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FINAL REPORT
for
LITTLE SNAKE RIVER / VERMILLION CREEK
WATERSHED STUDY, LEVEL I

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. WYWDC32)

September 2013

Anderson Consulting Engineers, Inc.
Civil • Water Resources • Environmental

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I. INTRODUCTION AND OVERVIEW

1.1 Introduction

On June 2, 2011 Anderson Consulting Engineers, Inc. (ACE) entered into a contract with the Wyoming Water Development Commission (WWDC) to provide professional services for the Little Snake River / Vermillion Creek Watershed Level I Study. ACE was retained to evaluate and describe the study area and specifically develop a watershed management plan. Opportunities and issues within the watershed are to be identified and practical economic solutions proposed. The plan was prepared on behalf of the project sponsors:

- Little Snake River Conservation District (LSRCD) and
- Sweetwater County Conservation District (SWCCD).

This report documents the results of all tasks associated with this effort.

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.

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 Little Snake River / Vermillion Creek 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
Thunder Basin Watershed Study
Badwater/Poison Creek Watershed Study
Clear Creek Watershed Study
Kirby Creek Watershed Study
Shell Valley Watershed Study
Buffalo Creek Watershed Study
Nowood River Watershed Study
Middle North Platte Watershed Study

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

1.3 Background

The project study area consists of the Little Snake River and the Vermillion Creek watersheds within the Colorado River Basin in southwestern Wyoming. The Little Snake River watershed is tributary to the Yampa River which is tributary to the Green River. The watershed spans state lines with the Colorado / Wyoming State line effectively dividing the watershed in half (Figure 1.3-1). The project study area includes the Vermillion Creek watershed, which lies west of the Little Snake River watershed and is directly tributary to the Green River in Colorado. The Vermillion Creek watershed also spans the Colorado / Wyoming State line. This project, being funded by the WWDC, is limited to the Wyoming portion of the watersheds and lies within Carbon and Sweetwater Counties.

The total area encompassed by these watersheds is approximately 5,052 square miles; however, the Wyoming portion (i.e., the project study area) encompasses roughly one half of the total area and is 2,887 square miles in size. Elevations range from less than 5,620 feet above mean sea level at its mouth to over 11,000 feet on Bridger Peak, resulting in overall relief of over 5,380 feet. Annual precipitation ranges widely throughout the study area, from over 50 inches per year in the Sierra Madres to less than 11 inches in the lower and drier western portions of the area.

The majority of the basin (approximately 74.0 percent) is federally owned and managed by the Bureau of Land Management (65.1 percent) and the United States Forest Service within the Medicine Bow National Forest (8.9 percent). The privately owned portion of the study area consists of approximately 20.6 percent. The State of Wyoming owns the remaining 5.3 percent of the area.

Given the large areal extent of the study area, there is obviously a wide range of environments and resource related management issues. The LSRCD and SWCCD have successfully demonstrated its abilities to complete a wide variety of projects requiring multi-agency coordination within a complex regulatory environment and with funding secured through a range of funding mechanisms.

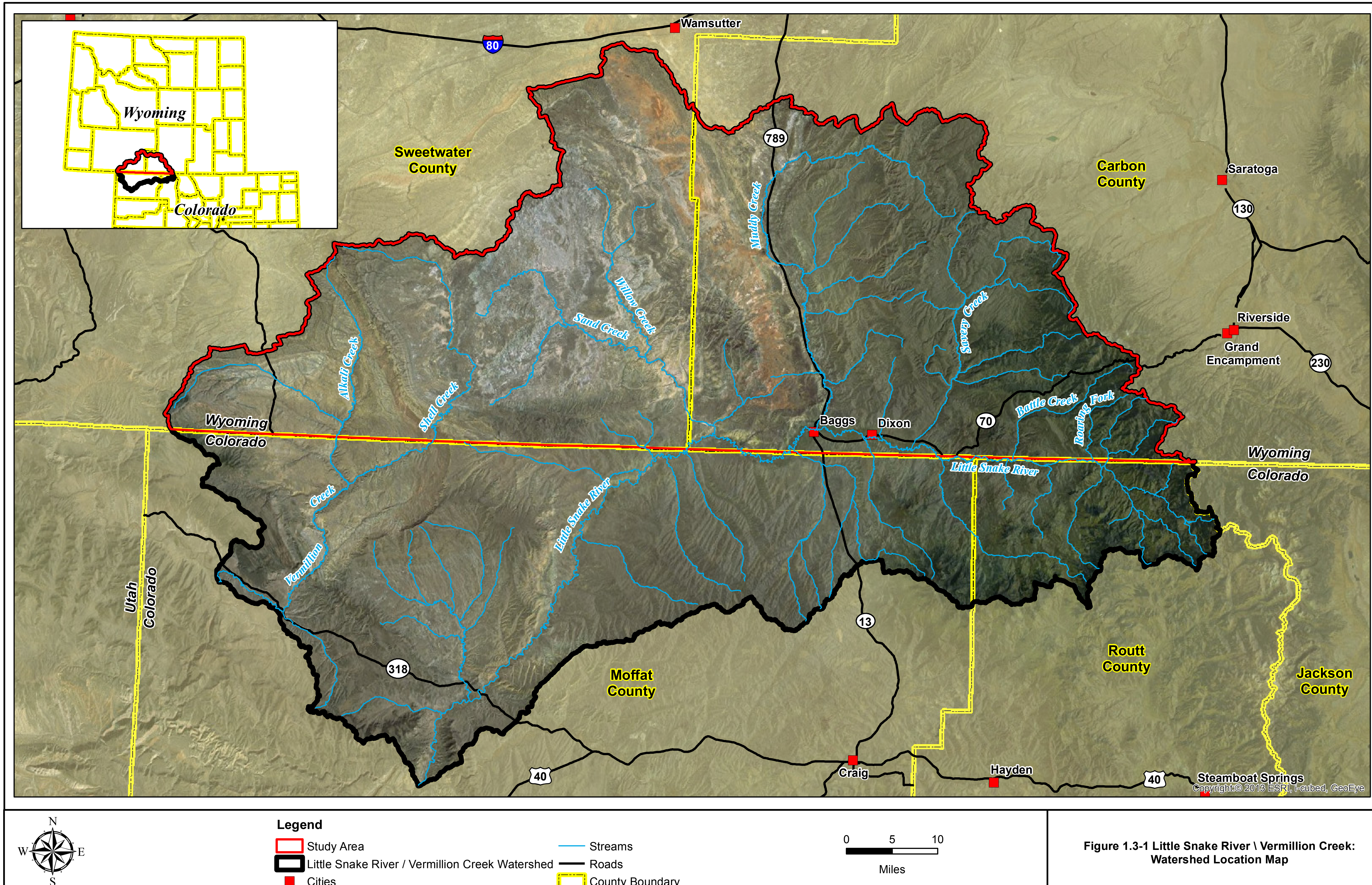


Figure 1.3-1 Little Snake River \ Vermillion Creek: Watershed Location Map

Some of the issues facing the LSRCD and the SWCCD which will direct their future planning efforts include the following:

- Information and Data Management
- Water Quantity, Location and Timing
- Impacts Associated with Energy Development
- Utilization of Grazing Allotments and Range Management
- Stream Channel Stability/Riparian Restoration/Wetlands Enhancement
- Irrigation System Rehabilitation Needs and Opportunities
- Water Storage Needs and Opportunities

1.4 Purpose and Scope

In view of the previous discussions, the 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 Plan. The purpose and objectives of the proposed project are itemized below:

- *Facilitate consensus building among the LSRCD, the SWCCD, landowners and the Wyoming Water Development Commission.*
- *Facilitate public participation.*
- *Develop a comprehensive GIS encompassing the vast amount of spatial data, background mapping, and aerial photography (including the legacy of historic aerial imagery,*
- *Construct a Digital Library with which the user can access the extensive amount of existing literature and data. The Digital Library should also be seamlessly available through the GIS environment.*
- *Conduct an evaluation and description of the Little Snake River/ Vermillion Creek watershed (and associated watersheds) based to a large degree on the wealth of available information. Included in the summary should be the discussion of quantity and quality of surface water resources and riparian/upland conditions.*
- *Augment existing baseline geomorphic data by conducting 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 an enhancement / 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.*

In summary, the Little Snake River / Vermillion Creek Watershed Plan represents a unique opportunity for the conservation districts and the landowners to continue to provide direction related to the future of their watershed. The proposed watershed management components of the plan that are identified will be evaluated and summarized in a matrix format to facilitate screening and prioritization. Evaluation criteria will include practical implementation, relative cost, economic feasibility and ability to fund, net hydrologic effects, sustainability, impacts to water rights and existing compacts, ease of permitting, and public acceptability, among others. The results of the initial screening effort will be a prioritized list of improvements for review and approval by the LSRCD, SWCCD, and the WWDC. This list essentially represents a road map that will guide the conservation districts and landowners in the selection and implementation of projects. This Plan will enable the conservation districts to apply for additional funding through the WWDC's Small Water Project Program and to allow for implementation of small projects in the short-term while planning the implementation of larger projects, such as reservoirs, for the long-term. In so doing, the Plan will guide the conservation districts and landowners in project implementation while optimizing potential funding opportunities and minimizing the time associated with potential NEPA/permitting requirements. Finally, the Plan will identify potential benefits to each project and will support formation of improvement districts, as necessary.

II. PROJECT MEETINGS

2.1 Introduction

An integral part of the Little Snake 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, 2011.

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.

Seven project meetings were held and included the following:

• Initial Scoping Meeting: Vermillion Ranch	August 8th, 2011
• Initial Scoping Meeting: Baggs	August 9th, 2011
• Project Update Meeting: Baggs	April 19th 2012
• Draft Results Presentation: Baggs	November 11, 2012

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.

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, hydrologic investigations (including establishment of temporary stream gages), and storage site 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.

III. WATERSHED DESCRIPTION AND INVENTORY

3.1 Introduction and Purpose

A considerable amount of information exists pertaining to the Little Snake River / Vermillion Creek Study Area 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.

Throughout the remainder of this chapter, an overview of existing conditions of natural resources found within the study area are discussed. Included are summaries of numerous individual disciplines: vegetation, soils, wildlife, hydrology, ecologic site descriptions, etc. For each discipline, individual maps delineating the character and extent of that watershed attribute were generated within the project GIS. In conjunction with many of the map figures, summary tables have been prepared which tabulate various attributes of the pertinent watershed characteristic. Due to the magnitude of the watershed areal extent and the range of environmental conditions encountered within it, tabular presentation of spatial data has been broken into five subregions. Figure 3.1-1 presents the boundaries of the subregions used for those watershed attributes where the additional detail is provided. These boundaries were selected based primarily upon hydrologic units and include:

- Little Snake River
- Muddy Creek
- Vermillion / Shell Creek
- Sand / Willow Creek
- Savery / Battle Creek

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:

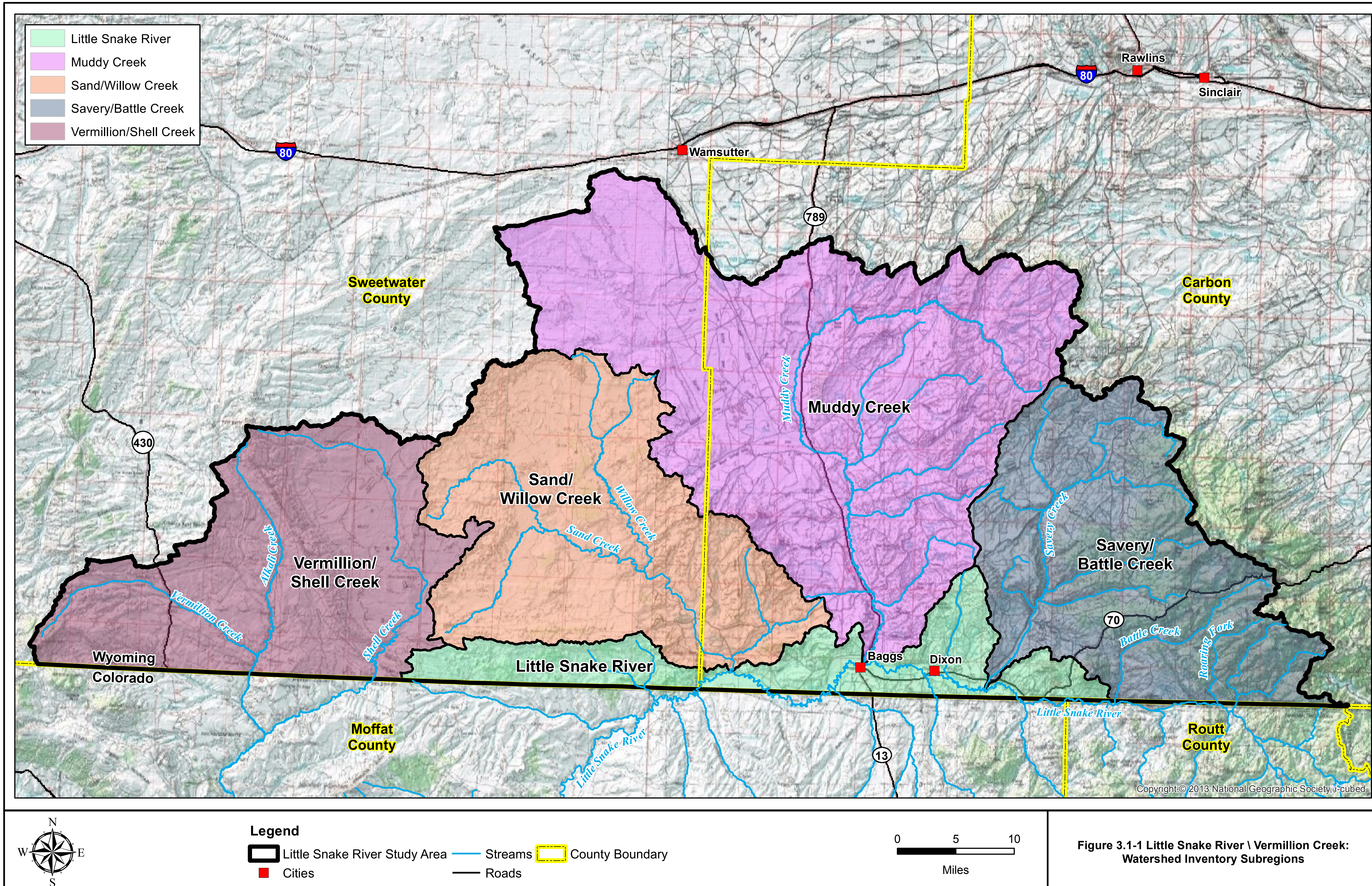


Figure 3.1-1 Little Snake River \ Vermillion Creek: Watershed Inventory Subregions

- Little Snake River Conservation District (LSRCD)
- Sweetwater Conservation District (SWCCD)
- U.S. Bureau of Land Management (BLM)
- 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)
- U.S. Department of Interior (DOI)
- Wyoming Water Development Commission (WWDC)
- Wyoming Department of Environmental Quality (WDEQ)
- Wyoming Abandoned Mine Land Program (AML)
- Wyoming Game and Fish Department (WGFD)
- Wyoming State Historic Preservation Office (SHPO)
- Wyoming State Engineer's Office (WSEO)
- Wyoming Oil and Gas Conservation Commission (WOGCC)
- Wyoming State Geological Survey (WSGS)
- Wyoming Geographic Information Science Center (WyGISC)
- Wyoming Natural Diversity Database (WYNDD)
- Wyoming Lands Conservation Initiative (WLCI)
- Sweetwater County Assessor's Office
- Colorado Parks & Wildlife
- Carbon County Assessor's Office
- Trout Unlimited (TU)

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 the location of irrigation ditches could also include numerical data pertaining to each ditch's irrigated acreage, improvements, problems, etc.

The Little Snake River / Vermillion Creek watershed GIS was developed with the "clearinghouse" approach in mind. The GIS is intended to incorporate not only the spatial data pertaining to the watershed, but also analytical spreadsheets and documents. Figure 3.2-1 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.

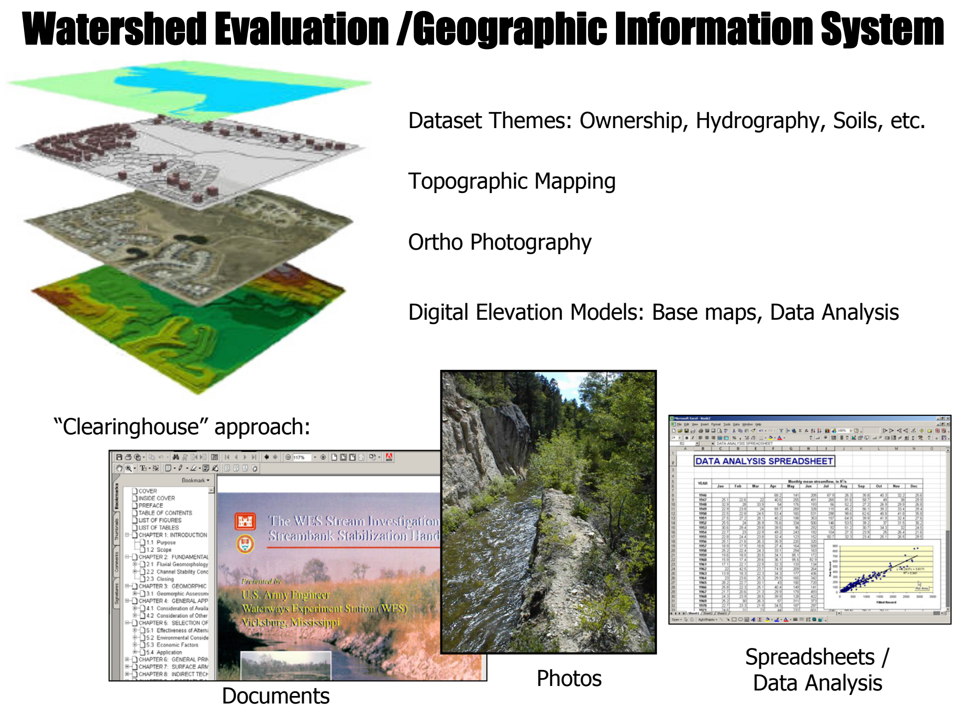


Figure 3.2-1 Example of the Little Snake River / Vermillion Creek Watershed Study GIS Structure and "Clearinghouse" Capabilities.

Spatial data pertaining to the Little Snake River / Vermillion Creek Study Area was collected from a wide range of sources. Agencies providing information included the State of Wyoming, USDI Bureau of Land Management, United States Geological Survey, Natural Resources Conservation Service, Wyoming Land Conservation Initiative, Wyoming Game and Fish Department, Carbon and Sweetwater Counties, the USDA Natural Resources Conservation Service, and others. A significant amount of the information was also specifically developed during the course of this investigation. Table 3.2-1 presents a list of the individual themes, maps, and aerial photographs which have been incorporated into the project GIS. All of the map figures presented in this report were prepared within the project GIS and are representative of the information housed within it.

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 (ArcMap 10.x) is required to view and utilize the data to the maximum of its potential. However, free 'shareware' data viewers (ArcGIS Explorer: http://www.esri.com/software/arcgis/explorer) 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.

Table 3.2-1 Generalized GIS Contents.

Linked Data	**Ownership**
Trout Unlimited (TU)	Private Ownership - Carbon and Sweetwater Counties
Wyoming Water Development Commission (WWDC)	**Energy Development**
Bureau of Land Management (BLM)	Electric Transmission Corridors
Little Snake River Conservation District (LSRCD)	Atlantic Rim CBM Project Area
Other (reports from various sources)	WY Wind Turbines
U.S. Corps of Engineers (USCOE)	Oil and Gas Wells
United States Geological Survey (USGS)	Oil and Gas Pipelines
Wyoming Department of Environmental Quality (WYDEQ)	EPA Oil and Gas Fields
Watershed Management Plan	**Communications**
BLM Proposed Improvements	FCC Antenna
Little Snake River Watershed Management Plan Points - Proposed Improvements	FCC Cellular Tower
Little Snake River Watershed Management Plan Linear - Proposed Improvements	FCC Micrwave Tower
Political	**Historic and Cultural**
City	Historic Forts
Counties (CO, WY)	Historic Monuments and Markers
PLSS (Township, Range, Section)	National Registry of Historic Places
UTM Zones	Pioneer Trails
Hydrology	Cultural Sites - WY State Historic Preservation Office (SHPO)
State Engineers Office Wells	**Fish and Wildlife**
Reservoirs evaluated by ACE	Sage Grouse Leks
Functional Reservoirs - 1 Mile Buffer	Sage Grouse Core Areas
PFC Data (Lentic, Lotic)	USGS Sagebrush ecosystem conservation and management: WY Basins Data
Lidstone_Anderson 1998 Proposed Reservoirs	Wyoming Landscape Conservation Initiative (WLCI) Integrated Assessment (IA) - 2013
Stream Gages: USGS & Temporary Project	Migration Routes (Antelope, Elk, Moose, Mule Deer, White Tail Deer)
BLM WaterWells	Migration Barriers (Antelope, Elk, Moose, Mule Deer, White Tail Deer)
Streams (NHD high resolution, USGS/BLM, Rosgen Classification)	Crucial Range (Antelope, Elk, Moose, Mule Deer, White Tail Deer)
Study Area	Seasonal Range (Antelope, Elk, Moose, Mule Deer, White Tail Deer)
Springs	Parturition Areas (Antelope, Elk, Moose, Mule Deer, White Tail Deer)
Subwatersheds (HUC 12)	Hunt Areas Herd Unit Boundaries (Antelope, Elk, Moose, Mule Deer, White Tail Deer)
HUC 250	Black Bear Hunt and Management Areas
Infrastructure	Mountain Lion Hunt and Management Areas
Roads (WY, CO, 100K, roads with names)	Aquatic Habitat Priorities
SWCCD Roads	Terrestrial Habitat Priorities
Railroads	Combined Habitat Priorities
Irrigation	Wyoming Game and Fish SWAP 2010 data (Fish, Mollusks, conservation areas)
Points of Diversion	Fish Barriers - Trout Unlimited (TU)
Irrigation Ditches	Fish Regional Boundaries
Irrigated Lands	Blue-ribbon Streams
Irrigation Districts	Critical Stream Corridors
Aqua Engineering Data (Canal & Structure Inventories)	**Climate**
State Engineers Water Rights Data	Ecological Site Precipitation Zone
Headgates	NWS weather Stations
Irrigated Lands-consumptive use (dry year)	Annual Average Precipitation
Irrigated Lands-consumptive use (wet year)	USGS Geographic Factors
Ditches	**Land Cover and Land Class**
Service Areas	WY Landcover - GAP Analysis
Fieldwork	LANDFIRE and National Wetlands Inventory
Fieldwork Pts	**Geology and Soils**
Fieldwork Track	Dikes
Land Management	Fault Lines
Wild Horse Management Areas	USGS National Earthquake Information Center (NEIC) Historic Data
Mine Permit Boundaries	Bedrock Geology
AML Sites (Bentonite, Coal, Hardrock, Industrial, Uranium, etc…)	Surficial Geology
WY BLM Surface Ownership	Landslides
CO BLM Surface Ownership	250K Soils and 24K Soils (where available)
WY BLM Field Office Boundary	Ecological Site Descriptions : Dominant Component
CO BLM Field Office Boundary	**Backgrounds**
Grazing Allotments and Rangeland Management Units (BLM &USFS)	National Agriculture Imagery Program (NAIP)- 2009 True Color and CIR
WY State Conservation Areas	USGS Earth Explorer Historic Imagery - Index
WY State Improvement Areas	USGS 10 Meter DEM

The data in the delivered Little Snake River GIS is stored in an ArcMap 10.1 File Geodatabase. The File Geodatabase format was chosen for a variety of reasons including; optimizing the GIS performance, customizing the data storage structure, and database compactness and portability. The general structure of the geodatabase is pictured below in Figure 3.2-2. Contained within the LSR.gdb (file geodatabase) is a series of feature datasets categorized by the agency who supplied the data (BLM, AML). Within each feature dataset are feature classes representing the various geographic data supplied by the agency or developed during the project.

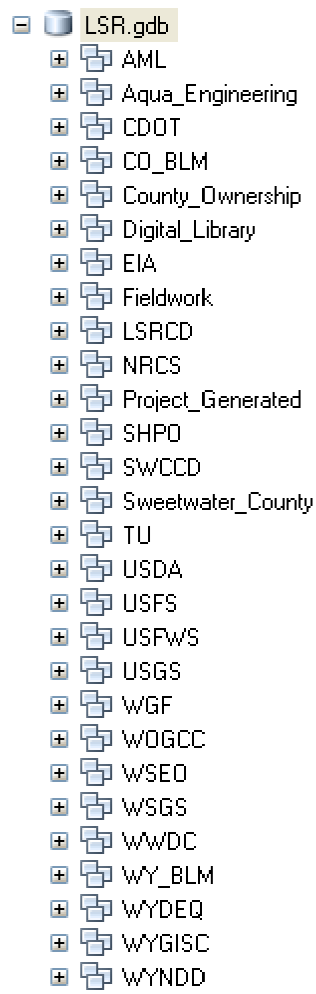


Figure 3.2-2 Little Snake River / Vermillion Creek Project GIS Geodatabase Structure.

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 3.2-2.

Table 3.2-2 Sources of Information Included in the Digital Library.

USDI Bureau of Land Management
United States Army Corps of Engineers
United States Environmental Protection Agency
United States Fish and Wildlife Service
USDI United States Geologic Survey
Little Snake River Conservation District
The Nature Conservancy
Wyoming Landscape Conservation Initiative
Colorado Division of Parks and Wildlife
Sweetwater County Conservation District
Wyoming Department of Environmental Quality
Wyoming Department of Game and Fish
University of Wyoming
Trout Unlimited
Wyoming Water Development Commission
Miscellaneous

To the extent possible, documents that included a geographical representation of the project area were scanned and georeferenced. The project areas were digitized and incorporated into the delivered geodatabase. These documents can be accessed by looking under the "Linked Data" heading in the project GIS. Figure 3.2-3 displays these areas.

This utility will enable the LSRCD/SWCCD and any other user of the GIS to access site-specific environmental information where it is available and incorporated into the GIS. The intent is to expedite preparation of future planning documents, environmental reports, etc, by enabling the user to review existing documents and extract pertinent information.

3.3 Land Uses and Activities

3.3.1 Land Ownership

The total land area within the project study area is approximately 1.85 million acres (2887.7 square miles). Figure 3.3-1 presents a map indicating the various land ownership categories within the watershed. The study area is almost evenly split between Carbon and Sweetwater Counties. Carbon County comprises 1526.2 square miles or 52.8 percent of the study area while the remaining 1361.5 square miles (47.2 percent) is located in Sweetwater County as indicated in Figure 3.3-2. This figure further displays the relative areas the five subregions of the study in relation to the entire project study area and the county they lie within.

