
3	R034XY362WY	186,554.7	ESD 3: SHALLOW LOAMY (10-14 SE)	10.0%
4	R034XY322WY	183,079.6	ESD 4: LOAMY (10-14SE)	9.9%
5	R034XY366WY	164,413.5	ESD 5: SHALLOW SANDY (10-14SE)	8.8%
6	R034XY312WY	108,609.3	ESD 6: GRAVELLY (10-14SE)	5.8%
7	R034XY326WY	58,450.2	ESD 7: LOAMY OVERFLOW (10-14SE)	3.1%
8	R032XY362WY	55,277.3	ESD 8: SHALLOW LOAMY (10-14E)	3.0%
9	R034XY342WY	39,426.1	ESD 9: SALINE SUBIRRIGATED (10-14SE)	2.1%
10	R034XY304WY	20,998.3	ESD 10: CLAYEY (10-14SE)	1.1%
11	R034XY376WY	20,857.4	ESD 11: VERY SHALLOW (10-14SE)	1.1%
12	R049XY122WY	20,721.7	ESD 12: LOAMY (15-19SE)	1.1%
13	R058BY146WY	18,857.4	ESD 13: SANDS (Sa) 10-14	1.0%
14	R034XY378WY	17,723.4	ESD 14: WETLAND (10-14SE)	1.0%
15	R034XY308WY	17,205.9	ESD 15: COARSE UPLAND (10-14SE)	0.9%
16	R034XY260WY	15,668.2	ESD 16: SHALLOW IGNEOUS (10-14W)	0.8%
17	R049XY108WY	14,273.8	ESD 17: COARSE UPLAND (15-19SE)	0.8%
18	R043XY322WY	9,148.0	ESD 18: LOAMY (15-19E)	0.5%
19	R034XY338WY	9,070.1	ESD 19: SALINE LOWLAND (10-14SE)	0.5%
20	R034XY346WY	8,662.0	ESD 20: SANDS (10-14SE)	0.5%
21	R034XY344WY	6,690.5	ESD 21: SALINE UPLAND (10-14SE)	0.4%
22	Rock	4,961.2	ESD 22: N/A	0.3%
23	R034XY358WY	4,312.6	ESD 23: SHALLOW CLAYEY (10-14SE)	0.2%
24	R049XY108WY	4,254.1	ESD 24: COARSE UPLAND (10-14E)	0.2%
25	R034XY374WY	3,057.2	ESD 25: SUBIRRIGATED (10-14SE)	0.2%
26	R034XY318WY	1,403.8	ESD 26: IMPERVIOUS CLAY (10-14SE)	0.1%
27	R049XA174WY	1,021.7	ESD 27: SUBIRRIGATED(Sb) 15-19	0.1%
28	R032XY322WY	991.0	ESD 28: LOAMY (10-14E)	0.1%
29	R043XY362WY	168.6	ESD 29: SHALLOW LOAMY (15-19E)	0.01%
30	Water	37.2	ESD 30: N/A	0.002%
31	R032XY218WY	27.4	ESD 31: IMPERVIOUS CLAY (5-9WR)	0.001%
32	R034AY368WY	0.4	ESD 32: STEEP LOAMY (10-14SE)	0.00002%

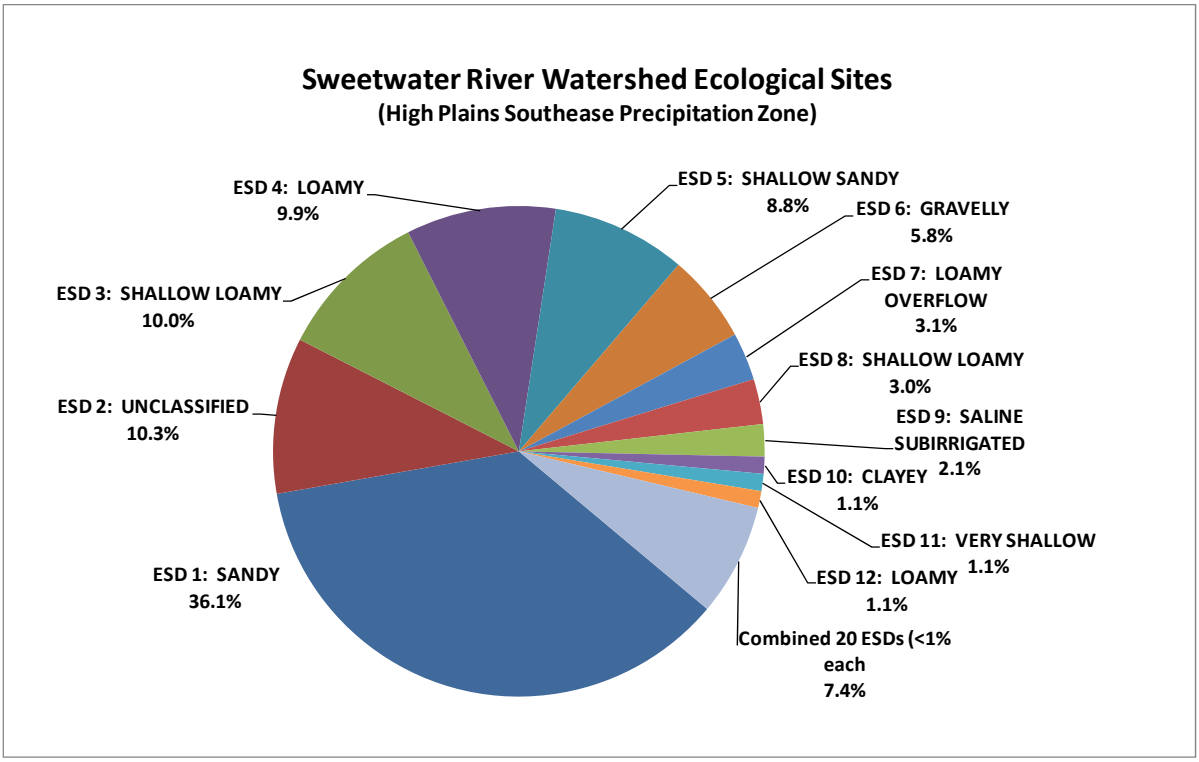


Figure 3.12 Distribution of Ecological Sites Within the Sweetwater River Watershed Study Area.

Sandy 10-14 inch Precipitation High Plains Southeast

Annual precipitation ranges from 10-14 inches per year. Wide fluctuations may occur in yearly precipitation and result in more dry years than those with more than normal precipitation. Temperatures show a wide range between summer and winter and between daily maximums and minimums. This is predominantly due to the high elevation and dry air, which permits rapid incoming and outgoing radiation. Cold air outbreaks in winter move rapidly from northwest to southeast and account for extreme minimum temperatures. Extreme storms may occur during the winter, but most severely affect ranch operations during late winter and spring.

Daytime winds are generally stronger than nighttime and occasional strong storms may bring brief periods of high winds with gusts to more than 50 mph.

Growth of native cool season plants begins about April 15 and continues to about June 15. Some green up of cool season plants usually occurs in September.

As this site deteriorates from improper grazing management, woody species such as big sagebrush and silver sagebrush will increase. Bunchgrasses such as Indian ricegrass and needlethread will decrease in frequency and production.

The interpretive plant community for this site is the Needleandthread/Rhizomatous Wheatgrass Plant Community Reference Plant Community. Potential vegetation is estimated at 75% grasses or grass-like plants, 10% forbs and 15% woody plants. The major grasses include needleandthread, Indian ricegrass, and rhizomatous wheatgrass. Big and silver sagebrush are the major woody plants. A typical plant composition for this state consists of needleandthread 20-50%, rhizomatous wheatgrass 15-25%, Indian ricegrass 10-20%, perennial forbs 5-10%,and shrubs 5-10%.

Ground cover, by ocular estimate, varies from 35-45%.The total annual production (air-dry weight) of this state is about 1200 pounds per acre, but it can range from about 700 lbs/acre in unfavorable years to about 1500 lbs/acre in above average years.

This state is extremely stable and well adapted to the Cool Central Desertic Basins and Plateaus climate. The diversity in plant species allows for high drought resistance. This is a sustainable plant community (site/soil stability, watershed function, and biologic integrity).

Transitions or pathways leading to other plant communities are as follows:

- *Moderate Continuous Season-long Grazing will convert the plant community to the Big Sagebrush/Shortgrass Plant Community if big sagebrush is present at 5-10%.*
- *Moderate Continuous Season-long Grazing or Continuous Spring Grazing with Brush Management (chemical) will convert the plant community to the Threadleaf Sedge/Blue grama Plant Community.*

Shallow Loamy 10-14 inch Precipitation Zone, High Plains Southeast

Annual precipitation ranges from 10-14 inches per year. Wide fluctuations may occur in yearly precipitation and result in more dry years than those with more than normal precipitation. Temperatures show a wide range between summer and winter and between daily maximums and minimums. This is predominantly due to the high elevation and dry air, which permits rapid incoming and outgoing radiation. Cold air outbreaks in winter move rapidly from northwest to southeast and account for extreme minimum temperatures. Extreme storms may occur during the winter, but most severely affect ranch operations during late winter and spring.

Daytime winds are generally stronger than nighttime and occasional strong storms may bring brief periods of high winds with gusts to more than 50 mph.

Growth of native cool season plants begins about April 15 and continues to about June 15. Some green up of cool season plants usually occurs in September

As this site deteriorates from improper grazing management, species such as threadleaf sedge, prairie junegrass, Sandberg bluegrass, and low growing forbs become dominant. Bluebunch wheatgrass and needleandthread decrease.

The Historic Climax Plant Community has been determined by study of rangeland relic areas, or areas protected from excessive disturbance. Trends in plant communities going from heavily grazed areas to lightly grazed areas, seasonal use pastures, and historical accounts have also been used.

Bluebunch Wheatgrass/ Rhizomatous Wheatgrass Plant Community (HCPC)

The interpretive plant community for this site is the Bluebunch Wheatgrass/ Rhizomatous Wheatgrass Historic Climax Plant Community (HCPC). Potential vegetation is about 70% grasses or grass-like plants, 10% forbs, and 20% woody plants.

The major grasses include bluebunch wheatgrass, western wheatgrass, needleandthread, and Indian ricegrass. Other grasses include, Sandberg and mutton bluegrass, prairie junegrass, bottlebrush squirreltail, plains reedgrass, and threadleaf sedge. Black sagebrush, big sagebrush, and green rabbitbrush are the major woody plants.

A typical plant composition for this state consists of bluebunch wheatgrass 15-30%, western wheatgrass 15-25%, needleandthread 5-10%, muttongrass 5-10% other grasses and grass-like plants 10-20%, perennial forbs 5-15%, black sagebrush 5-10%, and other shrubs 5-10% Ground cover, by ocular estimate, varies from 15-25%.

The total annual production (air-dry weight) of this state is about 900 pounds per acre, but it can range from about 700 lbs./acre in unfavorable years to about 1200 lbs./acre in above average years.

The state is stable and well adapted to the Cool Central Desertic Basins and Plateaus climatic conditions. The diversity in plant species allows for high drought resistance. This is a sustainable plant community (site/soil stability, watershed function, and biologic integrity).

Transitions or pathways leading to other plant communities are as follows:

- *Moderate Continuous Season Long Grazing will convert this plant community to the Black Sagebrush/Rhizomatous Wheatgrass Plant Community.*
- *Heavy Continuous Season-long Grazing will convert this plant community to the Short Grass & Grasslike/Forb plant community.*

Loamy 10-14 inch Precipitation Zone, High Plains Southeast

Annual precipitation ranges from 10-14 inches per year. Wide fluctuations may occur in yearly precipitation and result in more dry years than those with more than normal precipitation. Temperatures show a wide range between summer and winter and between daily maximums and minimums. This is predominantly due to the high elevation and dry air, which permits rapid incoming and outgoing radiation. Cold air outbreaks in winter move rapidly from northwest to southeast and account for extreme minimum temperatures. Extreme storms may occur during the winter, but most severely affect ranch operations during late winter and spring.

Daytime winds are generally stronger than nighttime and occasional strong storms may bring brief periods of high winds with gusts to more than 50 mph.

Growth of native cool season plants begins about April 15 and continues to about June 15. Some green up of cool season plants usually occurs in September.

As this site deteriorates from improper grazing management, woody species such as big sagebrush and rubber rabbitbrush will increase. Bunchgrasses such as needle and thread, bluebunch wheatgrass, and green needlegrass will decrease in frequency and production. These are usually replaced by prairie junegrass, Sandberg bluegrass, blue grama, and several undesirable forbs.

Big sagebrush will become dominant on some areas with an absence of fire. Wildfires are often actively controlled so chemical control using herbicides has replaced the historic role of fire on this site. Recently, prescribed burning has regained some popularity.

The Historic Climax Plant Community (description follows the plant community diagram) has been determined by study of rangeland relic areas, or areas protected from excessive disturbance. Trends in plant communities going from heavily grazed areas to lightly grazed areas, seasonal use pastures, and historical accounts have also been used.

The interpretive plant community for this site is the Rhizomatous Wheatgrass/Needle and Thread Historic Climax Plant Community (HCPC). Potential vegetation is estimated at 80% grasses or grass-like plants, 10% forbs and 10% woody plants.

The major grasses include rhizomatous wheatgrass, needle and thread, bluebunch wheatgrass, and green needlegrass. Big sagebrush and rubber rabbitbrush are the major woody plants.

A typical plant composition for this state consists of rhizomatous wheatgrass 30-40%, needle and thread 10-20%, bluebunch wheatgrass 5-15%, green needlegrass 5-10%, muttongrass 5-10%, perennial forbs 5-10%,and big sagebrush 5-15%. Ground cover, by ocular estimate, varies from 30-40%.

The total annual production (air-dry weight) of this state is about 1100 pounds per acre, but it can range from about 600lbs./acre in unfavorable years to about 1400 lbs./acre in above average years.

This state is extremely stable and well adapted to the Cool Central Desertic Basins and Plateaus climate. The diversity in plant species allows for high drought resistance. This is a sustainable plant community (site/soil stability, watershed function, and biologic integrity).

Transitions or pathways leading to other plant communities are as follows:

- *Continuous Season-long Grazing will convert the plant community to the Big Sagebrush/Mid Grass Plant Community if big sagebrush is present at 5-10%.*

- *Moderate Continuous Season-long Grazing or Continuous Spring Grazing will convert the plant community to the Blue Grama Sod Plant Community*

- *Heavy Continuous Season Long Grazing with Wild Fire will convert this plant community to the Rabbitbrush/Cheatgrass plant community.*

3.3.4.4 Range Conditions and Needs

The Sweetwater River study area has been grazed by domestic livestock (both cattle and sheep) since the mid- to late-1800's. Detailed assessment of range conditions within the study area was beyond the scope of this project. However, based upon information presented in NEPA documents associated with the Green Mountain Common Allotment, observations made during field investigations and

interviews with landowners and agency representatives, it is apparent that there is a great variety of conditions. The following observations describe the general condition of the study area:

- Utilization of upland resources varies throughout the study area and generally ranges from light to moderate use. Upland issues associated with livestock grazing do not appear to be significant. With respect to the GMCA, "upland issues associated with livestock grazing have been virtually eliminated" (BLM, 2011).
- Riparian areas in many portions of the study area continue to be heavily relied upon for their high resource value including sources of wildlife and livestock water, feed values, and cover.
- Portions of the study area near higher ridges appeared to be in high-good ecological condition. Offsite water development can reduce grazing impacts on riparian areas.
- Better distribution of grazing on upland areas would be beneficial to watershed values by moving grazing impacts from historically heavily utilized areas to under-utilized areas.
- Livestock water development is generally needed before constructing fences and implementing improved grazing systems.

An important factor needed to facilitate improved grazing management and thereby achieve the associated benefits to the watershed is well-distributed, reliable water. Good grazing systems control both the time (amount of time spent in an area), and the timing (the time of the year) that the livestock spend in a pasture. Grasses and other plants need to recover from the last grazing event before being grazed again because food reserves in the roots must be utilized for new plant growth. If root reserves are not restored, the plants are weakened and may eventually die. Less desirable plants eventually take over and plant densities decrease. In the absence of well-distributed livestock water, areas near water (frequently riparian areas) are grazed heavily while many other areas are under-utilized. Livestock water must also be reliable so that each pasture can be used as needed in a grazing rotation. Otherwise, the same pastures with reliable water get grazed repeatedly at the same crucial time of the year.

Due to the fact that plants grow rapidly during the growing season, re-growth is frequently grazed multiple times during each grazing period, resulting in depleted root reserves. Because of this, it is often desirable to combine herds so livestock can spend shorter time periods in one pasture. This requires adequate quantities of water to accommodate larger herds.

In addition to restoration of more healthy conditions, continuing adjustments in overall range management will contribute to the maintenance, recovery or improvement of a variety of interrelated aspects of watershed function, including but not necessarily limited to:

- Improved infiltration of snowmelt and rainfall;
- Retention of soil moisture;
- Groundwater recharge;

- Sustained release of soil moisture and groundwater as seeps/springs; and
- Stabilization of soils against erosion into streams.

In general, most range improvement practices which improve watershed and livestock values also improve wildlife habitat values. With important and sensitive species found within the watershed, such as sage grouse, care must be taken to ensure that practices are beneficial rather than detrimental to their habitat values. Examples of this include the need for mixed age stands of sagebrush, adequate vegetative residues, wildlife escape ramps from livestock tanks, and provisions for wildlife water.

Alternatives to address the need for additional wildlife/livestock watering sites are presented in Section 4.3. Potential management practices and improvements to address other rangeland/grazing related issues are included in Section 4.6. It is important to consider that to be cost-effective any range improvement practices/facilities that may be implemented must be followed up with a good grazing system. Otherwise, any short term gains will be lost, and often made worse. The key to any good grazing system is often a good, reliable livestock water system; this usually is the most cost-effective practice to initiate the process. The best value for the investment of resources frequently occurs on the more productive land. Land that is too steep or shallow can only show limited returns on investments.

3.3.5 Oil and Gas Production and Resources

The locations of all active and permanently abandoned oil and gas wells were obtained from the Wyoming Oil and Gas Conservation Commission (WOGCC) website: http://wogccms.state.wy.us/. Active wells and permanently abandoned wells within the study area are shown on Figure 3.13. In relation to much of the State, the Sweetwater River watershed has experienced relatively little impact from oil and gas production. According to the database provided by the WOGCC, there are approximately 66 active wells and 428 permanently abandoned wells within the watershed as a whole. As indicated in Figure 3.13 most of the oil and gas development has occurred within the Muddy Creek watershed (Phase II), the Crook Creek Watershed (Phase III), the Alkali Creek Watershed (Phase III) and the upper Long Creek watershed (Phase I). The Bison Basin field is located within the Alkali Creek watershed and represents one of the more extensive development areas in the study area. According to the BLM, approximately nine new wells per year have been drilled in the Bison Basin and Crooks Gap fields since 2005 (BLM, 2011). This number is compared to roughly one new well per year in these areas prior to that. The BLM reports that approximately 2 acres of disturbance results for each well in the form of access roads and associated infrastructure.

Annual oil and gas production for 2011 for the well fields encountered in the study area is summarized in Table 3.7 (It must be kept in mind that the well fields may extend beyond the boundaries of the current study area). Total oil production was approximately 970,717 barrels. Natural gas

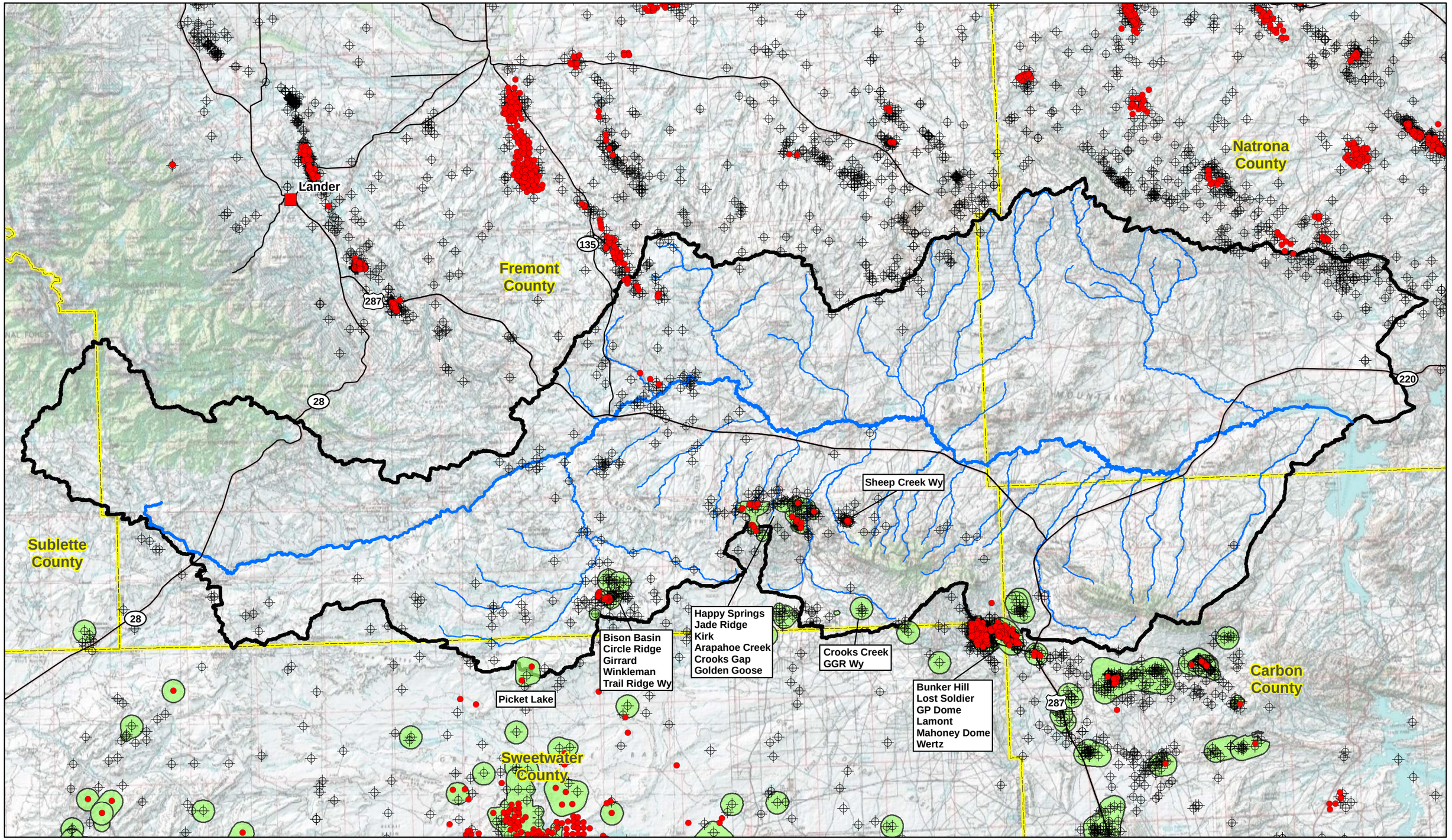


Figure 3.13 Sweetwater River Watershed: Oil and Gas Fields

production was 161,194,291 Mcf. In addition, approximately 99.7 million barrels of water were produced (approximately 9.643 acre feet). Historically, this water was typically discharged to receiving surface waters. However, due to restrictions imposed by the WYDEQ pertaining to water quality, a greater number of producers currently re-inject produced water.

Table 3.7 Summary of Oil and Gas Production for Fields Found in the Sweetwater River Watershed (2011).

Field	Oil Bbls	Gas Mcf	Water Bbls
BISON BASIN	41,443	0	2,317,418
BUNKER HILL	0	982	0
CROOKS CREEK	0	0	0
CROOKS GAP	8,872	0	288,354
GOLDEN GOOSE	3,935	0	224,893
GRIEVE	3,096	0	407,533
HAPPY SPRINGS	10,081	38,024	101,025
KOHLER	0	0	18,000
LONGS CREEK	0	12,045	0
MADDEN	16,725	115,857,353	5,389,578
PICKET LAKE	166	36,831	504,303
POISON SPRING CREEK	1,370	1,222	147
RIVERTON DOME EAST	2,565	634,975	169,357
SAND DRAW NORTH	53,929	6,291	494,527
SAND DRAW SOUTH	33,001	52,726	2,358,314
SHEEP CREEK	3,942	0	7,959
WC	158,206	25,423,262	55,185,134
WERTZ	633,386	19,130,580	32,280,316
Total	**970,717**	**161,194,291**	**99,746,858**

3.3.6 Mining and Mineral Resources

Current mine permit boundary information is tabulated in Table 3. 8 and displayed graphically in Figure 3.14. This figure indicates that uranium mining dominates current mining activities within the watershed.

Figure 3.14 also displays abandoned mine sites inventoried by various projects funded by the State of Wyoming Department of Environmental Quality, Abandoned Mine Lands Division (AML). In the vicinity of South Pass City are numerous relics of past hard rock mining activities. The majority of these are associated with historic gold mine activities.

To date, many of these sites have been reclaimed through AML's efforts; however, many represent safety hazards.

Table 3.8 Active Mine Permits within the Sweetwater River Watershed.

Permit Number	Company	Mine Type	Name	Permitted Acres
PT0219	PARKER, W RODNEY	Jade	Parker, W Rodney Mine	17.0
PT0231	RICE ENTERPRISES	Iron	Rice Enterprises Mine	803.0
ET0781	JTL GROUP INC	Sand & Gravel	Jtl Group Inc Mine	40.3
PT0438	POWER RESOURCES INC	Uranium	Power Resources Inc Mine	4616.6
PT0224	SHAW, DOUGLAS	Jade	Shaw, Douglas Mine	156.0
PT0593	SHAW, DOUGLAS	Jade	Shaw, Douglas Mine	156.0
PT0401	SWEETWATER JADE	Jade	Sweetwater Jade Mine	78.0
PT0279	PRAIRIE GEMS	Jade	Prairie Gems Mine	1562.5
PT0530	WIND RIVER ORIGINALS LLC	Jade	Wind River Originals LLC Mine	160.7
PT0234	HRUZA, RODNEY & O	Jade	Hruza, Rodney & O Mine	161.0
PT0357	WALKER & VONDRASEK	Jade	Walker & Vondrasek Mine	160.4
PT0226	POLLARD, KURT	Jade	Pollard, Kurt Mine	17.8
PT0545	J W K & T MINING	Gold	J W K & T Mining Mine	98.6
PT0638	GYORVARY MINING CO INC	Gold	Gyorvary Mining Co Inc Mine	79.5
ET0575	STEERS CONST INC	Sand & Gravel	Steers Const Inc Mine	78.5
PT0222	HUDSPETH, HENRY & BETTY	Jade	Hudspeth, Henry & Betty Mine	745.8
PT0514	STOUT, CHARLEY J	Gold	Stout, Charley J Mine	438.5
PT0513	HEINRICK, RUBEN J	Gold	Heinrick, Ruben J Mine	82.5
PT0601	STOUT, GERALD W	Gold	Stout, Gerald W Mine	315.7
PT0515	SMITH, STEVEN J	Gold	Smith, Steven J Mine	629.6
ET0709	GILPATRICK CONST CO	Sand & Gravel	Gilpatrick Const Co Mine	41.9
PT0660	GREEN MOUNTAIN MINING VENTURE	Uranium	Green Mountain Mining Venture Mine	2036.7
ET0880	WESTERN NUCLEAR INC	Shale	Western Nuclear Inc Mine	481.4
PT0649	WESTERN NUCLEAR INC	Shale	Western Nuclear Inc Mine	145.2
PT0381	U S ENERGY/CRESTED CORP	Uranium	U S Energy/crested Corp Mine	3725.6
PT0451	KENNECOTT URANIUM CO	Uranium	Kennecott Uranium Co Mine	2270.4
PT0369	QUARLES, L Q	Jade	Quarles, L Q Mine	79.9
PT0490	AMERICAN NUCLEAR CORP	Uranium	American Nuclear Corp Mine	1516.2
ET1152	RISSLER & MCMURRY CO	Sand & Gravel	Rissler & Mcmurry Co Mine	39.5
PT0504	OGLE PETROLEUM INC	Uranium	Ogle Petroleum Inc Mine	944.9

3.3.7 Wildlife

A considerable amount of the study area has been mapped by the Wyoming Game and Fish Department (WGFD) as crucial habitat for several big game species. Specifically, the entire study area has been identified as seasonal habitat for mule deer, and antelope and extensive portions of the area are seasonal habitat for elk and moose. In addition, crucial habitat has been mapped for antelope (278,552 acres), elk (66,944 acres), mule deer (67,432 acres), and moose (55,735 acres). The WGFD maps the seasonal ranges by herd unit for each big game species and makes special note of areas listed as crucial habitat and parturition (birthing areas). Crucial habitat or range is defined as those seasonal ranges or habitats (mostly winter range) that have been documented as the determining factor in a population's ability to maintain itself at a certain level over a long period of time. Figures 3.15 through 3.19 display the seasonal range, crucial range, parturition range, and migration corridors for big game species in the study area: antelope, elk, moose, and mule deer.

Ballast
Coal
Gold
Iron
Jade
Limestone
Quartzite
Sand & Gravel
Scoria
Shale
Uranium
Abandoned Mine Feature : Uranium
Abandoned Mine Feature : Hardrock
Abandoned Mine Feature : Coal
Abandoned Mine Feature : Sand & Gravel
Abandoned Mine Feature : Other

Natrona County
Fremont County
Sublette County
Sweetwater County
Carbon County

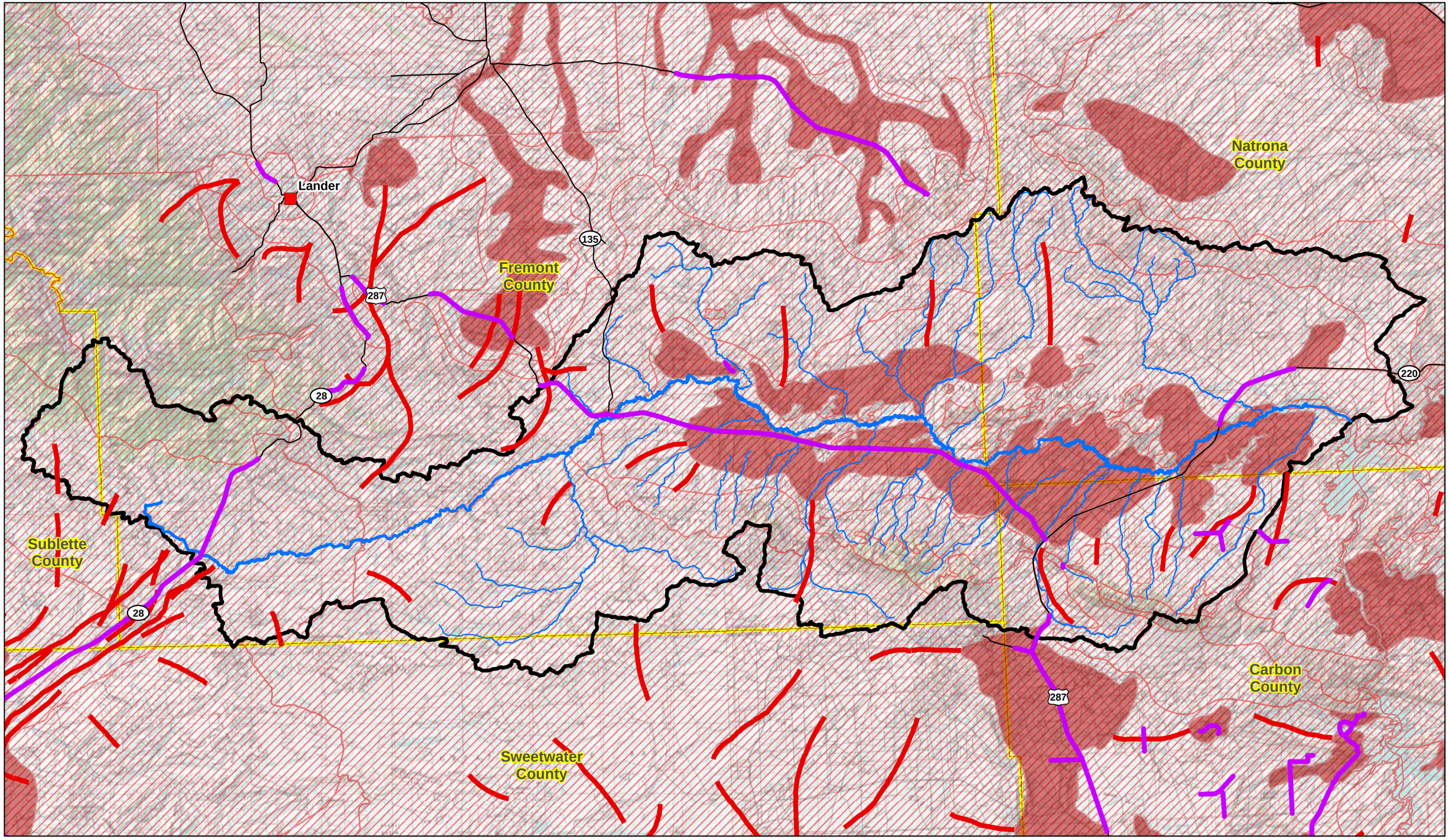
N
W
E
S

Legend

Cities
Sweetwater River
Streams
US / State Hwy
Sweetwater River Watershed
County Boundary

0 10 20
Miles

Figure 3.14 Sweetwater River Watershed: Mine Permit Boundaries



Legend

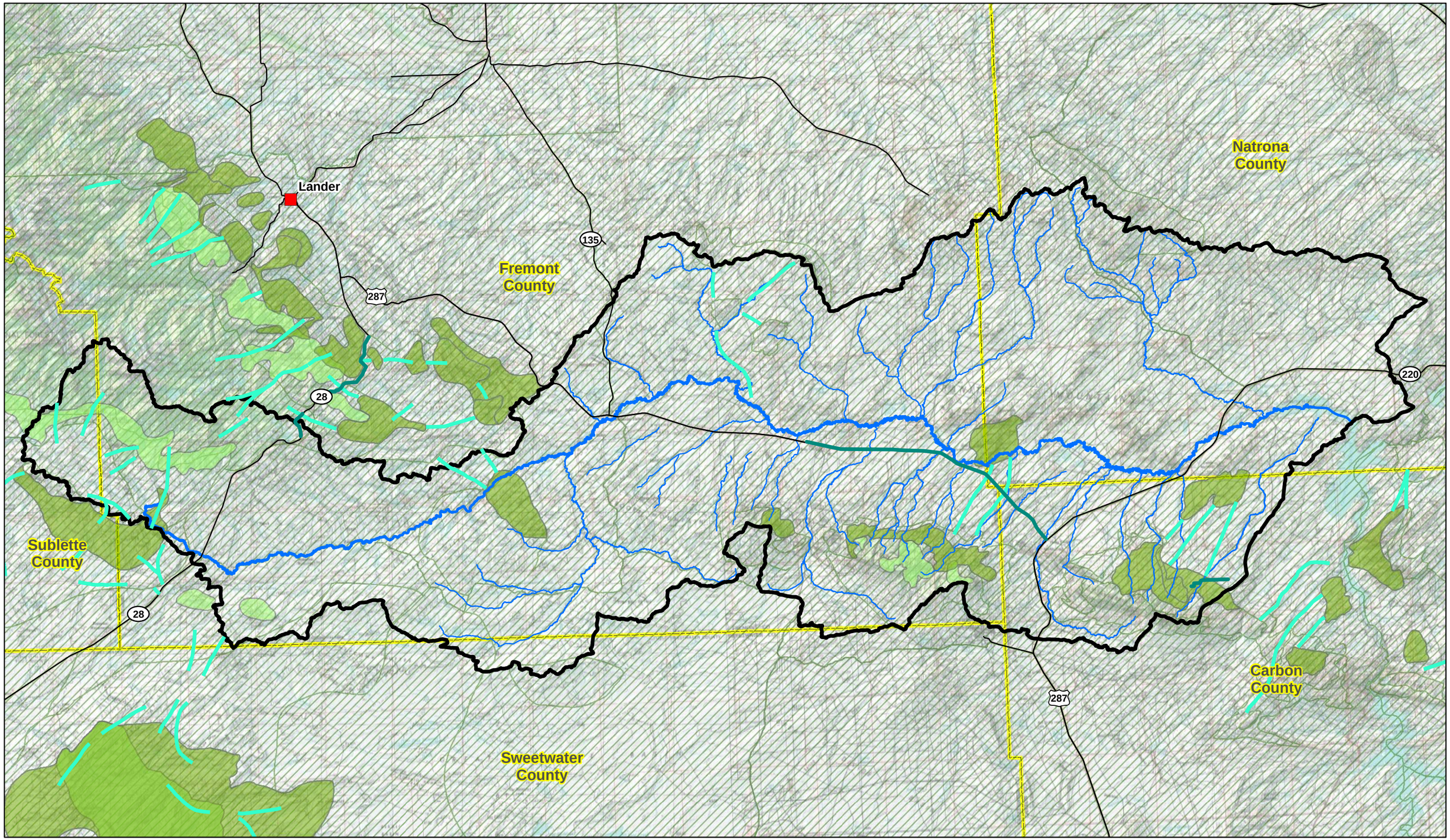
- Migration Barrier
- Migration Routes
- Crucial Range
- Seasonal Range
- Cities
- US / State Hwy
- Sweetwater River
- Streams
- Sweetwater River Watershed
- County Boundary

N W E S

0 10 20

Miles

Figure 3.15 Sweetwater River Watershed: Antelope Habitat



N
W E
S

Legend

- Migration Barrier
- Migration Routes
- Parturition Area
- Seasonal Range
- Crucial Range
- Cities
- Sweetwater River
- Streams
- US / State Hwy
- Sweetwater River Watershed
- County Boundary

0 10 20

Miles

Figure 3.16 Sweetwater River Watershed: Elk Habitat

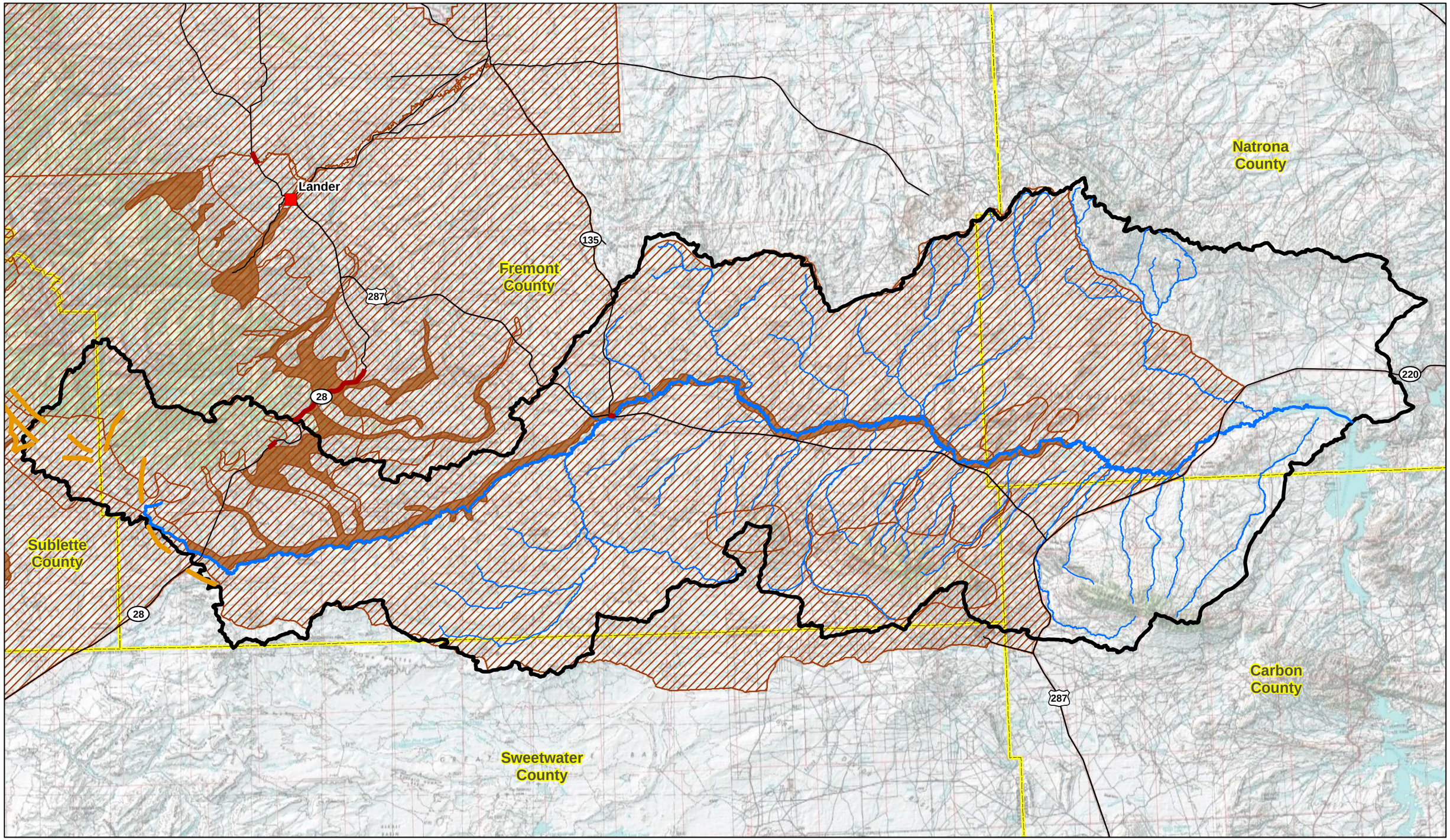


Figure 3.17 Sweetwater River Watershed: Moose Habitat

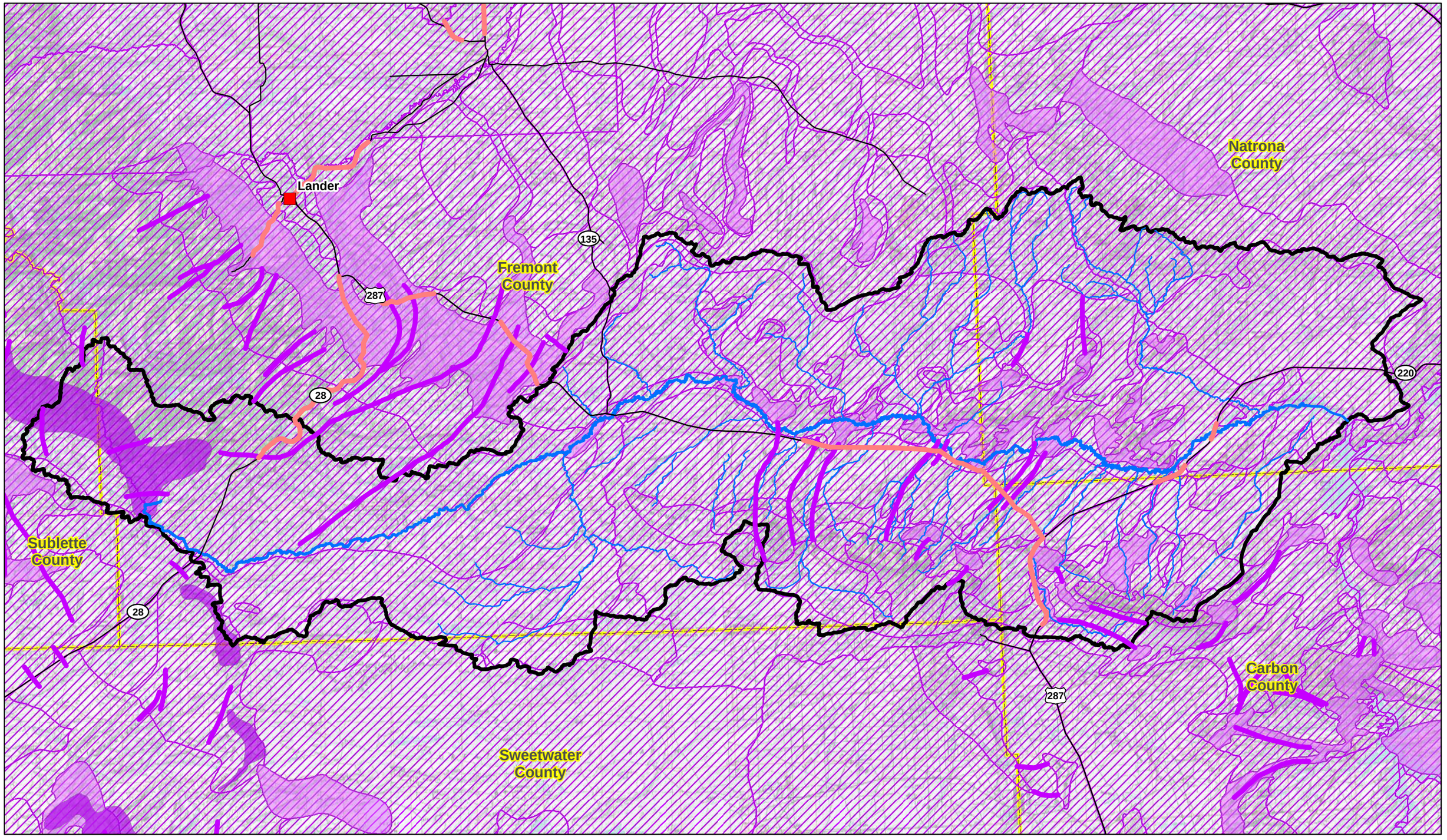
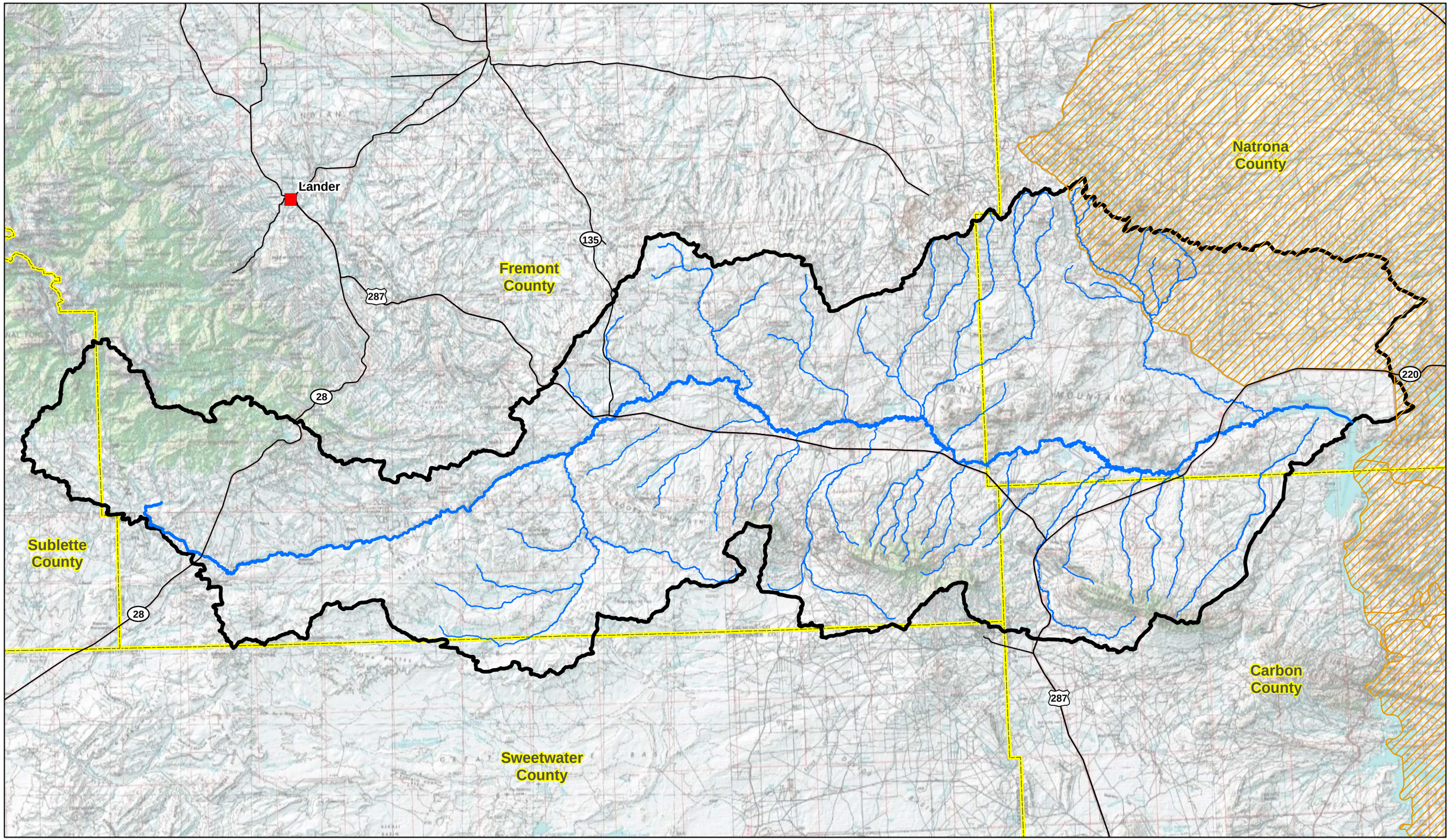


Figure 3.18 Sweetwater River Watershed: Mule Deer Habitat



N
W E
S

Legend

- Seasonal Range
- Cities
- County Boundary
- Sweetwater River
- US / State Hwy
- Streams
- Sweetwater River Watershed

0 10 20

Miles

Figure 3.19 Sweetwater River Watershed: Whitetail Deer Habitat

With respect to wildlife habitat within the GMCA portion of the study area, the following description was extracted from the 2011 GMCA EA:

"Historically, approximately 30 elk traveled extensively throughout this area, generally centering near Cyclone Rim. The South Wind River Elk Herd Unit occurs only in a small portion on the allotment north of the Sweetwater River. In the past, approximately 50 elk inhabited this area in the Sweetwater River Canyon. During recent years, up to 400 elk have been observed in this portion of the allotment during the late fall, winter, and early spring. These elk are believed to be migrating from the Wind River Mountains to the west. Elk populations of the Green Mountain, Steamboat, and South Wind River herd units have exceeded population objectives for the past five years. For further discussions of elk habitat, movements, and food habitats, refer to the Affected Environment chapter of the Green Mountain Grazing EIS.

Habitats preferred by mule deer in the allotment include woody riparian, shrubland, juniper woodland, and aspen habitats. These habitats typically have adequate cover and extensive stands of browse species available. During severe winters, deer are restricted to areas where cover and browse are still relatively accessible. On many deer winter ranges, riparian habitats provide the only available cover and most of the available forage. These riparian habitats also provide important forage and fawning areas during the spring and summer. Forage competition between livestock, wild horses, and elk in these riparian habitats has reduced the amount of forage available to deer. Mule deer population estimates for the Sweetwater, Steamboat, and South Wind River herd units have been below objective for a number of years.

The Red Desert Pronghorn Herd Unit utilizes the largest proportion of the allotment during the spring, summer, and fall period. Pronghorn generally migrate to the south and out of the allotment as a result of snow and colder temperatures. During most winters, a reduced number of antelope can be found along the southern boundary of the allotment from the Rocky Crossing Road to Eagles Nest Draw. The Beaver Rim Pronghorn Herd Unit occurs in the northern one-fourth of the allotment, which extends from the mouth of Alkali Creek along the Crooks Mountain divide to the area immediately southwest of Jeffrey City.

Antelope movements in this herd unit are generally from south and west to northeast, with pronghorn wintering in the vicinity of Ice Slough and outside of the allotment to the east. A small portion of habitat of the Sublette Pronghorn Herd Unit (about 300 acres) occurs in the extreme western portion of the allotment, where pronghorn occur during the spring, summer, and fall. The five-year average estimated population for all herds is currently below population objectives, as a result of the cumulative impacts from long-term summer drought, which began in the late 1980s and persisted through the mid-1990s. The drought has dramatically reduced fawn survival, yearling recruitment, and, ultimately, herd size for these populations. The severe winter of 1992-93 also negatively impacted these populations.

Moose habitat in the allotment generally occurs in forested or riparian habitats containing willow, cottonwood, or aspen species. Although moose occur in the allotment yearlong, the greatest numbers enter the allotment from the west as they migrate away from the Shoshone National Forest due to deep snow. Preferred forage for moose is willow, aspen, and other vegetative growth commonly found in

riparian habitats. Forage competition among other animals, including livestock, has adversely impacted the availability of forage and cover for moose".

The Wyoming Natural Diversity Database (WYNDD) develops and maintains lists of species in Wyoming that are rare, endemic, disjunct, threatened, or otherwise biologically sensitive, and supporting documentation. These lists are used to direct data acquisition at WYNDD. Plants and animals are considered for inclusion on the Species of Concern List (also known as tracked species) if they are vulnerable to extirpation at the global or state level due to:

- their rarity (e.g., restricted distribution, small population size, low population density)
- inherent vulnerability (e.g., specialized habitat requirements, restrictive life history)
- threats (e.g., significant loss of habitat, sensitivity to disturbances)

Additionally, the WYNDD "Species of Potential Concern List" (also known as watched species) includes species that appear to be secure at present, but because they have limited distribution as regional or state endemics they could become vulnerable under large-scale changes (WYNDD, 2012). For each of the four individual phases of the study, the respective study area was provided to WYNDD and a list of all species on the Species of Potential Concern List" was obtained. The individual reports should be consulted for the detailed lists and more detailed discussion of the results for each Phase. The results of the database inquiries indicated that there were several "watched" species. Threatened or endangered species were limited to:

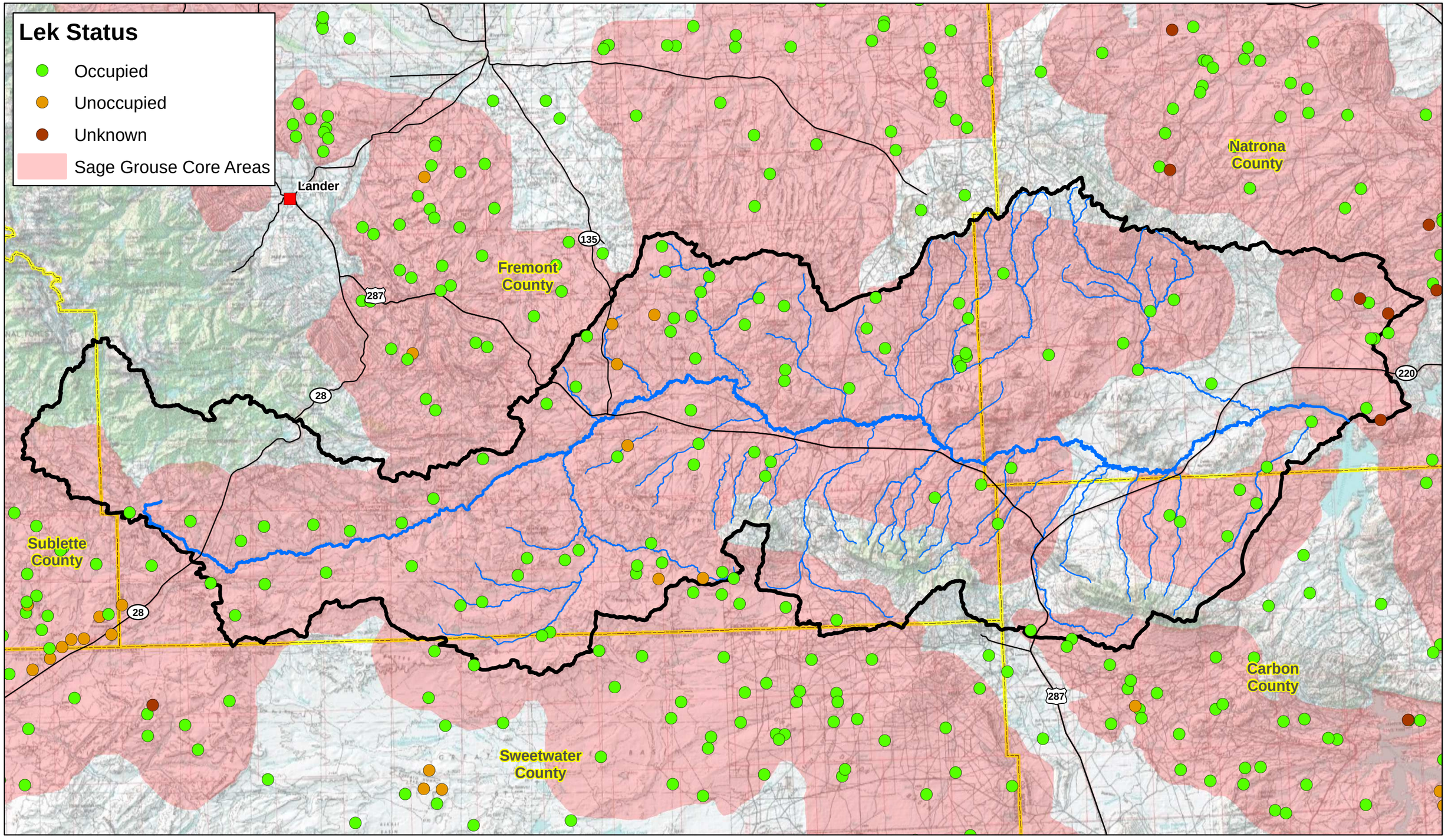
- Black-footed ferret (*Mustela nigripes*) in Phase I, II, III and IV study areas,
- Grey wolf (Canis lupus) in Phase I, II, and III study areas, and
- Whooping crane (Grus americana) in the Phase III study area.

Table 3.9 summarizes the results of the WYNDD data retrievals completed in support of the Phase I through IV studies.

The potential exists for some of these species to occur within appropriate habitats within the watershed. For example, areas of known greater sage grouse (*Centrocercus urophasianus*) leks are displayed in Figure 3.20. The sage grouse does not receive federal or state protection at this time; however, it is recognized as a sensitive species / species of concern by the BLM and a species of concern by WGFD. In August 2008, Executive Order 2008-2 was signed by the Governor which stresses additional management consideration to sage grouse and sage grouse habitat statewide. The Order includes requirements of state agencies to encourage development outside of the Core areas and to focus management to the greatest extent possible on the maintenance and enhancements of habitat within them. The Core Sage Grouse Population Areas and known leks within the study area are delineated in Figure 3.20.

Table 3.9 Wyoming Natural Diversity Database: Wildlife Species in the Sweetwater River Watershed Phase I through Phase IV Study Areas.

Scientific Name	Common Name	Listing Status	Tracked / Watched	Phase II	Phase I	Phase III	Phase IV
Amphibians							
Ambystoma tigrinum	Tiger Salamander		Watched	X		X	X
Lithobates pipiens	Northern Leopard Frog	Petitioned	Tracked	X		X	X
Rana pipiens	Northern Leopard Frog	Petitioned	Tracked	X			
Scaphiopus intermontanus	Great Basin Spadefoot Toad		Tracked			X	
Spea intermontana	Great Basin Spadefoot		Tracked		X		X
Birds							
Accipiter gentilis	Northern Goshawk	Listing Denied	Tracked	X		X	X
Aechmophorus clarkii	Clark's Grebe		Tracked				X
Ammodramus savannarum	Grasshopper Sparrow		Watched			X	
Amphispiza belli	Sage Sparrow		Tracked	X	X	X	
Aquila chrysaetos	Golden Eagle		Watched	X	X	X	X
Asio flammeus	Short-eared Owl		Tracked			X	X
Athene cunicularia	Burrowing Owl		Tracked	X	X	X	X
Aythya collaris	Ring-necked Duck		Watched	X			
Botaurus lentiginosus	American Bittern		Tracked	X			
Bucephala albeola	Bufflehead		Watched	X		X	
Bucephala clangula	Common Goldeneye		Watched	X			
Buteo regalis	Ferruginous Hawk		Tracked	X	X	X	X
Calcarius mccownii	Mccown's Longspur		Tracked	X	X	X	X
Centrocercus urophasianus	Greater Sage Grouse	Candidate	Tracked	X	X	X	X
Charadrius alexandrinus	Snowy Plover		Tracked	X			
Charadrius montanus	Mountain Plover	Listing Denied	Tracked	X	X	X	X
Cygnus buccinator	Trumpeter Swan	Listing Denied	Tracked			X	
Cygnus columbianus	Tundra Swan		Watched	X	X	X	
Dendroica townsendi	Townsend's Warbler		Watched	X			
Egretta thula	Snowy Egret		Watched	X	X	X	
Falco columbarius	Merlin		Watched			X	
Falco peregrinus anatum	American Peregrine Falcon	Delisted	Tracked	X	X	X	X
Gavia immer	Common Loon		Tracked	X	X	X	X
Grus americana	Whooping Crane	Endangered	Tracked			X	
Grus canadensis	Sandhill Crane		Watched	X	X	X	X
Haliaeetus leucocephalus	Bald Eagle	Delisted	Tracked	X	X	X	X
Himantopus mexicanus	Black-necked Stilt		Watched		X	X	
Lagopus leucurus	White-tailed Ptarmigan		Tracked	X			
Lanius ludovicianus	Loggerhead Shrike		Tracked	X	X	X	X
Larus californicus	California Gull (Breeding Colonies)		Watched	X	X	X	
Larus delawarensis	Ring-billed Gull (Breeding Colonies)		Watched		X	X	
Leucosticte atrata	Black-rosy Finch		Tracked			X	
Melanerpes lewis	Lewis' Woodpecker		Tracked			X	X
Numenius americanus	Long-billed Curlew		Tracked	X		X	
Nycticorax nycticorax	Black-crowned Night-Heron		Watched	X			
Oreoscoptes montanus	Sage Thrasher		Watched	X	X	X	X
Pandion haliaetus	Osprey		Watched		X		X
Pelecanus erythrorhynchos	American White Pelican (Breeding Colonies)		Tracked	X	X	X	X
Phalaropus lobatus	Red-necked Phalarope		Watched			X	X
Plegadis chihi	White-faced Ibis		Tracked	X		X	
Rallus limicola	Virginia Rail		Watched	X			
Recurvirostra americana	American Avocet		Watched	X		X	
Spizella breweri	Brewer's Sparrow		Watched	X	X	X	X
Spizella pallida	Clay-colored Sparrow		Watched		X	X	
Stellula calliope	Calliope Hummingbird		Tracked	X			
Sterna caspia	Caspian Tern		Tracked	X			
Tympanuchus cupido	Greater Prairie Chicken		Watched			X	
Aegolius funereus	Boreal Owl		Tracked			X	
Crustaceans							
Branchinecta constricta	A Fairy Shrimp		Tracked		X		
Mammals							
Bos bison	American Bison (Free-ranging Herds)	Petitioned	Tracked			X	
Brachylagus idahoensis	Pygmy Rabbit	Listing Denied	Tracked	X	X	X	X
Brachylagus idahoensis	Pygmy Rabbit	Listing Denied	Tracked		X		
Canis lupus	Gray Wolf	Threatened	Tracked	X		X	X
Corynorhinus townsendii	Townsend's Big-eared Bat		Tracked	X			
Corynorhinus townsendii townsendii	Townsend's Western Big-eared Bat		Tracked			X	
Cynomys leucurus	White-tailed Prairie Dog	Listing Denied	Tracked	X	X	X	X
Lasionycteris noctivagans	Silver-haired Bat		Watched				X
Lutra canadensis	River Otter		Tracked			X	
Mustela nigripes	Black-footed Ferret	Endangered	Tracked	X	X	X	X
Ovis canadensis	Bighorn Sheep		Watched	X		X	X
Perognathus fasciatus	Olive-backed Pocket Mouse		Watched	X	X		
Sciurus aberti	Abert's Squirrel		Watched			X	
Spermophilus elegans	Wyoming Ground Squirrel		Watched	X		X	X
Sylvilagus floridanus	Eastern Cottontail		Watched	X			X
Thomomys clusius	Wyoming Pocket Gopher	Listing Denied	Tracked		X	X	
Phlox muscoides cushion plant community type			Watched		X		
Reptiles							
Coluber constrictor flaviventris	Eastern Yellowbelly Racer		Watched	X			
Trionyx spiniferus	Spiny Softshell Turtle		Watched	X			



N
W E
S

Legend

Cities
Sweetwater River
Streams
US / State Hwy
Sweetwater River Watershed
County Boundary

0 10 20
Miles

Figure 3.20 Sweetwater River Watershed: Sage Grouse Leks and Core Areas

The BLM definition of a sensitive species is as follows: species that could easily become endangered or extinct in the state, including: (a) species under status review by the FWS/National Marine and Fisheries Service; (b) species whose numbers are declining so rapidly that Federal listing may become necessary; (c) species with typically small or fragmented populations; and (d) species inhabiting specialized refuge or other unique habitats.

WGFD lists the greater sage grouse as: species that are widely distributed, with population status or trends unknown but suspected to be stable; habitat restricted or vulnerable but no recent or on-going significant loss; species likely sensitive to human disturbance. *The sage grouse are not listed as a Threatened or Endangered species and does not receive any protections from the Endangered Species Act; however, BLM and WGFD have developed restrictions/recommendations to help protect the sage grouse.*

With respect to sage grouse within the GMCA portion of the study area, the following description was extracted from the 2011 GMCA EA and included herein due to its relevance to the study area as a whole:

> *"Livestock grazing has impacted sage-grouse in the allotment by the removal of herbaceous plants (grasses and forbs) that occur around the base of sagebrush plants. The removal of these plants permits predators to prey upon sage-grouse eggs by reducing the hiding cover around the nest. Livestock grazing practices have also impacted sage-grouse by reducing habitat quality in riparian habitats used for brood rearing. Continual livestock grazing during the growing season has caused most riparian habitats in the allotment to be in a low seral stage. These low seral riparian vegetation stages do not support the vegetative cover to hide sage-grouse from predators or to provide insect populations required for raising sage-grouse chicks. Energy exploration and development within the GMCA further impacts sage-grouse habitat as a result of road and well pad construction. The net result is that sage-grouse habitat is fragmented by roads, pipelines, and utilities associated with these new and existing developments.*
>
> *The GMCA has some of the highest lek density in the state of Wyoming. However, there are currently 37 leks within the GMCA boundary (34 on BLM surface). Six of the 37 leks have been inactive since 1996 or earlier although they are still considered occupied by WGFD.*
>
> *Analyses of male sage grouse populations counted on 25 leks in the GMCA over the past 20 years (Wyoming Game and Fish data) indicates that they are cyclic. Because of inconsistencies in the number of times that leks were surveyed during any given year, it is not possible to determine trend data. For instance, the highest sage grouse counts occurred during a 4 year period from 2005 to 2008 and averaged 55 males during this period. This higher average count may be due, at least in part, to increased efforts to count males on more than one occasion during the breeding season. The average number of male sage grouse counted on these leks during this period was 29 and ranged from a low of 9 males in 1996 to a high of 65 males in 2006. The highest count on an individual lek was 234 males on the Soap Holes lek in 2006."*

Wild horses are found throughout much of the Sweetwater River watershed. The horses are managed by the BLM through the individual field offices. The BLM establishes "appropriate

management level" (AML) for each "herd management area" (HMAs) (BLM, 2012). There are several HMAs which are at least partially encompassed by the Sweetwater River watershed as indicated in Figure 3.21. The descriptions of the respective HMAs were extracted from the BLM website at: (http://www.blm.gov/wy/st/en/field_offices/Lander/wh.html):

*"**Antelope Hills HMA***

The Antelope Hills HMA encompasses 57,000 acres, of which 54,600 are BLM-administered public lands. The AML for this HMA is 60-82 adult horses. The area is located approximately 15 miles south/southeast of Atlantic, City, Wyoming. Elevations in the HMA range from 7,100 to 7,250 feet along Cyclone Rim. The HMA is bisected by the Continental Divide National Scenic Trail. The area receives 5-7 inches of precipitation annually. The predominate vegetation type is sagebrush/grass. Riparian zones are infrequent but very important to wild horses, wildlife, and livestock. The topography ranges from rolling flatlands south of Cyclone Rim, uplifted ridges along Cyclone Rim, and abrupt rocky zones interspersed with rolling lands north of the rim to the Sweetwater River.

Crooks Mountain HMA

The Crooks Mountain HMA is located directly southeast of Sweetwater Station, Wyoming, and encompasses about 51,000 acres. The AML for this HMA is 65-100 adult horses. Elevations in the HMA range from 6,900 to 8,100 feet. The lower elevations receive approximately 10-14 inches of precipitation annually, and the upper elevations receive 15-20 inches annually. The major vegetation types are sagebrush/grass, woodland, and riparian. Topography within the HMA is generally rolling hills and slopes to the north and south of Crooks Mountain. The Crooks Mountain portion of the herd area is quite steep and broken with mountainous terrain. The area supports significant wildlife populations of elk, deer, and antelope. Livestock graze the area from May to December.

Muskrat Basin, Conant Creek, Rock Creek & Dishpan Butte HMAs

These four HMAs are located in southeast Fremont County. They encompass about 375,000 acres of land, of which about 90% are BLM-administered public lands. While the four HMAs are managed with recognized individual populations, there is no geographic separation of the HMAs and the gates between them remain open a significant part of the year. As a result, the horses move regularly among the HMAs, helping to ensure the overall genetic health of the horses. Topography of the area includes high ridges and steep terrain with grand vistas. Elevations in the HMAs range from 5,300 to 7,200 feet. The area receives 5 to 12 inches of precipitation a year, depending on the elevation, most of it in the form of snow.

The AML for these HMAs is 320 horses. A full range of colors is present. Most horses are solid in color. The horses range from 11 to 15 hands and 750-1000 pounds mature weight. Health is good with few apparent problems. Domestic cattle and sheep utilize the area during spring, summer, and fall. Vegetation is dominated by various sage and grass species. Elk, deer, and antelope also inhabit this area.

Wild Horse Management Area within basin

Wild Horse Management Area outside of basin

Conant Creek

Rock Creek

Muskrat Basin

Dishpan Butte

Crooks Mountain

Green Mountain

Antelope Hills

Divide Basin

Stewart Creek

Lost Creek

Lander

Fremont County

Natrona County

Sublette County

Sweetwater County

Carbon County

135

287

28

220

N

W E

S

Legend

Cities

Sweetwater River

Streams

US / State Hwy

Sweetwater River Watershed

County Boundary

0 10 20

Miles

Figure 3.21 Sweetwater River Watershed: Wild Horse Management Areas

Green Mountain HMA

The Green Mountain HMA encompasses 88,000 acres, of which 74,000 acres are BLM-administered public lands. Topography within the herd area is generally gently rolling hills and slopes north and south of Green Mountain. Green Mountain itself is quite steep with mountainous terrain and conifer/aspen forests. Elevations range from 6,200 to 9,200 feet with grand vistas of the Red Desert, Sweetwater Rocks, and Oregon Trail from the higher elevations. Precipitation ranges from 10-14 inches at the lower elevations to 15-20 inches at the upper elevations. Most of the precipitation is in the form of snow.

The AML for this HMA is 300 horses. A full range of colors is present. Most horses are solid in color, but a noticeable number of tobiano paints are present. The horses range from 11 to 15 hands and 750-1000 pounds mature weight. Health is good with few apparent problems. Domestic cattle and sheep utilize the area in all seasons with summer cattle use predominating. Vegetation around the mountain is dominated by various sage, grass, woodland, and riparian species. The area supports significant wildlife populations of elk, deer, antelope, and moose. "

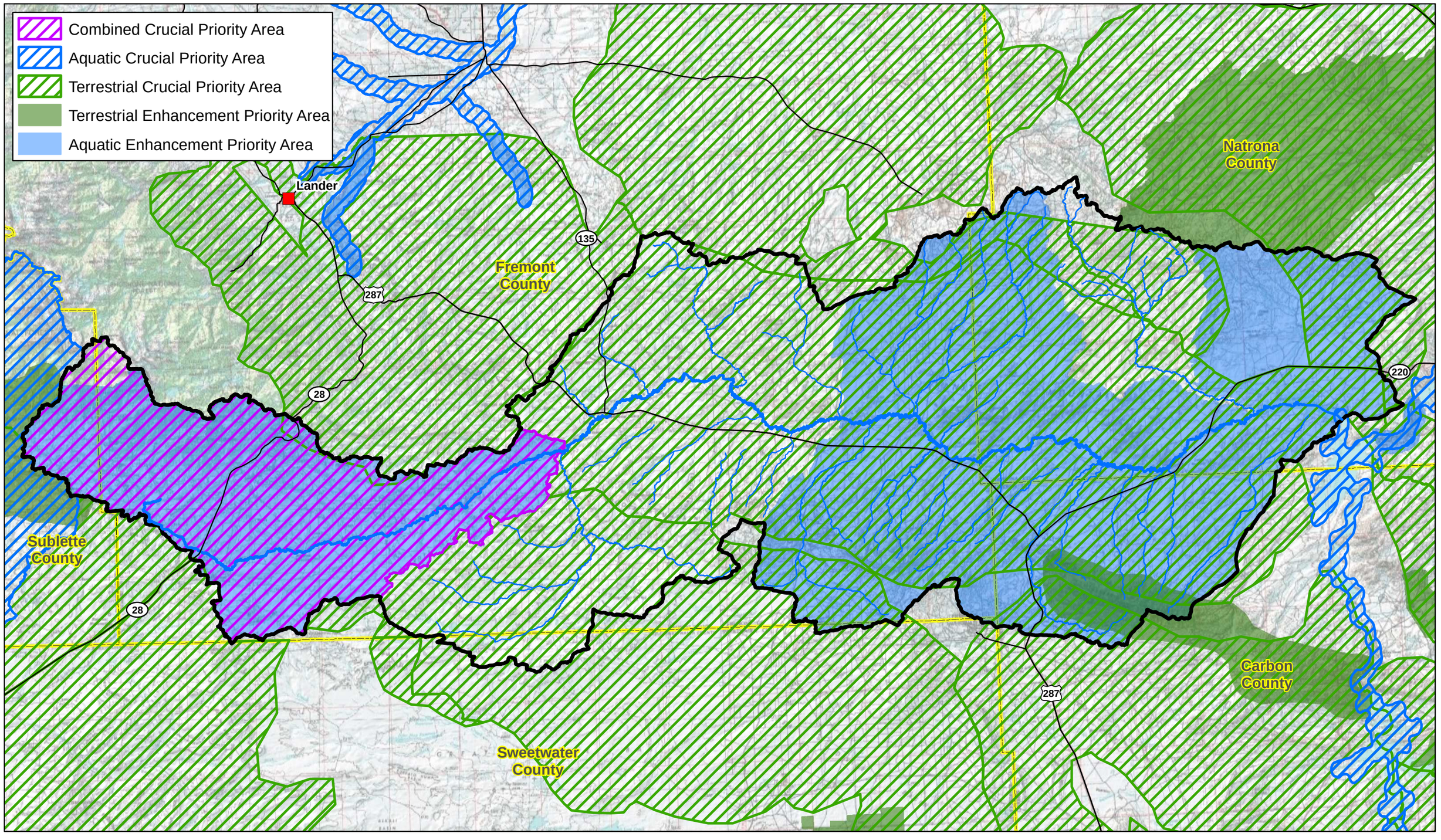
Great Divide HMA

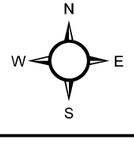
The Great Divide Basin HMA encompasses 778,915 acres, of which 562,702 acres are BLM - administered public lands. The management area is located 40 miles east of Rock Springs, to the Rawlins/Rock Springs field office boundary, west to the Continental Divide, and north of I-80 to just south of South Pass City. The northern portion of the herd management area consists primarily of consolidated public lands with state school sections and small parcels of private land making up the remaining lands. The southern portion is in the checkerboard land ownership area created by the Union Pacific Railroad grant. Topography within the herd area is generally gently rolling hills and slopes with some tall buttes and streams. Elevations range roughly from 6,200 to 8,700 feet. Precipitation ranges 6-10 inches, predominately in the form of snow.

The AML for this HMA is 500 horses. Most horses are bay, sorrel, black, brown, paint, buckskin, or gray, but many colors and combinations are present. The Wyoming horses have a diverse background of many domestic horse breeds. They are most closely related to North American gaited breeds such as Rocky Mountain Horse, American Saddlebred, Standardbred, and Morgan. The horses range from 14 to 15.5 hands and weighs up to 1,100 pounds mature weight. The health of the horses is good with no apparent problems.

As part of the WGFD Strategic Habitat Plan (2009), areas within the State which have been determined to be Crucial Priority Areas or Enhancement Priority Areas for both riparian and terrestrial terrain were delineated (Figure 3.22). As defined by WGFD at:

http://gf.state.wy.us/habitat/portal/index.asp,





Legend

- Cities
- Sweetwater River
- Streams
- US / State Hwy
- Sweetwater River Watershed
- County Boundary

0 10 20

Miles

Figure 3.22 Sweetwater River Watershed: Habitat Priority Areas

*"**Crucial Priority Areas** are based on significant biological or ecological values. These are areas that need to be protected or managed to maintain viable healthy populations of terrestrial and aquatic wildlife for the present and future. They represent habitat values and identify where those values occur on the landscape. Examples of values include crucial winter range, sage grouse core area seasonal habitats, Species of Greatest Conservation Need (SGCN) diversity and uniqueness, quality and condition of vegetative communities, movement corridors, quality of watershed hydrologic function, etc. The Department will concentrate habitat protection and management activities in these areas."*

***Enhancement Habitat Priority Areas** represent those with a realistic potential to address wildlife habitat issues and to improve, enhance, or restore wildlife habitats. These areas offer potential for improving habitat and focusing Department habitat efforts. They may overlap crucial areas or be distinct from them. Enhancement areas are based on habitat issues. Like crucial areas where values are key, issues were identified by regional personnel and used to select enhancement habitat areas. Examples of issues include loss of aspen communities, habitat fragmentation, development, loss of connectivity, water quality effects, water quantity limitations, beetle killed conifer, lack of fish passage, loss of fish to diversions, degraded habitat, etc." (http://gf.state.wy.us/habitat/portal/index.asp).*

3.3.8 Cultural Resources

The Sweetwater River watershed encompasses an extensive area with a rich and colorful history. There is a considerable amount of literature describing the area's historic and cultural features. Of specific pertinence is the following extract from the BLM's GMCA EA (2011). While this summary was written with the GMCA in mind, it is applicable to the watershed as a whole:

"The GMCA as a whole is rich in historic events and remains. Big game resources, extensive grasslands, the Sweetwater River, and South Pass, which provided a route over the Rocky Mountains, all contributed to early and continued use of the area by fur trappers, hunters, emigrants, livestock operators, and settlers.

The historic period in the GMCA can probably be said to have started when a party of Astorian fur trade explorers traveled through the area in 1812. But it wasn't until 1824 that a group of fur traders re-entered the area and advertised that an overland passage over the continent at South Pass was possible.

From the mid-1820s to around 1840, this part of Wyoming was explored and exploited mostly by fur trappers interested in procuring beaver and other pelts for sale in the U.S. and overseas. Together with government and other explorers, they discovered and mapped routes to the Far West.

In 1841, the first wagon trains traveled over what was to become the Oregon, Mormon, and California emigrant trails. Segments of these trails ran through the GMCA. The emigrants utilized South Pass, just west of the GMCA, to cross the continental divide, proving that those families with proper supplies and planning could successfully travel overland to the Far West.

In the early 1850s, an alternate route to the main trail was blazed by Charles (Simino) Lajeunesse, a fur trapper and trader. This new route stayed south of the Sweetwater River, and became known as the Seminoe Cutoff. Although it had less water and feed for animals than the main trail, it was popular with freighters, military expeditions, Mormon emigrants, and others who wished to avoid heavy traffic and obstacles on the main trail such as Rocky Ridge and the last four crossings of the Sweetwater River. The primary emigrant trail period lasted until just before 1870, when the transcontinental railroad was completed. At the same time, a gold rush began on the south end of the Wind River Mountains, and settlement began in this portion of Wyoming.

Cattle ranching proved feasible beginning in the 1870s, and by the 1880s ranching had become a major economic activity. The area within the GMCA began to be settled at this time. Slightly later, sheep grazing and production also became a significant activity. Settlement and growth slowly increased from this time onward, spurred on by farming, ranching, and increased mineral exploration and development.