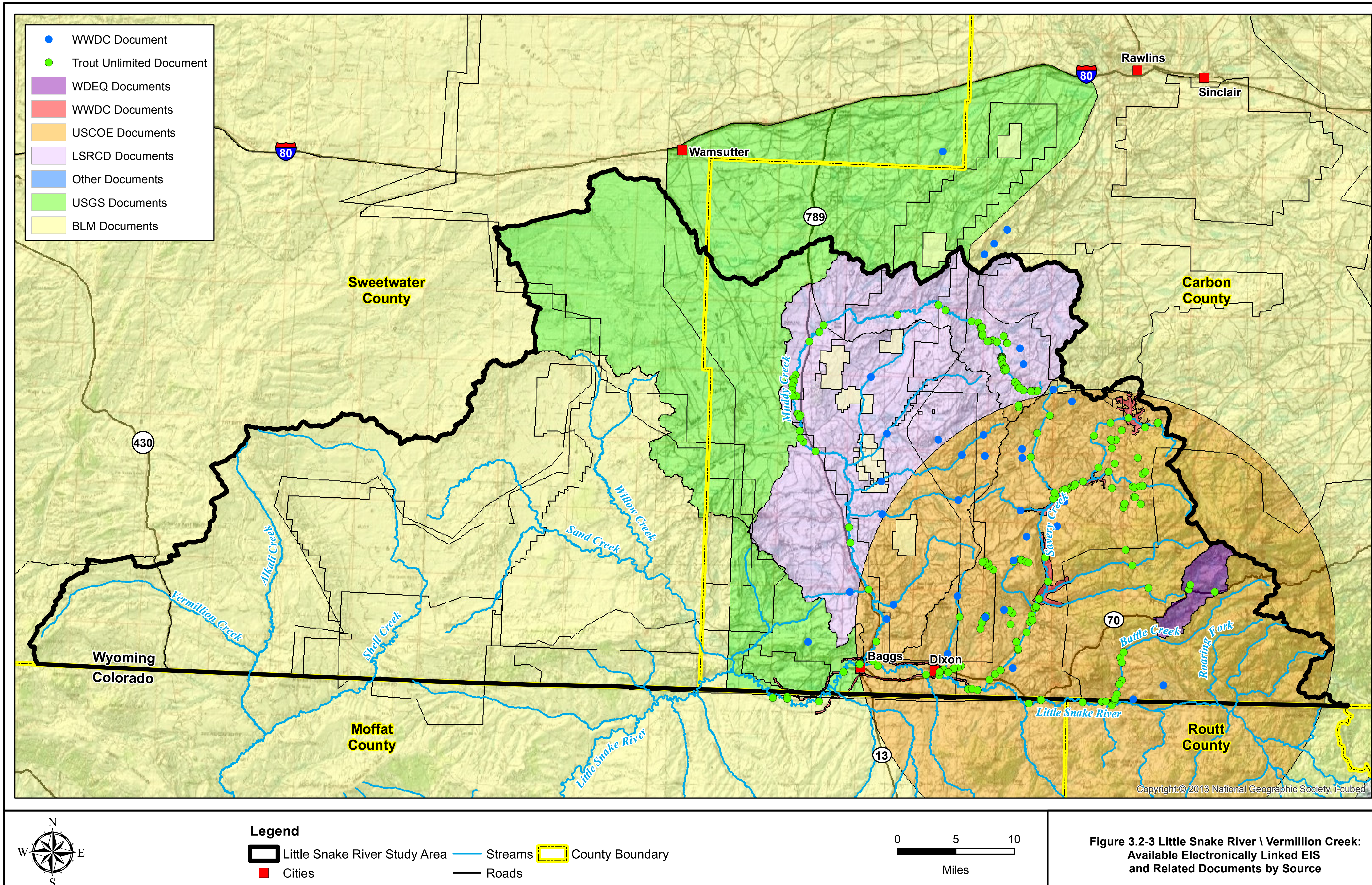


Figure 3.2-3 Little Snake River \ Vermillion Creek: Available Electronically Linked EIS and Related Documents by Source

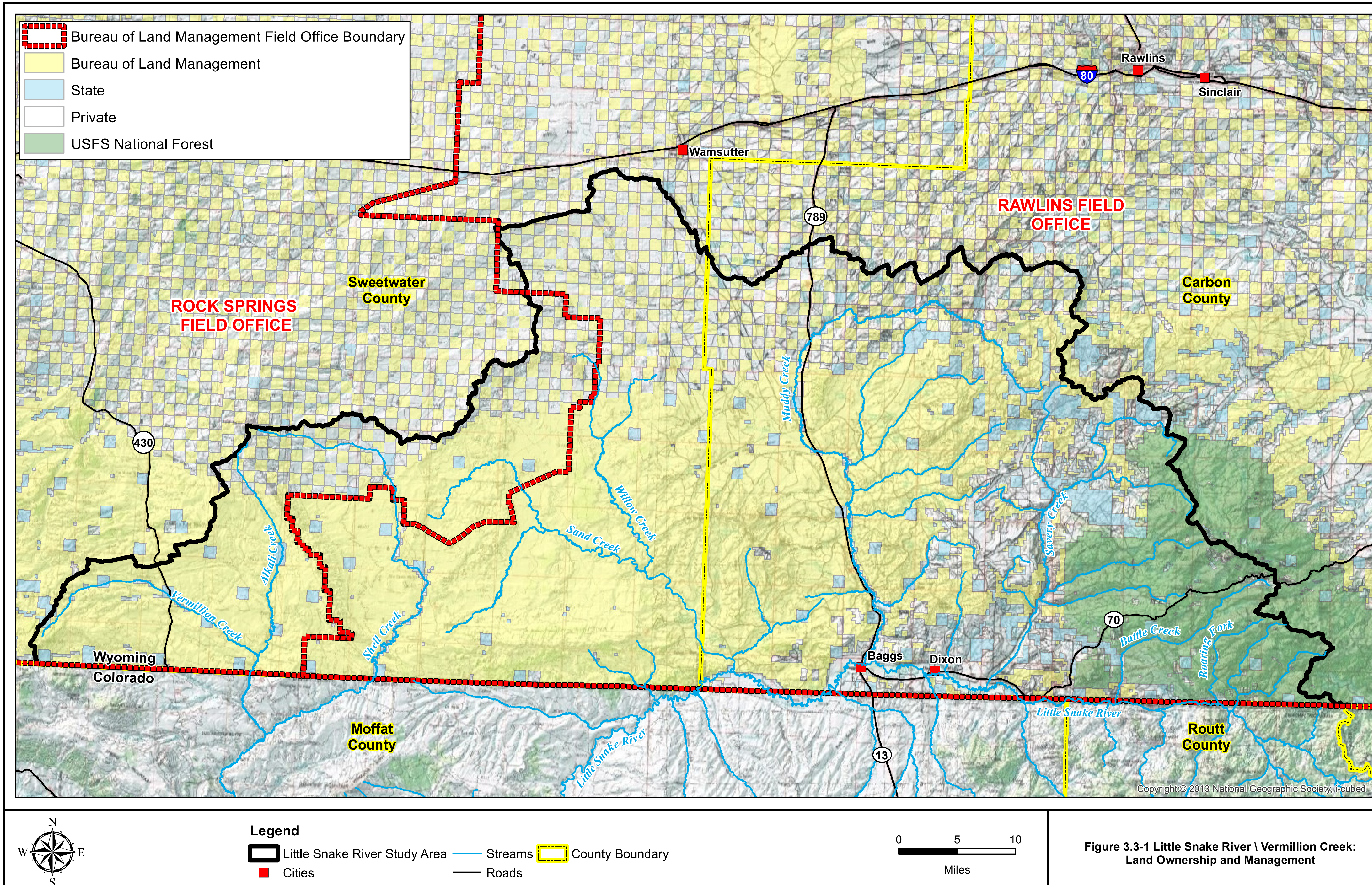


Figure 3.3-1 Little Snake River \ Vermillion Creek: Land Ownership and Management

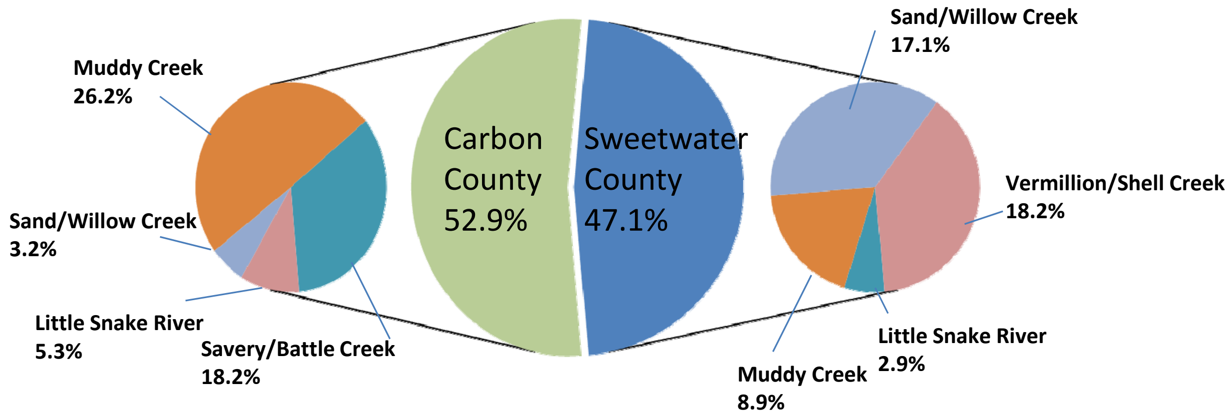


Figure 3.3-2 Distribution of Study Area among Counties and Study Area Subregions.

Land ownership information was obtained from the Bureau of Land Management (BLM), Carbon County and Sweetwater County Assessors' offices and incorporated into the project GIS. According to this data, approximately 1,880.7 square miles (65.1percent) of the study area is federally owned and administered by the Bureau of Land Management (BLM). The second largest land owner category is private individuals with approximately 594.8 square miles (20.6 percent). The United States National Forest Service (258.1 square miles or 8.9 percent) and the State of Wyoming (154.1 square miles or 5.4 percent) round out the surface ownership within the study area. A pie chart displaying the relative percentage of land ownership within the watershed is presented as Figure 3.3-3.

Note: The Project GIS includes detailed land ownership information (name, address, etc) for individual parcels in both Sweetwater and Carbon Counties. The data were obtained directly from the respective county assessor's offices and reflect ownership status as of the dates of their retrieval (Summer of 2012)

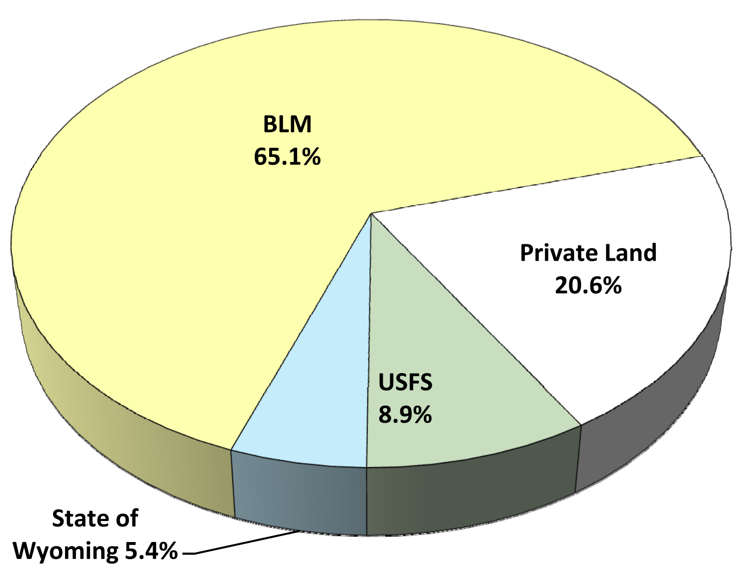


Figure 3.3-3 Distribution of Land Ownership within the Little Snake River / Vermillion Creek Study Area.

3.3.2 Transportation, Energy and Communications Infrastructure

Primary paved transportation routes traversing the study area are shown on Figure 3.3-4. State Highway 70 is the primary east/west transportation route. It enters the watershed from Colorado, southwest of Baggs, and runs easterly through the towns of Dixon and Savery. State Highway 789 is the primary north/south transportation corridor, running north from Baggs to the junction with I-80 near Creston Junction. There are several other improved roads within the watershed but much of the transportation network is made up of unimproved roads of varying quality. Access is difficult throughout most of the study area during winter or wet conditions.

The project GIS contains additional data layers pertaining to roads within the study area which are not displayed within this report because of the fine detail of the data. These datasets include detailed mapping of roads in Sweetwater County completed on behalf of the SWCCD to supplement BLM mapping.

Several electric transmission lines cross the area. Mapping of the lines provided by WyGISC is coarse in nature with poor accuracy; presumably for security reasons. Consequently, the lines indicated on Figure 3.3-4 are approximations of alignment only.

3.3.3 Irrigation

Irrigation activities are limited primarily to the Little Snake River floodplain as indicated on Figure 3.3-5. Smaller irrigated areas scattered throughout the study area on several of its tributaries: primarily Savery Creek, Battle Creek, Vermillion Creek, Coyote Creek and Muddy Creek; however, there are isolated and less extensive irrigated areas throughout other portions of the study area. Table 3.3-1 tabulates the irrigated acreage within each of the HUC 12 sub-watersheds. Approximately 26,000 acres in Wyoming and 3,400 acres in Colorado are presently permitted under Wyoming water law to receive irrigation water. With the exception of irrigated lands within the Vermillion/Shell Creek subregion, the irrigated lands and the ditches which provide water to them are within the Savery-Little Snake River Water Conservancy District (SLSWCD). Irrigated crops include alfalfa, hay and small grains which are used for livestock production (WWDC, 1999).

Table 3.3-1 Distribution of Irrigated Lands.

SubRegion	Acres	Percentage of Irrigated Land Acreage
Little Snake River	10,401.3	61%
Savery/Battle Creek	4,225.5	25%
Muddy Creek	1,808.4	11%
Vermillion/Shell Creek	536.2	3%
Sand/Willow Creek	0.0	0%
Total	16,971.3	100%

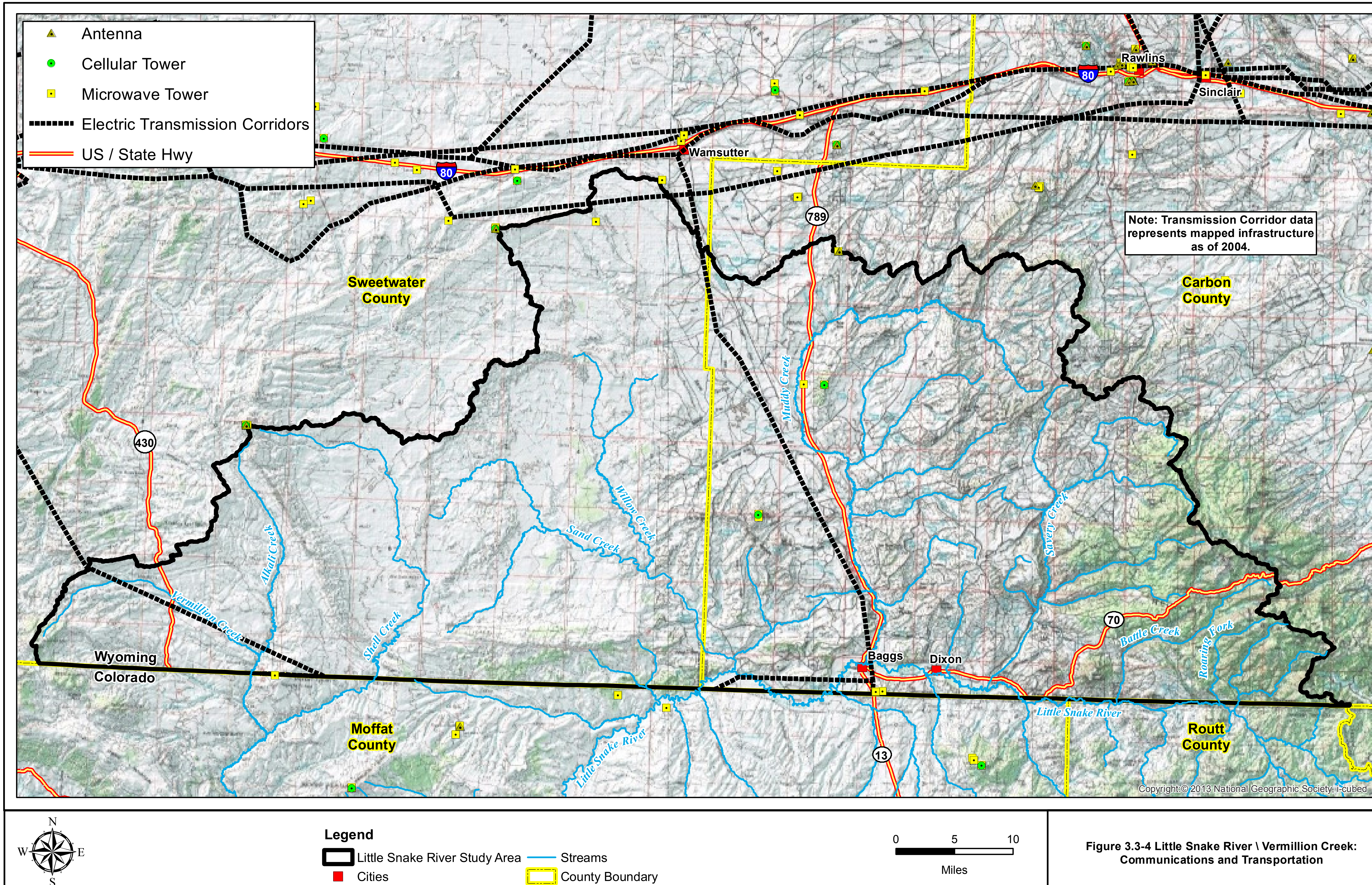


Figure 3.3-4 Little Snake River \ Vermillion Creek: Communications and Transportation

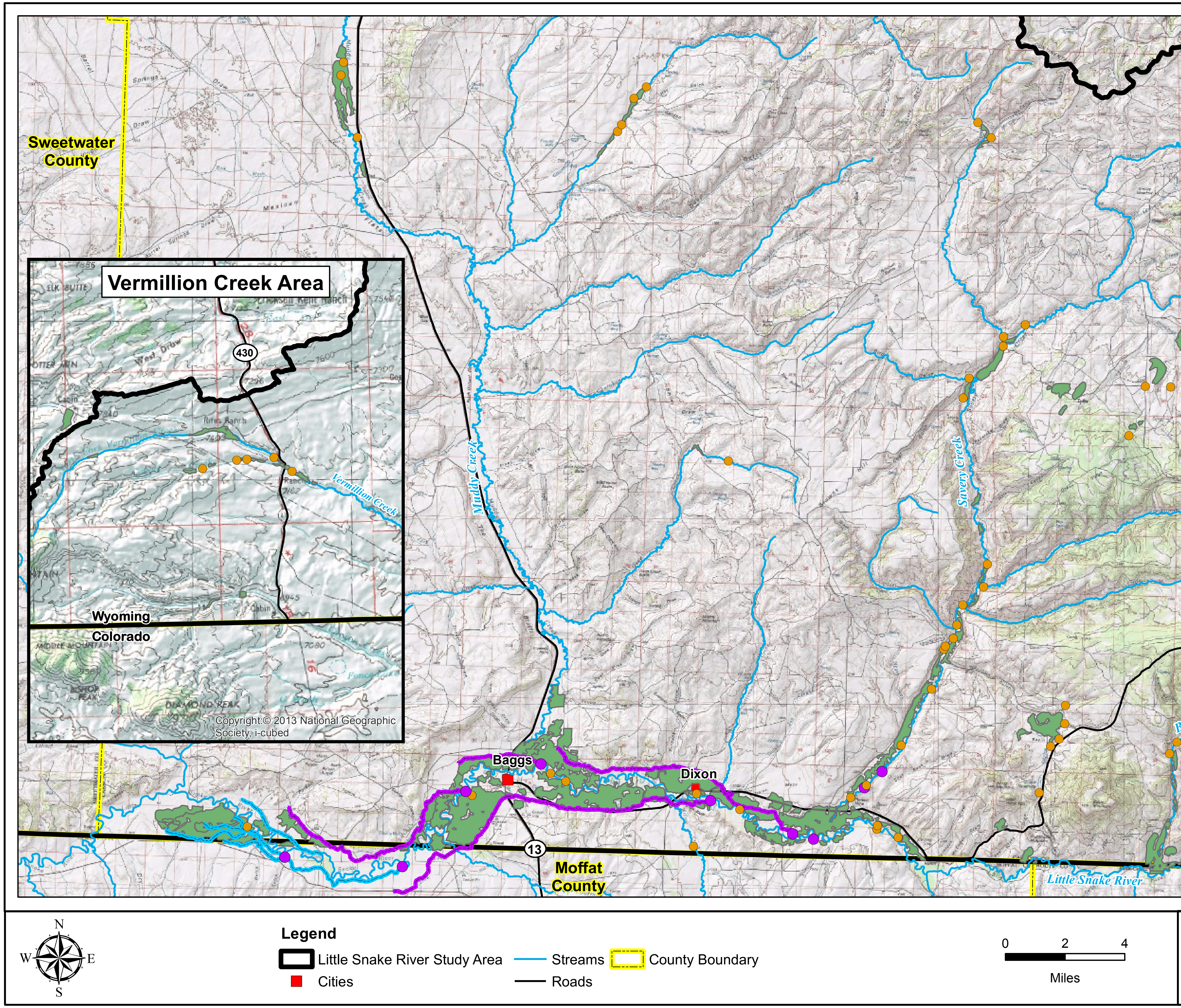


Figure 3.3-5 Little Snake River \ Vermillion Creek: Irrigation Ditches and Points of Diversion

Typically, the full growing season in the majority of the study area extends from mid-April to late September, with the period from mid-July to the end of September defined as late-season when shortages frequently occur. The growing season in the western portions of the watershed (i.e., Vermillion/Shell Creek subregion) typically begins in March. Water supplies are more abundant in April, May and June because of high volumes of snow melt runoff. During these months, water supplies frequently exceed the demand. However, the supply of irrigation water in the basin is substantially reduced during late July, August, and September as snowmelt slows and ceases.

Based upon evaluation of delineated irrigated acreage provided by the WWDO, there are approximately 17,502 acres within the study area rights. The discrepancy between permitted acreage and mapped acreage appears to be an artifact of the location and type of irrigation. Review of aerial photography with respect to the permitted headgate locations indicates that the majority of irrigated acres consist of narrow strips of irrigated pasture within riparian corridors. Consequently, mapping efforts may have excluded these areas. In addition, some headgates appear to have been rendered unusable due to channel incision. Figure 3.3-6 displays a headgate located on Canyon Creek which is no longer capable of diverting flows due to the significant magnitude of channel incision. According to the landowner, the length of time the headgate has been unusable isn't known. Consequently, irrigated acres associated with this headgate, and others, have not been irrigated in many years and may have also been excluded from irrigated lands mapping. This example of channel incision is extreme (approximately 20 – 30 feet); there may be other locations where channel incision of even a foot or two feet could render a headgate inoperable.

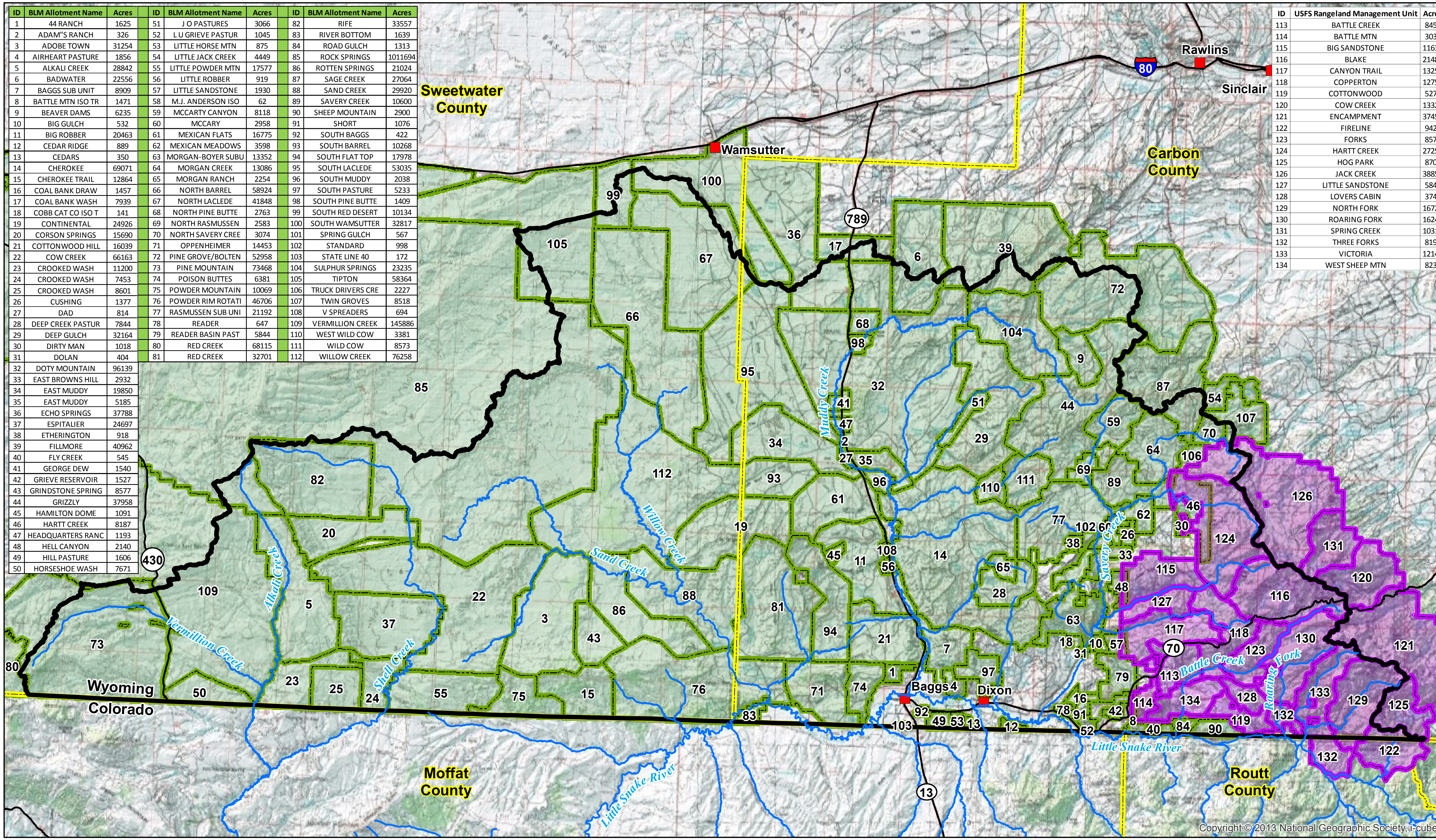
Figure 3.3-6 Inoperable Irrigation Headgate on Canyon Creek.

3.3.4 Range Conditions/Grazing Practices

3.3.4.1 Grazing Allotments Administration

Grazing on federal lands within the Little Snake River / Vermillion Creek watershed is administered by the United States Forest Service and the Bureau of Land Management. The USFS-administered allotments are located at higher elevations within the Medicine Bow National Forest. The allotments consist entirely of federal lands. There are 18 USFS individual allotments as indicated in Figure 3.3-7.

The BLM-administered allotments are administered by both the Rock Springs Field Office (Green River Resource Management Plan approved in 1997) and the Rawlins Field Office (Rawlins Resource Management Plan approved in 2008). The Rock Springs Field Office is currently revising the existing



ID	BLM Allotment Name	Acres	ID	BLM Allotment Name	Acres	ID	BLM Allotment Name	Acres
1	44 RANCH	1625	51	J O PASTURES	3066	82	RIFE	33557
2	ADAM"S RANCH	326	52	L U GRIEVE PASTUR	1045	83	RIVER BOTTOM	1639
3	ADOBE TOWN	31254	53	LITTLE HORSE MTN	875	84	ROAD GULCH	1313
4	AIRHEART PASTURE	1856	54	LITTLE JACK CREEK	4449	85	ROCK SPRINGS	1011694
5	ALKALI CREEK	28842	55	LITTLE POWDER MTN	17577	86	ROTTEN SPRINGS	21024
6	BADWATER	22556	56	LITTLE ROBBER	919	87	SAGE CREEK	27064
7	BAGGS SUB UNIT	8909	57	LITTLE SANDSTONE	1930	88	SAND CREEK	29920
8	BATTLE MTN ISO TR	1471	58	M.J. ANDERSON ISO	62	89	SAVERY CREEK	10600
9	BEAVER DAMS	6235	59	MCCARTY CANYON	8118	90	SHEEP MOUNTAIN	2900
10	BIG GULCH	532	60	MCCARY	2958	91	SHORT	1076
11	BIG ROBBER	20463	61	MEXICAN FLATS	16775	92	SOUTH BAGGS	422
12	CEDAR RIDGE	889	62	MEXICAN MEADOWS	3598	93	SOUTH BARREL	10268
13	CEDARS	350	63	MORGAN-BOYER SUBU	13352	94	SOUTH FLAT TOP	17978
14	CHEROKEE	69071	64	MORGAN CREEK	13086	95	SOUTH LACLEDE	53035
15	CHEROKEE TRAIL	12864	65	MORGAN RANCH	2254	96	SOUTH MUDDY	2038
16	COAL BANK DRAW	1457	66	NORTH BARREL	58924	97	SOUTH PASTURE	5233
17	COAL BANK WASH	7939	67	NORTH LACLEDE	41848	98	SOUTH PINE BUTTE	1409
18	COBB CAT CO ISO T	141	68	NORTH PINE BUTTE	2763	99	SOUTH RED DESERT	10134
19	CONTINENTAL	24926	69	NORTH RASMUSSEN	2583	100	SOUTH WAMSUTTER	32817
20	CORSON SPRINGS	15690	70	NORTH SAVERY CREE	3074	101	SPRING GULCH	567
21	COTTONWOOD HILL	16039	71	OPPENHEIMER	14453	102	STANDARD	998
22	COW CREEK	66163	72	PINE GROVE/BOLTEN	52958	103	STATE LINE 40	172
23	CROOKED WASH	11200	73	PINE MOUNTAIN	73468	104	SULPHUR SPRINGS	23235
24	CROOKED WASH	7453	74	POISON BUTTES	6381	105	TIPTON	58364
25	CROOKED WASH	8601	75	POWDER MOUNTAIN	10069	106	TRUCK DRIVERS CRE	2227
26	CUSHING	1377	76	POWDER RIM ROTATI	46706	107	TWIN GROVES	8518
27	DAD	814	77	RASMUSSEN SUB UNI	21192	108	V SPREADERS	694
28	DEEP CREEK PASTUR	7844	78	READER	647	109	VERMILLION CREEK	145886
29	DEEP GULCH	32164	79	READER BASIN PAST	5844	110	WEST WILD COW	3381
30	DIRTY MAN	1018	80	RED CREEK	68115	111	WILD COW	8573
31	DOLAN	404	81	RED CREEK	32701	112	WILLOW CREEK	76258
32	DOTY MOUNTAIN	96139						
33	EAST BROWNS HILL	2932						
34	EAST MUDDY	19850						
35	EAST MUDDY	5185						
36	ECHO SPRINGS	37788						
37	ESPITALIER	24697						
38	ETHERINGTON	918						
39	FILLMORE	40962						
40	FLY CREEK	545						
41	GEORGE DEW	1540						
42	GRIEVE RESERVOIR	1527						
43	GRINDSTONE SPRING	8577						
44	GRIZZLY	37958						
45	HAMILTON DOME	1091						
46	HARTT CREEK	8187						
47	HEADQUARTERS RANC	1193						
48	HELL CANYON	2140						
49	HILL PASTURE	1606						
50	HORSESHOE WASH	7671						

ID	USFS Rangeland Management Unit	Acres
113	BATTLE CREEK	8457
114	BATTLE MTN	3033
115	BIG SANDSTONE	11639
116	BLAKE	21485
117	CANYON TRAIL	13259
118	COPPERTON	12756
119	COTTONWOOD	5277
120	COW CREEK	13327
121	ENCAMPMENT	37457
122	FIRELINE	9424
123	FORKS	8576
124	HARTT CREEK	27253
125	HOG PARK	8702
126	JACK CREEK	38852
127	LITTLE SANDSTONE	5840
128	LOVERS CABIN	3747
129	NORTH FORK	16727
130	ROARING FORK	16245
131	SPRING CREEK	10315
132	THREE FORKS	8193
133	VICTORIA	12142
134	WEST SHEEP MTN	8231

Figure 3.3-7 Little Snake River \ Vermillion Creek: BLM Grazing Allotments and USFS Rangeland Management Units

Green River Resource Management Plan (RMP) and preparing an associated environmental impact statement (EIS). The revision will be known as the Rock Springs RMP. The Rock Springs RMP will replace the Green River RMP and will provide an updated and comprehensive framework for managing and allocating use of public lands and resources administered by the BLM in the Rock Springs Field Office.

Based upon information collected from the BLM, there are approximately 57 individual allotments. Note that some of these allotments may be located primarily in adjacent watersheds and "spill" over the watershed divide. Appendix 3A lists the allotments and pertinent data associated with them.

On USFS lands, livestock grazing is permitted through a permit system and allotment management plans (AMPs). General grazing management on Medicine Bow National Forest lands and the role of the AMP is discussed in the following paragraph extracted from the Final Environmental Impact Statement for the Medicine Bow National Forest Land and Resource Management Plan (2003). Appendix 3A includes information pertaining to the specific range management units which fall within the project study area:

> *Most sheep allotments practice an alternate rotation grazing system in which the pattern of grazing is "reversed" on alternating years. Sheep are herded, and move to new bedgrounds each night. Most cattle allotments are managed under a pasture rotation system that will use most or all of the allotment each year but will generally avoid the use of an individual pasture at the same time in succeeding years. A few cattle allotments are grazed under a season-long system where livestock distribution is controlled with water, salt, and herding. Salt is located to help draw livestock away from riparian areas, and most ranchers need to ride the allotments (if they don't have a full-time rider) several times each week to move livestock out of riparian zones and into other areas of available forage.*
>
> *Site-specific NEPA analysis for rangeland management uses and activities occurs during the allotment management planning process (analysis is completed for all rangelands, whether inside or outside of active allotments). The Medicine Bow National Forest is on a 15-year schedule to update and revise allotment management plans (AMPs) as mandated by the 1995 Rescissions Act. During the first six years of that schedule (1996-2001), 40 of the 104 active and 15 vacant allotments (34 percent) have undergone updated rangeland analysis, with resultant updates and revisions of the AMPs as needed. Allotment management plans are developed using the goals and objectives as well as the standards and guidelines of the approved Forest Plan. More specific grazing prescriptions can be developed during the allotment planning process to address site-specific resource issues and opportunities.*
>
> *The permitted livestock grazing use across the Forest is based on available forage and utilization in accordance with forest plan standards and guidelines. Some areas experience infrequent or seasonal overuse due to poor livestock distribution across the allotment. In addition, many areas receive dual grazing and browsing pressure on the vegetation from both livestock and big game during some part of the year.*
>
> *Some of these areas are along the Forest boundary at lower elevations in traditional winter ranges. Solutions to these problems are dealt with in communications and*

coordination with Wyoming Game and Fish biologists and at the site-specific level of NEPA analysis during allotment management planning."

Under the umbrella of the Rawlins Resource Management Plan (Rawlins Field Office) and the Green River Resource Management Plan (Rock Springs Field Office), management of BLM grazing allotments is 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 in 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, 2013). 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;
- 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; and
- 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, 2013). Each standard sets a specific objective, explains the function and importance of the objective, and provides indicators to assess the attainment of the objective. Detailed information regarding the BLM standards and guidelines is available at:

http://www.blm.gov/wy/st/en/programs/grazing/standards_and_guidelines.html

State Grazing Leases. Most of the state lands within the Little Snake River / Vermillion Creek watershed are leased to private landowners for grazing. These leases are typically issued by the Board of Land Commissioners and administered by the Office of State Lands and Investments (OSLI). Grazing management, practices and improvements on state lands are usually established and implemented by the lessee. Improvements are normally paid for and owned by the lessee with reimbursement by the new lessee upon transfer of the lease.

Grazing on Private Lands. Grazing practices on private lands are established by the landowner, often with technical assistance from the local NRCS staff and/or a range consultant. Range improvement projects implemented under NRCS program (e.g., EQIP or PL566) follow the guidelines established in the plan of operations developed for the property and/or applicable NRCS technical guidelines as adapted for local conditions.

3.3.4.2 Existing Water Supply

Numerous upland water supply sources currently exist within the study area. Within the project study area, numerous range improvement projects have been completed which utilize existing water sources (springs, wells, perennial streams, etc). Typical projects include livestock/wildlife water tanks and/or livestock/wildlife reservoirs, spring developments with pipelines providing water to remote stock tanks, well construction, etc.

Mapping of existing sources was completed to provide valuable information for completion of the watershed management plan:

- Mapping of stock reservoirs and springs was initially obtained from the Rawlins and Rock Springs Field Offices of the BLM.
- Mapping of wells with a designated stock use was obtained from the Wyoming State Engineers Office (SEO).
- Interviews with landowners were conducted during project meetings, and in the field. During these interviews, locations of existing sources were documented and the information incorporated into the project GIS.
- In addition, aerial photography was reviewed within the GIS environment to document visible features (i.e. stock reservoirs), and give an initial assessment of their condition.

Not all landowners participated in the project; consequently, the mapping is not expected to be an exhaustive accounting of all available sources. However, the information provides a starting point upon which to evaluate the watershed.

This mapping indicated the presence of 1,455 stock reservoirs, ponds, lakes or pits. Mapping of springs was augmented with digitized locations from USGS topographic mapping. 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 or showed no signs of physical breaches or sedimentation were determined to be functional water sources. Physical breaches were visible on many of the reservoirs resulting in a classification of “non-functional”. Likewise, many were visibly filled with sediment and also classified as “non-functional”. 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 3.3-8 displays an example of this process.

Figure 3.3-9 displays a map of the study area showing the results of this classification. Based upon this analysis, it appears that a minimum of 1,273 remain viable water sources. This analysis also indicates that 182 are either breached, sediment filled, or in need of site visits to determine their status. (Appendix 3B presents the results in a tabular format)

Figure 3.3-8 Evaluation of Stock Reservoirs within the Project GIS Environment.

Numerous additional water supply projects have been developed throughout the study area in support of livestock and wildlife including wild horses. These include construction of wells, spring developments, pipelines, etc. These generally incorporate some sort of livestock watering facility such as large bottomless concrete stock tanks, or as in the case of the facility depicted in Figure 3.3-10, a large storage tank where no viable source of water currently exists.

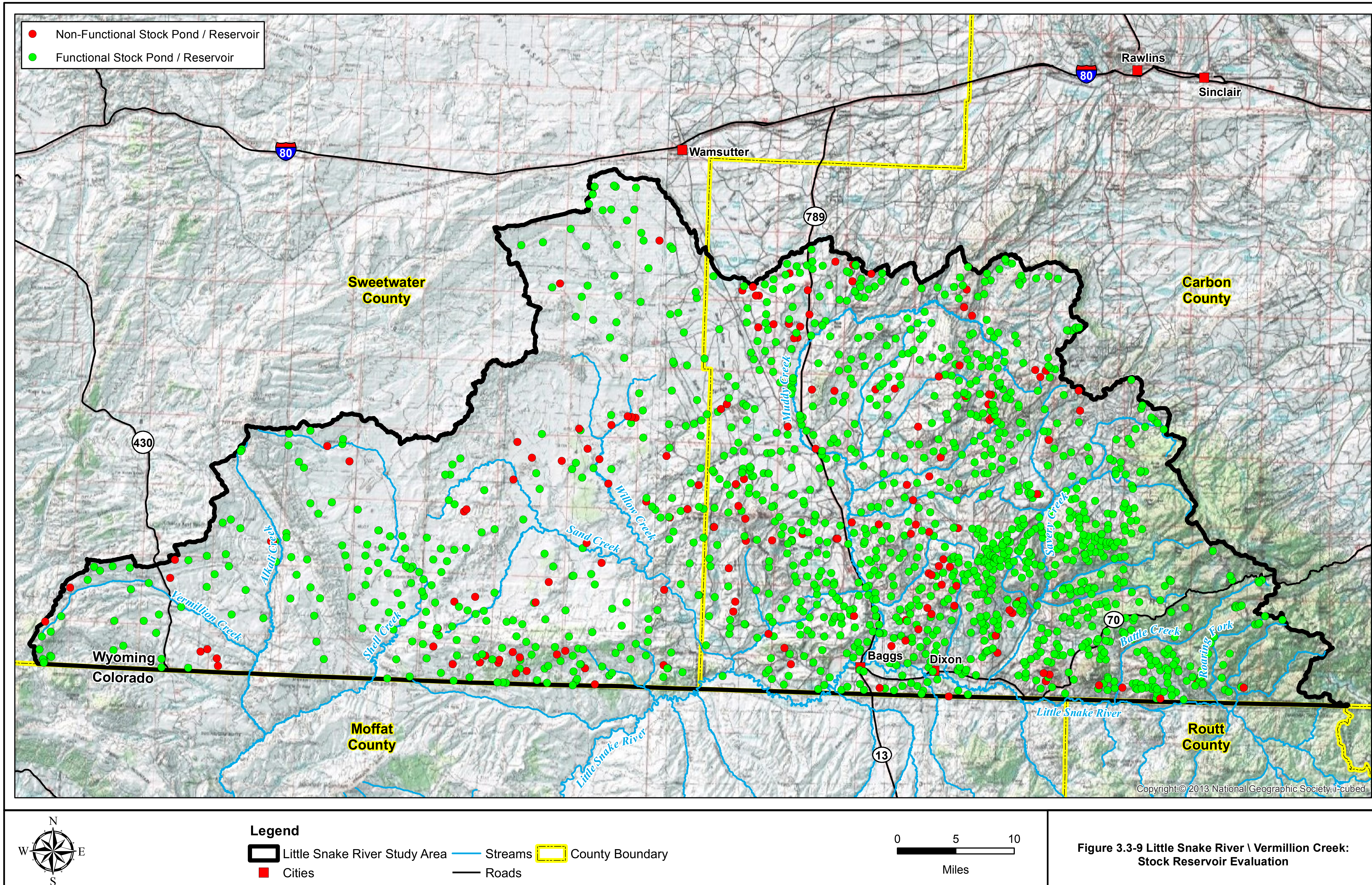


Figure 3.3-9 Little Snake River \ Vermillion Creek: Stock Reservoir Evaluation

Based upon the reservoir analysis effort and mapping data obtained from the BLM, existing water sources are displayed in Figure 3.3-11. Note that this feature does NOT include surface water sources such as perennial streams, intermittent streams, or undeveloped springs because a primary objective of this study is to reduce reliance upon these sources. Because they do not presently appear to provide sources of water to livestock or wildlife, reservoirs which appeared to be either breached, filled with sediment, or otherwise nonviable, are not included in this figure.

Figure 3.3-10 Livestock Watering Facility Requiring Hauled Water.

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/Welcome/pgESDWelcome.aspx.

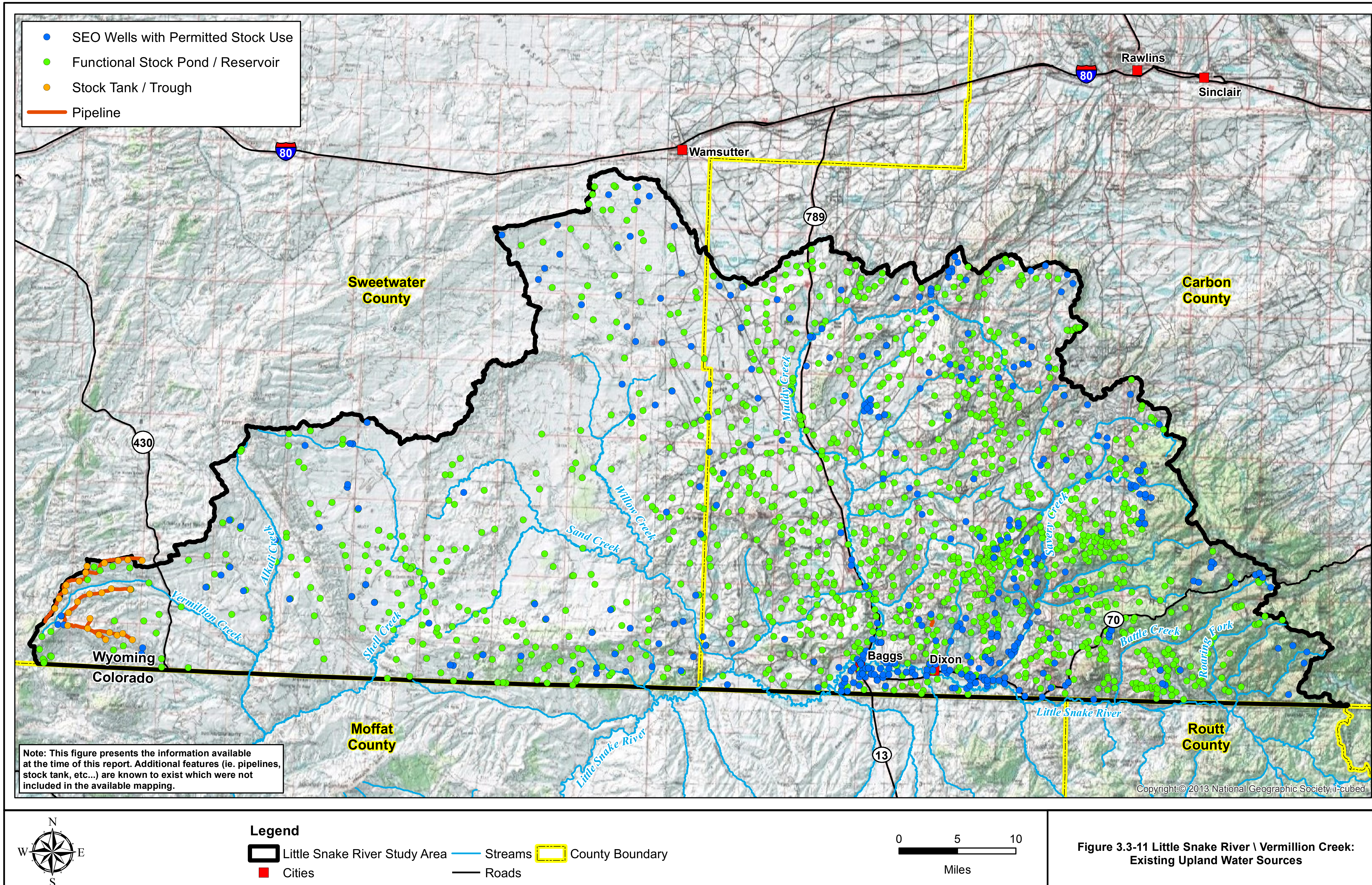


Figure 3.3-11 Little Snake River \ Vermillion Creek: Existing Upland Water Sources

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 3.3-12 displays the ecological precipitation zones found in the Study Area.

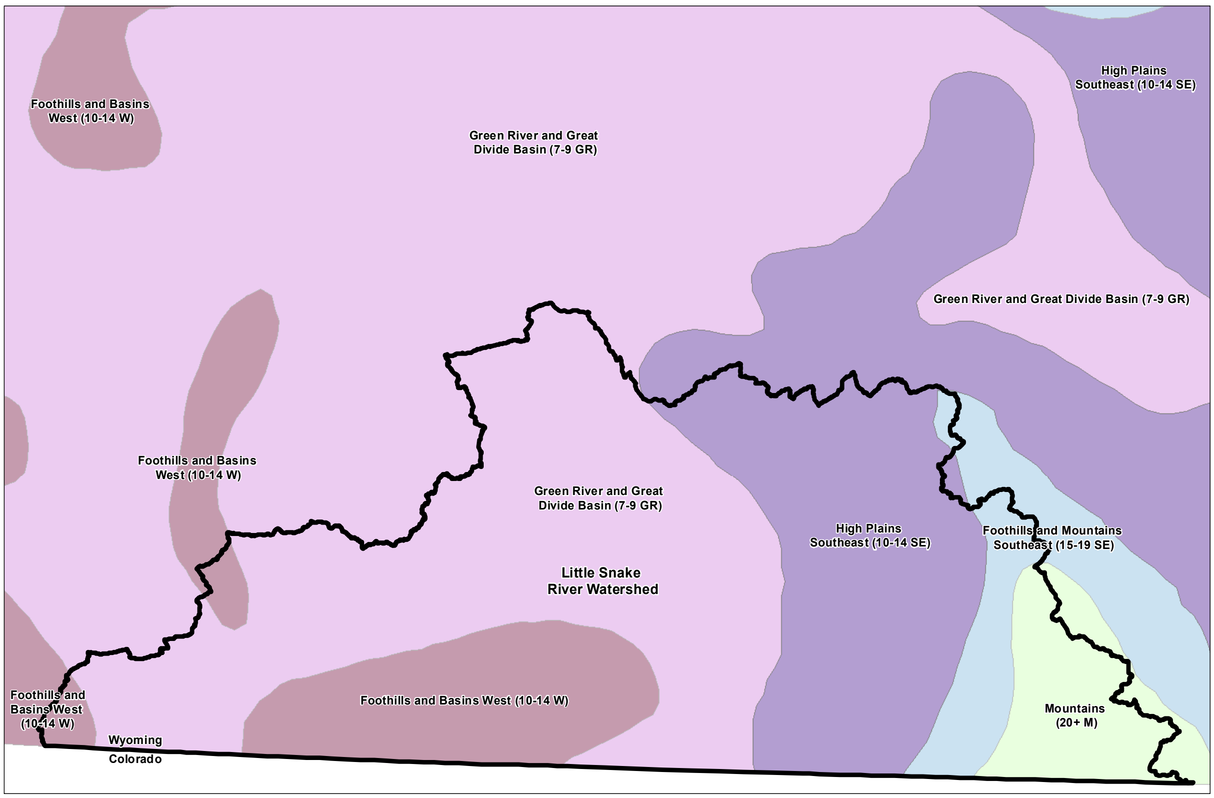


Figure 3.3-12 Ecological Precipitation Zones.

Ecological Sites are defined based upon their location within defined Ecological Precipitation Zones and soil characteristics. Using database tools provided by the NRCS, the available soils mapping was evaluated and Ecological Sites defined within the study area. Unfortunately, detailed soils mapping was only available for approximately 40% of the entire study area. (Please refer to section 3.4.4 for a discussion of soils mapping availability). The NRCS assigns its detailed soils mapping (1:24,000 scale) pertinent attributes, including the ESD. Figure 3.3-13 displays the locations of the major ecological sites where the 1:24,000 mapping was available.

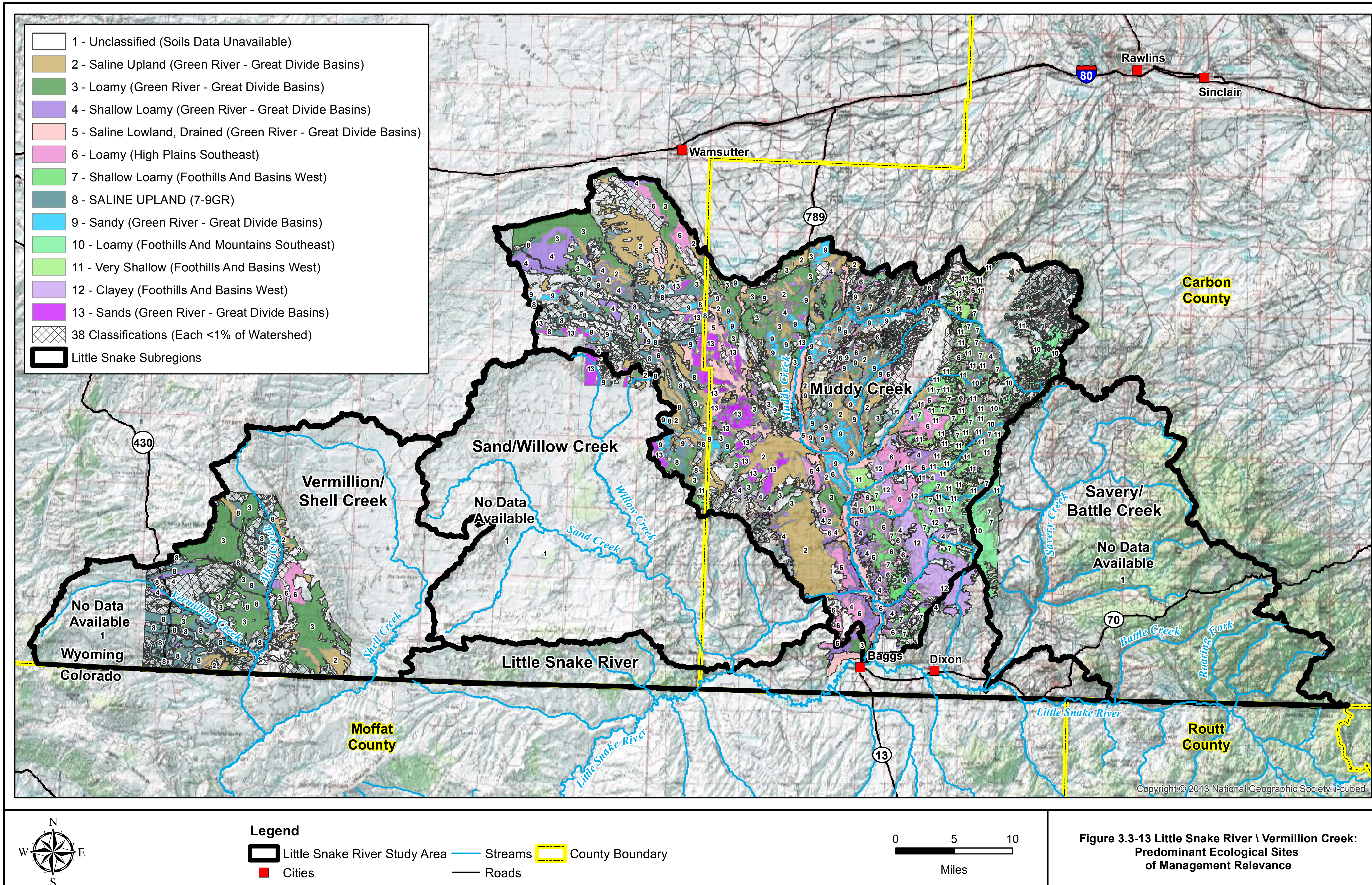


Figure 3.3-13 Little Snake River \ Vermillion Creek: Predominant Ecological Sites of Management Relevance

Based upon the mapping which is available, there are several ecological sites which are predominant. These ecological sites are:

- Saline Upland (SU) 7 – 9 inch precipitation zone (Green River - Great Divide Basins)
- Loamy (Ly) 7 – 9 inch precipitation zone (Green River - Great Divide Basins)
- Very Shallow (VS) 7-9" Green River and Great Divide Basins

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

<u>Saline Upland (SU) 7 – 9 inch precipitation zone (Green River - Great Divide Basins)</u>

The interpretive plant community for this site is the Historic Climax Plant Community. Potential vegetation is about 50% grasses or grass-like plants, 5% forbs, and 45% woody plants. Saline tolerant plants dominate this site. The major grasses include bottlebrush squirreltail and Indian ricegrass. Other grasses may include rhizomatous wheatgrass, needleandthread, Sandberg bluegrass, and Salina wildrye. Gardner's saltbush and bud sagebrush are the dominant woody plants. Other woody plants may include greasewood and winterfat.

A typical plant composition for this state consists of bottlebrush squirreltail 15-30%, Indian ricegrass 15-25%, other grasses and grass-like plants 5-20%, perennial forbs 1-5%, Gardner's saltbush 25-45%, bud sagebrush 5-15%, and 5-10% other woody species. This state provides valuable winter grazing for domestic livestock. Ground cover, by ocular estimate, varies from 20-40%.

The total annual production (air-dry weight) of this state is about 400 pounds per acre, but it can range from about 200 lbs./acre in unfavorable years to about 600 lbs./acre in above average years.

This state is fragile, but well adapted to the Cool Central Desertic Basins and Plateaus climatic conditions. The diversity in plant species allows for some drought resistance. This is a sustainable plant community, but is difficult to reestablish when damaged. (Site/soil stability, watershed function, and biologic integrity).

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

- *Severe Ground Disturbance will convert this plant community to the Halogeton State.*
- *Continuous Season-long Grazing will convert this plant community to the Gardner's Saltbush/Annual*

<u>Loamy (Ly) 7 – 9 inch precipitation zone (Green River - Great Divide Basins)</u>

The interpretive plant community for this site is the Historic Climax Plant Community. This state evolved with grazing by large herbivores and is well suited for grazing by domestic livestock. Potential vegetation is estimated at 75% grasses or grass-like plants, 10% forbs, and 15% woody plants. The major grasses include thickspike wheatgrass, needleandthread, Indian ricegrass, bluebunch wheatgrass, prairie junegrass, and bottlebrush squirreltail. Other grasses occurring in the state may include Sandberg and Canby bluegrass, threadleaf and needleleaf sedge, and plains reedgrass. Wyoming big sagebrush is the *dominant woody plant. Other woody species may include green rabbitbrush, bud sagebrush, shadscale, spiny hopsage, and winterfat.*

A typical plant composition for this state consists of thickspike wheatgrass 10-30%, needleandthread 10-20%, Indian ricegrass 10-20%, up to 10% prairie junegrass, up to 10% bottlebrush squirreltail, up to 10% bluebunch wheatgrass, other grasses and grass-like plants 5-15%, perennial forbs 5-15%, Wyoming big sagebrush 5-15%, and 5-15% other woody species. The overstory of sagebrush and understory of grass and forbs provide a diverse plant community that will support domestic livestock and wildlife such as mule deer and antelope. Ground cover, by ocular estimate, varies from 20-35%.

The total annual production (air-dry weight) of this state is about 500 lbs./acre, but it can range from about 300 lbs./acre in unfavorable years to about 700 lbs./acre in above average years. This plant community is extremely stable and well adapted to the Cool Central Desertic Basins and Plateaus climatic conditions. The diversity in plant species allows for high drought tolerance. 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:

- *Nonuse and No Fire will convert this plant community to the Big Sagebrush/Bunchgrass State.*
- *Heavy Continuous Season-long Grazing and No Fire will convert this plant community to the Big Sagebrush/Rhizomatous Wheatgrass State.*
- *Wildfire with Heavy Continuous Season-long Grazing will convert this plant community to the Douglas Rabbitbrush/Rhizomatous Wheatgrass State.*

Very Shallow (VS) 7-9" Green River and Great Divide Basins

The interpretive plant community for this site is the Historic Climax Plant Community. Potential vegetation is estimated at 65% grasses or grass-like plants, 10% forbs, and 25% woody plants. The major grasses include bluebunch wheatgrass, thickspike wheatgrass, Indian ricegrass, bottlebrush squirreltail, and needleandthread. Other grasses include Sandberg bluegrass, prairie junegrass, needleleaf sedge, and threeawn. At higher elevations, juniper may occur as the dominant woody plant. Other woody plants may include bud, big, and low sagebrush, green rabbitbrush, winterfat, skunkbush sumac, limber pine, and spiny horsebrush.

A typical plant composition for this state consists of bluebunch wheatgrass 20-40%, thickspike wheatgrass 15-30%, needleandthread 10-20%, Indian ricegrass 10-20%, bottlebrush squirreltail 10-20%, other grasses and grass-like plants 10-20%, perennial forbs 5-10%, juniper 1-10%, and 5-15% other woody plants. When this occurs at lower elevations and on windswept ridges, the woody component may lean toward winterfat or be absent. Ground cover, by ocular estimate, varies from 15-20%.

The total annual production (air-dry weight) of this state is about 300 pounds per acre, but it can range from about 200 lbs./acre in unfavorable years to about 400 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:

- *Severe Ground Disturbance will convert this plant community to the Cheatgrass State.*
- *Continuous Season-long Grazing will convert the plant community to the Rhizomatous Wheatgrass/Winterfat State.*

3.3.4.4 Range Conditions and Needs

As previously discussed, both the Rock Springs and Rawlins Field Offices of the BLM have prepared Resource Management Plans (RMPs) for their respective districts. The Rawlins Field Office operates under the Rawlins Resource Management Plan (BLM, 2008) while the Rock Springs Field Office operates under the Green River Resource Management Plan (BLM, 1997).

The Bureau of Land Management (BLM) Rock Springs Field Office is revising the existing Green River Resource Management Plan (RMP) and preparing an associated environmental impact statement (EIS).

The revision will be known as the Rock Springs RMP. The Rock Springs RMP will replace the Green River RMP and will provide an updated and comprehensive framework for managing and allocating use of public lands and resources administered by the BLM in the Rock Springs Field Office (BLM, 2012)

An important factor needed to facilitate improved grazing management and thereby achieve the associated benefits to the watershed is well-distributed, reliable water. Despite the relatively ample water supplies within eastern and higher portions of the watershed, 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. Within the western and lower portions of the watershed (particularly within the Sand / Willow Creek and Vermillion/Shell Creek subregions), conditions are dryer and water supplies are extremely limited.

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.

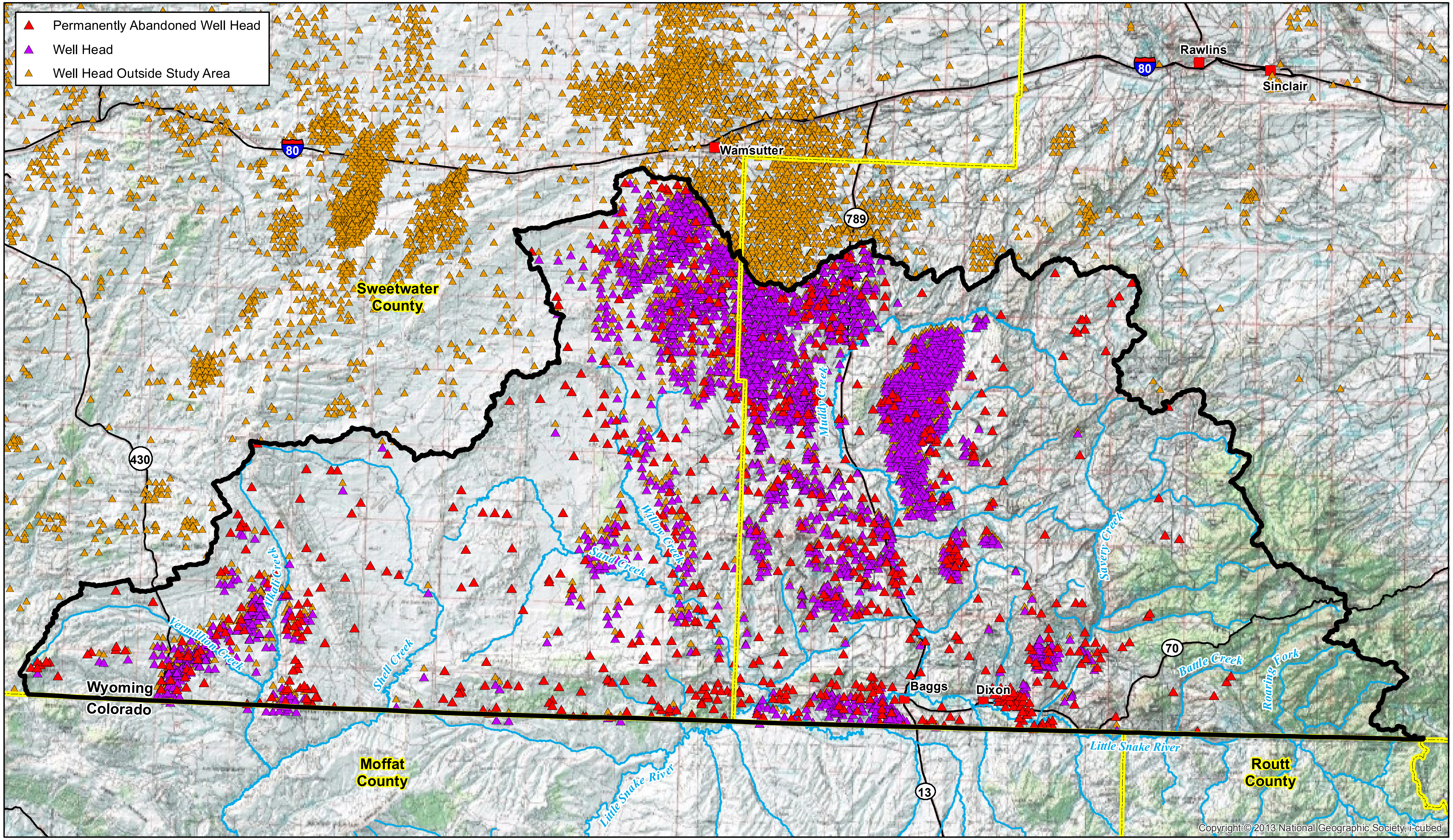
In general, most range improvement practices which improve watershed and livestock values also improve wildlife habitat values. With important and sensitive species found within the watershed, such as sage grouse, care must be taken to ensure that practices are beneficial rather than detrimental to their 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.