Post-1920 oil and gas exploration and development have occurred on the north and south sides of Crooks Mountain, around Crooks Gap, and at Bison Basin. Post-1950 uranium exploration and development has occurred around Crooks Gap, on Green Mountain, near Bison Basin, and nearby at Jeffrey City, which began as a uranium boom town. "

The Wyoming State Historic Preservation Office (SHPO) maintains an in-progress database of inventoried historic sites within the state. A determination of each site's eligibility for inclusion in the National Register of Historic Places (Register) is included in the database. The National Register of Historic Places is the nation's official list of cultural resources worthy of preservation. Administered on a federal level by the National Park Service and managed locally by the State Historic Preservation Office, the National Register is part of a program to coordinate and support both public and private efforts to identify, evaluate, and protect historic and archeological resources. The National Register recognizes the

accomplishments of those who have contributed to the history and heritage of the United States, the state, and local communities.

The WYGISC website has available a spatial data file from SHPO which generalizes cultural resource inventory to the section level. This "location fuzzing" of the archaeological data is to protect the sites from unauthorized disturbance. The attributes recorded for each section include: site count, inventory acres, report numbers, and eligible site number. Figure 3.23 displays the results of the database retrieval in a graphical format. Each section within the study area has been color coded based upon the number of sites within it determined to be eligible for inclusion on the Register.

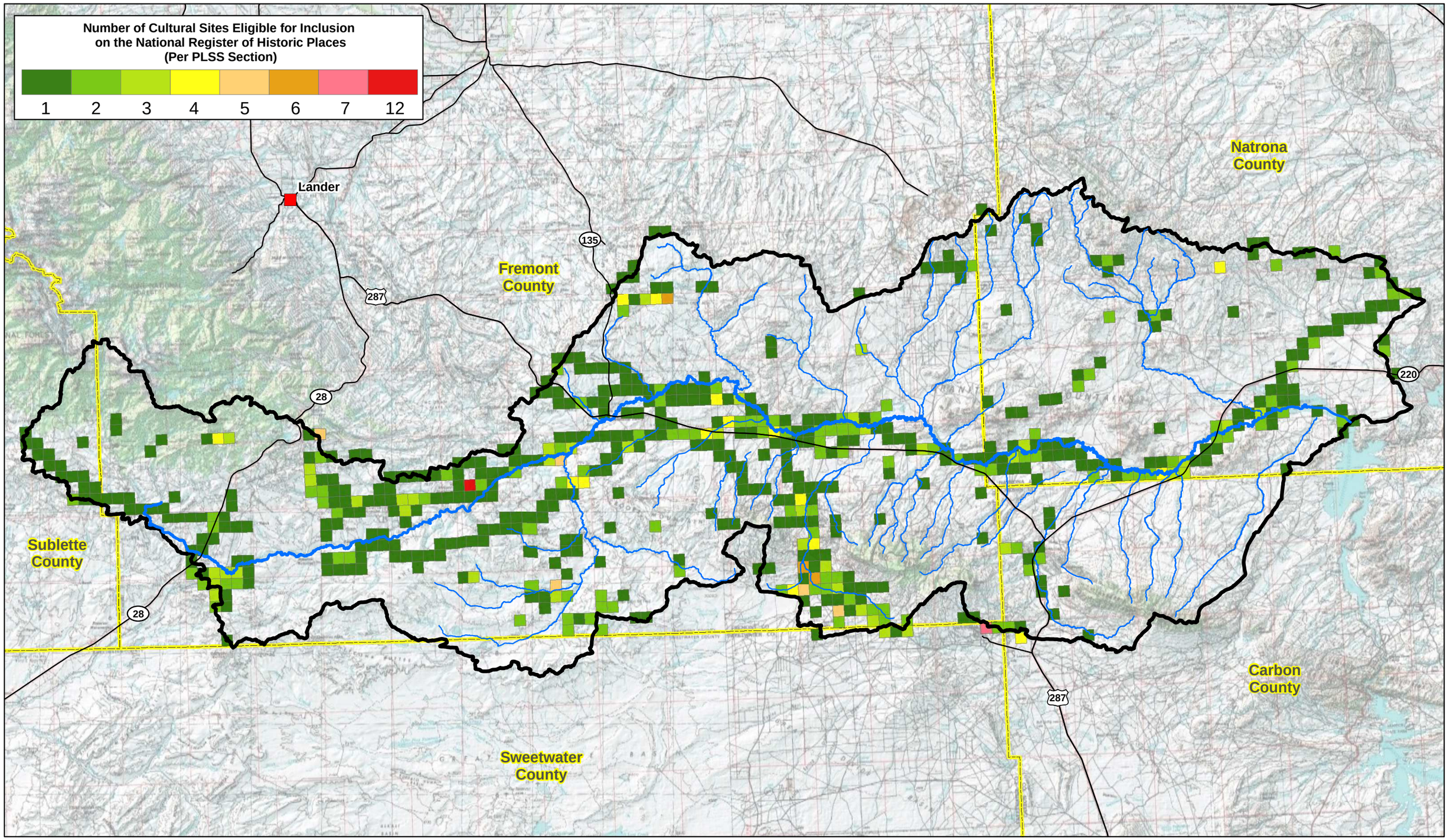
To date, seven sites within the study area have been included in the Register (Figure 3.24). The following descriptions of the sites were obtained from the Wyoming State Preservation Office website at: http://wyoshpo.state.wy.us/NationalRegister/.

Independence Rock

Independence Rock is a rounded outcropping of granite which became a well-known landmark on the Oregon Trail. It lies near the Sweetwater River, a favorite stopping and resting place for travelers along the Trail. Independence Rock became famous for the numerous names carved and painted on it. Rufus Sage, who passed the Rock in 1842 noted that its ''surface is covered with the names of travelers, traders, trappers, and emigrants engraved upon it in almost every practicable part, for the distance of many feet above its base.'' Located 23 miles south of Alcova on Wyoming State Highway 220 in Natrona County, today it is a Wyoming State Historic Site.

Martin's Cove

Martin's Cove is one of a number of handcart company campsites along the North Platte-Sweetwater segment of the Oregon Trail. The cove was not a natural landmark common to all Oregon Trail travelers such as Independence Rock, Devils Gate or Split Rock; rather it is a topographic feature of the Oregon Trail landscape that derives its historic significance as a temporary place of refuge for handcart emigrants. During an early winter storm in October and November of 1856 a party of Martin Handcart Company emigrants perished. More than the site of this tragedy, however, Martin's Cove is a symbol of the physical strain and hardship suffered by many who sought a better way of life.



N
W
E
S

Legend

- Cities
- Sweetwater River
- Streams
- US / State Hwy
- Sweetwater River Watershed
- County Boundary

0 10 20

Miles

Figure 3.23 Sweetwater River Watershed: Cultural Sites

National Registry of Historic Places
Historic Monuments and Markers
Bryan South Pass Road
Oregon/California
Oregon/California/Mormon
Oregon/California/Mormon/Pony-Express
Point of Rocks/South Pass
Rawlin-Ft.Washakie Stage Road

Natrona County
Fremont County
Sublette County
Sweetwater County
Carbon County

135
287
28
220

Sweetwater Valley Information Sign
Oregon Trail - Sweetwater Station
Bennett Tibbett Grave Site
Split Rock, Twin Peaks
Cattle Kate Grave
Independence Rock (numerous sites)
Martin's Cove
Sun, Tom, Ranch
Devil's Gate - Split Rock
BLM Devil's Gate Historic Site
Martin's Cove Monument
Split Rock Marker
Fort Stambaugh Monument
South Pass City Information Sign
Atlantic City Mercantile
South Pass City
South Pass City Monuments and Plaques
Saint Mary's Station
Oregon Trail - Ice Slough Information Sign
Oregon Trail - Lander Cutoff Information Sign
Mormon Trail - Willie's Handcart Company
South Pass Information Sign
Oregon Trail - Burnt Ranch Marker
Spalding and Whitman Monument
Oregon Trail - Continental Divide Marker

N
W
E
S

Legend

Cities
Sweetwater River
Streams
US / State Hwy
Sweetwater River Watershed
County Boundary

0 5 10
Miles

Figure 3.24 Sweetwater River Watershed: Historic Monuments and Historic Trails

Split Rock

The historic significance of the geologic developments leading to the formation of the Sweetwater River Valley is that they produced a break in the Rocky Mountain chain. That break became an important part of a major central east-west overland route that extended from the Missouri River to and through the Rocky Mountains. Along that route--the Oregon Trail--fur trappers, gold seekers, home seekers, merchants and troopers rode horseback or in wagons, walked, or pulled and pushed handcarts during the century that lasted from 1812 to 1912. The former date is the year the Astorians under Robert Stuart followed the trail from west to east on their journey from the mouth of the Columbia River. The latter year is said to be the one in which the last wagon train passed over the trail. There were at least three prominent landmarks along the trail. At the eastern end of the Sweetwater Valley was Independence Rock, a large protruding granite mass. The rock was a midway point in the journeys of those bound for the West Coast. Five miles west of Independence Rock is a second Sweetwater landmark, Devils Gate. Fifteen miles upriver from Devils Gate is Split Rock, the last of the three granite landmarks along the Sweetwater. To some, such as pioneer photographer W. H. Jackson, its summit was not a split rock but was seen as ''Twin Peaks''. For a day or two following their passing of Split Rock, emigrants could look backward at the V-shaped notch as they moved up the Sweetwater Valley toward South Pass. At the base of the pass the Sweetwater country was left behind and the emigrants crossed the Continental Divide, moving into the Pacific watershed and entering the long-anticipated Oregon Country.

Tom Sun Ranch

The Tom Sun Ranch, established in the early 1870s in the Sweetwater Valley of central Wyoming, dates to the period of the range cattle industry on the Plains. The Cheyenne Daily Leader remarked in 1882 that ''the eastern person of inquiring turn of mind who writes to his friends out west to ask what a ranch is like would find his answer in a description of Tom Sun's.'' Tom Sun was a frontiersman who became a pioneer cattleman. A French Canadian, who had been a mountain man and knew the Wyoming country thoroughly from his trapping days, Sun was highly respected in Wyoming. He was known for his integrity as well as for his ability to use a gun. The site of the ranch is both historic and scenic, for Sun chose his range on the Oregon Trail, along the Sweetwater River near Devils Gate and Independence Rock, notable landmarks on the famous overland trail.

Atlantic City Mercantile

The Atlantic City Mercantile, constructed in 1893, is one of the oldest buildings in the Atlantic City area and is a well-known landmark in the South Pass region. Atlantic City was a gold mining town. Even though the first indications that gold existed in the South Pass region occurred in the 1840s, no one filed a claim in the area until 1867. When this mine immediately began to produce significant amounts of gold, the rush to South Pass began. South Pass City was founded that year, and Atlantic City and Miners Delight were built in 1868. Approximately 3000 people lived in the area by 1869. By 1872, the gold mining boom had ended and Atlantic City was nearly deserted. Over the next one hundred years, the town experienced several mining booms, although none approached the 1867-68 rush. Throughout these years of fluctuating populations, the town merchants were a force of economic and social stability. They provided all the basic necessities to a small isolated town, and their establishments represented a social center for the local citizens. Lawrence Giessler's Atlantic City Mercantile reflected these traits more than other store or business from the 1890s to 1929. The Mercantile was the economic and social center of the town until 1929 when the store closed. The Giessler family utilized the Mercantile to provide many necessary community services. In addition to selling basic goods, the family operated the post office during the 1910s and 1920s. Giessler also helped finance and managed the town's first telephone company in the early years of the twentieth century. After Giessler's death the store remained closed until 1964 when a local steelworker bought the building from Giessler's descendants and reopened it as a beer tavern and a spring water concession. The Mercantile has endured as the economic and social center of Atlantic City under a series of owners since then.

South Pass City

South Pass City was the most important town established during the short-lived period of discovery and development in Wyoming's Sweetwater gold mining district. Laid out in 1867 the City reached its pinnacle about 1870 after which it steadily declined in stature and importance. In all, an estimated seven million dollars worth of precious metal was produced from the mines in the South Pass City region. The town derives its name from the famous landmark of South Pass, located just ten miles to the southwest. Thousands of people traveled through the South Pass region during the era of overland migration; however, this phase of American history is only indirectly related to that of South Pass City. More important to South Pass City is its association with the ''woman suffrage'' movement in the United States and its relationship to the early development of the State of Wyoming. Mrs. Esther Morris encouraged South Pass City legislator William H. Bright to introduce a bill that would give women the right to vote and hold office. The passage of that bill made Wyoming the first territory in the United States to grant the franchise to women. Wyoming Territory attained the additional distinction of having the first woman ever

appointed as a Justice of the Peace. At South Pass City Mrs. Morris succeeded incumbent Justice James Stillman. Starting February 14, 1870 Esther Morris presided over thirty-four cases at South Pass City before turning over the office to a new Justice on November 14, 1870. Only a few major original buildings remain at the South Pass City site on land administered by the State of Wyoming.

South Pass

South Pass served as the primary mountain gateway to the West for emigrants traveling the Oregon Trail during the great westward migration of the mid-nineteenth century. It was at this site that the route traversed the Continental Divide and deposited the emigrant traveler into what was considered to be the beginning of ''Oregon Country.'' The area known as South Pass is located in west-central Wyoming, approximately ten miles southwest of South Pass City in Fremont County. The pass itself is located on the northwest edge of the Wyoming Basin--a desert-like geographical feature which extends south for 150 miles and forms a complete break in the Rocky Mountain chain. While it was feasible to cross at any point along this 150 mile break, wagon trains of emigrants traveled through South Pass because of its numerous creeks and the availability of water in an otherwise dry desert terrain. The divide at South Pass is rimmed on the north by the Wind River Range, and on the south by barren hills, creating a broad, sagebrush-covered plain some twenty miles wide. The pass through the mountains was so gradual in its ascent that most emigrants were not fully aware of having crossed the Continental Divide until they had reached Pacific Springs three miles beyond the summit. It was there that travelers could observe for the first time water flowing west toward the Pacific Ocean, signifying their crossing over the pass and into Oregon Country.

Additional historic and cultural resources of the study area include several historic trails as indicated in Figure 3.24. Beginning in the early 1840's, travelers followed what became the Oregon, Mormon, and California emigrant trails. Segments of these and other trails traverse much of the watershed.

3.4 Natural Environment

3.4.1 Climate

The Sweetwater River watershed contains topography ranging in elevation from 5,849 msl feet at Pathfinder Reservoir to over 12,490 msl feet in the Wind River Mountains. Consequently, climate varies considerably. The Muddy Gap, Jeffrey City and South Pass City weather stations were used to

characterize the climatic condition of the study area (Figure 3.25). Data recorded at these stations were obtained from the Western Regional Climate Center (http://www.wrcc.dri.edu/). Table 3.10 presents a summary of the monthly average values for temperature and precipitation for the period 1980 through 2011.

Figure 3.25 also displays the isohyetals (lines of equal precipitation) within the study area. This figure clearly shows the relationship between elevation and precipitation amounts. The data used to generate this figure were obtained from the Wyoming Geographic Information Center (WyGISC). These data represent the results of PRISM spatial climate data generated at the Oregon Climate Center, Oregon State University. As indicated in this figure, the mean annual precipitation varies from a minimum of about 9 inches near Pathfinder Reservoir at the eastern and lowest portion of the watershed to nearly 40 inches in the Wind River Mountains at the western and highest portion of the basin.

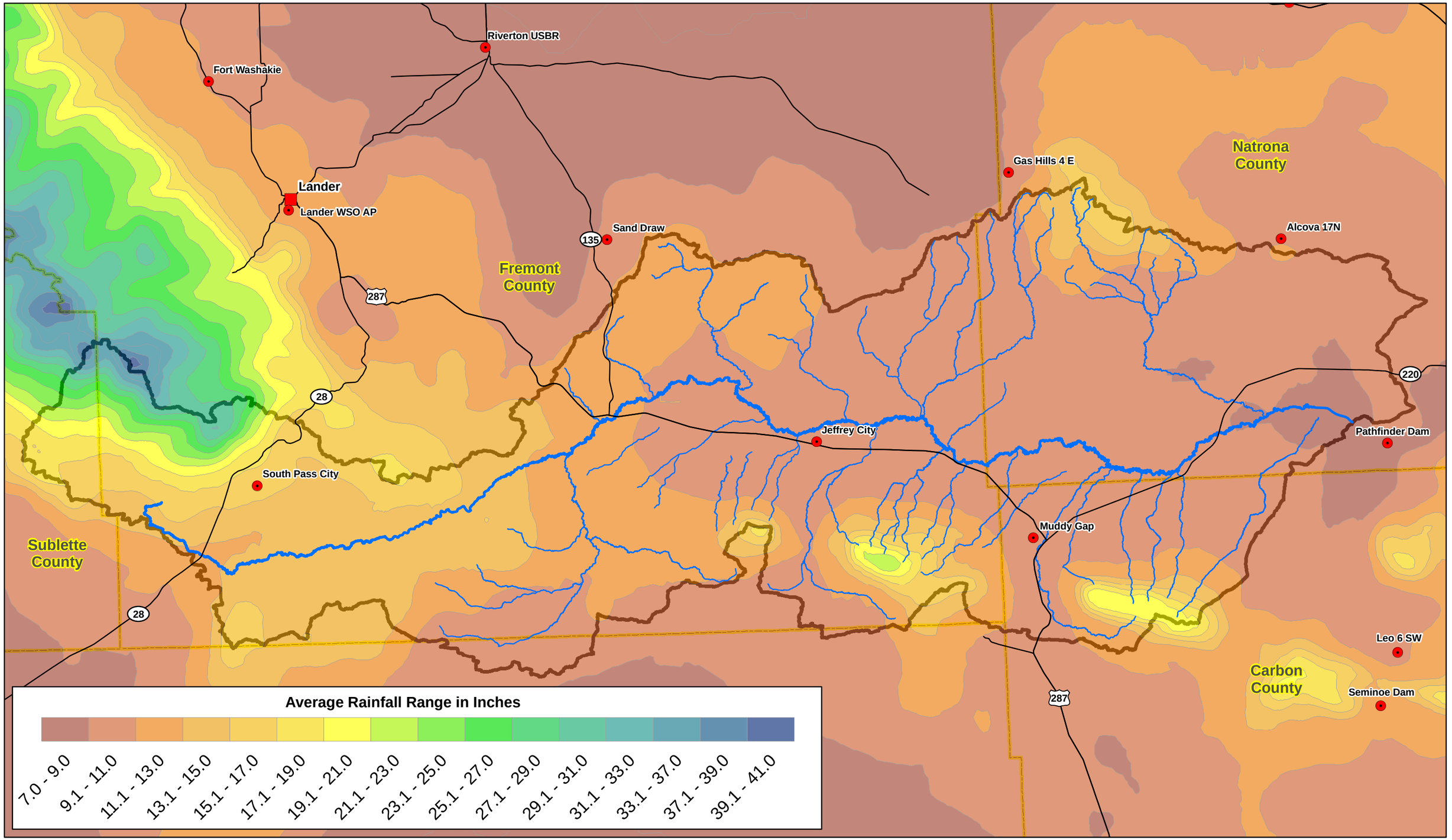
Table 3.10 Summary of Monthly Climatic Data.

Summary of Climate Data: Jeffrey City, Wyoming														
Weather Station	Period of Record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Jeffery City, Wyoming (484925)	4/10/1964to 12/31/2011													
Average Max. Temperature (F)		30.6	33.8	43.5	54.3	64	75.1	85	82.7	72.1	58.9	41.2	30.6	56
Average Min. Temperature (F)		8.4	10.3	18.7	26.3	34.6	42.5	49.7	48.2	38.1	28.8	17.2	9.3	27.7
Average Total Precipitation (in.)		0.35	0.42	0.81	1.21	2	1.07	0.85	0.62	0.76	0.87	0.54	0.46	9.96

Summary of Climate Data: Muddy Gap, Wyoming														
Weather Station	Period of Record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Muddy Gap, Wyoming (486595)	10/19/1949 to 1/31/2008													
Average Max. Temperature (F)		31.3	34.9	43.4	55.2	66	76.2	85.1	83.1	72.8	59.9	42.1	32.7	56.9
Average Min. Temperature (F)		13.8	15.9	21.4	29.2	37.9	46.4	53.5	52.2	42.5	32.9	22.1	15.1	31.9
Average Total Precipitation (in.)		0.29	0.43	0.74	1.24	1.9	1.11	0.83	0.63	0.82	0.83	0.6	0.46	9.87

Summary of Climate Data: South Pass City, Wyoming														
Weather Station	Period of Record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
South Pass City, Wyoming (488385)	3/11/1900 to 11/30/2011													
Average Max. Temperature (F)		25.8	28.1	33.9	45.4	57.3	67.5	76.4	74.9	65.2	52.9	37.4	27.8	49.4
Average Min. Temperature (F)		1.2	3.3	9.3	19.8	28	34.4	40.1	38.2	30	21.6	11.1	3.3	20
Average Total Precipitation (in.)		1.24	1	1.17	1.4	1.55	1.28	0.86	0.89	0.99	1.03	0.91	1.05	13.37

Figure 3.26 shows the distribution of the annual precipitation on a monthly basis. This figure and Table 3.8 show that the wettest months are typically May and June when about one third of the annual precipitation arrives. Figure 3.26 also shows the mean monthly high and low temperatures for each gage. Mean highs at Muddy Gap and Jeffrey City range from the mid-80's in July to the low single digits in December and January at Jeffrey City. Summer temperatures are cooler at South Pass City due to its higher elevation. Mean highs there range from the mid-70's in July and to single digits in December through February.



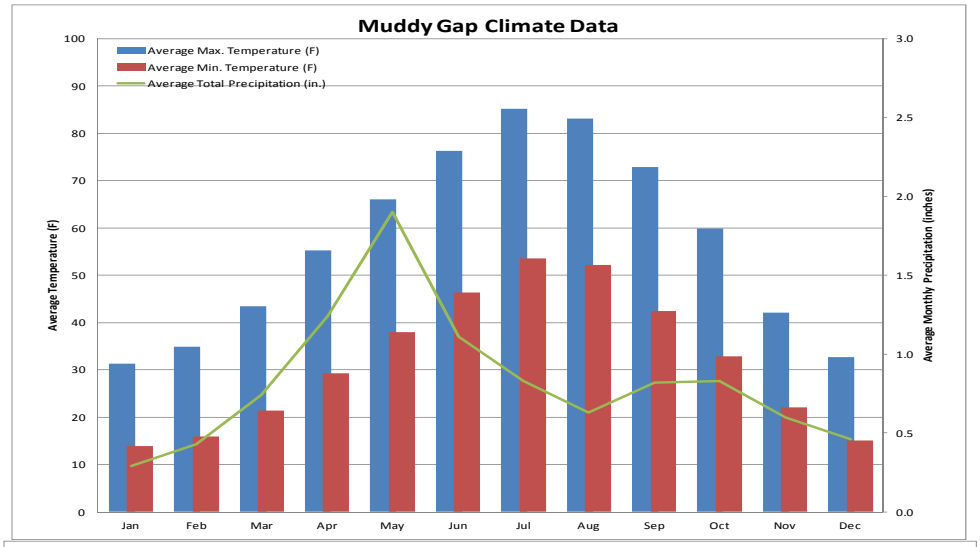
N
W E
S

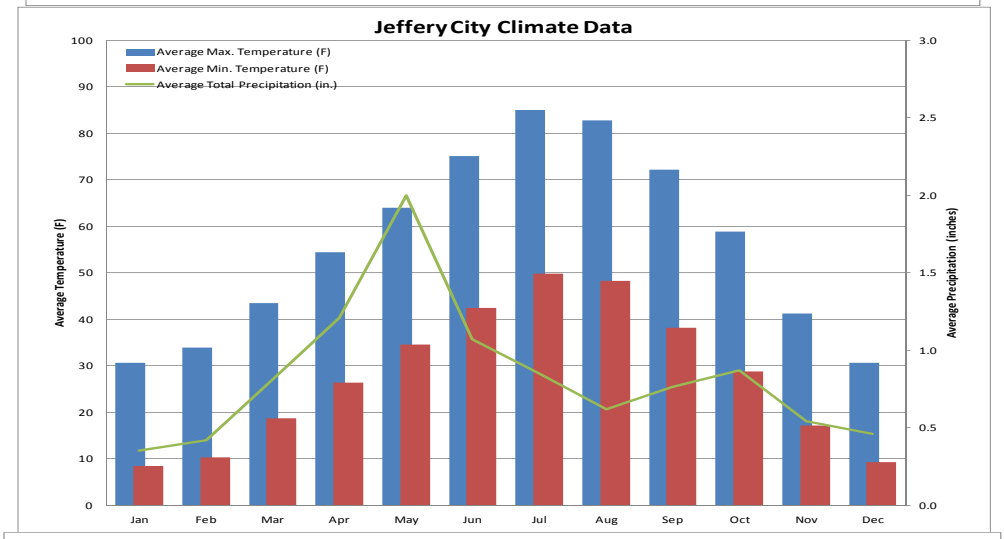
Legend

NWS Weather Stations
Cities
Sweetwater River
Streams
US / State Hwy
Sweetwater River Watershed
County Boundary

0 10 20
Miles

Figure3.25 Sweetwater River Watershed: Meterological Stations and Precipitation Isohyetals





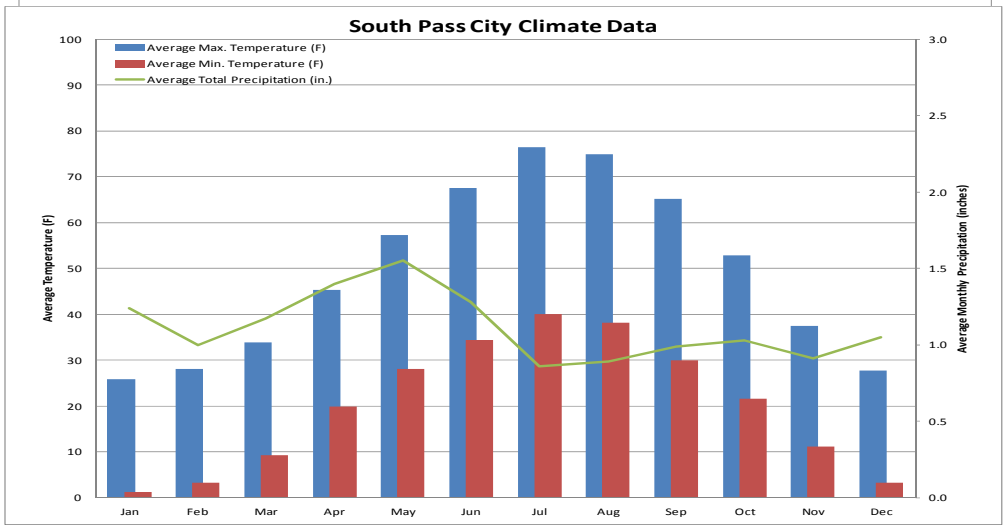


Figure 3.26 Mean Monthly Climatic Factors for Sweetwater River Watershed weather stations (1981 – 2010).

Figure 3.27 displays the annual precipitation for the 1980 through 2011 at the Jeffrey City. As indicated in this figure, at the time of this investigation (2007 though 2011) annual precipitation included two year with below average precipitation followed by two of the wetter years recorded. The long term average with total precipitation at Jeffrey City is 9.83 inches.

3.4.2 Vegetation and Land Cover

3.4.2.1 Overview

Vegetative cover within the watershed was evaluated using data obtained through the LANDFIRE project (www.landfire.gov). LANDFIRE (Landscape Fire and Resource Management Planning Tools Project) is an interagency vegetation, fire, and fuel characteristics mapping project. It is a shared project between the Department of Interior (DOI) and Forest Service wildland fire management programs. The primary purpose of the LANDFIRE project is to collect the data necessary to develop wildland fire models. The data are generated using remote sensing techniques with on-the-ground truthing. Data products accessed for this project included 30-meter spatial resolution raster data sets describing vegetation type and cover. LANDFIRE vegetation map units are derived from NatureServe's Ecological Systems classification (Comer and others, 2003).

The LANDFIRE data describes numerous attributes pertinent to this study, including:

- Environmental Site
- Potential Biophysical Settings
- Existing Vegetation Type
- Existing Vegetation Height
- Existing Vegetation Cover

The LANDFIRE "existing vegetation type" (EVT) data were analyzed and summarized in Table 3.11. The LANDFIRE existing vegetation data indicate 59 different vegetation classes within the watershed. As is clearly indicated in this table, the major sagebrush community (Inter-Mountain Basins Big Sagebrush Shrubland) dominates coverage of the study area with a total of over 47 percent of the watershed acreage. While the fact that the majority of the study area is covered in sagebrush comes as no surprise, the table presents valuable information pertaining to the vegetation types present to a much lesser extent.

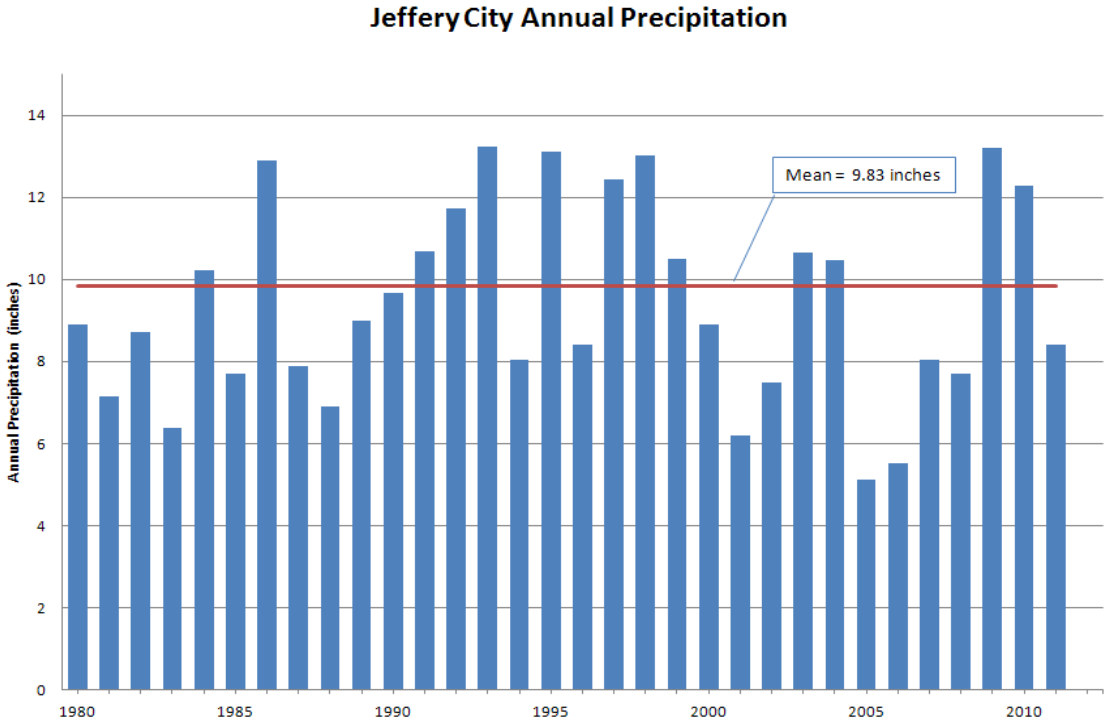


Figure 3.27 Annual Precipitation at Jeffrey City, WY 1980 to 2011.

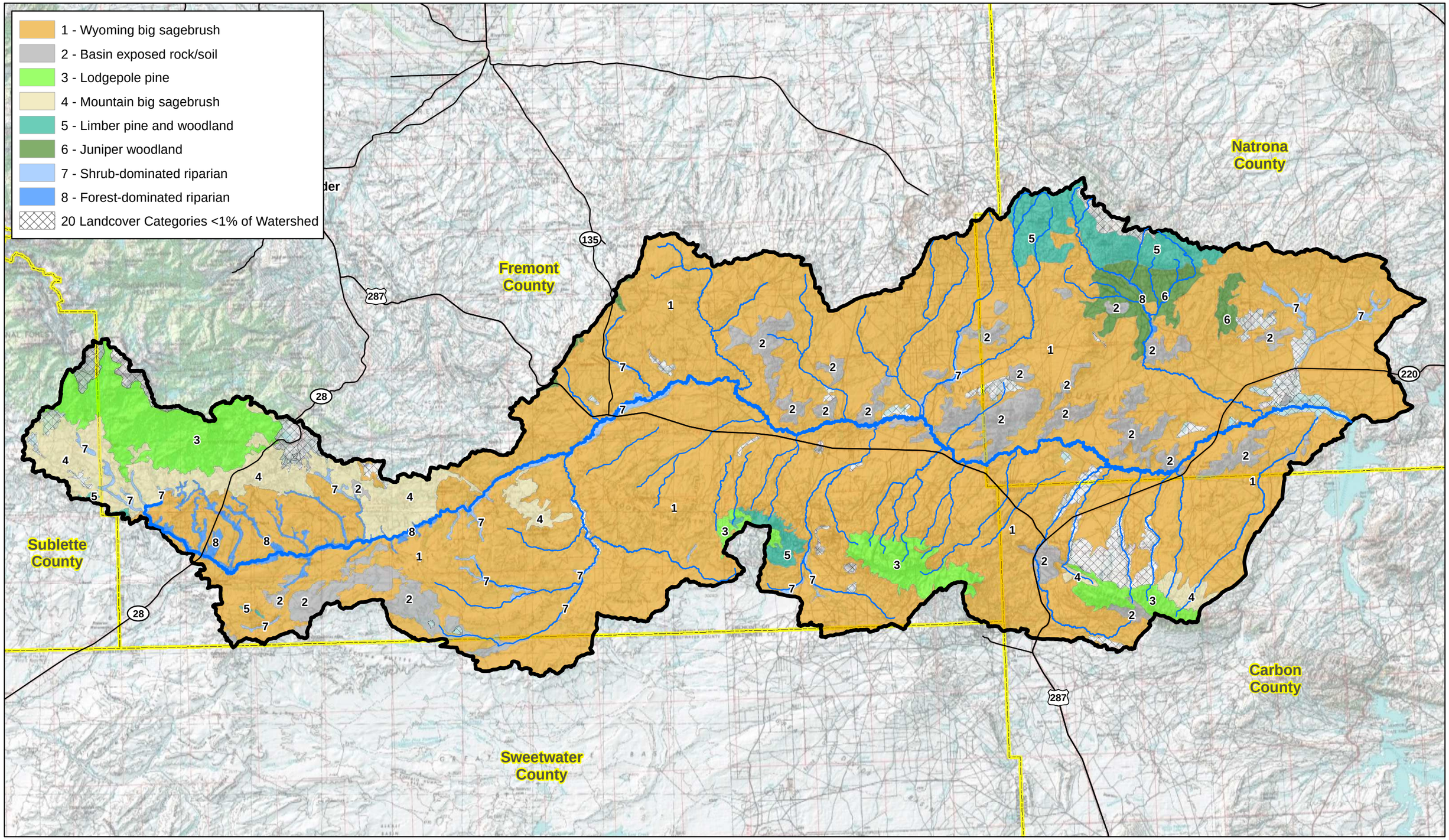
While the LANDFIRE data provides valuable insight into watershed conditions, its display is difficult because of the fact the data are represented by a grid with 30 meter spacing. However, this data set is included within the project GIS and available for use in subsequent projects and associated efforts. For graphical purposes, data obtained through the Wyoming Gap Analysis program are shown on Figure 3.28 (http://www.wygisc.uwyo.edu/wbn/gap.html).

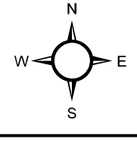
The GAP dataset was produced "with an intended application at the state or ecoregion level - geographic areas from several hundred thousand to millions of hectares in size. The data provide a coarse-filter approach to analyses, meaning that not every occurrence of habitat is mapped; only large, generalized distributions are mapped, based on the USGS 1:100,000 mapping scale in both detail and precision. Therefore, this dataset can be used appropriately for coarse-scale (> 1:100,000) applications, or to provide context for finer-level maps or applications" (University of Wyoming, Spatial Data Visualization Center, 1996).

The WYNDD, which was previously discussed, includes vegetative species in addition to the animal species discussed. During the completion of the Phase I through Phase IV reports, data from the WYNDD were requested and tabulated. Table 3.12 summarizes the results of this effort. A total of 21 vegetation species that are being either 'tracked' or 'watched' are potentially found within the Phase I through Phase IV study areas. The only species classified as Threatened is the Desert Yellowhead (Yermo xanthocephalus). The Phase I study area encompasses the entire worldwide distribution of this species, including designated critical habitat. According to the WYNDD, it is an upland plant with a narrow distribution, and not directly affected by water developments unless impoundments were constructed in the vicinity of the populated areas thereby changing livestock utilization, or unless infrastructure was built in the vicinity of the populated areas.

Table 3.11 Summary of LANDFIRE Existing Vegetation Type Data Analysis.

Existing Vegetation Type	Acres	Percent of Watershed	Cumulative Percent
Inter-Mountain Basins Big Sagebrush Shrubland	885,721	47.7%	47.7%
Inter-Mountain Basins Big Sagebrush Steppe	273,239	14.7%	62.4%
Artemisia tridentata ssp. vaseyana Shrubland Alliance	186,259	10.0%	72.5%
Inter-Mountain Basins Mat Saltbush Shrubland	78,210	4.2%	76.7%
Western Great Plains Floodplain Systems	56,704	3.1%	79.7%
Rocky Mountain Lower Montane-Foothill Shrubland	56,695	3.1%	82.8%
Wyoming Basins Low Sagebrush Shrubland	34,818	1.9%	84.6%
Rocky Mountain Subalpine/Upper Montane Riparian Systems	28,179	1.5%	86.2%
Inter-Mountain Basins Montane Sagebrush Steppe	24,257	1.3%	87.5%
Rocky Mountain Foothill Limber Pine-Juniper Woodland	23,209	1.3%	88.7%
Inter-Mountain Basins Semi-Desert Grassland	18,333	1.0%	89.7%
Rocky Mountain Montane Riparian Systems	18,212	1.0%	90.7%
Northern Rocky Mountain Subalpine Woodland and Parkland	17,564	0.9%	91.6%
Inter-Mountain Basins Greasewood Flat	16,457	0.9%	92.5%
Inter-Mountain Basins Semi-Desert Shrub-Steppe	15,963	0.9%	93.4%
Inter-Mountain Basins Mountain Mahogany Woodland and Shrubland	14,125	0.8%	94.1%
Rocky Mountain Lodgepole Pine Forest	12,524	0.7%	94.8%
Agriculture-Pasture/Hay	10,929	0.6%	95.4%
Rocky Mountain Aspen Forest and Woodland	10,510	0.6%	96.0%
Northern Rocky Mountain Lower Montane-Foothill-Valley Grassland	8,426	0.5%	96.4%
Introduced Upland Vegetation - Annual and Biennial Forbland	6,533	0.4%	96.8%
Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	6,379	0.3%	97.1%
Rocky Mountain Poor-Site Lodgepole Pine Forest	5,642	0.3%	97.4%
Developed-Open Space	5,633	0.3%	97.7%
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	5,490	0.3%	98.0%
Northern Rocky Mountain Subalpine Deciduous Shrubland	4,622	0.2%	98.3%
Middle Rocky Mountain Montane Douglas-fir Forest and Woodland	4,304	0.2%	98.5%
Pseudotsuga menziesii Forest Alliance	3,429	0.2%	98.7%
Rocky Mountain Dry Turf	3,166	0.2%	98.9%
Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	2,967	0.2%	99.0%
Barren	2,734	0.1%	99.2%
Rocky Mountain Subalpine-Montane Mesic Meadow	2,300	0.1%	99.3%
Northern Rocky Mountain Subalpine-Upper Montane Grassland	1,991	0.1%	99.4%
Open Water	1,865	0.1%	99.5%
Inter-Mountain Basins Mixed Salt Desert Scrub	1,851	0.1%	99.6%
Northern Rocky Mountain Conifer Swamp	1,193	0.1%	99.7%
Southern Rocky Mountain Ponderosa Pine Woodland	1,033	0.1%	99.7%
Inter-Mountain Basins Juniper Savanna	941	0.1%	99.8%
Developed-Low Intensity	761	0.04%	99.8%
Western Great Plains Depressional Wetland Systems	724	0.04%	99.8%
Inter-Mountain Basins Sparsely Vegetated Systems	722	0.04%	99.9%
Rocky Mountain Subalpine Wet-Mesic Spruce-Fir Forest and Woodland	482	0.03%	99.9%
Northwestern Great Plains Mixedgrass Prairie	382	0.02%	99.9%
Rocky Mountain Alpine Dwarf-Shrubland	327	0.02%	100.0%
Introduced Upland Vegetation - Annual Grassland	308	0.02%	100.0%
Northern Rocky Mountain Montane-Foothill Deciduous Shrubland	232	0.01%	100.0%
Rocky Mountain Gambel Oak-Mixed Montane Shrubland	137	0.01%	100.0%
Southern Rocky Mountain Montane-Subalpine Grassland	80	0.004%	100.0%
Colorado Plateau Pinyon-Juniper Woodland	74	0.004%	100.0%
Northern Rocky Mountain Mesic Montane Mixed Conifer Forest	18	0.001%	100.0%
Introduced Upland Vegetation - Perennial Grassland and Forbland	16	0.001%	100.0%
Agriculture-Cultivated Crops and Irrigated Agriculture	10	0.001%	100.0%
Developed-Medium Intensity	10	0.001%	100.0%
Snow/Ice	5	0.0003%	100.0%
Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland	4	0.0002%	100.0%
Rocky Mountain Bigtooth Maple Ravine Woodland	1	0.00005%	100.0%
Developed-High Intensity	1	0.00004%	100.0%
Columbia Plateau Low Sagebrush Steppe	0	0.00001%	100.0%
Western Great Plains Shortgrass Prairie	0	0.00001%	100.0%





Legend

- Cities
- Sweetwater River
- Streams
- US / State Hwy
- Sweetwater River Watershed
- County Boundary

0 10 20

Miles

Figure 3.28 Sweetwater River Watershed: Land Cover - Wyoming GAP Analysis

Table 3.12 Summary of WYNDD Vegetative Species: Phase I through Phase IV Study Areas.

Scientific Name	Common Name	Tracked / Watched	Phase I	Phase II	Phase III	Phase IV
Achnatherum nevadense	Nevada needlegrass	Tracked		x	x	
Antennaria arcuata	Meadow pussytoes	Tracked	x	x	x	
Astragalus nelsonianus	Nelson's milkvetch	Watched			x	
Boechera pendulina var. russeola	Daggett rockcress	Watched	x	x	x	
Cirsium pulcherrimum var. aridum	Cedar Rim thistle	Tracked	x	x	x	x
Cryptantha stricta	Erect cryptantha	Watched		x	x	x
Deschampsia danthonioides	Annual hairgrass	Tracked			x	
Downingia laeta	Great basin downingia	Tracked		x		
Eriastrum wilcoxii	Wilcox eriastrum	Tracked			x	
Lesquerella fremontii	Fremont bladderpod	Tracked	x		x	
Monolepis pusilla	Red poverty-weed	Tracked			x	
Oxytropis besseyi var. obnapiformis	Maybell locoweed	Tracked	x		x	
Oxytropis nana	Wyoming locoweed	Watched		x	x	x
Phacelia tetramera	Tiny phacelia	Tracked	x		x	
Phlox pungens	Beaver Rim phlox	Tracked	x	x	x	
Physaria eburniflora	Devil's Gate twinpod	Watched	x	x	x	x
Physaria saximontana var. saximontana	Rocky Mountain twinpod	Tracked	x		x	
Potamogeton illinoensis	Illinois pondweed	Tracked		x		
Psilocarphus brevissimus	Dwarf woolly-heads	Tracked			x	
Pyrrocoma clementis var. villosa	Hairy tranquil goldenweed	Tracked		x		
Yermo xanthocephalus	Desert yellowhead	Tracked	x	x	x	

3.4.2.2 Targeted Vegetation

The majority of the Sweetwater River watershed lies within Fremont County. The Fremont County Weed and Pest District has established continuous survey, or inventory, of all lands in the county. Currently, it is planned that all parts of the county will be surveyed at least once every 10 years. This will yield valuable information on the effectiveness of various weed control strategies, weed spread, and invasion by new species. The remainder of the watershed lies in, in order of decreasing areal extent, Natrona, Carbon, Sweetwater, and Sublette Counties.

In the Green Mountain Common Allotment Proposed Grazing Management Environmental Assessment (BLM, 2011), a description of existing noxious weeds and their management within the GMCA was presented. The description of both the weeds and their management is pertinent to the watershed as a whole. The following pertinent text was extracted directly from that document.

> *"The BLM Lander Field Office annually contracts with the Fremont County Weed and Pest Control District for control (i.e., inventory, spraying, releasing insect vectors, and monitoring) of weeds on BLM-administered lands This is done as a cooperative effort with private landowners who are engaged in weed control programs on their own lands. Without these precautionary actions, untreated federal lands could serve as a seed source of weeds for invading private lands that have weed control programs. The Fremont County portion of the allotment also lies within the Popo Agie Weed Management Area (PAWMA), the boundaries of which correspond to those of the Popo Agie Conservation District, which in this area is the county line. The PAWMA is a group of local, state, and federal agencies that work through a Memorandum of Understanding with*

the Fremont County Weed and Pest District to assist the landowners in the area with controlling noxious weeds. Private companies also control weeds around facilities in keeping fire and work hazards down. Only properly licensed commercial applicators are allowed to apply pesticides on BLM-administered public lands.

Wyoming state law (W.S. 11-5-101 through 11-5-119) requires landowners to control noxious weed infestations on their property, or face penalties that can range from daily fines to quarantine of farm products coming off of noxious weed-infested land".

The following noxious weeds are known to be present in project study area:

Russian knapweed (Centaurea repens)
Perennial pepperweed (Lepidium latifolium),
Canada thistle (Cirsium arvense)
Spotted knapweed (Centaurea maculosa)
Leafy spurge (Euphorbia esula)
Diffuse knapweed (Centaurea diffusa)
Musk thistle (Carduus nutans)
Tamarisk (Tamarix spp.) or Saltcedar
Hoary cress (Cardaria draba and C. pubescens)
Plumeless thistle (Carduus acanthoides)
Russian olive (Elaeagnus angustifolia)
Field bindweed (Convolvulus arvensis)
Quackgrass (Elytrigia repens)

Black henbane (Hyoscyamus niger) is not a State of Wyoming-designated noxious weed, but it is a poisonous weed of concern associated with oilfield roads in the Happy Spring oilfield area, the Uranium mine road along the side of Green Mountain, and the Three Forks-Atlantic City Road. It is also found on disturbed ground and pipeline rights-of-way.

Though not designated as noxious by the state, weedy annuals like cheat grass (Bromus tectorum), halogeton (Halogeton glomeratus), and Russian thistle (Salsola tragus), and the biennial black henbane (Hyoscyamus niger), are quick to invade disturbed soils in the allotment, and can hinder rehabilitation efforts. Two of these weeds are poisonous, and only the cheatgrass is of very limited forage use for grazing animals.

The Fremont County Weed and Pest District has established continuous survey, or inventory, of all lands in the county. Currently, it is planned that all parts of the county will be surveyed at

least once every 10 years. This will yield valuable information on the effectiveness of various weed control strategies, weed spread, and invasion by new species" (BLM, 2011).

3.4.2.3 Wetlands

Existing mapping of wetlands within the study area consisted of the National Wetlands Inventory (NWI) created by the US Fish and Wildlife Service (USFWS). The NWI mapping was completed using aerial photographs within the GIS environment and digitizing by analysts, however due to the relatively limited extent of mapped wetlands in relation to the size of the watershed, the data does not lend itself to presentation at this scale. Based upon the NWI mapping, approximately 1,892 acres of wetlands exist within the watershed. These wetlands are located primarily along perennial streams in the lower portions of the watershed, and also throughout the Shoshone National Forest. It is generally understood by users of the NWI mapping that the data are suitable for broad scale planning efforts such as this Level I investigation; however, before design and completion of any project potentially affecting wetlands, detailed onsite delineation should be conducted.

In addition to the NWI mapping, the LANDFIRE data includes limited determination of wetlands as well. The LANDFIRE data indicate that approximately 2.54 percent (47,115 acres) exist as some form of riparian vegetation (Rocky Mountain Subalpine/Upper Montane Riparian Systems, Rocky Mountain Montane Riparian Systems, plus Western Great Plains Depressional Wetland Systems). Figure 3.29 displays the general locations of these vegetation classes. This analysis indicates that even though the relative percentage may be very low, when evaluated at the watershed level, there are a considerable amount of wetland areas within the entire study area. Within each of the Phase I through Phase IV efforts, similar analyses of the LANDFIRE data were conducted. Table 3.13 summarizes these efforts.

Table 3.13 Summary of LANDFIRE Key Vegetation Classes.

Key Vegetative Class	Phase I	Phase II	Phase III	Phase IV
	Acres	Acres	Acres	Acres
Mountain Subalpine/Upper Montane Riparian Systems	4,950	3,220	5,689	3,059
Rocky Mountain Montane Riparian Systems	1,314	1,261	2,591	1,072
Western Great Plains Depressional Wetland Systems	4	224	302	69

The US Army Corps of Engineers has adopted a 'watershed approach' to wetland classification which includes consideration of the 'hydrogeomorphic character' of the various wetland types. According to the USACE manual (USACE, 1995):

Rocky Mountain Montane Riparian Systems
Rocky Mountain Subalpine/Upper Montane Riparian Systems
Western Great Plains Depressional Wetland Systems
Western Great Plains Floodplain Systems

Lander
Fremont County
Natrona County
Sublette County
Sweetwater County
Carbon County
135
287
28
220

N
W
E
S

Legend

Cities
Sweetwater River
Streams
US / State Hwy
Sweetwater River Watershed
County Boundary

0 10 20
Miles

Figure 3.29 Sweetwater River Watershed: LANDFIRE Wetlands Classes

"The hydrogeomorphic classification is based on three fundamental factors that influence how wetlands function, including geomorphic setting, water source, and hydrodynamics. Geomorphic setting refers to the landform of a wetland, its geologic evolution, and its topographic position in the landscape. For example, a wetland may occur in a depressional landform or a valley landform and may occur at the top, middle, or bottom of a watershed."

Seven wetland types have been defined using the classification system adopted by the USACE: Riverine, Slope, Lacustrine Fringe, Depressional, Estuarine, Mineral Soil Flats, and Organic Soil Flats. Within the study area, the following three types are likely to be encountered: slope wetlands, depressional wetlands, and riverine wetlands. In the paragraphs that follow, extracts from the USACE are presented which describe the nature and function of each.

"Slope Wetlands

Slope wetlands normally are found where there is a discharge of groundwater to the land surface. They normally occur on sloping land; elevation gradients may range from steep hillsides to slight slopes. Slope wetlands are usually incapable of depressional storage because they lack the necessary closed contours. Principal water sources are usually groundwater return flow and interflow from surrounding uplands as well as precipitation. Hydrodynamics are dominated by downslope unidirectional water flow. Slope wetlands can occur in nearly flat landscapes if groundwater discharge is a dominant source to the wetland surface. Slope wetlands lose water primarily by saturation subsurface and surface flows and by evapotranspiration. Slope wetlands may develop channels, but the channels serve only to convey water away from the slope wetland. Fens are a common example of slope wetlands.

Depressional Wetlands

Depressional wetlands occur in topographic depressions with a closed elevation contour that allows accumulation of surface water. Dominant sources of water are precipitation, groundwater discharge, and interflow from adjacent uplands. The direction of water movement is normally from the surrounding uplands toward the center of the depression. Depressional wetlands may have any combination of inlets and outlets or lack them completely. Depressional wetlands may lose water through intermittent or perennial drainage from an outlet, by evapotranspiration, and, if they are not receiving groundwater discharge, may slowly contribute to groundwater. Dominant hydrodynamics are vertical fluctuations, primarily seasonal. Peat deposits may develop in depressional wetlands. Prairie potholes are a common example of depressional wetlands.

Riverine Wetlands

Riverine wetlands occur in floodplains and riparian corridors in association with stream channels. Dominant water sources are overbank flow from the channel or subsurface hydraulic connections between the stream channel and wetlands. Additional water sources may be interflow and return flow from adjacent uplands, occasional overland flow from adjacent uplands, tributary inflow, and precipitation. When overbank flow occurs, surface flows down the floodplain may dominate hydrodynamics. At their headwater most extension, riverine wetlands often intergrade with slope or depressional wetlands as the channel (bed) and bank disappear, or they may intergrade with poorly drained flats or uplands. Perennial flow is not required. Riverine wetlands lose surface water via the return of floodwater to the channel after flooding and through saturation surface flow to the channel during rainfall events. They lose subsurface water by discharge to the channel, movement to deeper groundwater (for losing streams), and evapotranspiration. Peat may accumulate in off-channel depressions (oxbows) that have become isolated from riverine processes and subjected to long periods of saturation from ground-water sources. Bottomland hardwood floodplains are a common example of riverine wetlands."

The classification system discussed by the USACE also incorporates consideration of the various 'functions' of the wetland types:

"Wetland functions are defined as the normal or characteristic activities that take place in wetland ecosystems or simply the things that wetlands do. Wetlands perform a wide variety of functions in a hierarchy from simple to complex as a result of their physical, chemical, and biological attributes. For example, the reduction of nitrate to gaseous nitrogen is a relatively simple function performed by wetlands when aerobic and anaerobic conditions exist in the presence of denitrifying bacteria. Nitrogen cycling and nutrient cycling represent increasingly more complex wetland functions that involve a greater number of structural components and processes. At the highest level of this hierarchy is the maintenance of ecological integrity, the function that encompasses all of the structural components and processes in a wetland ecosystem."

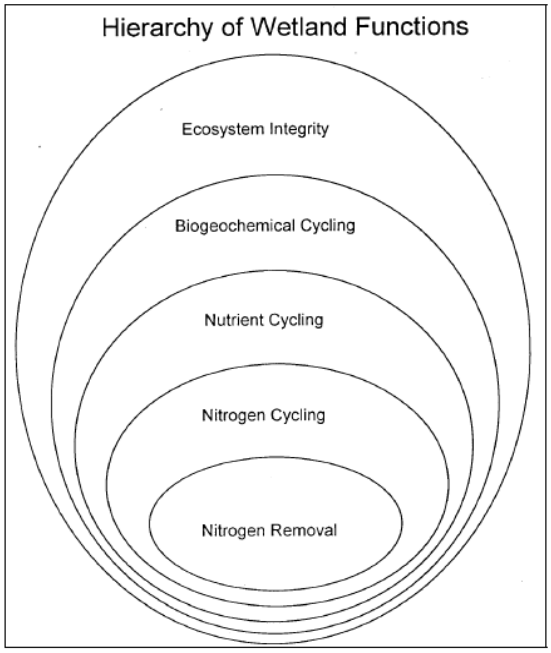


Figure 3.30 Hierarchy of Wetland Functions (USACE, 1995).

Figure 3.30 provides a figure extracted from the USACE manual depicting the hierarchy of wetland functions

associated with the example cited above regarding the nitrogen cycle. Additional information regarding the wetlands classification scheme is contained in the USACE document available at: http://el.erdc.usace.army.mil/wetlands/pdfs/wrpde9.pdf.

Delineation of wetlands and classification by function was beyond the scope of this study. However, based upon the project team's familiarity of the basin and the hydrologic regime of the watershed, it can be assumed that the majority of the wetlands in the study area consist primarily of riverine wetlands found along the water courses. To a lesser extent, slope wetlands are found in association with springs outside of the riparian zones.

3.4.3 Geology

3.4.3.1 Surficial Geology

Surficial materials identified by the Wyoming State Geological Survey (Case et al., 1998) within the Sweetwater River watershed as shown in Figure 3.31.

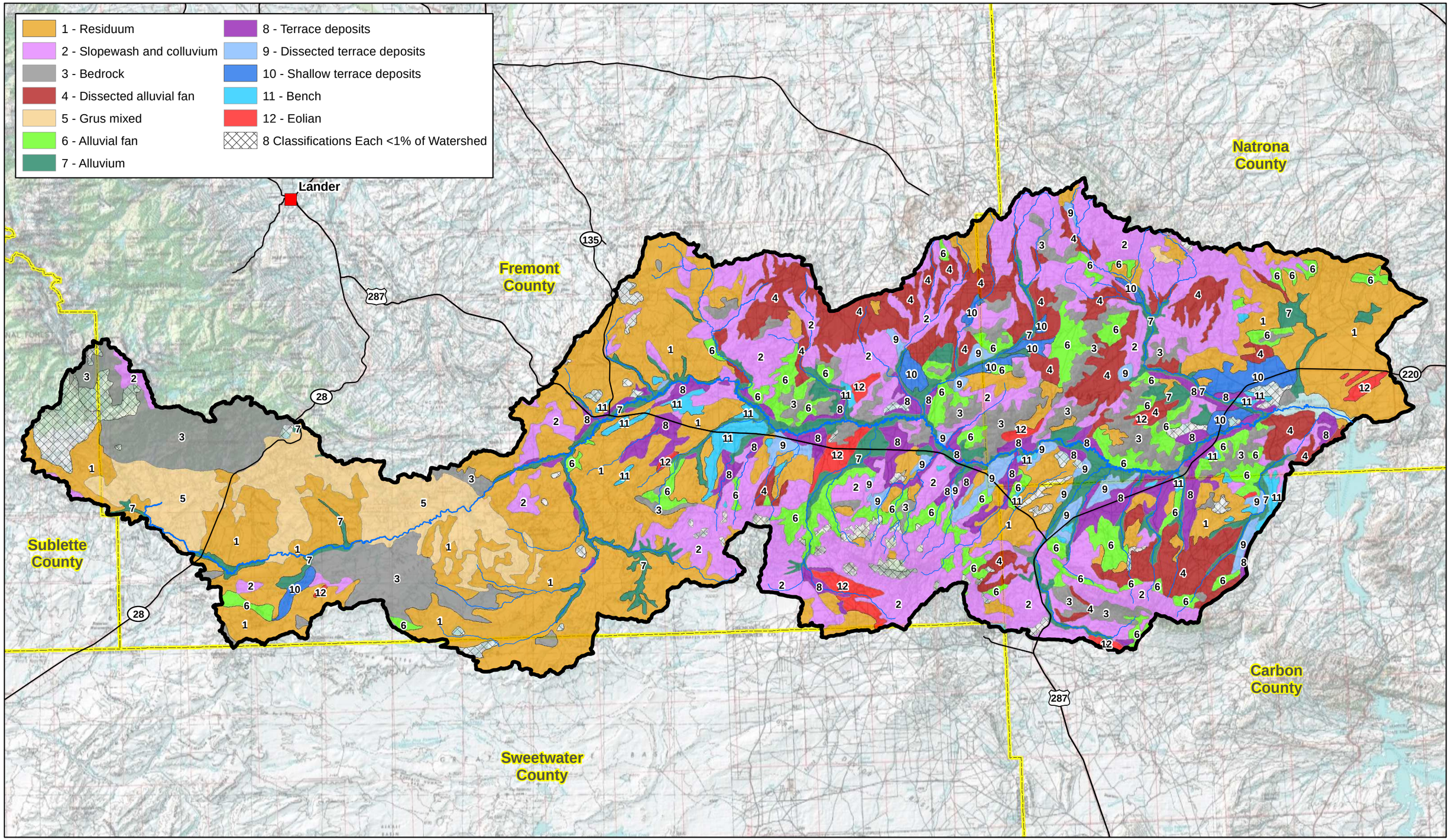
Alluvial materials within the watershed include alluvium, terrace deposits, bench deposits, and alluvial fan deposits. These materials were all transported and deposited by streams or rivers. Alluvium is the most recent type of alluvial deposit and consists of clays, silts, sands or gravels within the active stream channel or meander belt of streams or rivers. Terrace and bench deposits are found in abandoned floodplains at elevations above the active stream channel. Alluvial fan deposits are found at mouths of canyons where sediments are deposited as a stream's energy is dissipated with lower slope and less confined flow paths.

Colluvium, slopewash, and landslide deposits within the watershed were transported primarily by gravity. Colluvium consists of mixtures of sand, silt, clay, gravel, and rock fragments that accumulate near the base of slopes. Slopewash is similar to colluvium but the transport of these materials is assisted by unchannelized water (sheetflow). Landslide deposits consist of relatively intact blocks of materials that have become destabilized.

Resdual soil (residuum) was formed in place from weathering of the underlying bedrock. Grus is a specific type of residuum that consists of angular, coarse grained minerals formed from the disintegration of granitic rocks.

3.4.3.2 Bedrock Units

Mapping of bedrock geology was completed by the USGS and obtained through WyGISC. Figure 3.32 shows the distribution of outcropping or near surface bedrock (and the major surficial geologic units) within the watershed.



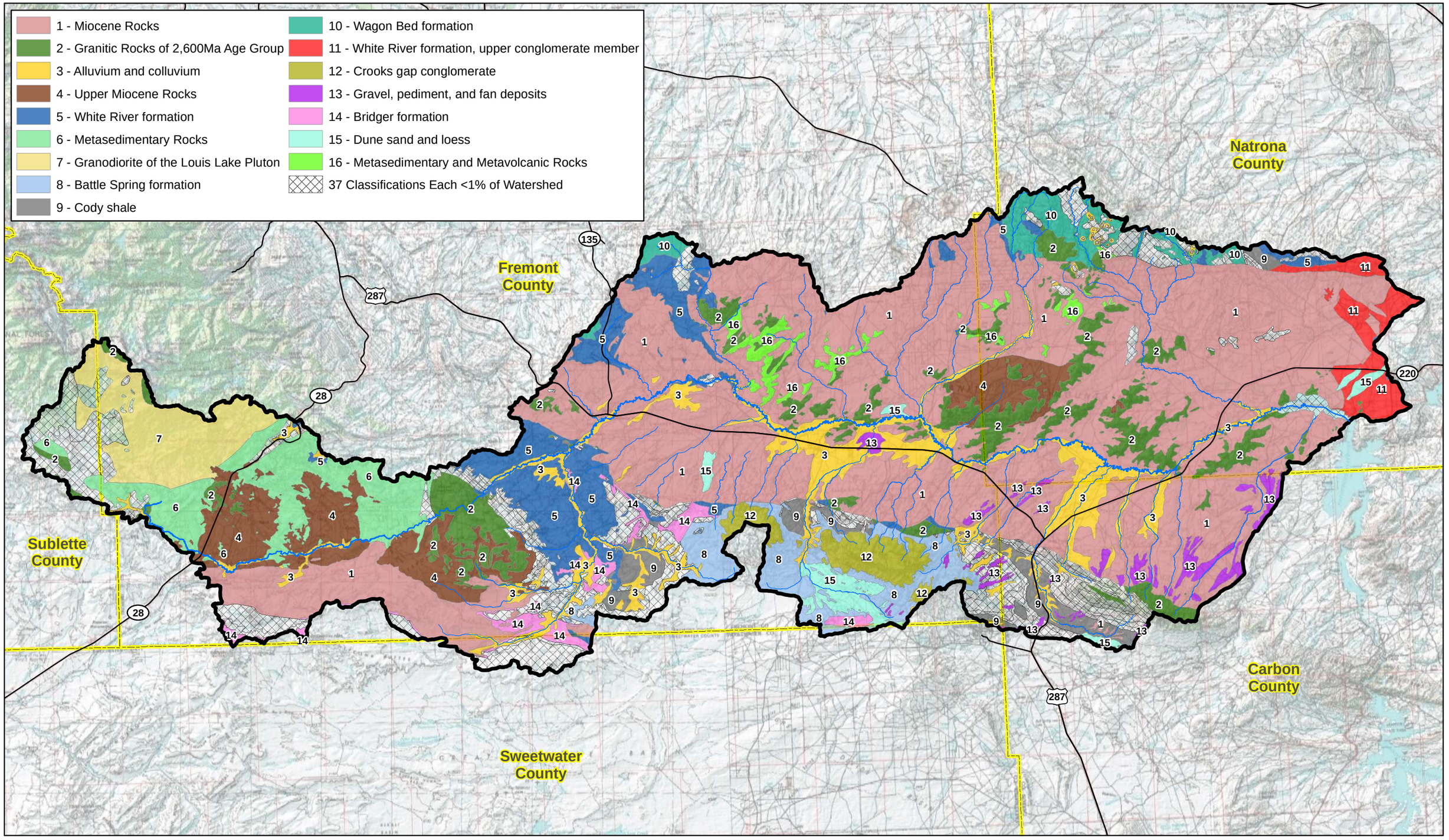
N
W E
S

Legend

Cities
Sweetwater River
Streams
US / State Hwy
Sweetwater River Watershed
County Boundary

0 10 20
Miles

Figure 3.31 Sweetwater River Watershed: Surficial Geology



N
W E
S

Legend

- Cities
- Sweetwater River
- Streams
- US / State Hwy
- Sweetwater River Watershed
- County Boundary

0 10 20

Miles

Figure 3.32 Sweetwater River Watershed: Bedrock Geology

3.4.3.3 Geologic Hazards

Figure 3.33 displays a figure of the known faults and landslides within the study area. There have been nine magnitude 2.0 or greater earthquakes recorded in the larger study area over the last 110 years (WyGISC, 2002). Although of sufficient magnitude to be felt by residents, none were reported to have resulted in significant damage.

Landslide hazards exist in areas where the resisting forces (friction and cohesion/adhesion between sediment particles) have the potential to be exceeded by the driving forces (gravity). This condition can be found throughout the upland areas of the Sweetwater River watershed. Slopes experiencing undercutting due to lateral erosion of streams are also at risk. The lateral erosion by streams undercuts the toe of slopes and removes their underlying support. Other factors for potential landslide areas include grain size and shape, lateral and underlying support, slope angle, sediment composition, and water content.

3.4.4 Soils

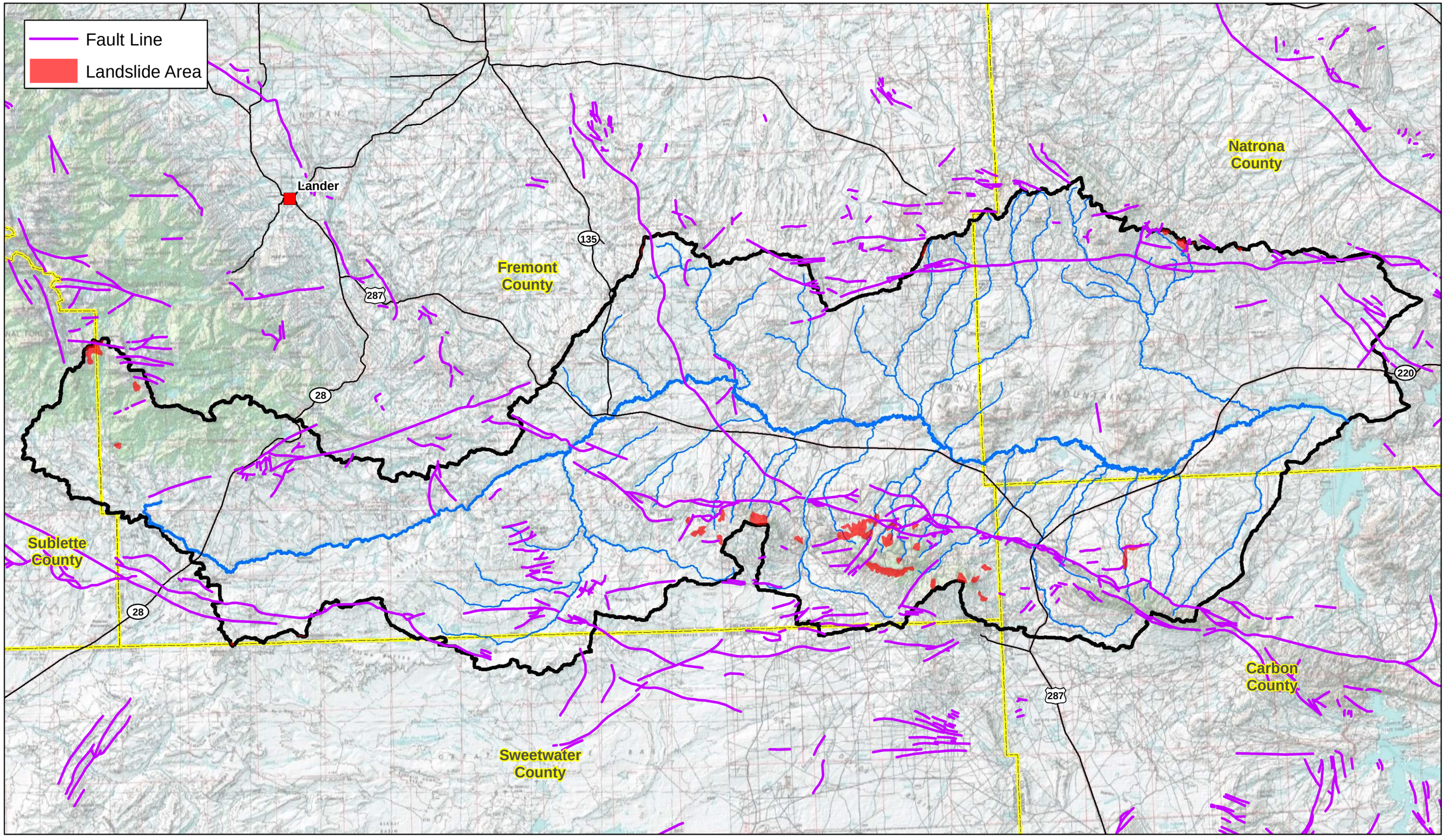
Many of the physical and chemical properties of the soils in the study area are strongly influenced by the nature of the parent materials. Very young soils, such as those of the Persayo series, are influenced more by parent material than by vegetation. Soils within the study area vary greatly as would be anticipated given the areal extent of the basin and the variety of parent materials, precipitation, and other soil forming factors. Figure 3.34 displays a general soils map of the study area prepared using the 1:250,000 level of detail and obtained from the NRCS. A large portion of the watershed has been mapped at the 1:24,000 scale. However, the extent of the study area precluded legible display of the detailed mapping. This information is, however, incorporated within the project GIS.

NRCS soils mapping at the 1:24,000 level of detail is available on a county by county basis. The Sweetwater River watershed study area includes portions of five different counties: Fremont, Natrona, Carbon, Sweetwater, and Sublette.

3.5 Watershed Hydrology

3.5.1 Groundwater

Groundwater in the Sweetwater River watershed occurs in both shallow (alluvial) and deeper (bedrock) aquifers. Both unconfined and artesian (confined) conditions exist, often in high quantities.



N
W E
S

Legend

- Cities
- Sweetwater River
- Streams
- US / State Hwy
- Sweetwater River Watershed
- County Boundary

0 10 20

Miles

Figure 3.33 Sweetwater River Watershed: Geologic Hazards

1 - Ryan Park-Rock River-Carmody-Bosler
2 - Travson-Ryan Park-Rock River-Rock outcrop-Hawkstone
3 - Lymanson-Irigul-Hoodle
4 - Rock River-Milvar-Milren-Dahlquist
5 - Rock River-Lupinto-Alcova
6 - Rock outcrop-Pesmore-Dahlquist-Bosler-Asholler
7 - Rock outcrop-Lymanson-Hoodle-Gelkie
8 - Rock River-Rentsac-Forelle-Diamondville-Cushool-Carmody
9 - Youga-Quander
10 - Rock outcrop-Handran-Frisco
11 - Rock River-Bosler-Alcova
12 - Havre-Forelle-Elkol-Absher
13 - Venapass-Silas-Lander variant-Lander
14 - Tisworth-Havermom
15 - Rock outcrop-Cryluha-Coutis-Conpeak
16 - Rentsac-Moyerson-Langspring-Delphill-Blazon-Blackhall
17 - Midelight-Handran-Ansel
18 - Zeomont-Ryark-Ryan Park
19 - Ryan Park-Rock River-Pinelli-Kemmerer-Forelle-Diamondville-Dahlquist
20 - Starley-Farlow-Bachus
21 - Wint-Westvaco-Teagulf-Tasselman-Rogrube-Huguston-Haterton
22 - Sambrito-Rogert-Rock outcrop-Mccort-Hiwan-Granile-Frisco
23 - Wellsville-Starman-Rogert-Owen Creek-Clayburn
24 - Patent-Forelle-Crownest
25 - Walcott-Taglake-Sebud
26 - Taglake-Sebud-Greyback-Gelkie
27 - Poposhia-Forelle-Carmody-Blazon-Blackhall
28 - Zeomont-Yetull-Ryark-Ryan Park-Kandaly
29 - Sapphire-Farlow-Duncom
30 - Wint-Roxal-Rock outcrop-Huguston-Haterton-Blazon
31 - Rock outcrop-Redsun-Hazton
32 - Vonason-Tresano-Fraddle-Forelle-Farson

Lander
Fremont County
Sublette County
Sweetwater County
Carbon County
135
287
28
220
30

N
W
E
S

Legend

Cities
Sweetwater River
Streams
US / State Hwy
Sweetwater River Watershed
County Boundary

0 10 20
Miles

Figure 3.34 Sweetwater River Watershed: Soils Mapping at 1:250,000

The quantity and quality of groundwater varies with geologic unit and is related to the lithology and geochemical properties of the material. In the following sections, the three primary groundwater sources are discussed: springs, alluvial aquifers, and bedrock aquifers.

3.5.1.1 Springs

Groundwater is naturally discharged by springs and seeps, by evapotranspiration, and by discharge to streams and other aquifers. Springs and seeps occur when the water table intersects the land surface. This commonly is the result of changes in lithology, faults and fractures, and topography. For example, where a sufficiently permeable geologic unit (e.g., uncemented sandstone or conglomerate) crops out in a swale or on a hillside at an elevation below the ambient groundwater table in the bedrock unit at that location, a spring may develop. Similarly, a permeable geologic structure (e.g., an open joint, fracture or fault zone) may intersect the ground surface and serve as a conduit for the discharge of groundwater. Spring flows vary widely due to the nature of the aquifer/structure discharging, the amount of seasonal recharge from snowmelt and rainfall, depletion of storage during periods of drought, and even evaporation and evapotranspiration at the site of the spring. The flows can be concentrated or diffuse, again depending on the nature of the geologic conditions causing the spring (Susong, et al., 1993).

Figure 3.35 displays the location of springs mapped by the USGS and the BLM.

3.5.1.2 Alluvial Aquifers

Alluvial aquifers are located along the major streams and consist of unconsolidated clay, silt, sand, gravel, and cobble. Alluvial aquifers which have been previously developed exist primarily along the Sweetwater River, however, wells have also been completed in alluvium associated with Alkali Creek, Crooks Creek, Sage Hen Creek, Dry Creek, and others.

Thickness of the alluvium varies. According to Plfafcan, et al., (1995), wells completed in quaternary alluvium range in depth from 9 to 60 feet along the Sweetwater River. Alluvium thicknesses along tributaries will vary accordingly with the local geology; however, based upon review of available data, they are typically less than 50 feet.

Wells completed in the alluvial aquifer have been tested at rates of typically 10 gallons per minute (Plafcan, 1995).

The number and depth of wells completed within alluvial aquifers in the watershed cannot be definitively determined from the WSEO database because it does not specify the geologic unit in which the wells were completed.

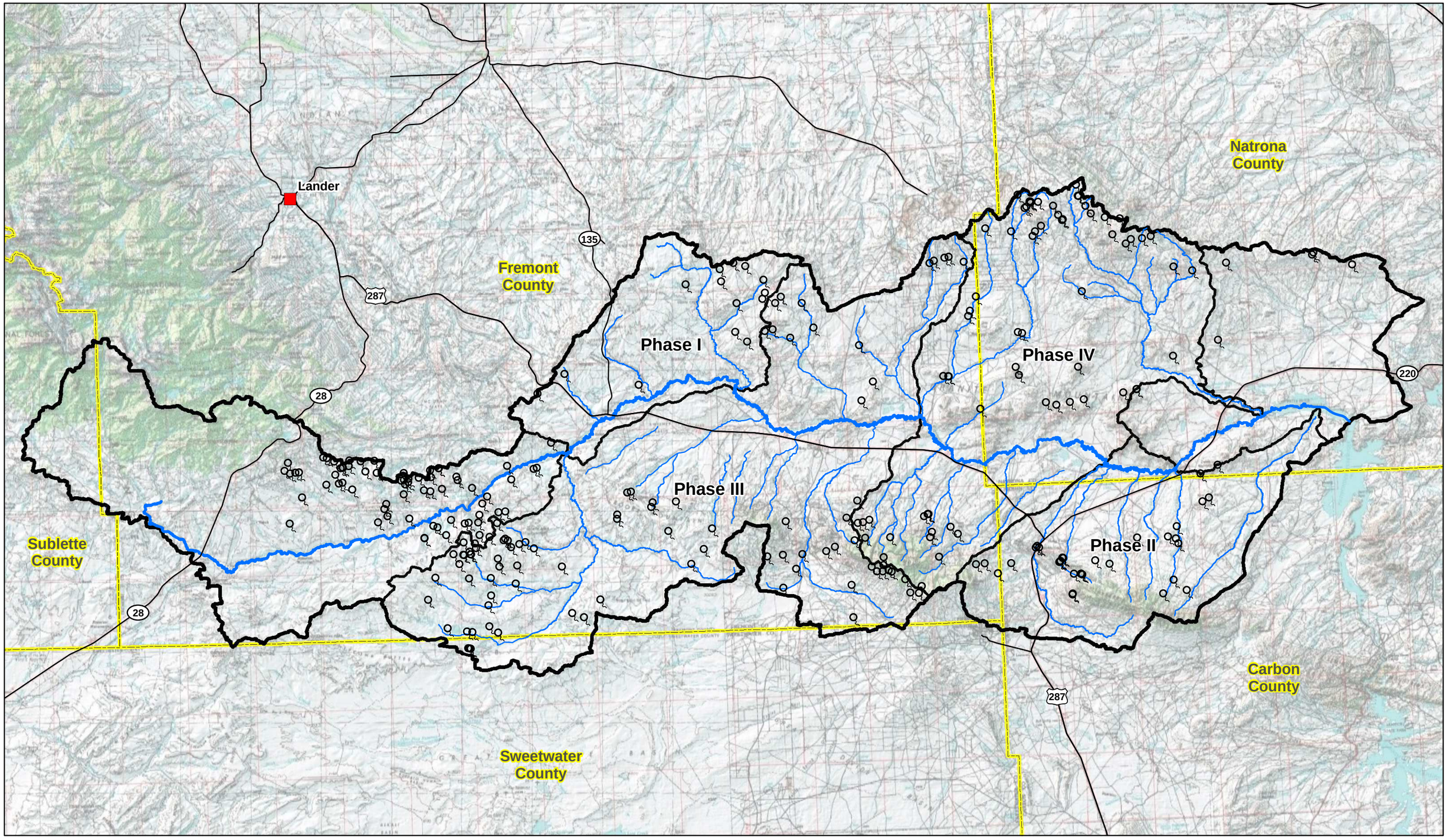


Figure 3.35 Sweetwater River Watershed: Springs

3.5.1.3 Bedrock Aquifers

Groundwater exists in both unconfined water table conditions (at atmospheric pressure) or under confined conditions where pressures are greater than atmospheric. Wells completed in confined aquifers in the study may potentially yield high volumes of water under significant pressures. Based upon the well inventory completed by Plafcan (1995), the principal aquifers are primarily the formations of Tertiary Age: Arikaree Formation, White River Formation, and the Wind River Formation. Other aquifers have been used to a lesser extent, however, these aquifers represent the dominant groundwater sources.

3.5.1.4 Groundwater Supply

A database of permitted well information was obtained from the Wyoming State Engineers Office (WSEO). Within the database are attributes for each well including: permit number, applicant name, well name, location, well depth, depth to water, well yield, and appropriated uses. A tabulation of well data is included in Appendix B. Figure 3.36 displays the locations of the wells.

Existing groundwater development in the study area generally consists of relatively shallow, low-yield wells constructed for stock and domestic use and the similar, limited development of small springs. With the exception of deep wells associated with oil field production, typical study area wells are approximately 100 feet to 250 feet deep with reported yields than 30 gpm. Depth to water is typically from ten (10) to two hundred (200) feet.