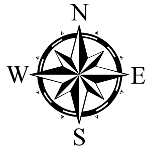
Alternatives to address the need for additional wildlife/livestock watering sites are presented in Section 4.6. Potential management practices and improvements to address other rangeland/grazing related issues are included in Section 4.7. It is important to consider that to be cost-effective any range 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 3.3-14. Annual oil and gas production for 2012 for the well fields encountered is summarized in Table 3.3-2 (It must be kept in mind that the well fields may extend beyond the boundaries of the current study area). Figure 3.3-15 displays the general extent of the oil and gas fields and mapped pipelines. Total oil production was approximately 2.36 million barrels. Natural gas production was approximately 184.8 million cubic feet.

The extensive number of oil and gas wells and the associated infrastructures has made a considerable mark on the landscape of the study area. In an effort to assist the LSRCD and the SWCCD in their on-going efforts to monitor conditions of existing resources, project team conducted a preliminary screening of reclamation success associated with abandoned oilfield wells. Within the project GIS and using 2012 aerial photography, analysts visually evaluated each site to assess its reclamation success in terms of vegetation establishment. Using locations of all abandoned wells in the study area (WOGCC, 2012), each site was designated one of four vegetation categories defined following coordination with the LSRCD and the SWCCD. Numerous sample photographs of well sites with a range of visual





Legend

- Little Snake River Study Area
- Cities
- Streams
- Roads
- County Boundary

0 5 10

Miles

Figure 3.3-14 Little Snake River \ Vermillion Creek: Oil and Gas Wells

Table 3.3-2 Tabulation of 2010 Oil, Gas, and Water Production.

Field	Discovery Year	Total Wells	Producing Wells	Idle Wells	2012 Production		Cummulative	
					Oil BBLS	Gas MCF	Oil BBLS	Gas MCF
Adobe Town	1981	0	0	0	0	0	0	41,492
Alkaline Creek	1977	0	0	0	0	0	5,696	596,842
Baggs South	1957	0	0	0	534	508,234	44,202	63,879,873
Baldy Butte	1982	81	76	5	41,041	3,642,603	590,761	53,122,727
Barrel Springs	1965	163	158	5	59,195	7,049,836	1,624,040	174,765,372
Big Ridge	1991	1	1	0	2	4,628	4,084	366,087
Blue Gap	1974	59	56	3	15,553	1,867,098	463,387	50,430,589
Blue Goose	1991	5	3	2	621	66,136	20,304	1,932,547
Browning	1969	8	6	2	1,184	31,064	427,080	3,990,392
Browns Hill	1976	1	0	1	0	0	0	122,538
Canyon Creek	1941	101	99	2	97,026	15,876,770	1,861,429	371,251,436
Cedar Breaks	1977	6	6	0	59	448,502	3,492	19,877,488
Cedar Canyon	1977	6	6	0	Data Not Available			
Cepo	1992	7	7	0	1,838	1,385,422	21,711	20,085,940
Cherokee Creek	1959	8	5	3	703	13,504	92,853	3,590,609
Cherokee Ridge	1959	8	5	3	Data Not Available			
Coal Gulch	1977	84	80	4	32,900	3,525,361	1,165,233	91,658,356
Cow Creek	1960	2	2	0	0	11,854	970	13,738,376
Creston	1960	165	150	15	94,455	7,936,949	1,453,491	114,154,412
Deep Creek	1950	2	2	0	1,347	0	92,830	5,206,663
Deep Gulch	1976	0	0	0	0	0	0	1,915,428
Desert Rose	1986	0	0	0	0	0	0	68,004
Dixon	1978	0	0	0	Data Not Available			
Dripping Rock	1984	16	16	0	1,206	1,360,272	69,085	129,633,928
Echo Springs	1976	528	476	52	389,173	25,028,476	12,230,493	728,327,699
Emigrant Springs	1958	45	42	3	15,829	1,078,618	1,030,019	60,203,307
Emigrant Trail	1981	10	9	1	1,574	87,085	69,842	2,729,165
Fairway	1994	1	1	0	17	56,585	421	2,965,391
Fireplace Rock	1978	2	2	0	95	5,906	1,583	1,046,108
Frewen	1990	119	113	6	205,296	5,775,465	1,958,213	54,686,032
Hansen Draw	1977	2	2	0	96	15,573	9,040	435,874
Haystack	1978	0	0	0	0	0	0	115,136
Hiawatha	1928	16	15	1	684	393,050	142,567	104,020,141
Irish Creek	1972	1	1	0	Data Not Available			
Kinney	1959	17	11	6	53	658,991	30,311	64,464,242
Kinney Rim	1983	0	0	0	0	0	0	0
Little Snake	1962	1	1	0	226	63,802	3,783	1,426,055
Lookout Wash	1998	21	21	0	4,339	814,262	170,039	26,771,321
Mcpherson Springs	1980	2	2	0	0	1,099	638	471,623
Middle Mountain	1952	1	1	0	47	3,358	57,911	9,122,772
Mud Creek	1983	0	0	0	0	0	372	0
Mulligan Draw	1990	23	23	0	8,008	2,379,932	372,844	96,710,329
Nt	1951	7	6	1	Data Not Available			
Overland	1970	0	0	0	0	0	117,182	10,792
Polar Bar	1994	4	3	1	11	265,236	2,193	8,809,126
Pole Gulch	1994	4	3	1				
Powder Springs	1970	1	0	1	0	0	74,681	6,944,270
Powder Wash	1970	1	0	1	Data Not Available			
Primitive	1985	1	1	0	150	6,320	5,579	304,530
Red Field	1971	7	6	1	Data Not Available			
Red Lake	2010	1	1	0	359	30,931	1,881	218,053
Rex Lake	1923	9	8	1	2,637	4,937	798,424	329,623
Rim Rock	1980	3	2	1	72	51,578	1,507	3,232,258
Robbers Gulch	1962	74	74	0	15,460	2,615,591	428,836	66,433,175
Round Table	1967	0	0	0	0	0	0	0
Salazar	1975	1	0	1	0	0	5,576	537,780
Savery	1954	0	0	0	0	0	0	7,172,584
Shallow Creek	1981	2	2	0	439	10,823	21,431	597,172
Siddon	1978	0	0	0	0	0	56,348	0
Side Canal W	1978	0	0	0	Data Not Available			
Sierra Madre	1981	32	24	8	29,898	60,188	1,470,008	4,591,830
Slater Dome	1946	19	14	5	Data Not Available			
Smith Ranch	1967	13	9	4	224	167,045	90,715	11,421,218
Smokey	1979	0	0	0	0	0	0	0
Snowbank	1995	1	1	0	9	32,639	1,338	1,143,359
Standard Draw	1978	411	364	47	300,297	21,362,184	10,651,374	652,521,628
State Line	1959	0	0	0	0	0	19,016	727,466
Tierney	1973	247	235	12	321,152	14,671,987	3,798,376	139,253,349
Trail Unit	1952	0	0	0	63,489	16,161,315	641,052	138,366,622
Triton	1980	5	5	0	6	117,008	6,336	8,024,259
Twin Fork	1980	0	0	0	0	0	6,879	135,081
Two Rim	1992	133	127	6	165,861	7,860,684	1,949,091	69,508,110
Wamsutter	1958	417	382	35	164,574	16,666,673	4,473,934	481,624,565
Wells Bluff	1977	8	7	1	646	8,146	42,067	906,558
Wild Rose	1975	568	527	41	285,038	20,390,923	9,046,899	589,118,974
Willow Reservoir	1992	2	2	0	118	36,917	3,540	1,982,982
Wilson Ranch	1973	110	102	8	38,205	4,184,978	1,743,390	194,881,414
Windmill Draw	1979	0	0	0	0	0	2,197	1,043,373
	Total	**3,593**	**3,303**	**290**	**2,361,746**	**184,796,538**	**59,478,574**	**4,663,764,445**

Source: WOGCC, 2013

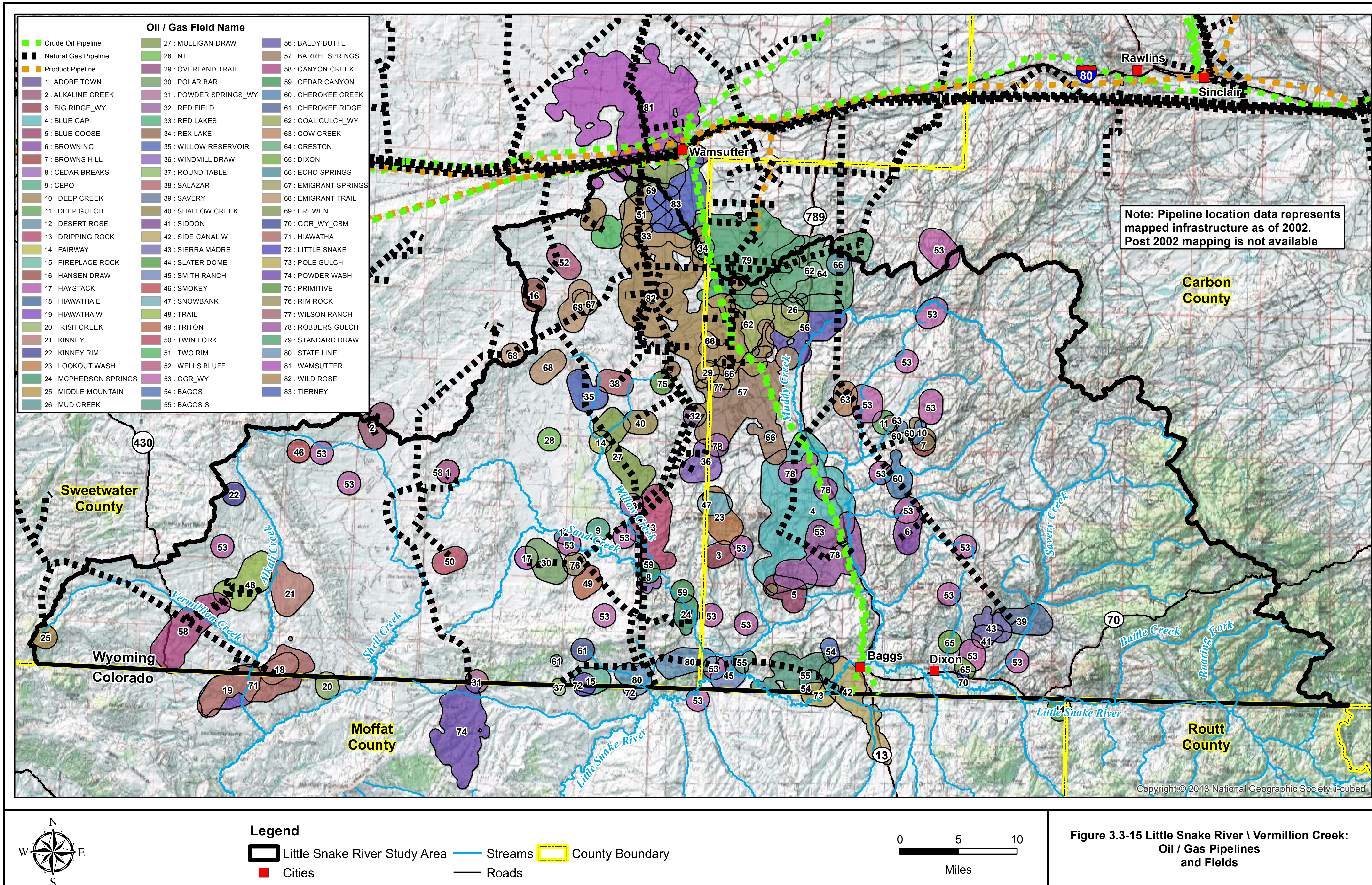


Figure 3.3-15 Little Snake River \ Vermillion Creek: Oil / Gas Pipelines and Fields

reclamation success were presented to members of the conservation districts and agreement was obtained on the classification categories. The categories are described as follows:

Vegetated:	Obvious vegetation establishment and a lack of discernible erosional features
Partially Vegetated:	Mixed establishment of vegetation and / or minor erosional features visible
No Vegetation:	Distinct lack of established vegetation and / or obvious erosional features.
Unknown:	Well site could not be verified or located

Figure 3.3-16 displays and example of this process. Note that all references to relative extent in vegetative cover are made in relation to the surrounding native ground. In addition, one must keep in mind that the plant species cannot be determined using this process, only the relative cover. Consequently, a fully vegetated abandoned well pad could be covered with non-desirable weed species and be classified as vegetated under this procedure.

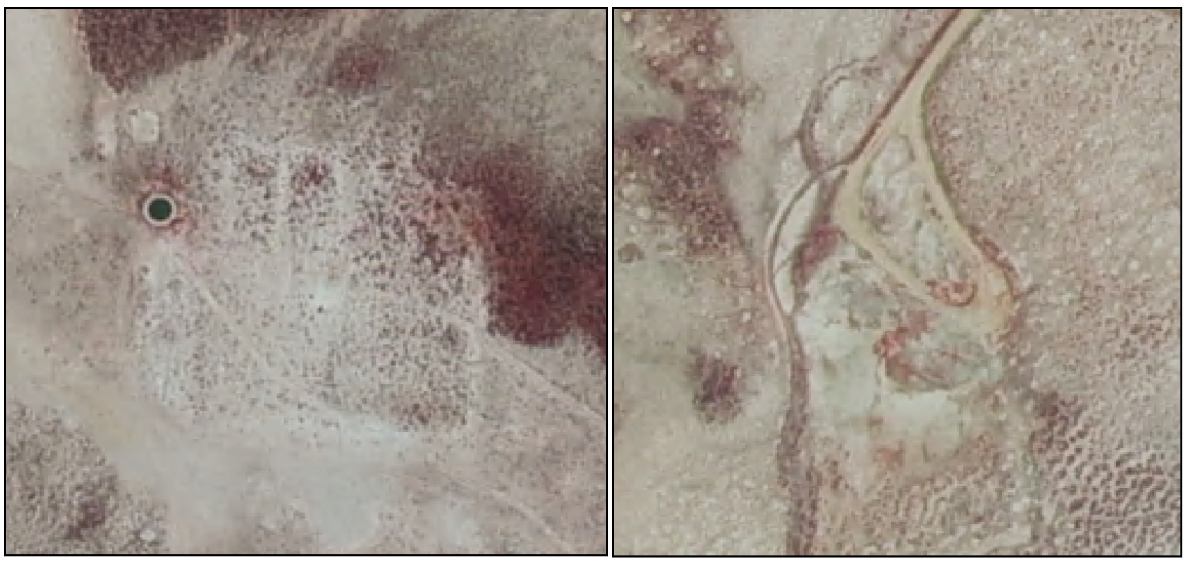


Figure 3.3-16 Example analysis of abandoned oil/gas well site. The site on the left displays vegetation cover equivalent with its surroundings, while the site on the right displays little, if any, vegetation establishment.

Using these visual classifications, each of the abandoned well sites was evaluated. As of March, 2012, of a total of 741 sites, 304 appeared to have obtained a reasonably successful level of vegetation cover; 280 showed a partial level of success and 98 appeared to be devoid of vegetation and/or exhibiting visual erosional features. The remaining 59 could not be verified or located. The 98 classified as “No Vegetation” represent the sites that the conservation districts could flag for potential site visits to confirm site-specific conditions. Figure 3.3-17 presents the results of this analysis graphically.

Note: The project GIS contains attributed spatial data which includes the results of this analysis.

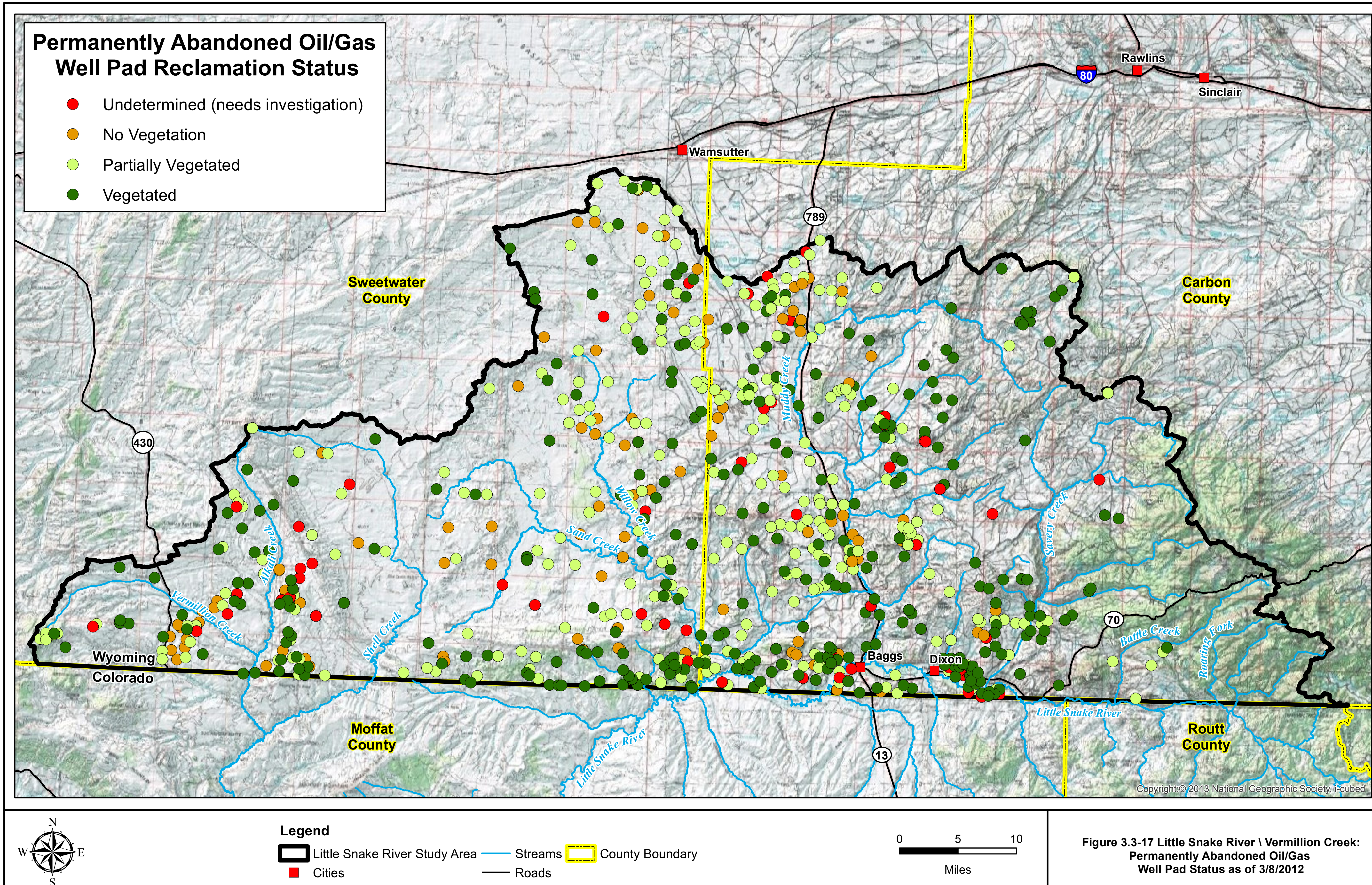


Figure 3.3-17 Little Snake River \ Vermillion Creek: Permanently Abandoned Oil/Gas Well Pad Status as of 3/8/2012

3.3.6 Mining and Mineral Resources

At the time of this reporting, there were twenty two active mine permits on record with the WDEQ within the study area (Table 3.3-3). The majority of these permits were associated with sand and gravel operations (18 permits). Two scoria mines are currently active as are two hardrock mines (one gold and one copper). Figure 3.3-18 displays the locations of these mines.

In addition to active mines, there are numerous abandoned mine features within the study area; also indicated in Figure 3.3-18. These features are related to the area's historic mining legacy when reclamation standards were either less stringent than today's regulatory environment or non-existent.

Table 3.3-3 Tabulation of Existing Mine Permits (WDEQ, 2012).

Permit Number	Company	Name	Commodity	Permit Acres
PT0255	HANKINS, TERRY	Hankins, Terry Mine	Copper	53.6
PT0600	ELECTRO-WIN CORP	Electro-win Corp Mine	Gold	1.7
ET0923	HIGH COUNTRY CONST INC	High Country Const Inc Mine	Sand & Gravel	9.9
ET0938	PANNELL LIVING TRUST	Pannell Living Trust Mine	Sand & Gravel	79.8
ET0937	VERMILLION RANCH LTD	Vermillion Ranch Ltd Mine	Sand & Gravel	40.0
PT0444	CARBON COUNTY ROAD & BRIDGE, DEPT	Carbon County Road & Bridge, Dept Mine	Sand & Gravel	39.8
ET0812	SIMS CORP	Sims Corp Mine	Sand & Gravel	39.9
ET0271	C & B SAND & GRAVEL INC	C & B Sand & Gravel Inc Mine	Sand & Gravel	40.3
PT0636	C & B SAND & GRAVEL INC	C & B Sand & Gravel Inc Mine	Sand & Gravel	80.8
ET0349	B J WATER CO	B J Water Co Mine	Sand & Gravel	39.4
ET0859	SIMON, JAMES E CO	Simon, James E Co Mine	Sand & Gravel	40.3
ET0595	DEVON SFS OPERATING INC	Devon Sfs Operating Inc Mine	Sand & Gravel	40.0
ET0595	DEVON SFS OPERATING INC	Devon Sfs Operating Inc Mine	Sand & Gravel	5.0
ET0862	MUDDY CREEK GRAVEL	Muddy Creek Gravel Mine	Sand & Gravel	39.3
ET1131	STRATTON SHEEP CO	Stratton Sheep Co Mine	Sand & Gravel	39.9
ET1070	AMOCO PRODUCTION CO	Amoco Production Co Mine	Sand & Gravel	30.0
ET0958	MORGAN, SAM D	Morgan, Sam D Mine	Sand & Gravel	40.3
ET0041	MILLER, LOREN K	Miller, Loren K Mine	Sand & Gravel	39.4
ET1136	EOG RESOURCES INC	Eog Resources Inc Mine	Sand & Gravel	80.9
ET0945	SNYDER OIL CORP	Snyder Oil Corp Mine	Sand & Gravel	49.8
ET0557	CONLON CONST INC	Conlon Const Inc Mine	Scoria	19.7
ET0979	BARTLETT INC	Bartlett Inc Mine	Scoria	39.4

The Wyoming Department of Environmental Quality, Abandoned Mine Lands Division (AML) mission is to mitigate safety hazards and repair environmental damage from past mining activities, and to assist communities impacted by mining. Many of the sites within the study area are eligible for mitigation through the AML program.

Most of the abandoned mine sites in the study area are associated with hardrock mining activities. These features include a variety of mining-related hazards including shafts and adits, spoil piles, etc. In addition, environmental impacts associated with the historic mines may still exist. For example, the Ferris Haggarty Mine, located in the Haggarty Creek watershed, is an on-going source of copper and silver in Haggarty Creek (WDEQ, 2011). Figure 3.3-19 displays copper rich drainage from the Oceola Tunnel at the Ferris Haggarty mine site.

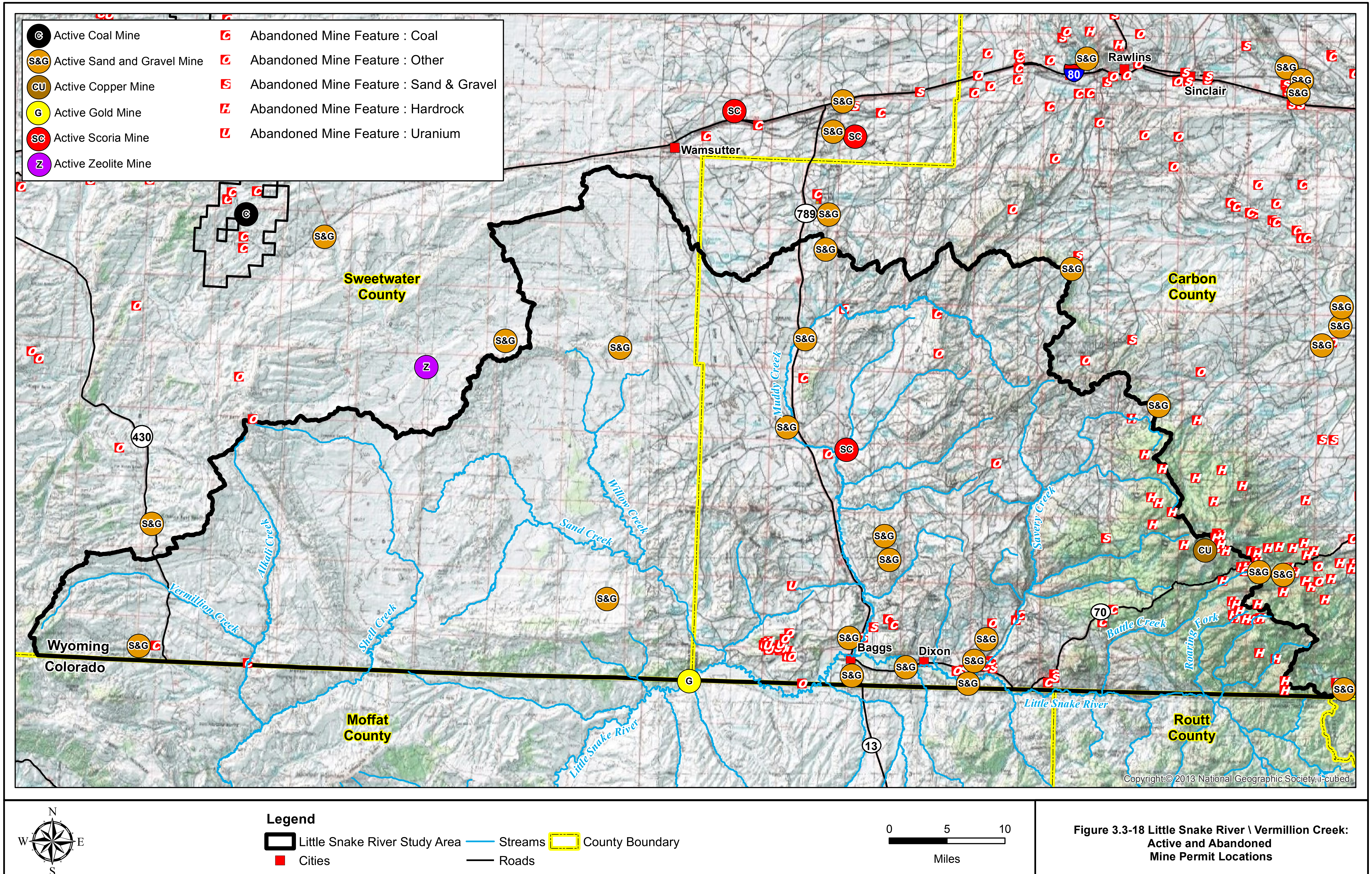


Figure 3.3-18 Little Snake River \ Vermillion Creek: Active and Abandoned Mine Permit Locations

Figure 3.3-19 Copper Laden Effluent from the Oceola Tunnel at the Farris Haggarty Mine Site.

3.3.7 Wildlife

3.3.7.1 General

The Wyoming Game and Fish Department (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. Approximately 562,830 acres (30 percent of the study area) have been determined to be crucial habitat for one or more of elk, antelope, or mule deer. Most of this crucial range is concentrated in two main corridors in the watershed. One corridor runs along the southern edge of the watershed extending from where the Little Snake River enters the watershed from Colorado westward to Vermillion Creek. The second corridor runs in a north and south direction following Muddy Creek.

According to the Wyoming Game and Fish Commission's Mitigation Policy (WGF 2008), parturition areas are defined as "high value habitats" that sustain a wildlife community, population or subpopulation. There are approximately 65,300 acres of Elk parturition areas located primarily in the national forest along the eastern border of the watershed.

Figures 3.3-20 through 3.3-23 display the seasonal range, crucial range, parturition areas, migration corridors and migration barriers for antelope, elk, moose, and mule deer within the study area. Examination of these figures shows that while the majority of the watershed is classified as seasonal range for the big game species, the crucial habitat for these species is limited to the two previously mentioned corridors along Muddy Creek and the southern edge of the watershed.

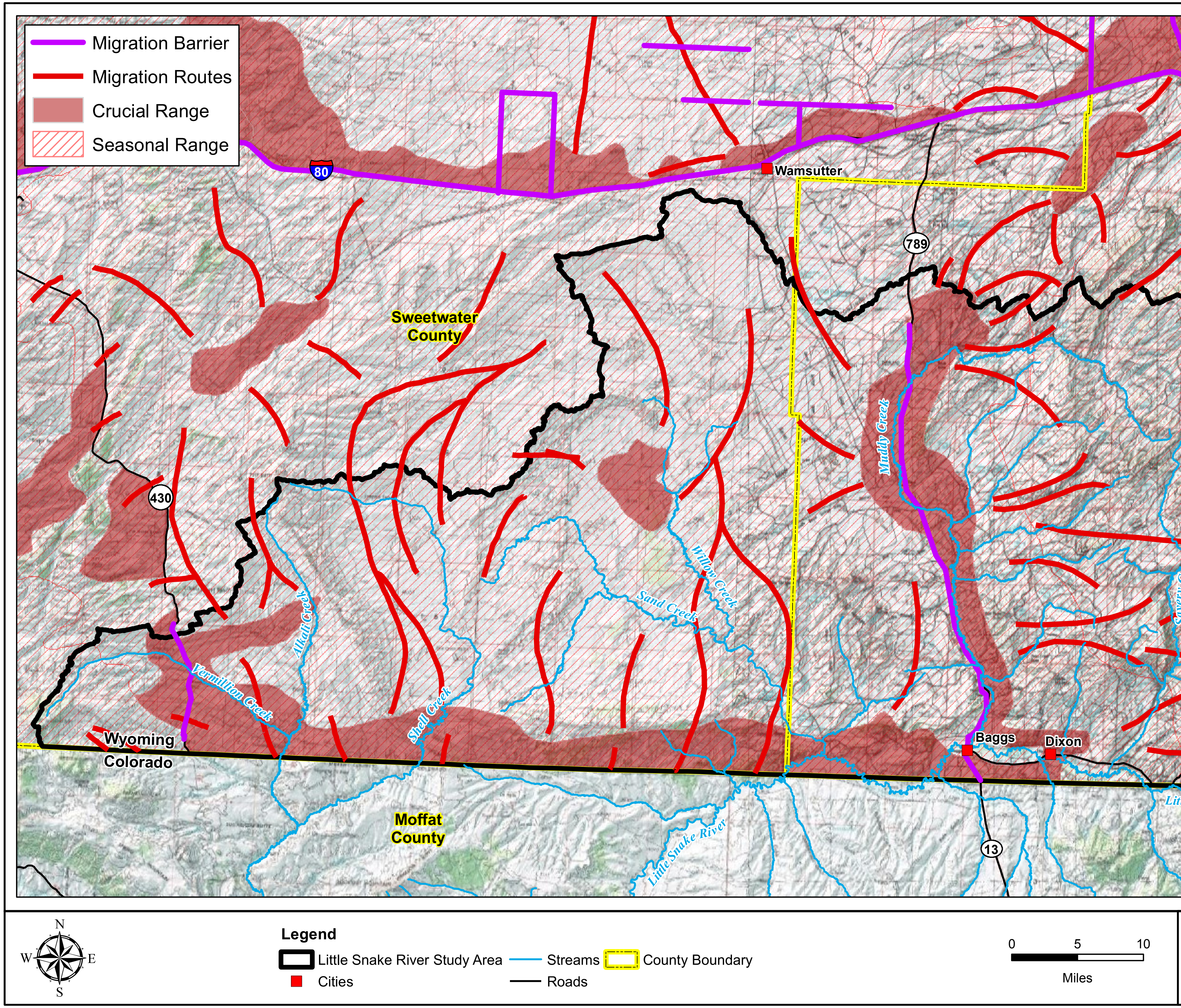


Figure 3.3-20 Little Snake River \ Vermillion Creek: Antelope Habitat

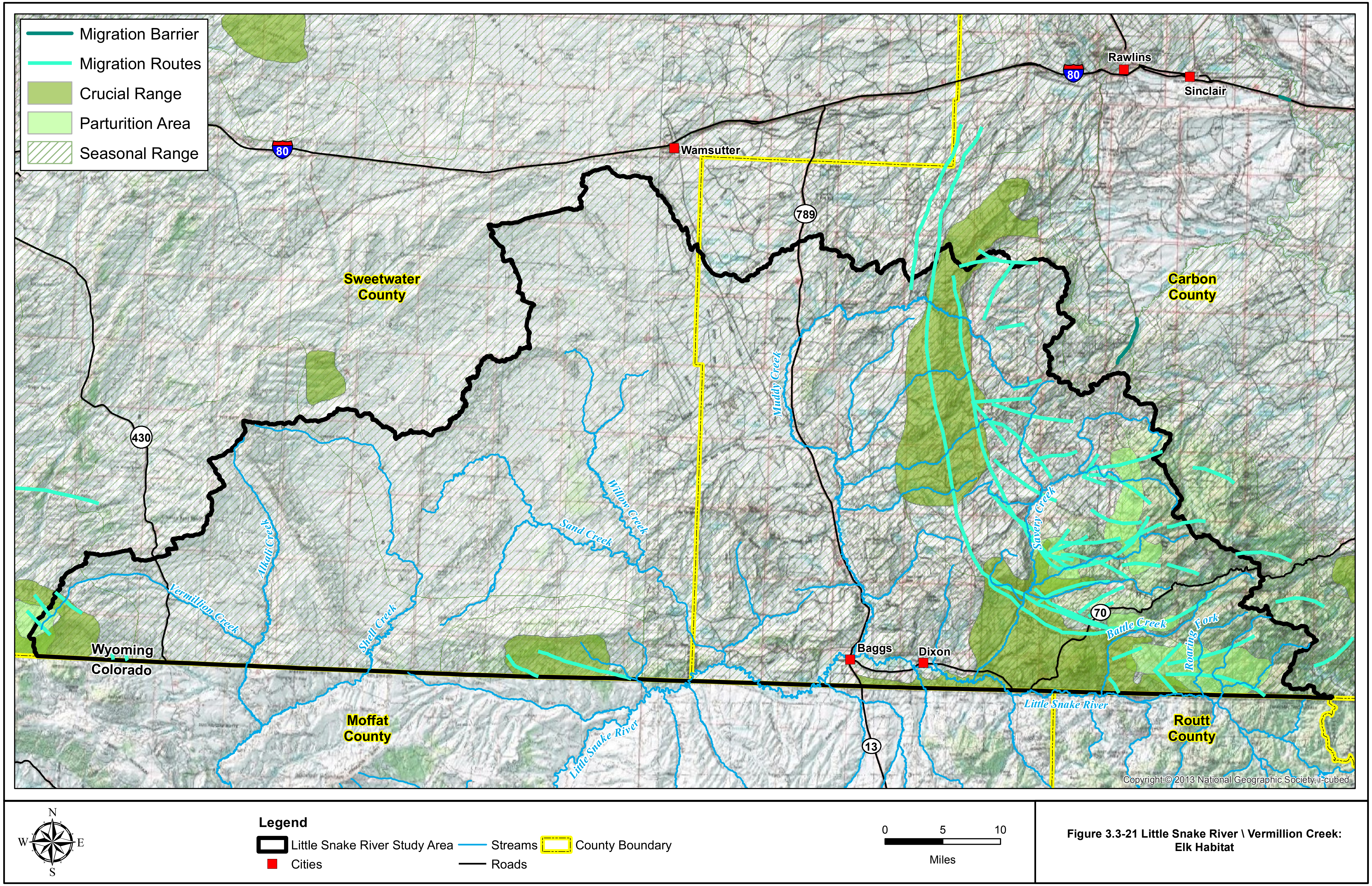


Figure 3.3-21 Little Snake River \ Vermillion Creek: Elk Habitat

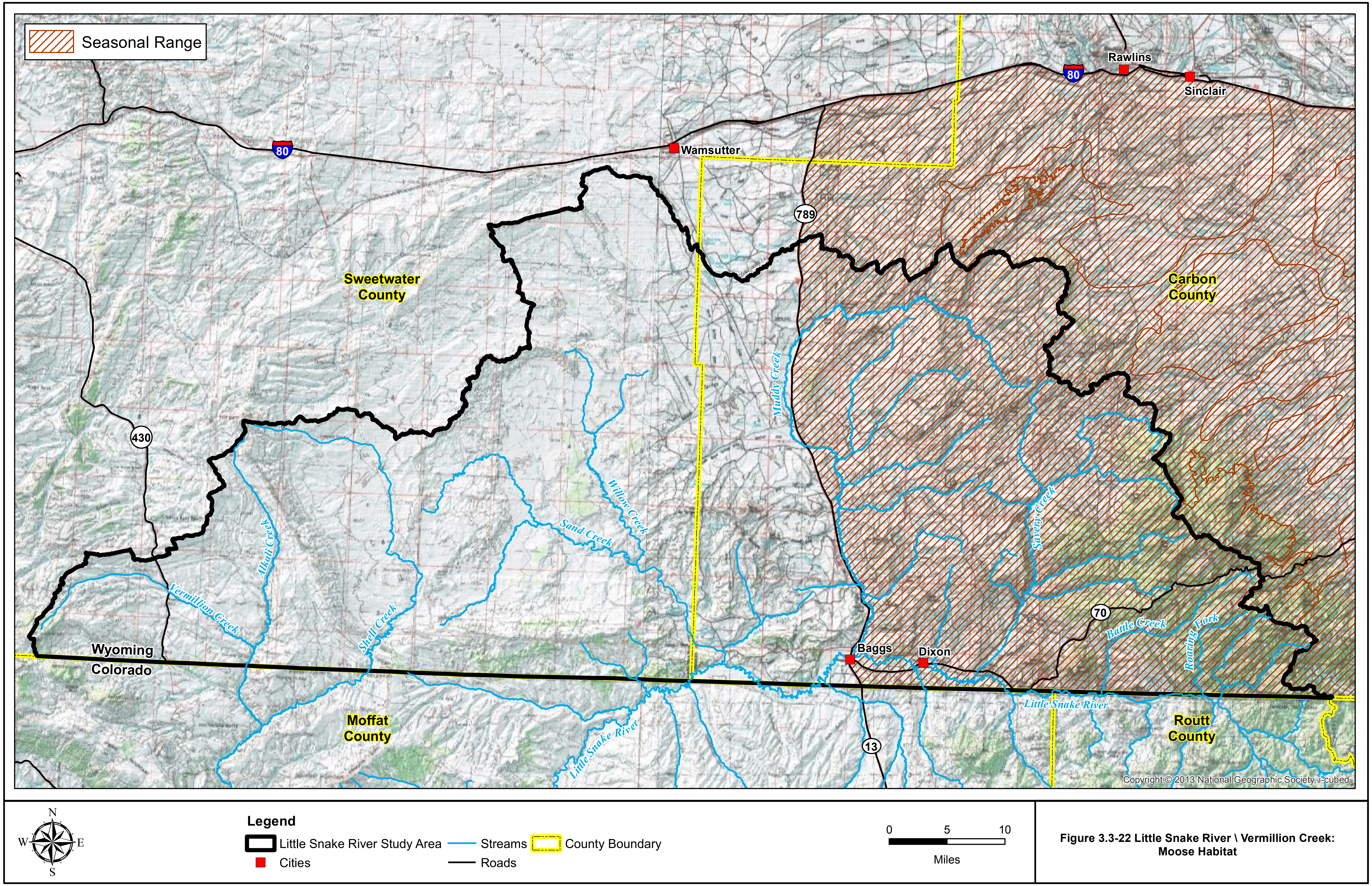
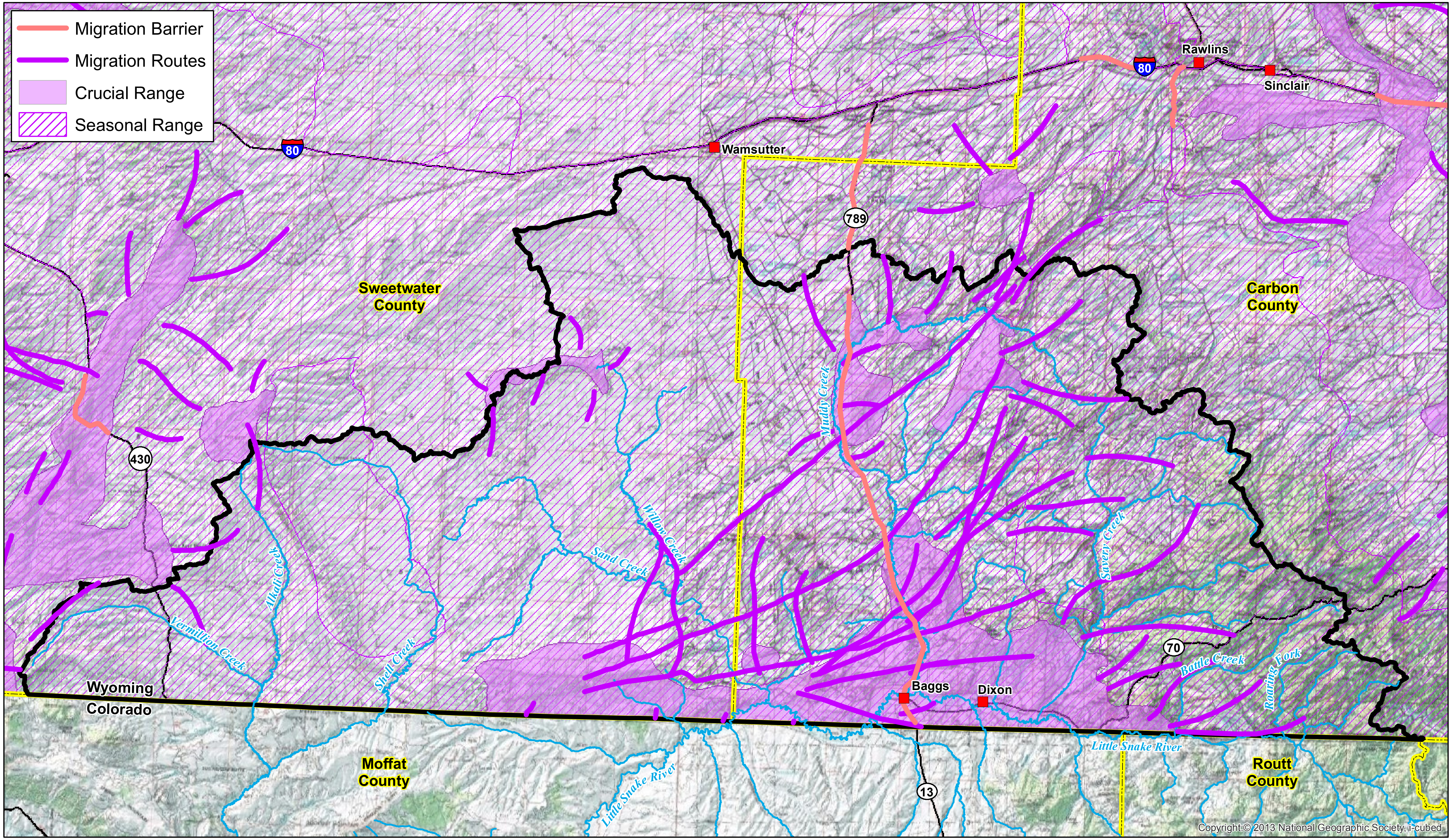


Figure 3.3-22 Little Snake River \ Vermillion Creek: Moose Habitat



N
W E
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Legend

Little Snake River Study Area
Streams
County Boundary
Cities
Roads

0 5 10
Miles

Figure 3.3-23 Little Snake River \ Vermillion Creek: Mule Deer Habitat

The Wyoming Natural Diversity Database (WYNDD) lists numerous non-game species of concern within the watershed, including amphibians, birds, fish, mammals, mollusks, and reptiles. Table 3.3-4 presents the results of a database query conducted by the WYNDD for the watershed broken down by subregion. Included in this list are all species of concern or species of potential concern which have been documented in the study area. Review of the list shows that there are two endangered species known to have been observed within the study area; the black-footed ferret (*Mustela nigripes*) and the Colorado River squawfish (*Ptychocheilus lucius*). There has also been two threatened species observed within the study area; the grey wolf (*Canis lupus*) and the Canada lynx (*Lynx Canadensis*).

3.3.7.2 Sage Grouse

Areas of known greater sage grouse (*Centrocercus urophasianus*) leks are displayed in Figure 3.3-24. 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 within the study area are delineated in Figure 3.3-23. As is evident in this figure, the Sage Grouse Core areas affect primarily the land located in the Savery Creek drainage and upper reaches of the Muddy Creek drainage on the east side of the study area. Sage Grouse Core areas are also located in the upper reaches of Vermillion and Shell Creeks on the west side of the study area.

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.

Research currently being completed by the Colorado Parks & Wildlife Division (CPW) and extending across the state line into the study area is focusing on generation of high-resolution maps of important sage-grouse wintering and breeding habitats within the proposed Hiawatha gas field. According to the principal investigators, this mapping is currently not available to the public, however, the LSRCD and the SWCCD can access the information through the CPW (Walker, Brett, pers. comm. 2013).

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.*

Table 3.3-4 Wyoming Natural Diversity Database: Wildlife Species in the Little Snake River / Vermillion Creek Watershed.

Scientific Name	Common Name	Listing Status	Tracked/Watched	Little Snake River	Muddy Creek	Vermillion / Shell Creek	Sand/Willow Creek	Savery/Battle Creek
		Amphibian						
Ambystoma mavortium	Tiger Salamander		Watched	X	X		X	X
Anaxyrus boreas boreas pop. 1	Boreal Toad (Southern Rocky Mountain Population)	Petitioned	Tracked		X			X
Lithobates pipiens	Northern Leopard Frog	Listing Denied	Tracked	X	X	X		X
Spea intermontana	Great Basin Spadefoot		Tracked			X	X	
		Bird						
Accipiter gentilis	Northern Goshawk	Listing Denied	Tracked	X	X	X	X	X
Ammodramus savannarum	Grasshopper Sparrow		Watched		X			X
Amphispiza belli	Sage Sparrow		Tracked	X	X	X	X	X
Aphelocoma californica	Western Scrub-Jay		Tracked	X			X	
Aquila chrysaetos	Golden Eagle		Watched	X	X	X	X	X
Asio flammeus	Short-eared Owl		Tracked		X	X	X	X
Athene cunicularia	Burrowing Owl		Tracked	X	X	X	X	
Aythya collaris	Ring-necked Duck		Watched	X	X	X		
Baeolophus ridgwayi	Juniper Titmouse		Tracked	X			X	
Botaurus lentiginosus	American Bittern		Tracked					X
Bucephala albeola	Bufflehead		Watched		X			
Bucephala clangula	Common Goldeneye		Watched	X				
Buteo regalis	Ferruginous Hawk		Tracked	X	X	X	X	X
Calcarius ornatus	Chestnut-collared Longspur		Tracked	X	X		X	
Catherpes mexicanus	Canyon Wren		Watched	X			X	
Centrocercus urophasianus	Greater Sage Grouse	Candidate (C)	Tracked	X	X	X	X	X
Charadrius alexandrinus	Snowy Plover		Tracked		X			
Charadrius montanus	Mountain Plover	Listing Denied	Tracked		X	X	X	
Chlidonias niger	Black Tern (Breeding Colonies)		Tracked		X	X	X	
Cinclus mexicanus	American Dipper		Watched					X
Cygnus buccinator	Trumpeter Swan	Listing Denied	Tracked		X			
Dendroica nigrescens	Black-throated Gray Warbler		Tracked	X			X	X
Dendroica townsendi	Townsend's Warbler		Watched		X			
Dolichonyx oryzivorus	Bobolink		Tracked	X	X			
Egretta thula	Snowy Egret		Watched		X			
Empidonax hammondii	Hammond's Flycatcher		Watched	X				X
Falco columbarius	Merlin		Watched		X			X
Falco peregrinus anatum	American Peregrine Falcon	Delisted (DM)	Tracked	X	X	X		X
Gavia immer	Common Loon		Tracked	X				
Grus canadensis	Sandhill Crane		Watched	X	X	X	X	X
Haliaeetus leucocephalus	Bald Eagle	Delisted (DM)	Tracked	X	X	X	X	X
Himantopus mexicanus	Black-necked Stilt		Watched		X			
Icterus parisorum	Scott's Oriole		Tracked	X			X	
Lanius ludovicianus	Loggerhead Shrike		Tracked	X	X	X	X	
Larus californicus	California Gull (Breeding Colonies)		Watched			X		
Larus delawarensis	Ring-billed Gull (Breeding Colonies)		Watched			X		
Loxia leucoptera	White-winged Crossbill		Watched					X
Megascops asio	Eastern Screech Owl		Watched					X
Melanerpes lewis	Lewis' Woodpecker		Tracked		X			X
Myiarchus cinerascens	Ash-throated Flycatcher		Watched	X			X	
Numenius americanus	Long-billed Curlew		Tracked		X	X		
Oreoscoptes montanus	Sage Thrasher		Watched	X	X	X	X	X
Otus flammeolus	Flammulated Owl		Watched					X
Pandion haliaetus	Osprey		Watched		X			X
Pelecanus erythrorhynchos	American White Pelican (Breeding Colonies)		Tracked	X	X			
Phalaropus lobatus	Red-necked Phalarope		Watched	X	X	X		
Pheucticus ludovicianus	Rose-breasted Grosbeak		Watched					X
Picoides dorsalis	American Three-toed Woodpecker		Tracked					X
Plegadis chihi	White-faced Ibis		Tracked	X	X	X	X	
Psaltriparus minimus	Bushtit		Tracked	X				
Recurvirostra americana	American Avocet		Watched	X	X	X	X	
Regulus satrapa	Golden-crowned Kinglet		Watched					X
Sitta pygmaea	Pygmy Nuthatch		Tracked					X
Sphyrapicus thyroideus	Williamson's Sapsucker		Tracked		X			X
Spizella breweri	Brewer's Sparrow		Watched	X	X	X	X	X
Spizella pallida	Clay-colored Sparrow		Watched		X		X	
Stellula calliope	Calliope Hummingbird		Tracked					X
Sterna forsteri	Forster's Tern		Tracked			X		
Strix nebulosa	Great Gray Owl		Tracked					X
Tympanuchus cupido	Greater Prairie Chicken		Watched		X		X	
Tympanuchus phasianellus columbianus	Columbian Sharp-tailed Grouse	Listing Denied	Tracked	X	X			X
Vermivora virginiae	Virginia's Warbler		Tracked					X
Vireo olivaceus	Red-eyed Vireo		Watched	X				
		Crustacean						
Branchinecta lateralis	Pocket Pouch Fairy Shrimp		Tracked	X	X		X	X
		Fish						
Catostomus discobolus	Bluehead Sucker		Tracked	X	X			X
Catostomus latipinnis	Flannelmouth Sucker		Tracked	X	X			X
Gila robusta	Roundtail Chub [Bonytail]		Tracked	X	X			
Oncorhynchus clarkii pleuriticus	Colorado River Cutthroat Trout (Native Populations)	Listing Denied	Tracked				X	X
Ptychocheilus lucius	Colorado River Squawfish	Endangered (E)	Tracked	X	X		X	
		Mammal						
Antrozous pallidus	Pallid Bat		Tracked		X			
Bos bison	American Bison (Free-ranging Herds)	Listing Denied	Tracked		X			
Brachylagus idahoensis	Pygmy Rabbit	Listing Denied	Tracked	X	X	X	X	X
Canis lupus	Gray Wolf	Threatened (T, EXPN)	Tracked	X	X			
Cynomys leucurus	White-tailed Prairie Dog	Listing Denied	Tracked	X	X	X	X	X
Lasionycteris noctivagans	Silver-haired Bat		Watched		X			X
Lasiurus cinereus	Hoary Bat		Watched		X	X		
Lynx canadensis	Canada Lynx	Threatened (T)	Tracked					X
Martes pennanti	Fisher	Listing Denied	Tracked					X
Mustela nigripes	Black-footed Ferret	Endangered (E, EXPN)	Tracked		X	X	X	
Myotis ciliolabrum	Western Small-footed Myotis		Watched		X		X	
Myotis evotis	Long-eared Myotis		Watched		X	X	X	X
Myotis volans	Long-legged Myotis		Watched		X			
Ovis canadensis	Bighorn Sheep		Watched	X		X		X
Perognathus fasciatus	Olive-backed Pocket Mouse		Watched	X			X	X
Peromyscus leucopus	White-footed Mouse		Watched		X			
Peromyscus truei	Pinon Mouse		Tracked	X				
Sciurus aberti	Abert's Squirrel		Watched					X
Sorex nanus	Dwarf Shrew		Watched		X		X	
Spermophilus armatus	Uinta Ground 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	X	X
Vulpes velox	Swift Fox	Listing Denied	Tracked		X			
		Mollusc						
Ferrissia rivularis	Creeping Ancylid		Tracked	X	X			X
		Reptile						
Eumeces multivirgatus multivirgatus	Northern Many-lined Skink		Tracked		X			
Opheodrys vernalis	Smooth Greensnake		Tracked					X
Pituophis catenifer deserticola	Great Basin Gophersnake		Watched	X		X		
Sceloporus tristichus	Plateau Fence Lizard		Tracked	X	X	X	X	
Thamnophis radix haydenii	Plains Gartersnake		Watched		X			

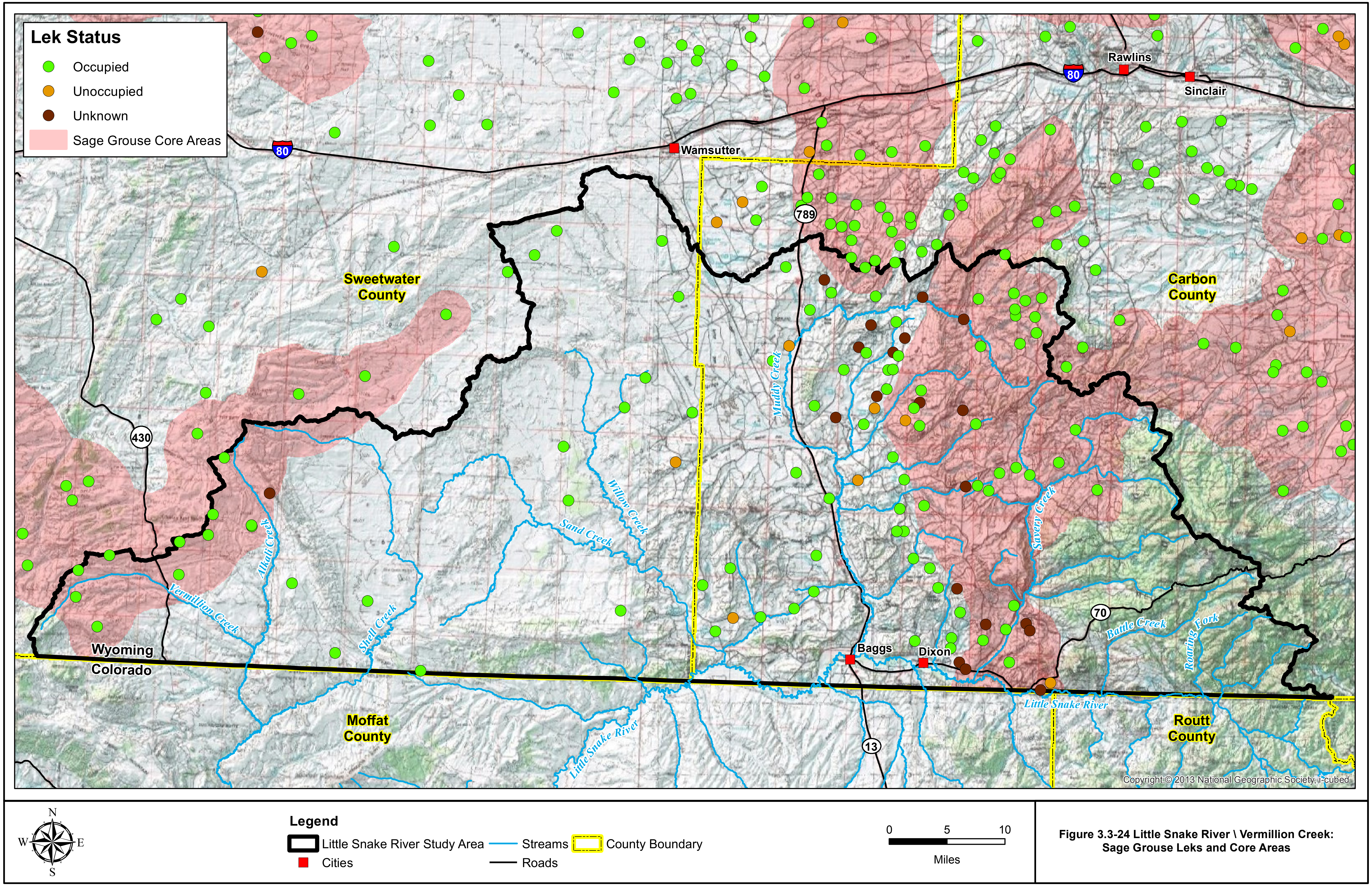


Figure 3.3-24 Little Snake River \ Vermillion Creek: Sage Grouse Leks and Core Areas

3.3.7.3 Wild Horses

Following passage of the Wild, Free-Roaming Horse and Burro Act in 1971, BLM maintains and manages wild horses or burros in "herd management areas" (HMAs). The BLM establishes an "appropriate management level" (AML) for each HMA. The AML is the population objective for the HMA that will ensure a “thriving ecological balance among all the users and resources of the HMA”. For example, wildlife, livestock, wild horses, vegetation, water, and soil. Wyoming has no wild burros (BLM, 2012). Within the project study area, there are two HMAs as indicated in Figure 3.3-25:

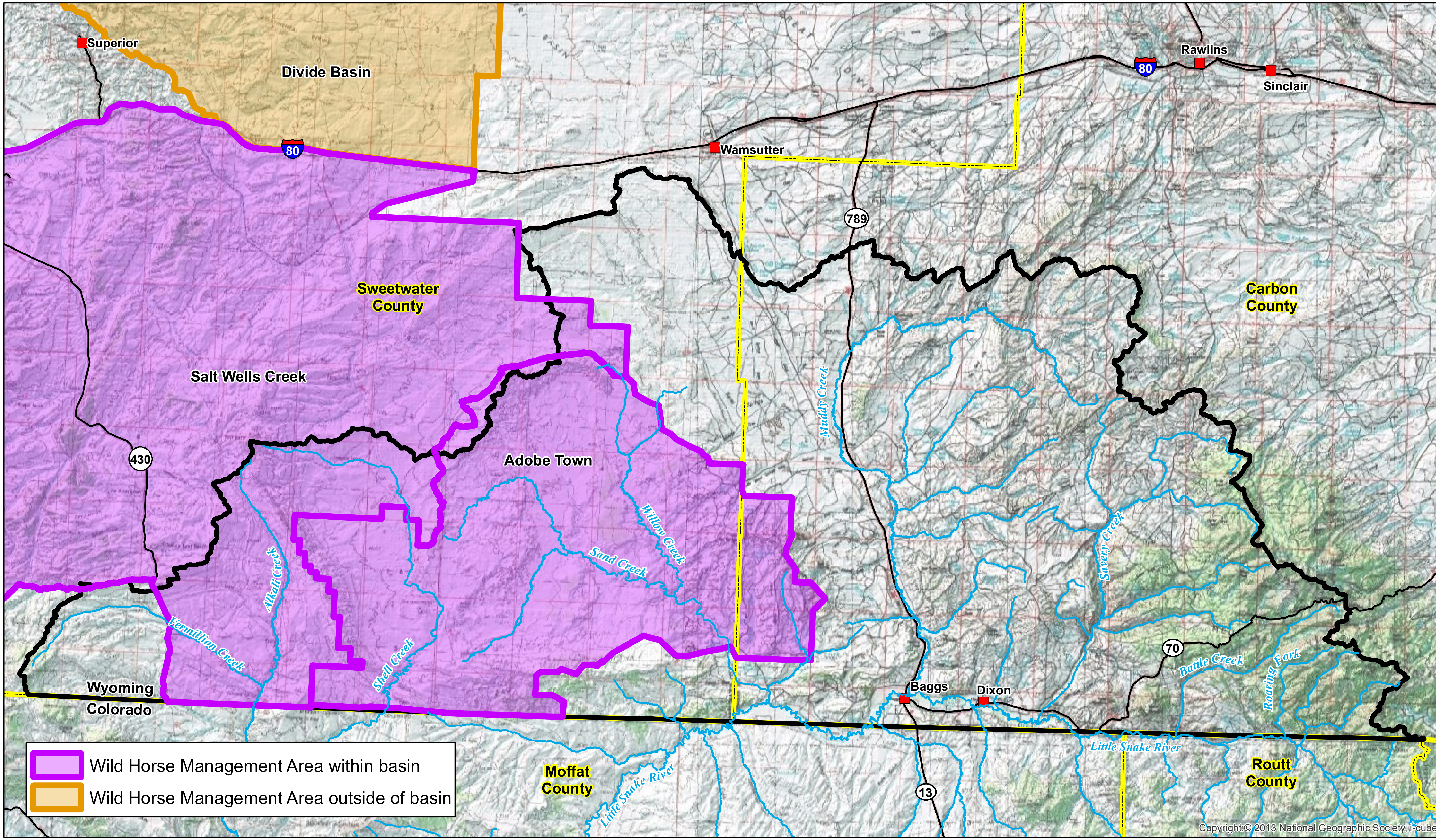
- Adobe Town HMA falls primarily within the boundaries of the Rawlins District and
- Salt Wells HMA falls primarily within the boundaries of the Rock Springs District.