3.5.2 Surface Water

3.5.2.1 Hydrologic Units

The USGS has designated watersheds within the United States with numeric identifiers called Hydrologic Unit Codes, or HUCs. According to the USGS, *"The United States is divided and sub-divided into successively smaller hydrologic units which are classified into four levels: regions, sub-regions, accounting units, and cataloging units. The hydrologic units are arranged within each other, from the smallest (cataloging units) to the largest (regions). Each hydrologic unit is identified by a unique hydrologic unit code (HUC) consisting of two to eight digits based on the four levels of classification in the hydrologic unit system."*

The first level of classification divides the Nation into 21 major geographic areas, or regions. These geographic areas typically contain the drainage area of a major river, such as the Missouri region. Eighteen of the regions occupy the land area of the conterminous United States. As regions are

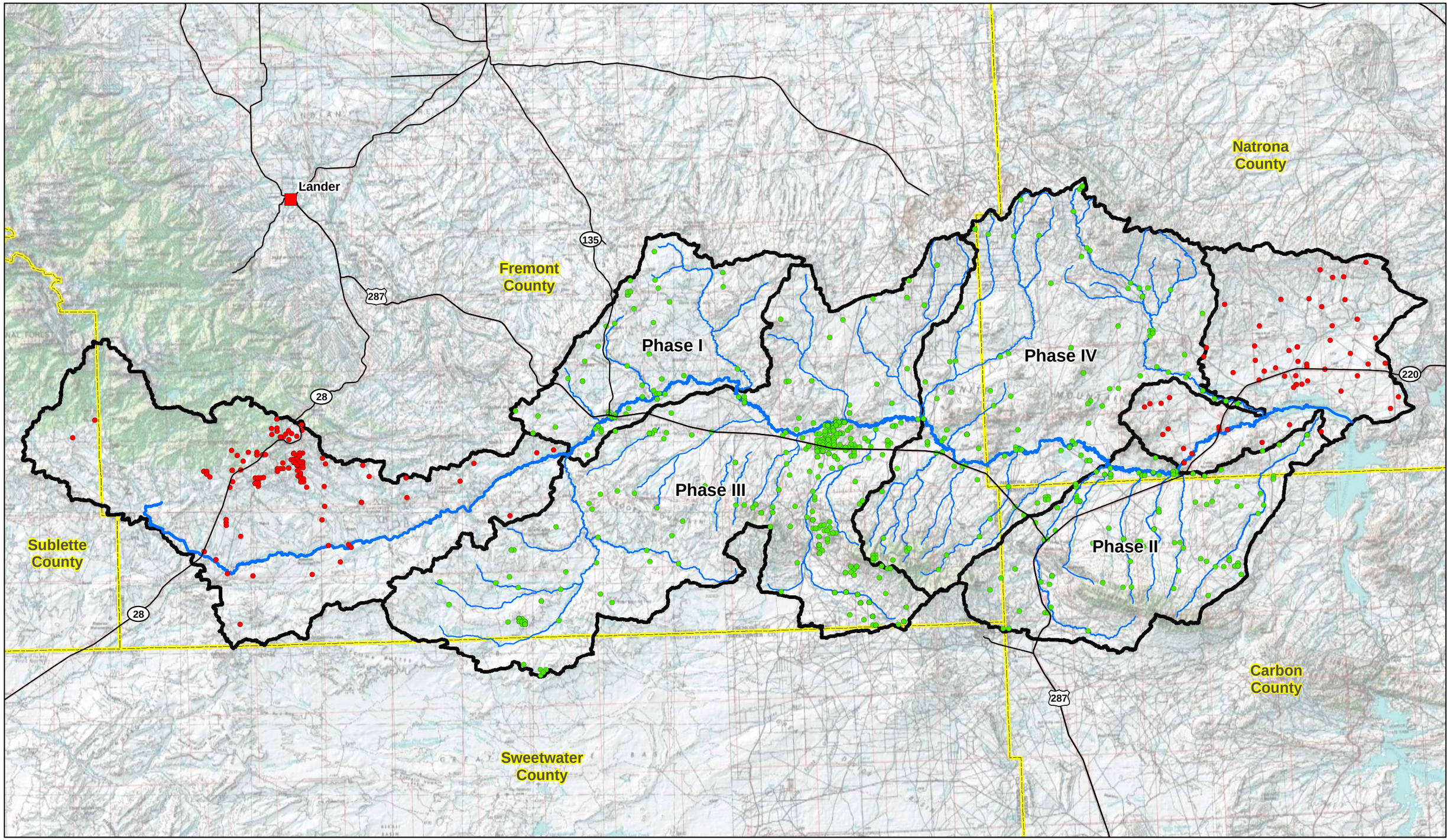


Figure 3.36 Sweetwater River Watershed: Wells Permitted with the Wyoming State Engineer

subdivided, the HUC identifier is extended. At this time, the smallest subdivision is referred to as the Twelfth order HUC due to the fact that the identifier has 12 digits. The following information is provided as an example of the HUC system as it refers to one of the Sweetwater River tributaries: Upper Sage Hen Creek.

Region:	10 Missouri River	(Second order HUC)
Subregion:	1018 Platte River	(Fourth Order HUC)
Accounting Unit:	101800 Platte River	(Sixth Order HUC)
Cataloging Unit:	100180006 Sweetwater River	(Eighth Order HUC)
Five subbasins:	10018000607 Sage Hen Creek	(Tenth Order HUC)
65 Sub-basins:	1001800060701 Upper Sage Hen Creek	(Twelfth Order HUC)

The Sweetwater River watershed study area was defined by the boundaries of the Eighth order HUC (HUC 100180006). Table 3.14 summarizes the HUC system as it pertains to the Sweetwater River and its tributaries. This table also summarizes the areal extent covered in each of the Phase I through Phase IV reports. Figure 3.37 displays this information graphically.

3.5.3 USGS Stream Gages

Streamflow data have historically been collected at eleven (11) stream gages within the study area. Table 3.15 tabulates the gage information including the period of record associated with each. The only gage currently active is the USGS gage Sweetwater River near Alcova (USGS Gage Number 6639000). The gage currently only operates during the irrigation season: April through September. The gage has been in operation since 1913 with a break in data collection from 1924 to 1938. Even with this break in the data record, the gage provides a lengthy period of record.

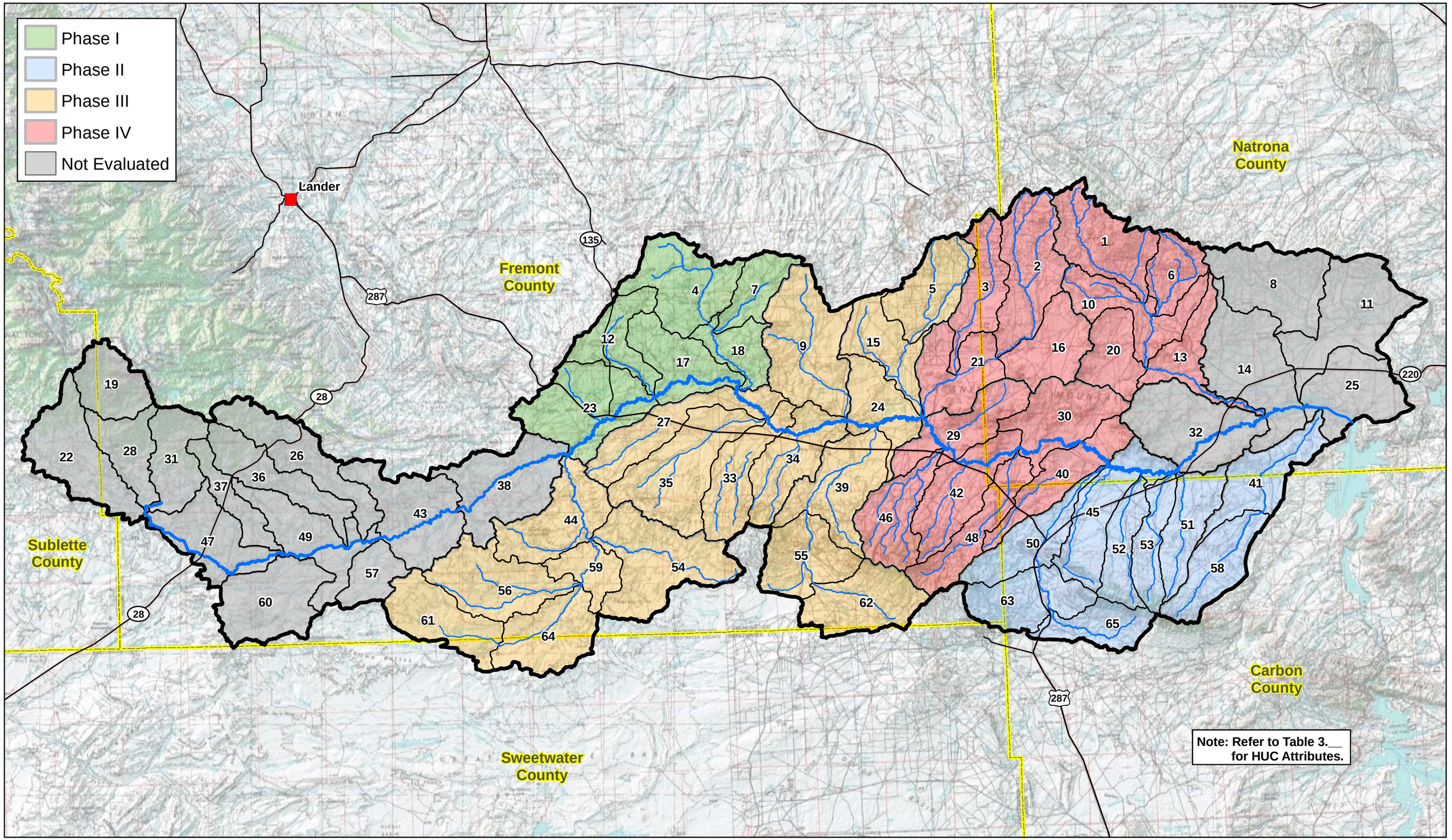
The mean annual hydrograph for this gage is presented in Figure 3.38. As shown in this figure, the river maintains a relatively consistent baseflow from August through March at approximately 45 to 50 cubic feet per second. Spring runoff begins in early March and peaks in May and June. Following the peak, the hydrograph recedes rapidly back to baseflow conditions.

Annual peak discharge recorded at the gage since 1914 are displayed in Figure 3.39 on the available 1:24,000 topographic mapping.

The majority of stream reaches and tributaries in the watershed typically range from intermittent to ephemeral. Ephemeral streams are defined as those streams/reaches that flow only in response to direct precipitation events, and where any groundwater inflows are insufficient to sustain streamflow due to losses from evaporation, transpiration, and seepage. The hydrologic behavior of intermittent streams/reaches is transitional between perennial and ephemeral stream hydrology. Ephemeral streams tend to be extremely 'flashy', displaying very rapid rise to peak followed by a rapid recession in streamflow. Annual runoff is typically low.

Table 3.14 Sweetwater River Watershed Study: Hydrologic Units.

HUC 2 Name / Number	HUC 4 Name / Number	HUC 6 Name / Number	HUC 8 Name / Number	HUC 10		HUC 12		Map ID	Area (sq. mi.)	Phase
				Number	Name	Number	Name			
Region 10: Missouri River	Subregion 1018: Platte River	Accounting Unit 101800: North Platte River	Cataloging Unit 10018006: Sweetwater River	1018000604	Long Creek	101800060401	Crooked Creek	23	65.3	I
						101800060402	Government Meadows Draw	12	32.6	I
						101800060403	Koehler Draw	17	41.6	I
						101800060404	Upper Long Creek	4	55.1	I
						101800060405	Lower Long Creek	18	24.9	I
						101800060406	East Fork Long Creek	7	24.8	I
				1018000609	Muddy Creek	101800060901	Upper Muddy Creek-Lower Muddy Creek	65	29.5	II
						101800060902	Middle Muddy Creek	63	43.8	II
						101800060903	Lower Muddy Creek	50	39.3	II
						101800060904	Whiskey Creek	45	50.2	II
						101800060905	Cherry Creek	52	28.7	II
						101800060906	Pete Creek	53	27.1	II
						101800060907	Rush Creek	51	36.0	II
						101800060908	Devil's Gate	32	66.0	NA
				1018000611	Horse Creek	101800061101	Steamboat Lake	14	71.1	NA
						101800061102	Upper Horse Creek	8	59.2	
						101800061103	Lower Horse Creek	11	67.2	
						101800061105	Bishop Point	25	48.6	
						101800061106	Upper Arkansas Creek	58	41.0	II
						101800061107	Lower Arkansas Creek	41	42.4	II
				1018000603	Alkali Creek	101800060301	Upper West Alkali Creek	61	45.6	III
						101800060302	Lower West Alkali Creek	64	47.3	III
						101800060303	Sulphur Creek-Alkali Creek	56	55.3	III
						101800060304	West Alkali Creek	59	22.4	III
						101800060305	East Alkali Creek	54	73.0	III
						101800060306	Weasel Draw	44	51.1	III
				1018000605	Buffalo Creek	101800060501	Warm Springs Creek	27	46.0	III
						101800060502	Ice Slough	35	69.3	III
						101800060503	Cottonwood Creek	33	41.4	III
						101800060504	O'Brian Creek	34	45.0	III
						101800060505	Buffalo Creek	9	73.3	III
				1018000606	Crooks Creek	101800060601	Soda Lakes	24	35.7	III
						101800060602	Upper Crooks Creek	62	48.9	III
						101800060603	Middle Crooks Creek	55	43.5	III
						101800060604	Lower Crooks Creek	39	55.3	III
						101800060605	Upper Diamond Springs Draw	5	42.5	III
						101800060606	Lower Diamond Springs Draw	15	35.8	III
				1018000607	Sage Hen Creek	101800060701	Upper Sage Hen Creek	2	59.5	IV
						101800060702	Lone Mountain	16	38.5	IV
						101800060703	Lower Sage Hen Creek	21	42.9	IV
						101800060704	West Sage Hen Creek	3	37.2	IV
				1018000608	Willow Creek	101800060801	Lankin Creek	29	42.5	IV
						101800060802	East Cottonwood Creek	46	41.5	IV
						101800060803	Cooper Creek	42	48.1	IV
						101800060804	Willow Creek	48	38.9	IV
						101800060805	Beef Gap	30	47.9	IV
						101800060806	Rawlins Draw	40	40.5	IV
				1018000610	Dry Creek	101800061001	Upper Dry Creek	1	52.3	IV
						101800061002	Middle Dry Creek	10	41.8	IV
						101800061003	Chokecherry Creek	6	25.9	IV
						101800061004	The Dry Lake	20	31.1	IV
						101800061005	Lower Dry Creek	13	29.8	IV
				1018000601	Lander Creek	101800060101	Pool Creek	19	32.8	NA
						101800060102	Little Sweetwater River	28	30.8	
						101800060103	East Sweetwater River	31	36.3	
						101800060104	Lander Creek	22	57.0	
						101800060105	Fish Creek	47	46.2	
				1018000602	Strawberry Creek	101800060201	Pine Creek	37	22.0	
						101800060202	Long Slough	49	48.1	
						101800060203	Meadow Creek	60	54.6	
						101800060204	Willow Creek	36	40.1	
						101800060205	Rock Creek	26	49.4	
						101800060206	Harris Slough	57	21.8	
						101800060207	Strawberry Creek	43	58.3	
						101800060208	Ladysmith Creek	38	61.3	



N
W E
S

Legend

- Cities
- Sweetwater River
- Streams
- US / State Hwy
- Sweetwater River Watershed
- County Boundary

0 10 20

Miles

Figure 3.37 Sweetwater River Watershed: Hydrologic Unit Codes (HUCs)

Table 3.15 Summary of Available Stream Gage Data Within the Sweetwater River Watershed.

Agency	Site Number	Site Name	Period of Record	Drainage Area (sq. miles)	Gauge Elevation (ft, NGVD29)
USGS	6637550	SWEETWATER RIVER NEAR SOUTH PASS CITY, WY	10/1/1958 to 10/4/1973	177	7420
USGS	6638000	SWEETWATER RIVER NR ATLANTIC CITY WYO	8/1/1946 to 9/30/1951	438	7200
USGS	6638090	SWEETWATER RIVER NEAR SWEETWATER STATION, WY	10/1/1973 to 9/30/1992	849	6590
USGS	6639000	SWEETWATER RIVER NEAR ALCOVA, WY	10/1/1913 to 9/30/1924 and 10/1/1938 to present	2338	5890
USGS	6637600	WILLOW CREEK NEAR ATLANTIC CITY, WY	3/1/1957 to 9/30/1958	3.1	8700
USGS	6637700	WILLOW CREEK NEAR SOUTH PASS CITY, WY	3/1/1957 to 9/30/1958	9.2	8050
USGS	6637750	ROCK CREEK ABOVE ROCK CREEK RESERVOIR, WY	5/1/1962 to 9/30/1995	9.2	8330
USGS	6637800	ROCK CREEK NEAR SOUTH PASS CITY, WY	3/1/1957 to 9/30/1960	9.87	8230
USGS	6637850	ROCK CREEK NEAR ATLANTIC CITY, WY	3/1/1957 to 9/30/1957	14.6	7920
USGS	6637900	SLATE CREEK NEAR ATLANTIC CITY, WY	3/1/1957 to 6/30/1957	5.9	7880
USGS	6637910	ROCK CREEK AT ATLANTIC CITY, WYO.	7/1/1957 to 10/4/1976	21.3	7850

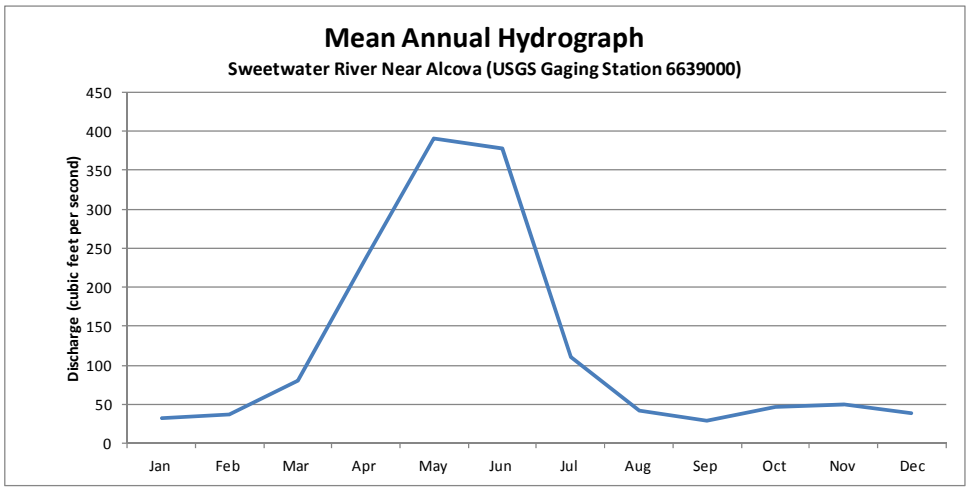


Figure 3.38 Mean Annual Hydrograph: Sweetwater River Near Alcova (USGS Gaging Station 6639000).

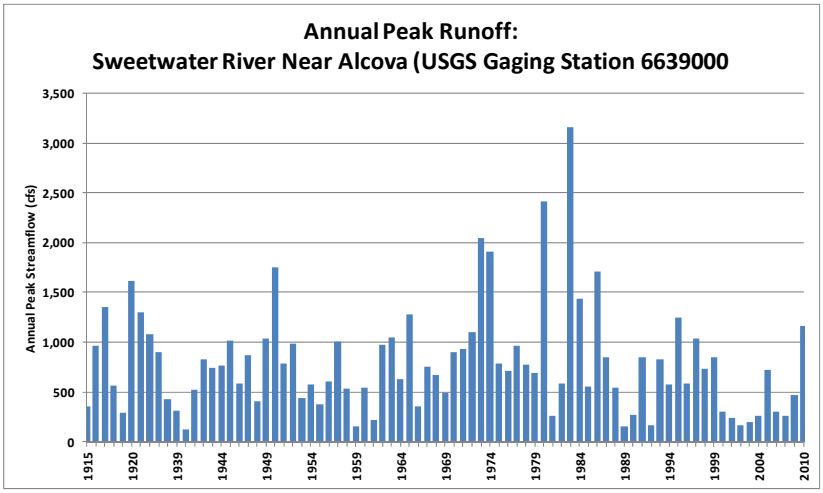


Figure 3.39 Annual Peak Discharge: Sweetwater River Near Alcova (USGS Gaging Station 6639000).

3.6 Stream Geomorphology

3.6.1 General

The field of fluvial geomorphology is the study of how land is formed under processes associated with running water. The balance between processes such as erosion, deposition, and sediment transport determines the character and condition of a stream. The objective of the geomorphic evaluation of the study area is to determine the nature of this balance, and where the balance has been upset.

The condition of a stream can be assessed with respect to its basic form (width, depth, slope, etc.), as well as its state of equilibrium, or geomorphic stability (Thorne, et al, 1996; Johnson, et al., 1999). Stable, or equilibrium, channels are generally defined as those that have achieved a balance between flow energy and sediment delivery, such that sediment is transported at the rate at which it is delivered, and the form and pattern of the channel is maintained (Thorne, et al., 1996). Dynamically stable channels are adjustable in nature, and "stability" does not preclude lateral migration and associated dynamics such as bank erosion and sediment deposition.

In geomorphically stable conditions, minor changes in either sediment supply or transport energy result in gradual adjustment of channel form to accommodate those changes (Lane, 1955). Channels destabilize when changes in those factors are extreme enough that rapid and dramatic alterations in pattern or form occur. Common indicators of channel instability include active downcutting and accelerated bank erosion, major changes in channel width/depth ratios, and increased flooding due to sediment deposition. Geomorphic function is achieved when a channel is in equilibrium, while undergoing processes such as lateral migration, sediment reworking, and occasional overbank flooding that effectively create and sustain quality habitat elements, such as bars, pool/riffles, step/pools, and healthy, regenerating riparian corridors.

Impairments to geomorphic function reflect a significant loss of the functional potential of the green channel segment. These impairments are typically described in general, qualitative terms, and any rehabilitation of impaired channel segments requires a more thorough, site-specific assessment of impacts, impairments, and feasible remedies.

3.6.2 Rosgen Classification System

The literature presents descriptions of numerous systems for classifying and evaluating stream systems. Of these, perhaps the most widely used today is the Rosgen classification system (Rosgen, 1996). This system, based upon the stream's existing channel morphology, was utilized in this study. Parameters such as the sinuosity, slope, width/depth ratio, and size of channel materials are evaluated and used to classify the stream into one of the various "types" included in the system.

There are four levels of classification in the Rosgen system, each being more detailed than the previous level. Figure 3.40 displays the hierarchy of the assessment levels and the general nature of effort associated with each. Much of the Level I geomorphic characterization is qualitative and utilizes aerial photography and topographic maps. Streams are divided into eight (8) broad types on the basis of their channel and floodplain geometry. Rosgen's classification system stream types can be thought of in their relative location within the watershed, from their headwaters through lowlands. The major stream types reflect their location in the watershed. For example, "A" type streams are located in headwaters; "C" & "E" stream types are located in meandering lowlands, etc.

The Level II effort provides a more detailed description of the stream using measurements at selected locations. Stream types are further subdivided into 94 subtypes based upon degree of entrenchment, width-to-depth ratio, water surface slope, streambed materials, and sinuosity (Figure 3.41). Consequently, the Level II characterization is more quantitative than the Level I effort. Levels III and IV require more extensive data collection and quantification of stream characteristics. ***The Sweetwater River Watershed Study included Level I evaluation of the mainstem streams and their principal tributaries.***

3.6.2.1 Level I Methods

The purpose of the Level I geomorphic classification is to provide an inventory of the Sweetwater River watershed study area's overall stream morphology, character, and condition. It is intended to serve as an initial assessment for use in more detailed assessments and to determine the location and approximate percentage of stream types within the basin. The results of the Level I classification can be integrated directly into the project Geographic Information System (GIS) providing a graphical "snapshot" of the basin. Based upon this initial effort, potential stream reference reaches can be identified for

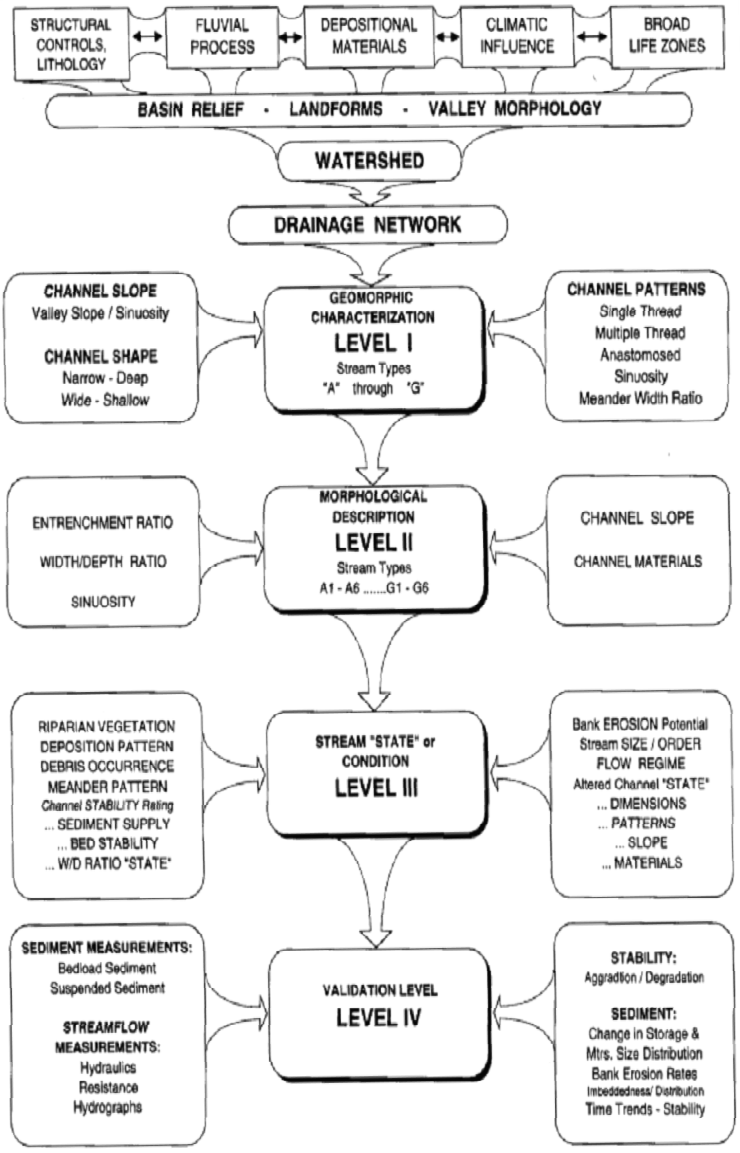


Figure 3.40 Hierarchy of the Rosgen Classification System (Rosgen, 1996).

further study in Level II classification efforts. The end product of the Level I classification is the determination of the major stream types, A through G.

Figure 3.42 with the Rosgen Classification System shows the relative locations of these stream types within a typical watershed. Brief descriptions of the various stream types encountered in the watershed are presented in the following paragraphs.

A-Type Channels are relatively steep channels that form in headwater areas as well as within bedrock canyons. These channels are entrenched and confined by steep valley margins such that little to no floodplain area borders them. As the boundaries of A-type channels are typically highly resistant to erosion, these stream types are generally quite resilient with respect to human impacts. The most common cause of geomorphic change within A-type channels is due to large-scale sediment transport events, (landslides, debris flows, debris jam failure) that may result in blockage or deflection of channel flow.

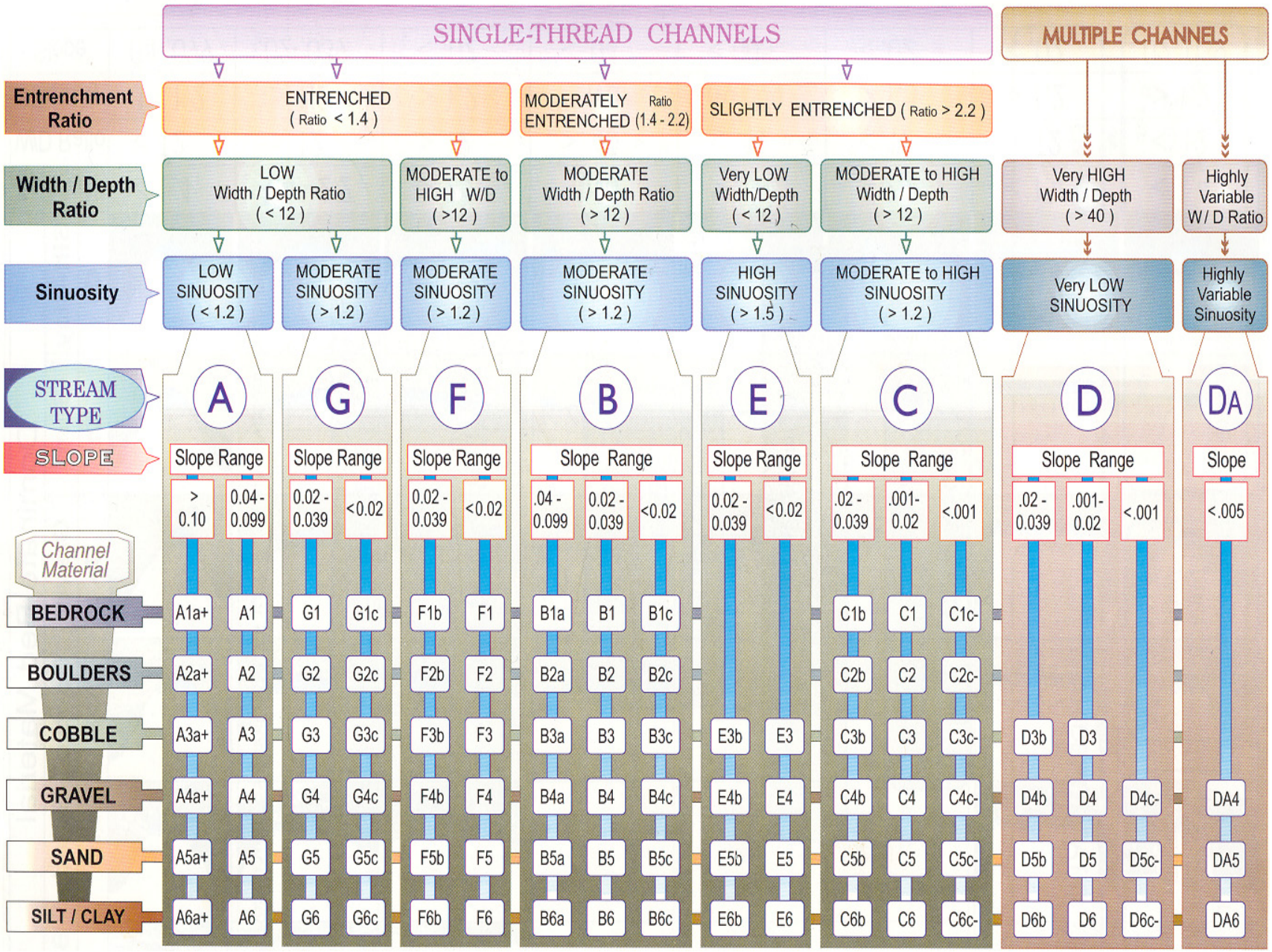


Figure 3.41 Rosgen Classification Matrix (Rosgen, 1996).

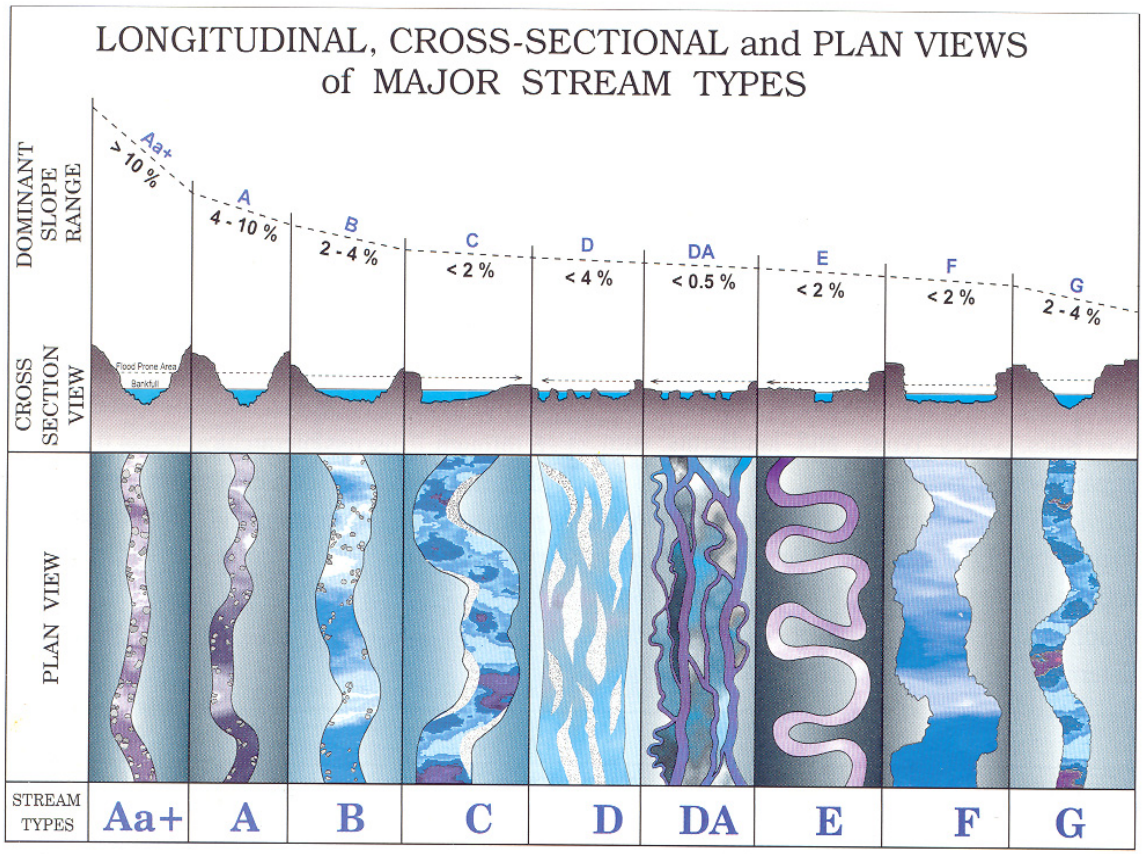


Figure 3.42 Major Stream Types within the Rosgen Classification System (Rosgen, 1996).

B-Type Channels tend to form downstream of headwater channels, in areas of moderate slope where the watershed transitions from headwater environments to valley bottoms (Figure 3.43). B-Type channels are characterized by moderate slopes, moderate entrenchment, and stable channel boundaries. Due to the relatively steep channel slopes and stable channel boundaries, B-channels are moderately resistant to human impacts, although, their reduced slopes relative to headwater areas can make them prone to sediment deposition and subsequent adjustment following a large sediment transport event such as an upstream landslide, debris flow, or flood.

Figure 3.43 East Fork Long Creek Riffle/ Pool Sequence (B-Type Channel).

C-Type Channels are typically characterized by relatively low slopes, meandering planforms (i.e., the shape one would see if viewing from above, as on a map or aerial photo), and pool/riffle sequences (Figure 3.44). The channels tend to occur in broad alluvial valleys, and they are typically associated with broad floodplain areas; they are not entrenched and still have 'access' to their floodplains. C-channels tend to be relatively sinuous, as they follow a meandering course within a single channel thread. In stream systems in which the boundaries of C-type channels are composed of alluvial sediments, channels tend to be dynamic in nature, and susceptible to rapid adjustment in response to disturbance.

Figure 3.44 Example Type C Channel: Sweetwater River.

E-Type Channels are somewhat similar to C channels, as they form as single threads with defined, accessible floodplain areas (Figure 3.45). However, E channels are different in that they tend to have fine-grained channel margins, which provide cohesion and support dense bankline vegetation. The fine-grained, vegetation-reinforced banklines allow for the development of steep banks, very sinuous planforms, and relatively deep, U-shaped channel cross sections. E-type channels commonly form in low gradient areas with fine-grained source areas, mountain meadows, and in beaver-dominated environments. E-channels tend to have very stable planforms, and efficient sediment transport capacities due to low width/depth ratios.

Figure 3.45 Example E-Type Channel: East Alkali Creek.

F-Type Channels typically have relatively low slopes (<2%), similar to C and E channel types. The primary difference between C/E channels and F channels is with respect to entrenchment. F channels are entrenched, which means that the floodplain is quite narrow relative to the channel width. The entrenchment of alluvial F-type channels typically is an indicator of an historic downcutting event. F-type channels may form in resistant boundary materials (e.g., U-shaped bedrock canyons), and relatively erodible alluvial materials (e.g., arroyos). When the boundary materials are erodible, the steep valley walls are

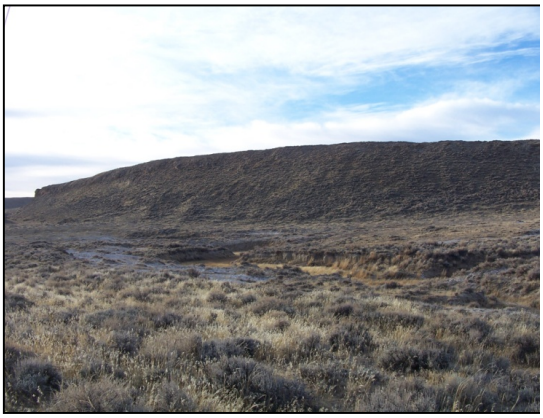


Figure 3.46 Example F-Type Channel: Corral Creek.

prone to instability, and channel widening commonly occurs within the entrenched channel cross section (Figure 3.46).

G-Type Channels are narrow, steep entrenched gullies. G-Type channels typically have high bank erosion rates and a high sediment supply. Channel degradation and sideslope rejuvenation processes are typical (Figure 3.47).

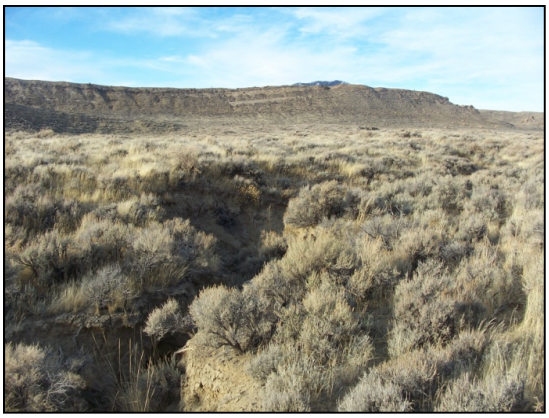


Figure 3.47 Example G-Type Channel: Tributary to Corral Creek.

The Level I classification effort was conducted primarily using existing information incorporated into the project GIS. Several analytical tools were developed and integrated into the GIS which allowed the evaluation of various geomorphic parameters (sinuosity, slope, stream station determination). The data collated and incorporated in the Project GIS include digital aerial photography, USGS topographic maps, Landsat color infrared imagery, a digital elevation model (DEM), and digitized hydrography information. The most current data available were used in the geomorphic evaluation. Because the DEM was limited to a 30-meter grid, elevations and subsequent slope calculations are approximate. Stream alignments were digitized using 2006 aerial photography and represent the best available estimate of current channel alignment.

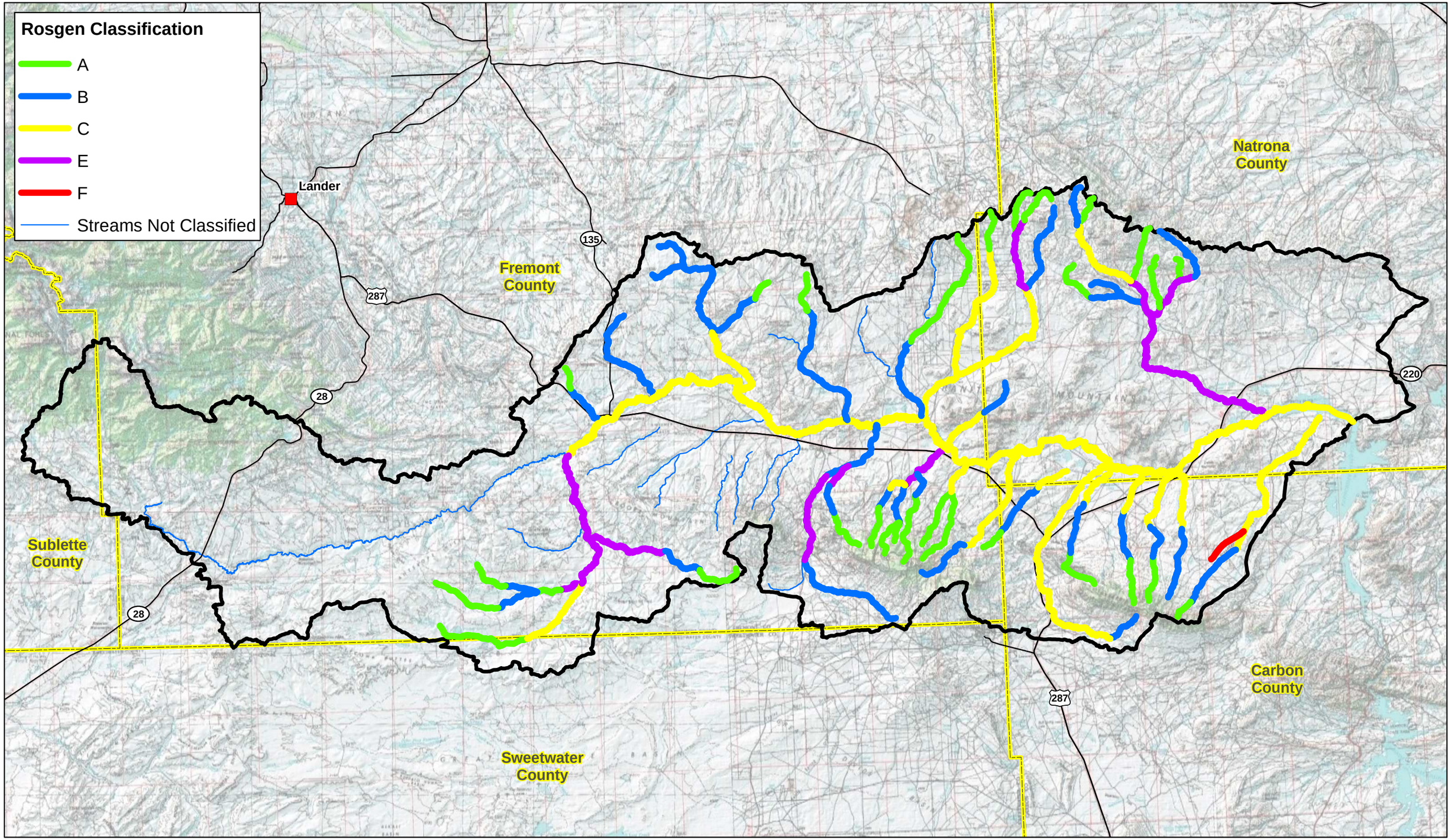
The streams evaluated were divided into reaches based upon definable geographic factors (e.g. confluences with tributaries, major road crossings, etc) or where their geomorphic character displayed changes. Each reach was evaluated in light of the characteristics required at the Level I classification. These parameters, as indicated in Figure 3.41, were channel slope, channel shape, channel patterns, and valley morphology. Note that in the Level I classification, these parameters are not typically quantified and the relative magnitude (i.e., “moderate”, “slightly”, etc.) is utilized to classify the stream.

3.6.2.2 Level I Classification Results

Results of the Level I classification efforts are presented in Table 3.16 and graphically in Figure 3.48. This figure displays a map of the study are depicting the various stream types as well as the reach designations used in the classification effort. Detailed mapping and evaluation of the Sweetwater River and its tributaries were beyond the scope of this project. Each of the Phase I through Phase II reports contain additional information pertinent to the specific study areas. In addition, the following general observations can be made:

Table 3.16 Summary of Rosgen Level I Classification Results.

Stream	Reach Number	Station (Distance from Mouth)		Reach Length (mi)	Sinuosity	Slope	Rosgen
		Station Start (mi)	Station Stop (mi)				
Phase I Results							
Crooked Creek	1	0.0	6.4	6.4	1.43	0.002	B
	2	6.4	8.5	2.1	1.06	0.021	A
East Fork Long Creek	1	0.0	7.5	7.5	1.43	0.008	B
	2	6.7	9.6	2.8	1.43	0.006	A
Government Meadows Draw	1	0.0	9.1	9.1	1.55	0.003	B
	2	9.1	15.2	6.1	1.39	0.005	B
Long Creek	1	0.0	11.7	11.7	1.48	0.004	C
Sweetwater River	1	0.0	17.0	17.0	1.75	0.002	C
	2	17.0	36.4	19.4	1.98	0.001	C
West Fork Long Creek	1	0.0	16.7	16.7	1.33	0.005	B
Phase II Results							
Arkansas Creek	1	0.0	3.1	3.1	1.45	0.0038	C
	2	3.1	6.1	3.0	1.15	0.0063	C
	3	6.1	25.6	19.5	1.75	0.0041	C
	4	25.6	33.0	7.5	1.17	0.0251	B
	5	33.0	35.0	2.0	1.05	0.1202	B
Cherry Creek	1	0.0	2.4	2.4	2.15	0.0053	C
	2	2.4	6.1	3.7	1.31	0.0062	C
	3	6.1	12.0	6.0	1.32	0.0182	B
	4	12.0	16.3	4.3	1.07	0.0730	B
Muddy Creek	1	0.0	5.8	5.8	2.16	0.0016	C
	2	5.8	16.8	10.9	1.31	0.0042	C
	3	16.8	28.4	11.7	1.62	0.0056	C
	4	28.4	36.2	7.7	1.67	0.0081	C
	5	36.2	40.0	3.8	1.15	0.0474	B
Pete Creek	1	0.0	0.7	0.7	1.89	0.0042	C
	2	0.7	5.2	4.5	1.24	0.0072	C
	3	5.2	8.3	3.1	1.68	0.0078	C
	4	8.3	9.5	1.1	1.26	0.0139	C
	5	9.5	13.4	4.0	1.66	0.0127	B
	6	13.4	18.0	4.6	1.09	0.0870	B
Rush Creek	1	0.0	7.7	7.7	1.36	0.0089	C
	2	7.7	15.2	7.5	1.16	0.0346	B
Whiskey Creek	1	0.0	2.4	2.4	1.12	0.0032	C
	2	2.4	6.3	4.0	1.49	0.0030	C
	3	6.3	10.1	3.7	1.09	0.0090	C
	4	10.1	11.4	1.4	1.15	0.0136	B
	5	11.4	16.6	5.1	1.09	0.0529	B
Phase III Results							
Alkali Creek	1	0	4.5	4.5	1.5	0.0026	E
	2	4.5	11.0	6.4	1.9	0.0017	E
	3	11.0	15.8	4.9	1.8	0.0019	E
	4	15.8	23.2	7.4	1.5	0.0023	E
Buffalo Creek	1	0.0	8.2	8.2	1.2	0.0054	B
	2	8.2	15.4	7.2	1.3	0.0103	B
	3	15.4	19.7	4.3	1.2	0.0138	A
Crooks Creek	1	0.0	8.2	8.2	1.2	0.0032	B
	2	8.2	20.2	12.0	1.5	0.0053	E
	3	20.2	33.0	12.8	1.2	0.0111	B
Diamond Springs Draw	1	0.0	9.2	9.2	1.2	0.0057	B
	2	9.2	14.5	5.3	1.1	0.0079	A
	3	14.5	21.6	7.0	1.4	0.0113	A
	4	21.6	23.4	1.9	1.1	0.0258	A
East Alkali Creek	1	0.0	7.2	7.2	1.7	0.0024	E
	2	7.2	11.6	4.3	1.4	0.0032	E
	3	11.6	16.7	5.1	1.3	0.0039	B
	4	16.7	21.4	4.8	1.1	0.0077	A
North Fork Sulphur Creek	1	0.0	1.2	1.2	1.1	0.0002	B
	2	1.2	3.7	2.4	1.4	0.0031	B
	3	3.7	4.7	1.0	1.2	0.0017	A
	4	4.7	8.4	3.7	1.4	0.0114	A
Sheep Creek	1	0.0	3.8	3.8	1.5	0.0045	E
	2	3.8	6.7	2.9	1.2	0.0228	B
	3	6.7	11.2	4.5	1.1	0.0702	A
South Fork Sulphur Creek	1	0.0	4.5	4.5	1.1	0.0022	B
	2	4.5	7.8	3.3	1.1	0.0073	A
	3	7.8	11.4	3.6	1.1	0.0108	A
Sulphur Creek	1	0.0	3.2	3.2	1.5	0.0048	E
	2	3.2	5.6	2.4	1.1	0.0043	A
Sweetwater River	1	0.0	10.9	10.9	2.5	0.0001	C
	2	10.9	27.0	16.1	2.3	0.0012	C
	3	27.0	42.2	15.3	2.1	0.0004	C
West Alkali Creek	1	0.0	4.6	4.6	1.3	0.0018	C
	2	4.6	9.2	4.7	1.3	0.0016	C
	3	9.2	18.4	9.1	1.1	0.0025	A
Phase IV Results							
Cooper Creek	1	0.0	3.9	3.87	1.23	0.009	C
	2	3.9	11.5	7.62	1.07	0.044	A
Cottonwood Creek	1	0.0	8.8	8.83	1.52	0.008	C
	2	8.8	16.1	7.30	1.24	0.028	B
Cottonwood Creek (Trib to Dry Creek)	1	0.0	8.3	8.33	1.63	0.005	E
Dry Creek	1	0.0	20.0	20.03	1.77	0.003	E
	2	20.0	36.4	16.41	1.80	0.005	E
	3	36.4	47.1	10.67	1.39	0.010	C
	4	47.1	52.9	5.76	1.48	0.012	B
East Cottonwood Creek	1	0.0	3.2	3.23	1.38	0.009	B
	2	3.2	6.5	3.31	1.10	0.035	A
	3	6.5	10.5	3.99	1.06	0.070	A
East Fork Middle Cottonwood Creek	1	0.0	1.9	1.88	1.08	0.117	A
East Fork Sage Hen Creek	1	0.0	10.5	10.49	1.28	0.017	B
Middle Cottonwood Creek	1	0.0	2.1	2.12	1.24	0.015	B
	2	2.1	4.3	2.16	1.15	0.031	B
Middle Fork Sage Hen Creek	1	0.0	4.9	4.89	1.12	0.019	A
Sage Hen Creek	1	0.0	9.1	9.07	1.74	0.003	C
	2	9.1	24.5	15.39	1.30	0.005	C
	3	24.5	34.8	10.34	1.55	0.008	E
	4	34.8	39.3	4.48	1.11	0.021	A
Spring Creek	1	0.0	5.9	5.87	1.08	0.053	A
West Cottonwood Creek	1	0.0	2.4	2.41	1.51	0.005	C
	2	2.4	4.9	2.51	1.28	0.016	B
	3	4.9	8.8	3.91	1.08	0.077	A
West Fork Middle Cottonwood Creek	1	0.0	3.8	3.83	1.05	0.085	A
West Sage Hen Creek	1	0.0	5.5	5.52	1.33	0.007	C
	2	5.5	16.9	11.38	1.35	0.009	C
	3	16.9	20.8	3.91	1.10	0.012	A
Willow Creek	1	0.0	5.5	5.50	1.25	0.009	C
	2	5.5	13.0	7.46	1.21	0.014	C
	3	13.0	18.5	5.53	1.08	0.035	B
Sweetwater River	1	0.0	14.9	14.92	2.31	0.001	C
	2	14.9	29.4	14.48	1.67	0.001	C
	3	29.4	41.6	12.18	1.80	0.001	C



N
W E
S

Legend

Cities
US / State Hwy
Sweetwater River Watershed
County Boundary

0 10 20
Miles

Figure 3.48 Sweetwater River Watershed: Rosgen Level I Classification

- As indicated in this figure, the Sweetwater River and the lower reaches of its principal tributaries are generally C-type channels. These channels are generally geomorphically stable and there was relatively little evidence of lateral or vertical channel instability. Bank erosion was noted in certain locations, however, these appear to be localized not indicative of systemic stability issues. Example C-Type channels include the Sweetwater River, Lower Long Creek (Phase I), Lower Muddy Creek (Phase II), Lower Crook and Alkali Creeks (Phase III), and Dry Creek (Phase IV), among others.

- Upper reaches of most stream channels typically transition into B-type and then A-type channels as one moves upward in the system. Perennial streams originating on Ferris Mountain, Whiskey Peak, Crooks Creek, Green Mountain, etc appear to also be generally laterally and vertically stable. These streams typically exhibited coarse bed and bank materials and a variety of riparian vegetation species. Examples include East Fork Long Creek (Phase I), Pete Creek, Rush Creek, and Cherry Creek (Phase II), portions of Crooks Creek and Sulphur Creek (Phase III), and East Sage Creek (Phase IV), among others.

- Utilization of a large number of stream channels by livestock and wildlife has resulted in a lack of diversity in riparian vegetation and locally degraded stream banks. Examples include, but are not limited to East Fork and West Fork Long Creek (Phase I), Arkansas Creek (Phase II), Alkali Creek, Sulphur Creek, Sheep Creek and Crooks Creek (Phase III), and Sage Hen Creek (Phase IV).

- Streams classified as F-type or G-Type channels are typically degraded in some way by definition of the classification. Both stream types are defined as incised channels. G-type channels were encountered throughout the study area and are discussed in each of the individual phase reports. F channels are entrenched, which means that the floodplain is quite narrow relative to the channel width. G-Type Channels are narrow, steep entrenched gullies. G-Type channels typically have high bank erosion rates and a high sediment supply. Channel degradation and sideslope rejuvenation processes are typical. Streams observed which would be classified as F- or G-type stream channels were typically unnamed tributaries to the principal tributaries within the watershed.

3.6.3 Proper Functioning Condition

The BLM utilizes a procedure for assessing the health of a stream called Proper Functioning Condition assessment or PFC. PFC is described by the BLM as:

"A qualitative method for assessing the condition of riparian-wetland areas. The term PFC is used to describe both the assessment process, and a defined, on the-ground condition of a riparian-wetland area. The PFC assessment refers to a consistent approach for considering hydrology, vegetation, and erosion/deposition (soils) attributes and processes to assess the condition of riparian-wetland areas. A checklist is used for the PFC assessment, which synthesizes information that is foundational to determining the overall health of a riparian-wetland system" (BLM, 1998).

The PFC assessment terminates with the definition of one of three classes for a given stream segment as described below.

Proper Functioning Condition: A stream is said to be functioning properly when adequate vegetation, landform, or debris is present to:

- dissipate energies associated with wind action, wave action, and overland flow from adjacent sites, thereby reducing erosion and improving water quality;
- filter sediment and aid floodplain development;
- improve flood water retention and groundwater recharge;
- develop root masses that stabilize islands and shoreline features against cutting action;
- restrict water percolation;
- develop diverse ponding characteristics to provide the habitat and water depth, duration, and temperature necessary for fish production, water bird breeding, and other uses; and
- support greater biodiversity.

Functional At Risk: Riparian/wetland areas are classified as *functioning-at-risk* when they are in functioning condition but an existing soil, water, or vegetation attribute makes them susceptible to degradation. These areas are further distinguished based on whether or not they demonstrate an *upward*, *not apparent*, or *downward* trend.

Nonfunctioning: Riparian/wetland areas are classified as *nonfunctioning* when they clearly are not providing adequate riparian vegetation, physical structure, or large woody debris to dissipate stream energy associated with high flows. Within the project study area, the BLM has conducted PFC assessments on selected stream segments intermittently since 1999. Results of the BLM PFC assessments (Lander Field Office) are shown on Figure 3.49. As evidenced in this figure, the PFC assessment results in evaluation of specific and frequently isolated stream reaches.

PFC Classification

- Proper Functioning Condition
- Functional At Risk
- Non-Functioning

Lander

Fremont County

Natrona County

Sublette County

Sweetwater County

Carbon County

135

287

28

220

N

W E

S

Legend

- Cities
- Sweetwater River
- Streams
- US / State Hwy
- Sweetwater River Watershed
- County Boundary

0 10 20

Miles

Figure 3.49 Sweetwater River Watershed: BLM Proper Functioning Condition (PFC) Assessments

3.6.4 Impairments

Impairments to stream channels within the study area appear to fall into two broad and interrelated categories:

- Riparian Vegetation Degradation: Impaired riparian condition and habitat, and
- Riparian Degradation: Generally bank erosion and physical disturbance of stream banks.

Based upon field observations and information provided by landowners, the Sweetwater River has experienced lateral migration. This is evidenced by numerous locations where bare vertical banks are present. In addition, review of aerial photography shows numerous abandoned channels (oxbows) within its lower reaches (Figure 3.50). A certain degree of lateral migration is a natural occurrence and is characteristic of the stream types encountered. With the exception of a few scattered ranches, much of the existing migration corridor is currently undeveloped. Without human development, a migration corridor could be established within which the river would be allowed to migrate without interference by man. The Sweetwater River can be considered to be a C-Type channel throughout most of its reach. Sinuosity in several areas exceeds 2.0.

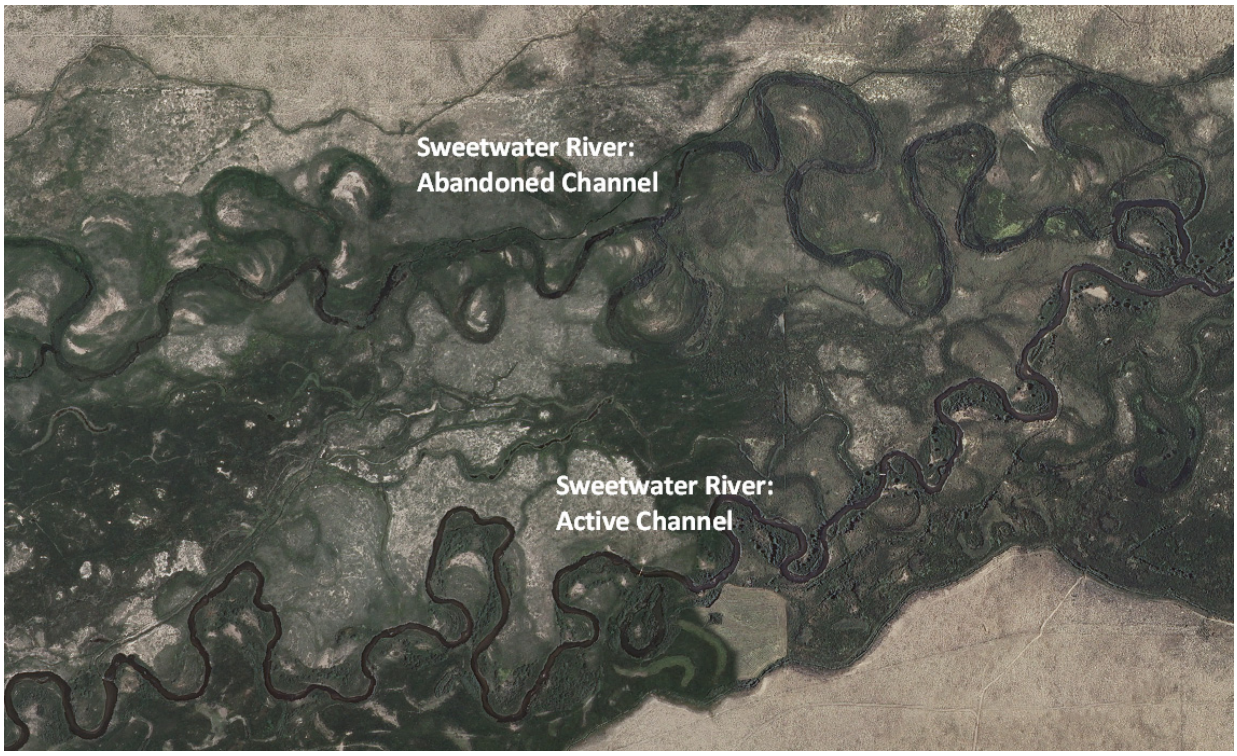


Figure 3.50 Abandoned Channels (Oxbows) On the Sweetwater River.

Channel degradation (incision) appears to be a dominant channel impairment within the portions of the study area. Portions of stream channels throughout the study area evaluated in the Phase I through Phase IV study efforts displayed some form of channel incision. Most notably may be those flanking the eastern side of Whisky Peak near Muddy Gap (Corral Creek, Murphrey Creek, and Corral Creek) evaluated in the Phase II study. The channel incision process tends to follow a relatively predictable series of evolutionary stages (Schumm, et al, 1994). First, the channel begins to erode its bed, downcutting vertically. This process typically migrates in the upstream direction. The downcut channel then begins to widen, as the steep vertical banks are unstable and begin to collapse. As the channel widens, bank angle is reduced, and the banks become more stable. Ultimately, the channel widens enough to allow the formation of depositional berms on the incised channel margin that may be colonized by vegetation. These deposits eventually form a surface bounding the incised channel that serves as a new floodplain that is lower in elevation from the original floodplain. The original floodplain becomes perched as a terrace, and is effectively isolated from the channel.

Within the study area, F- and G-Type channels are most likely to display the channel evolution described above in the future. The consequences of the incised channel evolution process can be severe. Large scale bank instability results in extensive bank failure and sediment production. As the groundwater table drops with the channel bed, the depth to groundwater from the original floodplain surface increases, commonly to the point where pre-incision vegetation patterns are not sustainable. Eventually, however, a new equilibrium condition will be achieved, as the channel develops a new equilibrium profile, and flood energies are dispersed on the new incised floodplain surface.

Multiple approaches to restoration can be applied to incised river channels (Rotar and Boyd, 1999). Common objectives in such restoration efforts are to promote channel stability, as well as to connect the channel to its historic floodplain. The reconnection of the channel to its historic floodplain requires raising the channel bed, which can be achieved through grade controls and channel infilling, or even reconstruction of a new channel. These approaches can have difficult and costly challenges, however, such as tying in the project end points to the incised channel grade, or preventing post-project channel relocation (avulsion). Another approach to incised channel stabilization is to completely armor the channel banks and add grade control structures. This process will reduce sediment inputs, but will not provide a dynamic, functional channel configuration. Perhaps the most geomorphically beneficial approach to incised channel restoration is to promote the natural recovery process of channel widening and incised floodplain development. This can be achieved by encouraging the development of a new floodplain surface adjacent to the channel to provide an area for flood energy dissipation and new riparian corridor establishment.

Any work in incised channel restoration requires an assessment of the status of the current channel stability, so that the potential for further downcutting is known and accommodated for in the channel restoration design.

Riparian conditions appear to be the dominant channel impairment of the B-type channels originating on the eastern side of the basin. Streams such as lower Rush Creek, Pete Creek, Alkali Creek,

Crook Creek, and others are affected by historic and current land use practices, including farming and grazing. Consequently, riparian vegetation is typically degraded in the lower reaches of these channels. Figure 3.51 shows a photo of East Fork Long Creek which exemplifies the character of these channels where loss of riparian conditions has led to bank erosion and channel degradation. Figure 3.52 displays a photo of Sage Hen Creek which has experienced similar degradation of riparian vegetation.

Figure 3.51 Example of Loss of Riparian Vegetation: Upper East Fork Long Creek.

3.7 Water Quality

3.7.1 Stream Classifications

All streams named on the U.S. Geological Survey 1:500,000 scale hydrologic map of Wyoming and other selected streams have been classified for protection of one or more designated uses by the Water Quality Division of the WDEQ. The stream classifications applicable to the study area as noted in the latest Wyoming Surface Water Classification List (WDEQ, 2001) are indicated below. Table 3.17 lists the classified streams within the study area. The definitions of the stream classes applicable to the watershed are quoted from the Water Quality Rules and Regulations, Chapter 1, Wyoming Surface Water Quality Standards (WDEQ, 2007) as follows:

WYDEQ defines class 1 waters as follows:

"Class 1, Outstanding Waters. Class 1 waters are those surface waters in which no further water quality degradation by point source discharges other than from dams will be allowed. Nonpoint sources of pollution shall be controlled through implementation of appropriate best management practices. Pursuant to Section 7 of these regulations, the water quality and physical and biological integrity which existed on the water at the time of designation will be maintained and protected. In designating Class 1 waters, the Environmental Quality Council shall consider water quality, aesthetic, scenic, recreational, ecological,

Figure 3.52 Loss of Riparian Vegetation and Habitat on Sage Hen Creek.

agricultural, botanical, zoological, municipal, industrial, historical, geological, cultural, archaeological, fish and wildlife, the presence of significant quantities of developable water and other values of present and future benefit to the people.

Table 3.17 WDEQ Stream Classifications in the Sweetwater River Watershed.

Stream	WDEQ Class
Sweetwater River above Alkali Creek	1
Sweetwater River below Alkali Creek	2AB
Dry Creek	2AB
Roberts Dr	3B
Cottonwood Creek	3B
Playa Lake	3B
Soda Lakes	3B
Rush Creek	3B
Pete Creek	2AB
Cherry Creek	2AB
Jackson Lakes	3B
Bucklin Reservoir	2AB
Muddy Creek	3B
Camp Creek	3B
Little Camp Creek	3B
Soda Lake	3B
Willow Creek	2AB
Cooper Creek	2AB
Lankin Creek	2AB
Cottonwood Creek	2AB
Sage Hen Creek	2AB
Diamond Springs Draw	3B
West Sage Hen Creek	2AB
Crooks Creek	2AB
Fourth Cr	2AB
Sheep Creek	2AB
Buffalo Creek	3B
O'Brian Creek	3B
Nancy Creek	3B
Haypress Creek	3B
Long Creek	2AB
West Fork Long Creek	2AB
East Fork Long Creek	2AB
Warm Springs	3B
Ice Slough	3B
Koehler Draw	3B
Carmody Lake	2AB
Crooked Creek	3B
Rock Draw	3B
Alkali Creek	2AB
Coyote Gulch	3B
East Alkali Creek	2C
West Alkali Creek	3B
Sulphur Creek	2AB
Picket Creek	3B
Picket Lake	2AB
Silver Creek	3B
Chimney Creek	2AB
Spring Creek	2AB
WIllow Creek	2AB
Lewiston Creek	2AB
Mormon Creek	2AB
Strawberry Creek	2AB
Harris Slough	2AB
Long Slough	3B

Stream	WDEQ Class
Rock Creek	2AB
Tabor Gulch	3B
Slate Creek	2AB
Oregon Slough	2AB
Slaughterhouse Gulch	2AB
Pine Creek	2AB
Fish Creek	2AB
Lander Creek	2AB
Blucher Creek	2AB
East Fork Sweetwater River	2AB
Clear Creek	2AB
Mill Creek	2AB
Blair Creek	2AB
Pool Creek	2AB
Larson Creek	2AB
Sweetwater Creek	2AB
Warm Springs	3B
Ice Slough	3B
Koehler Draw	3B
Carmody Lake	2AB
Crooked Creek	3B
Rock Draw	3B
Alkali Creek	2AB
Coyote Gulch	3B
East Alkali Creek	2C
West Alkali Creek	3B
Sulphur Creek	2AB
Picket Creek	3B
Picket Lake	2AB
Silver Creek	3B
Chimney Creek	2AB
Spring Creek	2AB
WIllow Creek	2AB
Lewiston Creek	2AB
Mormon Creek	2AB
Strawberry Creek	2AB
Harris Slough	2AB
Long Slough	3B
Rock Creek	2AB
Tabor Gulch	3B
Slate Creek	2AB
Oregon Slough	2AB
Slaughterhouse Gulch	2AB
Pine Creek	2AB
Fish Creek	2AB
Lander Creek	2AB
Blucher Creek	2AB
East Fork Sweetwater River	2AB
Clear Creek	2AB
Mill Creek	2AB
Blair Creek	2AB
Pool Creek	2AB
Larson Creek	2AB
Sweetwater Creek	2AB

WYDEQ defines class 2AB waters as follows:

Class 2AB waters are those 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 use is otherwise attainable. Class 2AB waters include all permanent and seasonal game fisheries and can be either "cold water" or "warm water" depending upon the predominance of cold water or warm water species present. All Class 2AB waters are designated as cold water game fisheries unless identified as a warm water game fishery by a "ww" notation in the "Wyoming Surface Water Classification List". Unless it is shown otherwise, these waters are presumed to have sufficient water quality and quantity to support drinking water supplies and are protected for that use. Class 2AB waters are also protected for nongame fisheries, fish consumption, aquatic life other than fish, recreation, wildlife, industry, agriculture and scenic value uses.

WYDEQ defines class 3B waters as follows:

Class 3B waters are tributary waters including adjacent wetlands that are not known to support fish populations or drinking water supplies and where those uses are not attainable. Class 3B waters are intermittent and ephemeral streams with sufficient hydrology to normally support and sustain communities of aquatic life including invertebrates, amphibians, or other flora and fauna which inhabit waters of the state at some stage of their life cycles. In general, 3B waters are characterized by frequent linear wetland occurrences or impoundments within or adjacent to the stream channel over its entire length. Such characteristics will be a primary indicator used in identifying Class 3B waters."

3.7.2 WYDES Permitted Discharges

A database of permitted discharges under the National Pollution Discharge Elimination System (NPDES) was obtained from the Wyoming Department of Environmental Quality. Based upon a total of 13 active permitted discharges are present within the study area. (This number does not include temporary permits). Table 3.18 summarizes pertinent information regarding the permits. The locations of these discharges are shown on Figure 3.53. Stormwater permits are not considered here due to the relatively low potential for significant impacts to the watershed assuming that the applicable BMPs and other controls contained in the permits are being implemented.

Table 3.18 Summary of WYPDES Permitted Discharge Locations.

ID	WY Permit Number	Outfall Number	Permittee	Facility Name	Receiving Water	Permit Status	Permit Expire	Permit Type
1	WY0000493	1	Wesco Operating, Inc.	South Sand Draw Unit	West Fork Long Creek	In Effect	2/28/2013	Oil Treaters
2	WY0024244	1	Richardson Operating Company	Happy Springs Unit	Nancy Creek	In Effect	4/30/2013	Oil Treaters
3	WY0025887	1	US Ore Corporation	Sheep Creek Field Cheyenne	Tributary to Sheep Cr	In Effect	4/30/2013	Oil Treaters
4	WY0025950	1	Green Mountain Mining Venture	Big Eagle Mine	Crooks Creek	In Effect	6/30/2013	Industrial
5	WY0033952	1	Green Mountain Mining Venture	Jackpot Mine	No Name Creek	In Effect	8/31/2013	Industrial
6	WY0033952	2	Green Mountain Mining Venture	Jackpot Mine	Fourth Creek	In Effect	8/31/2013	Industrial
7	WY0039187	1	Hudson, Robert	Picket Lake 40-13	Red Creek	In Effect	12/31/2012	Oil Treaters
8	WY0049662	5	Hudson Group, LLC	Picket Lake	Great Divide Basin	In Effect	4/30/2013	Coal Bed Methane
9	WY0049662	7	Hudson Group, LLC	Picket Lake	Great Divide Basin	In Effect	4/30/2013	Coal Bed Methane
10	WY0049662	12	Hudson Group, LLC	Picket Lake	Great Divide Basin	In Effect	4/30/2013	Coal Bed Methane
11	WY0049662	22	Hudson Group, LLC	Picket Lake	Great Divide Basin	In Effect	4/30/2013	Coal Bed Methane
12	WY0049662	24	Hudson Group, LLC	Picket Lake	Great Divide Basin	In Effect	4/30/2013	Coal Bed Methane
13	WY0049662	25	Hudson Group, LLC	Picket Lake	Great Divide Basin	In Effect	4/30/2013	Coal Bed Methane

3.7.3 Waters Requiring TMDLs

A Total Maximum Daily Load (TMDL) is the amount of pollutant which a stream can accept and still meet its designated uses. TMDLs must be established for each pollutant which is a source of stream impairment. They must be measurable and must consider both point and nonpoint source pollutant loads, natural background conditions, and a margin of safety.

Section 303(d) of the Clean Water Act requires States to:

1) Identify all waters of the state which are impaired--i.e. they contain pollutants which adversely affect the designated use of the water.
2) Prioritize all impaired waterbodies for development of TMDLs. Prioritization is to take into consideration public health and environmental risk. Therefore, point source discharges generally are a higher priority than nonpoint sources of clean sediment.
3) Establish and adopt TMDLs for all impaired waterbodies or for waterbodies which would be impaired if a TMDL was not established.

If a state does not comply with Section 303(d), the Environmental Protection Agency is required to perform these activities.

Crooks Creek has been listed by the WDEQ an impaired waterbody for oil and grease contamination just outside the GMCA boundary. According to the 305[b] Report of 2010, ambient monitoring of Crooks Creek, revealed a significant amount of oil in sediments, a violation of water quality standards. The source of oil is unknown at this time, but this stream is targeted on Table A of the 303[d] (Impaired Waterbody) list (p.55 of the list).

Lander
Fremont County
Natrona County
Sublette County
Sweetwater County
Carbon County
135
287
28
220
1
2
3
4
5
6
7
8
9
10
11
12
13

Reference Table 3.18 for detailed information related to NPDES Permits

N
W
E
S

Legend

- NPDES Permit Within Phase I - IV Study Areas
- NPDES Permit Outside Phase I - IV Study Areas
- Cities
- Sweetwater River
- Streams
- US / State Hwy
- Sweetwater River Watershed
- County Boundary

0 10 20
Miles

Figure 3.53 Sweetwater River Watershed: Location of NPDES Permitted Discharges

IV. WATERSHED MANAGEMENT AND REHABILITATION PLAN

IV. WATERSHED MANAGEMENT AND REHABILITATION PLAN

4.1 Overview

As stated previously, the objective of this study is to generate a watershed management and irrigation rehabilitation plan that is not only technically sound, but also one that is practical and economically feasible. In conjunction with the development of a database for the watershed, the investigative phase of this study focused on an assessment of the watershed and the identification and evaluation of improvements to address those issues described in Chapter 3.

Potential improvements were developed and categorized into the following:

- **Irrigation System Conservation and Rehabilitation.** The inventory and evaluation of the existing infrastructure was completed and improvements identified for the rehabilitation of existing structures and the potential conservation of existing irrigation diversions.

- **Livestock / Wildlife Upland Watering Opportunities**. Based upon an evaluation of existing water sources and the condition of upland grazing resources, potential upland water source development projects were identified.

- **Surface Water Storage Opportunities**. Based on flow availability and site-specific topography, potential storage reservoirs were identified, screened and evaluated.

- **Stream Channel Condition and Stability**. Stream channels within the watershed were characterized with respect to their condition and stability. Impaired channels were identified for further evaluation and alternative improvements developed.

- **Grazing Management Opportunities**. Based upon a review of the pertinent Ecological Site Descriptions (ESDs) and the ambient vegetation and soil conditions, grazing management strategies are presented.

- **Other Upland Management Opportunities**. Additional watershed management alternatives were identified.

In each of the Phase I through Phase IV reports, rehabilitation plans were developed for each category of the watershed management plan presented above. Conceptual designs and cost estimates were prepared in support of those components. In the remainder of this chapter of the Basinwide Summary, the watershed management plans developed in each phase are collated to form a watershed

management plan for the Sweetwater River watershed. The plans were prepared to provide an overview of potential improvements that can partially or fully address the key issue identified within the watershed.

In the remainder of this chapter, the individual plans developed within each watershed component are described and evaluated with respect to improving the existing water supply through conservation. The results of the geomorphic assessment are further refined to identify those impaired reaches that merit more immediate attention.

For the purposes of tracking individual components of the watershed management plan, each component was designated a unique project or 'improvement' number. The prefixes used for each improvement describe the category of the watershed management plan it falls under. The prefixes are as follows:

- Project Components "I": Irrigation system rehabilitation components
- Project Components "L/W": Livestock / wildlife upland watering opportunities
- Project Components "R": Reservoir storage Opportunities
- Project Components "G": Grazing management opportunities
- Project Components "S": Stream channel stability components
- Project Components "O": Other management opportunities

In summary, this chapter provides a plan that can be used to guide future efforts to enhance the water resources within the Sweetwater River Watershed Study Area.

4.2 Irrigation System Conservation and Rehabilitation (Plan Components "I")

During the Phase I through Phase IV investigations, irrigation systems were evaluated at the request of landowners. The system evaluations consisted of either single structures identified by the landowner (ex. a ditch headgate) or the entire length of a ditch and all of the infrastructure associated with it. For each structure inventoried, a determination was made of its rehabilitation needs, if any. Structures needing rehabilitation or replacement were included in the respective watershed management plan for the pertinent phase of the project.

The rehabilitation plan represents the integration of individual measures to mitigate problems identified in the inventory phase of the project. Specifically, the improvements that comprise the rehabilitation plan focus on:

- Rehabilitation/replacement of existing structures
- Mitigation of seepage losses
- Enhanced delivery of water

- Reduction in annual operation and maintenance costs
- Improvement in ditch management and efficiency through water measurement
- Economic practicality
- Physical feasibility

The plan is intended to provide the ditch owners an assessment of conditions associated with the ditch and its associated hydraulic structures. The irrigator can use the plan as a "resource or wish list" from which they can select projects for potential future funding assistance from sources such as the WWDC Small Water Project Program or NRCS EQIP.

In an effort to assist the ditch owner in prioritizing potential improvements to each ditch, relative priorities were defined as follows:

Priority 1: Install, replace, or rehabilitate aging infrastructure critical to the diversion and delivery of water.

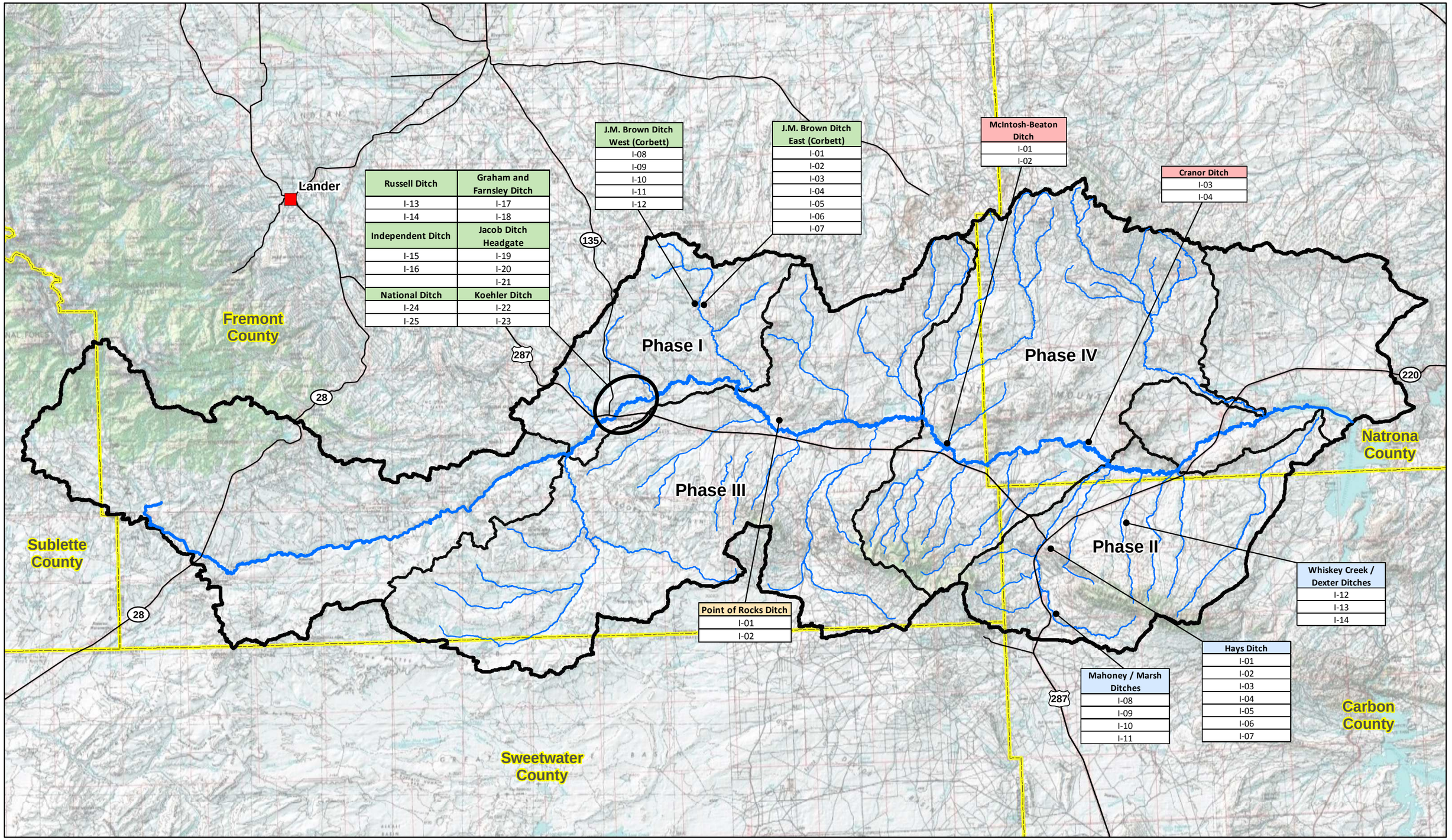
Priority 2: Install, replace, or rehabilitate aging infrastructure critical to the operation, measurement, and management of the irrigation diversions.