The following text describing the Adobe Town HMA was extracted from the Rawlins BLM Resource Management Plan (RMP:

> *“The Adobe Town HMA is located in south-central Wyoming between I-80 and the Colorado-Wyoming border. Topography in the area is varied, with everything from colorful eroded desert badlands to wooded buttes and escarpments. In between these two extremes are extensive rolling-to-rough uplands interspersed with some desert playa and vegetated dune areas. The Adobe Town WSA is contained entirely within the Adobe Town HMA. Off-road restrictions and difficult terrain within the WSA provide a relatively undisturbed location for wild horses.*
>
> *It should be noted that 6.1 percent of the HMA is deeded or Wyoming state lands. These privately controlled lands are generally unfenced and freely available to the horses. A disproportionate share of the dependable water sources occurs on these lands. Typically, these lands are controlled by the grazing permittee(s) in the area and used in conjunction with their public grazing operations*
>
> *Management of wild horses in the RMPPA is guided by the RFO Wild Horse Management Handbook. The handbook contains policy, practices, procedures, and technical support documentation that affect wild horse management. Specifically, the handbook contains guidelines for wild horse management, such as how AMLs are monitored and adjusted, in addition to other wild horse management practices”*

The following description of the Salt Wells HMA was extracted from the Rock Springs Field Office website:

> *“The Salt Wells HMA encompasses 1,193,283 acres, of which 724,704 acres are BLM-administered public lands. The majority of the herd management area consists primarily of checkerboard land ownership area created by the Union Pacific Railroad grant in the Northern portion. Consolidated public lands with state school sections and small parcels of private land making up the majority of lands in the southern section of the HMA.*



N
W E
S

Legend

Little Snake River Study Area
Cities
Streams
Roads
County Boundary

0 5 10
Miles

Figure 3.3-25 Little Snake River \ Vermillion Creek: Wild Horse Management Areas

Topography within the herd area is generally gently rolling hills. There are several small streams passing through the area, and some high ridges. Elevations range roughly from 6,300 to 7,900 feet. Precipitation ranges 7-10 inches in lower elevations and 15-17 inches at higher elevations, predominately in the form of snow. The area is unfenced other than portions of boundary fence and right-of-way boundaries along I-80.

The AML for this HMA is 365 horses. A full range of colors is present. This herd has a high number of palominos and sorrels with flaxen manes and tails. Other horse colors are bay, brown, black, paint, buckskin, or gray. The Wyoming horses have a diverse background of many domestic horse breeds. They 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 weigh between 750 and 1,100 pounds mature weight. The health of the horses is good, with no apparent problems.

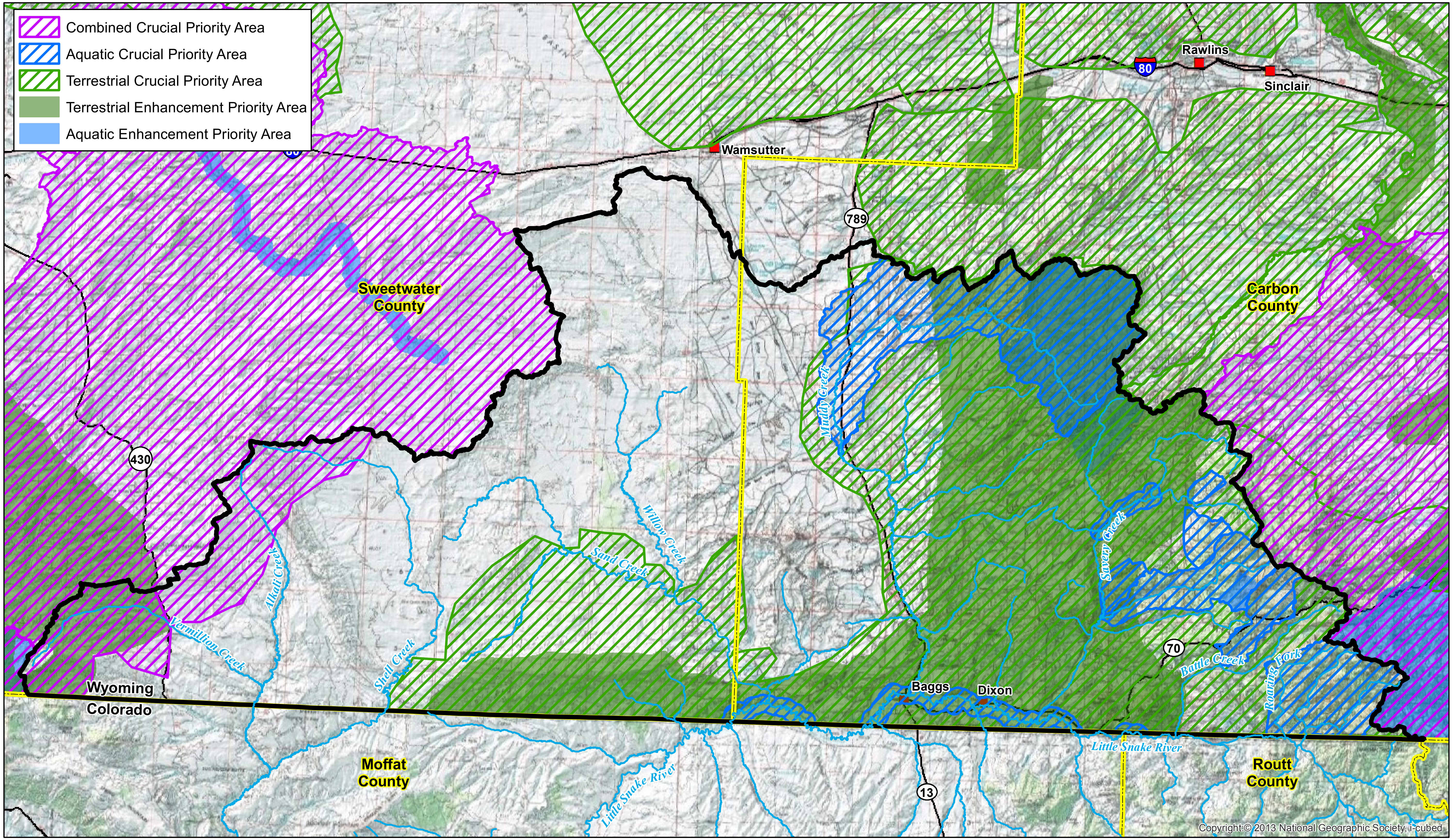
Domestic cattle and sheep utilize the area lightly in the summer and moderately in the winter, cattle use predominating. Vegetation in the HMA is dominated by sagebrush and grass, with juniper, aspen, and conifers interspersed. Horses typically use a high amount of grass species, the most favorable being needlegrass, Indian ricegrass, wheatgrass, and sedges. The area supports significant wildlife populations including elk, deer, and antelope."

3.3.7.4 WGF Crucial Habitat Areas

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 3.3-26), as defined by WGFD at: http://gf.state.wy.us/habitat/portal/index.asp.

*"**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).*



N
W E
S

Legend

Little Snake River Study Area
Cities
Streams
Roads
County Boundary

0 5 10
Miles

Figure 3.3-26 Little Snake River \ Vermillion Creek: Habitat Priority Areas

Finally, several streams within the study area host one or more threatened or endangered species of fish. According to the WYNDD, the following species of concern are encountered:

- Colorado RIver Cutthroat trout
- Bluehead Sucker
- Flannelmouth Sucker
- Roundtail Chubs
- Colorado River Squawfish

Review of the *WGF* Crucial Habitat Area Narratives (available at http://wgfd.wyo.gov) provides the following information regarding sensitive fisheries species within the study area. The paragraphs were extracted directly from the narratives for Crucial Habitat Areas found within the project study area:

Little Snake River Corridor:

- *The Little Snake River provides habitat for sensitive native warm water fish species.*
- *This reach of river may provide seasonal habitat for the Colorado River pikeminnow.*
- *The river corridor provides important cottonwood/willow riparian habitat diversity within the high sagebrush desert ecosystem that is used by several terrestrial and aquatic wildlife species.*
- *Cottonwoods, alders, willows and other riparian shrubs are common in the upper river corridor and provide habitat diversity. The vegetative community along the river riparian corridor gradually diminishes to scattered willow thickets and sagebrush/grasses along the downstream river section.*
- *The meandering nature of the channel has created many large, deep holes that provide fish cover. In some areas undercut banks associated with these deep holes provide additional cover. Some reaches of the river have been channelized and straightened in an effort to protect private lands.*
- *Some reaches of the river have been channelized and straightened in an effort to protect private lands.*
- *Irrigation of native hay crops, in many instances, depletes river flows during late summer, thus diminishing habitat function for fish.*
- *River channel dewatering severs connectivity with lateral side channel habitats.*
- *Irrigation diversion structures in the river may be barriers to fish passage and promotes habitat fragmentation.*
- *Agricultural water use has occurred extensively along the floodplain of the river throughout the drainage downstream of the forest boundary in suitable areas. Irrigation of native hay crops, in many instances, depletes river flows during late summer, thus diminishing habitat function for fish.*
- *Reason Selected:*
  The Little Snake River provides habitat for sensitive native fish species, and habitat protection is warranted. The river corridor provides important cottonwood/willow riparian habitat diversity used by several terrestrial and aquatic wildlife species.

Upper Little Snake River:

- *The North Fork, West Branch of the North Fork and upper Roaring Fork of the Little Snake River provide habitat for core populations of genetically pure Colorado River cutthroat trout.*
- *Crucial area provides habitat for sensitive native amphibian and reptile species.*
- *Stream water use, channel erosion, sediment yield associated with the Cheyenne Board of Public Utilities Stage II trans-basin water diversion remains the largest habitat issue in the headwaters area of the North Fork Little Snake River drainage.*
- *The loss of healthy aspen stands to conifer encroachment is slowly deteriorating potential for watershed productivity and function, and has significantly reduced available habitat for beaver in the West Branch downstream of Rabbit Creek.*
- *Pine Bark beetles are destroying coniferous forest throughout the Sierra Madre Range. A catastrophic wild fire could destroy the CRC populations in the headwaters by warming the water during the fire, introducing ash and silt (which will adversely affect spawning habitat and aquatic insect life) and eliminating stream shading. However, some post fire changes could be beneficial in some cases*
- *Reason Selected:*
  The crucial area contains the largest known, essentially pure population of Colorado River cutthroat trout remaining in its native range. Habitat maintenance and protection will be required to conserve these important CRC populations over time.

Upper Muddy Creek:

- *The upper Muddy Creek watershed provides habitat where the native fish assemblage of Colorado River cutthroat trout, mountain suckers, and speckled dace have been successfully restored to promote a meta population assemblage of cold water species.*
- *The warm water reach of Muddy Creek within this crucial habitat area supports the only viable assemblage of bluehead suckers, roundtail chubs, and flannelmouth suckers known to still exist in Wyoming.*
- *Existing land use practices continue to negatively impact watershed conditions in much of the upper Muddy Creek watershed including improper livestock grazing practices, agricultural use of tributary spring and stream water for stock pond development, coal-bed methane/natural gas exploration and extraction activities, and wind energy development.*
- *Genetically pure Colorado River cutthroat trout exist in the upper coldwater habitat reaches of West Muddy and Van Tassel creeks.*
- *The lower warm water reaches of Muddy Creek support habitat for flannelmouth suckers and roundtail chubsIrrigation of native hay crops, in many instances, depletes river flows during late summer, thus diminishing habitat function for fish. There is a trans basin water diversion from Van Tassel Creek to the Bear River drainage, and there may be others.*
- *Livestock grazing management could be improved to restore and enhance riparian habitat and watershed function.*

- *Reason Selected:*

  This crucial habitat area provides the best opportunity to restore the entire native cold and warm water fish species assemblage in southwest Wyoming, and the area is a high priority for aquatic habitat enhancement and protection. Opportunity to perform habitat enhancement work currently exists because of the Grizzly Wildlife Habitat Management Area, and the use of the WHMA as a grassbank forage reserve.

<u>Big Sandstone Area:</u>

- *Upper Deep and Mill creek provide habitat for a conservation population of Colorado River cutthroat trout.*
- *The crucial area provides habitat for smooth green snakes and boreal toads.*
- *Upper Mill and Deep creeks provide habitat for a conservation population of genetically pure Colorado River cutthroat trout. Habitat maintenance and protection will be required to conserve these CRC populations over time.*
- *Lower Big Sandstone and Deep creeks provide a popular recreational sport fishery and habitat for other native aquatic wildlife species.*

  The loss of healthy aspen stands to conifer encroachment has deteriorated overall watershed productivity and function.
- *Loss of aspen communities in or near riparian areas has deteriorated or eliminated suitable beaver habitat.*
- *Continuous conifer fuel accumulations prevent prescribed fire treatments to regenerate aspen because of the risk of an escaped wildfire.*
- *Fire suppression and a pine bark beetle epidemic increase the risk of catastrophic scale fires that threaten Colorado River cutthroat trout populations isolated in headwater streams.*
- *The loss of healthy aspen stands to conifer encroachment has deteriorated overall watershed productivity and function, and has significantly reduced available habitat for beaver in many tributaries within the watershed. As an example, successional conifer encroachment in the south Mill Creek drainage ceases water yield during the summer from several seeps and springs in the upper headwaters of the watershed, which reduces the base stream flow in south Mill Creek to residual pools through the late summer and winter period. The lack of aspen and flowing water has eliminated most of the suitable beaver habitat in south Mill Creek. Most of the Mill Creek drainage lays within a management area designation by the Forest Service, which prevents access for mechanical timber treatments to restore aspen. Moreover, continuous conifer fuel accumulations prevent prescribed fire treatments to regenerate aspen because of the risk of an escaped wildfire.*
- *Pine Bark beetles are destroying coniferous forest throughout the Sierra Madre Range. A catastrophic wild fire could destroy CRC populations in the headwaters by warming the water during the fire above lethal thresholds, and introduce ash and silt which will adversely affect spawning habitat and aquatic insect life and eliminate stream shading, which could be beneficial in some cases.*

- *Reason Selected:*
  The Big Sandstone area provides habitat for Colorado River cutthroat trout, mountain suckers, mountain whitefish, mottled sculpin, speckled dace, smooth green snakes, boreal toads, boreal chorus frogs, and northern leopard frogs. These species of greatest conservation need warrant protection because their populations are experiencing declines throughout their historic range as a result of hybridization and competition with non-native species, habitat degradation, and habitat loss.

Haggarty Creek:

- *A portion of Haggarty Creek and several small tributaries provide habitat for a remnant population of genetically pure Colorado River cutthroat trout.*
- *CRC are being reintroduced above the Ferris-Haggarty mine in Haggarty Creek and several tributaries downstream of the mine.*
- *Cover for trout consists of boulders and overhanging willows and alders, along with some woody debris.*
- *The stream flows through open meadows with scattered patches of conifers bordering the upper portion of the stream. Mature stands of conifers become dense in the lower portion, forming a canopy over the stream. Cover for trout consists of boulders and overhanging willows and alders, along with some woody debris.*
- *Although physical habitat conditions for trout are favorable, copper pollution from the Ferris-Haggarty Mine has decimated the trout population from the point of discharge, elevation 9,500 feet (R86W,T14N,S16 NW) downstream approximately 4 miles. Copper concentrations are extreme (3-5mg/l), producing a biologically sterile environment to within 1 mile of its confluence with Lost Creek. A fish barrier was incorporated into the Highway 70 (Battle Highway) crossing of Haggarty Creek to provide protection from non-native trout species in the lower portion of the Battle Creek drainage in the event the copper pollution problem is solved.*
- *Reason Selected:*
  A portion of Haggarty Creek and several small tributaries provide habitat for a remnant population of genetically pure Colorado River cutthroat trout. Potential exists to restore Colorado River cutthroat in the remaining portion of Haggarty Creek if the copper pollution problem is remedied.

Hatch Creek:

- *Upper Hatch Creek provides habitat for a remnant conservation population of Colorado River cutthroat trout.*
- *Healthy aspen stands and beaver are required to secure the long-term viability of this fragile CRC population, as flows in this small perennial stream are adversely affected by drought cycles.*
- *Upper Hatch Creek provides habitat for a remnant conservation population of Colorado River cutthroat trout. CRC in Hatch Creek were given a "B" purity rating (Oberholtzer 1990). Healthy aspen stands and beaver are required to secure the long-term viability of this fragile CRC population, as flows in this small perennial stream are adversely affected by drought cycles*

beginning in the late 1980's. Healthy riparian zones and active beaver ponds will be required to maintain, protect and conserve this CRC population over time.

- *Reason Selected:*
  Upper Hatch Creek provides habitat for a remnant conservation population of Colorado River cutthroat trout that warrants habitat protection.

Hell Canyon Creek:

- *Upper Hell Canyon Creek provides habitat for a conservation population of genetically pure Colorado River cutthroat trout.*
- *A 2000 wildfire fire burned 315 acres of conifers and mountain shrub habitat in the upper Hell Canyon Creek drainage on USFS lands in 2000. This fire is expected to regenerate aspen and mountain shrub stands to assist in improving watershed function and health.*
- *Reason Selected:*
  Upper Hell Canyon Creek provides habitat for a remnant conservation population of Colorado River cutthroat trout that warrants habitat protection.

High Savery Corridor:

- *High Savery Reservoir provides habitat for a brood source of Colorado River cutthroat trout to produce eggs for the fish culture system.*
- *High Savery Reservoir provides habitat to support a regionally important recreational sport fish water, and affords the angler an opportunity to catch tiger trout and kokanee.*
- *The Department and Water Development Commission are working together to promote suitable habitat conditions for a recreation sport fishery in tailwater of Savery Creek immediately downstream of the reservoir.*
- *Volume, timing, and temperatures of water released from the dam are the major habitat issues that will dictate the quality of trout habitat in the tailwater.*
- *Other important habitat issues include the effects of water releases from the dam on downstream stream channel geomorphology, and the effects of livestock grazing management of the tailwater riparian zones.*
- *Reason Selected:*
  High Savery Reservoir supports the brood source for Colorado River cutthroat trout eggs that are used for stocking of all cutthroat restoration waters in the Little Snake River watershed.
  Habitat protection issues for the reservoir include water management, avoiding accelerated sediment loading and accelerated euthrophication.

Dirtyman Creek

- *Upper Dirtyman Creek provides habitat for a conservation population of genetically pure Colorado River cutthroat trout.*
- *Reason Selected:*
- *Upper Dirtyman Creek provides habitat for a remnant conservation population of Colorado River cutthroat trout that warrants habitat protection.*

- *The loss of healthy aspen stands to conifer encroachment has reduced overall watershed productivity and function.*
- *Healthy aspen stands and beaver are required to secure the long-term viability of this fragile CRC population, as flows in this small perennial stream are adversely affected by drought cycles that began in the late 1980's.*
- *Healthy riparian zones and active beaver ponds will be required to maintain, protect and conserve this CRC population over time.*
- *Pine Bark beetles are destroying coniferous forest throughout the Sierra Madre Range. A catastrophic wild fire could destroy CRC populations in the headwaters by warming the water during the fire above lethal thresholds, and introduce ash and silt which will adversely affect spawning habitat and aquatic insect life and eliminate stream shading.*

As is evident upon review of these descriptions of WGF Crucial Habitat Areas within the watershed, barriers to fish passage present both positive and negative impacts to the system's native and introduced fisheries. In 2009, Trout Unlimited (TU) conducted an inventory of barriers to fish migration and passage in order to provide resource managers with information necessary to improve habitat for native game and non-game species as well as to prevent invasion of non-native species (Gregory, 2009).

The TU report provides the following discussion of their barrier classification protocols:

> *"Obstructions were classified as complete barriers, seasonal barriers, partial barriers, or non-barriers. Complete barriers were defined as one that most or all fish could not pass upstream over at most or all flows. Seasonal barriers were defined as one that most or all fish could not pass during some time during the year. Partial barriers were those structures that some fish or some age classes of fish could not pass during some times of year, even if some fish probably could pass the obstruction during the entire year. Obstructions were considered to not be barriers if it appeared that all fish could pass them at all flows. These designations were primarily based on when and to what extent a vertical drop in water surface occurred at the obstruction. Since the native non-game fish are not known to jump vertically, any obstruction that caused water to fall vertically and aerate under the fall was considered to be a barrier to those fish. Velocity barriers were more difficult to assess and often fell into the category of Partial Barriers."* (Gregory, 2009)

Barriers were prioritized for removal according to the following guidelines:

- Very High Priority: Barriers that had the potential to trap fish into locations where they would ultimately die. These included barriers immediately upstream from portions of seasonally dry river and barriers that isolated fish into areas they would need to leave to avoid temperatures higher than they could tolerate. See Figure 3.3-27 for an example structure.
- High Priority barriers: These structures included those that blocked migrations of spawning fish during the spawning period. Therefore, barriers that occurred in areas where only trout were found, and were passable by spawning sized trout were not included in this category. See Figure 3.3-27 for an example structure.

- Medium Priority barriers: Any remaining barriers not already prioritized in higher priority classifications.
- Low Priority Barriers: Structures that may have received a higher classification based on the criteria above were designated as Low Priority if the stream upstream from the barrier was considered ephemeral of if there was minimal habitat upstream from the barrier.
- Necessary Barriers: Within the assessment area, several barriers exist that function to protect isolated native populations of fish from invasive competitors and therefore should remain in place; these were classified as Necessary Barriers.

Figure 3.3-27 Examples of inventoried barriers to fish passage. Left is First Mesa Ditch Diversion (Very High Priority). Right is George Dew Dike Gabion (High Priority).

Two hundred eleven dams, diversions, grade control structures, road crossings, and constructed fish barriers were identified. Seventy of these were determined to be some type of barrier to upstream migration of fish as indicated in Figure 3.3-28. Twenty two were determined to be Complete Barriers; nineteen were determined to be Partial Barriers; nineteen were determined to be Seasonal Barriers; and ten were barriers constructed to block migration of non-native fish. Barriers were prioritized for removal with three barriers being classified as Very High Priority, twenty two were classified as High Priority, twenty four were classified as Medium Priority, and eight were classified as Low Priority. Appendix 3C presents a tabulation of structures inventoried during the completion of the study.

Finally with respect to fisheries within the project study area, the *Management Plan for Endangered Fishes in the Yampa River Basin and Environmental Assessment* (USFWS, 2004) is referenced as a source of additional information.

3.3.8 Cultural Resources

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. SHPO makes available a

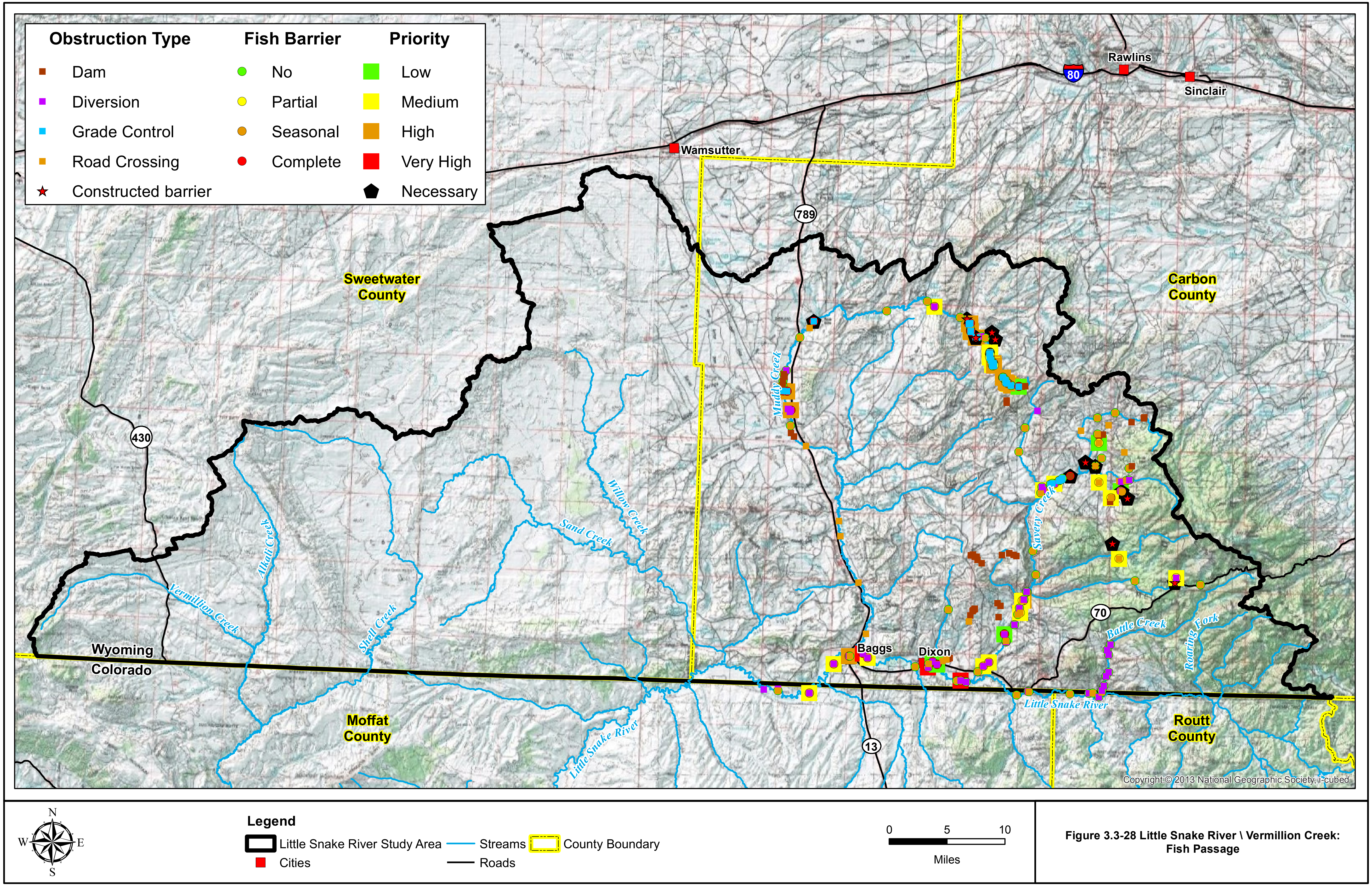


Figure 3.3-28 Little Snake River \ Vermillion Creek: Fish Passage

spatial data file which generalizes the 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 3.3-29 displays the results of the database retrieval in a graphical format. In addition, portions of the Overland Trail and Cherokee Trail traverse the study area. Figure 3.3-30 displays these routes, sites listed on the National Registry of Historic Places, and historic monuments and markers.

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.

3.4 Natural Environment

3.4.1 Climate

The Little Snake River / Vermillion Creek Study Area contains topography ranging in elevation from 6,000 msl feet at the Colorado/Wyoming state line to over 11,000 msl feet on Bridge Peak in the Sierra Madres, the highest point in the basin. Consequently, climate varies considerably. Generally, climatic conditions for the study area are classified as a semiarid mid-continental regime. The climate is typified by dry, windy conditions with limited precipitation and long cold winters.

Figure 3.4-1 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 7 inches at the lower elevations to over 50 inches at higher elevations

The recorded temperatures at both stations are typically cool, with average daily temperatures ranging between 5°F and 35°F in midwinter and 41°F to 83°F during midsummer. Extreme temperatures have ranged from a winter low of -55°F to over 100°F during summer months. The annual average total precipitation is 9.95 inches in Baggs and 12.1 in Dixon. Table 3.4-1 presents the average temperature range and average total precipitation while Figure 3.4-2 presents the average climatic conditions for the Baggs and Dixon sites graphically.

Table 3.4-1 Summary of Monthly Climatic Data: Baggs and Dixon, WY.

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Baggs 480484: 9/1/1979 to 9/30/2012													
Average Max. Temperature (F)	32.2	35.7	47.3	58.3	67.8	79	86.2	83.6	74	60.3	43.4	33.1	58.4
Average Min. Temperature (F)	5.3	9.1	20.8	28	34.8	41.8	48.5	46.7	38.2	28	17.1	7.4	27.1
Average Total Precipitation (in.)	0.42	0.41	0.5	0.81	1.35	0.86	1.07	0.88	1.16	1.29	0.62	0.57	9.95
Dixon 482610: 2/1/1922 to 9/30/2012													
Average Max. Temperature (F)	31.7	35.8	42.6	55.5	66.7	76	83.3	80.9	72.3	60.6	44.4	34.6	57
Average Min. Temperature (F)	2.8	7.6	16.5	26.9	34.1	40.6	47	45	36.2	26.7	16.2	6.3	25.5
Average Total Precipitation (in.)	0.89	0.72	0.96	1.14	1.18	0.94	1.07	1.12	1.04	1.23	0.8	1.02	12.09

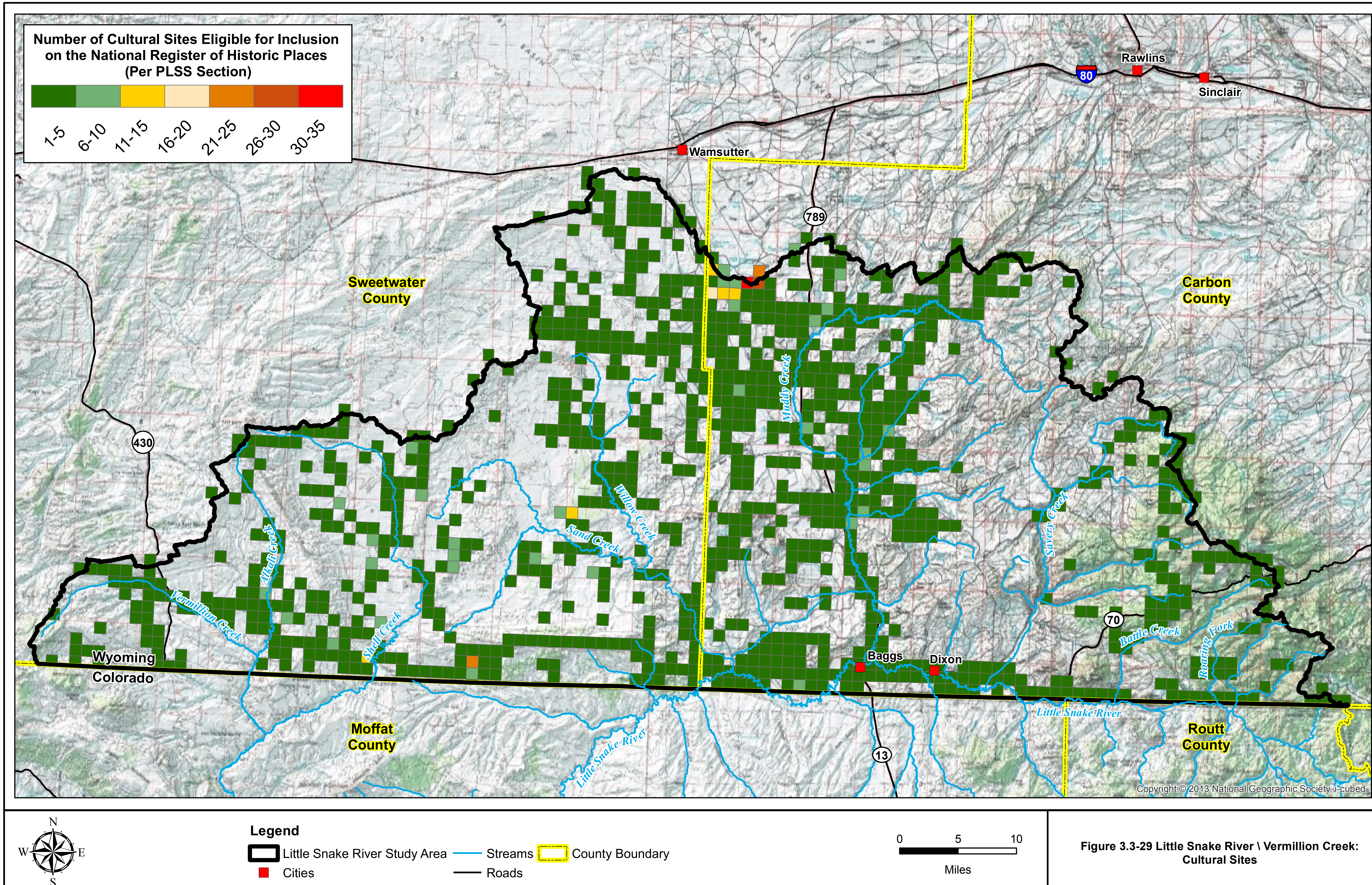


Figure 3.3-29 Little Snake River \ Vermillion Creek: Cultural Sites

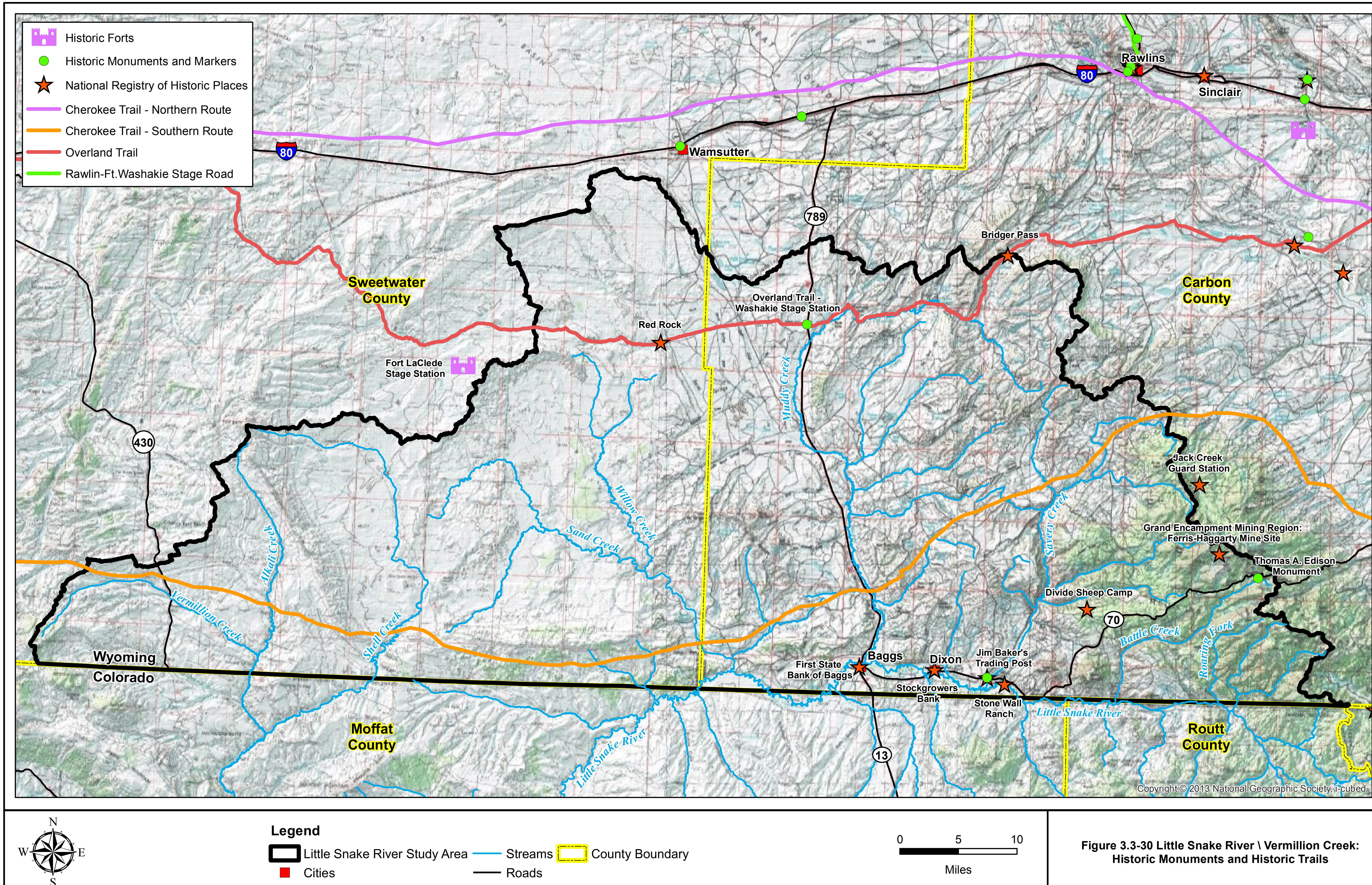


Figure 3.3-30 Little Snake River \ Vermillion Creek: Historic Monuments and Historic Trails

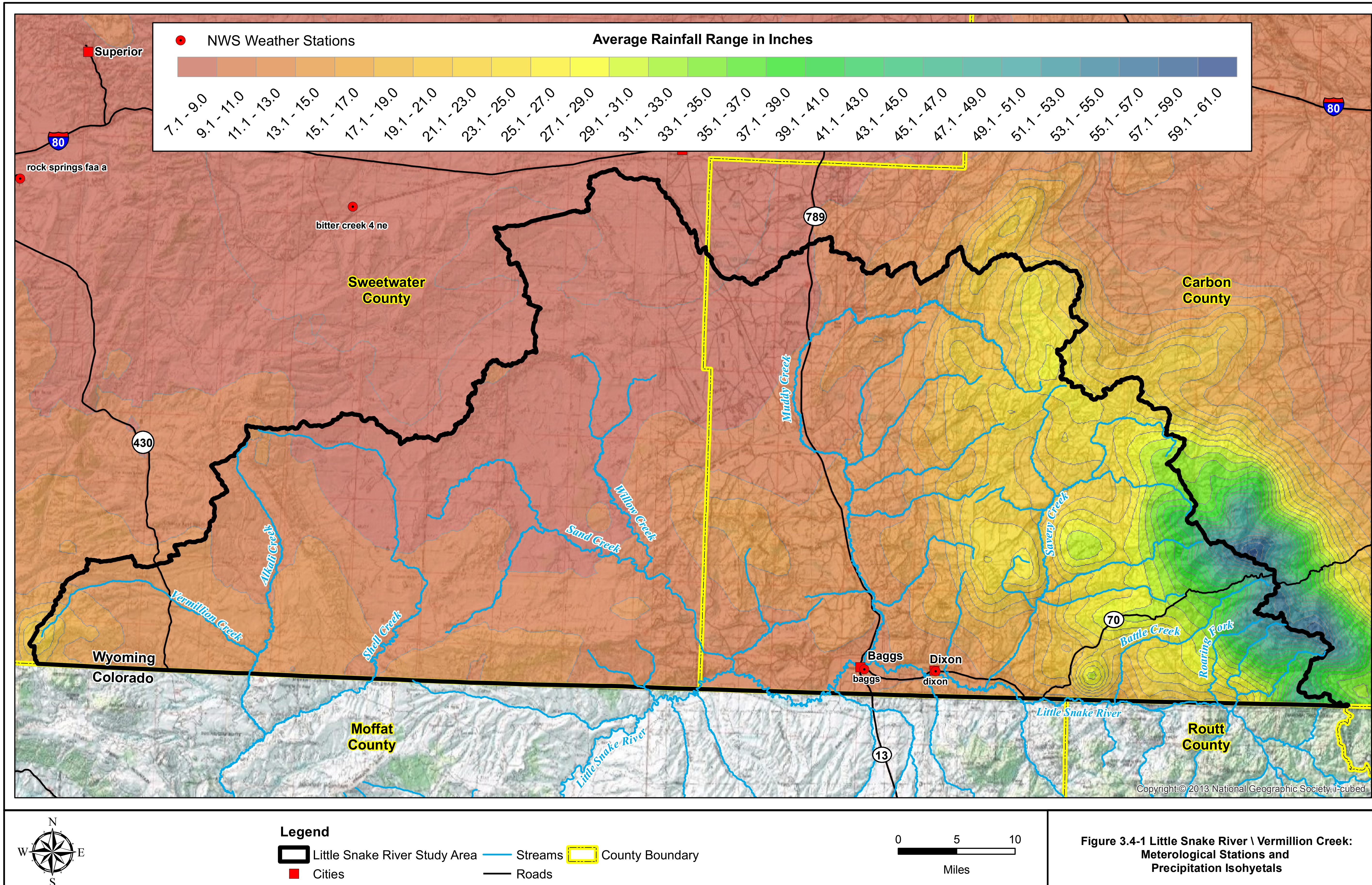
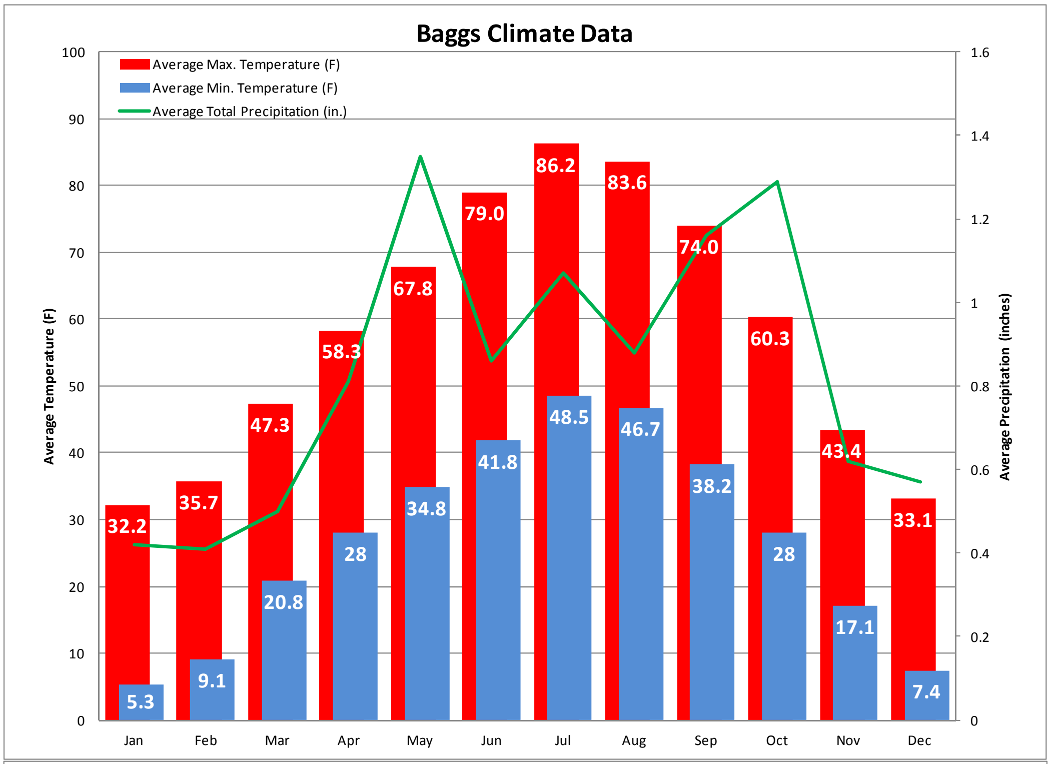


Figure 3.4-1 Little Snake River \ Vermillion Creek: Meterological Stations and Precipitation Isohyetals



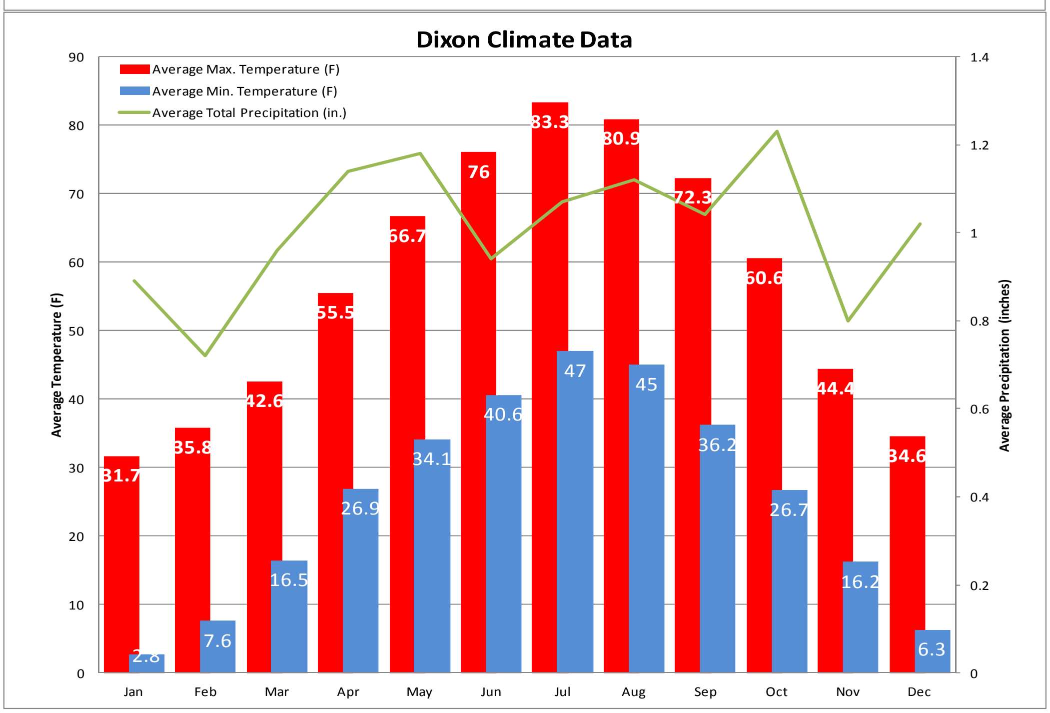


Figure 3.4-2 Mean Monthly Climatic Factors for Baggs and Dixon, Wyoming (1979 – 2011).

The project area is subject to strong gusty winds, often accompanied by snow during the winter months, producing blizzard conditions and drifting snow. Wind direction and speed data have not been routinely collected within the project study area; however, in conjunction with the Mount Zirkel Wilderness Area Visibility Study, data for the period December 1994 through November 1995 were collected near Baggs (Watson, et al, 1996). Figure 3.4-3 presents a wind rose generated from the Baggs data for the period December 1, 1994 through November 30, 1995. The wind rose depicts the relative directional frequency of the winds and the speed class. As indicated, the winds are predominately from the south to southwest approximately 37 percent of the time. The annual mean wind speed is 10.4 miles per hour (4.64 meters/second). Note that the meteorological data set used to generate the wind rose was processed with calm wind measurements set to a speed of one meter per hour. Therefore, the wind rose shows essentially no calms (BLM, 2004).

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 the distribution of vegetation classes is summarized in Appendix 3D. The LANDFIRE existing vegetation data indicate 58 different vegetation classes within the watershed.

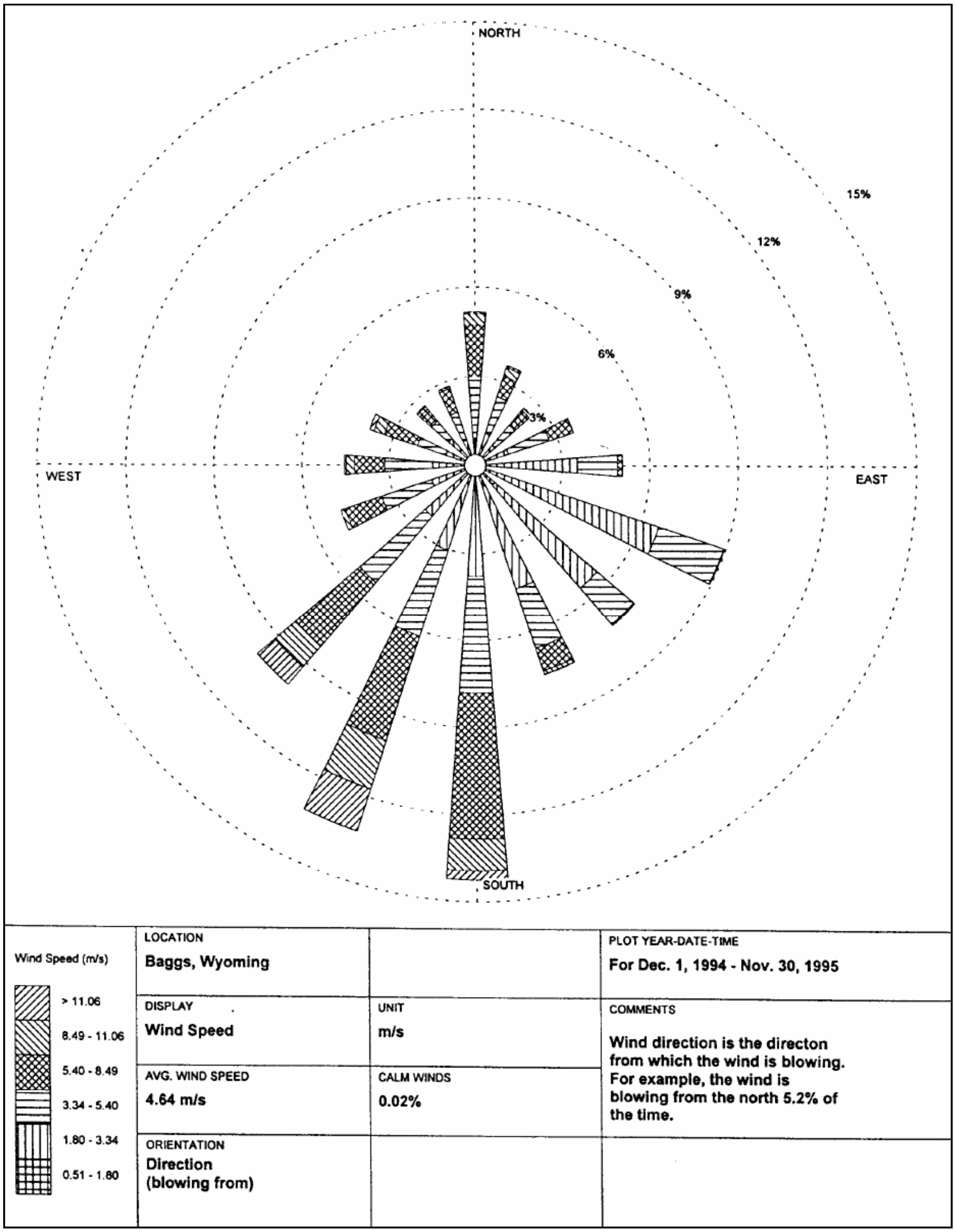


Figure 3.4-3 Baggs, Wyoming Wind Rose for December 1, 1994 to November 30, 1995. (Source: BLM, 2004)

As is clearly indicated in the data, the major sagebrush community (Inter-Mountain Basins Big Sagebrush Shrubland) dominates coverage of the study area with a total of over 40% of most of the subregions. 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. Table 3.4-2 summarizes the distribution of the wetland and riparian vegetation communities within each subregion (Rocky Mountain Subalpine/Upper Montane Riparian Systems, Rocky Mountain Montane Riparian Systems, plus Western Great Plains Depressional Wetland Systems).

Table 3.4-2 Tabulation of LANDFIRE Data.

Subregion: Little Snake River			
Existing Vegetation Type	**Acres**	**Percent of Subregion**	**Cumulative Percent**
Rocky Mountain Montane Riparian Systems	3,530	2.3%	2.3%
Western Great Plains Floodplain Systems	3,373	2.2%	4.6%
Rocky Mountain Subalpine/Upper Montane Riparian Systems	1,207	0.8%	5.4%
Western Great Plains Depressional Wetland Systems	157	0.1%	5.5%
Subregion: Muddy Creek			
Existing Vegetation Type	**Acres**	**Percent of Subregion**	**Cumulative Percent**
Rocky Mountain Montane Riparian Systems	11,148	1.7%	1.7%
Western Great Plains Floodplain Systems	10,934	1.7%	3.4%
Rocky Mountain Subalpine/Upper Montane Riparian Systems	2,188	0.3%	3.7%
Western Great Plains Depressional Wetland Systems	339	0.1%	3.8%
Subregion: Sand/Willow Creek			
Existing Vegetation Type	**Acres**	**Percent of Subregion**	**Cumulative Percent**
Western Great Plains Floodplain Systems	864	0.23%	0.23%
Rocky Mountain Montane Riparian Systems	207	0.06%	0.29%
Rocky Mountain Subalpine/Upper Montane Riparian Systems	69	0.02%	0.30%
Western Great Plains Depressional Wetland Systems	2	0.00%	0.30%
Subregion: Savery/Battle Creek			
Existing Vegetation Type	**Acres**	**Percent of Subregion**	**Cumulative Percent**
Rocky Mountain Montane Riparian Systems	10,588	3.1%	3.1%
Western Great Plains Floodplain Systems	3,455	1.0%	4.2%
Rocky Mountain Subalpine/Upper Montane Riparian Systems	3,215	1.0%	5.1%
Western Great Plains Depressional Wetland Systems	678	0.2%	5.3%
Subregion: Vermillion/Shell Creek			
Existing Vegetation Type	**Acres**	**Percent of Subregion**	**Cumulative Percent**
Western Great Plains Floodplain Systems	4603	1.4%	1.4%
Rocky Mountain Montane Riparian Systems	612	0.2%	1.6%
Rocky Mountain Subalpine/Upper Montane Riparian Systems	484	0.1%	1.7%
Western Great Plains Depressional Wetland Systems	43	0.01%	1.7%

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. For graphical purposes, data obtained through the Wyoming Gap Analysis program are shown on Figure 3.4-4 (http://www.wygisc.uwyo.edu/wbn/gap.html). However, this data set is included within the project GIS and available for use in subsequent projects and associated efforts.

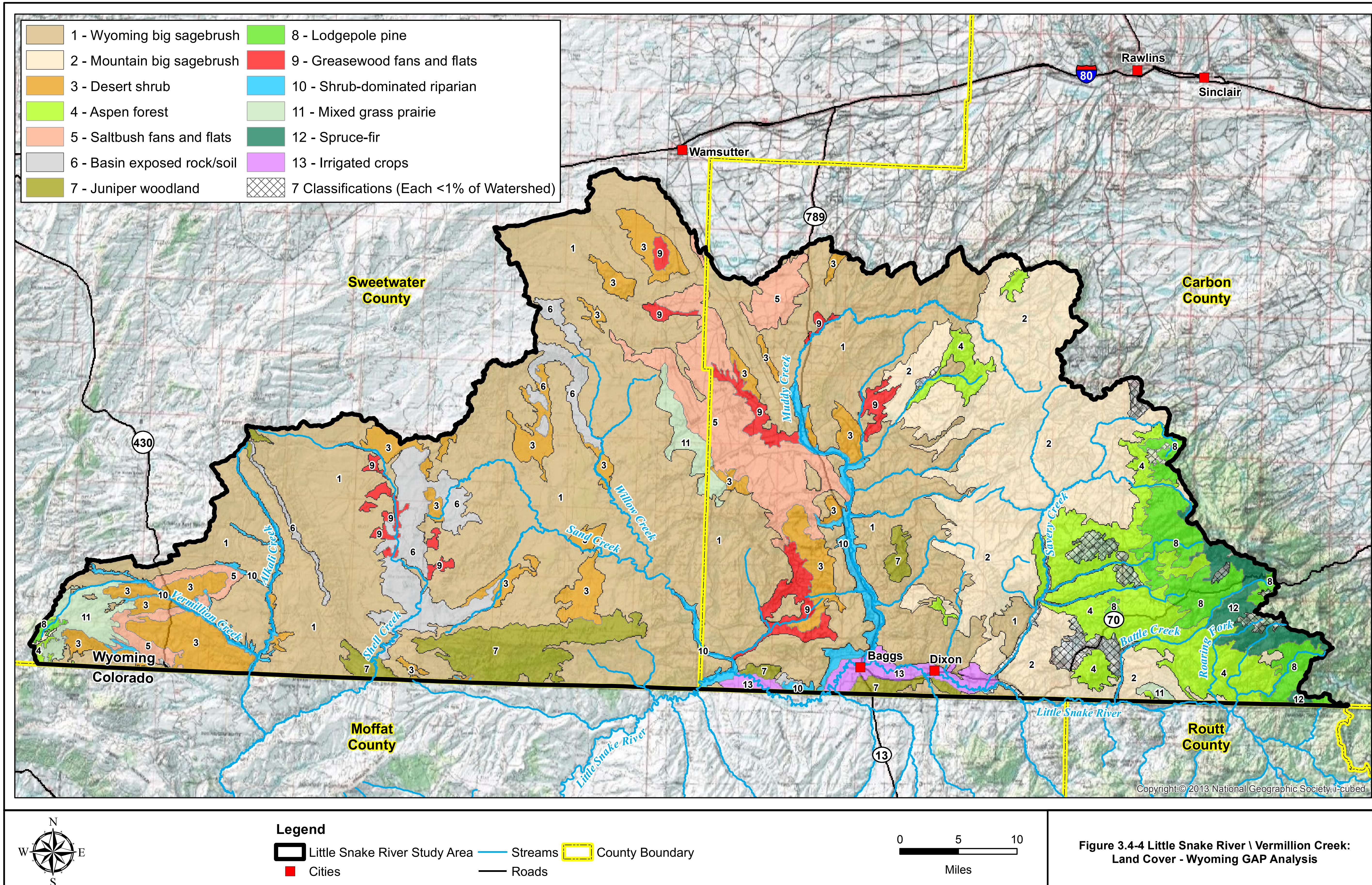


Figure 3.4-4 Little Snake River \ Vermillion Creek: Land Cover - Wyoming GAP Analysis

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).

Distinct plant communities within the study area are influenced by characteristics such as soil depth, texture, and salt content; climate variables, particularly temperature, total and seasonal distribution of precipitation, and wind; and topographic features, most importantly elevation, aspect, and slope. Plant communities respond to other environmental influences such as wildlife foraging, rodent burrowing, and ant hills. Plants themselves also influence soil chemistry and soil resistance to wind and water erosion. The following plant community overviews were extracted from the Rawlins BLM Resource Management Plan (RMP) and pertain to lands within both BLM field offices. This information is included here to explain the diverse and complex nature of the major vegetation communities in the study area.

Aspen

"Quaking aspen communities in the RMPPA occupy the transitional zones between the sagebrush-dominated communities and the coniferous forests. Aspen are also present along streams, in draws, or on the leeward areas of hills and ridges where snow collects. Aspen colonies typically reproduce asexually, producing clones in which separate trees are connected by root suckers. Therefore, several acres of aspen may be interconnected through their roots (Barns 1966). The soils of these areas are usually well-developed deep loam and sandy loam soils with good drainage and high organic matter.

Acting as snow traps, aspen stands are able to support higher productivity and more diverse herbaceous plants than are the adjacent coniferous or sagebrush communities. Aspen stands also provide protective cover essential to mountain watersheds. Understory plants commonly include mountain brome, lupine, columbine, Indian paintbrush, elk sedge, Columbia needlegrass, Kentucky bluegrass, wildrye, licorice-root, elkweed, bedstraw, yarrow, bluebells, yampah, fairy bells, arnica, snowberry, serviceberry, Oregon grape, wood rose, Scouler's willow, and common juniper.

Aspen respond well to fire, and fires typically stimulate repressed colonies to increase root sucker regeneration. This may diversify the age structure of the stand and increase herbaceous production. The occurrence of spring and fall fires has produced the best results. Wildlife use aspen in the fall, winter, and spring for both cover and forage. The open cover of aspen stands provides mule deer fawning areas and elk calving areas. High forb and grass production as well as shade draw wildlife and cattle into these areas during summer grazing seasons. Birds use these areas for important nesting sites, and other nongame species also rely on this habitat. Lower elevation aspen stands at edges of sagebrush are important areas of wildlife biodiversity for many small birds, raptors, and owls. A diversity of age classes and stand densities is important in maintaining diverse wildlife communities supported by aspen.

River bottom cottonwood forests occur along the North Platte River bottom and are dominated by plains cottonwood and narrowleaf cottonwood. The vegetation type is very similar to riparian woodlands; however, these areas are drier and usually have a natural understory dominated by upland grasses and forbs in areas where agriculture is absent.