Priority 3: Install, replace, or rehabilitate aging infrastructure to provide improvements in on-farm efficiency and conservation.

The number of irrigation rehabilitation projects delineated in Phase I through IV are presented in Table 4.1. Figure 4.1 displays their general locations. These components are then incorporated into the Sweetwater River Watershed Management Plan presented in Section 4.8

Table 4.1 Tabulation of Irrigation System Rehabilitation Projects: Phase I through Phase IV.

Phase	Number of Recommended Irrigation System Rehabilitation Projects
Phase I	25
Phase II	14
Phase III	2
Phase IV	4
Total	**45**



N
W E
S

Legend

Cities — Sweetwater River — US / State Hwy — County Boundary

Project Phase — Streams — Sweetwater River Watershed

0 10 20

Miles

Figure 4.1 Sweetwater River Watershed: Irrigation Rehabilitation Project Locations: Phase I through Phase IV

4.3 Upland Wildlife/Livestock Watering Sources (Plan Components "L/W")

4.3.1 Alternative New Watering Opportunities

Based upon the premise that existing water sources are capable of providing water to livestock within a one mile radius, buffers were drawn around existing water sources discussed in Chapter 3 (Figure 4.2). Note that this figure does not show buffers about perennial / intermittent streams, nor springs. A general objective of this effort was to provide means of providing reliable sources of livestock / wildlife drinking water as alternative water supplies to riparian corridors. As indicated in this figure, much of the study area appears to be adequately supplied with water sources. However, it is important to note that many of these sources are stock reservoirs located on intermittent/ephemeral channels and are consequently reliant upon uncertain runoff. Long-term or season-long utility is not always certain. Based upon this analysis, much of the study area may benefit by the development of upland water sources. In addition, land owners indicated locations where existing sources could benefit from enhanced or improved infrastructure.

As presented in Chapter 3, there are numerous springs scattered throughout the study area. Many of these could conceivably be developed as upland water sources for wildlife and livestock. Prior to the design of any project, site-specific evaluation of the water source would be required to ensure adequate water yield and to develop environmental safeguards. Final design of any upland water projects would consequently require consideration of the yield of the water source and the number of animals the project is anticipated to serve. Sizing of water facilities cannot be determined at this time due to the uncertainties associated with the grazing management plan proposed by the BLM.

For the purposes of this project, watering facilities were assumed to typically consist of rubber tire stock tanks providing approximately 1,200 gallons of storage. This volume would facilitate the water needs of approximately 80 cattle per day assuming a water requirement of 15 gallons per day. A water source capable of providing 1 gallon per minute would be required to supply these facilities. Within the Green Mountain Common Allotment (Phase III Study Area), larger 10,000 gallon water tanks were incorporated due to potential herding strategies requiring watering larger numbers of animals at a given time. By incorporating closed storage tanks in a project design, greater use of existing water sources could be realized.

4.3.2 Upland Wildlife/Livestock Water Development Projects

While completing the Phase I through Phase IV investigations, the project team met with landowners and allotment permittees to obtain their input regarding the availability of water in their areas. Individual meetings were scheduled and completed to gain their input on the water needs of

Viable Upland Water Source

Unevaluated Potential Upland Water Source

1 Mile Buffer Perennial Source

1 Mile Buffer Intermittent Source

Project Phase

Lander

135

287

28

Fremont County

Natrona County

Phase I

Phase IV

Phase III

Phase II

220

Sublette County

28

Carbon County

287

Note: See respective phase reports for detailed information regarding water sources

Sweetwater County

N

W E

S

Legend

Cities

Sweetwater River

Streams

US / State Hwy

Sweetwater River Watershed

County Boundary

0 10 20

Miles

Figure 4.2 Sweetwater River Watershed: Existing Upland Water Sources with 1 Mile Buffers

their respective geographical areas of interest. Based upon the results of these interviews and the information presented above pertaining to existing water supplies and areas in need of upland water development, conceptual water development projects were identified.

The general objective of this effort was to create a means of providing reliable sources of livestock / wildlife drinking water in water-short portions of the watershed as well as alternative water supplies to riparian corridors. In the individual Phase reports, alternatives are described at the conceptual level. For each project, a conceptual design is also presented. It must be kept in mind that these designs are conceptual only and if implemented, detailed design would be required.

Completion of upland water development projects would frequently involve coordination with the BLM in order for construction to occur. Written agreements would be required which define the maintenance responsibility and ownership liability associated with each project. In addition, environmental evaluations would be required for the impacts identified with each project. BLM typically conducts these evaluations; however, the NRCS or other agencies may provide input, particularly on archaeological or cultural resources issues. Consequently, implementation would be partially contingent upon BLM scheduling and manpower for their completion of the requisite evaluation and documentation. It is our understanding that the permitting process is simplified for those projects which do not involve placement of above ground facilities pipeline alignment only and thus requiring granting of easement for buried pipelines

The number of livestock / wildlife projects delineated in Phase I through Phase IV are presented in Table 4.2. Figure 4.3 displays the general location of all livestock/wildlife water opportunity projects. These components are then incorporated into the Sweetwater River Watershed Management Plan presented in Section 4.8.

Table 4.2 Tabulation of Livestock/Wildlife Water Supply Projects: Phase I through Phase IV.

Phase	Number of Recommended Livestock / Wildlife Projects
Phase I	14
Phase II	27
Phase III	40
Phase IV	10
Total	**91**

4.4 Reservoir Storage Opportunities (Plan Components "R")

Development of additional storage has been identified as a potential objective within the PhaseI study area (Long Creek). Storage could be developed as a source of irrigation water for irrigators within the Long Creek watershed and for irrigators on the Sweetwater River downstream. It must be

L/W-01 Phase I Upland Project locations

L/W-02 Phase II Upland Project locations

L/W-03 Phase III Upland Project locations

L/W-04 Phase IV Upland Project locations

Lander

Fremont County

Natrona County

Sublette County

Sweetwater County

Carbon County

Phase I

Phase II

Phase III

Phase IV

135

287

28

220

N

W E

S

Legend

Cities

Project Phase

Sweetwater River

Streams

US / State Hwy

Sweetwater River Watershed

County Boundary

0 10 20

Miles

Figure 4.3 Sweetwater River Watershed: Potential Upland Livestock/Wildlife Project Locations: Phase I through Phase IV

kept in mind when reviewing these alternatives, that evaluation of any storage opportunities would first require evaluation of existing Wyoming water law, specifically, adherence to requirements of the North Platte River Decree.

Four potential reservoir storage opportunities were identified within the Phase I study area through review of existing topography (Figure 4.4). Sites were selected based upon topographic features facilitating dam and reservoir construction. Based upon existing topographic maps, conceptual-level designs were completed, including estimates of dam size, dam configuration, and reservoir storage capacity.

Given the constraints associated with the North Platte River Decree and restrictions placed upon future storage development within the greater watershed area, evaluation of reservoir storage projects was discontinued upon completion of the Phase I study (Table 4.3).

Table 4.3 Tabulation of Reservoir Storage Development Projects: Phase I through Phase IV.

Phase	Number of Recommended Reservoir Storage Projects
Phase I	4
Phase II	0
Phase III	0
Phase IV	0
Total	**4**

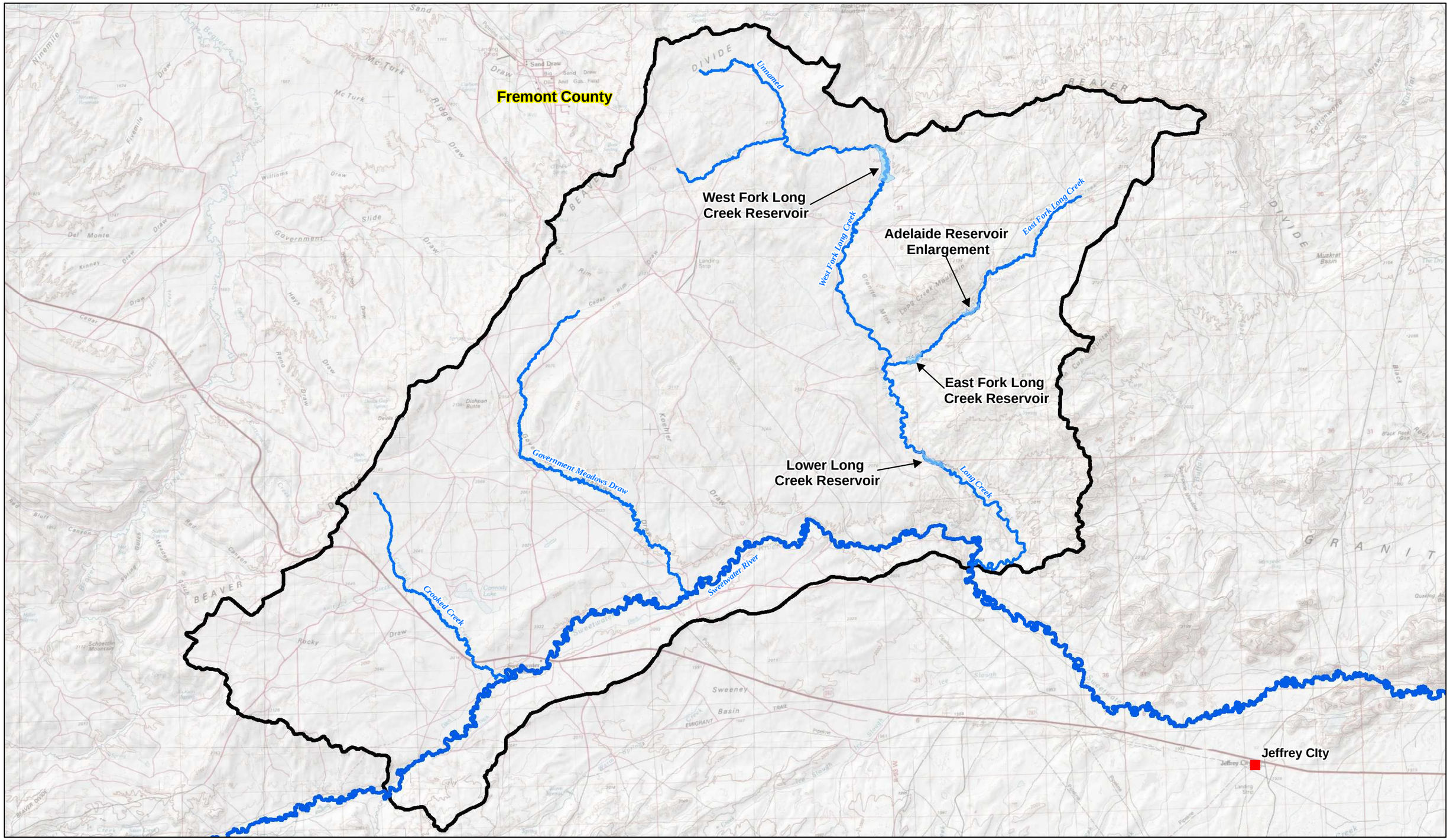
4.5 Stream Channel Condition and Stability (Plan Components "S")

4.5.1 Stream Channel Restoration Strategies

The general condition of the principal stream channels and primary tributaries were evaluated during the geomorphic investigations associated with the Phase I through Phase IV study efforts. Results of the studies are presented in Chapter 3. During the evaluation of existing channel conditions, several impaired reaches were identified and two general classes of impairments noted. The general category of impairments were classified as indicated below:

- Channel degradation/incision; and
- Bank erosion associated with channel migration and/or widening.

Various approaches can be taken during channel restoration and stabilization efforts, including both "hard" engineering and "soft" approaches and combinations of the two. Examples of "hard"



N
W E
S

Legend

- Potential Storage Site Locations
- Cities
- Sweetwater River
- Streams
- Phase I Study Area
- County Boundary

0 12,000 24,000

1 Inch = 12,000 Feet

Figure 4.4 Sweetwater River Watershed: Potential Reservoir Storage Project Locations

approaches would include construction of channel structures or reconstruction of channels themselves. The selection of the appropriate mitigation/restoration technique depends upon site-specific information and critical review of hydrologic and hydraulic data. Installation of an inappropriate type of structure or improper installation could exacerbate conditions.

For instance, methods of restoring incised channels may include construction of gradient restoration facilities (i.e., drop structures, check structures) within the incised channel. Figure 4.5 displays a diagram of a typical stream channel stabilization strategy for small channel experiencing limited incision where log check dams are placed in series within a problematic reach. Figure 4.6 shows an alternative form of stream stabilization: the rock filled gabion.

Figure 4.6 Stream Stabilization Structure.

Re-establishment of pre-incision channel elevations can be accomplished by means of check dams. Figure 4.7 displays a photo of a large-scale check dam on Muddy Creek within the Little Snake River Watershed. While this structure is considerably larger than would likely be required in the current study area, it serves as a good example of how gradient restoration strategies can be utilized to restore diversion capabilities at irrigation headgates rendered inoperable by changes in channel configuration.

Figure 4.7 Channel Gradient Restoration Feature on Muddy Creek near Baggs, WY. Photo on left is viewed downstream from the dam at incised channel. Photo on the right is viewed upstream at restored gradient.

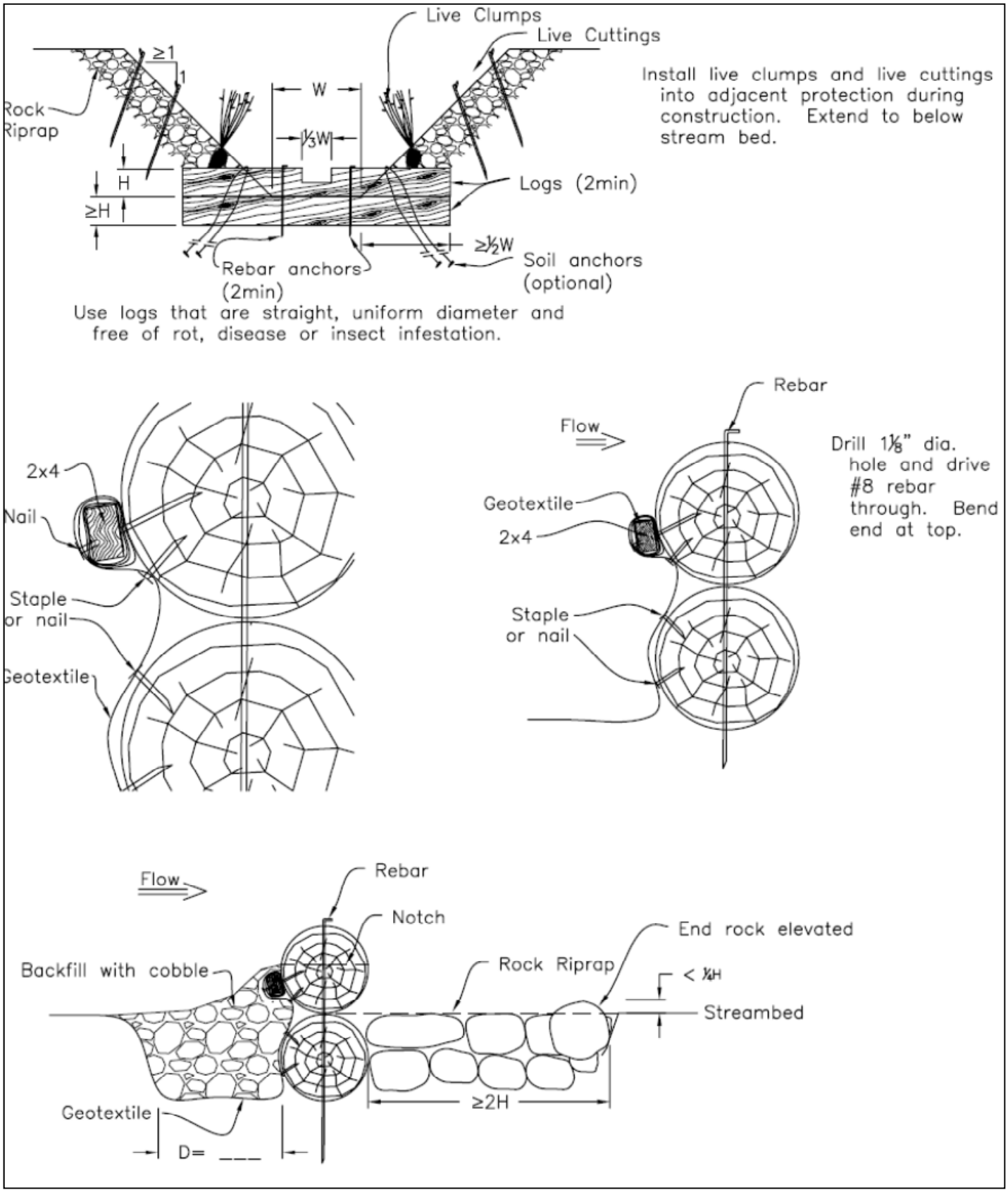


Figure 4.5 Conceptual Design: Log Check Dam.

Examples of "soft" approaches include a variety of Best Management Practices (BMPs). Examples of potentially applicable BMPs designed for channel restoration activities include those that result in reducing or, at least temporarily, excluding wildlife and livestock from accessing designated riparian zones, establishment of riparian buffers, etc. The proposed and potential wildlife/livestock water developments discussed previously (and others that may be identified in the future) can be considered elements of a range management BMP that will help restore over time those areas of channel impairment related to historic or current grazing practices that have resulted in overutilization of riparian areas or adjacent upland range. Figure 4.8 displays a photo of willow fascine installation. This strategy could be employed on many of the perennial channels or intermittent where sufficient flow exists to support the vegetation, in an effort to restore riparian habitat and stabilize streambanks.

Figure 4.8 Stream Stabilization Measure: Willow Fascine Installation.

These examples of "hard" and "soft" approaches represent both extremes of the continuum of channel restoration strategies that exist. In practice, it must be kept in mind that it is generally a combination of strategies, integrated into a cohesive plan that provides the most effective solution. Table 4.4 presents a summary of some of these channel restoration strategies which can be employed during future restoration efforts.

Development of more specific projects and BMPs was beyond the scope of this Level I study. Such projects can be identified and developed on the basis of more detailed geomorphic analysis of impaired stream reaches.

4.5.2 Stream Channel Components of the Watershed Management Plan

In each of the Phase I through Phase IV studies, streams were classified using the Rosgen Level I approach. Project Team members observed streams in each phase's study area throughout the completion of the project. Based upon these classifications and observations, general stream reaches were identified which would benefit from stream channel restoration efforts. Definition of specific plans for the streams or stream segments was beyond the scope of this project. Table 4.5 tabulates the streams within each Phase which were identified as those which would benefit from rehabilitation

efforts. It must be kept in mind that this listing is not intended to represent a comprehensive itemization of impaired stream reaches in need of rehabilitation. This list is provided to flag those areas where future planning efforts could be initiated targeting stream channel health and rejuvenation.

Table 4.4 Summary of Potential Stream Channel Stabilization/Restoration Techniques.

Flow-Redirection Techniques	**Biotechnical Techniques**
Vanes	Woody Plantings
Groins	Herbaceous Cover
Buried Groins	Soil Reinforcement
Barbs	Coir Logs
Engineered Log Jams	Bank Reshaping
Drop Structures	**Internal Bank-Drainage Techniques**
Porous Weirs	Subsurface Drainage Systems
Structural Techniques	**Avulsion-Prevention Techniques**
Anchor Points	Floodplain Roughness
Roughness Trees	Floodplain Grade Control
Riprap	Floodplain Flow Spreaders
Log Toes	**Other Techniques**
Roughened-Rock Toes	Channel Modifications
Log Cribwalls	Riparian-Buffer Management
Manufactured Retention Systems	Spawning-Habitat Restoration
	Fish Ladders/bypass structures
	Fish Screens/entrainment prevention

Based on the information presented above, the following items are presented for inclusion in the Sweetwater River Watershed Management plan:

Watershed Plan Component S-1: Installation of stream channel degradation/incision mitigation measures based upon site-specific evaluation of conditions. Appropriate mitigation measures could be 'hard' engineering, 'soft' approaches, or combinations of both.

Watershed Plan Component S-2: Installation of stream bank erosion mitigation measures based upon site-specific evaluation of conditions. Appropriate mitigation measures could be 'hard' engineering, 'soft' approaches, or combinations of both.

Figure 4.9 displays the general location of the stream channels presented above. These components are then incorporated into the Sweetwater River Watershed Management Plan presented in Section 4.8.

Table 4.5 Tabulation of Stream Channel Rehabilitation Projects: Phase I through Phase IV.

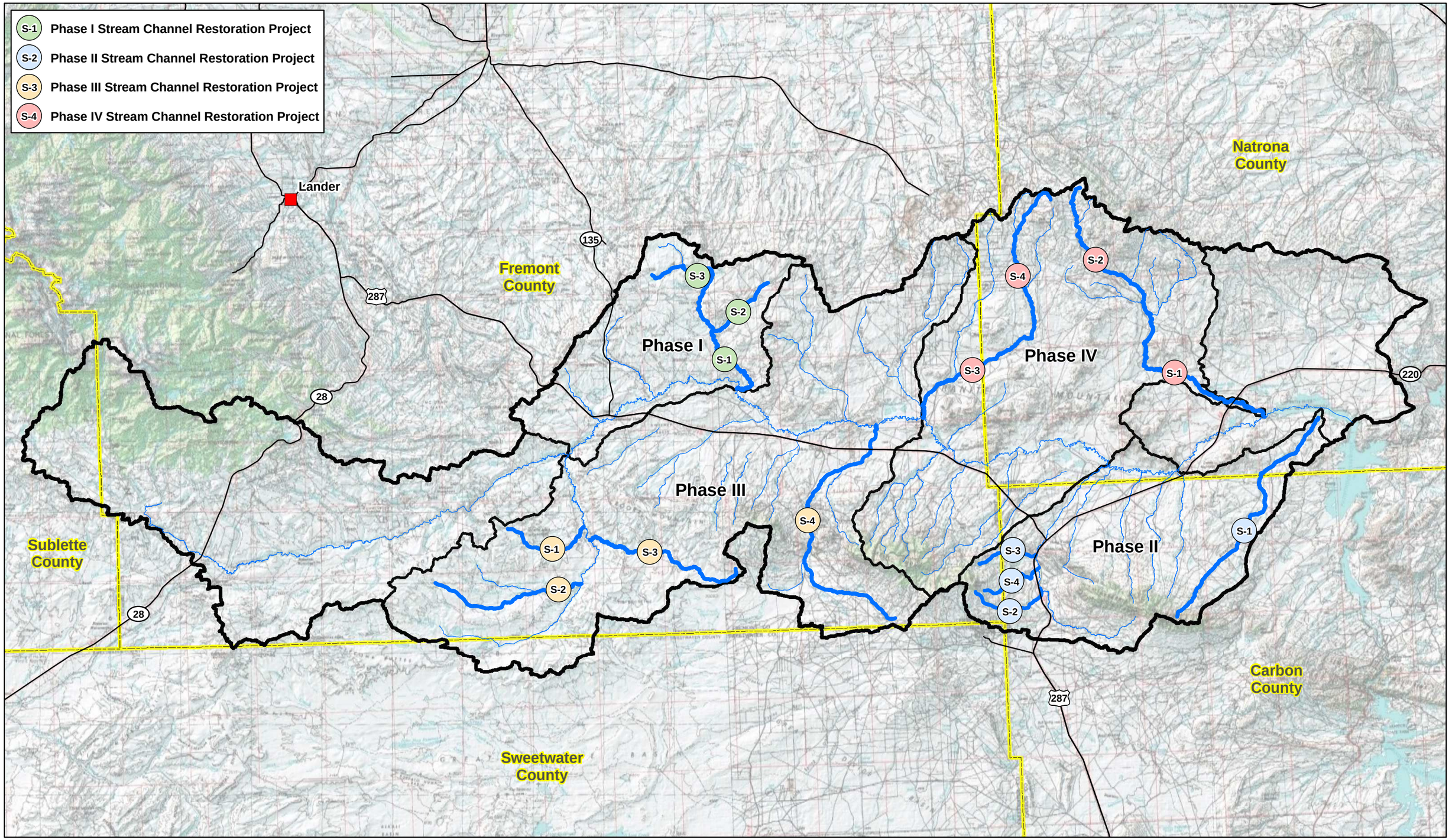
Phase I	
Plan Component	**Stream**
S-1	Long Creek Restoration
S-2	East Fork Restoration
S-3	West Fork Long Creek
Phase II	
S-1	Arkansas Creek Restoration
S-2	Murphrey Creek Restoration
S-3	Camp Creek Restoration
S-4	Corral Creek Restoration
Phase III	
S-1	Coyote Gulch Rehabilitation
S-2	Sulphur Creek Rehabilitation
S-3	Upper East Alkali Creek Rehabilitation
S-4	Crooks Creek Rehabilitation
Phase IV	
S-1	Lower Dry Creek Rehabilitation
S-2	Upper Dry Creek Rehabilitation
S-3	Lower Sage Hen Creek Rehabilitation
S-4	Upper Sage Hen Creek Rehabilitation

4.6 Grazing Management Opportunities

4.6.1 State and Transition Models

In Chapter 3, the ecological sites found within the watershed were presented and the concept of the ecological site description (ESD) was introduced. The ESD for a given ecological site contains a wealth of information pertaining to the site and its community. Within each ESD is a State and Transition model.

State and transition models describe the patterns, causes, and indicators of transitions between communities within an ecological site based upon the ecological site description (ESD). In a graphical form, they display information obtained from literature supplemented by the knowledge and experience of range scientists and managers. Basically, they display the response of a given ecological site to various range management practices or disturbances. They help to distinguish changes in vegetation and soils that are easily reversible versus changes that are subject to thresholds beyond which reversal is costly or unlikely. By being aware of the predicted response of a given ecological site to a treatment, the land manager can use this knowledge to best prescribe land management practices or treatments to direct the transition in a desirable direction. For instance, land management strategies can be prescribed



N
W E
S

Legend

- Cities
- Recommended Stream Channel Rehabilitation Reach
- Stream
- US / State Hwy
- Project Phase
- Sweetwater River Watershed
- County Boundary

0 10 20

Miles

Figure 4.9 Sweetwater River Watershed: Recommended Stream Channel Rehabilitation Projects: Phase I through IV

which could result in restoration of the Historic Climax Plant Community (HCPC) under the right circumstances.

Based upon the assumptions presented in Chapter 3, the three dominant ecological sites found within the Sweetwater River Creek Watershed study area are likely to be the following:

- Sandy 10-14 inch precipitation zone, High Plains Southeast
- Shallow loamy 10-14 inch High Plains Southeast
- Loamy 10-14 inch High Plains Southeast

It is important to note that other ecological sites will be encountered and that the list above is provided as an initial point for prescription of grazing practices. Prior to prescription of a grazing management plan, local site-specific conditions must be considered and the appropriate ESD determined.

4.6.1.1 ESD: Sandy 10-14 inch precipitation zone, High Plains Southeast

One of the most prevalent ecological sites within the lower portions of the study area is the Sandy 10-14 inch precipitation zone, High Plains Southeast site. Figure 4.10 displays the state and transition model for this site.

The following description of the ecological site's Reference Plant Community (RPC) and transitions to and from it was extracted from the NRCS ESD for the site:

Needleandthread/Rhizomatous Wheatgrass Plant Community

The interpretive plant community for this site is the Reference Plant Community. Potential vegetation is estimated at 75% grasses or grass-like plants, 10% forbs and 15% woody plants. The major grasses include needleandthread, Indian ricegrass, and rhizomatous wheatgrass. Big and silver sagebrush are the major woody plants. A typical plant composition for this state consists of needleandthread 20-50%, rhizomatous wheatgrass 15-25%, Indian ricegrass 10-20%, perennial forbs 5-10%,and shrubs 5-10%. Ground cover, by ocular estimate, varies from 35-45%.The total annual production (air-dry weight) of this state is about 1200 pounds per acre, but it can range from about 700 lbs/acre in unfavorable years to about 1500 lbs/acre in above average years. This state is extremely stable and well adapted to the Cool Central Desertic Basins and Plateaus climate.

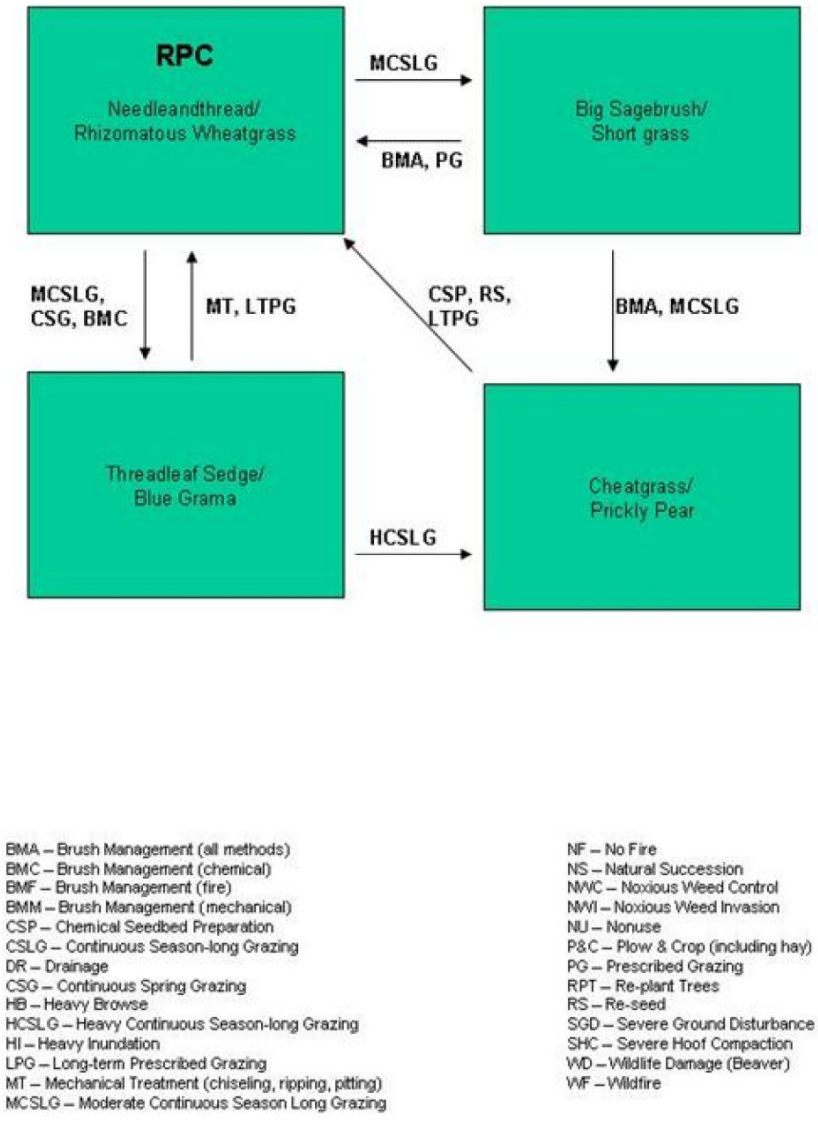


Figure 4.10 State and Transition Model Diagram: Sandy 10-14 inch precipitation zone High Plains Southeast.

The diversity in plant species allows for high drought resistance. This is a sustainable plant community (site/soil stability, watershed function, and biologic integrity).

Transitions or pathways leading to other plant communities are as follows:

- *Moderate Continuous Season-long Grazing will convert the plant community to the Big Sagebrush/Shortgrass Plant Community if big sagebrush is present at 5-10%.*
- *Moderate Continuous Season-long Grazing or Continuous Spring Grazing with Brush Management (chemical) will convert the plant community to the Threadleaf Sedge/Blue grama Plant Community.*

4.6.1.2 ESD: Shallow loamy 10-14 inch High Plains Southeast

Another prevalent ecological site within the study area is the Shallow loamy 15-19 inch High Plains Southeast. Figure 4.11 displays the state and transition model for this site. The following description of the ecological site's HCPC and transitions to and from it was extracted from the NRCS ESD for the site:

Bluebunch Wheatgrass/ Rhizomatous Wheatgrass Plant Community (HCPC)

The interpretive plant community for this site is the Historic Climax Plant Community. Potential vegetation is about 70% grasses or grass-like plants, 10% forbs, and 20% woody plants.

The major grasses include bluebunch wheatgrass, western wheatgrass, needleandthread, and Indian ricegrass. Other grasses include, Sandberg and mutton bluegrass, prairie junegrass, bottlebrush squirreltail, plains reedgrass, and threadleaf sedge. Black sagebrush, big sagebrush, and green rabbitbrush are the major woody plants.

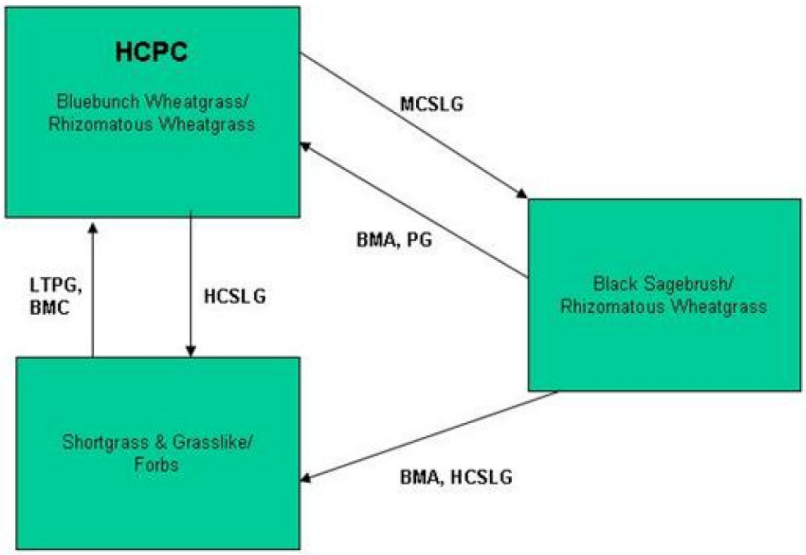
A typical plant composition for this state consists of bluebunch wheatgrass 15-30%, western wheatgrass 15-25%, needleandthread 5-10%, muttongrass 5-10% other grasses and grass-like plants 10-20%, perennial forbs 5-15%, black sagebrush 5-10%, and other shrubs 5-10% Ground cover, by ocular estimate, varies from 15-25%.

The total annual production (air-dry weight) of this state is about 900 pounds per acre, but it can range from about 700 lbs./acre in unfavorable years to about 1200 lbs./acre in above average years.

The state is stable and well adapted to the Cool Central Desertic Basins and Plateaus climatic conditions. The diversity in plant species allows for high drought resistance. This is a sustainable plant community (site/soil stability, watershed function, and biologic integrity).

Transitions or pathways leading to other plant communities are as follows:

- *Moderate Continuous Season Long Grazing will convert this plant community to the Black Sagebrush/Rhizomatous Wheatgrass Plant Community.*
- *Heavy Continuous Season-long Grazing will convert this plant community to the Short Grass & Grasslike/Forb plant community.*



BMA – Brush Management (all methods)
BMC – Brush Management (chemical)
BMF – Brush Management (fire)
BMM – Brush Management (mechanical)
CSP – Chemical Seedbed Preparation
CSLG – Continuous Season-long Grazing
DR – Drainage
CSG – Continuous Spring Grazing
HB – Heavy Browse
HCSLG – Heavy Continuous Season-long Grazing
HI – Heavy Inundation
LPG – Long-term Prescribed Grazing
MT – Mechanical Treatment (chiseling, ripping, pitting)
MCSLG – Moderate Continuous Season Long Grazing

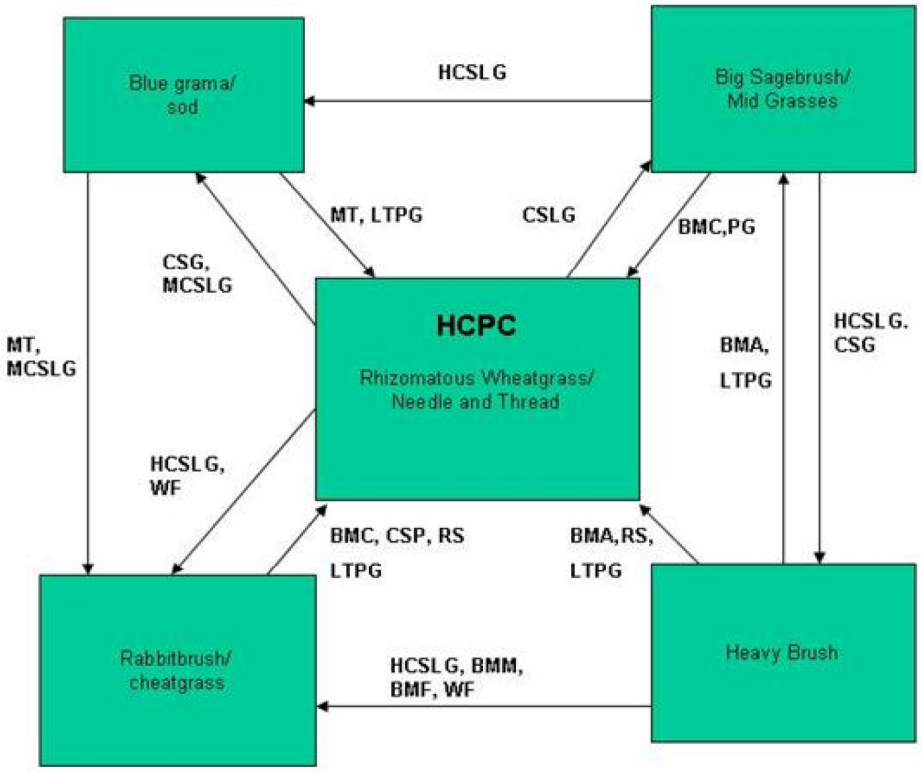
NF – No Fire
NS – Natural Succession
NWC – Noxious Weed Control
NWI – Noxious Weed Invasion
NU – Nonuse
P&C – Plow & Crop (including hay)
PG – Prescribed Grazing
RPT – Re-plant Trees
RS – Re-seed
SGD – Severe Ground Disturbance
SHC – Severe Hoof Compaction
WD – Wildlife Damage (Beaver)
WF – Wildfire

Figure 4.11 State and Transition Model Diagram:
Shallow Loamy 10-14 inch Precipitation Zone High Plains Southeast.

4.6.1.3 ESD: Loamy 10-14 inch High Plains Southeast

A third prevalent ecological site within the watershed is the loamy 10-14 inch precipitation zone Highe Plains Southeast site. Figure 4.12 displays the state and transition model for this site. The following description of the ecological site was extracted from the NRCS ESD for the site:

"The interpretive plant community for this site is the Historic Climax Plant Community. Potential vegetation is estimated at 80% grasses or grass-like plants, 10% forbs and 10% woody plants. The major grasses include rhizomatous wheatgrass, needle and thread, bluebunch wheatgrass, and green needlegrass. Big sagebrush and rubber rabbitbrush are the major woody plants. A typical plant composition for this state consists of rhizomatous wheatgrass 30-40%, needle and



BMA – Brush Management (all methods)
BMC – Brush Management (chemical)
BMF – Brush Management (fire)
BMM – Brush Management (mechanical)
CSP – Chemical Seedbed Preparation
CSLG – Continuous Season-long Grazing
DR – Drainage
CSG – Continuous Spring Grazing
HB – Heavy Browse
HCSLG – Heavy Continuous Season-long Grazing
HI – Heavy Inundation
LPG – Long-term Prescribed Grazing
MT – Mechanical Treatment (chiseling, ripping, pitting)
MCSLG – Moderate Continuous Season Long Grazing

NF – No Fire
NS – Natural Succession
NWC – Noxious Weed Control
NWI – Noxious Weed Invasion
NU – Nonuse
P&C – Plow & Crop (including hay)
PG – Prescribed Grazing
RPT – Re-plant Trees
RS – Re-seed
SGD – Severe Ground Disturbance
SHC – Severe Hoof Compaction
WD – Wildlife Damage (Beaver)
WF – Wildfire

Figure 4.12 State and Transition Model: Loamy 10-14 Inch High Plains Southeast.

thread 10-20%, bluebunch wheatgrass 5-15%, green needlegrass 5-10%, muttongrass 5-10%, perennial forbs 5-10%,and big sagebrush 5-15%. Ground cover, by ocular estimate, varies from 30-40%.

The total annual production (air-dry weight) of this state is about 1100 pounds per acre, but it can range from about 600lbs./acre in unfavorable years to about 1400 lbs./acre in above average years.

This state is extremely stable and well adapted to the Cool Central Desertic Basins and Plateaus climate. The diversity in plant species allows for high drought resistance. This is a sustainable plant community (site/soil stability, watershed function, and biologic integrity).

Transitions or pathways leading to other plant communities are as follows:

- *Continuous Season-long Grazing will convert the plant community to the Big Sagebrush/Mid Grass Plant Community if big sagebrush is present at 5-10%.*
- *Moderate Continuous Season-long Grazing or Continuous Spring Grazing will convert the plant community to the Blue Grama Sod Plant Community*
- *Heavy Continuous Season Long Grazing with Wild Fire will convert this plant community to the Rabbitbrush/Cheatgrass plant community."*

4.6.2 Range and Grazing Management Components of the Watershed Plan

Based on the information presented above, the following items are presented for inclusion in the watershed management plan:

Watershed Plan Component G-1: Water developments can be used to expand grazing distribution to areas that do not currently have reliable water. Riparian area plant community condition can be enhanced by development of water into upland areas.

Watershed Plan Component G-2: Fencing can be used to enhance grazing management options and to facilitate the planned grazing system.

Watershed Plan Component G-3: Strategic salting and herding are other tools that can be used to enhance grazing distribution.

Watershed Plan Component G-4: Most range improvement practices which improve watershed condition, may also improve wildlife habitat. Wildlife needs should be considered when installing practices such as wildlife friendly fences, wildlife escape ramps from tanks, and wildlife watering facilities.

Watershed Plan Component G-5: Strategies recommended in the state and transition models associated with NRCS descriptions of the ecological sites found within the watershed should be adopted and employed to optimize range conditions through prescribed grazing management and best management practices.

These tools can be used to maintain and/or improve watershed function particularly when coupled with implementation of appropriate grazing management strategies.

4.7 Other Upland Management Opportunities

4.7.1 Noxious Weed and Undesirable Plant Control

The County Weed and Pest Districts implement aggressive, well planned, and cost-effective treatment and control measures for noxious and other weeds as available staffing and funding allow. The District has been successful in enlisting broadly based participation in various control programs,

work days and workshops. The most effective overall strategy going forward would appear to be to assist the Districts in applying for additional grant funding, participate with in-kind efforts on work days and attend/support workshops and planning sessions.

4.7.2 Invasive Species Treatment

The respective county weed and pest districts are implementing aggressive, well planned, and cost-effective treatment and control measures for noxious and other weeds as available staffing and funding allow. It is our understanding that the Districts have been successful in enlisting broadly bases participation in various control programs, work days and workshops. The most effective overall strategy going forward would appear to be to assist the Districts in applying for additional grant funding, participating with in-kind efforts and attend/support workshops and planning sessions.

4.8 The Sweetwater River Watershed Management Plan

The information presented in this chapter provides recommendations for improvements associated with:

- Irrigation System Rehabilitation
- Upland Wildlife/Livestock Water Opportunities
- Stream Channel Restoration Opportunities

Table 4.6 presents the itemized components of the Sweetwater River Watershed Management Plan. Associated conceptual designs for these projects are presented in the respective Phase I through Phase IV reports. Conceptual cost estimates are tabulated in Chapter 5 of this report.

Other components of the watershed management plan are addressed as follows:

- Reservoir Storage Opportunities: Due to complications arising from the North Platte River Decree, construction of new reservoirs would be highly problematic and unlikely to occur. Consequently, construction of new reservoir projects within the Sweetwater River watershed is not included in the watershed management plan.

- Range and Grazing Management Components: Prescription of specific range and grazing management strategies will be dependent upon site-specific conditions and characteristics, including range health, vegetative cover, soils, aspect, etc. Ecologic Site Descriptions (ESDs) contain detailed information and prescriptions for management of each site. Pertinent ESDs

should be consulted as needed and the appropriate range management techniques utilized. These techniques would include but not be limited to: brush management (chemical, fire, or mechanical), seasonal grazing modification (moderate continuous season long grazing, continuous spring grazing, mechanical treatment, etc.

Specific components discussed in Section 4.7 should be incorporated into the evaluation and design of any range improvement projects within the project study area. Because these recommendations are general in nature, they are not specifically itemized in Table 4.6 but are recommended for incorporation into future planning efforts associated with all aspects of the watershed management plan.

- Other Management Opportunities: noxious weed management should be considered similarly to the range and grazing management components discussed above. These are general in nature and are consequently, not specifically itemized in Table 4.5.

Table 4.6 Sweetwater River Watershed Management Plan.

Item	Rehabilitation Item Number	Description	Priority
Phase I Irrigation System Components			
J.M. Brown Ditch East (Corbett)			
1	Phase I: I-1	Diversion Structure	1
2	Phase I: I-2	Install 2-ft Parshall flume	2
3	Phase I: I-3	Install 10-inch farm turnout headgates (5)	2
4	Phase I: I-4	Install 3-ft wide check structures (3)	2
5	Phase I: I-5	Install 24-inch underdrain culverts (4)	2
6	Phase I: I-6	Install 8-inch gated pipe (app. 3,000 LF)	2
7	Phase I: I-7	Install approx. 300 feet 18-inch PIP at seepage location	2
J.M. Brown Ditch West (Corbett)			
8	Phase I: I-8	Install diversion structure in creek	1
9	Phase I: I-9	Install 2-ft Parshall flume	2
10	Phase I: I-10	Install 10-inch farm turnout headgates (3)	2
11	Phase I: I-11	Install 3-ft wide check structures (3)	2
12	Phase I: I-12	Install 8-inch gated pipe (app. 1,200 LF)	3
Russell Ditch			
13	Phase I: I-13	Replace existing slide gate with 48-inch slide gate	1
14	Phase I: I-14	Install 2-ft Parshall flume	2
Independent Ditch			
15	Phase I: I-15	Remove existing headgate/install 36-inch diameter slide gate/concrete structure	1
16	Phase I: I-16	Install 2-ft Parshall flume	2
Graham and Farnsley Ditch			
17	Phase I: I-17	Remove existing headgate/install 36-inch diameter slide gate/concrete	1
18	Phase I: I-18	Install 2-ft Parshall flume	2
Jacob Ditch Headgate			
19	Phase I: I-19	Install 24-inch diameter slide gate/concrete headwall	1
20	Phase I: I-20	Install 2-ft Parshall flume	2
21	Phase I: I-21	Clear vegetation and sediment from Jacob Ditch	2
Koehler Ditch			
22	Phase I: I-22	Remove existing headgate/install 24-inch diameter slide gate/concrete	1
23	Phase I: I-23	Install 2-ft Parshall flume	2
National Ditch			
24	Phase I: I-24	Streambank stabilization (J-hook vanes / cross vane weir)	1
25	Phase I: I-25	Install 2-ft Parshall flume	2
Phase II Irrigation System Components			
Hays Ditch			
26	Phase II: I-01	Install diversion structure	1
27	Phase II: I-02	Install 2-ft Parshall flume	2
28	Phase II: I-03	Install approx. 1,000 ft 12-inch PIP	2
29	Phase II: I-04	Realign Ditch	2
30	Phase II: I-05	Install 12-inch farm turnout headgate	2
31	Phase II: I-06	Install 3-ft wide check structure	2
32	Phase II: I-07	Install 8-inch gated pipe (app. 3,000 LF)	3
Mahoney / Marsh Ditches			
33	Phase II: I-08	Marsh Irrigating Ditch: Install diversion structure in Muddy Ck.	1
34	Phase II: I-09	Install three Parshall Flumes (18-inch) on ungaged ditches	2
35	Phase II: I-10	Monitor rebuilt spillway	1
36	Phase II: I-11	Clear vegetation from selected ditch reaches	1
Whiskey Creek / Dexter Ditches			
37	Phase II: I-12	Dexter Ditch: Install headgate	1
38	Phase II: I-13	Whiskey Ditch No. 1: Install headgate	1
39	Phase II: I-14	Whiskey Ditch No. 2: Install headgate	1
Phase III Irrigation System Components			
Point of Rocks DitchDiversion Structure			
40	Phase III: I-1	Install rock weir structure in Sweetwater River	1
41	Phase III: I-2	Install 2-ft Parshall flume at diversion structure	2
Phase IV Irrigation System Components			
McIntosh-Beaton Ditch Diversion Structure			
42	Phase IV: I-1	Install rock weir structure in Sweetwater River	1
43	Phase IV: I-2	Install 2-ft Parshall flume at diversion structure	3
Cranor Ditch Rehabilitation			
44	Phase IV: I-3	Rehabiliate Cranor Ditch failure	1
45	Phase IV: I-4	Install 2-ft Parshall flume at diversion structure	3

Table 4.6 Sweetwater River Watershed Management Plan (Continued).

Phase I Wildlife / Livestock Water Supply Alternatives		
Recommended Alternative	**Description**	**Priority**
Phase I: L/W 01	East Fork Long Creek Wells Project	2
Phase I: L/W 02	East Fork Long Creek Reservoirs Project	2
Phase I: L/W 03	Divide Well Project	2
Phase I: L/W 04	Grieve Well Pipeline Project	2
Phase I: L/W 05	Elkhorn Spring Pipeline Project	2
Phase I: L/W 06	Spring Run Rehabilitation Project	2
Phase I: L/W 07	East Fork Long Creek Solar Pump Project	2
Phase I: L/W 08	East Fork Long Creek Reservoir Reconstruction	2
Phase I: L/W 09	Long Creek Divide Well Project	2
Phase I: L/W 10	Plateau Well Project	2
Phase I: L/W 11	Liberty Draw Well	2
Phase I: L/W 12	School Section Well Project	2
Phase I: L/W 13	Koehler Draw Well Project	2
Phase I: L/W 14	Wildlife Guzzlers	2
Phase II Wildlife / Livestock Water Supply Alternatives		
Recommended Alternative	**Description**	**Priority**
Phase II: L/W-01	Muddy Gap Spring	2
Phase II: L/W-02	McIntosh Well Enhancement	2
Phase II: L/W-03	Indian Creek Pipeline	2
Phase II: L/W-04	Muddy Creek Pipeline	2
Phase II: L/W-05	Ferris Mountain Well Construction	2
Phase II: L/W-06	Muddy Creek Spring Development	2
Phase II: L/W-07	Cress Creek Spring Rehabilitation	2
Phase II: L/W-08	UnNamed Spring Development	2
Phase II: L/W-09	Corral Creek Pipeline	2
Phase II: L/W-10	Murphrey Creek Pipeline	2
Phase II: L/W-11	Cherry/Pete Creek Pipeline	2
Phase II: L/W-12	Whiskey Creek Pipeline Extension	2
Phase II: L/W-13	Cherry/Whiskey Creek Pipeline	2
Phase II: L/W-14	Pete Creek Pipeline Extension	2
Phase II: L/W-15	Rush Creek Pipeline	2
Phase II: L/W-16	Pole Canyon Pipeline	2
Phase II: L/W-17	Annis Pipeline Phase I	2
	Annis Pipeline Phase II	2
Phase II: L/W-18	Mary's Well Pipeline	2
Phase II: L/W-19	Berra #3 Well Pipeline	2
Phase II: L/W-20	North Beefacre Well Replacement/Pipeline	2
Phase II: L/W-21	Wildlife Guzzlers	2

Table 4.6 Sweetwater River Watershed Management Plan (Continued).

Phase III Wildlife / Livestock Water Supply Alternatives		
Recommended Alternative	**Recommended Alternative**	**Priority**
Phase III: L/W-01	BLM Recommendations: Cameco Well	2
Phase III: L/W-02	BLM Recommendations: Bare Ring Butte Well	2
Phase III: L/W-03	BLM Recommendations: Circle Bar Well	2
Phase III: L/W-04	BLM Recommendations: North Horse Track Well	2
Phase III: L/W-05	BLM Recommendations: Monument Well	2
Phase III: L/W-06	BLM Recommendations: Smiley Well	2
Phase III: L/W-07	BLM Recommendations: Granite Spring	2
Phase III: L/W-08	BLM Recommendations: Upper Ladysmith Spring	2
Phase III: L/W-09	BLM Recommendations: Lower Wager Meadows Spring	2
Phase III: L/W-10	BLM Recommendations: Twin Springs	2
Phase III: L/W-11	BLM Recommendations: Mud Spring	2
Phase III: L/W-12	BLM Recommendations: Fuzzy Reservoir	2
Phase III: L/W-13	Tank Improvement 4	2
Phase III: L/W-14	West Alkali Well Improvement Project	2
Phase III: L/W-15	Daley Lake Well Improvement Project	2
Phase III: L/W-16	Stampede Well Improvement	2
Phase III: L/W-17	Soda Lakes Well Improvement	2
Phase III: L/W 18	Fletcher Gap Well Improvement	2
Phase III: L/W-19	Diamond Springs Pipeline Improvement Project	2
Phase III: L/W-20	Grassy Lake Well Improvement Project	2
Phase III: L/W-21	Mitten Flat Well Improvement Project	2
Phase III: L/W-22	Woods Gulch Pond Rehabilitation	2
Phase III: L/W-23	Green Mountain Unnamed Spring Redevelopment	2
Phase III: L/W-24	Unnamed Spring Sheep Creek Improvement Project	2
Phase III: L/W-25	Bare Ring Slough Well Improvement Project	2
Phase III: L/W-26	Black Rock Spring Pipeline Project	2
Phase III: L/W-27	Barras Spring Projection Project	2
Phase III: L/W-28	Tincup Spring Development	2
Phase III: L/W-29	Soda Lakes Well Project	2
Phase III: L/W-30	Picket Creek Well Construction Project	2
Phase III: L/W-31	Mitten Springs Area Well Construction Project	2
Phase III: L/W-32	Upper Middle Fork Sulphur Creek Well Construction Project	2
Phase III: L/W-33	Alkali Creek Tributary Well Construction Project No. 1	2
Phase III: L/W-34	Alkali Creek Tributary Well Construction Project No. 2	2
Phase III: L/W-35	Flats North of Ladysmith Draw-Well Construction Project	2
Phase III: L/W-36	Unnamed Alkali Tributary Well Pipeline Project No. 2	2
Phase III: L/W-37	North Immigrant Well Construction Project	2
Phase III: L/W-38	Upper Buffalo Creek	2
Phase III: L/W-39	Coyote Gulch Pipeline Project	2
Phase III: L/W-40	Warm Springs Pipeline Project	2
Phase IV Wildlife / Livestock Water Supply Alternatives		
Recommended Alternative	**Recommended Alternative**	**Priority**
Phase IV: L/W-01	Stock Tank Replacement Project	2
Phase IV: L/W-02	Hat Well #1 Improvement Project	2
Phase IV: L/W-03	Jammerman Pastures Well Improvement Project	2
Phase IV: L/W-04	Lankin Well Improvement Project	2
Phase IV: L/W-05	Nolan Pocket Spring Development	2
Phase IV: L/W-06	Well Replacement	2
Phase IV: L/W-07	Starr Well Pipeline Extension	2
Phase IV: L/W-08	Sage Hen Springs Improvement Project	2
Phase IV: L/W-09	Lone Mountain Springs Development Project	2
Phase IV: L/W-10	Dry Creek Pipeline Project	2

Table 4.6 Sweetwater River Watershed Management Plan (Continued).

Phase I	
Plan Component	**Stream**
S-1	Long Creek Restoration
S-2	East Fork Restoration
S-3	West Fork Long Creek
Phase II	
S-1	Arkansas Creek Restoration
S-2	Murphrey Creek Restoration
S-3	Camp Creek Restoration
S-4	Corral Creek Restoration
Phase III	
S-1	Coyote Gulch Rehabilitation
S-2	Sulphur Creek Rehabilitation
S-3	Upper East Alkali Creek Rehabilitation
S-4	Crooks Creek Rehabilitation
Phase IV	
S-1	Lower Dry Creek Rehabilitation
S-2	Upper Dry Creek Rehabilitation
S-3	Lower Sage Hen Creek Rehabilitation
S-4	Upper Sage Hen Creek Rehabilitation

V. PERMITS

V. PERMITS

The following discussion presents the results of an early regulatory process analysis for the types of alternative projects that have been identified in Chapter 4. The purpose of this analysis is to characterize the known and likely environmental processes, permits and related requirements and conditions associated with the alternative projects, including identification of environmental documentation, permits, agency clearances and approvals, and agency coordination steps that would be required for implementation of the proposed actions and alternatives.

Many of the potential projects described in this plan will be subject to the National Environmental Policy Act (NEPA) and other federal environmental regulations administered by federal agencies such as the EPA, Bureau of Land Management (BLM), Army Corps of Engineers (COE), and/or the U.S. Fish and Wildlife Service (FWS). The Wyoming agencies which may have environmental, land use, and other regulatory approval requirements include, but are not necessarily limited to the Department of Environmental Quality (WDEQ), State Engineer's Office (WSEO), State Historic Preservation Officer (SHPO), Board of Land Commissioners through the State Lands and Investments Board (SLIB), and Game and Fish Department (WGFD).

Much of the following text was extracted from previous watershed investigations conducted on behalf of the Wyoming Water Development Commission (WWDC) in which Anderson Consulting Engineers (ACE) participated. Specifically, the Nowood River Storage and Watershed Investigation (ACE, 2010) and the Buffalo Creek Watershed Study (ACE, 2012) are referenced here as sources of permitting information. The previously prepared descriptions of the permitting process were revised to reflect conditions anticipated within the Sweetwater River watershed.

5.1 NEPA Compliance and Documentation

NEPA applies to any of the proposed actions for which the project site is located on federal land, federal funds may be used, and/or when formal federal agency actions are necessary for the project to move forward. One of the primary intentions of the NEPA process is to avoid, minimize and mitigate adverse environmental consequences of federal actions. NEPA requires analysis and documentation of potential adverse and beneficial effects of a proposed action and alternatives and an open public involvement process.

For this project, it is likely that BLM would be the lead federal agency for implementation of the NEPA process for projects on lands under their administration. The COE would presumably be the lead federal agency otherwise where wetlands may be impacted. It is also possible that these agencies may work out a shared lead under a Memorandum of Understanding (MOU) if there are significant issues best led by both agencies for a given project.

5.1.1 NEPA Process for Reservoir Storage Projects

The following discussion characterizes the basic steps of the NEPA process applicable to a reservoir storage project. A separate discussion in Section 5.1.2 addresses other potential watershed rehabilitation or improvement projects.

Prepare a Purpose and Need Statement for the Project. It is important to develop an accurate and defensible Purpose and Need statement for the project as one of the first steps in the NEPA process. The Purpose and Need statement provides an overall or basic purpose for the proposed action and presents details supporting various needs for the project. The Purpose and Need statement should provide enough information to develop and support a "reasonable range" of alternatives. More specifically, the Purpose and Need statement guides the alternative development and screening process. With the COE as the lead agency, the Purpose and Need would include a reference to finding the "least damaging practicable alternative." This reference relates to the Clean Water Act Section 404 requirements that are under the jurisdiction of the COE and is an important part of the NEPA process for a reservoir storage project. Additional details about the Section 404 process are provided in Section 5.2. Develop Project Alternatives and NEPA Documentation Determination. The NEPA process requires analysis of the No Action alternative and a reasonable range of alternatives that fully address the project's purpose and need. The reasonable range of alternatives may include one or more "build" alternatives, depending on the nature and extent of anticipated project impacts and level of NEPA documentation to be provided.

For new, expanded or reconstructed reservoir storage projects, key issues associated with alternative development will or may include:

- loss of wetland and riparian habitat from direct inundation by a new, expanded or reconstructed reservoir;
- potential impacts on threatened and endangered species;
- potential impacts on fish and other aquatic species; and
- potential impacts on other wildlife (e.g., sage grouse; big game).

Given these issues and risk management considerations, the project team anticipates that an EIS will likely be the appropriate NEPA documentation for reservoir storage projects. An EIS involves analysis of more than one build alternative and typically takes up to several years to complete. An Environmental Assessment (EA) may or may not involve analysis of more than one build alternative and can typically be completed in less than 18 months. The outcome of an EA is either a Finding of No Significant Impact (FONSI) or a recommendation to prepare an EIS. If an EA is prepared, there is a possibility that the outcome might be that an EIS is needed. This could occur as a result of "significant impact findings" or as a result of substantial public controversy over the project's effects. If this occurs at the end of the EA process, the EIS process would need to start from the beginning, wasting a considerable amount of time

and money. At this time, it appears it would be prudent to assume that an EIS process would be applicable, while leaving the option open for an EA/FONSI, rather than to proceed with an EA and take the risk that an EIS will ultimately be needed. This decision should be reviewed during a Level II study (should the project advance) when more detailed information is available on a preferred proposed action and its appropriate alternatives.

Conduct a Proactive Public Involvement Program. The NEPA process begins with public and agency outreach and related input focused on alternatives and potential impacts. Education about the project's purpose and need, project details and issues is provided and input is solicited in various ways. It is very important that the public have a clear understanding of the benefits and potential adverse impacts of the proposed action and alternatives. Public involvement is continuous throughout the project and can influence alternative development, alternative screening, issues addressed, mitigation measures, the level of NEPA documentation to be prepared (EA or EIS), and the selection of the preferred alternative.

Collect and Analyze Environmental Baseline Data. It is important to carefully identify environmental constraints and considerations early and incorporate them into alternative development efforts as a means of avoiding and minimizing potential impacts. Early field investigations and agency consultation and coordination efforts help to focus this effort and streamline subsequent analysis methods, schedule needs, and budget requirements. Creating "self-mitigating" alternatives is highly advantageous and fully consistent with the intent of NEPA.

Many NEPA analyses relate to compliance with various laws and regulations. Integrating the NEPA, National Historic Preservation Act, Endangered Species Act and other compliance processes will reduce overall permitting timeframes and costs, and streamline agency decision-making. These issues are discussed in Section 5.2.

Prepare the Draft and Final Environmental Impact Statement. The Draft EIS would be prepared in two versions. A Preliminary Draft EIS would be prepared for internal review. The Draft EIS would respond to comments on the Preliminary Draft EIS. The Draft EIS would be circulated for public review and would be the subject of a public hearing. The Final EIS would also be prepared in two versions. A Preliminary Final EIS would be prepared for internal review. The Final EIS would respond to comments on the Preliminary Final EIS. The Final EIS would be circulated for public review and would be the subject of a public hearing. A Record of Decision would be prepared to complete the NEPA process.

5.1.2 NEPA Process for Other Project Types

The applicability of NEPA to projects other than major (non-stock pond) reservoir storage must be determined on a case-by-case basis. For example, proposed new wildlife/livestock watering developments, including especially tank/pipeline systems that cross and/or serve federal or state rangeland will require that an appropriate NEPA process be followed. In this case, and for many of the

lesser potential impact projects (e.g., a well, stock/wildlife pond, guzzler, etc.), it is possible if not likely that an EA process will be found appropriate rather than a full EIS (see related discussion in Section 5.1 above).

BLM. Under current practice, NEPA evaluations and processes for both reservoir storage projects and other types of projects that may be proposed where BLM is the lead federal agency will be performed by BLM staff or qualified, independent third party experts responsible to BLM. These experts may include specialists from other federal and/or state agencies working under memoranda of understanding (MOU) or other appropriate arrangement(s). The Sweetwater River study area involves lands within four BLM Districts. These lands are currently managed according to four separate Resource Management Plans: the Lander RMP (2012), the Casper RMP (2007), the Rawlins RMP (2008), and the Pinedale RMP (2008).

Other State/Federal Agencies. Depending on the specific circumstances of a particular project, it is possible that another state or federal agency may lead the NEPA process. For example, a project proposed within the Bighorn National Forest would presumably be led by the U.S. Forest Service, most likely from the Cody District office. All of the relevant state and federal land management agencies have management plans developed from NEPA-compliant processes where appropriate. As discussed above for BLM, these plans will guide these agencies' NEPA process for any applicable proposed projects or improvements.

Watershed-Wide Environmental Analysis. Given the significant number of planned and potential wildlife/livestock water development projects and the opportunity for larger-scale, cooperative projects as discussed identified Chapter 4, it is recommended that serious consideration be given to the potential benefits of conducting a comprehensive "watershed-wide" environmental analysis for these and other potential water-resources related improvement projects. A key benefit of this approach would be developing a single baseline characterization and impacts assessment of the relevant environmental issues associated with these types of projects rather than repetitively for many similar individual projects. This should, in turn, substantially reduce the overall resources and time necessary to conduct the required environmental permitting (including especially NEPA compliance) for these projects. If necessary, the overall environmental analysis could be supplemented on a case-by-case basis for a particular issue in a focused, time and resource efficient manner.

5.2 Permitting/Clearances/Approvals

5.2.1 Dam and Reservoir Construction

In addition to the U.S. Army Corps of Engineers (COE) Section 404 Permit, there are numerous other permits and/or approvals required for new dam and reservoir construction. Presented below are

the primary additional permits and/or approvals that would be required for any of the alternative projects under consideration.

Section 404 Permit. Like all water development projects, any dam and reservoir storage project in the Nowood River watershed will face environmental permitting issues. Typically the most significant environmental permit to be secured is a Section 404 Dredge and Fill permit from the COE, Omaha District. Even when impacts are anticipated to be modest, the process of obtaining a Section 404 permit for new storage projects may take several years from initiation of the NEPA process.

The primary guidance in embarking on the permitting process for a new dam and reservoir storage project is the development of a defensible Purpose and Need for the project. The NEPA process dictates that the least environmentally damaging practicable alternative that addresses the purpose and need be pursued. This is the alternative most likely to be successfully permitted.

Endangered Species Act (Section 7 Consultation). The lead agency would prepare a biological assessment to determine project effects on threatened and endangered plant and animal species listed or proposed for listing (candidate species) under the Endangered Species Act (16 U.S.C. § 1531 et seq.). U.S. Fish and Wildlife Service (FWS) would then issue an opinion on whether federal actions are likely to jeopardize the continued existence of a threatened or endangered species, or destroy or adversely modify critical habitat. FWS must approve the preparation of a biological assessment to comply with the Endangered Species Act in order to render its decision. If FWS determines that the preferred alternative would jeopardize the continued existence of a species, it may offer a reasonable and prudent alternative that would preclude jeopardy.

Fish and Wildlife Coordination Act. The Fish and Wildlife Coordination Act requires federal agencies involved in actions that will result in the control or structural modification of any natural stream or body of water for any purpose to take action to protect the fish and wildlife resources which may be affected by the action. It requires federal agencies or applicants to first consult with state and federal wildlife agencies to prevent, mitigate and compensate for project-caused losses of wildlife resources, as well as to enhance those resources.

Laws and Regulations Addressing Cultural Resources. Because federal approvals are likely involved with any of the identified alternatives, a consideration of effects on cultural resources must be undertaken (Section 106 consultation), as required under the following laws and regulations: the National Historic Preservation Act (NHPA) of 1966 (16 U.S.C. § 470 et seq.); the National Environmental Policy Act (NEPA) of 1969 (42 U.S.C., § 4321); the Archaeological Resources Protection Act (ARPA) of 1979 (16 U.S.C. § 470aa et seq.); the National Park Services (NPS) procedures concerning the National Register of Historic Places (NR) (36 CFR Part 60); the Advisory Council on Historic Preservation's Procedures for the Protection of Cultural Properties (36 CFR Part 800); the Treatment of Archaeological Properties of 1980: Determination of Eligibility for Inclusion in the NR (36 CFR 63); the Secretary of Interior's Standards and Guidelines for Archaeological Historical Preservation of 1983; Reservoir Salvage Act of 1960; and the l974 Amendment to the Reservoir Salvage Act of 1960. The State of Wyoming

Historic Preservation Office (SHPO) coordinates with federal agencies in determining the significance of cultural resources potentially affected by ground disturbing activities.

In addition, consultation with relevant Native American groups concerning traditional cultural properties is required under the American Indian Religious Freedom Act of 1978 (AIRFA, P.L. 95-341.42 U.S.C. § 1996) and Section 4 of ARPA of 1979. Guidelines for evaluation of traditional cultural properties are contained in Bulletin 38 issued by the National Park Service.

Wyoming Board of Land Commissioners. The Wyoming Board of Land Commissioners through the State Lands and Investments Board (SLIB) is responsible for regulating all activities on state lands, including granting of rights-of-way. Any facility, utility, road, railroad, ditch or reservoir to be constructed on state or school lands must have a right-of-way, as required in the "Rules and Regulations Governing the Issuance of Rights Of Way" (W.S. 36-20 and W.S. 36-202).

Wyoming State Engineer's Office Surface Water Storage Permit. The State Engineer's Office administers the water rights system of appropriation within the state. The Applicant must obtain the necessary water rights permits from the State of Wyoming for the diversion and storage of the State's surface water.

Wyoming State Engineer's Office Permit to Construct/Dam Safety Review. The Wyoming Dam Safety Law (W.S. 41-3) requires that any persons, public company, government entity or private company who proposes to construct a dam which is greater than 20 feet high or which will impound more than 50 acre-feet of water, or a diversion system which will carry more than 50 cubic feet of water per second, must obtain approval for construction of the dam or ditch from the Wyoming State Engineer's Office. The approval by the State Engineer's Office of a dam's construction is contingent upon the Office's review and approval of all dam plans and specifications, which must be prepared by a registered professional engineer licensed in Wyoming. Design, construction, and operation of jurisdictional dams must also comply with dam safety regulations promulgated pursuant to the Dam Safety Act.

Wyoming State Engineer's Office Ditch Enlargement Permit. In addition to the permits and clearances that will be required for reservoir construction, existing irrigation ditches may required to convey water to off-channel reservoirs. If so, this effort would require an enlargement filing with the Wyoming SEO. Even if physical enlargement of the existing ditch was found to not be required, the enlargement filing would be a legal formality as a water right requirement.

Wyoming Department of Environmental Quality – National Pollution Discharge Elimination System (NPDES) permit and Section 401 Certification. The federal Clean Water Act is administered in Wyoming by the Department of Environmental Quality (WDEQ), Water Quality Division (WQD) consistent with the Wyoming Environmental Quality Act. The Section 401 Certification is the State's approval to ensure that the activities authorized under Section 404 meet state water quality standards and do not degrade water quality. Any discharge of pollutants into the broadly defined "waters of the state" requires application to and permit issuance by WQD in accord with WQD's Rules and Regulations. This body of regulations sets forth classification of surface and groundwater uses and establishes water

quality standards (Wyoming Water Quality Standards). The WQD administers the NPDES permit system including storm water permits and construction-related, short-term discharge permits.

Implementation of any of the action alternatives would require application for and compliance with the provisions of the statewide general NPDES Construction Storm Water Discharge Permit (WYR10-000). Construction activities associated with dam construction or enlargement often result in the requirement to temporarily discharge pumped water. These discharges are provided for in a general permit. Upon acceptance of the application by DEQ, the temporary discharge must be in compliance with the terms of the general permit and any stipulations applied as a result of the application's review.

EPA has oversight responsibility for federal Clean Water Act programs delegated to and administered by the State Water Quality Division. EPA also may intervene to resolve interstate disputes where discharges of pollutants in an upstream state may affect water quality in a downstream state.

Mining Permit. A Wyoming mining permit is not required for development of an aggregate and/or borrow material source solely for use in construction of one of the various reservoir alternatives and whose product is not for commercial sale. Commercial sources of aggregate, rock, or other mined materials are responsible for obtaining and maintaining all required permits and clearances for their operations.

Special Use Permits/Rights-of-Way/Easements. Special use permits, rights-of-way (ROW) or easements will be required wherever access across the lands of others (private, state or federal) is needed for construction and/or operation of the project facilities. These may be temporary (e.g., access to a temporary borrow area or quarry site to be closed and reclaimed; construction of a new haul road; etc.) or permanent (e.g., construction of a wildlife/livestock pipeline alignment). Usually privately owned lands that will be rendered permanently unavailable (such as the dam and reservoir footprint of a storage project) would be purchased unless the owner desired (and the sponsoring entity agreed) to a permanent easement. Permanent use of BLM lands would most likely be administered under a grant with an appropriate term issued under their ROW process; the U.S. Forest Service would use their equivalent special use process. An easement or ROW from the Wyoming Department of Transportation (WyDOT), Big Horn County and/or Washakie County may also be required. The specific requirements for rights-of-way, special use permits and easements vary widely and should be determined as part of the early stages of planning for a specific proposed project. This will help to avoid the potential for significant project delay, higher costs, or required changes in location/alignment or design during project development and implementation.

Other. In addition to the above, there may be other permits and clearances required for a given dam and reservoir project. These might include permits typically required to be provided by the construction contractor (e.g., air quality permit; trash/slash burning permit; etc.).

5.2.2 Other Project Types

Permits, clearances and approvals for projects other than major dams and storage reservoirs will depend on the specific nature and location of the project. Various permits and clearances discussed above in Section 5.2.1 may also apply to other types of projects. The specific permits and clearances necessary for a particular project should be determined early in the planning stages of the project to ensure compliance with applicable laws and regulations, and to avoid possible delays, increased costs and possibly re-design later during project implementation.

5.3 Environmental Considerations

Proposed, Threatened and Endangered Species. The following species have the potential to occur within the proposed project areas within the watershed:

Endangered:	Black-footed Ferret (*Mustela nigripes)*
Threatened:	Gray Wolf *Canis lupus*
	Grizzly Bear *Ursus arctos horribilis*

(Wyoming Natural Diversity Database [WYNDD], 2007).

Other Animal Species of Concern. The Wyoming Natural Diversity Database (WYNDD) lists several other species of concern existing within the study area. This list was presented and discussed in Chapter 3 of this report and contained 2 amphibians, 4 reptiles, 2 fish, 53 birds, 24 mammals, and 1 mollusk.

The potential exists for some of these species to occur within appropriate habitats within the watershed. Although none of these species receive federal or state protection, sage grouse are identified as a sensitive species/species of concern and merit special attention as discussed in some detail in the following paragraphs.

Sage Grouse: In June 2011, Executive Order 2011-5 was signed by the Governor which stresses additional management consideration to sage grouse and sage grouse habitat statewide. The Order includes requirements of state agencies to encourage development outside of the Core areas and to focus management to the greatest extent possible on the maintenance and enhancements of habitat within them. Appendix C contains the language of the Executive Order as well as interpretive information published by Wyoming Game and Fish Department.

The greater sage grouse (Centrocercus urophasianus) is a native species to the area and is almost totally dependent on open sagebrush plain. The males will gather in the early spring to lek (breeding ground) locations to start their elaborate courtship rituals (strutting). They are considered

omnivores, eating insects, sagebrush and seeds; but are most reliant upon sagebrush for both cover from predators and for food.

The greater sage grouse is listed as a sensitive species by the BLM, and a species of concern by WGFD. The BLM definition of a sensitive species is as follows: species that could easily become endangered or extinct in the state, including: (a) species under status review by the FWS/National Marine and Fisheries Service; (b) species whose numbers are declining so rapidly that Federal listing may become necessary; (c) species with typically small or fragmented populations; and (d) species inhabiting specialized refugia or other unique habitats. WGFD lists the greater sage grouse as: species that are widely distributed, with population status or trends unknown but suspected to be stable; habitat restricted or vulnerable but no recent or on-going significant loss; species likely sensitive to human disturbance. The sage grouse are not listed as a Threatened or Endangered species and does not receive any protections from the Endangered Species Act; however, BLM and WGFD have developed restrictions/recommendations to help protect the sage grouse.

BLM has recommended that there be no surface occupancy within 0.25-mile radius of any known lek location or a 2-mile radius during the breeding season, on BLM land or lands adjacent to BLM lands. Recent studies have shown that the 2-mile radius is not sufficient, showing declines in the number of males returning to the leks with activities occurring beyond the 2-mile radius. Thus, the current recommendations may change over time.

It is recommended that coordination with BLM and WGFD occur regarding any proposed or alternative project that has the potential to impact sage grouse habitat. Note that providing water to areas where water is limited may create a beneficial impact for sage grouse and should be considered when evaluating the net potential impacts to this species.

Rare Plant Species of Concern. The WYNDD has 34 known sensitive plant species of concern located in the watershed as discussed in Chapter 3 of this report. The potential exists for some of these species to occur within appropriate habitats within the project area. However, none of these species receive federal or state protection.

Big Game. The Nowood River watershed contains portions of crucial big game habitat for antelope, mule deer, elk and moose managed by the Wyoming Game and Fish Department (WGFD) and big game (elk and moose) parturition (birthing) sites. The WGFD maps the seasonal ranges by herd unit for each big game species and makes special note of areas listed as crucial habitat. Crucial habitat or range is defined as those seasonal ranges or habitats (mostly winter range) that have been documented as the determining factor in a population's ability to maintain its self at a certain level over a long period of time.

Fisheries. Most of the alternative reservoir sites are located on tributaries that are considered perennial and contain viable fisheries resources. WGFD has provided initial comments on each site as indicated in Chapter 4 and in Appendix F. Impacts to the various streams and associated fishery resources will occur with any of the alternative dam and reservoir storage alternatives and should be considered during further environmental evaluation of these sites.

Wetland Resources. Formal wetland delineation in accordance with the Corps of Engineers guidelines was beyond the scope of this Level I study and was not conducted. GIS digital mapping from the National Wetland Inventory (NWI) was acquired to preliminarily identify wetland habitats in the study area. Likewise, LANDFIRE data were obtained and evaluated as presented in Chapter 3. The various locations identified as potential alternative reservoir storage sites are all located on what are considered intermittent to perennial riverine systems. These systems are associated with streambeds and their associated wetland/riparian habitat. Riparian habitats are considered to be valuable habitat for both mammals and birds, along with assisting in reducing flooding. The creation of a reservoir on the drainage would inundate the basin bottoms changing the landscape/habitat.

Some of the areas identified on the NWI maps and within the LANDFIRE datasets as wetlands or other riparian system categories, may in fact not qualify as jurisdictional wetlands upon subsequent detailed examination in the field. This is due to inherent limitations in the aerial photography or satellite imagery-based methodologies used to prepare the NWI maps. In general, our previous experience suggests that estimates of wetland acreage based on the NWI maps or within LANDFIRE datasets tend to be conservatively high and actual acreage of jurisdictional wetlands may be less.

Formal wetlands delineation would be necessary prior to construction at any proposed reservoir storage site, and in any other areas of proposed disturbance (e.g., at spring development sites and along associated pipeline alignments) to determine the level of impacts to wetlands located in the alternative project area and to identify and quantify any necessary mitigation of those impacts.

5.4 Mitigation

Based on prior experience, mitigation could be required at any of the identified alternative dam and reservoir sites to address impacts to wetlands, riparian vegetation, stream channel habitat, cultural resources, fish and game resources, and possibly threatened or endangered species. It is preferred to avoid the need for mitigation of a potentially significant impact by relocation and/or "self-mitigating" design if technically and economically feasible.

Detailed mitigation plans would need to be prepared and approved to replace any lost wetlands identified and quantified by formal wetlands delineation, and riparian vegetation communities. However, given the relatively small acreages of wetlands at the alternative dam and reservoir sites (ranging from less than 1 to 12.2 acres), it is anticipated that mitigation of this resource will be possible at any of the sites by constructing additional wetlands nearby, ideally in the same mainstem stream and/or in a close-by tributary.

Mitigation of potential raptor and big game impacts would generally involve control of certain construction activities during sensitive time periods, and avoidance of direct disturbance of the subject species. Mitigation of potential sage grouse lek impacts will be given special consideration as discussed previously. If any T&E species were encountered at a given site special studies would be required to

determine if appropriate mitigation could be implemented. In general, any such impacts would be avoided to the greatest extent possible by relocation of site facilities.

Additional cultural and historic resource fieldwork would need to be completed to identify and document any such resources that would be inundated or otherwise impacted as a result of constructing any one (or more) of the alternative dams and reservoirs or other potential projects described in Chapter 4. This would include, in turn, a class I (literature search) survey, a Class II (reconnaissance inventory) survey, and if needed, a class III (intensive inventory) survey. Ultimately, a mitigation plan for cultural resources would be developed which would culminate in a Memorandum of Agreement (MOA) between the Wyoming SHPO and the lead federal agency with concurrence by the project sponsor(s), and possibly affected Native American tribes. The agreement would require approval from the Advisory Council on Historic Preservation.

5.5 Bighorn National Forest (USDA)

Construction of projects within the boundary of the Bighorn National Forest will require coordination through the United Stated Department of Agriculture. Special Use Permits, with respect to NEPA, will likely be required for any facility place on forest lands. In this case, the USFS would likely be the lead federal agency.

5.6 Land Ownership and Property Owners

Where applicable, permission should be negotiated for easement/right-of-access for all construction activities associated with the project. ***It is important to note that the WWDC has stated that lands will NOT be 'taken' or condemned in order to construct projects recommended within the watershed management plan. Representatives of the WWDO have stated that the State is not interested in condemning lands for the purpose of constructing a reservoir built with objective of benefitting those whose lands would be used. Participation must be voluntary.***

VI. COST ESTIMATES

VI. COST ESTIMATES

Conceptual-level costs have been developed for each of the alternative potential projects identified and described in Chapter 4. The bases for these costs are described in the following subsections for each of the overall project categories. Cost estimates presented represent 2012 dollars.

6.1 Irrigation System Components

Costs associated with irrigation system components of the watershed management plan were estimated based upon current itemized unit costs for individual improvements. NRCS EQIP cost data were used where feasible for typical design items. These costs are included in Table 6.1.

6.2 Upland Wildlife/Livestock Water Components

The anticipated costs associated with these components of the watershed management plan were based upon previous experience completing similar projects in the Bighorn Basin, current NRCS EQIP cost tables, and current costs of various other system components obtained from reliable sources.

Table 6.2 presents the estimated costs associated with each of the upland wildlife / livestock water source components of the watershed management plan. The following components are common to most of the systems and are itemized below for general reference.

Spring Developments: Typical costs range from $1,000 to $5,000 depending on size and yield of the spring. For the purposes of this Level I investigation a cost of $3,000 was used because site-specific information was not available.

Conventional Windmills: Typical costs associated with installation of a windmill in an existing well is from $5,000 to $10,000 for the windmill, mechanical pump, tank pad, and tank depending on well yield, tank size, and depth to water.

Wind Turbine/Tower: A cost of $5,000 was used for a 1kW, 24 VDC turbine, controller, and 80-foot tilt-up tower for installation at an existing well.

Wells: $10,000-$15,000 (see discussion in Section 6.4 below).

Pipelines: A cost of approximately $1.34 / lineal foot (installed) for 1.5-inch diameter pipe was used and is based upon recently completed projects in the Bighorn Basin. Length of pipe associated with each project was approximated within the GIS environment.

Water Tanks (Stock and Storage): A cost of $3,000 per stock tank was used for a typical rubber-tire type tank. Cost of storage tanks were assumed to be approximately $1 per gallon of storage.

Table 6.1 Costs Associated with Irrigation System Components of the Watershed Management Plan.

Item	Rehabilitation Item Number	Description	Priority	Construction Cost	Engineering (10%)	Construction and Engineering Subtotal	Contingency (15%)	Total Construction Cost	Final Plans and Specs	Permitting / Legal Fees / Acces and Rights of Way	Total Project Cost
Phase I Irrigation System Components											
J.M. Brown Ditch East (Corbett)											
1	Phase I: I-1	Diversion Structure	1	$18,000	$1,800	$19,800	$3,000	$22,800	$3,000	$2,000	$27,800
2	Phase I: I-2	Install 2-ft Parshall flume	2	$2,000	$200	$2,200	$300	$2,500	$500		$3,000
3	Phase I: I-3	Install 10-inch farm turnout headgates (5)	2	$10,000	$1,000	$11,000	$1,700	$12,700	$1,800		$14,500
4	Phase I: I-4	Install 3-ft wide check structures (3)	2	$6,000	$600	$6,600	$1,000	$7,600	$2,000		$9,600
5	Phase I: I-5	Install 24-inch underdrain culverts (4)	2	$8,000	$800	$8,800	$1,300	$10,100	$3,000		$13,100
6	Phase I: I-6	Install 8-inch gated pipe (app. 3,000 LF)	2	$1,000	$100	$1,100	$200	$1,300	$1,000		$2,300
7	Phase I: I-7	Install approx. 300 feet 18-inch PIP at seepage location	2	$4,000	$400	$4,400	$700	$5,100	$1,600		$6,700
J.M. Brown Ditch West (Corbett)											
8	Phase I: I-8	Install diversion structure in creek	1	$18,000	$1,800	$19,800	$3,000	$22,800	$3,000	$2,000	$27,800
9	Phase I: I-9	Install 2-ft Parshall flume	2	$2,000	$200	$2,200	$300	$2,500	$500		$3,000
10	Phase I: I-10	Install 10-inch farm turnout headgates (3)	2	$6,000	$600	$6,600	$1,000	$7,600	$1,800		$9,400
11	Phase I: I-11	Install 3-ft wide check structures (3)	2	$6,000	$600	$6,600	$1,000	$7,600	$2,000		$9,600
12	Phase I: I-12	Install 8-inch gated pipe (app. 1,200 LF)	3	$4,000	$400	$4,400	$700	$5,100	$1,000		$6,100
Russell Ditch											
13	Phase I: I-13	Replace existing slide gate with 48-inch slide gate	1	$6,000	$600	$6,600	$1,000	$7,600	$2,000		$9,600
14	Phase I: I-14	Install 2-ft Parshall flume	2	$3,000	$300	$3,300	$500	$3,800	$500		$4,300
Independent Ditch											
15	Phase I: I-15	Remove existing headgate/install 36-inch diameter slide gate/concrete structure	1	$10,000	$1,000	$11,000	$1,700	$12,700	$2,000		$14,700
16	Phase I: I-16	Install 2-ft Parshall flume	2	$3,000	$300	$3,300	$500	$3,800	$500		$4,300
Graham and Farnsley Ditch											
17	Phase I: I-17	Remove existing headgate/install 36-inch diameter slide gate/concrete	1	$4,000	$400	$4,400	$700	$5,100	$2,000		$7,100
18	Phase I: I-18	Install 2-ft Parshall flume	2	$3,000	$300	$3,300	$500	$3,800	$500		$4,300
Jacob Ditch Headgate											
19	Phase I: I-19	Install 24-inch diameter slide gate/concrete headwall	1	$8,000	$800	$8,800	$1,300	$10,100	$2,000		$12,100
20	Phase I: I-20	Install 2-ft Parshall flume	2	$3,000	$300	$3,300	$500	$3,800	$500		$4,300
21	Phase I: I-21	Clear vegetation and sediment from Jacob Ditch	2	$4,000	$400	$4,400	$700	$5,100	$0		$5,100
Koehler Ditch											
22	Phase I: I-22	Remove existing headgate/install 24-inch diameter slide gate/concrete	1	$8,000	$800	$8,800	$1,300	$10,100	$2,000		$12,100
23	Phase I: I-23	Install 2-ft Parshall flume	2	$3,000	$300	$3,300	$500	$3,800	$500		$4,300
National Ditch											
24	Phase I: I-24	Streambank stabilization (J-hook vanes / cross vane weir)	1	$75,000	$7,500	$82,500	$12,400	$94,900	$2,000	$3,000	$99,900
25	Phase I: I-25	Install 2-ft Parshall flume	2	$3,000	$300	$3,300	$500	$3,800	$500		$4,300
Phase II Irrigation System Components											
Hays Ditch											
26	Phase II: I-01	Install diversion structure	1	$12,000	$1,200	$13,200	$1,980	$15,180	$2,500	$500	$18,180
27	Phase II: I-02	Install 2-ft Parshall flume	2	$3,000	$300	$3,300	$495	$3,795	$500	$0	$4,295
28	Phase II: I-03	Install approx. 1,000 ft 12-inch PIP	2	$7,000	$700	$7,700	$1,155	$8,855	$2,000	$0	$10,855
29	Phase II: I-04	Realign Ditch	2	$4,000	$400	$4,400	$660	$5,060	$500	$0	$5,560
30	Phase II: I-05	Install 12-inch farm turnout headgate	2	$2,000	$200	$2,200	$330	$2,530	$500	$0	$3,030
31	Phase II: I-06	Install 3-ft wide check structure	2	$2,000	$200	$2,200	$330	$2,530	$500	$0	$3,030
32	Phase II: I-07	Install 8-inch gated pipe (app. 3,000 LF)	3	$10,000	$1,000	$11,000	$1,650	$12,650	$1,000	$0	$13,650
Mahoney / Marsh Ditches											
33	Phase II: I-08	Marsh Irrigating Ditch: Install diversion structure in Muddy Ck.	1	$12,000	$1,200	$13,200	$1,980	$15,180	$2,500	$500	$18,180
34	Phase II: I-09	Install three Parshall Flumes (18-inch) on ungaged ditches	2	$9,000	$900	$9,900	$1,485	$11,385	$500	$0	$11,885
35	Phase II: I-10	Monitor rebuilt spillway	1	$0	$0	$0	$0	$0	$0	$0	$0
36	Phase II: I-11	Clear vegetation from selected ditch reaches	1	$3,000	$300	$3,300	$495	$3,795	$0	$0	$3,795
Whiskey Creek / Dexter Ditches											
37	Phase II: I-12	Dexter Ditch: Install headgate	1	$4,000	$400	$4,400	$660	$5,060	$250	$500	$5,810
38	Phase II: I-13	Whiskey Ditch No. 1: Install headgate	1	$4,000	$400	$4,400	$660	$5,060	$0	$0	$5,060
39	Phase II: I-14	Whiskey Ditch No. 2: Install headgate	1	$4,000	$400	$4,400	$660	$5,060	$0	$0	$5,060
Phase III Irrigation System Components											
Point of Rocks DitchDiversion Structure											
40	Phase III: I-1	Install rock weir structure in Sweetwater River	1	$120,000	$12,000	$132,000	$19,800	$151,800	$250	$4,000	$156,050
41	Phase III: I-2	Install 2-ft Parshall flume at diversion structure	2	$3,000	$300	$3,300	$495	$3,795	$250	$0	$4,045
Phase IV Irrigation System Components											
McIntosh-Beaton Ditch Diversion Structure											
42	Phase IV: I-1	Install rock weir structure in Sweetwater River	1	$120,000	$12,000	$132,000	$19,800	$151,800	$250	$4,000	$156,050
43	Phase IV: I-2	Install 2-ft Parshall flume at diversion structure	3	$3,000	$300	$3,300	$495	$3,795	$250	$0	$4,045
Cranor Ditch Rehabilitation											
44	Phase IV: I-3	Rehabiliate Cranor Ditch failure	1	$12,000	$1,200	$13,200	$1,980	$15,180	$250	$2,000	$17,430
45	Phase IV: I-4	Install 2-ft Parshall flume at diversion structure	3	$3,000	$300	$3,300	$495	$3,795	$250	$0	$4,045

Table 6.2 Costs Associated with each of the Upland Wildlife / Livestock Water Source Components of the Watershed Management Plan.

Phase I Wildlife / Livestock Water Supply Alternatives										
Recommended Alternative	**Description**	**Priority**	**Total Construction Cost**	**Engineering (10%)**	**Construction and Engineering Subtotal**	**Contingency (15%)**	**Total Construction Cost**	**Final Plans and Specs**	**Permitting / Legal Fees / Acces and**	**Total Project Cost**
Phase I: L/W 01	East Fork Long Creek Wells Project	2	$60,700	$6,070	$66,770	$10,016	$76,786	$2,000	$2,000	$80,786
Phase I: L/W 02	East Fork Long Creek Reservoirs Project	2	$62,040	$6,204	$68,244	$10,237	$78,481	$5,000	$5,000	$88,481
Phase I: L/W 03	Divide Well Project	2	$90,250	$9,025	$99,275	$14,891	$114,166	$3,000	$2,000	$119,166
Phase I: L/W 04	Grieve Well Pipeline Project	2	$162,600	$16,260	$178,860	$26,829	$205,689	$3,000	$3,000	$211,689
Phase I: L/W 05	Elkhorn Spring Pipeline Project	2	$84,600	$8,460	$93,060	$13,959	$107,019	$2,000	$2,000	$111,019
Phase I: L/W 06	Spring Run Rehabilitation Project	2	$11,000	$1,100	$12,100	$1,815	$13,915	$2,000	$2,000	$17,915
Phase I: L/W 07	East Fork Long Creek Solar Pump Project	2	$57,340	$5,734	$63,074	$9,461	$72,535	$2,000	$2,000	$76,535
Phase I: L/W 08	East Fork Long Creek Reservoir Reconstruction	2	$44,750	$4,475	$49,225	$7,384	$56,609	$7,000	$15,000	$78,609
Phase I: L/W 09	Long Creek Divide Well Project	2	$63,290	$6,329	$69,619	$10,443	$80,062	$3,000	$2,000	$85,062
Phase I: L/W 10	Plateau Well Project	2	$34,890	$3,489	$38,379	$5,757	$44,136	$3,000	$2,000	$49,136
Phase I: L/W 11	Liberty Draw Well	2	$31,890	$3,189	$35,079	$5,262	$40,341	$3,000	$2,000	$45,341
Phase I: L/W 12	School Section Well Project	2	$31,890	$3,189	$35,079	$5,262	$40,341	$3,000	$2,000	$45,341
Phase I: L/W 13	Koehler Draw Well Project	2	$31,890	$3,189	$35,079	$5,262	$40,341	$3,000	$2,000	$45,341
Phase I: L/W 14	Wildlife Guzzlers	2	$30,000	$3,000	$33,000	$4,950	$37,950	$1,000	$1,000	$39,950
Phase II Wildlife / Livestock Water Supply Alternatives										
Recommended Alternative	**Description**	**Priority**	**Total Construction Cost**	**Engineering (10%)**	**Construction and Engineering Subtotal**	**Contingency (15%)**	**Total Construction Cost**	**Final Plans and Specs**	**Permitting / Legal Fees / Acces and**	**Total Project Cost**
Phase II: L/W-01	Muddy Gap Spring	2	$15,715	$1,572	$17,287	$2,593	$19,880	$2,000	$1,000	$22,880
Phase II: L/W-02	McIntosh Well Enhancement	2	$15,000	$1,500	$16,500	$2,475	$18,975	$500		$19,475
Phase II: L/W-03	Indian Creek Pipeline	2	$31,256	$3,126	$34,382	$5,157	$39,539	$2,000	$1,000	$42,539
Phase II: L/W-04	Muddy Creek Pipeline	2	$28,412	$2,841	$31,253	$4,688	$35,941	$2,000	$1,000	$38,941
Phase II: L/W-05	Ferris Mountain Well Construction	2	$31,274	$3,127	$34,401	$5,160	$39,562	$2,000	$1,000	$42,562
Phase II: L/W-06	Muddy Creek Spring Development	2	$14,417	$1,442	$15,859	$2,379	$18,238	$2,000	$1,000	$21,238
Phase II: L/W-07	Cress Creek Spring Rehabilitation	2	$11,134	$1,113	$12,247	$1,837	$14,085	$2,000	$1,000	$17,085
Phase II: L/W-08	UnNamed Spring Development	2	$12,541	$1,254	$13,795	$2,069	$15,864	$2,000	$1,000	$18,864
Phase II: L/W-09	Corral Creek Pipeline	2	$39,914	$3,991	$43,905	$6,586	$50,491	$2,000	$1,000	$53,491
Phase II: L/W-10	Murphrey Creek Pipeline	2	$45,944	$4,594	$50,538	$7,581	$58,119	$2,000	$1,000	$61,119
Phase II: L/W-11	Cherry/Pete Creek Pipeline	2	$76,220	$7,622	$83,842	$12,576	$96,418	$2,000	$1,000	$99,418
Phase II: L/W-12	Whiskey Creek Pipeline Extension	2	$18,328	$1,833	$20,161	$3,024	$23,185	$2,000	$1,000	$26,185
Phase II: L/W-13	Cherry/Whiskey Creek Pipeline	2	$52,080	$5,208	$57,288	$8,593	$65,881	$2,000	$1,000	$109,564
Phase II: L/W-14	Pete Creek Pipeline Extension	2	$53,756	$5,376	$59,132	$8,870	$68,001	$2,000	$1,000	$49,982
Phase II: L/W-15	Rush Creek Pipeline	2	$43,182	$4,318	$47,500	$7,125	$54,625	$2,000	$1,000	$57,625
Phase II: L/W-16	Pole Canyon Pipeline	2	$60,252	$6,025	$66,277	$9,942	$76,219	$3,000	$1,000	$80,219
Phase II: L/W-17	Annis Pipeline Phase I	2	$73,280	$7,328	$80,608	$12,091	$92,699	$2,000	$1,000	$95,699
	Annis Pipeline Phase II	2	$54,944	$5,494	$60,438	$9,066	$69,504	$2,000	$1,000	$72,504
Phase II: L/W-18	Mary's Well Pipeline	2	$41,660	$4,166	$45,826	$6,874	$52,699	$2,000	$1,000	$55,699
Phase II: L/W-19	Berra #3 Well Pipeline	2	$31,479	$3,148	$34,627	$5,194	$39,821	$2,000	$1,000	$42,821
Phase II: L/W-20	North Beefacre Well Replacement/Pipeline	2	$67,644	$6,764	$74,408	$11,161	$85,570	$3,000	$1,000	$89,570
Phase II: L/W-21	Wildlife Guzzlers	2	$30,000	$3,000	$33,000	$4,950	$37,950	$1,000	$1,000	$39,950

Table 6.2 Costs Associated with each of the Upland Wildlife / Livestock Water Source Components of the Watershed Management Plan (Continued).

Phase III Wildlife / Livestock Water Supply Alternatives										
Recommended Alternative	Recommended Alternative	Priority	Total Construction Cost	Engineering (10%)	Construction and Engineering Subtotal	Contingency (15%)	Total Construction Cost	Final Plans and Specs	Permitting / Legal Fees / Acces and	Total Project Cost
Phase III: L/W-01	BLM Recommendations: Cameco Well	2	$10,180	$1,018	$11,198	$1,680	$12,878			$12,878
Phase III: L/W-02	BLM Recommendations: Bare Ring Butte Well	2	$10,180	$1,018	$11,198	$1,680	$12,878			$12,878
Phase III: L/W-03	BLM Recommendations: Circle Bar Well	2	$33,088	$3,309	$36,397	$5,460	$41,856			$41,856
Phase III: L/W-04	BLM Recommendations: North Horse Track Well	2	$33,088	$3,309	$36,397	$5,460	$41,856			$41,856
Phase III: L/W-05	BLM Recommendations: Monument Well	2	$33,088	$3,309	$36,397	$5,460	$41,856			$41,856
Phase III: L/W-06	BLM Recommendations: Smiley Well	2	$33,088	$3,309	$36,397	$5,460	$41,856			$41,856
Phase III: L/W-07	BLM Recommendations: Granite Spring	2	$7,362	$736	$8,098	$1,215	$9,313			$9,313
Phase III: L/W-08	BLM Recommendations: Upper Ladysmith Spring	2	$7,362	$736	$8,098	$1,215	$9,313			$9,313
Phase III: L/W-09	BLM Recommendations: Lower Wager Meadows Spring	2	$7,362	$736	$8,098	$1,215	$9,313			$9,313
Phase III: L/W-10	BLM Recommendations: Twin Springs	2	$7,362	$736	$8,098	$1,215	$9,313			$9,313
Phase III: L/W-11	BLM Recommendations: Mud Spring	2	$7,362	$736	$8,098	$1,215	$9,313			$9,313
Phase III: L/W-12	BLM Recommendations: Fuzzy Reservoir	2	$7,636	$764	$8,400	$1,260	$9,660			$9,660
Phase III: L/W-13	Tank Improvement 4	2	$7,500	$750	$8,250	$1,238	$9,488	$250		$9,738
Phase III: L/W-14	West Alkali Well Improvement Project	2	$7,500	$750	$8,250	$1,238	$9,488	$250	$1,000	$10,738
Phase III: L/W-15	Daley Lake Well Improvement Project	2	$7,500	$750	$8,250	$1,238	$9,488	$250	$1,000	$10,738
Phase III: L/W-16	Stampede Well Improvement	2	$7,500	$750	$8,250	$1,238	$9,488	$250	$1,000	$10,738
Phase III: L/W-17	Soda Lakes Well Improvement	2	$9,542	$954	$10,496	$1,574	$12,071	$500	$1,000	$13,571
Phase III: L/W-18	Fletcher Gap Well Improvement	2	$14,250	$1,425	$15,675	$2,351	$18,026	$2,000	$1,000	$21,026
Phase III: L/W-19	Diamond Springs Pipeline Improvement Project	2	$22,438	$2,244	$24,682	$3,702	$28,384	$2,000	$1,000	$31,384
Phase III: L/W-20	Grassy Lake Well Improvement Project	2	$18,520	$1,852	$20,372	$3,056	$23,428	$2,000	$1,000	$26,428
Phase III: L/W-21	Mitten Flat Well Improvement Project	2	$35,404	$3,540	$38,944	$5,842	$44,786	$2,000	$1,000	$47,786
Phase III: L/W-22	Woods Gulch Pond Rehabilitation	2	$158,000	$15,800	$173,800	$26,070	$199,870	$2,000	$4,000	$205,870
Phase III: L/W-23	Green Mountain Unnamed Spring Redevelopment	2	$9,402	$940	$10,342	$1,551	$11,894	$500	$1,000	$13,394
Phase III: L/W-24	Unnamed Spring Sheep Creek Improvement Project	2	$12,902	$1,290	$14,192	$2,129	$16,321	$500	$1,000	$17,821
Phase III: L/W-25	Bare Ring Slough Well Improvement Project	2	$78,435	$7,844	$86,279	$12,942	$99,220	$2,000	$1,000	$102,220
Phase III: L/W-26	Black Rock Spring Pipeline Project	2	$58,180	$5,818	$63,998	$9,600	$73,598	$2,000	$1,000	$76,598
Phase III: L/W-27	Barras Spring Projection Project	2	$5,000	$500	$5,500	$825	$6,325	$500	$1,000	$7,825
Phase III: L/W-28	Tincup Spring Development	2	$34,780	$3,478	$38,258	$5,739	$43,997	$1,500	$1,000	$46,497
Phase III: L/W-29	Soda Lakes Well Project	2	$23,140	$2,314	$25,454	$3,818	$29,272	$2,000	$1,000	$32,272
Phase III: L/W-30	Picket Creek Well Construction Project	2	$31,408	$3,141	$34,549	$5,182	$39,731	$2,000	$1,000	$42,731
Phase III: L/W-31	Mitten Springs Area Well Construction Project	2	$29,408	$2,941	$32,349	$4,852	$37,201	$3,000	$1,000	$41,201
Phase III: L/W-32	Upper Middle Fork Sulphur Creek Well Construction Project	2	$29,408	$2,941	$32,349	$4,852	$37,201	$3,000	$1,000	$41,201
Phase III: L/W-33	Alkali Creek Tributary Well Construction Project No. 1	2	$29,408	$2,941	$32,349	$4,852	$37,201	$3,000	$1,000	$41,201
Phase III: L/W-34	Alkali Creek Tributary Well Construction Project No. 2	2	$29,408	$2,941	$32,349	$4,852	$37,201	$3,000	$1,000	$41,201
Phase III: L/W-35	Flats North of Ladysmith DraW-Well Construction Project	2	$29,408	$2,941	$32,349	$4,852	$37,201	$3,000	$1,000	$41,201
Phase III: L/W-36	Unnamed Alkali Tributary Well Pipeline Project No. 2	2	$37,408	$3,741	$41,149	$6,172	$47,321	$3,000	$1,000	$51,321
Phase III: L/W-37	North Immigrant Well Construction Project	2	$29,408	$2,941	$32,349	$4,852	$37,201	$3,000	$1,000	$41,201
Phase III: L/W-38	Upper Buffalo Creek	2	$148,400	$14,840	$163,240	$24,486	$187,726	$2,000	$1,000	$190,726
Phase III: L/W-39	Coyote Gulch Pipeline Project	2	$90,850	$9,085	$99,935	$14,990	$114,925	$3,000	$1,000	$118,925
Phase III: L/W-40	Warm Springs Pipeline Project	2	$119,292	$11,929	$131,221	$19,683	$150,904	$3,000	$1,000	$154,904
Phase IV Wildlife / Livestock Water Supply Alternatives										
Recommended Alternative	Recommended Alternative	Priority	Total Construction Cost	Engineering (10%)	Construction and Engineering Subtotal	Contingency (15%)	Total Construction Cost	Final Plans and Specs	Permitting / Legal Fees / Acces and	Total Project Cost
Phase IV: L/W-01	Stock Tank Replacement Project	2	$7,500	$750	$8,250	$1,238	$9,488	$250	$0	$9,738
Phase IV: L/W-02	Hat Well #1 Improvement Project	2	$7,500	$750	$8,250	$1,238	$9,488	$250	$0	$9,738
Phase IV: L/W-03	Jammerman Pastures Well Improvement Project	2	$7,500	$750	$8,250	$1,238	$9,488	$250	$0	$9,738
Phase IV: L/W-04	Lankin Well Improvement Project	2	$9,542	$954	$10,496	$1,574	$12,071	$500	$1,000	$13,571
Phase IV: L/W-05	Nolan Pocket Spring Development	2	$39,126	$3,913	$43,039	$6,456	$49,494	$250	$1,000	$50,744
Phase IV: L/W-06	Well Replacement	2	$14,902	$1,490	$16,392	$2,459	$18,851	$500	$1,000	$20,351
Phase IV: L/W-07	Starr Well Pipeline Extension	2	$12,074	$1,207	$13,281	$1,992	$15,274	$2,000	$1,000	$18,274
Phase IV: L/W-08	Sage Hen Springs Improvement Project	2	$36,102	$3,610	$39,712	$5,957	$45,669	$2,000	$500	$48,169
Phase IV: L/W-09	Lone Mountain Springs Development Project	2	$24,406	$2,441	$26,847	$4,027	$30,874	$2,000	$1,000	$33,874
Phase IV: L/W-10	Dry Creek Pipeline Project	2	$126,852	$12,685	$139,537	$20,931	$160,468	$2,000	$1,000	$163,468

Guzzlers: A cost of $10,000 was used for a 2,250 square feet catchment area feeding a 1800 gallon, BOSS brand tank.

Solar Water Pump: A total cost of $8,640 was used for a typical system.

6.3 Other Management Practices and Improvements

The costs of other potential management practices and improvements such as:

- Stream channel restoration,
- Range/grazing management,
- Prescribed burning, and
- Removal/control of invasive plants and noxious weeds are very project and site dependent.

Normally, all but some of the range/grazing management practices or improvements would be implemented by the appropriate agency (NRCS, BLM, Weed and Pest Districts, etc.).

Local staff of those agencies should be consulted regarding the costs of these practices and improvements. The cost of range/grazing practices and improvements (other than wildlife/livestock watering addressed in Section 5.2 above) mostly involve the rancher's time for planning, herding, salting, noxious weed and plant control/removal (where not otherwise covered by cooperative efforts managed by the Weed and Pest Districts), and possibly installation of local fencing in critical areas.

VII. FUNDING OPPORTUNITIES

VII. FUNDING OPPORTUNITIES

7.1 Overview

Project funding/financing is a critical aspect associated with the implementation of watershed improvement projects. Given the scope of the investigation and the perceived projects which may be pursued (storage reservoirs, irrigation infrastructure improvements, wildlife/stock watering, stream/riparian corridor rehabilitation, and "other" water-resource related project types), there may be a large variety of funding sources which may be available to provide funding for future watershed improvements.

Alternative sources of funding to watershed projects are discussed in the pages that follow. Potential sources include local, state, and federal entities. Much of the information contained in this report was obtained through the following sources which provide a wealth of information on grant, loan and in-kind support for watershed related projects:

- ***Water Management & Conservation Assistance Programs Directory, Fourth Edition*** (WWDC, May 2009) first compiled by the Wyoming State Engineer's Office and now maintained by the Wyoming Water Development Commission at the following website: http://wwdc.state.wy.us/wconsprog/WtrMgntConsDirectory.html.

- ***Catalog of Federal Funding Sources for Watershed Protection*** developed and maintained by the Environmental Protection Agency. This site is a searchable database of financial assistance sources (grants, loans, cost-sharing programs, etc.) available to fund a variety of watershed protection projects. The document is available at the following website: http://cfpub.epa.gov/fedfund/

- ***Habitat Extension Bulletin No. 50 – Fisheries and Wildlife Habitat Cost Share Programs and Grants*** published by the Wyoming Game and Fish Department provides a very comprehensive listing of potential funding sources for fisheries and wildlife habitat projects. The document is available at the following website: http://gf.state.wy.us/downloads/pdf/habitat/Ext%20Bulletin%20No.%2050.pdf .

In addition, discussions of several funding programs were extracted from previous watershed investigations completed on behalf of the Wyoming Water Development Commission. Specifically, the Nowood River Watershed Investigation (Anderson Consulting Engineers, 2010) and the Thunder Basin Watershed Investigation (Olsson, 2011) were reviewed and sections incorporated herein where appropriate.

It is important to understand that the potential sources identified herein are not necessarily exhaustive of the resources that may be available, that existing programs change and sometimes disappear over time, new programs arise, funding levels vary year to year, and competition for many of the programs is significant. Also, contact information for various programs and key people can also change. Key local contacts for current information on funding sources relevant to watershed protection, restoration and conservation, wildlife/stock watering, and irrigation infrastructure improvements include, but are not limited to the following:

- Popo Agie Conservation District (307 307-332-3114)
- Natrona County Conservation District (307-234-4022)
- Saratoga-Encampment Conservation District (307-326-8156)
- NRCS Worland Office (307.347.2456)
- Bureau of Land Management/Worland District Office (307.347.5100)

Key aspects and information about the primary funding programs identified are discussed in the following sections and summarized in a matrix format (Table 7.1).

7.2 Local Agencies

7.2.1 Conservation Districts

The local conservation district serves as the local liaisons between local landowners and resource users and state and federal government agencies. As indicated in Figure 7.1, depending upon the location of a proposed project within the Sweetwater River watershed study area, any of four conservation districts could be involved:

- Popo Agie Conservation District
- Natrona County Conservation District
- Saratoga – Encampment – Rawlins Conservation District
- Sublette County Conservation District

In addition to their many other roles and responsibilities, these districts can also provide funding assistance as follows:

- In-kind technical assistance as local resources, capacity and expertise allow.
- Administration of programs, projects and grants on behalf of recipients of state and federal natural resources program funding.
- Assistance in development of leveraged, partnered programs and projects.

Table 7.1 Potential Funding Sources.

Agency/Entity	Program Name	Project Type(s)	Internet Site	Telephone	Email
Local					
Hot Springs Conservation District	n/a	Liaison, in-kind administrative and technical assistance, program coordination/partnering	http://www.conservewy.com/hscd.html	307.864.3488	See Website
Worland Grazing District	Range Improvement Fund	Range and related improvements	NA	Na	wsgb@wyoming.com
Hot Springs County Weed and Pest District	n/a	Noxious weed and undesirable plant control	www.wyoweed.org	307.864.2278	hscwpcd@rtconnect.net
State					
Wyoming Department of Environmental Quality	Nonpoint Source Implementation Grants (319 Program)	Water quality BMPs	http://deq.state.wy.us/wqd/watershed/index.asp	307.777.7072	See WDEQ Website for contact directories
Wyoming Game and Fish Department	Riparian Habitat Improvement Grant	Stock water development; streambank stabilization; etc.	http://gf.state.wy.us	Scott Talbott Director 307.777.4565	See WGF Website for contact diretories
	Water Development/Maintenance Habitat Project Grant	Water developments (springs, windmills, guzzlers, pumps, etc.)			
	Upland Development Grant	Range management; prescribed burns			
	Fish Wyoming	Public fishing opportunities	http://slf-web.state.wy.us/admin/slib.aspx		
	Wyoming Sage Grouse Conservation Fund	Sage-grouse habitat protection or improvement			
Wyoming Office of State Lands and Investments	Regular Farm Loans	Projects involving most agricultural purposes	http://lands.state.wy.us/	307.777.7331	lboomg@state.wy.us
	Small Water Development Project Loans	Converson of dry land to irrigated land and/or water use efficiency improvements			
Wyoming Water Development Commission	Wyoming Water Development Program	Planning, design and construciton of new reservoir storage and rehabiliation of existing reservoir storage projects	http://wwdc.state.wy.us/opcrit/final_opcrit.pdf	307.777.7626	jwade@state.wy.us
	Small Water Project Program	Small reservoirs and stock			rvore@state.wy.us
Wyoming Wildlife and Natural Resource Trust	n/a	Aquatic and wildlife habitat improvement, including water developments, prescribed burns, invasive plant control, etc.	http://wwnrt.state.wy.us	307.856.4665	NA
Federal					
Bureau of Land Management	Riparian Habitat Management Program	Projects to maintain, restore, improve, protect and expand riparian/wetland areas	http://www.blm.gov/wy/st/en.html	307.775.6092 (Rick Schuler)	Rick_Schuler@blm.gov
	Cooperative Agreement for Range Improvements	Reservoirs, pits, spring developments, wells, and associated distribution pipelines	http://www.blm.gov/wy/st/en/field_offices/Worland.html	307.347.5100 (Worland District Office)	worland_wymail@blm.gov
Bureau of Reclamation	Water 2025 Challenge Grant Program	Water conservation, efficiency and marketing	http://www.usbr.gov/newsroom/newsrelease/detail.cfm?RecordID=2541	307.261.5671	jlawson@gp.usbr.gov
Environmental Protection Agency	Targeted Watershed Grants Program	Riparian, wetland, aquatic and upland habitat protection and improvement	http://www.epa.gov/owow/funding/watershedfunding.html	202-566-1730	dtoledo@rivernetwork.org
Farm Service Agency	Conservation Reserve Program (CRP)	Removal of highly erobible lands from production	http://www.fsa.usda.gov/FSA/stateoffapp?mystate=wy&area=home&subject=landing&topic=landing	307.347.2456	Sherri.McMillan@wy.usda.gov
	Continuous Sign-Up for High Priority Conservation Practices	Riparian buffers, filter strips, grass waterways, salt tolerant vegetation, shallow water areas for wildlife, etc.			
	Emergency Conservation Program (ECO)	Emergency livestock watering conservation during severe drought			
Fish and Wildlife Service	Partners for Wildlife Habitat Restoration	Various fish and wildlife habitat restoration projects	http://ecos.fws.gov/partners/viewContent.do?viewPage=home	307.332.8719	mark_j_hogan@mail.fws.gov
	North American Wetlands Conservation Act Program	Various wetlands conservation projects	http://www.fws.gov/birdhabitat/Grants/NAWCA/index.shtm		
	Landowner Incentive Program (Non-Tribal)	Funding to WGFD to support above project types			
Natural Resources Conservation Service	Environmental Quality Incentives Program	Conservation planning, range management, irrigation rehabilitation, livestock watering, etc.	http://www.nrcs.usda.gov/PROGRAMS/EQIP	307.233.6750 (State Office) 307.864.3488 (Thermopolis Office)	jim.mischke@wy.usda.gov
	Watershed Protection and Flood Prevention Program	Water supply, water quality control, erosion and sediment control, wetland creation and restoration, fish and wildlife habitat enhancement, flood control, public recreation, etc.	http://www.nrcs.usda.gov/programs/watershed/index.html		
	Wildlife Habitat Incentives Program(WHIP)	See websites and/or local contacts for detailed information on these programs	http://www.nrcs.usda.gov/programs/whip/		
	Wetlands Reserve Program (WRP)		http://www.nrcs.usda.gov/programs/wrp/		
	Grassland Reserve Program (GRP)		http://www.nrcs.usda.gov/programs/GRP/		
	Conservation Security Program (CSP)		http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/alphabetical/csp		
	Farm and Ranchlands Protection Program (FRPP)		http://www.nrcs.usda.gov/programs/frpp/		
	Emergency Watershed Protection (ERP)		http://www.nrcs.usda.gov/programs/ewp/		
	Sage Grouse Restoration Project (SGRP)		http://sgrp.usu.edu/		
	Grazing Lands Conservation Initiative (GLCI) Grants		http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/programs/technical/?cid=nrcs143_008456		
Private					
Ducks Unlimited	n/a	Waterfowl aquatic and upland habitat protection, restoration and enhancement	http://www.ducks.org/conservation/du-regional-offices	Great Plains Regional Office: 701.355.3550	
National Fish and Wildlife Foundation	Pulling Together Initiative	Long-term weed management projects	http://www.nfwf.org/AM/Template.cfm?Section=Grants	202.857.0166	info@nfwf.org
	Native Plant Conservation Initiative	Restoration of native plant communities			
	Bring Back the Natives Grant Program	Riverine habitat and aquatic species restoration projects			
	Five-Star Restoration Program	Wetland and riparian habitat restoration			
Trout Unlimited	Watershed Restoration	Erosion control, fish habitat structures, willow and other riparian plantings, etc.	http://www.tu.org/conservation/watershed-restoration-home-rivers-initiative	307.332.7700	syates@tu.org

7.2.2 County Weed and Pest Districts

Wyoming Weed and Pest Districts provide in-kind support to landowners and other agencies/entities including, but not necessarily limited to:

- Assistance in the identification of noxious weeds and other undesirable plants;
- Organization and/or participation in local meetings, seminars and field trips to educate local landowners and agencies on the problems and potential solutions for weed and other undesirable plant control;
- Facilitating work days attended by a broad base of stakeholders (e.g., Russian olive tree cutting); and
- Assistance in preparation of grant applications.

The Weed and Pest Control Districts within the study area are:

- Fremont County Weed and Pest District
- Carbon County Weed and Pest District
- Sweetwater County Weed and Pest District
- Natrona County Weed and Pest District
- Sublette County Weed and Pest District

7.3 State Programs

7.3.1 Wyoming Department of Environmental Quality

The Wyoming Department of Environmental Quality (WDEQ) provides funding for implementation of best management practices (BMPs) to address non-point sources of pollution under Section 319 of the Clean Water Act. Section 319 grant funding requires a non-federal (i.e., local) match of 40 percent from the applicant. These matching funds may be provided by landowners, a conservation district, other quasigovernmental entities (e.g., watershed improvement district, irrigation district, etc.), and/or non-profit organizations (e.g., Trout Unlimited, Ducks Unlimited, and the Rocky Mountain Elk Foundation). Applications (proposals) conforming to a specified format are required. The proposal describes in some detail the issues to be addressed and the proposed methods/BMPs to be implemented, as well as providing all other information required to evaluate the proposed project and matching fund entity(ies). These proposals are normally due in August or September of each year.

7.3.2 Wyoming Game and Fish Department

The following summary of funding assistance available from the Wyoming Game and Fish Department (WGFD) is quoted from the Water Management & Conservation Assistance Program Directory (WWDC, 2009):

> "The Wyoming Game and Fish Department offers a funding program to help landowners, conservation groups, institutions, land managers, government agencies, industry and non-profit organizations develop and/or maintain water sources for fish and wildlife. This program also provides funding for the improvement and/or protection of riparian/wetland areas for fish and wildlife resources in Wyoming. Applications for projects are accepted any time with approval on January 1 and August 1 of each year."

- **Riparian Habitat Improvement Grant**. The purpose of this program is to improve or maintain riparian and wetland resources. Fencing, herding, stock water development, streambank stabilization, small damming projects and beaver transplanting are a few examples of efforts that qualify under this program. Permits, NEPA compliance, construction, maintenance, access and management planning are all grantee responsibilities. There is $10,000/project maximum available with 50% cash or in-kind required from grantee.
- **Water Development/Maintenance Habitat Project Grant.** The purpose of this program is to develop or maintain water for fish and wildlife. Spring development, windmills, guzzlers, water protection and pumping payments are examples of the extent of this program. Permits, NEPA compliance, maintenance, access and water rights are responsibilities of the grantee. There is a maximum of $7,500/project and 50% cash or in-kind contribution required from the grantee.
- **Upland Development Grant**. The purpose of this program is to develop upland wildlife habitat. Example project include management, grazing systems, prescribed burning, wildlife food plots such as oat, millet or corn plantings, range pitting and range seeding. Permits, NEPA compliance, maintenance, access and management planning are responsibilities of the grantee. There is a maximum of $10,000/project and 50% cash or in-kind contribution required from the grantee.
- **Fish Wyoming**. The purpose of this program is to develop public fishing opportunities. Examples of projects within this effort are boat ramps and fishing access. This program provides a 50% match of funding which is channeled through a private organization or municipality."
- **Wyoming Sage Grouse Conservation Fund**. WGFD also administers the Wyoming Sage-Grouse Conservation Fund (WSGCF); http://gf.state.wy.us). The WSGCF is a special fund

established by the Wyoming State Legislature to support the efforts of Local Sage-Grouse Working Groups (LWGs). The WSGCF funding is intended to promote conservation of sage grouse populations and habitat (sagebrush ecosystems), including socio-economic and human use of the habitat. The BHLWG has recently completed the Sage-grouse Conservation Plan for the Big Horn Basin (BHLWG, 2007) to identify and guide implementation of these objectives.

Requests for WSGCF funding must be made on a Project Proposal Form available at: http://gf.state.wy.us/wildlife/wildlife_management/sagegrouse/BigHornBasin/BHB%20SgConservPlanFinal.pdf . Funding is normally considered for projects ranging between $5,000 and $50,000, with priority given to those with matching funds, established partnerships, multi-species benefits, management relevance and consistency with the local sage-grouse conservation plan, highest wildlife impact, appropriate budgets, landscape scale, and a lasting legacy of benefits. Evaluation criteria include: consistency with the local plan, likelihood of project success, project readiness, availability of matching funds, multiple species benefits, significance at local/state/regional level, duration of benefits, and adequacy of funding. Application may be made at any time, but should be made by February 1 to receive first round consideration. Funds awarded must be expended between July 1 of the year received and September 30 of the second year after award. The funds are normally distributed as reimbursable grants (i.e., payments are made for expenses incurred and not "up-front"). Requests for funding of habitat improvement projects, including water developments, must include a livestock grazing management plan. A Project Close-out Report must also be submitted upon completion to allow tracking of expenditures and tracking of results.

7.3.3 Wyoming Office of State Lands and Investments

As the administrative advisory arm of the Board of Land Commissioners and State Loan and Investment Board, the Office of State Lands and Investments (OSLI) administers Regular Farm Loans and Small Water Development Project Loans that may be applicable to potential projects identified in Chapter 4.

- **Regular Farm Loans**. These loans are made for a wide range of agricultural purposes, including as most applicable to the potential projects identified in Chapter 3, purchasing, constructing or installing equipment and/or improvements necessary to maintain or improve the earning capacity of the farming operation. Eligible applicants include individuals whose primary residence is in Wyoming and legal entities with a majority of the ownership meeting the individual residency requirements. Single loans or combinations of loans cannot exceed an outstanding principal balance of $600,000. Loan rates are 8 percent for loans up to 50 percent

of the appraised value of the security land and improvements and 9 percent for loans between 50 and 60 percent of the security. The term of a given loan is limited to 30 years.

- **Small Water Development Project Loans**. These loans are authorized for projects for development and use of water upon agricultural lands for agricultural purposes. These projects may convert dry land into irrigated land or lead to more efficient use of water and/or increased crop or forage production. Eligible recipients may include court approved water districts, agencies of state and local government, persons, corporations, associations, and other legal entities recognized under state law. Individual loans up to $150,000 may be made. Interest is currently set at 6 percent and the maximum term of loans is 40 years.

7.3.4 Wyoming Water Development Commission

The mission of the Wyoming Water Development Commission (WWDC) as defined in the enabling legislation is to: *"provide, through the commission, procedures and policies for the planning, selection, financing, construction, acquisition and operation of projects and facilities for the conservation, storage, distribution and use of water, necessary in the public interest to develop and preserve Wyoming's water and related land resources. The program shall encourage development of water facilities for irrigation...for abatement of pollution, for preservation and development of fish and wildlife resources…and shall help make available the waters of the state for all beneficial uses…"* (W.S. 41-2-112(a)).

Key aspects of the Wyoming Water Development Program and the Small Water Project Program administered by WWDC are described in the following subsections.

7.3.4.1 Wyoming Water Development Program

The main Wyoming Water Development Program encompasses new development, dams and reservoirs, rehabilitation, water resources planning and master planning. Of most relevance to the Buffalo Creek Study Area in terms of implementing alternative projects are the New Development - Rehabilitation Programs and Dams and Reservoirs Program described below. This information was abstracted from the Operating Criteria of the Wyoming Water Development Program available at: http://wwdc.state.wy.us/opcrit/final_opcrit.pdf and from a form titled Information for New Applicants available at the following website: http://wwdc.state.wy.us/projappl/New_Ap_Info.pdf .

It is very important to ensure that the most current information on funding is reviewed prior to making an application as WWDC's policies and procedures can and do change over time in response to legislative direction and/or Commission action. Review of information available at the above websites

and contact with the staff of the WWDC (307.777.7626) is recommended prior to beginning the application process.

- New Development Program — The New Development Program develops presently unused and/or unappropriated waters of Wyoming.
- Rehabilitation Program — The Rehabilitation Program provides funding assistance for the improvement of water projects completed and in use for at least fifteen (15) years.
- Dam and Reservoir Program — Proposed new dams with storage capacity of 2,000 acre feet or more and proposed expansions of existing dams of 1,000 acre feet or more qualify for the Dam and Reservoir Program.
- Water Resource Planning — The Wyoming Water Development Commission serves as the water development planning agency for the State of Wyoming. In this capacity, the WWDC can provide the following assistance to project sponsors.
    - Basin Wide Plans — The program serves to develop basin wide plans for each of the state's major drainage basins.
    - Master Plans — The program provides a service to municipalities, districts and other entities to assist in the preparation of planning documents which serve as master plans for future water supply systems and improvements. The plans serve as a framework for the entities to establish project priorities and to perform the financial planning necessary to meet those priorities. These plans can assist entities in preparing the reports necessary to achieve federal funding assistance for water development and other water related projects.
- Groundwater Grant Program — The primary purpose of the program is to inventory the available groundwater resources in the state. The program also serves to assist communities in developing efficient water supplies. Municipalities and special districts that purvey drinking water are eligible to receive up to $400,000 in grant funds if 25% of the total project costs will be paid by local matching funds.

New Development Program. This program provides technical assistance and funding to develop waters of the state that are unused and/or unappropriated at present. It deals with a wide range of projects, including as most relevant to the Buffalo Creek Study Area are the following types of projects:

- Multiple Purpose (including among other uses two or more of the following: agriculture, recreation, environmental, and erosion control);
- New Storage (dams and reservoirs less than 2,000 acre-feet);
- New Supply (e.g., deep wells, alluvial wells, diversion dams);
- Watershed Improvement (for components whose primary function or benefit is water development); and
- Recreation.

These project types are listed above in the order of preference assigned by WWDC when determining what projects to pursue among all of the applications received for funding.

Rehabilitation Program. The Rehabilitation Program addresses the improvement of water projects completed and in use for at least fifteen years in order to assist in keeping existing water supplies effective and viable for the future. Relative to the Buffalo Creek Study Area, the Rehabilitation Program can improve existing agricultural storage facilities or conveyance systems to insure safety, decrease operation and maintenance (O&M) costs, and increase the efficiency of agricultural water use. The types of projects supported relevant to this watershed are essentially the same as listed above for the New Development Program.

Note that on-farm improvements (e.g., gated pipe, side rolls, center pivots and related facilities and/or equipment such as pumps, power lines) are excluded from WWDC funding under both the New Development and Rehabilitation Programs.

Dam and Reservoir Program. Proposed new dams with storage capacity of 2,000 acre feet or more and proposed expansions of existing dams of 1,000 acre feet or more qualify for the Dam and Reservoir Program. The source of revenue for the program is Water Development Account No. III [W.S. 41-2-124(a)(iii)], which has received Water Development Account No. I appropriations and budget reserve account appropriations on occasion, as approved by the legislature; the interest earnings that have accrued to the Water Development Account No. III; and a percentage (0.5%) of the revenues which accrue to the state's severance tax distribution account. Legislative approval must be granted prior to allocating funds to a particular purpose or project.

Dams and reservoirs typically provide opportunities for many potential uses. While water supply shall be emphasized in the development of reservoir operating plans, recreation, environmental enhancement, flood control, erosion control and hydropower uses should be explored as secondary purposes.

Key Criteria and Procedures. An application for funding under either the New Development and Rehabilitation Programs must meet the following key criteria most applicable to potential projects as identified in Chapter 3 above:

- *"The project sponsor shall be a public entity that can legally receive state funds, incur debt, generate revenues to repay a state loan, hold title and grant a minimum of a parity position mortgage on the existing water system and improvements or provide other adequate security for the anticipated state construction loan."*
- *"The proposed project must serve…2,000 or more acres of irrigated cropland, or must rehabilitate watershed infrastructure, which will develop or preserve the beneficial use of water in a watershed. The watershed rehabilitation projects must possess an estimated minimum useful life span of twenty-five (25) years and demonstrate that sufficient public benefits will accrue to justify construction of the anticipated improvements..."*

Important procedures, deadlines and requirements for applications to the New Development and Rehabilitation Programs include but are not necessarily limited to the following:

- A fee of $1,000 must be submitted with initial project applications; the fee does not apply to projects advanced to the next level of study or to construction.
- A certified resolution passed by the governing body of the sponsoring entity must accompany an application for a Level II study or Level III construction. This requirement may be deferred if the applicant is in the process of forming a public entity.
- A public entity must be in place before a Level II study or Level III construction can commence, with certain exceptions discussed below.
- The due date for new project applications is August 15 of each year; the due date for applications for advancing to the next study level or construction funding is October 1 of each year.

Two important criteria that apply specifically to dam and reservoir projects are:

- *"For projects that enlarge existing storage projects by 1,000 acre-feet or greater or for proposed new dam and reservoirs with a capacity of 2,000 acre-feet or greater, expenses associated with final engineering design and required National Environmental Policy Act reviews, including but not limited to environmental assessments and environmental impact statements, are eligible components of a Water Development Program Level II, Phase III Study Project."*
- *"For dam and reservoir projects, the Commission may waive sponsor eligibility requirements through Level II, Phase II. However. the eligible entity requirements shall be met prior to initiation of Level II, Phase III activities described herein."*

Financial Plan. The current standard terms of the Wyoming Water Development Program financial plan are summarized as follows:

- Sixty-seven (67) percent grant to thirty-three (33) percent loan mix.
- Minimum four (4) percent loan interest rate (current rate is 4 percent, but legislature may increase rate).
- Maximum 50-year term of loans; term shall not exceed economic life of project.
- Payment of loan interest and principal may be deferred up to 5 years after substantial completion at WWDC's discretion under special circumstances.

In the document titled Information for New Applicants the following additional relevant information is provided regarding financial terms:

- *"The best available project financial terms include a grant for Level I and Level II expenses, a grant of 75% of the Level III costs, a loan of 25% of the Level III costs with an interest rate of four percent (4%) and a term equal to the economic life of the project/improvements or fifty (50) years, whichever is less. Principal and interest payments may be deferred for five (5) years after project completion. However, these favorable terms will be granted when a project is essential and the project sponsor has a very limited ability to pay."*
- *"Those sponsors who feel more favorable terms are warranted due to a limited ability to pay must make a formal presentation to the Commission documenting their case. Sponsors electing to pursue this option should be aware that the Commission is reluctant to deviate from this standard and such requests will be denied unless they are clearly documented and justified."*

The Commission will evaluate whether or not a project will be funded for Level III construction following review of the results of Level II studies. If the Commission determines that the project should not advance due to high repayment costs (as determined by an analysis of the sponsor's ability-to-pay and after other funding sources have been considered), the sponsor has the option of making a formal presentation to WWDC relative to the sponsor's ability and willingness to pay. This presentation must address the need for the project, the direct and indirect benefits of the project, and any other information the sponsor feels is relevant to the Commission's final decision.

The project sponsor shall be a public entity that can legally receive state funds, incur debt, generate revenues to repay a state loan, hold title and grant a minimum of a parity position mortgage on the existing water system and improvements appurtenant to the project or provide other adequate security for the anticipated state construction loan.

The WWDC may waive the requirement that the project sponsor be a public entity under the following exceptions:

1. The WWDC may accept applications for Level I studies from applicants that are not public entities. This will allow the applicant to know if there is a viable project prior to becoming a public entity. However, the applicant must be a public entity before applying for a Level II study. Under these circumstances, the Level I process will have a two-year duration with the study being completed the first year and the sponsor forming a public entity the second year.

2. The WWDC may accept applications related to the construction of dams and reservoirs from applicants that are not public entities. As the evaluations of the feasibility of new dams are complex, this will allow the applicant to know if the proposed reservoir is feasible prior to becoming a public entity. However, the applicant must be a public entity before applying for Level II, Phase III funding.

7.3.4.2 Small Water Project Program

The Small Water Project Program (SWPP) is intended to be compatible with the conventional WWDC program described above. Small water projects are defined as providing multiple benefits where the total estimated project costs (including construction, permitting, construction engineering, and land procurement) are less than $100,000 or where WWDC's maximum financial contribution is 50 percent of project costs or twenty-five thousand dollars ($25,000), whichever is less. SWPP funding is a "one-time" grant so that ongoing operation and maintenance costs are not included. Loans are not available under SWPP.

Eligibility. The kinds of projects eligible for SWPP funding include, but are not necessarily limited to:

- small reservoirs and stock watering ponds (up to 20 feet high and 20 acre-feet capacity);
- wells;
- pipelines and conveyance facilities;
- spring developments;
- windmills; and
- wetland developments.

Irrigation works/projects may be eligible if they are already documented in a conservation district's existing watershed plan or a resource management plan or environmental evaluation prepared by a state or federal agency. These types of projects are only eligible if they cannot be addressed by the Water Development Program. Benefits associated with SWPP projects may include, but are not necessarily limited to:

- improved water quality;
- habitat and water for fish and wildlife;
- improved riparian habitat; and
- increased recreational opportunities.

These projects may address environmental concerns by providing water supplies to support plant and animal species, and serve as instruments to improve range land conditions.

Funding can only be provided to eligible public entities including but not necessarily limited to conservation districts, watershed improvement districts, water conservancy districts, and irrigation districts.

Application, Evaluation and Administration. Details of the application and evaluation process and program administrative procedures are provided in the Small Water Project Program Operating Criteria available online as noted previously. Some key aspects of the process and procedures applicable to the potential projects identified in Chapter 4 include the following:

1. Planning for small water projects will be generated by a WWDC watershed study or equivalent as determined by the WWDO. A watershed study will incorporate, at a minimum, available technical information describing conditions and assessments of the watershed including hydrology, geology, geomorphology, geography, soils, vegetation, water conveyance infrastructure, and stream system data. A plan outlining the site specific activities that may remediate existing impairments or address opportunities beneficial to the watershed shall also be included. A watershed study may identify one or more projects that may qualify for SWPP funding. A professional engineer and/or geologist, as appropriate, shall certify any analysis submitted unless generated by a federal agency.

2. Applications shall be received by January 1 of each calendar year. Applications meeting criteria requirements will be considered during the regularly scheduled WWDC meeting in March. Applications shall include a project application, sponsor project referral, project location map, project cost estimates and any letters of authorization or commitment of participation that may be available from other funding sources.

3. Projects that improve watershed condition and function, provide multiple benefits, and meet the funding criteria specified in W.S. 99-3-703(j)(vii) or W.S. 99-3-704(g)(vii), as described in B.4 herein, are eligible for consideration.

4. The sponsoring entity will be required to address the WWDC and provide testimony and other additional supporting evidence that justifies SWPP funding whenever the public benefit documentation, submitted with the application, is deemed to be insufficient by the WWDO.

7.3.5 Wyoming Wildlife and Natural Resource Trust

The Wyoming Wildlife and Natural Resource Trust (WWNRT) was formed by the state legislature in 2005 to preserve and enhance Wyoming's wildlife and natural resources. Projects funded by WWNRT must provide a public benefit such as continued agricultural production to maintain open space and healthy ecosystems, enhancements to water quality, and maintenance or enhancement of wildlife habitat.

Wildlife and Natural Resource Trust funding is available for a wide variety of projects throughout the state, including natural resource programs of other agencies. Some examples include the following:

- Projects that improve or maintain existing terrestrial habitat necessary to maintain optimum wildlife populations may include grassland restoration, changes in management, prescribed fire, or treatment of invasive plants.

- Preservation of open space by purchase or acquisition of development rights contractual obligations, or other means of maintaining open space.
- Improvement and maintenance of aquatic habitats, including wetland creation or enhancement, stream restoration, water management or other methods.
- Acquisition of terrestrial or aquatic habitat when existing habitat is determined crucial / critical, or is present in minimum amounts, and acquisition presents the necessary factor in attaining or preserving desired wildlife or fish population levels.
- Mitigation of impacts detrimental to wildlife habitat, the environment and the multiple use of renewable natural resources, or mitigation of conflicts and reduction of potential for disease transmission between wildlife and domestic livestock.

Allowable projects under this program that are potentially relevant to this watershed management plan study include:

- Improvement and maintenance of existing aquatic habitat necessary to maintain optimum fish populations.
- Conservation, maintenance, protection and development of wildlife resources, the environment, and Wyoming's natural resource heritage.
- Participation in water enhancement projects to benefit aquatic habitat for fish populations and allow for other watershed enhancements that benefit wildlife.

Funding is by grant with no matching funds required. Non-profit and governmental organizations (including watershed improvement districts, conservation districts, etc.) are eligible for funding by WWNRT. Projects will be funded in July and January. Applications may be filed any time, but must be filed within 90 days of the next funding cycle to receive consideration in that cycle.

7.4 Federal Agencies

7.4.1 Bureau of Land Management

- **BLM's Riparian Habitat Management Program** offers the opportunity to coordinate with outside interests on riparian improvement projects. The goal of BLM's riparian-wetland management is to maintain, restore, improve, protect, and expand these areas so they are in proper functioning condition for their productivity, biological diversity, and sustainability. The overall objective is to achieve an advanced ecological status, except where resource management objectives, including proper functioning condition, would require an earlier successional stage. The goal includes aggressive riparian-wetland information, inventory,

training, and research programs as well as improving the partnerships and cooperative management processes.

Partnerships have been available for riparian improvement projects and for research into riparian issues. Funding is available on an annual basis subject to budget allocations from Congress. All submitted cooperative projects compete for the funds available in the riparian program. For information on the riparian habitat program within BLM, please contact Mark Gorges (307) 775-6100.

- **Range Improvement Planning and Development** is a cooperative effort not only with the livestock operator but also with other outside interests including the various environmental/conservation groups. Water development, whether it be for better livestock distribution or improved wetland habitats for wildlife, is key to healthy rangelands and biodiversity. Before actual range improvement development occurs, an approved management plan must be in place. These plans outline a management strategy for an area and identify the type of range improvements needed to accommodate that management. Examples of these plans are Coordinated Resource Plans, Allotment Management Plans, and Wildlife Habitat Management Plans.

  All rangeland improvement projects on lands administered by the Bureau of Land Management require the execution of a Permit. Although there are a couple of methods for authorizing range improvements on the public lands, Cooperative Agreement for Range Improvements form 4120-6 is the method most commonly used. This applies equally to range improvement projects involving water such as reservoirs, pits, springs, and wells including any associated pipelines for distribution. The major funding source for the Bureau of Land Management's share comes from the range improvement fund which is generated from the grazing fees collected. There, too, is a limited amount of funding from the general rangeland management appropriations. If the cooperator is a livestock operator, their contributions come generally in the form of labor. There are times they also provide some of the material costs as well. Contributions from the conservation/environmental interests is monetary and often come in the form of grants. They also contribute labor on occasion. For information on the range improvement program within BLM, please contact Jim Cagney (307) 775-6194.

- **BLM's Watershed and Water Quality Improvement** efforts are undertaken in a cooperative approach with the State of Wyoming, Conservation Districts, livestock operators and various conservation groups. Wyoming's BLM is partnering in the implementation of several Section 319 watershed plans state-wide.

It is anticipated that as the Wyoming Department of Environmental Quality (WDEQ) continues the inventory of waters of the State and the identification of Impaired and/or Threatened water bodies, BLM will be partnering with the WDEQ to improve water quality in water bodies on Public Lands. In the course of developing watershed plans or TMDL's for these watersheds, BLM will be routinely involved in watershed health assessments, planning, project implementation and Best Management Practice (BMP) monitoring.

Now, and in the future, the goals of cooperative watershed projects will typically be the restoration and maintenance of healthy watershed function. These goals will typically be accomplished through approved BMP's, e.g. prescribe burns, vegetation treatments, instream structures, too enhance vegetation cover, control accelerated soil erosion, increase water infiltration and enhance stream flows and water quality.

Currently, in response to the Clean Water and Watershed Restoration initiative and associated funding increases, BLM is expanding its efforts to address water quality and environmental concerns associated with abandoned mines. This work will also be accomplished, in cooperation with the State Abandoned Mine Lands Division, on a priority watershed basis and will employ appropriate BMP's to address identified acid mine drainage and runoff problems from mine tailings and waste rock piles.

7.4.2 Bureau of Reclamation

The Bureau of Reclamation (BOR) administers the Water 2025 Challenge Grant Program. This program provides funding on a competitive basis for projects focused on water conservation, efficiency and water marketing. Preference is given to projects that can be completed within 24 months that will help to prevent crises over water in areas identified as "hot spots" where potential for conflict is judged to be moderate to highly likely by 2025.

Because there are no existing projects within the Buffalo Creek watershed study area under jurisdiction of the BOR, funding through this program is unlikely.

7.4.3 Environmental Protection Agency

The Targeted Watershed Grants Program administered by the Environmental Protection Agency (EPA) "encourages watershed practitioners to examine local water related problems in the context of the larger watershed in which they exist, to develop solutions to those problems by creatively applying the full array of available tools, including general, state and local programs, to restore and preserve water resources through strategic planning and coordinated project management that draw in public and private sector partners..." as described in the following program website:

http://www.epa.gov/twg/2006/2006faq.html#intro. Organizations eligible for funding include nonprofits, tribes, and local governments. The assistance provided consists of grants for up to 75 percent of the total project costs. A match of at least 25 percent is required. The typical median amount awarded is $700,000 with a typical range of $300,000 to $900,000. It is important to note that application must be made by the governor, and that the competition for these grants is keen.

7.4.4 Farm Service Agency

The Farm Service Agency (FSA) administers three different programs that may be applicable to some of the alternative projects identified in Chapter 4. Technical assistance for the FSA programs is provided by NRCS. Each of these three programs is briefly discussed below.

- **Conservation Reserve Program (CRP).** This is a voluntary program under which eligible highly erodible cropland is removed from production in return for annual rental payments and cost share assistance by FSA over a 10-15 year period. The producer is required to establish long-term conservation practices on the erodible, environmentally sensitive lands taken out of production. Continuous Sign-Up for High Priority Conservation Practices. Under this program farmers and ranchers implement certain high-priority conservation practices on their eligible CRP lands. These practices may include: riparian buffers, filter strips, grass waterways, shelter belts, field windbreaks, living snow fences, contour grass strips, salt tolerant vegetation, and shallow water areas for wildlife.

  This cost share program offers rental rates for the CRP lands based on the average value of dryland cash rent with an additional financial incentive of up to 20 percent of the soil rental rate for selected practices. Establishing permanent cover merits up to a 50 percent cost share.

- **Emergency Conservation Program (ECP)**. This program provides emergency funding and technical assistance for implementing emergency livestock watering conservation measures during periods of severe drought and rehabilitating farmland damaged during natural disasters. Cost share assistance up to 75 percent of the cost to implement the emergency measure(s) is available.

- **Continuous Sign-Up for High Priority Conservation Practices:** Continuous sign-up provides management flexibility to farmers and ranchers to implement certain high-priority conservation practices on eligible land. Land must meet the requirements of CRP and be determined by the NRCS to be eligible and suitable for:

Riparian buffers	Living snow fences
Filter strips	Contour grass strips
Grass waterways	Salt tolerant vegetation
Shelter belts	Shallow water areas for wildlife Field windbreaks

This is a cost share program that offers rental rates based on the average value of dryland cash rent with an additional financial incentive of up to 20% of the soil rental rate for field windbreaks, grass waterways, filter strips and riparian buffers. An additional 10% may be added if the land is located in an EPA-designated wellhead protection area. There is also a provision for cost share of up to 50% of the cost of establishing permanent cover.

7.4.5 Fish and Wildlife Service

Technical and financial assistance are available to private landowners, profit or nonprofit entities, public agencies and public-private partnerships under several programs addressing the management, conservation, restoration or enhancement of wildlife and aquatic habitat (including riparian areas, streams, wetlands and grasslands). These programs include, but are not necessarily limited to:

- **Partners for Wildlife Habitat** This program provides technical and financial assistance directly to private landowners through voluntary cooperative agreements called Wildlife Extension Agreements (WEA). The program targets habitats that are in need of management, restoration or enhancement such as riparian areas, streams, wetlands and grasslands. Under these Wildlife Extension Agreements, private landowners agree to maintain the restoration projects as specified in the agreement but otherwise retain full control of the land. Depending on the number of partners, the cost share may vary somewhat but is typically 75% partners and 25% landowner.

- **North American Wetlands Conservation Act Grant Program** This grant program promotes long-term conservation of wetlands ecosystems and the waterfowl, migratory birds, fish and wildlife that depend upon such habitat. Conservation actions supported are acquisition, enhancement and restoration of wetlands and wetlands associated habitat. This program encourages voluntary , public-private partnerships. Public or private , profit or non-profit entities or individuals establishing public-private sector partnerships are eligible . Cost-share partners must at least match grant funds with non-federal monies.. *Small Grants are typically for $50,000.*

- **Wildlife Conservation and Appreciation Program .** This program provides grants to state fish and wildlife agencies to fund projects that bring together USFWW S, state agencies and private organizations and individuals. Projects include identification of significant problems that can adversely affect fish and wildlife and their habitats, actions to conserve species and their habitats, actions that will provide opportunities for the public to use and enjoy fish and wildlife through non-consumptive activities, monitoring of species and identification o f significant habitats.

- **Cooperative Endangered Species Conservation Fund.** This program is available to states that have a cooperative agreement with the Secretary of Interior. The intent is to provide Federal assistance too any state to assist in the development of programs for the conservation of endangered and threatened species. Potential programs include animal, plant and habitat surveys, research, planning, management, land acquisition, protection and public education. Single states may receive up to 75% of program costs

- **Landowner Incentive Program (Non-Tribal**). This program provides funding directly to the lead state wildlife service agency (WGFD in Wyoming) for programs addressing the issues noted previously.

7.4.6 Natural Resources Conservation Service

The Natural Resources Conservation Service (NRCS) administers a number of funding and technical assistance programs applicable to many of the alternative projects identified in Chapter 4. These programs are briefly described below and summarized in Table 7.1.

- **Environmental Quality Incentives Program.** The Environmental Quality Incentives Program (EQIP) is a voluntary program available to agricultural producers that provides technical assistance, cost sharing and incentive payments for projects and practices that improve water quality, enhance grazing lands, and/or increase water conservation. Current priorities used by NRCS in allocating EQIP funds that are applicable to the Buffalo Creek study area include reduction of nonpoint source pollution of surface waters, reduction in soil erosion and sedimentation from agricultural lands, and promotion of at-risk species habitat conservation.

  Non-federal landowners (including American Indian tribes) that engage in livestock operations or agricultural production are eligible for funding. Eligible land includes cropland, rangeland, pasture, forestland, and other farm and ranch lands. Eligibility also requires that

the applicant develop an EQIP plan of operations that becomes the basis of the cost-sharing agreement between NRCS and the participant.

EQIP provides payments up to 75 percent of the incurred costs and income foregone of certain conservation practices and activities. However certain historically underserved producers (Limited resource farmers/ranchers, beginning farmers/ranchers, socially disadvantaged producers) may be eligible for payments up to 90 percent of the estimated incurred costs and income foregone. Farmers and ranchers may elect to use a certified Technical Service Provider (TSP) for technical assistance needed for certain eligible activities and services. The new Farm Bill established a new payment limitation for individuals or legal entity participants who may not receive, directly or indirectly, payments that, in the aggregate, exceed $300,000 for all program contracts entered during any six year period. Projects determined as having special environmental significance may, with approval of the NRCS Chief, have the payment limitation raised to a maximum of $450,000.

Detailed information about the EQIP program is available at the following website: http://www.nrcs.usda.gov/PROGRAMS/EQIP/.

- **Watershed Protection and Flood Prevention Program.** Also known as the "Small Watershed Program" or the "PL 566 Program," this program provides technical and financial assistance to address resource and related economic problems on a watershed basis. Projects related to watershed protection, flood prevention, water supply, water quality, erosion and sediment control, wetland creation and restoration, fish and wildlife habitat enhancement, and public recreation are eligible for assistance. Technical and financial assistance is also available for planning and installation of works of improvement to protect, develop, and use land and water resources in small watersheds.

  Applicants eligible for funding through this program that are potentially relevant to the Buffalo Creek study area include: local or state agencies, counties, conservation districts, or other subunits of state government (e.g., watershed improvement, water conservancy and irrigation districts) with the authority and capacity to carry out, operate, and maintain installed works of improvement. Projects are limited to watersheds containing less than 250,000 acres.

  The assistance provided consists of technical assistance and cost sharing (amount varies) for implementation of NRCS-authorized watershed plans. Technical assistance is provided on watershed surveys and planning. Although projects vary significantly in scope and

complexity, projects receiving $3.5 million to $5 million in federal financial assistance are not uncommon.

- **Other NRCS Programs.** Other programs administered through NRCS that may be relevant to certain of the alternative projects discussed in Chapter 4 include, but are not necessarily limited to the following:

    - **Wildlife Habitat Incentives Program (WHIP**) – Through WHIP, technical and financial assistance is provided to landowners and others to develop and improve wildlife habitat on private lands.
    - **Wetlands Reserve Program (WRP)** – Eligible landowners may receive technical and financial assistance through the WRP to address wetland, wildlife habitat, soil, water and related natural resource concerns on private lands.
    - **Grassland Reserve Program (GRP**) – This program emphasizes support for grazing operations, plant and animal biodiversity, and grassland and land containing shrubs and forbs under the greatest threat of conversion.
    - **Farm and Ranch Lands Protection Program (FRPP**) – FRPP is designed to help farmers and ranchers keep their land in agriculture. It provides matching funds to State, Tribal or local governments and non-governmental organizations with existing farm and ranch land protection programs to purchase conservation easements.
    - **Resource Conservation and Development (RC&D)** – Wyoming's five RC&D areas assist communities by promoting conservation, development and use of natural resources; improving the general level of economic activity; and enhancing the environment and standard of living for residents of those communities.
        - **Emergency Watershed Protection (ERP)**
        - **Small Watershed Rehabilitation Program**
        - **Sage Grouse Restoration Project (SGRP)**
        - **Grazing Lands Conservation Initiative (GLCI) Grants**
        - **Cooperative Conservation Partnership Initiative (CCPI)**

Information on all NRCS programs is available from the local contacts listed Table 7.1.

7.4.7 US Army Corps of Engineers

The Army Corps of Engineers has civil responsibilities for flood damage reduction, hydroelectric power generation and navigational improvement as well as other water and land resource problems and needs including environmental preservation and enhancement, ecosystem management and

comprehensive flood plain management. The Corps is responsible for a worldwide military construction program, an extensive environmental program and a broad national civil works program.

The Corps of Engineers is authorized to provide technical assistance to local communities, States and federally recognized Indian Tribes in support of their efforts to alleviate flooding impacts, reduce erosion and otherwise plan for the wise and prudent use of the nation's water and related land resources. They also have authority to construct certain water resources related projects and respond to water resource needs.

- **Planning Assistance to States.** This program provides for assistance in preparation of plans for the development, utilization and conservation of water and related land resources. The Corps provide technical planning assistance in all areas related to water resources development such as bank stabilization, sedimentation, water conservation, ecosystem and watershed planning and water quality. Assistance is limited to $500,000 per state and studies are cost-shared on a 50-50 basis with a non-federal sponsor such as a state, public entity or an Indian Tribe.

- **Flood Plain Management Services.** This program provides technical services and planning guidance for support and promotion of effective flood plain management. Flood and flood plain data are developed and interpreted with assistance and guidance provided in the form of "Special Studies" on all aspects of flood plain management planning. All services are provided free of charge to local, regional, state or non-federal public agencies. Federal agencies and private entities have to cover 100% of costs.

- **Flood Damage Reduction Projects.** This program provides structural and non-structural projects to reduce damages caused by flooding and focuses on solving local flood problems in urban areas, towns and villages. The Corps works with the project sponsor to define the flood problem, evaluate solutions, select a plan, develop the design and construct a project. A feasibility study is conducted to identify potential projects with the first $100,000 of the cost Federal. Any cost above this amount is cost-shared 50-50 with the sponsor in the form of cash and in-kind services. Construction lands, easements, rights-of-way, relocations and disposal and 5% of the projects costs are the sponsor's responsibility. Operation and maintenance and a maximum of 50% of total project cost are the sponsor's responsibility.

- **Project Modification For Improvement of Environment.** The purpose of this program is to modify structures or operation of previously constructed water resources projects to improve environmental quality, especially fish and wildlife values. A study, at federal expense, is initiated followed by a feasibility plan that is cost-shared 25% by the sponsor.

- **Aquatic Ecosystem Restoration.** This effort is for restoration of historic habitat conditions to benefit fish and wildlife resources. This is primarily to provide structural or operational changes to improve the environment such river channel reconnection, wetland creation or improving water quality. Conditions are similar to the Project Modification program with sponsor cost-share being 35%.

- **Water Resources Projects.** The purpose of this program is to construct larger projects for flood damage reduction and to provide technical assistance in resolving more complex water resource problems. It is used to evaluate projects costing more than $10 million that include purposes of flood control, water supplies, water quality, environmental protection and restoration, sedimentation or recreation. This would include reservoirs, diversions, levees, channels or flood plain parks as examples. The Corps works with a non-federal sponsor to define the flood or water resource related problem or opportunity, evaluate flood control or solutions, select a plan, develop a design and construct a project. This requires special authorization and funding from Congress with a reconnaissance study being federal cost. A feasibility study to establish solutions is cost-shared 50% by the non-federal sponsor with 35 to 50% of construction cost the responsibility of the sponsor.

- **Support For Others Program.** This program provides for environmental protection and restoration or facilities and infrastructure. This includes Environmental Planning and Compliance, Economic and Financial Analyses, Flood Plain Management, Cultural Resources and General Planning. All costs for these programs are provided by the customer agency.

- **Regulatory Authority/Responsibility.** The Corps of Engineers has regulatory authority under the Clean Water Act and the River and Harbor Act. The purpose of these laws is to restore and maintain the chemical, physical and biological integrity of waters of the United States. Section 404 of the Clean Water Act authorizes the Corps to regulate the discharge of dredged or fill material into waters. This would include dams and dikes, levees, riprap, bank stabilization and development fill. There are three kinds of permits issued by the Corps. They are Individual, Nationwide and Regional General permits.

7.4.8 Rural Utilities Service

The United States Department of Agriculture, Rural Development's utilities program is authorized to provide financial assistance for water and waste disposal facilities in rural areas and towns of up to 10,000 people. This program is intended for Non-profit corporations and public bodies such as municipalities, counties, and special purpose districts and authorities.

Funding may be obtained through Rural Development only when the applicant is unable to secure funding from other sources at reasonable rates and terms. The applicant must have legal capacity to borrow and repay loans, to pledge security for loans and to operate and maintain the facilities. The applicant must be financially sound and able to manage the facility effectively as well as have a financially sound facility based upon taxes, assessments, revenues, fees or other satisfactory sources of income to pay costs of operating, debt service and reserve. Grants are also available and are used to supplement loans to reduce debt service where necessary to achieve reasonable user rates. Assistance is also available on how to assemble information concerning engineering, financing and management of proposed improvements.

Loans and grants may be used to construct, repair, improve, expand or modify rural water supplies and distribution facilities such as reservoirs, pipelines, wells and pumping stations, waste collection, pumping, treatment or other disposal facilities. This assistance may also be used to acquire a water supply or water right or finance facilities in conjunction with funds from other agencies or those provided by the applicant. These funds can be used to pay legal and engineering fees connected with the development of a facility or pay other costs related to development including rights-of-way or easements and relocation of roads or utilities. Loan terms are a maximum of 40 years, State Statute, or the useful life, whichever is less with interest rates based on current market yields for municipal obligations.

USDA Rural Development also guarantees loans to eligible commercial lenders to improve, develop or finance water or waste disposal facilities in rural areas. This guarantee is a warrant to protect the lender and may cover up to 90% of the principal advanced. The guarantee fee is 1% of the loan amount multiplied by the percent of the guarantee. Interest rates will be negotiated between the lender and the borrower.

7.5 Non-Profit and Other Organizations

7.5.1 Ducks Unlimited

Ducks Unlimited, Inc. (DU) is a potential funding source for wetlands and waterfowl restoration projects. Although direct grant funding is limited (to the extent that there is generally about $20,000 to $30,000 available annually statewide), in-kind assistance may be available from the local chapter of DU. Additional information on DU's funding programs and opportunities is available in the Water Management & Conservation Assistance Program Directory referenced previously.

7.5.2 National Fish and Wildlife Foundation

The National Fish and Wildlife Foundation (NFWF) is a private, non-profit, tax exempt organization chartered by Congress in 1984 to sustain, restore and enhance the Nation's fish, wildlife, plants and habitats. NFWF provides grant funding on a competitive basis through their Keystone Initiative Grants and Special Grant Program. Some of the grants/programs that may be applicable to potential projects in the Buffalo Creek Study Area include, but are not limited to the following:

- **Pulling Together Initiative** - provides support on a competitive basis for the formation of local Weed Management Area (WMA) partnerships that engage federal resource agencies, state and local governments, private landowners, and other interested parties in developing long-term weed management projects within the scope of an integrated pest management strategy; minimum 1:1 nonfederal match is required.

- **Native Plant Conservation Initiative** – funding preference for "on-the-ground" projects that involve local communities and citizen volunteers in the restoration of native plant communities.

- **Bring Back the Natives Grant Program** – funds to restore damaged or degraded riverine habitats and their native aquatic species provided by BLM, Bureau of Reclamation, FWS, Forest Service, and NFWF; minimum 2:1 nonfederal match required.

- **Five-Star Restoration Program** - provides modest financial assistance on a competitive basis to support community-based wetland, riparian, and coastal habitat restoration projects that build diverse partnerships and foster local natural resource stewardship through education, outreach and training activities; average grant is $13,000.

Information about all of these and other NFWF grants/programs is available at their website: http://nfwf.org/.

7.5.3 Trout Unlimited

The Wyoming Council of Trout Unlimited provides funding and volunteer labor for a variety of stream and watershed projects such as erosion control and fish habitat structures, willow and other riparian plantings and stream protection fencing. Embrace-A-Stream grants are available for up to $10,000 per project. Partnerships are encouraged and can include local conservation districts and state and federal agencies.

VIII. CONCLUSIONS AND RECOMMENDATIONS

VIII. CONCLUSIONS AND RECOMMENDATIONS

A multidisciplinary inventory of the Sweetwater River watershed was conducted in an effort to identify and evaluate key resource issues and concerns. A comprehensive Geographic Information System (GIS) was completed in conjunction with the inventory. The GIS incorporates the data collected and results generated during the study and collates it with information collected from a wide variety of sources. The GIS will be a valuable resource for the community and future studies which will likely be conducted in the watershed.

8.1 Conclusions

Upon completion of the watershed inventory phase of the project, the project team developed several watershed management plans. The plans were developed based upon findings of an inventory phase, a series of public meetings, questionnaires, and interaction with the project steering committee. Key issues and problems were within the watershed identified and ultimately, project goals and objectives were formulated and improvements subsequently developed to address them. Specifically, plans were developed to address issues associated with the following broad categories:

- *Irrigation System Conservation and Rehabilitation,*
- *Livestock/Wildlife Upland Watering Opportunities,*
- *Surface Water Storage Opportunities,*
- *Stream Channel Condition and Stability,*
- *Grazing Management Opportunities, and*
- *Other Upland Management Opportunities.*

In summary, the following conclusions are provided.

8.1.1 Irrigation System Considerations

- Potential solutions to the primary issues and problems associated with irrigation system infrastructure were identified for 14 individual ditch systems. Conceptual level cost estimates were completed for the recommended improvements.

- Of the irrigation systems inventoried and evaluated during this study, several structures are in immediate need of rehabilitation. Several improvements have been identified to reduce potential seepage and conserve water.

- Individual improvements range from installation of measurement devices to reconstruction of irrigation diversions on the Sweetwater River which could cost in excess of $156,000.

- The recommended improvements to each irrigation system can be implemented individually, in combination, or as a complete package depending on the needs, preferences and financial ability of the owner.

- The majority of the recommended improvement projects involving irrigation system infrastructure would require little, if any, permits or coordination with agencies in order to be completed. Several projects would require work within stream channels and consequently, coordination with the United States Army Corps of Engineers would be required. However, it is our understanding that these projects may be included in the Section 404(f) exemption found at 33 C.F.R. Part 323.4(a)(3) which reflects construction and maintenance of farm or stock ponds or irrigation ditches and associated structures.

8.1.2 Livestock/Wildlife Upland Watering Considerations

- The Green Mountain Common Allotment (GMCA) represents a significant portion of the study area. Management strategies pertaining to this allotment are currently in a state of transition and lie to a large degree with the courts. Attention should be paid to the judicial process by all stakeholders within the watershed as forthcoming management decisions pertaining to the GMCA could likely be precedents for other portions of the watershed.

- Depending on the ultimate outcome of pending court cases, development of recommended upland livestock/wildlife water supply projects should be implemented to the extent possible.

- Due to the fact that large percentage of the watershed is federally owned and managed by the BLM, coordination with BLM will be required for the majority of the recommended projects. Given the current regulatory climate and involvement of private interest groups, construction of projects involving federal lands could be problematic and at the least, involve lengthy delays. Many of the recommended pipeline projects could feasibly be redesigned to involve deeded or State lands only. This would likely involve greater materials and construction costs associated with greater project lengths, but this could offset potential permitting issues. Alternatively, projects could also be phased to involve deeded or State lands initially and extended during subsequent phases.

- There appears to be numerous opportunities to improve range and riparian conditions by means of increasing the availability of upland water sources for wildlife and livestock use.

- Pipeline/tank systems appear to offer the most efficient and cost-effective means to provide adequate watering to large areas of rangeland. Water sources for these systems will depend on the location of the rangeland to be served and the available alternative sources. The most likely sources are wells or spring developments.

- A total of 92 potential wildlife/livestock water supply projects were identified following an evaluation of available water sources and input from local land owners and allotment permittees. Conceptual plans and conceptual level cost estimates were prepared for each project. Projects ranged from installation of a guzzler to a regional upland water supply project servicing several wildlife / livestock water tanks and several miles of buried pipeline.

- Any such improvements and practices must be fully implemented and maintained by the landowner to gain the maximum overall benefits to the watershed.

8.1.3 Surface Water Storage Opportunities

- Due to constraints imposed by the North Platte River settlement, development of future storage opportunities other than stock reservoirs within the Sweetwater River watershed was not identified as a priority objective in this study (See Supreme Court of the United States. 2001. *Final Settlement Stipulation in State of Nebraska v. State of Wyoming*. No. 108).

8.1.4 Stream Channel Condition and Stability

- Based on the geomorphic assessment, several impaired channel reaches were identified within the watershed. The categories of impairments that were identified include, but are not limited to degradation of riparian vegetation and degradation of riparian condition in the form of stream bank erosion and channel degradation.

- Site-specific solutions should be developed to mitigate the channel impairment and ultimately included in the watershed management rehabilitation plan.

- Community-sponsored stream channel and habitat improvement projects could provide numerous benefits to the watershed. Potential projects would include efforts such as bank stabilization efforts using techniques such as willow plantings. In addition to providing direct benefits to the specific stream, ancillary benefits include education and community involvement.

- Recommendations pertaining to livestock/wildlife water supply alternatives (Section 8.1.2) should be incorporated into future stream channel rehabilitation efforts where applicable.

8.1.5 Grazing Management Opportunities

- Acceptance of management alternatives by permittees and landowners is paramount to the success of any range management improvement strategy. Without participation, even the best of plans will fail. Commitment is required of those involved to implement a plan and to continue to maintain any infrastructure which may be incorporated.

- Construction of water supply projects must be completed before alternative management strategies will be efficient.

- Water developments can be used to expand grazing distribution to areas that do not currently have reliable water. Fencing of riparian areas is desired to optimize the utilization of the non-riparian facilities. In other words, the mere presence of upland water sources will not keep livestock and wildlife from preferring riparian areas. Riparian area plant community condition can be enhanced by development of water into upland areas.

- Fencing to control livestock can enable a rest-rotation grazing system.

- Fencing combined with low-stress herding can be used to discourage use of riparian areas.

- Riparian areas can be fenced to exclude livestock and wildlife (i.e., wild horses) as well as facilitating utilization for short-term grazing pastures. Riparian pastures should generally be large enough to permit grazing as appropriate to their needs.

- Strategic salting and herding are other tools that can be used to enhance grazing distribution.

- Most range improvement practices which improve watershed condition, may also improve wildlife habitat. Wildlife needs should be considered when installing practices such as wildlife friendly fences, wildlife escape ramps from tanks, and wildlife watering facilities.

- Strategies recommended in the state and transition models associated with NRCS descriptions of the ecological sites found within the watershed should be adopted and employed to optimize range conditions through prescribed grazing management and best management practices.

- Proposed range management strategies associated with the GMCA may result in a single large herd of livestock. Consequently, water supply alternatives must incorporate adequate infrastructure to facilitate use by a large number of animals at any given time. That is, water supply necessary to meet demand and larger stock tanks will enable more animals to use the facility at one time and will minimize the amount of time animals linger in the vicinity.

8.1.6 Other Upland Management Opportunities

1. Noxious weed management programs currently being conducted by the respective weed and pest control districts of the counties involved and should continue. Education opportunities for land owners and managers should continue to be made available.

8.2 Recommendations

Based upon the information presented throughout this report and the conclusions discussed above, the recommendations listed below are included for consideration:

1. Many of the irrigation rehabilitation improvements and the livestock / wildlife upland watering improvements fall within the constraints for funding eligibility of the SWPP. These projects should be reviewed and selected improvements should be implemented as soon as is practical. Completion of one or more of these projects in the near future would serve to benefit those directly involved in the project and increase interest and awareness of the benefits associated with the watershed planning process.

   Funding through the SWPP does not require formation of a district. Consequently, individuals can seek funding through this program. The local conservation districts are eligible sponsors of SWPP project applications. As discussed in Chapter 7, projects providing

multiple benefits and for which total project cost are less than $100,000 are eligible for funding under this program. Grants are available for up to 50 percent of the total project cost or $25,000, whichever is less.

2. Several alternative sources exist for funding of improvements within the watershed including on-farm improvements, irrigation rehabilitation projects, stream enhancements/restoration projects, and conservation and flood control projects. Creative strategies for funding/financing of projects should be more fully investigated following identification of projects worthy of additional evaluation and potential implementation. As an example, replacement of a failing ditch headgate and diversion which are also identified by WGFD as a barrier to fish passage, could potentially be eligible for funding through SWPP (if total project cost meets SWPP criteria). Additional funding could also be attained through WGFD, Trout Unlimited, and other sources because of the fisheries and stream habitat benefits achievable with completion of the project. *By combining funding sources, the owner could conceivably obtain grants for most, if not all, of the project costs.*

IX. REFERENCES

IX. REFERENCES

Bureau of Land Management (2011). ENVIRONMENTAL ASSESSMENT Green Mountain Common Allotment Proposed Grazing Management, WY-050-EA11-5. February, 2011

Bureau of Land Management, Lander District, (1993). Interim Rangeland Management Agreement: Granite Mountain Open Allotment No. 1636.

Bureau of Land Management, Rawlins District. Big Pasture Allotment Management Plan, 1991.

Bureau of Land Management, Rawlins District. Environmental Assessment of the Big Pasture AMP, 1991.

Bureau of Land Management, Rawlins Field Office. Great Divide Basin/Ferris and Seminoe Mountain Watersheds Standards and Guidelines Statement, 2003.

Comer, P., D. Faber-Langendoen, R. Evans, S. Gawler, C. Josse, G. Kittel, S. Menard, M. Pyne, M. Reid, K. Schulz, K. Snow, and J. Teague. 2003. Ecological Systems of the United States: A Working Classification of U.S. Terrestrial Systems. NatureServe, Arlington, VA. 75 p.

Environmental Protection Agency, 1999. Catalog of Federal Funding Sources for Watershed Protection (Second Edition). EPA 841-B-99-003, December

Harrelson, C. C., Rawlins, C. L., and Potyondy, J. P., 1994. Stream Channel Reference Sites: An Illustrated Guide to Field Technique. United States Forest Service Rocky Mountain Forest and Range Experiment Station. General Technical Report RM-245.

Natural Resources Conservation District (NRCS), 2008. Ecological Site Descriptions. Available online at: http://esis.sc.egov.usda.gov/ESIS/About.aspx

NatureServe. 2008. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.0. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer.

Plafcan, M., Eddy-Miller, C.A., Ritz, G. F., Holland, J.P. R. II., 1995. Water Resources of Freemont County, Wyoming. USGS Water Resources Investigations, Report 95-4095.

Rankle, J. G., Montague, E., and Lenz, B. N., 1994. Estimates of Monthly Streamflow Characteristics at Selected Sites, Wind River and Part of Bighorn River Drainage Basins, Wyoming. USGS Water-Resources Investigations Report 94-4014

Rosgen, D. and Silvey, L., 1998. Filed Guide for Stream Classification. Wildland Hydrology.

Rosgen, D. L., 1996. Applied River Morphology: Wildland Hydrology Books, Pagosa Springs, CO. USDA Soil Conservation Service, 1981. Soil Survey of Fremont County, Wyoming Lander Area. Cheyenne, Wyoming

USDA Soil Conservation Service, 1981. Soil Survey of Fremont County, Wyoming Lander Area. Cheyenne, Wyoming

USFS, 2006. LANDFIRE website available at: http://www.landfire.gov/index.php

Wyoming Department of Game and Fish, 2004. Annual Report for Lander Region. Available online at: http://gf.state.wy.us/downloads/pdf/AnnualReports/2004/AN04Lander.pdf

APPENDIX A

SURFACE WATER RIGHTS

PERMIT NO.	DITCH	APPROPRIATOR	PRIORITY	USE	C.F.S.		ACRES	HG LOC.	Notes
	DRY GULCH, Tributary Canyon or Canon Creek								
7553	Robert Cardwell No. 5.....	Robert Cardwell.....	10-08-1906	I	1.17		82.00	31-28-083	
9538	Robert Cardwell No. 6.....	Robert Cardwell.....	10-08-1906	I	0.44		31.00	31-28-083	
	(Water is stored in Robert Cardwell No. 2 Res., Permit 960R.)								
960R	Robert Cardwell No. 2 Res.....	Robert Cardwell.....	10-08-1906	I	282.88	a.f.		31-28-083	
	(Stored water is for Robert Cardwell No. 5 Ditch, Permit 7553.)								
12441	Dry Gulch.....	Henry Cole Cardwell.....	06-03-1914	I	0.44		31.00	20-28-083	
	(Water is stored in Dry Gulch Res., Permit 2672R.)								
2672R	Dry Gulch Res.....	Henry Cole Cardwell.....	06-03-1914	I	110.90	a.f.		20-28-083	
15815	D. G.....	Roy J. Cardwell.....	08-09-1920	I	0.34 Sec.Sup.		24.00	8-28-083	
	(Stored water is from Dry Gulch Res. No. 3, Permit 3643R.)								
3643R	Dry Gulch No. 3 Res.....	Roy J. Cardwell.....	08-09-1920	I	5.35	a.f.		8-28-083	
	SPRING GULCH, Tributary Dry Gulch								
9539	Robert Cardwell No. 7.....	Robert Cardwell.....	01-11-1920	Supply Ditch				2-27-084	
	(Supply ditch for Robert Cardwell No. 2 Res., Permit 960R., from Dry Gulch Tributary Canyon or Canon Creek.)								
	RICK DRAW, Tributary Dry Gulch								
8841SR	Rick Stock Res.....	Wheatland Farms, Inc.....	08-05-1975	S	0.44	a.f.		1-27-084	
	TWIN SPRINGS CREEK, Tributary Canyon or Canon Creek								
16429	Fitchie No. 1.....	Harry H. Fitchie.....	07-19-1922	I	0.10		7.10	22-28-083	
16430	Fitchie No. 2.....	Harry H. Fitchie.....	07-19-1922	I	0.08		6.00	22-28-083	
	JOSENTHAL CREEK, Tributary Canyon or Canon Creek								
16918	Cam No. 1.....	C. W. Sheffner.....	01-15-1925	D,I,S	0.66		46.00	24-28-083	
	SOUTH FORK CANYON OR CANON CREEK, Tributary Canyon or Canon Creek								
7319	Irvine No. 3.....	Frank A. Irvine.....	08-08-1906	I	0.42		30.00	16-28-082	
7814	Canyon Creek.....	Charles Anda.....	05-31-1907	I	0.16		11.00	22-28-082	
	SWEETWATER RIVER, Tributary North Platte River								
Terr.	Rongis.....	Charles Fletcher.....	04-05-1884	I	1.21		85.00	36-30-093	
	(Amended certificate issued.)								
Terr.	Schoonmaker.....	Dumbbell Ranch Co.....	08-01-1886	D,I,S	12.88		901.40	35-29-087	
	(Amended certificate issued to successor of E. P. Schoonmaker, original appropriator of 12.90 c.f.s. and 903 acres, of which 0.02 c.f.s. and 1.6 acres were cancelled, November 12, 1947.)								
Terr.	Bothwell Sweetwater No. 2.....	A. J. Bothwell.....	09-01-1886	I	6.77		474.18	5-29-085	
	(Amended certificate issued, December 6, 1907.)								
Terr.	Bothwell Sweetwater No. 2.....	State of Wyoming, et al.....	09-01-1886	I	2.99		209.00	5-29-085	
	(Amended certificate issued, December 6, 1907.)								

PERMIT NO.	DITCH	APPROPRIATOR	PRIORITY	USE	C.F.S.	ACRES	HG LOC.	Notes
Terr.	Countryman No. 1	Matador Cattle Company	04-18-1887	I	0.55	40.00	19-29-089	
	(Amended certificate issued to successor of C. R. Countryman, original appropriator. Partial change of means of conveyance to Pump No. 1, 20-29-89, thence water will be pumped to the Matador Circle System No. 1 and the Matador Roller Sprinkler System.)							
Terr.	Brown	Barrass & Crofts	Spring 1887	I,S	1.46	104.00	19-29-096	
Terr.	Arnold No. 1	Barrass & Crofts	05-01-1888	I,S	3.70	217.00	26-29-097	
Terr.	Bothwell Sweetwater No. 3	A. J. Bothwell	06-01-1888	D,I	9.55	669.00	5-29-085	
Terr.	Arnold No. 2	Barrass & Crofts	06-00-1888	I,S	0.72	51.00	25-29-097	
Terr.	Sherlock & Marrin	United States Steel Corporation	-1889	D,Ind,Mun	1.78		28-28-101	
	(Amended certificate issued to successor of Sherlock and Marrin, original appropriators of 1.78 c.f.s. and 125 acres of which 1.78 c.f.s. were detached from irrigation and changed to preferred use at the Upper Rock Creek Res., Permit 6394R., and Enlargement, Permit 6497R., on Rock Creek, Tributary Sweetwater River for industrial, domestic, municipal, steam engines, railway, steam heating and power plant use by exchange from Sherlock and Marrin, Enlargement of Sherlock and Marrin, McDowell and Enlargement of McDowell Ditches. These rights to remain in the stream in lieu of the return flow as replacement for water to be stored in the Upper Rock Creek Res., not to exceed 2800 a.f.)							
979	Callahan	John Hay	05-16-1895	I	1.00	70.00	14-29-096	
1067	Riverside	E. J. Williams	08-23-1895	I	0.51	36.00	19-28-101	
1156	Russell Canal	Harry J. Fredericks	02-28-1896	I	1.44	112.00	27-30-095	
1156	Russell Canal	John A. Myers	02-28-1896	I	1.42	100.00	27-30-095	
1178	Jamerman	Emil Jamerman	03-11-1896	I	1.34	95.00	34-30-091	
	(Point of diversion and means of conveyance changed to NT-Ditch 34-30-91.)							
1262	Graham & Farnsley No. 1	Graham & Farnsley	06-22-1896	I	1.65	117.00	7-29-095	
1263	Graham & Farnsley No. 2	Graham & Farnsley	06-22-1896	I	1.34	95.00	7-29-095	
1264	Graham Ditch (as changed in part... to Salmon Ditch)	E. T. Graham, et al	06-22-1896	I	2.45	173.00	16-30-093	
	(Point of diversion for 48 acres changed to 21-30-93. Amended certificate issued. Change of place of use, point of diversion and means of conveyance of a portion, 102.0 acres (1.46 c.f.s.) to the Salmon Ditch.)							
1472	Countryman No. 2	Matador Cattle Company	04-10-1897	I	1.42	99.40	16-29-089	
	(Amended certificate issued to successor of C. R. Countryman, original appropriator. Voluntarily abandoned 11.6 acres (0.14 c.f.s.) from 111.0 acres (1.56 c.f.s.), June 27, 1979. Point of diversion and means of conveyance changed from 19-29-89 to 16-29-89.)							
1703	A. R. Cowley No. 1	Donald A. Beaton	01-10-1898	I	0.86	60.00	13-29-089	
	(Amended certificate issued, June 18, 1919.)							
1906	McIntosh	P. J. McIntosh	07-14-1898	I	3.70	217.00	8-29-090	
	(Point of diversion changed to a new location, 8-29-90, May 21, 1987.)							
367E	Enl. Jamerman	Emil Jamerman	09-21-1898	I	0.26	20.00	34-30-091	
	(Point of diversion and means of conveyance changed to NT-Ditch, 34-30-91.)							
1987	Miller	A. R. Cowley	10-18-1898	I	0.30	21.00	14-29-089	
394E	Enl. Graham	Graham Ranch, Inc	12-05-1898	I	1.92	135.00	16-30-093	
	(Amended certificate issued to successor of James M. Graham, original appropriator, allowing a change of place of use; and point of diversion and means of conveyance for 43.30 acres (0.61 c.f.s.) changed to the Graham Ditch (21-30-93), February 18, 1997.)							
393E	Enl. Salmon	James M. Graham	12-12-1898	I	0.42	30.00	27-30-093	
397E	Enl. Highland Branch Bothwell... Sweetwater No. 2	A. J. Bothwell	12-22-1898	D,I,S	2.79	195.00	5-29-085	
	(Amended certificate issued, December 6, 1907.)							
397E	Enl. Highland Branch Bothwell... Sweetwater No. 2	A. J. Bothwell	12-22-1898	D,I,S	0.79	55.00	5-29-085	
	(Amended certificate issued, December 6, 1907.)							
397E	Enl. Highland Branch Bothwell... Sweetwater No. 2	State of Wyoming; A. J. Bothwell	12-22-1898	D,I,S	1.01	71.00	5-29-085	
	(Amended certificate issued, December 6, 1907.)							
2080	Craner (as previously... changed to the McIntosh Ditch)	James D. Baker	03-05-1899	I	1.43	99.80	19-29-090	
	(Point of diversion changed to a new location in 8-29-90, May 21, 1987. Point of diversion and means of conveyance of 29.8 acres (0.43 c.f.s.) changed to the Countryman No. 1 Ditch, 19-29-89, and amended certificate issued to successor of Donald A. Beaton, original appropriator, with a reduction of 5.2 acres (0.07 c.f.s.) from 105.0 acres (1.50 c.f.s.), May 18, 1987.)							
481E	Enl. Rongis	Josephine Fletcher	12-15-1899	I	1.60	76.00	36-30-093	
2492	McKinney No. 2	Nora S. McKinney	03-03-1900	I	0.13	10.00	7-30-093	
2493	McKinney No. 1	Nora S. McKinney	03-03-1900	I	0.38	27.00	7-30-093	
2515	Sheehan	Glenara M. Sheehan, et al	03-16-1900	I,S	5.64	396.00	4-29-092	

PERMIT NO.	DITCH	APPROPRIATOR	PRIORITY	USE	C.F.S.	ACRES	HG LOC.	Notes
2990	South Side	C. P. Sheehan	01-05-1901	I,S	6.16	433.00	5-29-092	
662E	Enl. A. R. Cowley	Samuel Johnson	05-09-1901	I	1.76	125.00	13-29-089	
700E	Enl. McIntosh	Jennifer Ann Jamerman; Jennifer Ann and Joe McIntosh William McIntosh, and State Board of Land Commissioners	08-27-1901	I	1.10	77.00	8-29-090	
	(Amended certificate issued to successors of P. J. McIntosh, original appropriator, and point of diversion of 10.0 acres changed to a new point, 8-29-90, May 21, 1987.)							
702E	Enl. McIntosh	James D. Baker	09-02-1901	I	1.10	77.30	22-29-090	
	(Amended certificate issued to successor of Donald A. Beaton, original appropriator, and point of diversion and means of conveyance changed from the Enl. McIntosh Ditch, 8-29-90, to the Cranor Extension Ditch, 22-29-90, with a reduction of 178.7 acres (2.55 c.f.s.), May 18, 1987.)							
702E	Enl. McIntosh	P. J. McIntosh	09-02-1901	I	1.00	70.00	8-29-090	
	(Point of diversion changed to a new location, 8-29-90.)							
3389	W. M. Cranor	James D. Baker	09-04-1901	I	0.71	50.00	23-29-090	
	(Amended certificate issued to successor of W. M. Cranor, original appropriator, May 18, 1987.)							
3448	Canyon	James M. Graham, et al	10-03-1901	I	4.71	330.00	11-30-094	
712E	Enl. Sherlock & Marrin	United States Steel Corporation	10-07-1901	D,Ind Mun,RR	3.85		28-28-101	
	(Amended certificate issued to successor of Sherlock and Marrin, original appropriators of 3.85 c.f.s. and 270 acres of which 3.85 c.f.s. were detached from irrigation and changed to preferred use at the Upper Rock Creek Res., Permit 6394R., and Enlargement, Permit 6497R., on Rock Creek, Tributary Sweetwater River for industrial, domestic, municipal, steam engines, railway, steam heating and power plant use by exchange from Sherlock and Marrin, Enlargement of Sherlock and Marrin, McDowell and Enlargement of McDowell Ditches. These rights to remain in the stream in lieu of the return flow as replacement for water to be stored in the Upper Rock Creek Res., not to exceed 2800 a.f.)							
3488	McDowell	U. S. Steel Corp	10-21-1901	D,Ind Mun,RR	3.50		28-28-101	
	(Amended certificate issued to successor of Alfred C. McDowell, original appropriator of 3.50 c.f.s. and 245 acres of which 3.50 c.f.s. were detached from irrigation and changed to preferred use at the Upper Rock Creek Res., Permit 6394R., and Enlargement, Permit 6497R., on Rock Creek, Tributary Sweetwater River for industrial, domestic, municipal, steam engines, railway, steam heating and power plant use by exchange from Sherlock and Marrin, Enlargement of Sherlock and Marrin, McDowell and Enlargement of McDowell Ditches. These rights to remain in the stream in lieu of the return flow as replacement for water to be stored in the Upper Rock Creek Res., not to exceed 2800 a.f.)							
5097	Three Crossings	D. J. Sheehan, et al	10-08-1902	I	1.65	116.00	31-30-091	
946E	Enl. South Side	D. J. Sheehan, et al	11-15-1902	I,S	2.36	237.00	5-29-092	
981E	Enl. McIntosh	Mrs. Donald A. Beaton	01-24-1903	I	1.55	110.00	8-29-090	
	(Point of diversion changed to a new location, 8-29-90.)							
990E	Enl. Canyon	James M. Graham, et al	02-10-1903	I	1.92	135.00	11-30-094	
1007E	Enl. Burnt Ranch	Albert W. Carpenter	03-21-1903	I	0.90	63.00	27-28-100	
1007E	Enl. Burnt Ranch	James H. Carpenter	03-21-1903	I	0.31	22.00	27-28-100	
1007E	Enl. Burnt Ranch	Mrs. N. W. Carpenter	03-21-1903	I	1.59	111.00	27-28-100	
1155E	Enl. Three Crossings	Calvin Lemmon	01-27-1904	I	1.64	115.00	31-30-091	
1155E	Enl. Three Crossings	Fred W. Roedde	01-27-1904	I	4.42	310.00	31-30-091	
1155E	Enl. Three Crossings	Glenara M. Sheehan	01-27-1904	I	0.85	60.00	31-30-091	
1271E	Enl. McDowell	U. S. Steel Corp	09-26-1904	D,Ind Mun,RR	0.50		28-28-101	
	(Amended certificate issued to successor of John J. Marrin, original appropriator of 0.50 c.f.s. and 35 acres of which 0.50 c.f.s. were detached from irrigation and changed to preferred use at the Upper Rock Creek Res., Permit 6394R., and Enlargement, Permit 6497R., on Rock Creek, Tributary Sweetwater River for industrial, domestic, municipal, steam engines, railway, steam heating and power plant use by exchange from Sherlock and Marrin, Enlargement of Sherlock and Marrin, McDowell and Enlargement of McDowell Ditches. These rights to remain in the stream in lieu of the return flow and in exchange for water to be stored in the Upper Rock Creek Res., not to exceed 2800 a.f.)							
6278	Wyoming Central	H. D. Schoonmaker, Ex. Est E. P. Schoonmaker	10-24-1904	I	22.10	1,548.50	13-29-089	
	(Amended land description and change in point of diversion and means of conveyance of a portion to the A R Cowley Ditch per SEO petition.)							
1308E	Enl. Jamerman	Emil Jamerman	12-27-1904	D,I,S	3.04	216.00	34-30-091	
	(Point of diversion and means of conveyance changed to NT-Ditch, 34-30-91.)							
1379E	Enl. Countryman	Matador Cattle Company	03-27-1905	I	2.07	145.00	19-29-089	
	(Amended certificate issued to successor of C. R. Countryman, original appropriator. Partial change of means of conveyance to Pump No. 1, 20-29-89, thence water will be pumped to the Matador Circle System No. 1 and the Matador Roller Sprinkler System.)							

PERMIT NO.	DITCH	APPROPRIATOR	PRIORITY	USE	C.F.S.	ACRES	HG LOC.	Notes
6979	National	Pease & Van Patten	05-12-1905	D,I,S	1.88	142.00	24-30-095	
1489E	Enl. (W. M.) Cranor	James D. Baker	02-26-1906	I	0.49	34.50	23-29-090	
	(Amended certificate issued to successor of W. M. Cranor, original appropriator, with a reduction of 27.5 acres (0.39 c.f.s.), May 18, 1987.)							
1607E	Enl. Sherlock & Marrin	William H. Sherlock, et al	07-27-1906	I	1.30	91.00	28-28-101	
1616E	Enl. Schoonmaker	Dumbbell Ranch Co., & State Board of Land Commissioners	09-26-1906	I	13.93	975.40	19-29-086	
	(Amended certificate issued to successors of Sweetwater Land and Livestock Company, original appropriator of 14.40 c.f.s. and 1,008 acres, of which 0.47 c.f.s. and 32.6 acres were cancelled, April 21, 1948. Point of diversion changed from 26-29-87.)							
1703E	Enl. National	Maud Pease	03-16-1907	I,S	0.85	60.00	24-30-095	
7876	Point of Rocks	Cathryn O. Sheehan, et al	05-20-1907	I	4.11	288.50	6-29-092	
7876	Point of Rocks	Cathryn O. Sheehan, et al	05-20-1907	I	1.93	133.00	6-29-092	
8760	Frederick	Lura E. Frederick	11-21-1908	I	3.34	234.00	24-30-095	
1974E	Enl. Canyon	James M. Graham	11-21-1908	I	2.29	160.00	11-30-094	
9392	Beaver Dam	U. E. Cook	11-10-1909	I	1.33	93.00	19-28-099	
9756	Emigrant Road	Fayetta Sheehan	04-25-1910	I	0.77	54.00	6-29-092	
9942	Cranor Extension	James D. Baker	04-25-1910	I	0.32	22.50	22-29-090	
	(Amended certificate issued to successor of W. M. Cranor, original appropriator with a reduction of 3.5 acres (0.05 c.f.s.), May 18, 1987.)							
9954	Jacob	Frank Koehler	07-02-1910	I	1.76	123.00	23-30-095	
9955	Meyers	Albert Meyers	07-02-1910	I	3.11	218.00	27-30-095	
	(Point of diversion and means of conveyance for 218.0 acres (3.11 c.f.s.) changed to the Russell Ditch (Permit 1156), 27-30-95. Voluntarily abandoned 28.6 acres (0.41 c.f.s.) from 246.6 acres (3.52 c.f.s.), May 15, 1986.)							
9955	Meyers	John A. Meyers	07-02-1910	I	1.40	98.30	27-30-095	
	(Point of diversion and means of conveyance of 98.3 acres (1.40 c.f.s.) changed to the Russell Ditch (Permit 1156), 27-30-95. Voluntarily abandoned 1.9 acres (0.06 c.f.s.) from 100.2 acres (1.46 c.f.s.), May 15, 1986.)							
10776	NT-	William O. Collins	06-15-1911	I,S	2.17	152.00	34-30-091	
2526E	Enl. National	Luella Van Patten	08-16-1911	I,S	0.31	22.00	24-30-095	
11271	Miller	John D. Miller, et al	05-06-1912	I	1.80	126.00	6-29-095	
3271E	Enl. of Three Crossings	The Grieve Land and Cattle Company	08-30-1912	D,I,S	0.83	58.00	31-30-091	
3271E	Enl. of Three Crossings	Collins Jamerman, et al	08-30-1912	D,I,S	1.18	83.00	31-30-091	
2744E	Enl. No. 2 Schoonmaker	Dumbbell Ranch Co., & State Board of Land Commissioners	01-07-1913	I	3.00	209.80	35-29-087	
	(Amended certificate issued to successor of Sweetwater Land and Livestock Company, original appropriator of 3.50 c.f.s. and 245 acres, of which 0.50 c.f.s. and 35.2 acres were cancelled, April 21, 1948. Point of diversion changed from 25-29-87.)							
3202E	Enl. Beaver Dam	Albert W. Carpenter	06-12-1915	I,S	1.01	71.00	19-28-099	
3190E	Enl. Point of Rocks	C. P. Sheehan	07-16-1915	I	1.90	133.00	6-29-092	
3190E	Enl. Point of Rocks	Glennara Sheehan	07-16-1915	I	0.43	30.00	6-29-092	
3571E	Enl. Miller	Lottie A. Miller	11-01-1915	I	1.57	110.00	6-29-095	
3605E	Enl. Graham & Farnsley No. 1	James Weisner	12-27-1915	I	0.97	68.00	7-29-095	
3578E	Enl. Russell	Frank Koehler & State Board of Land Commissioners	12-28-1915	I	0.93	65.00	27-30-095	
3578E	Enl. Russell Canal	Myers Land & Cattle Co., Inc	12-28-1915	I	0.86	60.00	27-30-095	
3724E	Enl. Brown	Lillian Ellis	11-20-1916	I	0.54	38.00	19-29-096	
3782E	Enl. Myers	M. N. Baldwin Co	06-22-1917	D,I	1.51	106.00	27-30-095	
	(Point of diversion and means of conveyance of 15.0 acres (0.21 c.f.s.) changed to the Russell Ditch (Permit 1156), 27-30-95. Point of diversion and means of conveyance of 56.0 acres changed to the Russell Canal, 27-30-95. Point of diversion and partial means of conveyance of 91.0 acres (1.30 c.f.s.) changed to the Russell Canal (as previously changed in part to the Russell Canal), 27-30-95, August 17, 1988.)							
3819E	Enl. Miller	Mamie B. Miller	08-10-1917	D,I,S	0.11	7.50	6-29-095	
3970E	Enl. A. R. Cowley No. 1	Verla B. Beaton, et al	02-17-1919	D,I,S	3.70	259.00	13-29-089	
4130E	Enl. A. R. Cowley No. 1	Elwood Gantz	04-05-1920	D,I,S	1.00	70.00	13-29-089	
4119E	Enl. Burnt Ranch	James L. Silber	06-21-1920	I	1.64	115.00	27-28-100	
16025	Independent	Frank Koehler	02-14-1921	I	0.71	50.00	33-30-095	
4222E	Enl. Emigrant Road	William P. McIntosh	06-20-1921	I	0.53	37.00	6-29-092	
4215E	Enl. Burnt Ranch	Mrs. N. W. Carpenter	07-13-1921	D,I,S	1.31	92.00	27-28-100	
16662	Producers & Refiners Corporation... Water Line	Producers & Refiners Corporation	09-04-1923	D,Ind	0.48		5-29-085	
4500E	Hay Enl. of McDowell	Blair and Hay Land and Livestock Company	08-14-1926	I,S Supply Ditch	S.S.	320.00	28-28-101	
	(Original supply is from Pacific Creek through the Archibald Blair Ditch, Permit 8091. Also supply ditch for Pacific Res. No. 1, Permit 4025R, and for Pacific							

PERMIT NO.	DITCH	APPROPRIATOR	PRIORITY	USE	C.F.S.		ACRES	HG LOC.	Notes
	Res. No. 2, Permit 4026R.)								
4025R	Pacific No. One Res.....	Blair and Hay Land and Livestock... Company	08-14-1926	I,S	106.91	a.f.		1-27-102	
	(Pacific No. One Res., Permit 4025R., located in Water Division No. Four, but supplied from Sweetwater River in Water Division No. One supply ditch, the Hay Enl. of McDowell Ditch, Permit 4500E., which is also supplemental supply for 320 acres through Archibald Blair Ditch, Permit 8091, is carried in Tabulation of Water Division No. One.)								
4499E	Enl. Independent.....	D. F. Hudson.....	08-26-1926	D,I,S	2.14		150.00	33-30-095	
17176	The Jacob.....	Jacob J. Jacobs and Est..... of Lena Jacobs	02-14-1927	I	2.35		164.44	35-30-093	
18785	Koehler.....	Frank Koehler.....	09-20-1935	D,I,S	0.69		48.00	10-30-094	
18785	Koehler.....	W. Richard Scarlett.....	09-20-1935	D,I,S	0.14		10.00	10-30-094	
5961E	Enl. Frederick.....	Myers Land and Cattle Company.....	06-02-1958	I,S	0.40		28.00	24-30-095	
22091	McDowell.....	Bar X Sheep Company.....	11-21-1958	I,S	4.03		282.00	28-28-101	
22091	McDowell.....	John T. Radosevich.....	11-21-1958	I,S	0.54		38.00	28-28-101	
6005E	Enl. Sherlock and Marrin.....	John T. Radosevich.....	11-21-1958	I,S	6.14		430.00	28-28-101	
6005E	Enl. Sherlock and Marrin.....	Bar X Sheep Company.....	11-21-1958	I,S	0.43		30.00	28-28-101	
	SWEETWATER RIVER, Tributary North Platte River, PACIFIC CREEK, Tributary Little Sandy Creek; AND WHITE HORSE DRAW, Tributary Alkali Creek, Tributary Little Sandy Creek								
4026R	Pacific No. Two Res.....	Blair and Hay Land and Livestock... Company	08-14-1926	I,S	1,394.21	a.f.		33-27-102	
	(Pacific No. Two Res., Permit 4026 Res. is located in Little Sandy Creek watershed in Water Division No. Four and is partially supplied from Sweetwater River in Water Division No. One. This reservoir is supplied from the Hay Enl. McDowell Ditch (Div. Four) under Permit No. 17140, and the Hay Enl. McDowell Ditch (Div. One) under Permit No. 4500 Enl.)								
	ARKANSAS CREEK, Tributary Sweetwater River								
3308	Dawes No. 2.....	James E. Williams.....	07-15-1901	I	0.51		36.00	26-27-087	
3309	Dawes No. 3.....	James E. Williams.....	07-15-1901	I	0.32		23.00	24-27-087	
15825	Annis.....	Carol E. Annis.....	09-11-1920	I	0.70		49.00	27-29-085	
15825	Annis.....	Oscar T. Annis.....	09-11-1920	I	0.73		51.00	27-29-085	
17504	Arkansas "B".....	Ida H. Puntenney.....	08-06-1928	I	2.43		170.13	8-27-086	
17504	Arkansas "B".....	Melissa B. Spurlock.....	08-06-1928	I	2.27		158.87	8-27-086	
17505	Arkansas "C".....	Ida H. Puntenney.....	08-06-1928	I	0.91		63.91	5-27-086	
17505	Arkansas "C".....	Melissa B. Spurlock.....	08-06-1928	I	0.01		0.72	5-27-086	
18109	Esther No. 2.....	Esther M. Annis.....	09-22-1932	I	1.44		101.00	23-28-086	
18299	Oscar.....	Oscar T. Annis.....	07-29-1933	I	0.43		30.00	22-29-085	
	EAST ARKANSAS CREEK, Tributary Arkansas Creek								
18110	Esther No. 2.....	Esther M. Annis.....	09-22-1932	I	S.S.		62.00	24-28-086	
	(Original supply is from Arkansas Creek, through Esther No. 2 Ditch, Permit 18109.)								
9831SR	East Arkansas Stock Res.....	USDI, Bureau of Land Management... and SS Ranch (lesse)	03-03-1982	S	12.04	a.f.		10-27-086	
	WEST ARKANSAS CREEK (BRAID), Tributary Arkansas Creek								
9832SR	Upper Arkansas Stock Res.....	USDI, Bureau of Land Management... and SS Ranch (lessee)	03-03-1982	S	11.70	a.f.		7-27-086	

PERMIT NO.	DITCH	APPROPRIATOR	PRIORITY	USE	C.F.S.		ACRES	HG LOC.	Notes
	LITTLE ARKANSAS CREEK, Tributary Arkansas Creek								
3307	Dawes No. 1	James E. Williams	07-15-1901	I	0.12		10.00	26-27-087	
	HORSE CREEK, Tributary Sweetwater River								
Terr.	Connor No. 1	Robert Taylor	04-15-1880	I	0.43		30.00	23-31-085	
Terr.	Connor No. 2	Robert Taylor	04-15-1880	I	0.28		20.00	23-31-085	
Terr.	Smith No. 1	A. J. Bothwell	06-17-1885	D,I	2.80		190.00	34-30-085	
Terr.	Smith No. 2	A. J. Bothwell	06-17-1885	I	1.14		80.00	34-30-085	
Terr.	Omstead	John H. Omstead	12-00-1888	D,I	1.16		80.00	16-31-085	
Terr.	Connor No. 1, 2nd Appropriation	Robert Taylor	-1890	I	0.28		20.00	23-31-085	
293	Wilson	Henry H. Wilson	06-18-1892	I	1.14		80.00	15-30-085	
	(Erroneously adjudicated with priority of October 1897.)								
	Connor No. 3	Robert Taylor	Spring 1895	I	1.50		105.00	15-30-085	
	Connor No. 4	Robert Taylor	Spring 1895	I	1.07		75.00	15-30-085	
	Weaver	Robert Taylor	Spring 1895	I	1.14		80.00	22-31-085	
16265	Sanford	Archie Sanford	11-25-1921	I	0.45		32.00	22-30-085	
16265	Sanford	Gordon Sanford	11-25-1921	I	0.03		2.00	22-30-085	
4974E	Enl. Wilson	Archie Sanford	10-09-1934	I,S	3.71		260.00	15-30-085	
	FISH CREEK, Tributary Horse Creek								
16946	Fish Creek Pump Station 2" Water Pipe Line	Producers & Refiners Corporation	03-20-1925	D,Oil,S	0.05			31-31-084	
	FISH CREEK AND SPRINGS, Tributaries Horse Creek								
Terr.	Healey	Robert Taylor	Spring 1895	I	0.43		30.00	26-31-084	
2160R	McQueary Res	W. M. McQueary, et al	04-08-1911	I,S	43.74	a.f.		27-31-084	
	(Stored water is for McQueary Ditch, Permit 19794.)								
10742	McQueary	W. M. McQueary, et al	04-08-1911	I,S	3.58		251.10	23-31-084	
13822	McQueary Outlet	C. R. I. Livestock Co.	01-10-1916	I	S.S.		22.00	27-31-084	
	(Water is stored in McQueary Res., Permit 2160R., for McQueary Ditch, Permit 10742. Adjudicated as supplemental supply instead of secondary supply.)								
	SHELL CREEK AND FISH CREEK AND SPRINGS, Tributaries Horse Creek								
19794	McQueary	Archie Sanford	07-10-1943	I,S	130.15 Sec.Sup.	a.f.	251.10	22-31-084	
	(Water is stored in Shell Creek Res., Permit 5508R.)								
5508R	Shell Creek Res	Archie Sanford	07-10-1943	I,S	130.15	a.f.		23-31-084	
	SPRINGS, Tributary Fish Creek								
3206	Krischel No. 3	Jacob Krischel	05-24-1901	I	0.73		52.00	14-31-084	

PERMIT NO.	DITCH	APPROPRIATOR	PRIORITY	USE	C.F.S.	ACRES	HG LOC.	Notes
	HENDERSON CREEK, Tributary Horse Creek							
5394	Henderson	H. L. Omstead	04-02-1903	I	0.57	40.00	36-32-085	
11902	Hoshaw	Mary Ann Hoshaw	06-23-1913	I	0.45	32.00	36-32-085	
	GRANITE KNOB SPRINGS, Tributary Sweetwater River							
1384	Tributary Bothwell Sweetwater No. 2	A. J. Bothwell	02-06-1897	I,S	S.S.		33-30-085	
	(Original supply is from Sweetwater River through Bothwell No. 2 Ditch, Territorial Appropriation.)							
	DRY CREEK, Tributary Sweetwater River							
1484	Circle Bar No. 1	W. E. Claytor	05-17-1897	I	0.62	44.00	22-32-088	
1485	Circle Bar No. 2	W. E. Claytor	05-17-1897	I	0.13	10.00	22-32-088	
2532B	Hanes	S. L. Hanes	04-02-1900	I	0.74	52.00	34-33-088	
2601	Roberts	Lynn Roberts	05-08-1900	I	0.30	21.00	22-31-087	
3735	Riddel	Edward Riddel	02-24-1902	I	0.14	11.00	9-30-087	
5811	Roberts No. 4	Art Roberts	11-23-1903	I	0.36	27.00	4-30-087	
6157		E. P. Schoonmaker	08-25-1904	S			29-30-086	
6338	Elizabeth	Elizabeth Roberts	12-01-1904	I	0.42	30.00	34-31-087	
8360	Miller	Wm. S. Miller	05-05-1908	I	0.11	8.00	5-31-087	
2224B	Enl. Miller	Mrs. Veta L. Miller	05-23-1910	I	0.05	3.60	5-31-087	
9823	Four V	Mrs. Veta L. Miller	05-23-1910	D,I,S	0.61	42.80	31-32-087	
2285E	Enl. Four V	Mary A. Taylor	08-26-1910	I	0.11	7.50	31-32-087	
10195	Simplot	Walter L. Simplot	09-28-1910	I	0.77	54.00	9-32-088	
10196	Circle Cross	Emma F. Claytor	09-30-1910	I	1.42	100.00	16-32-088	
10584	Riddel No. 2	Edward Riddel Est	04-29-1911	I	0.67	47.00	16-30-087	
10647	Riddel No. 3	Forest L. Riddel	05-08-1911	I	0.23	16.40	5-31-087	
13072	Fisher	Peter Fisher	04-01-1915	I	0.77	54.00	16-30-087	
14078	Enspear	Julia Fisher	04-12-1916	I	0.40	28.00	15-30-087	
15338	Greenwood	Abraham J. Greenwood	11-13-1918	I	1.61	119.00	29-30-086	
	BLACK ROCK SPRING, Tributary Black Rock Draw, Tributary Dry Creek							
6156	Black Rock Springs	Edgar P. Schoonmaker	08-25-1904	D,S			3-30-086	
	(No amount of appropriation given.)							
10418	Black Rock Springs Pipeline	Shoshone & Arapaho Tribes, % Joint Business Council	01-14-1911	S	0.05		13-6N-03E	
	(Actual amount of appropriation is 0.056 c.f.s.)							
	BEULA BELL LAKE, Tributary Dry Creek							
6158	(None Given)	Edgar P. Schoonmaker	08-25-1904	S			29-30-086	
	(No c.f.s. indicated.)							

PERMIT NO.	DITCH	APPROPRIATOR	PRIORITY	USE	C.F.S.		ACRES	HG LOC.	Notes
	U. T. CREEK, Tributary Dry Creek								
12533	U T	W. S. Miller	07-13-1914	I	0.33		23.50	5-31-087	
	BRUSH OR BUSH CREEK, Tributary Dry Creek								
9374	Lady Emma	William Wahlert	10-11-1909	I	1.08		76.00	3-32-088	
1641R	Lady Emma Res	William Wahlert	10-11-1909	I,S	32.20	a.f.		3-32-088	
	(Stored water is for Lady Emma Ditch, Permit 9374.)								
	SPRINGS, Tributary Dry Creek								
4088	Hanes & Curran No. 1	Rena J. Hanes, et al	07-12-1902	I	0.70		49.00	5-32-088	
4089	Hanes & Curran No. 2	Rena J. Hanes, et al	07-12-1902	I	0.51		36.00	5-32-088	
	RUSH CREEK, Tributary Sweetwater River								
Terr.	Rush Creek	Tom Sun	05-10-1882	I	0.45		33.00	35-29-087	
	(Actually supplemental supply for Pete Creek Irr. Ditch, Territorial Priority of 6-4-1882, from Pete or Pete's Creek.)								
3068	Rush	Tom Sun	03-07-1901	I	0.53		38.00	22-28-087	
18108	Esther No. 1	Esther M. Annis	09-22-1932	I	S.S.		101.00	27-27-087	
	(Original supply is from Arkansas Creek through Esther No. 2 Ditch, Permit 18109.)								
20217	Dry Lake Supply	Tom Sun	04-29-1948	Supply Ditch				14-27-087	
	(Supply ditch for Dry Lake Res., Permit 5660R., Lone Rock Res., Permit 5661R., and White Rock Res., Permit 5662R.)								
5660R	Dry Lake Res	Tom Sun	04-29-1948	S	17.90	a.f.		20-28-086	
5661R	Lone Rock Res	Tom Sun	04-29-1948	S	3.92	a.f.		13-28-087	
5662R	White Rock Res	Tom Sun	04-29-1948	S	1.35	a.f.		25-28-087	
	PETE OR PETE'S CREEK, Tributary Sweetwater River								
Terr.	Bar 11	Samuel Johnson	05-01-1881	I	0.83		59.00	29-28-087	
Terr.	Peter Creek Irrigating	Tom Sun	06-04-1882	I,S	1.32		93.00	4-28-087	
Terr.	Hospitality	Samuel Johnson	04-03-1885	I	0.72		51.00	29-28-087	
Terr.	Center	Samuel Johnson	04-20-1887	I	1.56		111.00	29-28-087	
9902	Johnson	Samuel Johnson	06-14-1910	I	2.10		147.00	29-28-087	
	(This ditch also diverts from Red Birch Creek, tributary Pete or Pete's Creek.)								
22442	Enl. Hospitality	Samuel Johnson	06-14-1910	I	1.64		115.00	29-28-087	
22420	Pete No. 1	Bernard Sun	02-28-1963	I	0.24		17.00	4-28-087	
22421	Pete No. 2	Bernard Sun	02-28-1963	I	1.34		93.50	4-28-087	
	BARNABY DRAW, Tributary Pete or Pete's Creek								
10281SR	Bar Eleven Pit Stock Res	USDI, Bureau of Land Management	10-05-1987	S	4.15	a.f.		21-28-087	
	(This stock reservoir is unadjudicated, but built within the terms of the permit. No certificate of construction will be issued.)								

PERMIT NO.	DITCH	APPROPRIATOR	PRIORITY	USE	C.F.S.		ACRES	HG LOC.	Notes
	RED BIRCH CREEK, Tributary Pete or Pete's Creek								
4031	Gants	Elwood Gants	07-02-1902	I	0.66		48.00	32-28-087	
9902	Johnson	Samuel Johnson	06-14-1910	I	2.10		147.00	29-28-087	
	(This ditch also diverts from Pete or Pete's Creek.)								
	CHERRY CREEK, Tributary Sweetwater River								
Terr.	Cherry Creek No. 1	Tom Sun, et al	05-00-1882	I,S	3.35		236.00	32-29-087	
Terr.	Cherry Creek No. 2	Tom Sun, et al	05-00-1882	I,S	1.42		100.00	32-29-087	
Terr.	Stony Supplemental to Dexter	Stewart J. Sharp	05-02-1884	I,S	0.56		41.00	35-28-088	
	(There is an apparent conflict of 38 acres in NW1/4 SE1/4, Section 26 Township 28 North, Range 88 West with lands under Dexter Ditch, Territorial Priority April 24, 1885.)								
Terr.	Cherry Creek No. 3	Tom Sun, et al	05-00-1884	I,S	2.53		178.00	12-28-088	
Terr.	Dexter	Steward J. Sharp	04-24-1885	I	1.83		129.00	35-28-088	
Terr.	Sam	Steward J. Sharp	05-15-1885	I	0.26		20.00	35-28-088	
Terr.	Center	Steward J. Sharp	05-20-1887	I	0.43		31.00	35-28-088	
4217E	Enl. Cherry Creek No. 1	Hub and Spoke Ranch Company	08-02-1921	I	0.88		62.00	32-29-087	
4218E	Enl. Cherry Creek No. 2	Hub and Spoke Ranch Company	08-02-1921	I	0.28		20.00	32-29-087	
	WEST CHERRY CREEK, Tributary Cherry Creek								
Terr.	Ferris	Steward J. Sharp	05-28-1886	I	1.55		110.00	2-27-088	
	WATERMELON DRAW, Tributary Sweetwater River								
11474SR	Watermelon Stock Res	Sun Land & Cattle Co. and State Board of Land Commissioners	01-13-1992	S	0.34	a.f.		16-28-088	
	(This stock reservoir is unadjudicated, but built within the terms of the permit. No certificate of construction will be issued.)								
	MUDDY CREEK, Tributary Sweetwater River								
Terr.	Marsh Irrigating	John Mahoney	05-30-1888	I,S	1.50		105.00	9-26-088	
1704	A. R. Cowley No. 2	A. R. Cowley	01-10-1898	D,I	1.02		72.00	2-26-089	
1888	Mahoney No. 2	John Mahoney	08-05-1898	I,S	0.55		40.00	2-26-089	
1889	Mahoney No. 1	John Mahoney	08-05-1898	I,S	0.70		49.00	2-26-089	
1951	Mahoney No. 3	John Mahoney	09-01-1898	I,S	0.42		30.00	10-26-088	
1965	Continuation Mahoney No. 3	John Mahoney	09-14-1898	I,S	1.52		107.00	10-26-088	
1966	Marsh & Co. No. 7	John Mahoney	09-14-1898	I,S	1.05		75.00	8-26-088	
1966	Marsh & Co. No. 7	John Mahoney	09-14-1898	I,S	3.04		213.00	8-26-089	
6121	Muddy Gap No. 3	Mary L. Harper	07-18-1904	I	0.07		5.00	3-27-089	
6122	Muddy Gap No. 4	Mary L. Harper	07-18-1904	I	0.07		5.00	3-27-089	
823R	Hanna Mahoney No. 1 Res	John Mahoney	03-28-1906	I	92.40	a.f.		6-26-088	
	(Stored water is for Mahoney Nos. 1 and 2 Ditches, Permit 1888 and 1889. Place of storage changed to Marsh and Company Res., Permit 825R. The total capacity not to exceed the combined adjudicated storage of 92.4 a.f. under Permit 823R. and 44.17 a.f. under Permit 825R. or 136.57 a.f.)								
824R	Hanna Mahoney No. 2 Res	John Mahoney	03-28-1906	I	73.92	a.f.		2-26-089	
	(Stored water is for Mahoney Nos. 1 and 2 Ditches, Permits 1888 and 1889.)								
825R	Marsh & Company Res	John Mahoney	03-28-1906	I	44.17	a.f.		8-26-088	
	(Stored water is for Marsh & Co. No. 7 Ditch, Permit 1966.)								
9375	Brady	Michael Brady	10-12-1909	I	0.14		10.00	27-27-089	
11025	Brady No. 2	Michael Brady	10-09-1911	I	0.44		31.10	27-27-089	

PERMIT NO.	DITCH	APPROPRIATOR	PRIORITY	USE	C.F.S.		ACRES	HG LOC.	Notes
12762	Brady No. 3	Michael Brady	10-03-1914	I	0.10		7.00	27-27-089	
16560	Muddy Gap	Sun Land & Cattle Co. & State Board of Land Commissioners	01-22-1923	I Supply Ditch	1.46		102.00	27-28-089	
	(Also supply ditch for Bucklin Res., Permit 1026R.)								
16560	Muddy Gap	Sun Land & Cattle Company	01-22-1923	Res. Supply				27-28-089	
	(This appropriation is limited to reservoir supply for the Enl. Bucklin Res., Permit No. 1967 Res. This appropriation is limited to the amount of water beneficially used to supply the Enl. Bucklin Res., Permit No. 1967 Res., not to exceed 720 acre-feet from all sources in any one year at a rate not to exceed 32.4 c.f.s.)								
16560	Muddy Gap	Cole Tully	01-22-1923	I	2.14		150.00	27-28-089	
17425	H. M.	Hazel M. Gantz	07-02-1928	I	3.53		247.50	6-28-088	
4619E	Enl. Muddy Gap	Norman D. Bucklin	04-02-1929	Supply Ditch				27-28-089	
	(Supply ditch for Bucklin No. 2 Res., Permit 4108R., from Whiskey Creek.)								
	WHISKEY CREEK, Tributary Muddy Creek								
1251	Whiskey Creek No. 1	A. A. Harper	05-09-1896	I	0.73		52.00	1-27-089	
1251	Whiskey Creek No. 1	Mary Sharp, et al.	05-09-1896	I	0.54		33.00	1-27-089	
	(Erroneously adjudicated with priority of May 4, 1896.)								
1252	Whiskey	A. A. Harper	05-09-1896	I	0.63		45.00	1-27-089	
2121	Hays	S. J. Sharp	05-19-1899	I	1.28		85.00	12-27-089	
	(Amended certificate issued to successor of A. A. Harper, original appropriator.)								
1026R	Bucklin Res	Norman D. Bucklin	02-06-1907	I	435.00	a.f.		18-28-088	
	(Stored water is for Bucklin Ditch, Permit 7713.)								
10159	Bucklin Outlet	Norman D. Bucklin	09-15-1910	I	2.21		155.00	18-28-088	
	(Lands in Section 8 of this appropriation are under the Buckling Ditch, Permit No. 7713. This permit should have been filed as an enlargement of Bucklin Ditch.)								
1967R	Enl. Bucklin Res	Sun Land and Cattle Company	09-15-1910	I	285.00	a.f.		19-28-088	
	(Total capacity of this reservoir is 720.0 a.f. This enlargement is for 285.0 a.f., and the original Bucklin Res., Permit 1026 Res., is for 435.0 a.f., supplied from New Inlet Ditch, Permit No. 17553.)								
17553	New Inlet	Norman D. Bucklin	12-20-1928	Supply Ditch				30-28-088	
	(Supply ditch for Bucklin Res., Permits 1026R., 1967R., 4108R., and 4109R.)								
4108R	Bucklin No. 2 Res	Norman D. Bucklin	12-20-1928	I	360.75	a.f.		19-28-088	
4109R	Bucklin No. 3 Res	Norman D. Bucklin	12-20-1928	I	61.75	a.f.		24-28-089	
	WATER STORED IN BUCKLIN RESERVOIR (Permit No. 1026 Res.), Supplied from Whiskey Creek								
7713	Bucklin	Norman D. Bucklin	02-06-1907	I	Sec.Sup.		160.00	18-28-088	
	(Also serves as a supply ditch for the Bucklin Reservoir, Permit No. 1026 Res. Point of diversion and means of conveyance for the supply ditch changed to the New Inlet Ditch, Permit No. 17553. Point of diversion from reservoir remains in 18-28-88, November 14, 1929.)								
	MAJOR SPRINGS, Tributary Muddy Creek								
6119	Muddy Gap No. 1	Mary L. Harper	07-18-1904	I	0.42		30.00	34-28-089	
6120	Muddy Gap No. 2	Mary L. Harper	07-18-1904	I	0.07		5.00	34-28-089	
18787	State Highway Pipe Line	Wyoming State Highway Department	09-15-1936	D	0.12			34-28-089	
	CAMP CREEK, Tributary Muddy Creek								
16449	Producers & Refiners Corporation... 2" Water Line	Producers & Refiners Corporation...	08-24-1922	D,Oil	0.02			35-27-090	

PERMIT NO.	DITCH	APPROPRIATOR	PRIORITY	USE	C.F.S.		ACRES	HG LOC.	Notes
	LITTLE CAMP CREEK, Tributary Muddy Creek								
6379	Speyer No. 2	F. C. Speyer	12-27-1904	I	0.64		46.00	2-27-090	
6380	Speyer No. 1	F. C. Speyer	12-27-1904	I	0.73		52.00	2-27-090	
9381	Harper No. 1	Clarence E. Harper	10-15-1909	I	1.06		74.00	31-28-089	
9382	Harper No. 2	Clarence E. Harper	10-15-1909	I	0.20		14.00	31-28-089	
9383	Harper No. 3	Clarence E. Harper	10-15-1909	I	0.27		19.00	31-28-089	
1645R	Harper Res	Clarence E. Harper	10-15-1909	I	21.00	a.f.		6-27-089	
	(Stored water is for Harper No. 1 Ditch, Permit 9381.)								
15354	Desert	Alma M. Grieve	02-01-1919	I	1.14		80.00	2-27-090	
	UNNAMED CREEK AND SPRING, Tributaries Little Camp Creek								
15355	(None Given)	Alma M. Grieve	02-01-1919	I	S.S.		40.00	2-27-090	
	(Original supply is from Little Camp Creek, through Desert Ditch, Permit 15354.)								
	RAWLINS DRAW, Tributary Sweetwater River								
11364SR	Rawlins Draw No. 6069 Stock Res	USDI, Bureau of Land Management	09-09-1991	S	4.53	a.f.		25-28-090	
	(This stock reservoir is unadjudicated, but built within the terms of the permit. No certificate of construction will be issued.)								
	WILLOW CREEK (16-29-89), Tributary Sweetwater River								
1379	Johnson No. 1	R. L. Tully	01-21-1897	I	0.63		45.00	34-28-090	
1380	Johnson No. 2	R. L. Tully	01-21-1897	I	0.42		30.00	27-28-090	
3776	Big Willow Creek	Mark W. Countryman	03-17-1902	I	0.26		20.00	6-27-090	
4025	Tully	R. L. Tully	06-27-1902	I	1.71		120.00	33-28-090	
6284	Tully No. 5	Lena Tully	10-29-1904	I	0.36		27.00	26-28-090	
6285	Tully No. 2	R. L. Tully	10-29-1904	I	0.42		30.00	34-28-090	
1282E	Enl. Johnson No. 1	R. L. Tully	10-29-1904	I	0.31		22.00	34-28-090	
1283E	Enl. Johnson No. 2	Ella M. Tully	10-29-1904	I	0.51		36.00	27-28-090	
8919	Lena Speyerer No. 1	Lena Speyerer	01-16-1909	Supply Ditch				13-28-090	
	(Supply ditch to Speyerer Res., Permit 1467R.)								
8920	Lena Speyerer No. 3	Lena Speyerer	01-16-1909	I	Sec.Sup.		7.00	6-28-089	
	(Water is stored in Speyerer Res., Permit 1467R.)								
8921	Lena Speyerer No. 2	Lena Speyerer	03-02-1909	I	Sec.Sup.		167.00	6-28-089	
	(Water is stored in Speyerer Res., Permit 1467R.)								
1467R	Speyerer Res	Lena Speyerer	03-02-1909	I	312.00	a.f.		6-28-089	
	(Stored water is for Lena Speyerer Nos. 2 and 3 Ditches, Permits 8921 and 8920.)								
9943	Grieve No. 1	John T. Grieve	06-14-1910	I	Sec.Sup.		17.00	23-28-090	
	(Water is stored in Grieve Res., Permit 1873R.)								
9944	Grieve No. 2	John T. Grieve	06-14-1910	Supply Ditch				26-28-090	
	(Supply ditch from Willow Creek and Grieve Res., Permit 1873R., to Enl. Tully No. 5 Ditch, Permit 2254E.)								
2254E	Enl. Tully No. 5	John T. Grieve	06-14-1910	I	Sec.Sup.		18.00	26-28-090	
	(Water is stored in Grieve Res., Permit 1873R.)								
1873R	Grieve Res	John T. Grieve	06-14-1910	I	66.00	a.f.		26-28-090	
	(Stored water is for Grieve No. 1 and Enl. Tully No. 5 Ditches, Permits 9943 and 2254E.)								
2253E	Enl. Johnson No. 1	John T. Grieve	06-24-1910	I	0.80		56.00	34-28-090	

PERMIT NO.	DITCH	APPROPRIATOR	PRIORITY	USE	C.F.S.		ACRES	HG LOC.	Notes
	COOPER CREEK, Tributary Sweetwater River								
1955	Frantzen	Ole Frantzen	09-07-1898	I	0.52		37.00	29-28-090	
1993	Cooper Creek	Levi Johnson	10-20-1898	I	0.26		20.00	31-28-090	
1117E	Enl. Frantzen	Ole C. Frantzen	10-27-1903	I	1.28		90.00	29-28-090	
1731E	Enl. Cooper Creek	Jesse Johnson	05-08-1907	I	0.42		30.00	31-28-090	
8993	Home	David Johnson	05-05-1909	D,I,S	0.10		7.00	17-28-090	
30646	No. 1 Cooper Creek Pipeline	USDI, Bureau of Land Management	08-20-1990	S	0.03			17-28-090	
		Tena Marie Sun, et al.							
	(Actual amount of appropriation is 0.035 c.f.s.)								
	SPRING CREEK, Tributary Cooper Creek								
1992	Spring Creek	William Johnson	10-20-1898	I	0.15		12.00	18-28-090	
7757	Spring Creek No. 2	Jesse Johnson	05-08-1907	I	0.14		10.00	19-28-090	
7758	Spring Creek No. 3	Jesse Johnson	05-08-1907	I	0.31		22.00	19-28-090	
17809	Desert No. 1	Fannie Knapp	12-15-1930	I	0.20		14.00	18-28-090	
17810	Desert No. 2	Fannie Knapp	12-15-1930	I	0.60		42.00	18-28-090	
	WILLOW CREEK, Tributary Spring Creek								
7756	Willow Spring	Jesse Johnson	05-06-1907	I	0.04		3.00	19-28-090	
	WEST COOPER CREEK, Tributary Cooper Creek								
8992	Home No. 1	David Johnson	05-05-1909	I	0.11		7.50	17-28-090	
	EAST COTTONWOOD CREEK, Tributary Cottonwood Creek, Tributary Sweetwater River								
2502	Wales Irrigating (No. 1)	John Wales	03-06-1900	I	0.42		30.00	22-28-091	
1044E	Enl. Wales Irrigating (No. 1)	John Wales	05-18-1903	I	0.13		10.00	22-28-091	
5468	Wales No. 2	Nancy Wales	05-18-1903	I	0.51		36.00	11-28-091	
7761	Wales No. 2	Nancy Wales	05-08-1907	I	0.14		10.00	15-28-091	
2190E	Enl. Lateral Wales No. 1	John Wales	05-08-1907	I	0.44		31.00	22-28-091	
8998	East Cottonwood	Jesse Johnson	05-05-1909	I	0.36		25.00	2-28-091	
2249E	Enl. Wales No. 1	William D. E. Johnson	04-25-1910	D,I,S	1.42		100.00	22-28-091	
13058	Johnson Supply	Jesse Johnson	01-06-1915	I	S.S.			27-28-091	
	(Original supply is from Middle Cottonwood Creek, tributary Cottonwood Creek, through Johnson No. 1 Ditch, Territorial Appropriation, Johnson No. 2 Ditch, Territorial Appropriation, Johnson No. 3 Ditch, Permit 1956, Johnson No. 4 Ditch, Permit 3749 and Johnson No. 5 Ditch, Permit 11935.)								
	WEST COTTONWOOD CREEK, Tributary Cottonwood Creek, Tributary Sweetwater River								
1954	Wash	William Johnson	09-07-1898	I	0.35		26.00	8-28-091	
7261	Ole No. 1	Jesse Johnson	06-28-1906	I	0.64		45.00	17-28-091	
7262	Ole No. 2	Jesse Johnson	06-28-1906	I	0.52		37.00	17-28-091	
7755	Wash No. 2	William Johnson	05-08-1907	I,S	0.12		10.00	4-28-091	
9135	Henry Johnson	Jesse Johnson	06-25-1909						
	(Voluntarily abandoned May 10, 1957.)								
2814E	Enl. Johnson No. 2	Jessie Johnson	06-25-1909						
	(Voluntarily abandoned May 10, 1957.)								
1549R	Henry Johnson Res	Jesse Johnson	06-25-1909						
	(Voluntarily abandoned May 10, 1957.)								

PERMIT NO.	DITCH	APPROPRIATOR	PRIORITY	USE	C.F.S.		ACRES	HG LOC.	Notes
11881	Wash No. 3	Jesse Johnson	08-16-1911	I	0.44		31.00	4-28-091	
17958	Walsh	Edward Walsh	08-01-1931	D,I,S	0.14		9.73	8-28-091	
	BUTTE SPRING, Tributary West Cottonwood Creek								
5453	Butte Springs	H. V. Johnson	05-06-1903	I	0.40		28.00	12-28-092	
	MIDDLE COTTONWOOD CREEK, Tributary Cottonwood Creek, Tributary Sweetwater River								
Terr.	Johnson No. 1	Jessie Johnson	-1882	I,S	0.34		25.00	16-28-091	
Terr.	Johnson No. 2	Jessie Johnson	-1885	I,S	0.31		22.00	9-28-091	
1956	Johnson No. 3	Jesse Johnson	09-07-1898	I	0.40		28.00	3-28-091	
3749	Johnson No. 4	Levi Johnson	03-11-1902	I	0.31		22.00	3-28-091	
1652E	Enl. Johnson No. 2	Henry V. Johnson, Est. Levi Johnson	02-07-1907	I,S	0.37		26.00	9-28-091	
7759	Johnson	H. V. Johnson	05-08-1907	I	0.18		13.00	35-29-091	
2072E	Enl. Johnson No. 2	Jesse Johnson	06-25-1909	I	0.78		55.00	9-28-091	
9940	Rock Cut	William D. E. Johnson	04-25-1910	D,I,S	0.43		30.00	16-28-091	
2815E	Enl. Johnson No. 1	Jesse Johnson	08-16-1911	I,S	0.13		9.00	16-28-091	
11935	Johnson No. 5	Jesse Johnson	08-30-1912	I,S	0.21		15.00	3-28-091	
	SAGE HEN CREEK, Tributary Sweetwater River								
Terr.	DeBardeleben	John Nolan	-1889	D,I,S	0.33		24.00	16-30-090	
2468	Sage Hen	Albert N. Stagland	02-12-1900	I	1.53		108.00	15-30-090	
2489	Nolan Irrigating	John Nolan	02-27-1900						
	(Erroneously adjudicated with priority of July 27, 1900. Actually diverts from West Sage Hen Creek.)								
3707	Asbell	S. P. Asbell	02-10-1902	I	0.17		11.70	15-32-089	
453R	Dome Rock Res	Emil Jamerman	12-11-1903	I	93.00	a.f.		30-30-090	
	(Stored water is for Reservoir Ditch, Permit 5709.)								
5709	Reservoir	Emil Jamerman	12-11-1903	I	4.28		300.00	30-30-090	
9646	Sage Hen	James L. McIntosh, et al	10-04-1909	D,I,S	1.34		93.50	34-32-089	
2518E	Enl. DeBardeleben	John Nolan	07-31-1911	D,I,S	0.81		57.00	16-30-090	
2649E	Enl. Sage Hen	James L. McIntosh, et al	07-18-1912	D,I,S	0.37		26.00	34-32-089	
12002	Margaret	James L. McIntosh, et al	09-15-1913	D,I,S	2.04		143.00	27-32-089	
2807R	Enl. Dome Rock Res	Emil Jamerman	01-06-1915	I	109.80	a.f.		30-30-090	
	WEST SAGE HEN CREEK, Tributary Sage Hen Creek								
2489	Nolan Irrigating	John Nolan	02-27-1900	I	0.83		59.00	24-31-090	
	(Adjudicated as from Sage Hen Creek.)								
	ALLEY SPRINGS, Tributary Sage Hen Creek								
9395	Alley Springs	James L. McIntosh, et al	10-06-1909	S				26-31-089	

PERMIT NO.	DITCH	APPROPRIATOR	PRIORITY	USE	C.F.S.		ACRES	HG LOC.	Notes
	MIDDLE SAGE HEN CREEK, Tributary Sage Hen Creek								
16627	Sage Hen	Roy E. Turner	05-16-1923	I	0.91		63.80	22-32-089	
10075SR	Rim Stock Res	USDI, Bureau of Land Management	01-27-1987	S	6.78	a.f.		35-33-089	
	(This stock reservoir is unadjudicated, but built within the terms of the permit. No certificate of construction will be issued.)								
	DIAMOND SPRINGS DRAW, Tributary Sweetwater River								
10068SR	Big Diamond Springs Stock Res	James D. Baker, DVM	01-16-1987	S	0.70	a.f.		27-32-090	
	BLACK ROCK SPRINGS, Tributary Black Rock Draw, Tributary Diamond Springs Draw								
7585	(None Given)	D. J. Sheehan	01-25-1907	D,Min,S				32-31-091	
	(No amount of appropriation given.)								
	BIG DIAMOND SPRING, Tributary Diamond Springs Draw								
28924	Big Diamond Spring Pipeline	USDI, Bureau of Land Management	03-26-1985	S	0.02			22-32-090	
	(Amount of appropriation is actually 0.025 c.f.s.)								
	WEST DIAMOND SPRINGS DRAW, Tributary Diamond Springs Draw								
10067SR	West Diamond Springs Stock Res	James D. Baker, DVM	01-16-1987	S	0.11	a.f.		28-32-090	
	EAST DIAMOND SPRINGS DRAW, Tributary Diamond Springs Draw								
10069SR	East Diamond Springs No. 1 Stock Res.	James D. Baker, DVM	01-16-1987	S	0.02	a.f.		25-32-090	
	LITTLE EAST DIAMOND SPRINGS DRAW, Tributary East Diamond Springs Draw								
10071SR	East Diamond Springs No. 3 Stock Res.	James D. Baker, DVM	01-16-1987	S	0.08	a.f.		25-32-090	
	NATMONT DRAW, Tributary East Diamond Springs Draw								
10070SR	East Diamond Springs No. 2 Stock Res.	James D. Baker, DVM	01-16-1987	S	0.05	a.f.		25-32-090	
	CROOK'S CREEK, Tributary Crook's Lake, In the Drainage of Sweetwater River								
1275	Crook's Creek	John S. Brown	07-01-1896	I	0.60		42.00	31-28-092	
1417	North	Dennis J. Sheehan	01-20-1897	I,S	1.03		72.00	26-29-092	
1418	South	Dennis J. Sheehan	01-20-1897	I,S	1.63		115.00	26-29-092	
1563	Rigby's No. 1	Mason Rigby	08-10-1897	I	0.76		55.00	24-29-092	
1564	Rigby's No. 2	Mason Rigby	08-10-1897	I	1.00		70.00	24-29-092	
1565	Rigby's Reservoir Supply	Mason Rigby	08-10-1897	Supply Ditch				34-29-092	
	(Supply ditch to Rigby's Res., Permit 82R., and to increase supply to Rigby's Ditches Nos. 1 and 2, Permits 1563 and 1564.)								

PERMIT NO.	DITCH	APPROPRIATOR	PRIORITY	USE	C.F.S.		ACRES	HG LOC	Notes
82R	Rigby's Res.	Mason Rigby	08-10-1897	I	336.00	a.f.		27-29-092	
	(Stored water is for Rigby's Res. Ditch, Permit 3883, Rigby's Ditches Nos. 1 and 2, Permits 1563 and 1564. Also secondary supply for Rigby's Sheep Creek Ditch, Permit 3882, from Sheep Creek.)								
3195	Stevens No. 3	Charles Johnson	05-24-1901	I	0.37		26.00	20-28-092	
	(Point of diversion and means of conveyance changed to Enl. Stevens No. 3 Ditch, 20-28-92.)								
685E	Enl. Crook's Creek	John S. Brown	07-01-1901	I	0.15		12.00	31-28-092	
3883	Rigby's Res.	Mason Rigby	04-03-1902	I	1.42		100.00	27-29-092	
				Supply Ditch					
	(Also supply ditch for Rigby's Res., Permit 82R.)								
403R	Rigby's Res.	Mason Rigby	03-09-1903	I				27-29-092	
	(Stored water is for Rigby's Nos. 1 and No. 2 Ditches, Permits 1563 and 1564. Proof indicates capacity is 112 a.f.)								
7774	Crook's Creek	Calvin Lemmon	05-20-1907	I	1.06		74.00	20-28-092	
2181E	Enl. Rigby's No. 2	L. H. Alger	11-28-1910	I	0.14		10.00	24-29-092	
11639	Alger No. 1	Edith K. Alger	08-30-1912	D,I,S	1.27		89.70	19-29-091	
11640	Alger No. 2	Edith K. Alger	08-30-1912	D,I,S	0.74		52.00	19-29-091	
11641	Alger No. 3	Edith K. Alger	08-30-1912	D,I,S	0.17		12.00	19-29-091	
15248	Bar E. H.	William P. McIntosh	07-11-1918	D,I,S	0.43		30.10	8-27-092	
15549	Harris	William P. McIntosh	06-23-1919	I	0.07		5.00	31-28-092	
				S.S.			6.00		
	(Original supply for 6 acres is from Spring Creek, Tributary Crooks Creek, through Spring Creek Ditch, Permit 5600.)								
15570	Kirk No. 1	John T. Kirk	09-18-1919	I	1.21		85.00	7-28-092	
15571	Kirk No. 2	John T. Kirk	09-18-1919	I	0.17		12.00	7-28-092	
3568R	Kirk Res.	Lonnie Claytor	09-30-1919	S	44.70	a.f.		28-29-092	
	(This reservoir also receives a supply from Dry Wash, in the drainage of Crook's Creek.)								
17025	Crooks Creek 2" Water Line	Producers & Refiners Corporation	10-05-1925	D,Drl,S	0.05			18-28-092	
17409	Supply Ditch No. 4 (as changed to Kirk No. 1)	Lonnie J. Claytor	09-22-1926	Res. Supply				7-28-092	
	(Supply ditch for Kirk Reservoir, Permit No. 3568 Res., not to exceed 44.7 acre-feet from all sources in any one year and at a rate not to exceed 4.03 c.f.s.)								
	SHEEP CREEK, Tributary Crook's Creek								
3197	Sheep Creek No. 2	Jesse Johnson	05-24-1901	I	0.78		55.00	22-28-092	
3882	Sheep Creek	Mason Rigby	04-03-1902	I	1.40		98.00	25-29-092	
5759	Sheep Creek No. 1	Jesse Johnson	12-31-1903	I	0.80		56.00	22-28-092	
7817	Sheep Creek No. 1	Mrs. David Johnson	05-20-1907	I	0.57		40.00	4-28-092	
7823	Sheep Creek No. 2	Mrs. David Johnson	06-06-1907	I	0.11		8.00	4-28-092	
	(Erroneously adjudicated with priority of June 6, 1908.)								
8994	Sheep Creek No. 4	Mrs. David Johnson	05-05-1909	D,I,S	0.02		2.00	4-28-092	
				S.S.					
	(Original supply is through Sheep Creek No. 2 Ditch, Permit 7823. Source is actually a Spring, tributary Sheep Creek.)								
9136	Sheep Creek No. 3	Amanda M. Johnson	06-26-1909	D,I,S	S.S.		6.00	4-28-092	
	(Original supply is through Sheep Creek No. 2 Ditch, Permit 7823. Source is actually a Spring, tributary Sheep Creek.)								
2731E	Enl. Sheep Creek	Edith K. Alger	08-30-1912	D,I,S	0.49		34.00	25-29-092	
17019	Sheep Creek Pipe Line No. 1	Union Oil Company of California	08-31-1925	D,Drl				15-28-092	
	(Actual amount of appropriation is 0.003 c.f.s.)								
	SPRING, Tributary Sheep Creek								
17020	Sheep Creek Pipe Line No. 2	Union Oil Company of California	08-31-1925	D,Drl				15-28-092	
	(Actual amount of appropriation is 0.003 c.f.s.)								
17021	Sheep Creek Pipe Line No. 3	Union Oil Company of California	08-31-1925	D,Drl				10-28-092	
	(Actual amount of appropriation is 0.002 c.f.s.)								

PERMIT NO.	DITCH	APPROPRIATOR	PRIORITY	USE	C.F.S.		ACRES	HG LOC.	Notes
	DRY WASH, In the Drainage of Crook's Creek								
3568R	Kirk Res.	Lonnie Claytor	09-30-1919	S	44.70	a.f.		28-29-092	
	(This reservoir also receives a supply from Crook's Creek through the Supply Ditch No. 4 (as changed to the Kirk No. 1 Ditch), Permit No. 17409.)								
	O'NEIL CREEK, Tributary Crook's Creek								
3193	Stevens No. 1	Mrs. J. E. Stevens	05-24-1901	I	0.11		8.00	13-28-093	
	BURNT GULCH SPRING, Tributary Crook's Creek								
16964	Burnt Gulch 2" Water Line	Producers & Refiners Corporation	04-22-1925	D,Oil,S				13-28-093	
	(Actual amount of appropriation is 0.0096 c.f.s.)								
	CHUTE CREEK, Tributary Crook's Creek								
3194	Stevens No. 2	Mrs. J. E. Stevens	05-24-1901	I	0.22		16.00	24-28-093	
	(Erroneously adjudicated with priority of May 21, 1901.)								
	QUAKING ASP CREEK, Tributary Crook's Creek								
8104SR	McIntosh No. 2 Stock Res.	U.S. Energy/Crested Corp.	03-11-1976	S	14.20	a.f.		32-28-092	
	SPRING CREEK, Tributary Crook's Creek								
5600	Spring Creek	Frank O. Sparhawk	09-19-1903	I	0.26		20.00	6-27-092	
	GOLD SPRINGS, Tributary Crook's Creek								
5458	Deitch No. 1	Fred Deitch	05-09-1903	I	0.16		13.00	8-27-092	
	JADE DRAW, Tributary Buffalo Creek, Tributary Sweetwater River								
8611SR	Verla Irene Stock Res.	Norbit, Inc. d.b.a. Prairie Gems; Bureau of Land Management	09-04-1979	S	0.48	a.f.		3-30-092	
	(Amount of appropriation is 0.484 a.f.)								
	STAMPEDE SPRINGS, Tributary Tin Cup Creek, Tributary Buffalo Creek, Tributary Sweetwater River								
18301	Trout	Ralph H. Trout	07-01-1933	D,S	0.10			29-31-092	
	LONG'S CREEK, Tributary Sweetwater River								
Terr.	Long's Creek No. 1	Long's Creek Sheep Co	-1886	I	0.21		15.00	4-31-093	
Terr.	Stewart No. 1	Long's Creek Sheep Co	-1886	I	0.21		15.00	3-31-093	
Terr.	Long's Creek No. 2	Long's Creek Sheep Co	-1888	I	0.13		10.00	9-31-093	
1556	Taylor	Long's Creek Sheep Co	07-26-1897	I	0.34		25.00	20-31-093	

PERMIT NO.	DITCH	APPROPRIATOR	PRIORITY	USE	C.F.S.		ACRES	HG LOC.	Notes
2275E	Enl. Taylor	Adelaide Hudson	07-28-1910	I,S	2.16		151.00	20-31-093	
1884R	Hudson Res	Adelaide Hudson	07-28-1910	I,S	48.00	a.f.		16-31-093	
	(Stored water is for Enl. Taylor Ditch, Permit 2275E.)								
16579	J. M. Brown	Wyo. Farm Loan Board	05-05-1923	I	0.60		42.00	5-30-093	
	EAST LONG CREEK, Tributary Long's Creek								
3944R	Daniel F. Hudson Res	W. Richard Scarlett	12-20-1923	D,I,S	112.41	a.f.		2-31-093	
	HAPPY SPRING, Tributary Ice Slough, Tributary Sweetwater River								
19695	Happy Spring	Fremont Sheep Co. and State of Wyoming	08-23-1941	D,S	0.25			35-29-095	
	WARM SPRINGS CREEK, Tributary Sweetwater River								
21717	Wells No. 1	James D. Hester, et al	10-14-1955	I,S	1.19		83.50	6-29-094	
21718	Wells No. 2	James D. Hester, et al	10-14-1955	I,S	0.67		46.90	5-29-094	
6288R	Wells Res	James D. Hester, et al	10-14-1955	I,S	32.50	a.f.		6-29-094	
	WARM SPRINGS, Tributary Warm Springs Creek								
7714	Riddet	Della N. M. Kinney	04-10-1907	D,I,S	1.07		75.00	11-29-095	
	DISHPAN BUTTE DRAW, Tributary Government Meadows Creek, Tributary Sweetwater River								
11771SR	Dishpan Butte	USDI, Bureau of Land Management	03-05-1993	S	10.69	a.f.		33-31-095	
	(This stock reservoir is unadjudicated, but built within the terms of the permit. No certificate of construction will be issued.)								
	CROOKED CREEK, Tributary Sweetwater River								
11770SR	Upper Crooked Creek Stock Res	USDI, Bureau of Land Management	03-05-1993	S	5.54	a.f.		1-30-096	
	(This stock reservoir is unadjudicated, but built within the terms of the permit. No certificate of construction will be issued.)								
	ALKALI CREEK, Tributary Sweetwater River								
3931	The Stough	Minnie Stough	06-16-1902	I	1.65		116.00	36-29-096	
	SULPHUR CREEK, Tributary Sucker Creek, Tributary Alkali Creek								
14089	Sucker	J. A. Hobbs	05-11-1916	I	1.71		120.00	9-27-096	
3790R	Sulphur Creek Res	J. A. Hobbs	10-27-1921	I	10.60	a.f.		9-27-096	

PERMIT NO.	DITCH	APPROPRIATOR	PRIORITY	USE	C.F.S.		ACRES	HG LOC.	Notes
	DRY WATER COURSE, Tributary Sulphur Creek								
16687	Brannan No. Four	Chester Brannan	10-22-1923	Supply Ditch				18-27-097	
	(Supply ditch for Brannan No. 4 Res., Permit 3937R. Erroneously adjudicated as being in range 98.)								
3937R	Brannan No. Four Res.	Chester Brannan	10-22-1923	D,S	131.00	a.f.		19-27-097	
	(Erroneously adjudicated as being in range 98.)								
	LOWER SEVEN LAKE, Tributary Sand Creek, Tributary Alkali Creek								
1325R	Lower Seven Lake Res.	William Daley Company	07-06-1908	D,S	35.00	a.f.		3-26-097	
	UPPER SEVEN LAKE, Tributary Sand Creek, Tributary Alkali Creek								
1332R	Upper Seven Lake Res.	State of Wyoming	07-06-1908	D,S	85.00	a.f.		8-26-097	
	JOHN R. DRAW, Tributary Sweetwater River								
7595SR	Woolery Stock Res.	State Board of Land Commissioners, and Clyde R. Wollery, et al.	08-25-1972	S	0.60	a.f.		9-29-096	
	SULPHUR SPRINGS, Tributary Sweetwater River								
Terr.	Sulphur Springs	Barrass & Croft	05-01-1887	I,S	0.56		41.00	16-29-096	
	BARRASS SPRING, Tributary Sulphur Springs								
14574	Ellis	Lillian Ellis	11-20-1916	I	0.38		27.00	21-29-096	
	CANOY DRAW, Tributary Chimney Creek, Tributary Sweetwater River								
7591SR	Canoy Stock Res.	Ethel V. Woolery	08-25-1972	S	0.17	a.f.		29-29-097	
	SPRING, Tributary Sweetwater River								
10006	Wagers	C. J. Wagers	07-28-1910	D,I,S	0.05		3.50	18-28-097	
	MCLEAN MEADOW DRAW, Tributary Sweetwater River								
7593SR	McLean Meadow No. 2 Stock Res.	Harriet N. Woolery, et al.	08-25-1972	S	0.13	a.f.		31-29-097	
7594SR	McLean Meadow No. 1 Stock Res.	Harriet N. Woolery, et al.	08-25-1972	S	0.63	a.f.		25-29-098	
	STRAWBERRY CREEK, Tributary Sweetwater River								
6921SR	Strawberry Stock Res.	Frank Hancock, et al.	02-18-1971	S	0.27	a.f.		32-29-098	

PERMIT NO.	DITCH	APPROPRIATOR	PRIORITY	USE	C.F.S.		ACRES	HG LOC.	Notes
	SPRING, Tributary Spring Gulch, Tributary Strawberry Creek								
3314	Overland Springs	James F. Anderson	07-25-1901	Min	0.26			34-29-098	
	GIBLIN GULCH, Tributary Strawberry Creek								
6924SR	Giblin No. 1 Stock Res.	Dale L. Hancock, et al	02-18-1971	S	0.28	a.f.		33-29-098	
6925SR	Giblin No. 2 Stock Res.	Dale L. Hancock, et al	02-18-1971	S	0.25	a.f.		33-29-098	
	FAULKNER GULCH, Tributary Strawberry Creek								
6923SR	Faulkner Gulch Stock Res.	Frank Hancock, et al	02-18-1971	S	0.13	a.f.		6-28-098	
	WILSON GULCH, Tributary Sweetwater River								
6922SR	McCullough Stock Res.	Frank Hancock, et al	02-18-1971	S	0.20	a.f.		7-28-098	
	LEWISTON SLOUGH, Tributary Sweetwater River								
6106	S. P. Harris	S. P. Harris	08-12-1904	I	0.72		51.00	26-28-099	
	ROCK CREEK, Tributary Sweetwater River								
Terr.	Rock Creek	Dexter Mining & Development Company	-1884	Mil,Min				2-29-100	
	(Certificate does not show amount of appropriation but Court Decree and Proof show 75.695 c.f.s.)								
19278	Carpenter	C. E. Carpenter	12-09-1939	D,I,S	S.S.		304.50	28-29-099	
	(Original supply is from Willow Creek through Oregon Trail No. 1 Ditch, Permit 11953; Oregon Trail No. 2 Ditch, Permit 11954; New Giessler Ditch, Permit 6111, Giessler Ditch, Permit 2794; and Enl. Giessler Ditch, Permit 1246E. Right deeded to U. S. Steel Corporation.)								
6394R	Upper Rock Creek Res.	Columbia Geneva Steel	11-19-1956	Ind	1,457.50	a.f.		27-30-100	
	(Stored water for industrial, domestic, municipal, railway and power plant use is replaced through change to preferred use of appropriations, through the Sherlock & Marrin and McDowell Ditches from Sweetwater River.)								
6497R	First Enl. Upper Rock Creek Res.	Columbia Geneva Steel	07-18-1958	Ind	1,342.30	a.f.		27-30-100	
	(Stored water for industrial, domestic, municipal, railway and power plant use is replaced through change to preferred use of appropriations through the Sherlock & Marrin and McDowell Ditches from Sweetwater River.)								
	SMITH GULCH, Tributary Rock Creek								
4592R	Gold Dollar No. 2 Res.	Dee Samuelson	07-31-1934	D,S	2.53	a.f.		6-29-099	
	(Actual amount of approrpriation is 2.532 acre-feet.)								
4593R	Gold Dollar No. 3 Res.	Dee Samuelson	07-31-1934	D,S	0.88	a.f.		8-29-099	
	FLADER SPRING, Tributary Smith Gulch								
17926	Flader Pipe Line	Lewis Flader	06-25-1931	D,Mil,Min	0.50			6-29-099	

PERMIT NO.	DITCH	APPROPRIATOR	PRIORITY	USE	C.F.S.		ACRES	HG LOC.	Notes
	SWABES SPRING, Tributary Coal Gulch, Tributary Big Atlantic Gulch, Tributary Rock Creek								
23144	W.H.D. Pipeline	USDA, Forest Service, and Wyoming State Highway Department	11-13-1968	D	0.05			36-30-100	
	TIMBA BAH OR TOMBABAH SPRING, Tributary Basket Gulch, Tributary Rock Creek								
18303	Gustavsen Water Works	Peter Gustavsen, et al	11-15-1932	D,S	0.10			12-29-100	
	TWO SPRINGS OR GEISSLER SPRING, Tributary Anthony Gulch, Tributary Rock Creek								
8511	Giessler Pipe Line	L. L. Giessler	07-11-1908						
	(Voluntarily abandoned, November 21, 1985.)								
	HOTCHKISS SPRING, Tributary Baltic Gulch, Tributary Anthony Gulch, Tributary Rock Creek								
22528	George Hotchkiss Domestic Water Supply Pipeline	George Hotchkiss	08-11-1964	D	0.01			12-29-100	
	SPRINGS (BUCK AND ANTHONY), Tributary Rock Creek								
Terr.	Granyea	Dexter Mining & Development Company	-1884	D			None Given	12-29-100	
	BROWN SPRING, Tributary Rock Creek								
23457	Brown Pipeline	Albert T. Brown	08-17-1970	D	0.01			11-29-100	
	TABOR SPRING, Tributary Tabor Gulch, Tributary Beaver Gulch, Tributary Rock Creek								
2804	Tabor Pipe Line	Dexter Mining & Development Co.	08-25-1900	D,Min				14-29-100	
	(No amount of appropriation given.)								
19129	Carpenter Pipe Line	Ellen McKisson Carpenter	09-08-1936	D	0.16			14-29-100	
	SPRINGS, Tributary Beaver Gulch, Tributary Rock Creek								
2707	Pipe Line	South Pass Mining & Milling Company	07-09-1900	D,Min			None Given	14-29-100	
	WILLOW CREEK (21-28-99), Tributary Sweetwater River								
2794	Giessler	L. L. Giessler	09-04-1900	I,S	1.42		100.00	5-28-099	
2794	Giessler	L. L. Giessler	09-04-1900	I,S	0.35		25.00	5-28-099	
5370	Kenyon	W. E. Kenyon	03-21-1903	I,S	1.01		71.00	7-29-100	
6111	New Giessler	L. L. Giessler	08-03-1903	I,S	0.91		64.00	5-28-099	
6111	New Giessler	William Giessler	08-03-1903	I,S	0.28		20.00	5-28-099	
12465	Enl. Giessler	William Giessler	08-03-1903	I,S	0.52		37.00	5-28-099	
11166	Abra	Ellen Carpenter	07-31-1911	I,S	1.27		88.50	21-28-099	
	(Erroneously adjudicated as having 1.41 c.f.s. and 98.5 acres.)								

PERMIT NO.	DITCH	APPROPRIATOR	PRIORITY	USE	C.F.S.		ACRES	HG LOC.	Notes
11947	Green No. 1	Anthony Green	07-31-1913	I	0.54		38.00	25-29-100	
11948	Green No. 2	Anthony Green	07-31-1913	I	0.06		4.00	25-29-100	
11953	Oregon Trail No. 1	Emma J. Giessler	07-31-1913	I	0.76		53.00	5-28-099	
11954	Oregon Trail No. 2	Emma J. Giessler	07-31-1913	I	0.29		20.50	5-28-099	
11992	Magagna	Anna Magagna	09-10-1913	I	0.51		35.50	32-29-099	
11992	Magagna	Valentino Magagna	09-10-1913	I	0.45		32.00	32-29-099	
16166	Carlson	Phillip B. Carlson	08-22-1921	I,S	0.50		35.00	26-29-100	
	SPRING GULCH, Tributary Willow Creek (21-28-99)								
11949	Green No. 3	Anthony Green	07-31-1913	I	0.14		10.00	30-29-099	
	BIG HERMIT CREEK, Tributary Willow Creek (21-28-99)								
1975	Carissa Pipe Line	Federal Gold Mining Company	10-04-1898	Mil,Min	4.55			21-29-100	
	OREGON SLOUGH, Tributary Sweetwater River								
1137R	Daley Res	Richard J. Daley	12-07-1907	S	2.80	a.f.		30-27-100	
9134	Basco	Joseph Basco	06-30-1909	I	0.37		25.50	35-28-100	
	SLAUGHTER HOUSE GULCH, Tributary Sweetwater River								
8761	Bertagnolli	Louis Magagna	11-16-1908	D,I,S	0.83		58.00	15-28-100	
	SPRINGS, Tributary Slaughter House Gulch								
8757	Rizzi	Luigi Magagna	11-16-1908	I	0.26		18.00	10-28-100	
	PINE CREEK, Tributary Sweetwater River								
857E	Enl. Rineker	J. M. Dumphey	06-07-1902	I	1.66		118.00	15-29-101	
9259	Fish Creek Supply	John Sherlock, et al	08-09-1909	I	S.S.		107.20	36-29-101	
	(Original supply is from Fish Creek, through Jornado Ditch, Permit 9258.)								
10202	Blair	John Blair, Jr. et al	10-06-1910	D,I,S	2.97		208.00	1-28-101	
	(Adjudicated as from Fish Creek.)								
2670E	Enl. Blair	John Blair, et al	07-19-1912	D,I,S	0.35		24.60	1-28-101	
	(Adjudicated as from Fish Creek.)								
11737SR	Pine Creek Pond Stock Res	Donald Metzger	10-26-1992	S	1.11	a.f.		15-29-101	
	(This stock reservoir is unadjudicated, but built within the terms of the permit. No certificate of construction will be issued.)								
	FISH CREEK, Tributary Sweetwater River								
7882	Bob Jack	Anna Jack	07-20-1907	D,I,S	1.81		127.00	34-29-101	
9258	Jornado	John Sherlock	07-26-1909	I	1.36		95.80	3-28-101	
9258	Jornado	Peter R. Sherlock	07-26-1909	I	0.16		11.40	3-28-101	
9948	Fish Creek	James E. Smith	06-25-1910	I	1.32		92.40	14-28-101	
10202	Blair	John Blair, Jr., et al	10-06-1910						
	(Actually diverts from Pine Creek.)								

PERMIT NO.	DITCH	APPROPRIATOR	PRIORITY	USE	C.F.S.		ACRES	HG LOC.	Notes
2670E	Enl. Blair	John Blair, et al	07-19-1912						
	(Actually diverts from Pine Creek.)								
	LANDER CREEK, Tributary Sweetwater River								
5657	Roach	Lena Moss	06-29-1903	I,S	2.04		143.00	15-29-103	
5658	Long	Hiram W. Moss	06-29-1903						
	(Actually diverts from Blucher Creek, a tributary of Lander Creek.)								
5665	Short	Hiram W. Moss	06-29-1903	I,S	1.05		74.00	24-29-103	
5666	Jensen No. 1	Anton Jensen	06-29-1903	I,S	1.64		115.00	6-29-103	
	BLUCHER CREEK, Tributary Lander Creek								
5658	Long	Hiram W. Moss	06-29-1903	I,S	0.92		65.00	19-29-102	
	(Adjudicated as from Lander Creek.)								
5663	Jensen No. 2	William Jensen	06-29-1903	I,S	2.92		205.00	35-30-103	
8357	Larson No. 1	Jennie B. Larson	03-26-1908	I	1.11		78.00	26-30-103	
8358	Larson No. 2	Magnus Larson	03-26-1908	I	1.47		103.00	1-29-103	
11545	Larson No. 3	Jennie B. Larson	11-29-1912	D,I,S	0.56		39.00	26-30-103	
11546	Larson No. 4	Magnus Larson	11-29-1912	I	0.28		20.00	1-29-103	
	ORD CREEK, Tributary Lander Creek								
5664	Ord	S. C. Sorensen	06-29-1903	I,S	1.40		98.00	28-30-103	
	WILMETTI CREEK, Tributary Sweetwater River								
11756SR	Wilmetti Stock Res	Sweetwater Gap Ranch	04-23-1993	S	0.04	a.f.		24-30-103	
	(This stock reservoir is unadjudicated, but built within the terms of the permit. No certificate of construction will be issued. The actual capacity is 0.0432 acre-feet.)								
	GRANITE CREEK, Tributary Josh Draw, Tributary North Platte River								
9007SR	Granite Ridge Stock Res	John Hancock Mutual Life Ins. Co.	08-02-1982	S	3.47	a.f.		35-29-085	
	(This stock reservoir is unadjudicated, but built within the terms of the permit. No certificate of construction will be issued.)								
	SAND CREEK (26-28-85), Tributary North Platte River								
Terr.	Spring Creek Nos. 1 a[illegible]	James V. Cantlin	06-00-1877						
	(Actually diverts from La[illegible] Sand Creek.)								
Terr.	Birmingham	Buz[illegible] Ranch Co	Early 1879	I	[illegible]		262.00	27-27-086	
	(Amended certificate issued to successor of H. Cha[illegible] original appropriator of 4.28 c.f.s. and 300 acres [illegible]ich 0.54 c.f.s. and 38 acres were cancelled May 14, 1969.)								
Terr.	Birmingham	Tye S. Moore	[illegible]y 1879	I	0.57		40.00	27-27-086	
	(Amended certificate issued to successor of James V. Cantlin, [illegible] appropriator. Point of diversion and means of conveyance for 40 acres changed to Moore No. 2 Pump and Sprinkler System, 30 32 81. Point of diversion and means of conveyance changed from 30 [illegible]1 to the Moore Pump Point, 31-32-81.)								
Terr.	Granger No. 2	[illegible] Granger	05-00-1881						
	(Voluntarily abando[illegible]y 14, 1969.)								
Terr.	Garden	William Granger	06-10-1881	D,I	0.90		60.00	18-27-085	
Terr.	Eva [illegible]	Tye S. Moore	Spring 1881	I	0.79		55.2	26-27-086	
					S.S.		44.80		
	(Amended certificate issued to successor of James V. Cantlin, original appropriator for change in point of diversion and means of conveyance for 55.2 acres to Moore.								

APPENDIX B

GROUNDWATER PERMITS

Sweetwater River Watershed Study: Basinwide Groundwater Permits

Permit Number	Priority Date	Status	Township	Range	Section	Applicant	Facility Name	Uses	Reported Yield	Well Depth	Depth to Water
P79481W	4/14/1989	GST	29N	100W	20	LIDSTONE & ANDERSON INC	CR 2	MON	0	70	-7
P61502W	7/23/1982	GST	27N	87W	15	DEPAD, STATE OF WYOMING	DEPAD TEST #7	MON	0	172	-7
P92804W	9/3/1993	GST	30N	94W	17	MYERS LAND AND CATTLE CO.	THOMPSON #1	STO	2	100	-6
P7236P	10/3/1968	GST	27N	98W	13	BUREAU OF LAND MANAGEMENT	N. PICKETT LAKE WELL #4312	STO	12	294	-6
P71277W	9/25/1985		26N	90W	1	AMOCO PRODUCTION COMPANY	WERTZ BATTERY #2	IND	2200	0	-4
P148001W	11/1/2002	GST	27N	96W	3	STANLEY/LINDA COLE	ARNOLD SPRING	DOM,STO	25	1	-4
P148000W	11/1/2002	GST	27N	97W	12	STANLEY/LINDA COLE	SULPHUR BAR SPRING	DOM,STO	25	1.5	-4
P45584W	10/16/1978	GST	29N	100W	24	WILLIAM A. AND BLANCHE B. FARTHING	FAR STAR #1	DOM,STO	8	2	-4
P46377W	8/14/1978	GST	32N	89W	15	MATADOR CATTLE COMPANY	SAGE HEN #3	STO	1	2	-4
P54629W	11/10/1980		29N	100W	12	RONALD DALE & KATHRYN ANN CUNNINGHAM	ENL GIESSLER SPRING		12	2	-4
P80073W	6/23/1989	GST	29N	100W	13	RAY E GUTHRIDGE	GUTHRIDGE #2 (SPRING)	DOM,STO	5	2	-4
P88186W	5/21/1992	GST	28N	87W	31	USDI BLM - RAWLINS DISTRICT	UPPER PETE CREEK SPR.-6316	STO	5	2	-4
P88187W	5/21/1992	GST	28N	87W	31	USDI BLM - RAWLINS DISTRICT	MCINTOSH HORSE PASTURESPR.-6315	STO	5	2	-4
P90334W	12/14/1992	GST	29N	97W	29	USDI BLM	SILVER CREEK SPRING	STO	4	2	-4
P147996W	11/1/2002	GST	28N	93W	9	STANLEY/LINDA COLE	NANCY CREEK SPRING #1	DOM,STO	5	2	-4
P147997W	11/1/2002	GST	28N	93W	6	STANLEY/LINDA COLE	COTTONWOOD #1 SPRING	DOM,STO	5	2.5	-4
P53375W	7/25/1980	GST	29N	100W	14	BRUCE K. WARD	DUCAN #1 SPRING FILING	DOM	10	3	-4
P147000W	9/10/2002	GST	29N	96W	9	WY STATE BOARD OF LAND COMMISSIONERS	WOOLERY RANCH #1	STO	2	3	-4
P148003W	11/1/2002	GST	28N	95W	19	STANLEY/LINDA COLE	EAST ALKALI # 3	DOM,STO	25	3	-4
P147995W	11/1/2002	GST	28N	93W	9	STANLEY/LINDA COLE	WOODS DRAW SPRING #1	DOM,STO	3	3.5	-4
P147995W	11/1/2002	GST	28N	93W	9	STANLEY/LINDA COLE	WOODS DRAW SPRING #1	DOM,STO	3	3.5	-4
P49333W	8/6/1979	GST	32N	89W	8	MATADOR CATTLE COMPANY	BARREL SPRINGS #1	STO	1	4	-4
P82893W	7/2/1990	GST	29N	100W	13	RAY E GUTHRIDGE	GUTHRIDGE #3 (SPRING)	DOM,STO	8	4	-4
P85406W	6/24/1991	GST	30N	88W	16	WYO BOARD OF LAND COMMISSIONERS**PET	PETERS SPRING #1	STO	1	4	-4
P147992W	11/1/2002	GST	28N	95W	31	STANLEY/LINDA COLE	WEST ALKALI SPRING	DOM,STO	4	4	-4
P147993W	11/1/2002	GST	28N	93W	10	STANLEY/LINDA COLE	O'BRIAN SPRING # 2	DOM,STO	5	4	-4
P147994W	11/1/2002	GST	28N	93W	10	STANLEY/LINDA COLE	O'BRIAN SPRINGS #1	DOM,STO	25	4	-4
P147998W	11/1/2002	GST	28N	94W	32	STANLEY/LINDA COLE	EAST ALKALI # 1	DOM,STO	25	4	-4
P147999W	11/1/2002	GST	27N	97W	10	STANLEY/LINDA COLE	HORSE TRACK SPRING	DOM,STO	20	4	-4
P148002W	11/1/2002	GST	27N	96W	9	STANLEY/LINDA COLE	TROUT SPRING	DOM,STO	25	4	-4
P46376W	8/14/1978	GST	32N	89W	13	MATADOR CATTLE COMPANY	SAGE HEN #4	STO	25	5	-4
P46378W	8/14/1978	GST	33N	89W	26	MATADOR CATTLE COMPNAY	SAGE HEN #1	STO	1	5	-4
P71756W	9/13/1984	GST	33N	88W	23	CLEAR CREEK CATTLE CO.	LESMEISTER SPRING	STO	5	5	-4
P45585W	10/16/1978	GST	29N	100W	24	GEORGE AND HELEN M. GOOD	GOOD #1	DOM,STO	15	6	-4
P46072W	12/8/1978	GST	29N	100W	24	JOSEPH R. & JOYCE P. ROUNTREE	ROUNTREE #2	DOM	25	6	-4
P59532W	10/16/1982	GST	29N	100W	14	USDI, BLM**STEPHEN A. GYORVARY	GYORVARY SPRING #1	DOM	25	6	-4
P88873W	7/20/1992	GST	29N	100W	12	DAVID S. LUZMOOR	LUZMOOR #1	DOM	1	6	-4
P90518W	1/6/1993	UNA	29N	100W	24	JOSEPH R. & JOYCE P. ROUNTREE	ENL. ROUNTREE #2	STO	0	6	-4
P70135W	5/21/1985	GST	29N	100W	24	ROBERT J. MCKINLEY	(SPRING) MCKINLEY #1	DOM	25	7	-4
P14505W	7/7/1972	GST	29N	100W	13	GERRY L. SPENCE	TERMS #1	DOM,STO	25	8	-4
P24183P	8/13/1973	GST	30N	88W	27	MATADOR CATTLE COMPANY	MILLER SPRING #28-4	STO	5	8	-4
P92763W	8/26/1993	GST	29N	100W	13	JO AND GARY WALLER	SPRING WALLER #1	DOM	1	20	-4
P56230W	3/25/1981	GST	29N	92W	2	WESTERN NUCLEAR INC.	WNI17	MON	0	71	-4
P28743W	12/30/1974	GST	31N	84W	4	USDI BLM CASPER DISTRICT	SANFORD	STO	25	376	-4
P60740W	5/11/1982	GST	30N	95W	13	USDI BLM, RAWLINS DISTRICT	SWEETWATER WELL	STO	7	1080	-4
P63188W	2/1/1983	GST	30N	90W	18	USDI BLM, RAWLINS DISTRICT	MEADOW DRAW WELL PROJECT #4789	STO	7	1080	-4
P44802W	9/1/1978	GST	33N	88W	27	MATADOR CATTLE COMPANY	RATTLESNAKE #7	STO	1	-4	-1
P10693P	7/2/1941	GST	28N	86W	18	BUREAU OF LAND MANAGEMENT	SOUTH LONE ROCK SPRING #102	STO	5	-1	-1
P10694P	7/2/1941	GST	28N	86W	18	BUREAU OF LAND MANAGEMENT	EAST LONE ROCK SPRING #101	STO	5	-1	-1
P8345P	9/30/1934	GST	28N	88W	35	WM. M. MCINTOSH** VIRGINIA SHARP EST	CHERRY CREEK WELL #1	STO	5	-1	-1
P8346P	12/31/1933	GST	29N	90W	4	WM. M. MCINTOSH	BILL'S PEAK WELL #1	STO	5	-1	-1
P8348P	12/31/1934	GST	27N	89W	15	WM. M. MCINTOSH** MARY SHARP EST.**R	MUDDY WELL #1	STO	5	-1	-1
P11137P	12/31/1966	GST	30N	96W	12	UNITED STATES GOVERNMENT	CROOKED CREEK SPRING #0812	STO	10	-1	-1
P12657W	12/6/1971	GST	30N	90W	3	U.S. BUREAU OF LAND MANAGEMENT	AGATE FLAT WELL #3507	STO	10	-1	-1
P42356W	2/22/1978	GST	29N	90W	7	JENNIFER MCINTOSH	B J WELL #4	STO	20	-1	-1
P66278W	1/3/1984		28N	93W	4	AMOCO PRODUCTION COMPANY	FREE WATER KNOCK-OUTHAPPY SPRINGS UN	IND	60	-1	-1

Sweetwater River Watershed Study: Basinwide Groundwater Permits

Permit Number	Priority Date	Status	Township	Range	Section	Applicant	Facility Name	Uses	Reported Yield	Well Depth	Depth to Water
P12964P	7/2/1941	GST	29N	86W	32	U.S. GOVERNMENT	WEST BEEF ACRE SPRING #0045	STO	4	3	-1
P12965P	7/2/1941	GST	29N	86W	33	U.S. GOVERNMENT	MIDDLE BEEF ACRES SPRING #0044	STO	3	3	-1
P12584P	9/14/1954	GST	28N	91W	5	U.S. GOVERNMENT	GREEN MOUNTAIN SPRING DEVELOPMENT #0	STO	10	3	-1
P12585P	9/11/1954	GST	27N	91W	5	U.S. GOVERNMENT	GREEN MTN SPRING DEVELOPMENT #2 #047	STO	5	3	-1
P12975P	7/5/1962	GST	28N	93W	13	U.S. GOVERNMENT	KIRK SPRINGS #0638 (A)	STO	5	3	-1
P12968P	9/4/1943	GST	27N	91W	5	U.S. GOVERNMENT	SAGEBRUSH PARK SPRING #0146	STO	3	4	-1
P12978P	8/31/1965	GST	28N	94W	19	U.S. GOVERNMENT	GERAUD SPRING #0720	STO	4	4	-1
P12990P	9/18/1964	GST	29N	99W	29	U.S. GOVERNMENT	LITTLE JOE SPRING #0715	STO	3	4	-1
P11133P	9/8/1967	GST	27N	90W	13	UNITED STATES GOVERNMENT	COAL CREEK SPRING #2 #0873	STO	10	5	-1
P11134P	8/15/1967	GST	27N	89W	8	UNITED STATES GOVERNMENT	COAL CREEK SPRING #1 #0872	STO	10	5	-1
P11135P	8/31/1967	GST	29N	96W	10	UNITED STATES GOVERNMENT	FLAGG SPRING #0870	STO	10	5	-1
P11130P	11/7/1967	GST	28N	99W	19	UNITED STATES GOVERNMENT	DEXTER SPRING #0878	STO	10	6	-1
P11131P	9/23/1967	GST	29N	99W	24	UNITED STATES GOVERNMENT	HILL TOP SPRING #0877	STO	10	6	-1
P11132P	9/8/1967	ADJ	29N	99W	13	USDI, BLM	WESTERN UNION SPRING #0876	STO	10	6	-1
P12976P	7/5/1962	GST	28N	93W	12	U.S. GOVERNMENT	KIRK SPRINGS #0638 (B)	STO	3	6	-1
P12985P	10/9/1964	GST	29N	98W	21	U.S. GOVERNMENT	FRANK SPRING #0717	STO	2	6	-1
P16758W	11/29/1972	GST	28N	92W	12	BUREAU OF LAND MANAGEMENT	BOULDER SPRING #4039	STO	10	8	-1
P12989P	9/11/1968	GST	28N	99W	21	U.S. GOVERNMENT	ROCK CREEK SPRING DEVELOPMENT #3518	STO	4	10	-1
P70391W	3/28/1985	GST	28N	92W	17	WY BOARD OF LAND COMMISSIONERS**FREM	IME #JC 4	MON	0	13	-1
P14851P	6/21/1941	GST	29N	90W	18	DAVE & JENNIFER JAMERMAN	HAT WELL #1	STO	8	40	-1
P9778P	8/10/1968	GST	29N	100W	12	MARTIN C. CHRISTIAN	DOMESTIC WATER #1	DOM	15	40	-1
P7010P	12/31/1937	GST	29N	92W	19	HOLY CROSS CATTLE CO.	BLODGETT HOME WELL #1	STO	16	50	-1
P12231P	12/31/1968	GST	31N	85W	16	DIAMOND RING RANCH**WYO BOARD OF LAN	CALF PASTURE #1	STO	5	50	-1
P29986W	6/3/1975	GST	29N	100W	12	STEVE & KATHERINE JACKOVICH	JACKOVICH #1	DOM	10	60	-1
P8451P	9/10/1943	GST	28N	88W	7	SUN LAND/CATTLE CO.	66 #1	DOM	10	100	-1
P13575P	12/31/1962	GST	31N	84W	6	DIAMOND RING RANCH	DRY PASTURE FLOWING #1	STO	5	100	-1
P14852P	5/31/1968	GST	29N	90W	13	DAVE & JENNIFER JAMERMAN	HAT WELL #2	STO	6	100	-1
P28364W	11/6/1974	GST	28N	87W	29	SUN LAND/CATTLE CO.	II #2	DOM,STO	16	100	-1
P12022P	12/31/1936	GST	31N	87W	9	EVA L. FRANCE	SEVEN DEE #1	DOM,STO	5	160	-1
P8350P	12/31/1935	GST	30N	87W	33	WM. M. MCINTOSH** VIRGINIA SHARP EST	ORDWAY WELL #1	STO	3	160	-1
P12427P	2/5/1966	GST	27N	93W	14	U.S. GOVERNMENT	CROOKS MTN. WELL #1 #0782	STO	25	180	-1
P8344P	4/30/1962	GST	29N	90W	16	WM. M. MCINTOSH	HAT RANCH WELL #1	DOM	10	220	-1
P62783W	11/29/1982	GST	32N	88W	22	JOE FRANCE	F 33	STO	2	278	-1
P11306P	4/26/1962	GST	32N	94W	29	UNITED STATES GOBERNMENT - BLM	SHANNON WELL #0647	STO	6	415	-1
P62782W	11/29/1982	GST	32N	88W	4	JOE FRANCE	F 2	STO	2	435	-1
P28675W	8/27/1974	ADJ	28N	92W	20	U.S. ENERGY-CRESTED CORP.	GOLDEN GOOSE II WATER	IND	7	500	-1
P12425P	11/30/1966	GST	28N	94W	17	U.S. GOVERNMENT	CROOKS MTN. WELL #3 #0821	STO	25	600	-1
P224C	10/9/1937	UNA	27N	89W	32	THE ROCKY MOUNTAIN GAS CO.	KOSOMING WATER WELL #1	IND,DOM	13	775	-1
P1490W	5/6/1965	UNA	28N	92W	21	U.S. ENERGY-CRESTED CORP.	GOLDEN GOOSE WATER WELL #1	IND,DOM	5	800	-1
P28674W	8/27/1974		28N	92W	21	USDI, BLM**U.S. ENERGY-CRESTED CORP.	SHEEP MOUNTAIN #1 WATER	IND	10	1360	-1
P41766W	11/29/1977		26N	89W	6	RAINBOW RESOURCES INC.	HUSKY-RAINBOW #11-6 FEDERAL	IND	4	6851	-1
P107795W	10/8/1997	GST	29N	100W	5	HELEN Z KNUDSEN**LYNN JAMES WOOLFORD	TRAILER SPRING	DOM	1	-1	0
P11159W	11/16/1971	GST	29N	93W	20	UNITED STATES GOVERNMENT	HAYPRESS WELL #4087	STO	0	0	0
P11161W	11/16/1971	GST	29N	96W	4	UNITED STATES GOVERNMENT	ST. MARYS WELL #4022	STO	0	0	0
P14794W	7/24/1972	EXP	27N	91W	20	USDI BLM**INC. PASCO	BATTLE SPRINGS WATER SUPPLY #5	IND	0	0	0
P45504W	10/20/1978	GST	32N	90W	28	USDI, BLM	WEST DIAMOND #2	STO	0	0	0
P101047W	12/11/1995	UNA	29N	92W	2	WESTERN NUCLEAR, INC	MP-46	MON	0	0	0
P92845W	9/7/1993	GST	30N	91W	16	WY BOARD OF LAND COMMISSONERS**COLLI	RITA #1	STO	1	0	0
P88188W	5/21/1992	UNA	27N	88W	24	USDI BLM - RAWLINS DISTRICT	BAR ELEVEN PIPELINE SPR.-6274	MIS	5	2	0
P90630W	1/11/1993	GST	28N	87W	31	BLM	POINT SPR. (#6427)	STO	2	2	0
P85405W	6/24/1991	GST	30N	88W	34	WYO BOARD OF LAND COMMISSIONERS**PET	MILLER SPRING #1	STO	25	3	0
P90632W	1/11/1993	GST	27N	87W	2	BLM	U. RUSH CREEK SPR. #2 (6321)	STO	1	3	0
P90633W	1/11/1993	GST	28N	87W	34	BLM	U. RUSH CREEK SPR. #1 (6319)	STO	2	3	0
P98528W	9/12/1994	GST	28N	92W	1	JAMES L. MCINTOSH	BUTTE SPRINGS #2	STO	3	50	0
P62824W	11/29/1982	GST	32N	88W	27	USDI, BLM**JOE FRANCE	33-6	STO	0	271	0
P77430W	7/15/1988	UNA	30N	100W	35	UNIVERSAL EQUIPMENT CO.	IRON LAKE RES #1	RES,MIS	295	292	0
P56234W	3/25/1981	GST	29N	92W	2	WESTERN NUCLEAR INC.	WNI-23	MON	0	70.5	0.8

Sweetwater River Watershed Study: Basinwide Groundwater Permits

Permit Number	Priority Date	Status	Township	Range	Section	Applicant	Facility Name	Uses	Reported Yield	Well Depth	Depth to Water
P94751W	3/16/1994	GST	29N	98W	33	DONALD AND STEVEN STERNBERG	STERNBERG #1	DOM,STO	8	3	1
P66392W	2/13/1984	GST	29N	99W	30	RAY E GUTHRIDGE	GUTHRIDGE #1 (SPRING)	DOM,STO	24	5	1
P65893W	11/3/1983	GST	29N	100W	12	DANIEL E. & MALINDA R. ALLEN	ALLEN SPRING #1	DOM	5	6	1
P31331W	10/1/1975	GST	29N	100W	12	WM. L. & MARY C. HAMILTON	GEISSLER SPRING	DOM	13	2	2
P11380W	12/9/1971		29N	95W	34	UNITED STATES GOVERNMENT - BLM	BULL CANYON SPRING #4052	WIL,STO	5	5	2
P11381W	12/9/1971	UNA	28N	97W	11	UNITED STATES GOVERNMENT - BLM	LADYSMITH SPRING #4051	WIL,STO	5	5	2
P11382W	12/9/1971	UNA	28N	95W	1	UNITED STATES GOVERNMENT - BLM	FREMONT SPRING #4053	WIL,STO	5	5	2
P63563W	4/4/1983	GST	30N	103W	24	ROBERT WILMETTI	WILMETTI SPRING	DOM,STO	25	10	2
P56237W	3/25/1981	GST	30N	92W	36	WY BOARD OF LAND COMMISSIONERS** WES	WNI-19	MON	0	60.8	2.74
P59383W	1/27/1982	GST	27N	86W	30	USDI BLM, RAWLINS DISTRICT	BUZZARD SPRING & PIPELINE #1, #4967	STO	7	5	3
P85710W	4/26/1991	GST	28N	91W	29	MR. AND MRS. WILLIAM L. MAIERS	MAIERS #1	DOM	4	7	3
P113270W	12/4/1998	UNA	28N	91W	34	USDI BLM	COTTONWOOD CAMPGROUND WELL	MIS	1	70	3
P15495W	9/13/1972	UNA	29N	100W	8	JOHN M. PATIK	PATIK #1	IND,MIN	1000	100	3
P15496W	9/13/1972		29N	100W	9	JOHN M. PATIK	PATIK #2	IND,MIN	1000	100	3
P15505W	9/19/1972		29N	100W	9	JOHN M. PATIK	PATIK #3	STO,IND,MIN	1000	100	3
P15506W	9/19/1972		29N	100W	9	JOHN M. PATIK	PATIK #4	STO,IND,MIN	1000	100	3
P105209W	3/17/1997	GST	30N	92W	36	WY STATE BOARD OF LAND COMMISSIONERS	WN-41A	MON	0	186	3
P48775W	5/23/1979	GST	29N	85W	14	THE OSCAR T. ANNIS FAMILY TRUST	ANNIS #5	STO	20	11	4
P105248W	3/17/1997	GST	29N	92W	2	WESTERN NUCLEAR INC.	TT-IW	MON	0	18	4
P103917W	9/18/1996	GST	29N	92W	2	WESTERN NUCLEAR INC.	WN-39C	MON	0	21	4
P53403W	9/3/1980	UNA	29N	100W	20	WILLIAM AND NONA BATES	LOWE #2		5	22	4
P8594P	5/11/1940	GST	29N	91W	2	JOHN P. MC INTOSH	RODIE #3	DOM,STO	8	40	4
P101728W	3/13/1996	GST	30N	92W	36	WYO BOARD OF LAND COMMISSIONERS**WES	FPEB-8	MON	0	148	4
P101729W	3/13/1996	GST	30N	92W	36	WYO BOARD OF LAND COMMISSIONERS**WES	FPEB-9	MON	0	295	4
P16923P	9/30/1959	GST	29N	100W	12	ALBERT T. BROWN	BROWN #1	DOM	25	12	5
P8185P	10/31/1968	GST	30N	94W	17	ALBERT VERNON MYERS	MYERS #4	STO	11	12	5
P24813P	10/22/1973	GST	30N	91W	31	COLLINS JAMERMAN	HOUSE WELL #1	DOM	25	13	5
P102527W	6/3/1996	GST	29N	92W	11	WESTERN NUCLEAR INC.	SWAB-9	MON	0	17	5
P8441P	11/12/1965	GST	29N	87W	35	HUB & SPOKE RANCH CO.	CHICKEN HOUSE #1	STO	10	23	5
P15180W	9/7/1972	GST	29N	100W	12	JAMES R. MORAN	WATER HOLE #1	DOM	6	50	5
P105210W	3/17/1997	GST	30N	92W	36	WY STATE BOARD OF LAND COMMISSIONERS	WN-41B	MON	0	115	5
P105206W	3/17/1997	GST	30N	92W	35	WESTERN NUCLEAR INC.	WN-40A	MON	0	216	5
P141371W	12/18/2001	GST	29N	92W	13	WESTERN NUCLEAR, INC.	SWEB 40	MON	0	45.3	5.05
P51407W	3/11/1980	GST	29N	100W	12	MELVIN HITSHEW	MEL #1	DOM	10	44	5.5
P61508W	7/23/1982	GST	28N	88W	33	DEPAD, STATE OF WYOMING	DEPAD TEST #13	MON	0	23	5.61
P56238W	3/25/1981	GST	29N	92W	2	WESTERN NUCLEAR INC.	WNI-18	MON	0	180	5.67
P22190P	12/31/1931	GST	30N	93W	21	EDWARD T. GRAHAM	GRAHAM RANCH, INC. #1	DOM	25	10	6
P22192P	12/31/1945	GST	30N	93W	21	INC. GRAHAM RANCH	GRAHAM RANCH, INC. #3 (BARN)	STO	17	10	6
P14032P	5/31/1966	GST	29N	100W	12	CLINTON DUNNING	DUNNING #1	DOM	25	13	6
P48772W	5/23/1979	GST	29N	85W	14	THE OSCAR T. ANNIS FAMILY TRUST	ANNIS #2	DOM	10	15	6
P105251W	3/17/1997	GST	29N	92W	2	WESTERN NUCLEAR, INC	TT-4	MON	0	18	6
P13176W	2/28/1972	GST	29N	100W	12	MARY LEAH H. DAVIS	DAVIS #1	DOM	1	20	6
P126864W	7/11/2000	GST	29N	100W	7	MICHEL & MARY YOUNG	WILLOW CREEK #1	DOM	15	34	6
P102198W	4/30/1996	GST	29N	92W	2	WESTERN NUCLEAR INC.	WN-42B	MON	0	55	6
P106846W	8/4/1997	GST	29N	100W	12	COLEEN PATRICIA REILY	WILDHAIR #1	DOM	5	60	6
P134775W	5/11/2001	GSI	30N	95W	27	Corp of Presiding BP of the church o	6Th Crossing RV park	MIS	15	60	6
P105644W	4/29/1997	UNA	29N	99W	35	CHURCH OF JESUS CHRIST OF LDS	WILLIE #1	MIS	10	64	6
P129267W	9/27/2000	GSM	29N	99W	35	CHURCH OF JESUS CHRIST OF LATTER-DAY	WILLIE #2	MIS	10	65	6
P103070W	7/23/1996	GST	29N	92W	3	WESTERN NUCLEAR INC.	SWEB-7	MON	0	91	6
P101440W	2/9/1996	GST	30N	92W	35	WESTERN NUCLEAR INC.	WN-39B	MON	0	97	6
P101438W	2/9/1996	GST	29N	92W	2	WESTERN NUCLEAR INC.	WN-42A	MON	0	120	6
P101441W	2/9/1996	GST	30N	92W	35	WESTERN NUCLEAR INC.	WN-39A	MON	0	140	6
P103915W	9/18/1996	GST	30N	92W	36	WY STATE BOARD OF LAND COMMISSIONERS	WN-38B	MON	0	140	6
P686G	7/15/1957		29N	92W	2	WESTERN NUCLEAR CORP.	MILL WELL #3	IND	1100	159	6
P692G	7/25/1957	UNA	29N	92W	2	WESTERN NUCLEAR CORP.	MILL WELL #3	IND	1100	159	6
P61514W	7/23/1982	GST	29N	88W	26	DEPAD, STATE OF WYOMING	DEPAD TEST #19	MON	0	13	6.25
P72406W	3/11/1985		29N	92W	11	WESTERN NUCLEAR INC.	WNI C	IND,MIS	35	209.75	6.3

Sweetwater River Watershed Study: Basinwide Groundwater Permits

Permit Number	Priority Date	Status	Township	Range	Section	Applicant	Facility Name	Uses	Reported Yield	Well Depth	Depth to Water
P61513W	7/23/1982	GST	29N	88W	17	DEPAD, STATE OF WYOMING	DEPAD TEST #18	MON	0	79	6.63
P15318W	9/15/1972	GST	29N	100W	12	JAMES P. & DORIS J. DINSMORE	BURSITIS #1	DOM	5	10	7
P57891W	8/14/1981	GST	29N	100W	12	GERALD A. & GLORIA KOERSCHEN	GREEN CABIN #1	DOM	5	11	7
P105211W	3/17/1997	GST	30N	92W	36	WY STATE BOARD OF LAND COMMISSIONERS	WN-41C	MON	0	16	7
P7008P	4/15/1969	GST	30N	92W	35	WESTERN NUCLEAR, INC	J J RANCH WELL #1	DOM	2	20	7
P105222W	3/17/1997	GST	29N	92W	2	WESTERN NUCLEAR INC.	MN-43C	MON	0	22	7
P103916W	9/18/1996	GST	30N	92W	36	WY STATE BOARD OF LAND COMMISSIONERS	WN-38C	MON	0	28	7
P72791W	6/17/1986	GST	29N	101W	15	JERRY E/MARY F ALEXANDER	ALEXANDER #1	DOM	3	30	7
P76719W	4/28/1988	GST	29N	100W	12	LARRY AND LEANN DAVIS	MKN 1	DOM	10	38	7
P33449W	5/13/1976	ADJ	30N	95W	27	FRANCES E. COUNTRYMAN	FRANNIE #1	MIS,DOM	15	40	7
P135471W	6/5/2001	GST	29N	100W	12	MICHAEL McCLURE, MARK HIGDON, SHANNO	MARY #1	DOM	15	50	7
P105221W	3/17/1997	GST	29N	92W	2	WESTERN NUCLEAR INC.	MN-43B	MON	0	55	7
P13557P	12/31/1957	GST	30N	85W	15	DIAMOND RING RANCH**WYO BOARD OF LAN	U C W #2	STO	5	120	7
P105220W	3/17/1997	GST	29N	92W	2	WESTERN NUCLEAR INC.	MN-43A	MON	0	235	7
P86267W	10/4/1991	GST	29N	94W	1	WY STATE DEPT. OF TRANSPORTATION	ICE SLOUGH #2	MON	0	238	7
P61512W	7/23/1982	GST	29N	87W	34	DEPAD, STATE OF WYOMING	DEPAD TEST #17	MON	0	64	7.78
P1916W	3/8/1967	GST	29N	100W	12	P. W. BRANDON	PHIL #1	DOM	30	12	8
P24975P	10/30/1973	GST	30N	95W	32	GEORGE FLAGG	FLAGG HOUSE #1	DOM	5	12	8
P24976P	10/30/1973	GST	30N	95W	32	GEORGE FLAGG	MEADOW WELL #1	STO	5	12	8
P48774W	5/23/1979	GST	29N	85W	14	THE OSCAR T. ANNIS FAMILY TRUST	ANNIS #4	DOM,STO	10	12	8
P6317P	9/1/1968	GST	29N	100W	12	HENRY HUDSPETH**PAT FITZWILLIAMS	HF #1	DOM	9	13	8
P48762W	5/1/1979	GST	29N	85W	14	THE OSCAR T. ANNIS FAMILY TRUST	ANNIS #1	DOM,STO	25	15	8
P111257W	7/30/1998	GST	29N	91W	4	WESTERN NUCLEAR, INC.	SWAB-38	MON	0	18	8
P105208W	3/17/1997	GST	30N	92W	35	WESTERN NUCLEAR INC.	WN-40C	MON	0	20	8
P14576W	7/12/1972	GST	29N	100W	12	WILLIAM & PEGGY MOFFAT	MOFFAT #7 (DEEPENED)	DOM	15	40	8
P3325W	10/10/1969	GST	29N	100W	12	GERALD A. & GLORIA M. KOERSCHEN	KOERSCHEN WELL #2	DOM	25	42	8
P12087P	1/31/1968	GST	31N	87W	9	EVA L. FRANCE	SEVEN DEE #4	DOM,STO	20	50	8
P92844W	9/7/1993	GST	30N	91W	30	BLM**COLLINS JAMERMAN	COLLINS #1	STO	5	50	8
P139094W	9/18/2001	GST	30N	90W	31	CHARLES W. SYLVESTER	NT BAR # 1	STO	12	56	8
P53020W	7/18/1980		30N	93W	4	JOHN G. (JACK) CORBETT	CORBETT #1		15	60	8
P141902W	10/30/2001	GST	29N	100W	12	MICHAEL G & AMY F McCLURE	MOLLY # 1	DOM	15	100	8
P105207W	3/17/1997	GST	30N	92W	35	WESTERN NUCLEAR INC.	WN-40B	MON	0	144	8
P101730W	3/13/1996	GST	30N	92W	36	WY STATE BOARD OF LAND COMMISSIONERS	WN-38A	MON	0	175	8
P28734W	12/10/1974	GST	29N	92W	3	DAVE JAMERMAN	JAMERMAN #1	STO	20	200	8
P80471W	8/10/1989	ADJ	29N	86W	9	WYOMING STATE HIGHWAY DEPARTMENT	INDEPENDENCE ROCK REST AREA #1	MIS	25	200	8
P56229W	3/25/1981	GST	29N	92W	10	WESTERN NUCLEAR INC.	WNI-16	MON	0	320	8.3
P107796W	10/8/1997	GST	29N	100W	8	HELEN Z KNUDSEN**LYNN JAMES WOOLFORD	CRANE SPRING	DOM	4	12	9
P103370W	8/5/1996	GST	29N	92W	10	WESTERN NUCLEAR INC.	SWAB-25	MON	0	16	9
P8456P	1/16/1959	GST	29N	87W	35	HUB & SPOKE RANCH CO.	WASH HOUSE #1	DOM	10	27	9
P30465W	7/22/1975	GST	29N	100W	12	CHARLES M. & LOIS M. EMERSON	EMERSON WATER WELL #4	DOM	12	38	9
P7095W	11/27/1970	GST	29N	100W	12	FRANK PREVEDEL	PREVEDEL #1	DOM	10	39	9
P139095W	9/18/2001	GST	30N	90W	31	CHARLES W. SYLVESTER	NT BAR # 2	STO	13	77	9
P102620W	6/11/1996	GST	29N	92W	11	WESTERN NUCLEAR INC.	SWEB-11	MON	0	495	9
P103073W	7/23/1996	GST	29N	92W	11	WESTERN NUCLEAR INC.	SWAB-21	MON	0	14	10
P22005P	12/31/1950	GST	31N	87W	5	INC. RUSCO	CROS A HOUSE #1	DOM	25	15	10
P53519W	8/28/1980		29N	100W	20	BLAIR & ROMONA MEYERS	MEYERS #1		5	20	10
P121278W	12/9/1999	GST	29N	91W	2	WESTERN NUCLEAR INC.	Hoffmeister #3	STO	4	22	10
P22191P	12/31/1968	GST	30N	93W	21	E. THOMAS GRAHAM	GRAHAM RANCH, INC. #2	DOM	25	28	10
P30515W	7/28/1975	GST	29N	92W	10	BILL W. & CHRISTINE E. WICKSTROM	HEATHER #1	DOM	25	28	10
P54928W	11/24/1980		29N	100W	20	WALTER RIDGE BROWN	PROSPECTOR #1		6	35	10
P60198W	4/2/1982	GST	29N	87W	33	HUB & SPOKE RANCH CO.	BEAR TRAP #2	STO	10	35	10
P23159W	7/13/1973	GST	29N	100W	13	ABRAHAM J. & PATRICIA A. MILLER	MILLER #1	DOM	3	38	10
P8182P	10/31/1965	GST	30N	95W	24	ALBERT VERNON MYERS	MYERS #1	STO	10	40	10
P38238W	6/9/1977	GST	29N	100W	12	JANIS L. KNADJIAN	KNADJIAN #1	DOM	6	40	10
P58147W	9/10/1981	GST	29N	100W	12	GERALD KOERSCHEN	CANDY STORE #1	DOM	22	40	10
P60197W	4/2/1982	GST	29N	87W	35	HUB & SPOKE RANCH CO.	H & S #1	STO	10	40	10
P75703W	10/5/1987	GST	29N	100W	12	JACK WEGER	WEGER #2	DOM	12	40	10

Sweetwater River Watershed Study: Basinwide Groundwater Permits

Permit Number	Priority Date	Status	Township	Range	Section	Applicant	Facility Name	Uses	Reported Yield	Well Depth	Depth to Water
P6962W	11/13/1970	GST	29N	100W	12	FRED E. BATES**ANNE BATES	BATES #1	DOM	17	41	10
P38336W	6/13/1977	GST	29N	100W	12	CHARLES HELLYER	HELLYER #1	DOM	6	46	10
P113268W	12/4/1998	GST	29N	94W	2	USDI BLM	WARM SPRINGS WELL #2 #1917	STO	5	50	10
P17700P	12/31/1942	GST	27N	89W	34	GEORGE TULLY	TULLY #1	DOM,STO	5	65	10
P54039W	10/14/1980	GST	30N	95W	26	J. B. & LORRAINE FOSTER	FOSTER #1	STO	8	65	10
P154998W	10/30/2003	GST	29N	97W	16	PRESIDING BISHIP OF THE CHURCH OF JE	SAGE CAMPGROUND #1	STO,MIS	5	100	10
P127543W	8/10/2000	GST	29N	100W	12	ALEX PASTOR	ALEX WELL 1	DOM	12	102	10
P47190W	3/27/1979	GST	29N	88W	19	SUN LAND & CATTLE COMPANY	Y Z #1	STO	15	120	10
P103295W	7/31/1996	GST	29N	100W	12	TRAVIS/SUSAN MOFFAT	MOFFAT #3	DOM	12	140	10
P101430W	2/9/1996	GST	29N	92W	11	WESTERN NUCLEAR INC.	SWEB-4	MON	0	149	10
P409C	7/31/1945	UNA	28N	92W	18	SINCLAIR REFINING CO.	CROOKS GAP STATION WATER WELL	IND	15	215	10
P542G	2/12/1957	UNA	29N	92W	2	LOST CREEK OIL & URANIUM CO.	LOST CREEK OIL & URANIUM CO.MILL TES	IND	200	230	10
P14775W	6/28/1972	UNA	27N	92W	14	AMOCO PRODUCTION COMPANY** WYOMING B	BATTLE SPRINGS WATER SUPPLY #1	IND	391	2080	10
P71036W	8/29/1985	UNA	27N	92W	14	WY BOARD OF LAND COMMISSIONERS** TOW	ENL BATTLE SPRINGS #1	MIS,MUN	0	2080	10
P71270W	8/29/1985	UNA	27N	92W	14	WY BOARD OF LAND COMMISSIONERS** AMO	ENL BATTLE SPRINGS #1	MIS	0	2080	10
P71709W	12/16/1985		27N	92W	14	AMOCO PRODUCTION COMPANY	ENL BATTLE SPRINGS #1	MIS	0	2080	10
P73788W	5/21/1986	UNA	27N	92W	14	AMOCO PRODUCTION COMPANY	ENL BATTLE SPRING #1	MIS	0	2080	10
P73789W	5/21/1986		27N	91W	19	AMOCO PRODUCTION COMPANY	ENL BATTLE SPRING #2	MIS	0	2080	10
P114960W	4/15/1999	GST	30N	95W	28	WDOT	SWS-4	MON	0	15	11
P102525W	6/3/1996	GST	29N	92W	11	WESTERN NUCLEAR INC.	SWAB-4	MON	0	18	11
P106423W	6/16/1997	GST	29N	92W	10	SAMUEL E PETERSON** WESTERN NUCLEAR	SWAB-40	MON	0	18	11
P39317W	6/16/1977	GST	29N	92W	1	WESTERN NUCLEAR INC.	WN 9 HA	MON	0	40	11
P35444W	10/29/1976	GST	27N	92W	11	GREEN MOUNTAIN MINING VENTURE	ROCK WELL #2	MON	0	100	11
P74404W	4/14/1987	ADJ	30N	95W	28	WYOMING STATE HIGHWAY DEPARTMENT	SWEETWATER STA #1	MIS	20	100	11.5
P145055W	6/10/2002	GST	29N	92W	10	WESTERN NUCLEAR, INC.	SWAB-43	MON	0	23.6	11.67
P72404W	3/11/1985		29N	92W	11	WESTERN NUCLEAR INC.	WNI A	IND,MIS	45	253.2	11.68
P114959W	4/15/1999	GST	30N	95W	28	WDOT	SWS-3	MON	0	16	12
P6132P	6/21/1958	GST	29N	100W	20	STATE OF WYOMING	SOUTH PASS CITY #1	DOM	10	25	12
P102195W	4/30/1996	GST	29N	92W	2	WESTERN NUCLEAR INC.	WN-36C	MON	0	27	12
P46563W	2/12/1979	GST	29N	89W	20	MATADOR CATTLE COMPANY	CROSS L #1	STO	12	30	12
P48773W	5/23/1979	GST	29N	85W	14	THE OSCAR T. ANNIS FAMILY TRUST	ANNIS #3	DOM,STO	25	30	12
P22019P	9/15/1964	GST	29N	87W	25	INC. RUSCO	DUMBELL HOUSE	DOM	20	35	12
P14179W	5/24/1972	GST	29N	100W	18	ALBERT A. & JOYCE LOSH** LOSH & WRIG	LOSH #1	DOM	25	35	12
P23156W	7/18/1973	GST	29N	100W	12	MELVIN F. FREEBURGH	HAKA #1	DOM	5	40	12
P22011P	5/14/1953	GST	30N	86W	29	INC. RUSCO	OIL CAN CORRAL #1	STO	10	43	12
P22007P	11/5/1956	GST	30N	87W	15	INC. RUSCO	SPEAR HOUSE #1	DOM	10	44	12
P22010P	5/10/1953	GST	30N	86W	29	INC. RUSCO	OIL CAN HOUSE #1	DOM	10	46	12
P7011P	4/30/1933	GST	29N	91W	16	STATE OF WYOMING** HOLY CROSS CATTLE	SCHOOL SECTION 16	STO	20	50	12
P2361W	6/12/1968	GST	29N	100W	12	ALBERT H. & JOAN B. PAYSON	PAYSON #1	DOM	10	50	12
P7009P	6/13/1963	GST	29N	92W	24	GRIEVE LAND & CATTLE CO.	MEADOW WINDBREAK #1	STO	25	50	12
P81710W	1/19/1990	GST	29N	100W	21	DENNIS BALLARD	STARKOVITCH #2	DOM	3	75	12
P34832W	8/24/1976	GST	29N	100W	20	WYOMING RECREATION COMMISSION	LOWE #1	DOM	15	80	12
P106808W	7/21/1997	GST	30N	103W	34	BERTAGNOLLI DANNENBERG LLC	WHITE ACORN #1	DOM	25	83	12
P21452P	7/3/1967	GST	29N	100W	12	DON C. JONES	JONES #1	DOM	6	100	12
P105174W	3/17/1997	GST	29N	92W	13	WESTERN NUCLEAR INC.	SWEB-14	MON	0	115	12
P114352W	3/4/1999	ADJ	28N	88W	8	Corp of Presiding BP of the church o	PARKING LOT #1	MIS	5	120	12
P117260W	7/16/1999	ADJ	28N	88W	8	Corp of Presiding BP of the church o	ENL PARKING LOT #1	MIS	15	120	12
P102194W	4/30/1996	GST	29N	92W	2	WESTERN NUCLEAR INC.	WN-36B	MON	0	185	12
P39312W	6/16/1977	GST	29N	92W	2	WESTERN NUCLEAR INC.	WN 4 HA	MON	0	229	12
P101437W	2/9/1996	GST	29N	92W	2	WESTERN NUCLEAR INC.	MW-36A	MON	0	267	12
P141370W	12/18/2001	GST	29N	92W	13	WESTERN NUCLEAR, INC.	SWEB 39	MON	0	43.52	12.8
P24693W	10/22/1973	GST	30N	91W	31	COLLINS JAMERMAN	CORRAL #1	STO	5	18	13
P114958W	4/15/1999	GST	30N	95W	28	WDOT	SWS-2	MON	0	18	13
P103888W	9/16/1996	GST	29N	92W	10	WESTERN NUCLEAR INC.	SWAB-14	MON	0	19	13
P103920W	9/18/1996	GST	29N	92W	13	LONNIE J. CLAYTOR** WESTERN NUCLEAR	SWAB-29	MON	0	19	13
P48776W	5/23/1979	GST	29N	85W	14	THE OSCAR T. ANNIS FAMILY TRUST	ANNIS #6	DOM	10	22	13
P72790W	6/17/1986	GST	29N	101W	1	JAMES J. & LYNDA A. ROBESON	J & J #1	DOM	5	31	13

Sweetwater River Watershed Study: Basinwide Groundwater Permits

Permit Number	Priority Date	Status	Township	Range	Section	Applicant	Facility Name	Uses	Reported Yield	Well Depth	Depth to Water
P102199W	4/30/1996	GST	29N	92W	2	WESTERN NUCLEAR INC.	WN-35B	MON	0	39	13
P134778W	5/11/2001	UNA	29N	95W	4	Corp of Presiding BP of the church o	6Th Crossing Primitive CG	MIS	5	78	13
P105009W	2/13/1997	GST	29N	88W	17	BERNARD/NORLINE SUN	GANTZ HOUSE #1	DOM,STO	8	110	13
P81777W	2/7/1990	GST	30N	85W	27	PATHFINDER RANCH INC.	BERRA #1	DOM,STO	12	120	13
P101429W	2/9/1996	GST	29N	92W	11	WESTERN NUCLEAR INC.	SWEB-3	MON	0	241	13
P101420W	2/9/1996	GST	29N	92W	2	WESTERN NUCLEAR INC.	NWEB-3	MON	0	325	13
P56232W	3/25/1981	GST	29N	92W	11	WY BOARD OF LAND COMMISSIONERS** WES	WNI-25	MON	0	191	13.07
P101439W	2/9/1996	GST	29N	92W	2	WESTERN NUCLEAR INC.	WN-42C	MON	0	19	14
P102624W	6/11/1996	GST	29N	92W	11	WESTERN NUCLEAR INC.	SWAB-5	MON	0	20	14
P103889W	9/16/1996	GST	29N	92W	10	WESTERN NUCLEAR INC.	SWAB-35	MON	0	20	14
P102626W	6/11/1996	GST	29N	92W	10	WESTERN NUCLEAR INC.	SWAB-12	MON	0	21	14
P103520W	8/21/1996	GST	29N	92W	10	WESTERN NUCLEAR INC.	SWAB-27	MON	0	24	14
P67272W	5/9/1984	GST	29N	90W	26	JAMES D. BAKER	GRAVEL PIT WELL	STO	15	120	14
P101421W	2/9/1996	GST	29N	92W	2	WESTERN NUCLEAR INC.	NWEB-2	MON	0	220	14
P101419W	2/9/1996	GST	29N	92W	2	WESTERN NUCLEAR INC.	NWEB-2	MON	0	385	14
P103521W	8/21/1996	GST	29N	92W	13	WESTERN NUCLEAR INC.	SWEB-12	MON	0	494	14
P61511W	7/23/1982	GST	28N	90W	13	DEPAD, STATE OF WYOMING	DEPAD TEST #16	MON	0	24	14.73
P102622W	6/11/1996	GST	29N	92W	14	WESTERN NUCLEAR INC.	SWAB-7	MON	0	20	15
P102524W	6/3/1996	GST	29N	92W	11	WESTERN NUCLEAR INC.	SWAB-3	MON	0	23	15
P102627W	6/11/1996	GST	29N	92W	14	WESTERN NUCLEAR INC.	SWAB-15	MON	0	24	15
P103367W	8/5/1996	GST	29N	92W	11	WESTERN NUCLEAR INC.	SWAB-18	MON	0	24	15
P111256W	7/30/1998	GST	29N	91W	8	WESTERN NUCLEAR, INC.	SWAB-37	MON	0	25	15
P15885P	9/12/1968	ADJ	29N	100W	12	WM. P. BOULETTE	DONNA #1	DOM	3	27	15
P127229W	7/25/2000	GST	29N	101W	24	WILLOWBROOK RANCH, INC	WILLOWBROOK #3	DOM	25	30	15
P15007W	8/18/1972	GST	29N	100W	12	W. L. & MARY C. HAMILTON	HAMILTON #2	DOM	0	31	15
P162102W	9/1/2004	GST	31N	94W	31	USDI, BUREAU OF LAND MANAGEMENT	RUSTY BUCKET WELL	STO	15	35	15
P22022P	1/31/1968	GST	29N	86W	19	INC. RUSCO	DUMBELL LOWER CORRAL #1	DOM,STO	20	40	15
P22023P	1/31/1968	GST	29N	87W	25	INC. RUSCO	DUMBELL BARN #1	STO	22	40	15
P30309W	6/6/1975	GST	29N	101W	13	WILLOWBROOK RANCH INC.	WILLOWBROOK #1	DOM	25	40	15
P7015P	4/13/1969	GST	29N	92W	10	HOLY CROSS CATTLE CO.	SAND PASTURE WELL #1	STO	8	50	15
P73150W	8/18/1986	GST	30N	93W	21	GRAHAM RANCH INC.	GRAHAM RANCH CORRAL #1	STO	10	50	15
P33568W	5/26/1976	GST	29N	100W	20	W. RIDGE & GERTRUDE M. BROWN	BROWN #1	DOM	12	60	15
P34293W	7/28/1976	GST	29N	100W	13	RONALD E. MIONCZYNSKI	MION #1	DOM	6	60	15
P38214W	6/2/1977	GST	29N	100W	12	HOMER J. & CHRISTINA POLETTI	POLETTI #1	DOM	10	60	15
P43583W	9/12/1977	GST	29N	100W	11	GEORGE W. KLOVER	KLOVER #1	DOM	12	60	15
P57072W	5/18/1981	GST	29N	91W	18	WARREN L. REFFETT**CAROLYN M. HERBER	R H #1	DOM	25	80	15
P126072W	6/7/2000	GST	29N	100W	12	CHARLES M. & JUDY L. WOJCIESZAK	WOJ-ATC #1	DOM	12	98	15
P12023P	8/31/1963	GST	31N	87W	9	EVA L. FRANCE	SEVEN D #2	DOM	7	110	15
P113241W	12/4/1998	GST	29N	92W	6	ROBERT L/LEE D WHITLOCK	WATER GAP WELL #1	DOM,STO	6	112	15
P3021W	9/10/1969	GST	32N	88W	22	EVA L. FRANCE	CIRCLE BAR #1	DOM	10	120	15
P54038W	10/14/1980	GST	30N	95W	26	J. B. & LORRAINE FOSTER	HERGENRETER #1	STO	8	120	15
P101788W	3/21/1996	GST	29N	88W	17	SUN LAND & CATTLE CO.	T TRACK HORSE BARN - HORSE PASTURE W	STO	10	120	15
P80948W	10/4/1989	GST	29N	92W	2	WESTERN NUCLEAR INC.	WNI 31	MON	0	240	15
P102197W	4/30/1996	GST	29N	92W	2	WESTERN NUCLEAR INC.	WN-35A	MON	0	251	15
P145053W	6/10/2002	GST	29N	92W	10	WESTERN NUCLEAR, INC.	SWAB-41	MON	0	23.5	15.55
P66874W	4/11/1984		29N	92W	3	WESTERN NUCLEAR INC.	WN 27	IND,MIS	225	260	15.9
P103071W	7/23/1996	GST	29N	92W	11	WESTERN NUCLEAR INC.	SWAB-19	MON	0	21	16
P79483W	4/14/1989	GST	29N	100W	20	LIDSTONE & ANDERSON INC	CR 4	MON	0	22.2	16
P103074W	7/23/1996	GST	29N	92W	3	WESTERN NUCLEAR INC.	SWAB-22	MON	0	24	16
P3027P	7/6/1968	GST	29N	100W	12	JAMES W. CARPENTER	CARPENTER #1	DOM	5	34	16
P8472P	9/11/1963	GST	29N	87W	35	HUB & SPOKE RANCH CO.	CELLAR WELL #1	DOM	10	38	16
P103516W	8/21/1996	GST	29N	100W	12	JAMES P/DORIS DINSMORE	JIM #2	DOM	25	70	16
P7438P	4/25/1929	GST	29N	90W	9	BESSIE A. MCINTOSH	P BAR RANCH #1	DOM,STO	10	85	16
P134844W	5/22/2001	GST	30N	91W	27	Charles W. Sylverter	Albert's Homestead # 1	STO	10	100	16
P118323W	8/12/1999	GST	30N	94W	18	MYERS LAND AND CATTLE CO.** USDI, BU	MEADOW DRAW WELL	STO	4	120	16
P113269W	12/4/1998	GST	32N	94W	17	USDI BLM	WEST LONG CREEK BASING WELL #1839	STO	10	150	16
P102618W	6/11/1996	GST	29N	92W	11	WESTERN NUCLEAR INC.	SWEB-6	MON	0	408	16

Sweetwater River Watershed Study: Basinwide Groundwater Permits

Permit Number	Priority Date	Status	Township	Range	Section	Applicant	Facility Name	Uses	Reported Yield	Well Depth	Depth to Water
P84343W	2/4/1991	GST	29N	90W	11	AMOCO PRODUCTION COMPANY	MW 4889.17	MON	0	25	17
P41773W	12/13/1977	ADJ	28N	91W	34	USDI BLM, RAWLINS DISTRICT	COTTONWOOD CAMPGROUND #1	MIS	10	31	17
P22020P	8/31/1959	GST	29N	87W	25	INC. RUSCO	DUMBELL BUNKHOUSE #1	DOM,STO	10	33	17
P13566P	12/31/1954	GST	30N	85W	3	DIAMOND RING RANCH	SANFORD #1	STO	5	60	17
P101787W	3/21/1996	GST	29N	88W	17	SUN LAND & CATTLE CO.	CALVING BARN WELL - SUN HORSE PASTUR	STO	8	120	17
P107992W	11/4/1997	ADJ	29N	88W	35	CORPORATION OF THE PRESIDING BISHOP	JACKSON #1	MIS	10	120	17
P148215W	11/26/2002	GST	30N	95W	2	MYERS LAND AND CATTLE CO.	THOMPSON # 1	STO	25	190	17
P103069W	7/23/1996	GST	29N	92W	11	WESTERN NUCLEAR INC.	SWEB-10	MON	0	231	17
P34440W	8/19/1976	UNA	27N	92W	11	GREEN MOUNTAIN MINING VENTURE	ROCK WELL #1	MIS	0	358	17
P145056W	6/10/2002	GST	29N	92W	10	WESTERN NUCLEAR, INC.	SWAB-44	MON	0	28.3	17.64
P103369W	8/5/1996	GST	29N	92W	10	WESTERN NUCLEAR INC.	SWAB-24	MON	0	19	18
P84342W	2/4/1991	GST	29N	90W	11	AMOCO PRODUCTION COMPANY	MW 4889.16	MON	0	23	18
P103922W	9/18/1996	GST	29N	92W	10	WESTERN NUCLEAR INC.	SWAB-30	MON	0	24	18
P102528W	6/3/1996	GST	29N	92W	11	WESTERN NUCLEAR INC.	SWAB-11	MON	0	25	18
P6133P	4/18/1968	GST	29N	100W	20	STATE OF WYOMING	SOUTH PASS CITY #2	DOM	25	30	18
P121277W	12/9/1999	GST	29N	91W	10	WESTERN NUCLEAR INC.	Hoffmeister #2	STO	1	30	18
P108265W	12/11/1997	GST	30N	95W	28	USDI, BLM**DON ABERNATHY	SWEETWATER WELL & PIPELINE #1386	STO	20	40	18
P7014P	12/31/1933	GST	30N	92W	32	GRIEVE LAND & CATTLE CO.	JIGGS WELL #1	STO	25	50	18
P74924W	6/19/1987	GST	29N	91W	18	ROBERT E. & DEBORAH L. DERBISH	ROB #1	DOM	25	56	18
P89169W	8/14/1992	GST	29N	100W	12	MARY LEAH H. HENRY	MARY #1	DOM	5	60	18
P104150W	10/8/1996	GST	29N	92W	28	USDI, BUREAU OF LAND MANAGEMENT** WE	SAB-1	MON	0	76	18
P8592P	8/20/1966	GST	29N	91W	3	JOHN P. MC INTOSH	RODIE #1	DOM,STO	10	85	18
P83810W	10/16/1990	GST	29N	90W	16	WILLIAM M. MCINTOSH	HAT STOCKYARD	STO	25	110	18
P134777W	5/11/2001	ADJ	29N	87W	32	Corp of Presiding BP of the church o	Cherry Creek #2	MIS	5	120	18
P80947W	10/4/1989	GST	29N	92W	2	WESTERN NUCLEAR INC	WNI 30	MON	0	230	18
P7440P	8/20/1963	GST	29N	92W	5	BESSIE A. MCINTOSH	LAZY CS #2	DOM,STO	10	290	18
P103366W	8/5/1996	GST	29N	92W	11	WY STATE BOARD OF LAND COMMISSIONERS	SWEB-9	MON	0	416	18
P14793W	7/24/1972	UNA	27N	92W	15	AMOCO PRODUCTION COMPANY** WYOMING B	BATTLE SPRINGS WATER SUPPLY #4	IND	419	2043	18
P71039W	8/29/1985	UNA	27N	92W	15	WY BOARD OF LAND COMMISSIONERS** TOW	ENL BATTLE SPRINGS #4	MIS,MUN	0	2043	18
P71273W	8/29/1985		27N	92W	15	WY BOARD OF LAND COMMISSIONERS** AMO	ENL BATTLE SPRINGS #4	MIS	0	2043	18
P71712W	12/16/1985		27N	92W	15	AMOCO PRODUCTION COMPANY	ENL BATTLE SPRINGS #4	MIS	0	2043	18
P73791W	5/21/1986	UNA	27N	92W	15	AMOCO PRODUCTION COMPANY	ENL BATTLE SPRING #4	MIS	0	2043	18
P145054W	6/10/2002	GST	29N	92W	10	WESTERN NUCLEAR, INC.	SWAB-42	MON	0	31	18.6
P61504W	7/23/1982	GST	27N	88W	12	DEPAD, STATE OF WYOMING	DEPAD TEST #9	MON	0	116	18.91
P102782W	6/24/1996	GST	29N	92W	11	WESTERN NUCLEAR INC.	SWAB-6	MON	0	23	19
P14182W	5/30/1972	GST	29N	100W	12	R.M. SILER	SILER #1	DOM	6	31	19
P46630W	2/20/1979	GST	29N	92W	15	RAYMOND HEWITT	HEWITT #1	DOM	11	100	19
P134779W	5/11/2001	ADJ	29N	88W	35	Corp of Presiding BP of the church o	Jackson #2	MIS	15	120	19
P39321W	6/16/1977	GST	29N	92W	11	WESTERN NUCLEAR INC.	WN 2 HD	MON	0	148	19
P56233W	3/25/1981	GST	29N	92W	11	WESTERN NUCLEAR INC.	WNI-24	MON	0	282	19.65
P4547P	4/30/1925	GST	28N	99W	21	ARMSTRONG RANCH, INC.	CARP #5	DOM	3	25	20
P103519W	8/21/1996	GST	29N	92W	10	WESTERN NUCLEAR INC.	SWAB-26	MON	0	25	20
P79484W	4/14/1989	GST	29N	100W	20	LIDSTONE & ANDERSON INC	CR 5	MON	0	25.5	20
P102523W	6/3/1996	GST	29N	92W	11	WESTERN NUCLEAR INC.	SWAB-2	MON	0	28	20
P94242W	11/17/1993	UNA	28N	92W	29	SHEEP MOUNTAIN PARTNERS**U.S.A., BLM	SUN HEALD "A" PORTAL	MIS,DEW	5	33	20
P8453P	10/5/1943	GST	28N	88W	6	SUN LAND/CATTLE CO.	MUDDY #1	STO	10	35	20
P8454P	9/25/1970	GST	28N	89W	13	SUN LAND/CATTLE CO.	MUDDY #2	STO	10	35	20
P75762W	10/22/1987	GST	30N	90W	22	THOMAS E. MURPHREE	MURPHREE #1	DOM	10	36	20
P8320P	4/30/1955	GST	29N	92W	10	WALTER IRVIN**FRANCES IRVIN	CABIN CAMP WELL #1	DOM	7	40	20
P24974P	10/30/1973	GST	30N	95W	32	GEORGE FLAGG	TENANT HOUSE #1	DOM	5	40	20
P29653W	5/14/1975	GST	29N	100W	12	LARRY J. SHELDON**JULIA M. SHELDON	SHELDON #1	DOM	25	40	20
P109762W	4/16/1998	UNA	28N	88W	8	CHURCH OF JESUS CHRIST OF LDS	66 #1	MIS	15	40	20
P109763W	4/16/1998	UNA	28N	88W	8	CHURCH OF JESUS CHRIST OF LDS	66 #2	MIS	15	40	20
P63532W	3/28/1983	GST	29N	100W	24	DAVE & SANDRA SMAIL	SMAILS #6	DOM	5	41.5	20
P103405W	8/14/1996	GST	29N	101W	13	WILLOWBROOK RANCH, INC	WILLOWBROOK #2	DOM	10	45	20
P10692P	7/15/1943	GST	28N	88W	6	BUREAU OF LAND MANAGEMENT	MUDDY #1 - 239	STO	17	48	20
P7013P	7/20/1948	GST	30N	92W	16	GRIEVE LAND & CATTLE CO.	BUFFALO CREEK #1	STO	7	50	20

Sweetwater River Watershed Study: Basinwide Groundwater Permits

Permit Number	Priority Date	Status	Township	Range	Section	Applicant	Facility Name	Uses	Reported Yield	Well Depth	Depth to Water
P8184P	11/30/1950	GST	30N	94W	20	ALBERT VERNON MYERS	MYERS #3	DOM	12	50	20
P8321P	7/31/1957	GST	29N	92W	10	WALTER IRVIN**FRANCES IRVIN	TRAILER #2	DOM	19	50	20
P44791W	8/21/1978	GST	29N	100W	12	SAMUEL E. PETERSON	SAM #1	DOM	10	50	20
P8445P	5/10/1932	GST	29N	87W	15	HUB & SPOKE RANCH CO.	SAVAGE #1	STO	10	60	20
P3012W	10/2/1969	GST	29N	87W	24	INC. RUSCO	DUMBELL MEADOW #1	STO	10	60	20
P8183P	10/31/1960	GST	30N	94W	17	ALBERT VERNON MYERS	MYERS #2	STO	12	60	20
P12813W	2/7/1972	GST	29N	89W	16	MATADOR CATTLE CO.**WYO BOARD OF LAN	CROSS ELL #1	STO	5	60	20
P23679W	8/2/1973	GST	31N	87W	33	MATADOR CATTLE CO.	BUG #4	STO	6	60	20
P24579W	9/19/1973	GST	31N	87W	27	MATADOR CATTLE COMPANY	BUG #5	STO	6	60	20
P28099W	10/7/1974	GST	31N	87W	34	THE MATADOR CATTLE CO.	BUG #6	STO	10	60	20
P30131W	6/5/1975	GST	29N	100W	12	GERALD A. & GLORIA M. KOERSCHEN	CABIN #1	DOM	10	60	20
P38712W	7/8/1977	GST	28N	88W	35	ELLEN M FOX	BAR V #2	STO	6	60	20
P44942W	9/7/1978	GST	29N	100W	11	CARL E. PFAFF	CAROLYN #1	DOM	25	60	20
P62014W	9/17/1982	GST	29N	100W	12	NAT & JANICE L. BELSER	JANICE #1	DOM	25	60	20
P74562W	5/4/1987	GST	29N	100W	20	EDWARD S. & FERN I. NILES	NILES #2	DOM	12	65	20
P39499W	8/11/1977	GST	30N	95W	27	MACE & ELIZABETH CONTRYMAN	COUNTRYMAN #76	DOM	10	67	20
P8468P	1/30/1930	GST	29N	87W	28	HUB & SPOKE RANCH CO.	BEAR TRAP WELL #1	DOM,STO	10	70	20
P44064W	6/28/1978	GST	29N	91W	18	MIX FUNKHOUSER**MONTE FUNKHOUSER	WILLY MAX 1	DOM	20	75	20
P105365W	4/4/1997	UNA	29N	92W	27	LONNIE J. CLAYTOR** USDI, BUREAU OF	SAB-6	STO,MON	5	75	20
P49291W	7/30/1979	GST	29N	91W	18	RAYMOND HEWITT	HEWITT #6	DOM	10	80	20
P6957W	11/10/1970	GST	29N	88W	21	SUN LAND/CATTLE CO.	COYOTE #1	STO	10	80	20
P48567W	6/22/1979	GST	29N	91W	18	DONALD O. FOX	FOX 1	DOM	12	90	20
P130847W	11/16/2000	GST	29N	101W	15	JOHN E/MICHELE A FYLER	COYOTE # 1	DOM	3	92	20
P42355W	2/22/1978	GST	29N	90W	9	JENNIFER MCINTOSH	P BAR WELL #2	DOM,STO	20	100	20
P153414W	8/19/2003	GST	29N	100W	12	DARWIN COBURN	COBURN #1	DOM	15	100	20
P8595P	6/15/1940	GST	27N	92W	36	STATE OF WYOMING**JOHN P. MC INTOSH	BARON BUTE #1	DOM,STO	8	105	20
P15777P	12/31/1964	GST	31N	85W	30	USDI BLM	UC #8 WELL	STO	7	130	20
P102892W	7/1/1996	GST	29N	99W	8	GERALD M RUSSELL	MURPH #1	DOM,STO	8	155	20
P42150W	9/28/1977	ADJ	27N	92W	11	GREEN MOUNTAIN MINING VENTURE	DOMINO #1	MIS	15	190	20
P7439P	5/15/1929	GST	29N	92W	33	BESSIE A. MCINTOSH	LAZY C S #1	DOM,STO	10	280	20
P45525W	9/21/1978	UNA	29N	92W	10	JEFFREY CITY LAND COMPANY	JC #1	MIS	25	280	20
P84341W	2/4/1991	GST	29N	90W	11	AMOCO PRODUCTION COMPANY	MW 4889.15	MON	0	25	21
P103072W	7/23/1996	GST	29N	92W	11	WESTERN NUCLEAR INC.	SWAB-20	MON	0	26	21
P14484P	12/31/1950	GST	30N	85W	21	SANFORD RANCHES INC.	SANFORD #8	STO	5	27	21
P44491W	8/3/1978	GST	29N	91W	18	M. V. & J. M. BERRYMAN	BALD EAGLE #1	DOM	20	52	21
P8593P	8/12/1966	GST	29N	91W	3	JOHN P. MC INTOSH	RODIE #2	DOM,STO	10	65	21
P109516W	3/26/1998	UNA	29N	87W	35	CHURCH OF JESUS CHRIST OF LDS	ENL CELLAR WELL #1	DOM,MIS	25	120	21
P103919W	9/18/1996	GST	29N	92W	10	WESTERN NUCLEAR INC.	SWEB-13	MON	0	555	21
P60204W	4/6/1982	GST	29N	92W	11	WESTERN NUCLEAR INC.	WN 7HB-R	MON	Unknown	366	21.2
P102623W	6/11/1996	GST	29N	92W	14	WESTERN NUCLEAR INC.	SWAB-10	MON	0	29	22
P105204W	3/17/1997	GST	29N	91W	7	LONNIE J. CLAYTOR** WESTERN NUCLEAR	SWAB-33	MON	0	29	22
P44264W	7/17/1978	GST	29N	100W	20	DAVID D. DOUGHTY	D DOUGHTY #4	DOM	25	75	22
P8347P	12/31/1934	GST	29N	90W	17	WM. M. MCINTOSH	COTTONWOOD WELL #1	STO	5	100	22
P101431W	2/9/1996	GST	29N	92W	11	WESTERN NUCLEAR INC.	SWEB-5	MON	0	245	22
P114957W	4/15/1999	GST	30N	95W	28	WDOT	SWS-1	MON	0	28	23
P103368W	8/5/1996	GST	29N	92W	3	WESTERN NUCLEAR INC.	SWAB-23	MON	0	29	23
P121276W	12/9/1999	GST	29N	91W	17	WESTERN NUCLEAR INC.	Hoffmeister #1	STO	2	32	23
P29978W	5/30/1975	GST	29N	100W	12	ALBERT A. LOSH	LOSH #3	DOM	15	40	23
P15779P	5/10/1969	GST	29N	100W	12	DALE H. CHAMBERS	CHAMBERS #1	DOM	7	56	23
P27104P	6/26/1974	GST	31N	84W	5	USDI BLM CASPER DISTRICT	U C #6	STO	8	60	23
P146056W	7/29/2002	GST	29N	100W	12	RODGER A. AND MARYANNE CAMPBELL & EL	CAMPBELL # 3	DOM	20	75	23
P80944W	10/4/1989	GST	29N	92W	11	WESTERN NUCLEAR INC	WNI 28	MON	0	285	23
P102522W	6/3/1996	GST	29N	92W	11	WESTERN NUCLEAR INC.	SWAB-1	MON	0	28	24
P105205W	3/17/1997	GST	29N	91W	7	LONNIE J. CLAYTOR** WESTERN NUCLEAR	SWAB-34	MON	0	33	24
P58866W	11/10/1981	GST	29N	100W	12	CHARLES EMERSON	BIGCHUCK #1	DOM	12	70	24
P44422W	8/1/1978	GST	29N	91W	18	ROGER R. VEACH**AVIS H. VEACH	VEACH #2	DOM	10	75	24
P117471W	7/30/1999	UNA	28N	88W	8	CORPORATION OF THE PRESIDING BISHOP	66 #3	MIS	25	100	24

Sweetwater River Watershed Study: Basinwide Groundwater Permits

Permit Number	Priority Date	Status	Township	Range	Section	Applicant	Facility Name	Uses	Reported Yield	Well Depth	Depth to Water
P102619W	6/11/1996	GST	29N	92W	11	WESTERN NUCLEAR INC.	SWEB-8	MON	0	195	24
P39313W	6/16/1977	GST	29N	92W	1	WESTERN NUCLEAR INC.	WN 5 HB	MON	0	223	24
P39311W	6/16/1977	GST	29N	92W	2	WESTERN NUCLEAR INC.	WN 3 HG	MON	0	240	24
P43808W	6/8/1978	UNA	29N	92W	15	JEFFREY CITY WATER & SEWER DISTRICT	JEFFREY CITY TOWNSITE #4	MUN	50	300	24
P73617W	11/7/1986	GST	30N	100W	35	UNIVERSAL EQUIPMENT CO.	TAILINGS #4	MON	0	35	24.5
P84339W	2/4/1991	GST	29N	90W	11	AMOCO PRODUCTION COMPANY	MW 4889.13	MON	0	30	25
P3592W	11/21/1969	GST	29N	100W	12	GEORGE HOTCHKISS	KEN #1	DOM	10	39	25
P102193W	4/30/1996	GST	29N	92W	11	WESTERN NUCLEAR INC.	WN-32C	MON	0	42	25
P128348W	8/16/2000	GST	30N	100W	27	JCL, LLC	MEYER #00	DOM	15	55	25
P60199W	4/2/1982	GST	29N	88W	27	SUN LAND/CATTLE CO.	COYOTE #3	STO	10	60	25
P6280W	8/7/1970	GST	29N	100W	12	FLOYD W. SNYDER**MARION R. SNYDER	SNYDER #1	DOM	25	65	25
P8599P	7/21/1967	GST	29N	91W	20	JOHN P. MC INTOSH	GREEN #1	DOM,STO	15	75	25
P24186P	8/13/1973	GST	31N	87W	27	MATADOR CATTLE COMPANY	BUG RANCH #29-2	STO	5	75	25
P44065W	6/28/1978	GST	29N	91W	18	MIX FUNKHOUSER**MONTE FUNKHOUSER	WILLY MAX 2	DOM	20	75	25
P541G	2/12/1957	UNA	29N	92W	15	JEFFREY CITY WATER & SEWER DISTRICT	SPLIT ROCK TOWNSITE #1	MUN	80	90	25
P105022W	2/18/1997	ADJ	29N	87W	32	CORPORATION OF THE PRESIDING BISHOP	HANDCART TRAIL #1	MIS	15	120	25
P105087W	3/3/1997	UNA	29N	86W	10	SUN RANCH HUB/SPOKE	INDEPENDENCE ROCK PICNIC #1	MIS	15	120	25
P134774W	5/3/2001	UNA	29N	87W	35	CHURCH OF JESUS CHRIST OF LATTER-DAY	MHVC # 3	MIS	13	120	25
P134776W	5/11/2001	UNA	28N	88W	7	Corp of Presiding BP of the church o	MHVC Parking Lot # 2	MIS	10	120	25
P24184P	8/13/1973	GST	30N	88W	24	CPT. DELBERT W. FOOTE**MATADOR CATTL	MILLER SPRING #28-5	STO	5	150	25
P24185P	8/13/1973	GST	31N	87W	28	MATADOR CATTLE COMPANY	BUG RANCH #29-1	DOM,STO	5	150	25
P24180P	8/13/1973	GST	30N	89W	5	MATADOR CATTLE CO.	LANKIN DOME #26-2	STO	5	180	25
P49908W	9/13/1979	GST	29N	92W	10	HAROLD J. THOMPSON	HOME #1	DOM	10	200	25
P39310W	6/16/1977	GST	29N	92W	11	WESTERN NUCLEAR INC.	WN 1 HD	MON	0	293	25
P101427W	2/9/1996	GST	29N	92W	11	WESTERN NUCLEAR INC.	SWEB-1	MON	0	460	25
P84340W	2/4/1991	GST	29N	90W	11	AMOCO PRODUCTION COMPANY	MW 4889.14	MON	0	30	26
P102621W	6/11/1996	GST	29N	92W	11	WESTERN NUCLEAR INC.	SWAB-8	MON	0	34	26
P85659W	7/15/1991	GST	29N	100W	20	RICHARD SNELL JORREY, II	JORREY #1	DOM	20	50	26
P8598P	7/8/1964	GST	29N	91W	18	JOHN P. MC INTOSH	ERK SON #2	DOM,STO	10	59	26
P55144W	1/14/1981		29N	100W	12	SCOTT W. & DEBORAH S. SMITH	SMITTY'S #1	DOM	12	84	26
P58867W	11/10/1981	GST	29N	100W	12	STEPHEN M/MARY C CROCKETT	WALDOWELL #1	DOM	6	100	26
P102192W	4/30/1996	GST	29N	92W	11	WESTERN NUCLEAR INC.	WN-32B	MON	0	196	26
P101436W	2/9/1996	GST	29N	92W	11	WESTERN NUCLEAR INC.	WN-32A	MON	0	341	26
P103921W	9/18/1996	GST	29N	92W	13	LONNIE J. CLAYTOR** WESTERN NUCLEAR	SWAB-28	MON	0	34	27
P14000W	5/22/1972	GST	29N	100W	12	GARFF K. & DOREEN J. MCMULLIN	MC #1	DOM	5	40	27
P142913W	2/27/2002	GST	29N	101W	15	PAT / DIXIE REALING	REALING # 3	DOM	9	42	27
P8597P	7/8/1964	GST	29N	91W	18	MR. & MRS. MICHAEL J. KELLEY	KELLEYS KACHE #1	DOM,STO	10	57	27
P105021W	2/18/1997	ADJ	29N	87W	32	CORPORATION OF THE PRESIDING BISHOP	CHERRY CREEK #1	MIS	15	120	27
P31835W	11/6/1975	UNA	29N	92W	15	JEFFREY CITY WATER & SEWER DISTRICT	JEFFREY CITY TOWNSITE #3	MUN	500	241	27
P141368W	12/18/2001	GST	29N	92W	13	WESTERN NUCLEAR, INC.	SWEB 15	MON	0	99.59	27.32
P56235W	3/25/1981	GST	29N	92W	11	WESTERN NUCLEAR INC.	WNI-21	MON	0	322	27.32
P105203W	3/17/1997	GST	29N	92W	13	LONNIE J. CLAYTOR** WESTERN NUCLEAR	SWAB-32	MON	0	34	28
P21371P	7/20/1968	GST	29N	100W	12	JACOB K. BOOTH	BOOTH #1	DOM	10	37	28
P48763W	5/1/1979	GST	29N	85W	22	THE OSCAR T. ANNIS FAMILY TRUST	CAROLS WELL #1	STO	10	38	28
P7012P	4/17/1969	GST	29N	91W	8	HOLY CROSS CATTLE CO.	CRANDELL WELL #1	STO	4	40	28
P70390W	3/28/1985	GST	28N	92W	17	WY BOARD OF LAND COMMISSIONERS**FREM	IME #JC 3	MON	0	61.5	28.2
P141369W	12/18/2001	GST	29N	92W	13	WESTERN NUCLEAR, INC.	SWEB 16	MON	0	99.75	28.65
P103923W	9/18/1996	GST	29N	92W	13	LONNIE J. CLAYTOR** WESTERN NUCLEAR	SWAB-31	MON	0	40	29
P41774W	12/13/1977	ADJ	28N	91W	34	USDI BLM, RAWLINS DISTRICT	COTTONWOOD CAMPGROUND #2	MIS	10	60	29
P53474W	9/4/1980	ADJ	28N	101W	20	LESSEE WYOMING STATE HIGHWAY DEPT.**	SOUTH PASS REST AREA NUMBER ONE	MIS	20	200	29
P77177W	6/21/1988	GST	28N	101W	20	WYOMING STATE HIGHWAY DEPARTMENT**US	ENL SOUTH PASS REST AREA #1	DOM	0	200	29
P103371W	8/5/1996	GST	29N	92W	11	WY STATE BOARD OF LAND COMMISSIONERS	SWAB-17	MON	0	39	30
P43694W	6/8/1978	GST	29N	91W	18	GAIL & SHERRIL LARSON	#1	DOM	25	50	30
P99913W	7/25/1995	GST	29N	100W	20	RIDGE BROWN	SPC #7	DOM	5	53	30
P75763W	10/22/1987	GST	30N	90W	29	THOMAS E. MURPHREE	MURPHREE #2	STO	10	56	30
P14489P	12/31/1935	GST	30N	85W	3	SANFORD RANCHES INC.	SANFORD #12	STO	5	60	30
P15176W	6/20/1972	GST	29N	100W	12	JOHN H. & MARILYN R. PERNICH	PERNICH #1	DOM	10	60	30

Sweetwater River Watershed Study: Basinwide Groundwater Permits

Permit Number	Priority Date	Status	Township	Range	Section	Applicant	Facility Name	Uses	Reported Yield	Well Depth	Depth to Water
P28365W	11/6/1974	GST	29N	88W	34	SUN LAND/CATTLE CO.	COYOTE #2	STO	5	60	30
P41566W	1/25/1978	GST	29N	91W	18	RICHARD & MARY JANE BRINDA	BRINDA #5	DOM,STO	5	60	30
P43640W	6/2/1978	GST	29N	100W	12	CHARLES A. & LINDA K. FREE	LINDA K #1	DOM	15	60	30
P91402W	4/16/1993	GST	30N	94W	20	MYERS LAND AND CATTLE CO.	MYERS #1	DOM,STO	10	60	30
P8349P	10/31/1954	GST	28N	88W	35	WM. M. MCINTOSH** MARY SHARP EST.**R	BAR V HOUSE WELL #1	DOM	10	62	30
P10698P	7/28/1943	GST	28N	89W	13	BUREAU OF LAND MANAGEMENT	MUDDY WELL #2 - 240	STO	15	70	30
P12229P	12/31/1955	GST	30N	85W	22	DIAMOND RING RANCH	UC #1	STO	8	80	30
P41567W	1/25/1979	GST	29N	91W	18	ALVIN L. & BEVERLY A. GRABILL	RED MULE #1	DOM	5	80	30
P49238W	7/25/1979	GST	29N	91W	18	JAMES D. & LORETTA J. MINAHAN	MINAHAN #1	DOM	6	80	30
P55185W	1/5/1981		29N	100W	12	MICHEAL D. & KAREN EMERSON**SCOTT W.	EMERSON #5		12	80	30
P22016P	2/26/1961	GST	30N	87W	14	INC. RUSCO	MIDDLE SPEAR #1	STO	25	85	30
P8450P	12/31/1925	GST	28N	88W	7	SUN LAND/CATTLE CO.	REED #1	STO	10	90	30
P35431W	9/29/1976	GST	29N	100W	12	WALTER E. & GLORIA M. PFISTERER	PFISTERER #1	DOM	10	90	30
P80300W	7/19/1989	GST	27N	89W	26	ALFRED FORSTER	FORSTER #1	DOM	25	90	30
P49985W	9/10/1979	GST	29N	92W	6	HEINOLD RANCHES OF WYOMING	WELCH #2	DOM,STO	15	101	30
P153260W	8/25/2003	GST	29N	100W	12	WILLIAM & RAYME MOORE	MS. RAYME'S DELIGHT	DOM	7	125	30
P101789W	3/21/1996	GST	29N	88W	28	SUN LAND & CATTLE CO.	S.S. HILL WELL - SCHOOL SECTION WW #	DOM,STO	20	165	30
P10784W	11/4/1971	GST	30N	85W	14	DIAMOND RING RANCH**WYO BOARD OF LAN	DIAMOND RING SUPPLY #1	STO	7	320	30
P28783W	11/29/1974		27N	91W	33	INC. MAPCO	MAPCO WHISKEY PEAK UNIT #1-33	IND,MIS	25	500	30
P103887W	9/16/1996	GST	29N	92W	11	WESTERN NUCLEAR INC.	SWAB-13	MON	0	35	31
P94243W	11/17/1993	UNA	28N	92W	29	SHEEP MOUNTAIN PARTNERS**U.S.A., BLM	BIG SHEEP DECLINE #1	MIS,DEW,RES	10	39	31
P152497W	7/28/2003	GST	29N	100W	12	JACOB K BOOTH	BOOTH #1	DOM	12	95	31
P101428W	2/9/1996	GST	29N	92W	11	WESTERN NUCLEAR INC.	SWEB-2	MON	0	468	31
P52293W	5/30/1980	GST	28N	92W	21	USDI, BLM**U.S. ENERGY-CRESTED CORP.	PZ 10	MON	0	400	31.55
P60521W	7/9/1981	ADJ	29N	100W	12	DONALD L. AND M. JOLEEN PRESGROVE	BUD #1	MIS	25	75	32
P36354W	9/16/1976	GST	29N	100W	12	SIMS. W. M. & GERALDINE	SIMS WATER WELL #1	DOM	10	77	32
P39315W	6/16/1977		29N	92W	11	WESTERN NUCLEAR INC.	WN 7 HB	MIS	0	384	32
P64105W	5/18/1983	GST	29N	90W	27	USDI BLM, RAWLINS DISTRICT	CCC #5410	STO	14	120	33
P56231W	3/25/1981	GST	29N	92W	1	WY BOARD OF LAND COMMISSIONERS** WES	WNI-26	MON	0	111.5	33.01
P61510W	7/23/1982	GST	28N	89W	8	DEPAD, STATE OF WYOMING	DEPAD TEST #15	MON	0	380	33.17
P23167W	7/6/1973	GST	29N	100W	12	GEORGE P. JELACO	GEORGE #1	DOM	10	103	34
P22193P	12/31/1914	GST	30N	93W	21	JAMES M. GRAHAM	GRAHAM RANCH, INC. #4	DOM	25	42	35
P46867W	3/12/1979	GST	29N	91W	18	MICHAEL & MILA SMITH	SMITH #1	DOM	10	48	35
P48616W	6/15/1979	GST	29N	92W	15	RAYMOND HEWITT	HEWITT #4	DOM	10	60	35
P11126P	12/21/1943	GST	29N	91W	7	USDI, BLM	VI WELL #121	STO	5	70	35
P87886W	5/13/1992	GST	29N	101W	15		ALEXANDER #1	DOM	10	78	35
P51055W	2/12/1980	GST	29N	92W	15	RAYMOND HEWITT	HEWITT #7	DOM	8	80	35
P22014P	8/31/1959	GST	30N	87W	24	INC. RUSCO	KULAGE CORNER #1	STO	10	98	35
P11378W	12/9/1971	GST	31N	88W	6	USDI BLM	BARLOW WELL #4103	STO	5	100	35
P24190P	8/13/1973	GST	28N	90W	26	MATADOR CATTLE COMPANY	DIAMOND HOOK #34-1	DOM,STO	5	100	35
P152059W	6/23/2003	GST	29N	100W	12	HENRY F/BEVERLY A BROWN	LOUIS HOPE #1	DOM	10	100	35
P29905W	5/19/1975	GST	29N	100W	12	CHARLES M. EMERSON**LOIS M. EMERSON	EMERSON #1	DOM	11	146	35
P24187P	8/13/1973	GST	28N	89W	6	MATADOR CATTLE COMPANY	SPLIT ROCK #31-1	STO	5	150	35
P52W	8/20/1958	UNA	29N	92W	15	JEFFREY CITY WATER & SEWER DISTRICT	JEFFREY CITY TOWNSITE #1	MUN	175	152	35
P24157P	8/13/1973	GST	30N	90W	3	STATE OF WYOMING**MATADOR CATTLE COM	LANKIN BOME #26-1	STO	0	160	35
P49290W	7/30/1979	GST	29N	92W	15	RAYMOND HEWITT	HEWITT #5	DOM	15	160	35
P24181P	8/13/1973	GST	30N	89W	4	MATADOR CATTLE COMPANY	LONE MT. #27-1	STO	5	165	35
P8056W	2/9/1971	GST	27N	89W	14	WM. M. MC INTOSH	MC INTOSH #3	DOM	17	220	35
P48615W	6/15/1979	GST	29N	92W	15	RAYMOND HEWITT	HEWITT #3	DOM	10	260	35
P15024W	8/22/1972	GST	30N	85W	14	DIAMOND RING RANCH**WYO BOARD OF LAN	DIAMOND RING RANCH WELL #1	STO	7	300	35
P70389W	3/28/1985	GST	28N	92W	17	WY BOARD OF LAND COMMISSIONERS**FREM	IME #JC 1	MON	0	39	35.7
P11160W	11/16/1971	GST	31N	92W	26	USDI BLM	BRONCO WELL #4059	STO	5	55	36
P6130P	6/28/1968	GST	29N	100W	12	FLORENCE M. BLACK	BLACK #1	DOM	25	60	36
P59934W	3/15/1982	GST	29N	100W	5	USDI BLM	SLAUGHTERHOUSE WELL #4697	STO	15	82	36
P39318W	6/16/1977	GST	29N	92W	1	WESTERN NUCLEAR INC.	WN 10 HA	MON	0	244	36
P51167W	2/19/1980	GST	28N	99W	29	USDI BLM	LONG SLOUGH #4614	STO	15	100	37
P48473W	6/5/1979	GST	29N	92W	15	RAYMOND HEWITT	HEWITT #2	DOM,STO	13	260	37

Sweetwater River Watershed Study: Basinwide Groundwater Permits

Permit Number	Priority Date	Status	Township	Range	Section	Applicant	Facility Name	Uses	Reported Yield	Well Depth	Depth to Water
P51044W	1/30/1980	GST	29N	94W	6	WILLIAM R. & CAROL S. LEWIS		DOM,STO	10	80	38
P25501W	1/2/1974	GST	29N	100W	12	WILLIAM E. & PEARL RANTA	SLEEPY HOLLOW #1	DOM	25	50	39
P73614W	11/7/1986	GST	30N	100W	35	UNIVERSAL EQUIPMENT CO.	TAILINGS #1	MON	0	56	39.5
P14482P	12/31/1950	GST	30N	85W	19	SANFORD RANCHES INC.	SANFORD #5	STO	5	43	40
P13556P	12/31/1952	GST	30N	85W	17	DIAMOND RING RANCH	U C #4	STO	8	43	40
P13951W	5/22/1972	GST	29N	100W	12	PATRICK J. KENNEY	PEBE #1	DOM	17	60	40
P2745W	5/26/1969		29N	100W	12	GEORGINA D. NEWMAN	MINER'S DELIGHT #1	MIS,DOM	12	62	40
P2654W	6/23/1969	GST	29N	100W	12	JAMES E. CADY	CADY #1	DOM	17	63	40
P75565W	9/16/1987	GST	29N	92W	23	LONNIE J. CLAYTOR	SAMS	STO	10	69	40
P34296W	7/29/1976	GST	28N	101W	34	BAR X SHEEP CO.	MARY HAY I	DOM	8	70	40
P14853W	7/31/1972	GST	29N	90W	7	DAVE & JENNIFER JAMERMAN	B-J #1	DOM,STO	20	95	40
P104147W	10/8/1996	GST	29N	92W	15	WESTERN NUCLEAR INC.	SAB-2	MON	0	95	40
P8448P	12/31/1920	GST	29N	88W	17	SUN LAND/CATTLE CO.	TURKEY TRACK HOUSE #1	DOM	10	100	40
P148684W	12/3/2002	GST	28N	92W	5	CHARLES MCINTOSH	RIGBY PASTURE NO. 1	DOM,STO	25	100	40
P52827W	7/2/1980	GST	29N	100W	13	JOHN T. PAPPAS	PAPPAS #1	DOM	3	105	40
P22013P	4/24/1952	GST	30N	86W	18	INC. RUSCO	DRY LAKE #1	STO	10	110	40
P8351P	11/30/1961	GST	30N	87W	34	WM. M. MCINTOSH**RUTH BEEBE	ORDWAY WELL #2	STO	20	120	40
P98128W	1/6/1995	GST	29N	100W	24	DANIEL M. & BARBARA A. PALMER	PALMER #1	DOM	1	140	40
P133959W	4/12/2001	GST	28N	90W	32	DAVID E. LIEB	LIEB #1	DOM	8	150	40
P164482W	8/3/2004	GST	31N	84W	31	RATTLESNAKE GRZING ASSOC.	BULL PASTURE #1	STO	15	150	40
P24182P	8/13/1973	GST	30N	88W	35	MATADOR CATTLE COMPANY	MILLER SPRING #28-1	STO	5	160	40
P49405W	8/15/1979	GST	29N	92W	15	STANLEY & MARY LYNN WEGNER	STANLEY #2310	DOM,STO	18	160	40
P105484W	4/11/1997	GST	29N	100W	12	ANDREW P/DORIS M RADMAN	RADMAN #1	DOM	12	225	40
P8596P	6/22/1939	GST	30N	89W	30	JOHN P. MCINTOSH	PAINE #1	STO	8	265	40
P74097W	3/6/1987	GST	30N	85W	23	L. CHARLES DAVIS** USDI BUREAU OF RE	L C DAVIS #1	DOM	25	130	41
P102196W	4/30/1996	GST	29N	92W	2	WESTERN NUCLEAR INC.	WN-34	MON	0	281	41
P79482W	4/14/1989	GST	29N	100W	20	LIDSTONE & ANDERSON INC	CR 3	MON	0	62.5	41.3
P13780W	5/8/1972	GST	29N	100W	12	TIMOTHY M. & SHEILA M. VINCENT	MASSON #1	DOM	12	47	42
P101434W	2/9/1996	GST	29N	92W	1	WESTERN NUCLEAR INC.	WN-33D	MON	0	61	42
P133626W	4/2/2001	GST	29N	101W	15	JOHN E. / MICHELE A. FYLER	COYOTE # 2	DOM	15	110	42
P107991W	11/3/1997	GST	29N	92W	23	WESTERN NUCLEAR INC.	SAB-5	MON	0	53	43
P76339W	2/19/1988	GST	29N	100W	12	WYDEQ	MW 6	MON	0	61	43
P56228W	3/25/1981	GST	29N	92W	11	WY BOARD OF LAND COMMISSIONERS** WES	WNI-15	MON	0	303	43.02
P104148W	10/8/1996	GST	29N	92W	14	WESTERN NUCLEAR INC.	SAB-3	MON	0	49	44
P76335W	2/19/1988	GST	29N	100W	12	WYDEQ	MW 2	MON	0	57	44
P62433W	10/19/1982	GST	27N	97W	25	OGLE PETROLEUM INC.	M 75	MON	0	77	44
P157879W	4/15/2004	GST	29N	91W	15	WESTERN NUCLEAR, INC.	HOFFMEISTER #4	STO	14	120	44
P103918W	9/18/1996	GST	29N	92W	14	LONNIE J. CLAYTOR** WESTERN NUCLEAR	SEB-1	MON	0	235	44
P49084W	7/16/1979	GST	29N	100W	12	PHILIP E. FREESE	COYOTE CAMP #2	DOM	10	50	45
P14282P	9/21/1968	GST	29N	100W	12	WOODROW VAN BICKER	VAN BICKER #1	DOM	10	55	45
P75196W	7/22/1987	GST	29N	92W	14	RAYMOND & SHIRLEY WHITE	WHITE #1	DOM	3	59	45
P43594W	6/5/1978	GST	29N	100W	20	WALTER RIDGE BROWN	GOLD 7	DOM	5	60	45
P13949W	5/19/1972	GST	29N	100W	12	LOREN A. MATHISEN	MATHISEN #1	DOM	17	65	45
P2747W	7/25/1969	GST	29N	100W	12	JOHN L. DAVISON	DAVISON #1	DOM	10	68	45
P59413W	2/4/1981	GST	29N	94W	6	JOHN & FAY GILMORE	GILMORE #1	DOM	10	80	45
P45596W	10/26/1978	GST	29N	94W	6	HOWARD C. BOYD	BOYD #1	DOM,STO	10	95	45
P33715W	5/28/1976	GST	29N	100W	12	HAL N. HARDY	HARDY #1	DOM	15	100	45
P49678W	7/25/1979	GST	29N	94W	6	RAY G. HEFLIN	HEFLIN #1	DOM	25	100	45
P67326W	5/21/1984	GST	30N	95W	27	ARNOLD & AMY WEST	WEST #1	DOM	20	100	45
P39371W	8/2/1977	GST	30N	89W	28	WM. M. MCINTOSH	VICE WELL #1	STO	5	125	45
P24188P	8/13/1973	GST	29N	89W	16	MATADOR CATTLE COMPANY**WYO BOARD OF	CROSS L #32-1	DOM	5	150	45
P101435W	2/9/1996	GST	29N	92W	11	WESTERN NUCLEAR INC.	WN-37E	MON	0	198	45
P34829W	8/18/1976		29N	92W	14	INC. GREEN MOUNTAIN MOBILE HOME PARK	GREEN MOUNTAIN #1	MIS	145	226	45
P41978W	2/20/1978	UNA	29N	92W	14	INC. GREEN MOUNTAIN VILLAGE	GREEN MOUNTAIN VILLAGE #2	MIS	175	300	45
P46491W	12/18/1978		29N	92W	14	INC. GREEN MOUNTAIN VILLAGE	ENL GREEN MOUNTAIN VILLAGE #2	MIS	75	300	45
P23689W	7/16/1973	GST	29N	100W	12	KEITH E. & MARIANNE M. KOCH	MARIANNE #1	DOM	5	64	46
P85717W	7/24/1991	GST	29N	100W	12	RAYMOND H. VAN NATTA	RAY #1	DOM	10	106	46

Sweetwater River Watershed Study: Basinwide Groundwater Permits

Permit Number	Priority Date	Status	Township	Range	Section	Applicant	Facility Name	Uses	Reported Yield	Well Depth	Depth to Water
P76340W	2/19/1988	GST	29N	100W	12	WYDEQ	MW 7	MON	0	62	47
P13875W	5/18/1972	GST	29N	100W	12	CLINTON & HELEN DUNNING	DUNNING WELL #2	DOM	15	50	48
P73615W	11/7/1986	GST	30N	100W	35	UNIVERSAL EQUIPMENT CO.	TAILINGS #2	MON	0	65	48
P62432W	10/19/1982	GST	27N	97W	25	OGLE PETROLEUM INC.	M 74	MON	0	76	48
P52826W	7/2/1980	GST	29N	100W	13	PAUL F. & BARBARA G. PHILLIPS	CHIPLEY #1	DOM	10	105	48
P52828W	7/2/1980	GST	29N	100W	13	JOHN L. VIDAKOVICH	DUKE #1	DOM	5	207	48
P63712W	4/1/1983	GST	31N	95W	16	WY BOARD OF LAND COMMISSIONERS	GOVERNMENT MEADOWS #1	STO	25	120	49
P48764W	5/1/1979	GST	29N	85W	9	THE OSCAR T. ANNIS FAMILY TRUST	FLANDERS WELL #1	STO	6	60	50
P62431W	10/19/1982	GST	27N	97W	25	OGLE PETROLEUM INC.	M 73	MON	0	73	50
P2562W	6/3/1969	GST	29N	100W	12	ROBERT A. FRISCH**CARLIENNE A. FRISC	FRISCH #1	DOM	10	74	50
P62430W	10/19/1982	GST	27N	97W	25	OGLE PETROLEUM INC.	M 72	MON	0	75	50
P29910W	5/23/1975	GST	29N	100W	12	DAVID GUTHRIDGE	GUTHRIDGE #1	DOM	12	80	50
P46564W	2/12/1979	GST	29N	89W	15	MATADOR CATTLE COMPANY		STO	10	80	50
P48613W	6/14/1979	GST	29N	100W	12	WILLIAM P. & SHIRLEY ROGERS	ROGERS #1	DOM	15	80	50
P59414W	2/4/1981	GST	29N	94W	6	JOHN & FAY GILMORE	GILMORE #2	DOM	10	80	50
P40487W	5/11/1977	GST	29N	100W	12	ALBERT A. LOSH	LOSH #5	DOM	10	90	50
P13083P	1/31/1961	GST	30N	100W	36	WYOMING HIGHWAY DEPARTMENT	SOUTH PASS #1	DOM	7	98	50
P13583P	12/31/1963	GST	30N	85W	7	DIAMOND RING RANCH**WYO BOARD OF LAN	D R R #21	STO	8	100	50
P73151W	8/18/1986	GST	30N	93W	21	GRAHAM RANCH INC.	GRAHAM RANCH CORRAL #2	STO	10	110	50
P115931W	5/17/1999	GST	28N	87W	29	HANDCART RANCH	BAR 11 #1	DOM,STO	8	110	50
P27103P	6/26/1974	GST	31N	84W	19	USDI BLM CASPER DISTRICT	U C #5	STO	8	118	50
P10203W	8/23/1971	GST	29N	100W	12	SAMUEL E. PETERSON**JEAN B. PETERSON	JEAN #1	DOM	10	120	50
P52072W	5/8/1980	GST	29N	92W	15	JAMES H. SWICK	JAMES 4249	DOM	14	120	50
P14496P	12/31/1955	GST	30N	86W	35	SANFORD RANCHES INC.	FLEMING #1	STO	5	125	50
P64744W	7/12/1983	GST	29N	100W	20	EDWARD S. & FERN I. NILES	WEST #1	DOM	20	135	50
P24189P	9/13/1973	GST	29N	89W	16	MATADOR CATTLE COMPANY**WYO BOARD OF	CROSS L #32-2	STO	5	160	50
P49404W	8/15/1979	GST	29N	92W	15	MARILOU MUSIC	STANLEY #2310	DOM,STO	16	300	50
P59591W	3/1/1982	GST	30N	92W	33	WM. M. MCINTOSH	EMMIGRANT ROAD	STO	7	300	50
P82642W	6/4/1990	GST	30N	96W	30	USDI BLM	ASBELL MEADOWS	STO	3	330	50
P58075W	8/26/1981	GST	29N	100W	12	JIM RUTTER	RUTTER #1	DOM	20	60	51
P112115W	10/5/1998	GST	29N	92W	9	LEE D/RAMONA R WILLERT	Willert Well #1	STO	3	90	51
P62428W	10/19/1982	GST	27N	97W	25	OGLE PETROLEUM INC.	M 62	MON	0	246	51
P147588W	10/22/2002	GST	27N	92W	2	KENNECOTT URANIUM COMPANY	BEMW-002	MON	0	80	51.6
P76337W	2/19/1988	GST	29N	100W	12	WYDEQ	MW 4	MON	0	65.2	52
P44854W	8/23/1978	GST	27N	97W	25	OGLE PETROLEUM INC.	303-M 7	MON	0	81	53
P73616W	11/7/1986	GST	30N	100W	35	UNIVERSAL EQUIPMENT CO.	TAILINGS #3	MON	0	75	54
P76336W	2/19/1988	GST	29N	100W	12	WYDEQ	MW 3	MON	0	72	55
P45592W	10/18/1978	GST	29N	94W	5	NORMAN AND JUDY HUNTSMAN	HUNTSMAN #1	DOM,STO	12	80	55
P110201W	5/22/1998	GST	29N	100W	12	STEVEN M JOHNSON	LONE WOLF #1	DOM	10	80	55
P8476P	12/31/1930	GST	29N	88W	35	SUN LAND/CATTLE CO.	WHITE HOUSE #1	DOM,STO	10	100	55
P12331P	9/11/1964	GST	31N	87W	8	UNITED STATES GOVERNMENT	BEN-JOE-JAKE WELL #0761	STO	5	100	55
P13852W	5/12/1972	GST	29N	100W	12	FRANK J. & DOROTHY L. BETTENCOURT	BETTENCOURT #1	DOM	25	100	55
P13555P	12/31/1955	GST	30N	85W	10	DIAMOND RING RANCH	U C #3	STO	8	120	55
P62429W	10/19/1982	GST	27N	97W	25	OGLE PETROLEUM INC.	M 71	MON	0	75	56
P39366W	7/28/1977	GSM	29N	100W	12	ATLANTIC CITY MERCANTILE, INC	MERC #1	MIS,DOM	10	80	56
P147542W	10/21/2002	GST	27N	92W	2	KENNECOTT URANIUM COMPANY	BEMW-001	MON	0	98	56
P62427W	10/19/1982	GST	27N	97W	25	OGLE PETROLEUM INC.	M 61	MON	0	230	57
P14777W	6/28/1972	UNA	27N	92W	24	AMOCO PRODUCTION COMPANY** WYOMING B	BATTLE SPRINGS WATER SUPPLY #3	IND	388	2010	58
P71038W	8/29/1985	UNA	27N	92W	24	WY BOARD OF LAND COMMISSIONERS** TOW	ENL BATTLE SPRINGS #3	MIS,MUN	0	2010	58
P71272W	8/29/1985	UNA	27N	92W	24	WY BOARD OF LAND COMMISSIONERS** AMO	ENL BATTLE SPRINGS #3	MIS	0	2010	58
P71711W	12/16/1985	UNA	27N	92W	24	AMOCO PRODUCTION COMPANY	ENL BATTLE SPRINGS #3	MIS	0	2010	58
P73790W	5/21/1986	UNA	27N	92W	24	AMOCO PRODUCTION COMPANY	ENL BATTLE SPRING #3	MIS	0	2010	58
P53184W	8/4/1980	GST	29N	100W	13	ALBERT H. PAYSON	COYOTE #3	DOM	12	63	59
P108178W	11/28/1997	GST	29N	92W	12	WESTERN NUCLEAR INC.	SWAB-16	MON	0	74	59
P104151W	10/8/1996	GST	29N	92W	22	WY STATE BOARD OF LAND COMMISSIONERS	SAB-4	MON	0	75	59
P33943W	6/29/1976	GST	29N	100W	13	JOHN MIONCZYNSKI	COYOTE #1	DOM	0	88	59
P47302W	4/6/1979	GST	29N	92W	15	INC. DUBOIS CATV	CATV #1	DOM	10	90	60

Sweetwater River Watershed Study: Basinwide Groundwater Permits

Permit Number	Priority Date	Status	Township	Range	Section	Applicant	Facility Name	Uses	Reported Yield	Well Depth	Depth to Water
P72658W	6/9/1986	GST	29N	101W	15	DON & VICKI METZGER	SPOOK #2	DOM	10	95	60
P106411W	6/26/1997	GST	29N	100W	12	WILLIAM/THERESA TILLER	ATLANTIC CITY #1	DOM	14	95	60
P8442P	4/23/1959	GST	29N	87W	35	SUN LAND/CATTLE CO.	STONE HOUSE WELL #2	DOM	20	100	60
P68637W	10/4/1984	GST	30N	94W	10	LEE D. WHITLOCK	WHITLOCK #1 WELL	STO	5	100	60
P89066W	8/10/1992	GST	29N	100W	21	STEPHEN W. GREEN	GREEN #1	DOM	8	100	60
P14486P	12/31/1955	GST	30N	84W	6	SANFORD RANCHES INC.**WYO BOARD OF L	SANFORD #9	STO	5	109	60
P44098W	7/10/1978	GST	29N	90W	36	HUB & SPOKE RANCH CO.**M & D LAND CO	DIAMOND HOOK #3	STO	5	120	60
P103056W	7/15/1996	GST	29N	100W	12	MICHAEL/FRANCES MCCARTY	MCCARTY #2	DOM	15	120	60
P103404W	8/14/1996	GST	29N	100W	12	WILLIAM P(BILL)/SHARON JOHNSON	BJ #1	DOM	25	120	60
P8457P	9/23/1967	GST	29N	88W	3	SUN LAND/CATTLE CO.	I V BAR WELL #1	STO	10	130	60
P44097W	7/10/1978	GST	28N	90W	26	HUB & SPOKE RANCH CO.**M & D LAND CO	DIAMOND HOOK #2	DOM	20	180	60
P81689W	1/24/1990	GST	28N	88W	27	USDI BLM, RAWLINS DISTRICT	LITTLE CHERRY	STO	5	180	60
P14498P	12/31/1940	GST	31N	84W	27	SANFORD RANCHES INC.	C R I #1	DOM,STO	10	200	60
P2665W	6/10/1969	GST	29N	100W	12	LYLE F. MOERER**NORMA G. MOERER**SIG	SUGAR #1	DOM	15	92	62
P11149P	6/2/1942	GST	31N	95W	15	UNITED STATES GOVERNMENT	GOVERNMENT MEADOWS WELL #0086	STO	6	160	62
P105647W	4/28/1997	UNA	28N	89W	26	USDI, BLM**COLORADO INTERSTATE GAS C	MUDDY GAP #1	MIS	12	230	62
P44141W	6/20/1978	GST	27N	97W	25	OGLE PETROLEUM INC.	303 6 M 3	MON	0	265	62
P46199W	12/12/1978	ADJ	28N	89W	27	WYOMING STATE HIGHWAY DEPARTMENT	MUDDY GAP #4	MIS	20	400	63
P76338W	2/19/1988	GST	29N	100W	12	WYDEQ	MW 5	MON	0	77	64
P104154W	10/8/1996	GST	29N	92W	16	WY STATE BOARD OF LAND COMMISSIONERS	SAB-8	MON	0	115	64
P82018W	3/22/1990	GST	30N	88W	5	USDI, BLM**JAMES D. BAKER	NORTH DOBIE FLAT	STO	10	200	64
P57400W	7/1/1981	GST	29N	91W	18	HARRY & BONNIE DURBEN	DURBEN #1	DOM	15	80	65
P113397W	12/31/1998	GST	29N	92W	18	LEE/ROBERT WHITLOCK	WHITLOCK #1	STO	5	98	65
P45021W	9/15/1979	GST	29N	100W	12	TERRY JOE WEHRMAN	SHERI #1	DOM	25	100	65
P113267W	12/4/1998	GST	29N	94W	5	USDI BLM	WARM SPRINGS WELL #1 #1841	STO	5	103	65
P110475W	6/16/1998	GST	29N	100W	15	DENNIS/DEBBIE GRAHAM	GRAHAM WELL #1	DOM,STO	20	120	65
P11309P	7/30/1945	GST	31N	95W	31	UNITED STATES GOVERNMENT - BLM	DISH PAN BUTTE WELL #0206	STO	10	135	65
P22017P	11/14/1954	GST	30N	87W	26	INC. RUSCO	BULL WHISKEY #1	STO	25	135	65
P12429P	12/15/1964	GST	30N	96W	28	U.S. GOVERNMENT	ROCKY DRAW WELL #0721	STO	15	150	65
P113245W	12/4/1998	GST	27N	90W	7	JAMES D LUND	LUND #1	DOM	12	180	65
P53504W	4/16/1980	GST	27N	97W	25	USDI, BLM**OGLE PETROLEUM INC.	M 18	MON	0	230	65
P12230P	12/31/1957	GST	31N	85W	13	DIAMOND RING RANCH	UCW#1	STO	5	127	67
P101432W	2/9/1996	GST	29N	92W	1	WESTERN NUCLEAR INC.	WN-33C	MON	0	239	67
P101433W	2/9/1996	GST	29N	92W	1	WESTERN NUCLEAR INC.	WN-33B	MON	0	123	68
P14479P	12/31/1950	GST	30N	84W	2	SANFORD RANCHES INC.	SANFORD #1	STO	15	107	70
P22015P	4/25/1957	GST	30N	86W	34	INC. RUSCO	SWEDE #1	STO	10	120	70
P61507W	7/23/1982	GST	28N	87W	34	DEPAD, STATE OF WYOMING	DEPAD TEST #12	MON	0	116	70.04
P22012P	4/27/1952	GST	30N	86W	14	INC. RUSCO	HAMILTON ROCK #1	STO	10	150	72
P147590W	10/22/2002	GST	27N	92W	2	KENNECOTT URANIUM COMPANY	BEMW-004	MON	0	100	73.2
P147589W	10/22/2002	GST	27N	92W	2	KENNECOTT URANIUM COMPANY	BEMW-003	MON	0	95	73.25
P22006P	4/12/1958	GST	30N	86W	33	INC. RUSCO	GREENWOOD #1	STO	10	100	75
P17701P	9/30/1964	GST	27N	89W	34	GEORGE TULLY	TULLY #2	DOM	5	105	75
P62422W	10/19/1982	GST	27N	97W	25	OGLE PETROLEUM INC.	M 47	MON	0	210	75
P62424W	10/19/1982	GST	27N	97W	25	OGLE PETROLEUM INC.	M 49	MON	0	245	75
P62423W	10/19/1982	GST	27N	97W	25	OGLE PETROLEUM INC.	M 48	MON	0	250	75
P8447P	12/31/1946	GST	28N	87W	29	SUN LAND/CATTLE CO.	BAR 11 #1	DOM	10	100	80
P8449P	5/15/1932	GST	29N	87W	11	HUB & SPOKE RANCH CO.	SAVAGE #2	DOM,STO	10	130	80
P82017W	3/22/1990	GST	29N	89W	9	JAMES D. BAKER	ROCK PASTURE	STO	6	132	80
P13558P	12/31/1954	GST	30N	85W	18	DIAMOND RING RANCH	U C W #3	STO	5	150	80
P99512W	6/23/1995	GST	29N	100W	15	E.D. & JERILYN J. FINCH	EXCHANGE #1	DOM	10	150	80
P12441P	10/20/1964	GST	31N	92W	13	U.S. GOVERNMENT	GRIEVE WELL #0764	STO	10	172	80
P75088W	7/9/1987	UNA	28N	89W	26	FRANK E. & ROBERTA M. ERICKSON	ERICKSON WELL #2	MIS,DOM	25	319	80
P34213W	7/15/1976	ADJ	29N	100W	13	WILLIAM P. & GERALDINE BOULETTE	BOULETTE #1	DOM	14	90	85
P14481P	12/31/1959	GST	30N	84W	9	SANFORD RANCHES INC.	SANFORD #3	STO	5	150	85
P38713W	7/8/1977	GST	27N	89W	14	PATRICK WATSON	47 #2	STO	10	160	85
P145529W	6/26/2002	GST	29N	100W	15	BARNHART DRILLING CO., INC.	LITTLE BEAVER CREEK LOT #4 - NO 1	DOM	10	165	85
P79480W	4/14/1989	GST	29N	100W	20	LIDSTONE & ANDERSON INC	CR 1	MON	0	130	87.6

Sweetwater River Watershed Study: Basinwide Groundwater Permits

Permit Number	Priority Date	Status	Township	Range	Section	Applicant	Facility Name	Uses	Reported Yield	Well Depth	Depth to Water
P294W	2/12/1959	UNA	28N	93W	4	AMOCO PRODUCTION COMPANY	HAPPY SPRINGS WATER WELL #1	IND,DOM	0	102	88
P52290W	5/30/1980	GST	28N	92W	16	WY BOARD OF LAND COMMISSIONERS**U.S.	PZ 7	MON	0	240	89
P103062W	7/17/1996	GST	29N	100W	12	REBECCA SISSMAN	EASY WATER #2	DOM	10	140	90
P8455P	12/31/1945	GST	28N	89W	10	SUN LAND/CATTLE CO.	RAWLINS DRAW #1	STO	10	150	90
P11312P	8/11/1964	GST	31N	95W	12	UNITED STATES GOVERNMENT - BLM	CEDAR RIM WELL #0762	STO	5	160	90
P38588W	7/1/1977	GST	28N	101W	36	BAR X SHEEP CO.**WYO BOARD OF LAND C	MARY HAY 2	STO	15	220	90
P147591W	10/22/2002	GST	27N	92W	2	KENNECOTT URANIUM COMPANY	BEMW-005	MON	0	120	90.06
P75516W	7/13/1987	UNA	29N	100W	14	GYORVARY GYORVARY MINING CO., INC.	MARY ELLEN GOLD MINE	DEW,RES,MIS	50	125	92
P38517W	6/2/1977	GST	29N	100W	13	RALPH E. HOPKINS	HOPKINS #1	DOM	8	140	96
P7017P	10/25/1964	GST	31N	92W	18	HOLY CROSS CATTLE CO.	MAC WELL #1	STO	10	172	96
P62306W	7/19/1982	GST	29N	100W	12	KATHY CURLESS	ARMADILLO #1	DOM	7	110	97
P27507W	7/24/1974	GST	28N	89W	27	FRANK & ROBERTA ERICKSON	ERICKSON #1 (DEEPENED)	DOM	10	223	97
P50290W	7/5/1979		28N	89W	27	FRANK & ROBERTA ERICKSON	ENL ERICKSON #1	MIS	12	223	97
P5821W	6/17/1970	GST	29N	92W	8	BESSIE A. MC INTOSH	LAZY WATER WELL #2	DOM,STO	10	100	100
P21366P	7/31/1947	GST	28N	95W	26	FREMONT SHEEP CO.	FREMONT #3	DOM,STO	10	180	100
P14495P	12/31/1952	GST	30N	84W	29	SANFORD RANCHES INC.	BISHOP #1	STO	5	200	100
P14485P	12/31/1934	GST	28N	85W	6	SANFORD RANCHES INC.	SANFORD #8 STATION	STO	5	400	100
P49786W	7/25/1979	GST	28N	92W	29	U.S. ENERGY-CRESTED CORP.	PIEZO #1	MON	0	200	101
P22009P	5/7/1953	GST	30N	87W	12	INC. RUSCO	HORSESHOE #1	STO	10	162	105
P2126W	2/23/1968		27N	96W	28	UNION CARBIDE CORPORATION	CYCLONE #1	IND,DOM	20	290	105
P44140W	6/20/1978	GST	27N	97W	25	OGLE PETROLEUM INC.	303 6 M 2	MON	0	410	106
P101830W	3/22/1996	GST	30N	84W	13	USDI, BLM	RATTLESNAKE #1	STO	1	480	107
P22008P	4/9/1958	GST	30N	86W	5	INC. RUSCO	NORTH MILL #1	STO	7	130	110
P9645W	3/29/1971	GST	28N	89W	16	WM. M. MC INTOSH	WHISKEY CREEK WELL #1	STO	10	265	110
P57815W	8/10/1981	GST	27N	96W	17	OPI OF CALIF.	SC #19	MON	0	325	110
P151198W	5/14/2003	GST	31N	87W	11	BLM/WESTERN STAR AG RESOURCES, INC.*	EAST DRY CREEK # 1	STO	6	400	112
P26764W	5/8/1974	UNA	27N	91W	31	AMOCO PRODUCTION COMPANY** UNITED ST	BATTLE SPRINGS WATER SUPPLY #8	IND	513	2002	112
P71041W	8/29/1985	UNA	27N	91W	31	WY BOARD OF LAND COMMISSIONERS** TOW	ENL BATTLE SPRINGS #8	MIS,MUN	0	2002	112
P71275W	8/29/1985	UNA	27N	91W	31	WY BOARD OF LAND COMMISSIONERS** AMO	ENL BATTLE SPRINGS #8	MIS	0	2002	112
P71714W	12/16/1985	UNA	27N	91W	31	AMOCO PRODUCTION COMPANY	ENL BATTLE SPRINGS #8	MIS	0	2002	112
P73793W	5/21/1986	GST	27N	91W	31	AMOCO PRODUCTION COMPANY	ENL BATTLE SPRING #8	MIS	0	2002	112
P11151P	12/21/1942	GST	30N	92W	18	UNITED STATES GOVERNTMENT	FLETCHER GAP WELL #0116	STO	10	145	113
P7016P	9/29/1942	GST	30N	92W	18	GRIEVE LAND & CATTLE CO.	MICROWAVE TOWER WELL #1	STO	20	145	113
P53503W	4/16/1980	GST	27N	97W	25	USDI, BLM**OGLE PETROLEUM INC.	M 19	MON	0	405	114
P41594W	10/3/1977	ADJ	29N	92W	9	JEFFREY CITY WATER & SEWER DISTRICT	LUCK MC #JC 101	MIS	250	312	117
P44142W	6/20/1978	GST	27N	97W	25	OGLE PETROLEUM INC.	303 6 M 4	MON	0	400	119
P12021P	3/20/1964	GST	31N	87W	9	EVA FRANCE	SEVEN D #3	STO	10	133	120
P59265W	1/12/1982	GST	27N	97W	25	OGLE PETROLEUM INC.	M-42	MON	0	325	122
P59263W	1/12/1982	GST	27N	97W	25	OGLE PETROLEUM INC.	M-40	MON	0	359	122
P52287W	5/30/1980	GST	28N	92W	20	USDI, BLM**U.S. ENERGY-CRESTED CORP.	PZ 6A	MON	0	240	123
P52289W	5/30/1980	GST	28N	92W	20	USDI, BLM**U.S. ENERGY-CRESTED CORP.	PZ 6C	MON	0	240	123
P56236W	3/25/1981	GST	29N	91W	6	WY BOARD OF LAND COMMISSIONERS** WES	WNI-20	MON	0	216	123.41
P156054W	1/26/2004	GST	27N	98W	2	ARMSTRONG RANCH, INC** USDI, BUREAU	ANTELOPE HILLS WELL	STO	5	170	124
P63189W	2/1/1983	GST	29N	93W	20	USDI BLM, RAWLINS DISTRICT	HAYPRESS WELL-PROJECT #2505	STO	12	181	124
P52288W	5/30/1980	GST	28N	92W	20	USDI, BLM**U.S. ENERGY-CRESTED CORP.	PZ 6B	MON	0	241	124
P63386W	3/9/1983	GST	31N	90W	14	USDI BLM, RAWLINS DISTRICT	AGATE BUTTE PROJECT #4550	STO	6	235	125
P51168W	2/19/1980	GST	28N	101W	14	USDI BLM	FISH CREEK WELL #4513	STO	7	160	127
P44143W	6/20/1978	GST	27N	97W	25	OGLE PETROLEUM INC.	303 6 M 5	MON	0	395	127
P49788W	7/25/1979	GST	28N	92W	29	U.S. ENERGY-CRESTED CORP.	PIEZO #3	MON	0	280	129
P44144W	6/20/1978	GST	27N	97W	25	OGLE PETROLEUM INC.	303 6 M 6	MON	0	390	129
P61501W	7/23/1982	GST	27N	87W	12	DEPAD, STATE OF WYOMING	DEPAD TEST #6	MON	0	173	129.7
P77596W	8/2/1988	GST	31N	91W	12	USDI BLM**JAMES D. BAKER	WEST DIAMOND WELL #2	STO	2	340	130
P3801W	12/22/1969	ADJ	29N	90W	27	AMERICAN TELEPHONE & TELEGRAPH COMPA	A T & T MUDDY GAP #1	MIS	10	380	130
P59013W	11/23/1981	GST	27N	96W	17	OPI OF CALIFORNIA	SC #11 & 12	MON	0	460	130
P26762W	5/8/1974	UNA	27N	92W	24	AMOCO PRODUCTION COMPANY** UNITED ST	BATTLE SPRING WATER SUPPLY #6	IND	588	2010	132
P71040W	8/29/1985	UNA	27N	92W	24	WY BOARD OF LAND COMMISSIONERS** TOW	ENL BATTLE SPRINGS #6	MIS,MUN	0	2010	132
P71274W	8/29/1985	UNA	27N	92W	24	WY BOARD OF LAND COMMISSIONERS** AMO	ENL BATTLE SPRINGS #6	MIS	0	2010	132

Sweetwater River Watershed Study: Basinwide Groundwater Permits

Permit Number	Priority Date	Status	Township	Range	Section	Applicant	Facility Name	Uses	Reported Yield	Well Depth	Depth to Water
P71713W	12/16/1985	UNA	27N	92W	24	AMOCO PRODUCTION COMPANY	ENL BATTLE SPRINGS #6	MIS	0	2010	132
P73792W	5/21/1986	UNA	27N	92W	24	AMOCO PRODUCTION COMPANY	ENL BATTLE SPRING #6	MIS	0	2010	132
P12430P	7/24/1964	GST	31N	94W	17	U.S. GOVERNMENT	FINDLAY LAKE #2 WELL #0128	STO	5	295	135
P49790W	7/25/1979	GST	28N	92W	32	U.S. ENERGY-CRESTED CORP.	PIEZO #5	MON	0	440	135
P10699P	7/29/1943	GST	28N	89W	11	BUREAU OF LAND MANAGEMENT	TURKEY TRACT WELL #241	STO	4	196	136
P10699P	7/29/1943	GST	28N	89W	11	BUREAU OF LAND MANAGEMENT	TURKEY TRACT WELL #241	STO	4	196	136
P10699P	7/29/1943	GST	28N	89W	11	BUREAU OF LAND MANAGEMENT	TURKEY TRACT WELL #241	STO	4	196	136
P10699P	7/29/1943	GST	28N	89W	11	BUREAU OF LAND MANAGEMENT	TURKEY TRACT WELL #241	STO	4	196	136
P44139W	6/20/1978	GST	27N	97W	25	OGLE PETROLEUM INC.	303 6 M 1	MON	0	410	136
P14487P	12/31/1948	GST	31N	84W	16	SANFORD RANCHES INC.**WYO BOARD OF L	SANFORD #10	STO	15	174	140
P43197W	5/9/1978	GST	28N	92W	5	STEPHEN & LINDA BORDEN	BORDENS WELL #101	DOM,STO	12	235	140
P11310P	8/14/1964	GST	30N	96W	35	UNITED STATES GOVERNMENT - BLM	WHITLOCK WELL #0705	STO	5	240	140
P11153P	7/14/1964	GST	32N	94W	32	UNITED STATES GOVERNMENT	FINDLAY LAKE WELL #1 #0130	STO	10	259	140
P85610W	7/9/1991	UNA	30N	95W	7	USDI BLM	ENL LORRAINE WELL	MIS	0	380	140
P14497P	12/31/1934	GST	30N	84W	18	SANFORD RANCHES INC.	WARD #1	STO	5	170	143
P59261W	1/12/1982	GST	27N	97W	25	OGLE PETROLEUM INC.	M-38	MON	0	375	144
P97975W	12/1/1994	GST	30N	88W	24	USDI BLM**USDI, BLM	MILLER SPRINGS WELL #1786	STO	10	170	145
P59262W	1/12/1982	GST	27N	97W	25	OGLE PETROLEUM INC.	M-39	MON	0	358	145
P147592W	10/22/2002	GST	27N	92W	2	KENNECOTT URANIUM COMPANY	BEMW-006	MON	0	170	148.99
P61503W	7/23/1982	GST	27N	87W	22	DEPAD, STATE OF WYOMING	DEPAD TEST #8	MON	0	173	149.02
P14488P	12/31/1950	GST	30N	85W	26	SANFORD RANCHES INC.	SANFORD #11	STO	5	200	150
P46570W	2/14/1979	GST	32N	84W	35	USDI BLM CASPER DISTRICT	HIGH #1	STO	5	245	150
P14483P	12/31/1934	GST	29N	85W	20	SANFORD RANCHES INC.	SANFORD #7	STO	5	300	150
P14493P	12/31/1922	GST	30N	85W	27	SANFORD RANCHES INC.	HEADQUARTERS #1	DOM,STO	5	300	150
P14494P	12/31/1950	GST	30N	85W	27	SANFORD RANCHES INC.	HEADQUARTERS #2	DOM,STO	5	300	150
P61743W	8/12/1982	GST	29N	85W	19	OSCAR T. ANNIS FAMILY TRUST	ANNIS KLINE #1	STO	7	340	150
P295W	2/12/1959	UNA	28N	93W	5	AMOCO PRODUCTION COMPANY	HAPPY SPRINGS UNIT WATER WELL #2	IND,DOM	0	169	151
P64313W	6/9/1983	GST	31N	91W	9	USDI BLM, RAWLINS DISTRICT	BEAVER RIM #5093	STO	4	280	152
P59264W	1/12/1982	GST	27N	97W	25	OGLE PETROLEUM INC.	M-41	MON	0	335	152
P14776W	6/28/1972	UNA	27N	91W	19	AMOCO PRODUCTION COMPANY** WYOMING B	BATTLE SPRINGS WATER SUPPLY #2	IND	346	2084	152
P71037W	8/29/1985	UNA	27N	91W	19	WY BOARD OF LAND COMMISSIONERS** TOW	ENL BATTLE SPRINGS #2	MIS,MUN	0	2084	152
P71271W	8/29/1985		27N	91W	19	WY BOARD OF LAND COMMISSIONERS** AMO	ENL BATTLE SPRINGS #2	MIS	0	2084	152
P71710W	12/16/1985		27N	91W	19	AMOCO PRODUCTION COMPANY	ENL BATTLE SPRINGS #2	MIS	0	2084	152
P14490P	12/31/1950	GST	29N	84W	1	SANFORD RANCHES INC.	SANFORD #13	STO	5	375	155
P62426W	10/19/1982	GST	27N	97W	2	OGLE PETROLEUM INC.	M 51	MON	0	400	155
P62425W	10/19/1982	GST	27N	97W	25	OGLE PETROLEUM INC.	M 50	MON	0	440	155
P11158W	11/16/1971	GST	30N	94W	28	UNITED STATES GOVERNMENT	SCARLETT WELL #4042	STO	25	300	156
P56354W	3/20/1981	GST	28N	87W	16	WY BOARD OF LAND COMMISSIONERS** DEP	DEPAD TEST WELL #2	MON	0	813	156.97
P56356W	3/20/1981	GST	28N	87W	16	WY BOARD OF LAND COMMISSIONERS** DEP	DEPAD TEST WELL #4	MON	0	1225	159.42
P12428P	8/29/1966	GST	29N	92W	30	U.S. GOVERNMENT	CLAYTOR WELL #0773	STO	6	233	160
P12439P	4/14/1965	GST	30N	91W	12	U.S. GOVERNMENT	AGATE FLATS WELL #0733	STO	20	250	160
P33910W	5/18/1976	ADJ	28N	92W	29	U.S. ENERGY-CRESTED CORP.**WILLIAM M	MCINTOSH WELL #2	MIS	5	250	160
P83811W	10/16/1990	GST	27N	89W	14	WILLIAM M. MCINTOSH	47 #2	STO	2	360	160
P59260W	1/12/1982	GST	27N	97W	25	OGLE PETROLEUM INC.	M-37	MON	0	385	160
P59266W	1/12/1982	GST	27N	97W	25	OGLE PETROLEUM INC.	M-43	MON	10	379	163
P56355W	3/20/1981	GST	28N	87W	16	WY BOARD OF LAND COMMISSIONERS** DEP	DEPAD TEST WELL #3	MON	0	1240	163
P56353W	3/20/1981	GST	28N	87W	16	WY BOARD OF LAND COMMISSIONERS** DEP	DEPAD TEST WELL #1	MON	0	690	165.76
P49789W	7/25/1979	GST	28N	92W	33	U.S. ENERGY-CRESTED CORP.	PIEZO #4	MON	0	220	168
P11152P	1/30/1943	GST	29N	91W	26	UNITED STATES GOVERNMENT	VICTORY WELL #0120	STO	5	322	170
P82019W	3/23/1990	GST	27N	86W	15	USDI, BLM** PATHFINDER RANCH INC.	BERRA #2	STO	14	400	170
P11779P	10/6/1961	GST	30N	83W	31	FLYING SEVEN THREE LLC	MILES LIVESTOCK #11	STO	5	375	175
P14491P	12/31/1958	GST	30N	84W	21	SANFORD RANCHES INC.	SANFORD #14	STO	5	210	180
P124862W	4/14/2000	GST	29N	85W	14	MARTIN E. ANNIS	MAIN ROAD WELL #1	DOM,STO	10	220	180
P12440P	12/21/1964	GST	31N	94W	4	U.S. GOVERNMENT	ELKHORN WELL #0763	STO	5	242	180
P4956W	3/12/1970	GST	30N	85W	6	DIAMOND RING RANCH	BLACK ROCK WELL #1	STO	10	260	180
P21885W	6/8/1973		29N	93W	36	WY BOARD OF LAND COMMISSIONERS** STA	WWPP TEST HOLE #2	MIS	0	360	187
P64314W	6/9/1983	GST	29N	95W	3	USDI BLM, RAWLINS DISTRICT	OREGON TRAIL #5097	STO	7	310	192

Sweetwater River Watershed Study: Basinwide Groundwater Permits

Permit Number	Priority Date	Status	Township	Range	Section	Applicant	Facility Name	Uses	Reported Yield	Well Depth	Depth to Water
P61509W	7/23/1982	GST	28N	89W	22	DEPAD, STATE OF WYOMING	DEPAD TEST #14	MON	0	232	198.44
P8473P	9/5/1933	GST	29N	86W	31	HUB & SPOKE RANCH CO.	MARYS WELL #1	STO	10	250	200
P12423P	3/31/1967	GST	29N	91W	31	U. S. GOVERNMENT	MILLIE WELL #0774	STO	1	250	200
P10697P	11/2/1964	GST	28N	86W	15	BUREAU OF LAND MANAGEMENT	CHALK VALLEY WELL #993	STO	5	300	200
P4158W	1/12/1970	UNA	28N	92W	20	U.S. ENERGY-CRESTED CORP.	YELLOWSANDS #1	IND,DOM	12	500	200
P64315W	6/9/1983	GST	29N	95W	18	USDI BLM, RAWLINS DISTRICT	SOUTH SWEETWATER #5098	STO	5	300	202
P52292W	5/30/1980	GST	28N	92W	16	WY BOARD OF LAND COMMISSIONERS**U.S.	PZ 9	MON	0	840	205
P11150P	6/30/1942	GST	30N	89W	19	UNITED STATES GOVERNMENT	LANKIN WELL #0090	STO	7	310	210
P41033W	4/15/1977	ADJ	27N	92W	1	GREEN MOUNTAIN MINING VENTURE	ZENITH #1	MIS	60	850	210
P63384W	3/9/1983	GST	32N	95W	25	USDI BLM, RAWLINS DISTRICT	OBRIEN PROJECT #4838	STO	6	800	214
P10701W	10/22/1971	GST	28N	87W	13	USDI BLM, RAWLINS DISTRICT	POINT OF ROCKS WELL #4331	STO	7	340	215
P42764W	4/12/1978	GST	29N	85W	13	JAMES E. STEVENSON & SONS	DOUBLE S #1	STO	5	320	220
P21884W	6/8/1973	GST	29N	93W	36	WY BOARD OF LAND COMMISSIONERS** STA	WWPP TEST HOLE #1	MON	0	1000	220
P44853W	8/23/1978		27N	97W	25	OGLE PETROLEUM INC.	303 I 1	MIS	5	772	228
P8474P	9/20/1941	GST	28N	86W	12	HUB & SPOKE RANCH CO.	ARKANSAS #1	STO	5	250	234
P68777W	10/16/1984	GST	28N	86W	5	USDI, BLM**SUN LAND & CATTLE CO.	DEPAD TEST #10 OVERFILING	STO	5	510	234
P61505W	7/23/1982	GST	28N	86W	5	DEPAD, STATE OF WYOMING	DEPAD TEST #10	MON	0	510	234.34
P49787W	7/25/1979	GST	28N	92W	8	U.S. ENERGY-CRESTED CORP.	PIEZO #2	MON	0	730	236
P8446P	12/28/1960	GST	28N	86W	13	HUB & SPOKE RANCH CO.	CHALK HILLS #1	STO	10	300	250
P50224W	10/5/1979	ADJ	32N	91W	36	WY BOARD OF LAND COMMISSIONERS** THE	ADAMS #1	STO	4	400	250
P5827W	6/19/1970	GST	28N	86W	3	USDI BLM, RAWLINS DISTRICT	NORTH BEEF ACRE #1	STO	6	420	250
P48765W	5/1/1979	GST	28N	86W	23	THE OSCAR T. ANNIS FAMILY TRUST	ANNIS DESERT #1	STO	4	440	263
P63385W	3/9/1983	GST	31N	90W	8	USDI BLM, RAWLINS DISTRICT	WEST DIAMOND PROJECT #4548	STO	15	290	275
P14480P	12/31/1955	GST	30N	84W	15	SANFORD RANCHES INC.	SANFORD #2	STO	5	650	300
P52291W	5/30/1980	GST	28N	92W	21	USDI, BLM**U.S. ENERGY-CRESTED CORP.	PZ 8	MON	0	420	304
P408C	9/18/1935	UNA	28N	85W	6	SINCLAIR REFINING CO.	STATION #8 WATER WELL	IND	36	900	310
P22018P	6/10/1961	GST	31N	86W	20	INC. RUSCO	ROBERTS DRAW #1	STO	7	350	325
P22021P	4/30/1966	GST	31N	86W	15	INC. RUSCO	BLACK ROCK DRAW #1	STO	7	380	330
P106602W	7/1/1997	GST	32N	90W	12	GOEMEX MINERALS, INC	PCHMP 97-1	MON	0	802	438
P106601W	7/1/1997	GST	32N	90W	12	GOEMEX MINERALS, INC	PCHM097-1	MON	0	513	452
P100620W	5/8/1995	UNA	28N	92W	28	USDI, BLM** SHEEP MOUNTAIN PARTNERS	SHEEP #2 SHAFT	MIS	300	1400	500
P506W	3/29/1961		27N	95W	18	GULF OIL CORPORATION	BISON-FEDERAL #1	IND	28	3414	500
P100619W	5/8/1995	UNA	28N	92W	22	USDI, BLM** SHEEP MOUNTAIN PARTNERS	SHEEP #1 SHAFT	MIS	300	1800	625
P64608W	7/11/1983	GST	28N	91W	31	PATHFINDER MINES CORPORATION	GREEN MOUNTAIN OBSERVATION #2	MON	0	2686	667
P44886W	8/21/1978	UNA	28N	92W	22	USDI, BLM**U.S. ENERGY-CRESTED CORP.	PL 21A	MIS	35	1410	675
P83028W	7/19/1990	GST	27N	91W	4	U.S. ENERGY CORP.	JP #6	MON	0	2380	692
P44469W	7/17/1978	UNA	28N	92W	28	U.S. ENERGY-CRESTED CORP.	SD 18 16	MIS	20	1410	757
P64607W	7/11/1983	GST	28N	91W	31	PATHFINDER MINES CORPORATION	GREEN MOUNTAIN OBSERVATION #1	MON	0	2515	847
P100621W	9/14/1995	UNA	28N	92W	21	USDI, BLM** SHEEP MOUNTAIN PARTNERS	GOLDEN GOOSE #1 SHAFT	MIS	60	860	859
P44145W	6/22/1978		27N	95W	20	GULF OIL CORPORATION**USDI, BLM	BISON BASIN UNIT FEDERAL WATER SUPPL	IND	122	3636	1000
P50129W	10/1/1979	GST	27N	91W	4	THE ANACONDA COMPANY	GM-290	MON	0	3441	1050
P145052W	6/10/2002	GST	29N	92W	10	WESTERN NUCLEAR, INC.	SWAB-36R	MON	0	1388	1091
P43954W	6/14/1978	ADJ	28N	92W	29	U.S. ENERGY-CRESTED CORP.**WILLIAM M	MCINTOSH WELL #3	MIS	25	300	1207
P75520W	9/14/1987	UNA	27N	91W	8	U.S. ENERGY CORP.	U S E G #2	MIS			
P53533W	9/8/1980	GST	29N	91W	18	ROBERT & CAROL VANDERWEGE	VAN #1	DOM			
P69630W	3/25/1985	GST	29N	88W	35	USDI BLM, RAWLINS DISTRICT	DIPPING VAT	STO			
P74066W	2/23/1987	UNA	28N	92W	32	U.S. ENERGY-CRESTED CORP.**WILLIAM M	MCINTOSH PIT #1	RES,STO,MIS			
P79328W	3/31/1989	GST	30N	95W	7	USDI BLM	LORRAINE	STO			
36/7/493W	7/22/2004	UNA	28N	99W	7	USDI, Bureau of Land Management	LONG GULCH WELL	STO			
37/7/493W	4/26/2005	GSI	29N	88W	27	TOBY WINGERT	TENA'S WELL NWNW-SEC 27-29N-88W	DOM			
38/7/87W	7/25/2005	UNA	30N	100W	27	JOSEPH & BONNIE MOTHERWAY	MOTHERWAY WELL #2	DOM			
P126600W	6/29/2000	GSE	29N	100W	7	CHRISTOPER A. & KATHY S. CROFTS	KC2	DOM			
P138119W	8/13/2001	GSE	30N	95W	27	FARMLAND RESERVE, INC. A UTAH NON-PR	6TH CROSSING CAMPGROUND	MIS			
P140761W	11/8/2001	GSE	29N	85W	19	LINDA J. WHITEHOUSE	WHITEHOUSE # 1	DOM,STO			
P141869W	1/16/2002	GSI	27N	90W	23	DENNIS ROBERSON	R BAR QUARTER CIRCLE SPRING	DOM,STO			
P142794W	2/19/2002	GSI	29N	96W	4	BUREAU OF LAND MANAGEMENT/RAWLINS FI	ST. MARY'S WELL # 2	STO			
P143418W	4/1/2002	GSI	29N	94W	36	ROBERT L/JUDY F WHITLOCK** WY STATE	SOAP HOLE WELL #1	STO			

Sweetwater River Watershed Study: Basinwide Groundwater Permits

Permit Number	Priority Date	Status	Township	Range	Section	Applicant	Facility Name	Uses	Reported Yield	Well Depth	Depth to Water
P144114W	4/22/2002	GSI	30N	100W	34	DON/PAULA KINCHELOR	1# KINCHELOE	DOM			
P145384W	6/12/2002	GSI	26N	97W	13	HUDSON GROUP, LLC** USDI, BUREAU OF	PICKET LAKE # 5	STO,MIS			
P147593W	10/22/2002	GSI	27N	92W	11	KENNECOTT URANIUM COMPANY	BEMW-007	MON			
P148004W	11/1/2002	GSI	28N	95W	35	STANLEY/LINDA COLE	HAPPY SPRING	DOM,STO			
P150273W	4/3/2003	GSE	28N	89W	6	SUN LAND CATTLE CO	SPEYERS WELL	STO			
P150275W	4/3/2003	GSI	29N	88W	27	TOBY WINGERT/TENA SUN	TENAS WELL	STO			
P152604W	7/31/2003	GSI	29N	100W	12	WALDA G ELLIOTT	ELLIOTT #1	DOM			
P154664W	10/22/2003	GSE	29N	92W	10	RICHARD L AYERS	SPLITROCK OIL & ENERGY #1	DOM			
P155699W	11/10/2003	GSI	31N	95W	28	DON ABERNATHY** USDI, BUREAU OF LAND	ABERNATHY WELL #1	STO			
P156382W	2/23/2004	GSI	29N	95W	32	FARMLAND RESERVE, INC.	6TH CROSSING RANCH RESIDENCE	DOM,STO			
P157199W	3/22/2004	GSI	29N	91W	10	DEREK L KELLEY	KELLEY'S CACHE #2	DOM			
P157200W	3/22/2004	GSI	29N	91W	10	DEREK L KELLEY	KELLEY'S CACHE #3	STO			
P157230W	2/10/2004	GSI	29N	87W	35	PRESIDING BISHIP OF THE CHURCH OF JE	MHVC BUS PARKING LOT WELL	MIS			
P159178W	5/26/2004	GSI	28N	96W	16	MITTEN RANCH & LIVESTOCK COMPANY** W	MITTEN FLATS WELL	STO			
P160970W	7/26/2004	GSI	28N	101W	28	GARY AND DIANE FRANK	DIANE'S WELL	DOM			
P161055W	7/30/2004	GSI	30N	100W	34	JOHN AND WANNETTA COWLING	COWLING 1	DOM,STO			
P161723W	9/2/2004	GSI	29N	100W	12	AARON MCGARVEY	CABIN WELL #2	DOM			
P162103W	9/1/2004	GSI	27N	86W	7	WY STATE WATER DEVELOPMENT COMMISSIO	SR-6	TST			
P162104W	9/1/2004	GSI	27N	86W	7	WY STATE WATER DEVELOPMENT COMMISSIO	SR-5	TST			
P162105W	9/1/2004	GSI	27N	86W	8	WY STATE WATER DEVELOPMENT COMMISSIO	SR-4	TST			
P162106W	9/1/2004	GSI	27N	86W	9	WY STATE WATER DEVELOPMENT COMMISSIO	SR-2	TST			
P162107W	9/1/2004	GSI	27N	86W	9	WY STATE WATER DEVELOPMENT COMMISSIO	SR-1	TST			
P162108W	9/1/2004	GSI	27N	86W	9	WY STATE WATER DEVELOPMENT COMMISSIO	SR-MW-1A	MON			
P162109W	9/1/2004	GSI	27N	86W	9	WY STATE WATER DEVELOPMENT COMMISSIO	SR-MW-1B	MON			
P162110W	9/1/2004	GSI	27N	86W	9	WY STATE WATER DEVELOPMENT COMMISSIO	SR-MW-1C	MON			
P162112W	9/1/2004	GSI	27N	86W	9	WY STATE WATER DEVELOPMENT COMMISSIO	SR-MW-2A	MON			
P162113W	9/1/2004	GSI	27N	86W	9	WY STATE WATER DEVELOPMENT COMMISSIO	SR-MW-2B	MON			
P162185W	9/9/2004	GSI	29N	100W	12	EPISCOPAL CHURCH	ST. ANDREWS #1	MIS			
P162673W	9/21/2004	GSI	27N	89W	14	BUREAU OF LAND MANAGEMENT	MCINTOSH WELL	STO			
P163184W	10/4/2004	GSI	29N	87W	32	Corp of Presiding BP of the church o	CHERRY CREEK CG #3	MIS			
P163431W	10/28/2004	GSI	29N	99W	17	NEIL OTTO	OTTO SPRING #2	DOM			
P163767W	9/10/2004	GSI	27N	91W	34	ANSBRO PETROLEUM CORPORATION	HADSELL RANCH 12-34	MIS			
P167437W	5/5/2005	GSI	28N	101W	10	DENNIS & BRENDA HUGHES	FISH CREEK #3	DOM			
P167440W	5/5/2005	GSI	28N	101W	10	MIKE RADOSEVICH	FISH CREEK #2	DOM			
P167451W	5/9/2005	GSI	28N	101W	3	CHUCH & DEBBIE RADOSEVICH	FISH CREEK 1	DOM			
P168031W	6/2/2005	GSI	29N	90W	16	ELLEN M FOX	HAT RANCH BARN WELL	STO			
P168084W	5/31/2005	GSI	29N	100W	12	COLEEN REILY	WILD HAIR 3	DOM			
P168115W	6/2/2005	GSI	30N	100W	27	ROBERT W. DENUNE	DENUNE NO. 1	DOM			
P168468W	6/14/2005	GSI	27N	86W	9	WYOMING WATER DEVELOPMENT COMMISSION	LAYNE TW-1	MIS			
P168469W	6/14/2005	GSI	27N	86W	9	WYOMING WATER DEVELOPMENT COMMISSION	LAYNE TW-2	MIS			
P168543W	6/15/2005	GSI	29N	92W	10	VAMPIRE SYSTEMS, INC.	VAMPIRE SYSTEMS NO. 1 WELL	DOM			