Juniper

Juniper woodlands in the Colorado River watershed area often have Utah juniper as the single tree species. These sites occur on rocky, fractured bedrock areas at elevations between 5,700 and 7,500 feet, with annual precipitation between 10 and 15 inches. In other areas, on foot-slopes adjacent to conifer forests, Rocky Mountain juniper occurs in association with limber pine. These sites may occur in association with basin and mountain big sagebrush steppe in shallow, poorly developed soils at elevations between 7,500 and 8,500 feet. Annual precipitation in these areas is between 16 and 20 inches. Both types of juniper woodlands have understory vegetation that may include bluebunch wheatgrass, needle-and-thread, slender wheatgrass, Idaho fescue, Wyoming big sagebrush, mountain big sagebrush, snowberry, mountain mahogany, bitterbrush, and common juniper.

Juniper-dominated communities often become decadent because the dominant species pumps most of the soil water into the atmosphere, resulting in a monoculture of juniper. At this point, prescribed fire in these areas does not result in an effective burn, because the fine fuels on the ground do not carry the fire into the trees. However, when these communities do eventually burn, they may sustain dangerous high-intensity wildland fire during high winds in the hot season. After juniper woodlands burn, production of herbaceous vegetation responds very well.

Lodgepole Pine Forest

The most common tree in the mountains of northern Colorado, Wyoming, and much of the Northern Rockies is lodgepole pine. These forests occur in the middle elevations of the area mountain ranges, between 8,000 and 10,000 feet (Knight 1994). Lodgepole pine is considered a pioneer species, as it returns rather quickly following fire and does not regenerate well in a continuously shaded environment. These trees also produce serotinous cones, which are more likely to release their seeds and germinate following intense heat.

The lodgepole pine forest canopy does not allow for a very diverse understory plant community. Plants that occur here are pine reedgrass, Wheeler bluegrass, heartleaf arnica, bedstraw, wortleberry, common juniper, wood rose, wax currant, and russet buffalo berry. Lodgepole pine will grow in mixed stands of aspen, Englemann spruce, subalpine fir, Douglas fir, and Ponderosa pine (Knight 1994).

Lodgepole pine forests are present in many mountain areas of the RMPPA and are managed for wildlife habitat, watershed maintenance, and timber production. A detailed discussion of the management of these areas is included in Section 3.5 [of the RMP] *Forest Management.*

Greasewood

Greasewood-dominated shrublands occur on the fringes of playas, desert lakes, ponds, and desert streams. Greasewood is a halophyte that does well in very saline soils; however, it needs more soil moisture to survive than does saltbush.

Where greasewood is the dominant shrub, subdominant shrubs include shadscale, Gardner saltbush, alkali sagebrush, and basin big sagebrush. The understory is limited to salt-tolerant herbaceous vegetation such as inland saltgrass, western wheatgrass, alkali sacaton, bottlebrush squirreltail, Sandberg bluegrass, biscuit root, pepperweed, and sea blight.

Large expanses of this vegetation type occur in the Great Divide Basin. Greasewood shrublands often occur on the terraces above wetter areas, where silver sagebrush or basin big sagebrush dominate (Knight 1994). Greasewood communities are often found adjacent to saltbush-dominated communities, growing in deeper, sandier soils and alluvial fans. Although greasewood is not considered palatable forage, pronghorn and sheep will eat the spiny twigs and leaves in the spring and early summer, and cattle use this species in summer and fall as a source of salt.

Mesic Upland Shrub Steppe

Serviceberry or chokecherry, or a combination of both, dominates the mesic upland shrub steppe community, often in conjunction with snowberry, currant, and wood rose. Good examples of this plant community occur on the middle elevations of Battle Mountain near Savery. These shrubs may reach 10 to 15 feet in height. They occur in dense stands or scattered patches, often adjacent to aspen or willow. Understory grasses include basin wildrye, green needlegrass, Columbia needlegrass, and Kentucky bluegrass, and forbs include bluebell, columbine, aster, violet, elkweed, chickweed, and stinging nettle.

This community provides hiding and thermal cover for deer, elk, and other wildlife species. The dominant shrubs provide excellent forage for browsing animals when their softer leaves and shoots stay within reach. These shrubs will reestablish following fire, often in less dense patches, making them more accessible to wildlife and livestock.

Sagebrush: Wyoming Big Sagebrush/Grassland

The Wyoming big sagebrush/grassland is the most common vegetative cover type in south-central Wyoming. It occurs in shallow-to-moderately deep soil at lower elevations, giving way to basin big sagebrush in deeper soils and to mountain big sagebrush above 6,500 feet in elevation and within the 9- to 16-inch annual precipitation zones (Knight 1994). Shrub height varies from as little as 6 inches on shallow sites to around 30 inches in deeper soils. Canopy cover is generally lower than observed in either basin or mountain big sagebrush—usually under 30 percent.

Wyoming big sagebrush often appears as the dominant plant in mosaic communities intermixed with Gardner saltbush and open grasslands. In shallow, rocky-to-gravelly *soils, Wyoming big sagebrush may co-dominate with black sagebrush, green rabbitbrush, and sometimes winter fat. Grass and forb species vary depending on soil texture, aspect, and slope. Common grass and grass-like species include bluebunch and thickspike wheatgrass, Sandberg and mutton bluegrass, Indian ricegrass, needle-and-thread, threadleaf sedge, and bottlebrush squirrel tail. Common forbs include phlox, Hooker sandwort, onion, goldenweed, sego lily buckwheat, penstemon, Indian paintbrush, globemallow, and prickly-pear cactus.*

Wyoming big sagebrush is the most frequently eaten sagebrush and is a staple for pronghorn antelope, mule deer, and greater sage-grouse. It is also one of the dominant species found on antelope and mule deer crucial winter ranges. Fire is an important component of all sagebrush-dominated plant communities. Depending on the nature of the site, the fire return interval can be between 25 and 100 years (Knight 1994).

Sagebrush: Mountain Big Sagebrush/Grassland

Mountain big sagebrush is located in shallow or moderately deep soils at elevations above 6,500 feet, in 12- to 20-inch annual precipitation zones. It is the dominant plant community on the Brown's Hill-to-Miller Hill plateau south of Rawlins. This is one of the largest homogeneous communities of this sagebrush type in the United States. Mountain big sagebrush also occurs as smaller plant communities at the lower mountain elevations, intermixed with aspen and conifer woodlands. Shrub height will vary from 10 to 30 inches, with canopy cover reaching 50 to 60 percent.

Mountain big sagebrush is usually the dominant shrub in foothill and mountain sage communities, with bitterbrush, serviceberry, snowberry, and mountain mahogany providing subdominant brush diversity. Grasses include Idaho fescue; king spike fescue; green and Colombia needle grass; Kentucky, mutton, and big bluegrass; elk sedge; and Ross' sedge. Common forbs found in these areas include Indian paintbrush, phlox, balsamroot, locoweed, lupine, larkspur, penstemon, and Oregon grape.

Mountain big sagebrush is palatable to wildlife, although browsing is limited during the winter when these habitats become unavailable because of snow. Following fire, mountain big sagebrush reestablishes as the dominant species more quickly than do other sagebrush types, often resuming dense canopy cover after approximately 40 years. The natural fire recurrence interval in this sagebrush type is approximately 25 to 75 years.

Sagebrush: Low Sages—Alkali, Birdsfoot, Black, and Wyoming Three-Tip Sagebrush/Grassland

Alkali sagebrush is found growing in clay soils and, as its name implies, can withstand soils of higher alkalinity than can other sagebrushes (Beetle and Johnson 1982; Knight 1994). It occurs in relatively pure communities because of the high clay content and high cation exchange capacity in the soils in areas below 7,500 feet in elevation. Understory grasses include bluebunch wheatgrass, western wheatgrass, mutton bluegrass, bottlebrush squirreltail, and Indian ricegrass. Forbs noted at this site include wild buckwheat, biscuit root, and wild onion. Browsing on this sage is light.

Birdsfoot sagebrush is found in alkaline soils, where pH ranges from 8.5 to 11, and below 7,500 feet. At lower pH levels, birdsfoot sage mixes with Gardner saltbush, and it appears with a mixture of grasses and forbs on windswept ridges and hills. At higher pH levels, birdsfoot sagebrush occurs as a monoculture.

Black sagebrush occurs on gravelly-to-rocky soils that have a "shallow effective" rooting depth (less than 15 inches) and various textures from sandy loams to clay loams. Above 7,400 feet, it gives way to Wyoming three-tip sagebrush. It also has been observed as an understory shrub in true mountain mahogany stands. On sandy sites, it is commonly found with needle-and-thread, threadleaf sedge, Junegrass, sandwort, and buckwheat, whereas on loamy soils it will occur with wheatgrasses, bluegrasses, Indian ricegrass, phlox, onion, paintbrush, and penstemon. Black sagebrush sites rarely burn, probably because of the low production and shrub cover these sites support. In some locations, black sagebrush is considered an important browse species for mule deer.

Wyoming three-tip sagebrush occurs above 7,000 feet in the foothills and at the higher elevations of the mountain ranges. It normally grows between 4 inches and 15 inches tall in moderately deep, well-drained soils (Beetle and Johnson 1982). It is often found intermixed with mountain big sagebrush and black sagebrush. Understory grasses and forbs include Idaho fescue, king spike fescue, Colombian needlegrass, elk sedge, Ross' sedge, Indian paintbrush, mountain pea, larkspur, balsamroot, phlox, and buckwheat. Wyoming three-tip sagebrush-dominated areas are often used as forage for wildlife. This species does burn, but because of a lack of fuel continuity, large, resource-damaging fires are rare.

Saltbush

Salt desert shrubland is perhaps the most arid vegetation type in the intermountain West (Knight 1994). Gardner saltbush dominates the salt desert shrub community type and in some instances occurs as up to 90 percent of the vegetation cover. These areas are characterized by accumulations of salt in poorly developed soils. Soils of these areas usually have a pH of 7.8 to 9, which restricts the uptake of water by all but the most salt-tolerant plants (halophytes). Soil textures can be sandy loam, sandy clay loam, or loam and clay. Salts accumulate around these plants each year with leaf fall. Halophytes function essentially to redistribute salts from the soil depths to the surface, thereby concentrating salts around the perimeter of the plant. This enables the plant to eliminate competition for scarce water and nutrients from other, less salt-tolerant plants (Goodin and Mozafar 1972).

Gardner saltbush normally grows no higher than 12 inches. It may grow along the ground, forming a mat. Subdominant shrubs include birdfoot sage, bud sage, spiny hopsage, greasewood, broom snakeweed, shadscale, spiny horsebrush, and winterfat. Grasses associated with these sites are Indian ricegrass, bottlebrush squirreltail, Sandberg bluegrass, and western wheatgrass. Forbs found in these areas include wild onion, biscuit root, woody aster, globemallow, princess plume, and prickly-pear cactus.

Riparian: Foothills and Mountain Riparian

Riparian areas in the foothills and mountains are generally moister for longer periods of time and support plants that need to be in wet or saturated soils throughout the growing season. The stream gradients are also steeper, and the streambed material much larger. Riparian areas in the foothills and mountains receive snowmelt and spring discharges that provide perennial flow and cooler water. The soils are usually coarser, with higher organic matter content and increased soil development compared with lower elevations. These areas range in elevation from 7,500 to 10,000 feet and may include alpine tundra characteristics in the upper reaches of the watersheds.

Willow is often the dominant species in these environments. Frequently observed are sandbar willow, Geyer willow, yellow willow, whiplash willow, Wolf willow, Booth willow, Bebb's willow, and plain leaf willow. Species prominent in the composition of the willow understory include beaked sedge, Nebraska sedge, water sedge, field sedge, Baltic rush, bull rush, spike rush, tufted hairgrass, Kentucky bluegrass, meadow foxtail, and reedgrass. These understory plants dominate in the open meadows and marshes. Other shrubs and trees that occur are water birch, shrubby cinquefoil, redosier dogwood, snowberry, skunkbrush sumac, narrow leaf cottonwood, aspen, Englemann spruce, and lodgepole pine (Knight 1994).

As in the desert riparian area, mountain riparian vegetation is more diverse and higher in productivity than the surrounding uplands, causing livestock and game to concentrate there. The forage also stays lush and more palatable into the late summer (when upland grasses have cured), adding to the attractiveness of these areas. Livestock management strategies often include controlled season and duration of use of these areas."

3.4.2.2 Targeted Vegetation

Vegetation of particular importance with respect to land use and habitat that were identified by Carbon County Weed and Pest District, Sweetwater County Weed and Pest District, and local landowners include:

Designated Noxious Weeds .S. 11-5-102 (a) (xi) and Prohibited Noxious Weeds W.S. 11-12-104

- Field bindweed (Convolvulus arvensis L.)
- Canada thistle (Cirsium arvense L.)
- Leafy spurge (Euphorbia esula L.)
- Perennial sowthistle (Sonchus arvensis L.)
- Quackgrass (Elymus repens (L.) Gould.)
- Hoary cress (whitetop) (Cardaria draba & Cardaria pubescens (L.) Desv.)
- Perennial pepperweed (giant whitetop) (Lepidium latifolium L.)
- Ox-eye daisy (Leucanthemum vulgare Lam.)
- Skeletonleaf bursage (Ambrosia tomentosa Nutt.)

- Russian knapweed (Acroptilon repens L.)
- Yellow toadflax (Linaria vulgaris (P.) Mill)
- Dalmatian toadflax (Linaria dalmatica (L.) Mill.)
- Scotch thistle (Onopordum acanthium L.)
- Musk thistle (Carduus nutans L.)
- Common burdock (Arctium minus (Hill) Bernh.)
- Plumeless thistle (Carduus acanthoides L.)
- Dyer's woad (Isatis tinctoria L.)
- Houndstongue (Cynoglossum officinale L.)
- Spotted knapweed (Centaurea stoebe L. ssp. micranthos (Gugler) Hayek)
- Diffuse knapweed (Centaurea diffusa Lam.)
- Purple loosestrife (Lythrum salicaria L.)
- Saltcedar (Tamarix spp.)
- Common St. Johnswort (Hypericum perforatum L.)
- Common Tansy (Tanacetum vulgare)
- Russian olive (Elaeagnus angustifolia L.)

According to the Wyoming Weed and Pest Council, the following weeds are listed as declared weeds by county:

Carbon County:

- Halogeton (Halogeton glomeratus (Bieb.) C.A. Mey)
- Plains pricklypear (Opuntia polycantha Haw.)
- Plains larkspur / Geyer larkspur (Delphinium geyeri Green)
- Wyeth lupine (Lupinus wyethii S. Watts)
- Black Hembane (Hyoscyamus niger L.)
- Common cocklebur (Xanthium strumarium L)

Sweetwater County: :

- Black henbane Hyoscyamus niger L.
- Foxtail barley Hordeum jubatum L.
- Lady’s bedstraw Galium verum L.
- Mountain thermopsis Thermopis montana Nutt.
- Wild licorice Glycyrrhiza lepidota Pursh

The county Weed and Pest Districts actively conducts control measures to reduce the spread and reproduction of weed species. *Note: GIS data pertaining location of mapped weeds was not publically available through either Weed and Pest District.*

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 22,545 acres of wetlands exist within the watershed (Note that the NWI mapping was completed in 1980 and consequently, does not include the LSRCD wetlands creation project on Muddy Creek). These wetlands are located primarily along perennial streams in the lower portions of the watershed, and also throughout the Medicine Bow 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 and as previously discussed and presented in Table 3.4-2, the LANDFIRE data includes limited determination of wetlands as well. Figure 3.4-5 displays the location of all riparian/wetland vegetation communities included in the LANDFIRE analysis.

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):

> *"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*

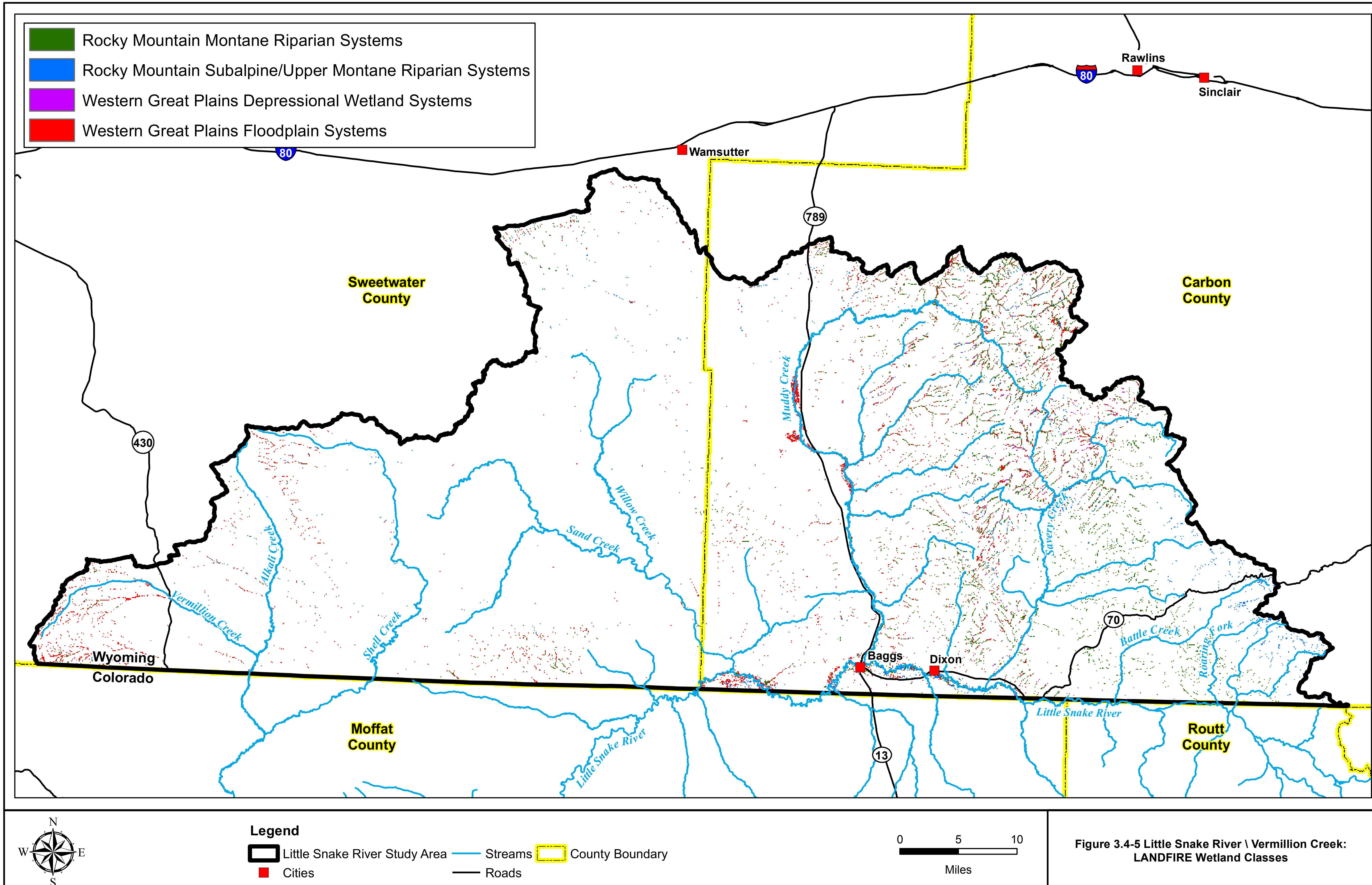


Figure 3.4-5 Little Snake River \ Vermillion Creek: LANDFIRE Wetland Classes

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."*

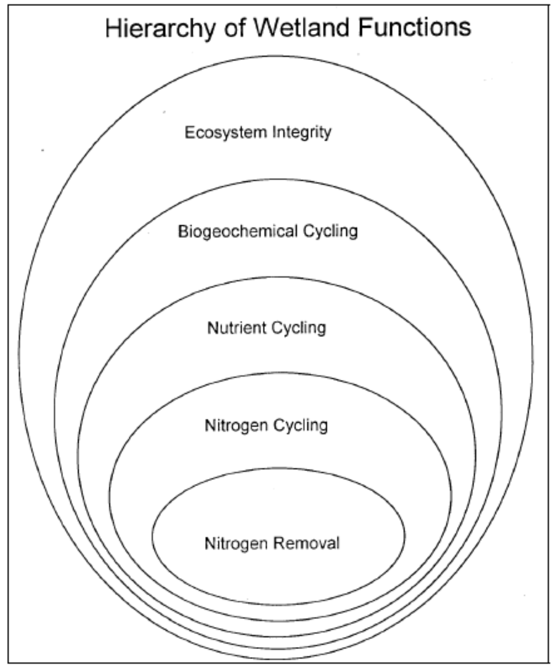


Figure 3.4-6 Hierarchy of Wetland Functions (USACE, 1995).

Figure 3.4-6 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 review of LANDFIRE data 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

The surficial deposits found within the Little Snake River / Vermillion Creek watershed are presented on Figure 3.4-7. The figure shows the wide distribution of alluvium, eolian mixed, residuum, slope wash and colluvium within the watershed. These sediment types constitute the dominant exposed geology within the watershed. The remaining exposed geology is composed of bedrock, grus, landslide, and terrace deposits.

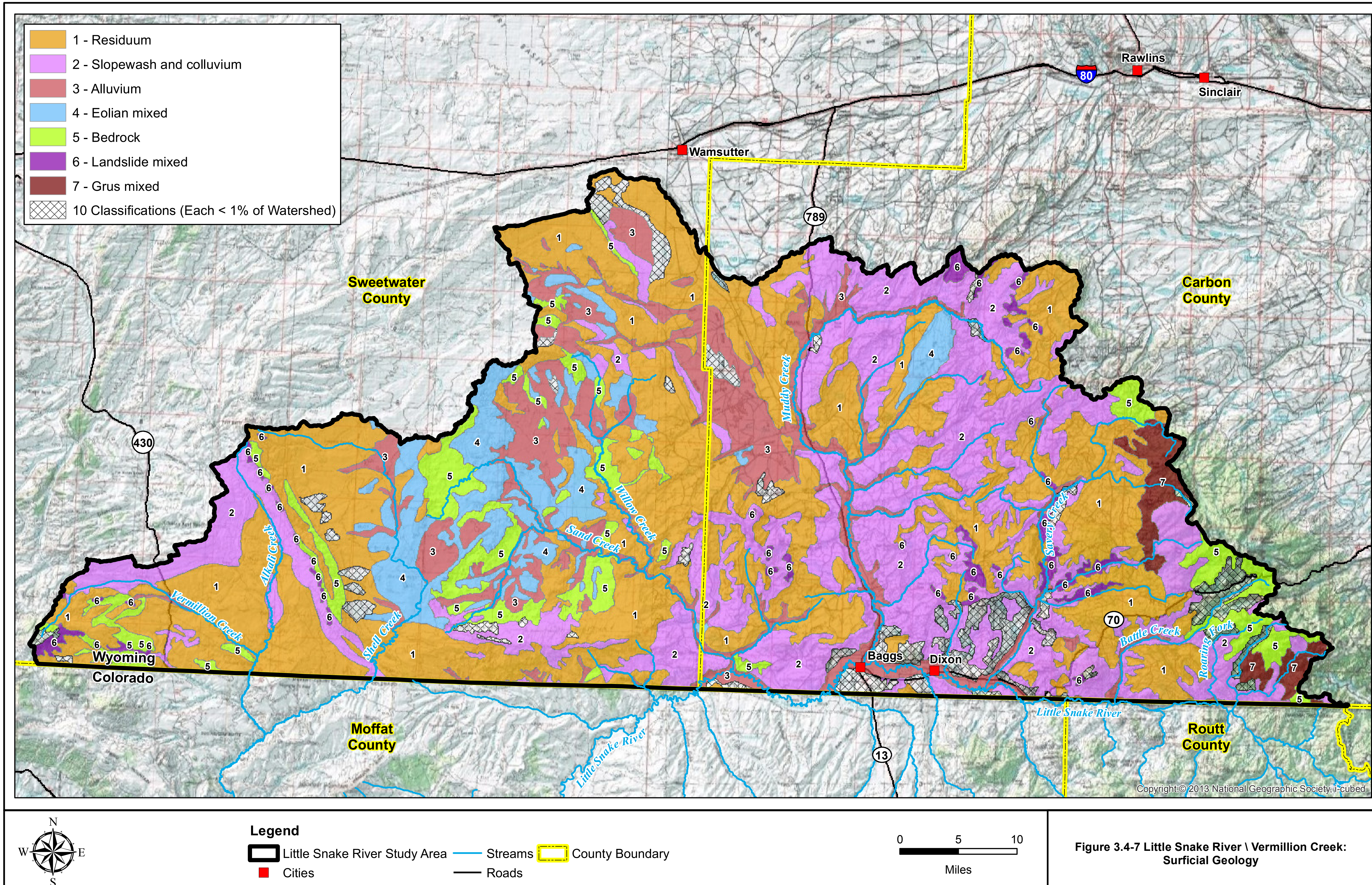


Figure 3.4-7 Little Snake River \ Vermillion Creek: Surficial Geology

Each of these deposits will produce soils and vegetation as a function of its physical and chemical composition, slope, slope aspect, local precipitation and other climatic factors, age, etc. which vary widely across the study area.

Residuum is an in-situ deposit formed from the weathering of bedrock. Soluble components of the bedrock were transported from the area by fluvial, fluvioglacial, and groundwater processes. The insoluble portions of the rock experienced some mechanical weathering from freeze-thaw and rain-drop impact with little to no transport of the remaining materials. The residuum deposits within the study area are primarily derived from late Paleozoic to Mesozoic rocks. The deposits are relatively young and are therefore thin compared to other quaternary deposits.

Colluvium exists throughout the watershed and has a genetic origin related to mass wasting mechanisms. These sediments were derived from the movement of material down slope under the influence of gravity. The colluvial deposits are composed of material derived from bedrock at higher elevations. Grain sizes range from silt to gravel, and grain shape is predominantly angular to subangular.

Alluvium is found adjacent to surface drainages and is of fluvial origin (produced by the action of a stream or river). The extent of the alluvial deposits varies with the size of the respective fluvial system. Headwater deposits are typically narrower and shallower compared to downstream areas in the watershed. These deposits are actively growing with the fluvial action of existing surface drainages. Fluvial action includes flooding (vertical deposition) and point-bar migration (lateral deposition).

3.4.3.2 Bedrock Units

The geologic formations that underlie the study area range in age from Precambrian to Recent. Figure 3.4-8 provides a generalized geologic map of the study area extracted from the 1:500,000-scale geologic map compilation by Love and Christiansen (1985). Figure 3.4-9 provides a geologic column for the study area, modified from the Collentine, et al, (1981) report on the occurrence and characteristics of groundwater in the Great Divide and Washakie Basins of Wyoming.

A detailed description of the complexities of the study area's geology is beyond the scope of this level I investigation. A multitude of sources exist which provide site-specific geologic descriptions and mapping. For the purposes of this planning investigation, the general geologic maps and column are presented in order to define the formations present which could potentially affect development of potential watershed improvement projects, reservoir storage, etc. Descriptions of key formations as they relate to groundwater availability and development are discussed in Section 3.5 of this report.

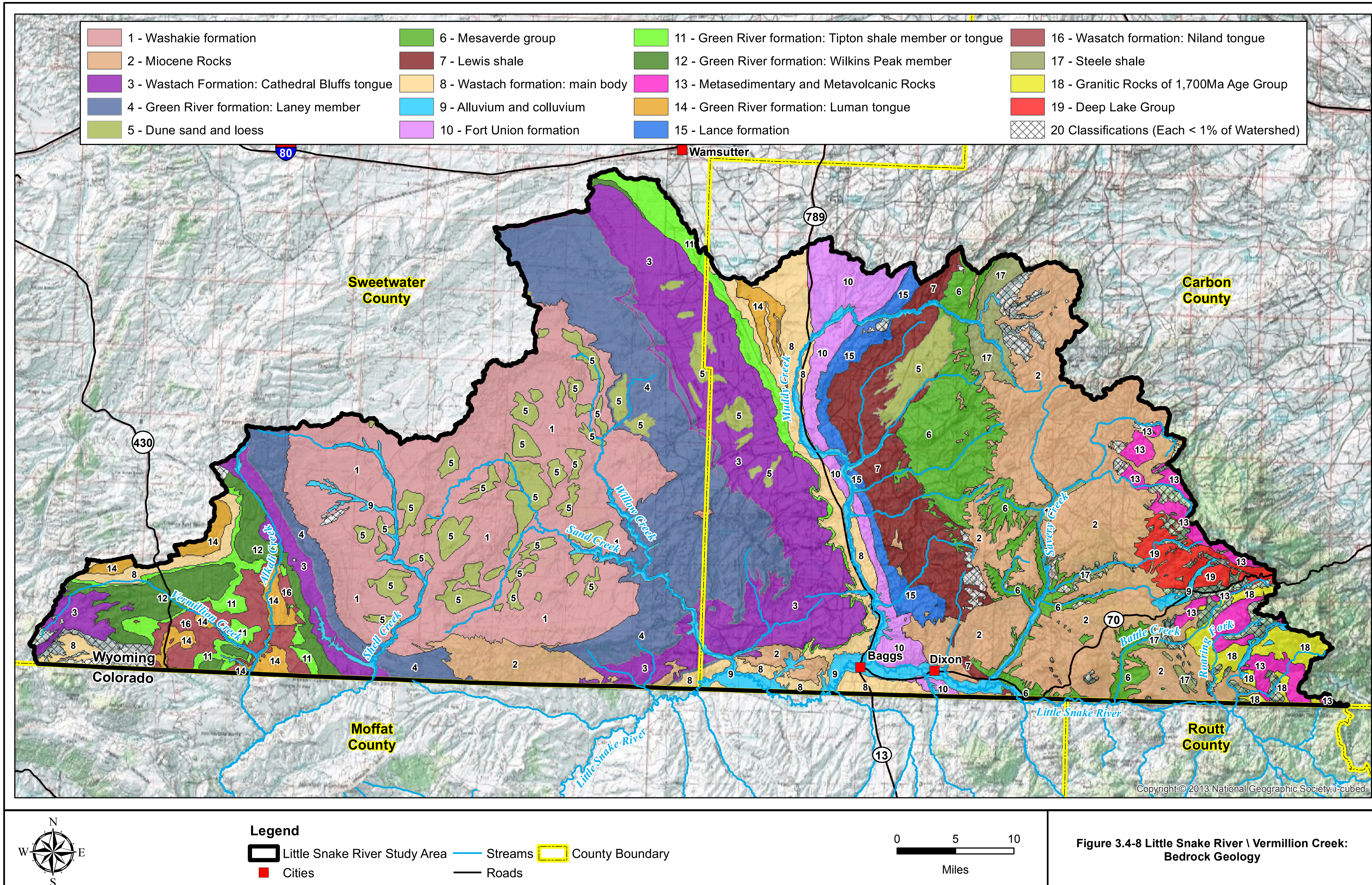


Figure 3.4-8 Little Snake River \ Vermillion Creek: Bedrock Geology

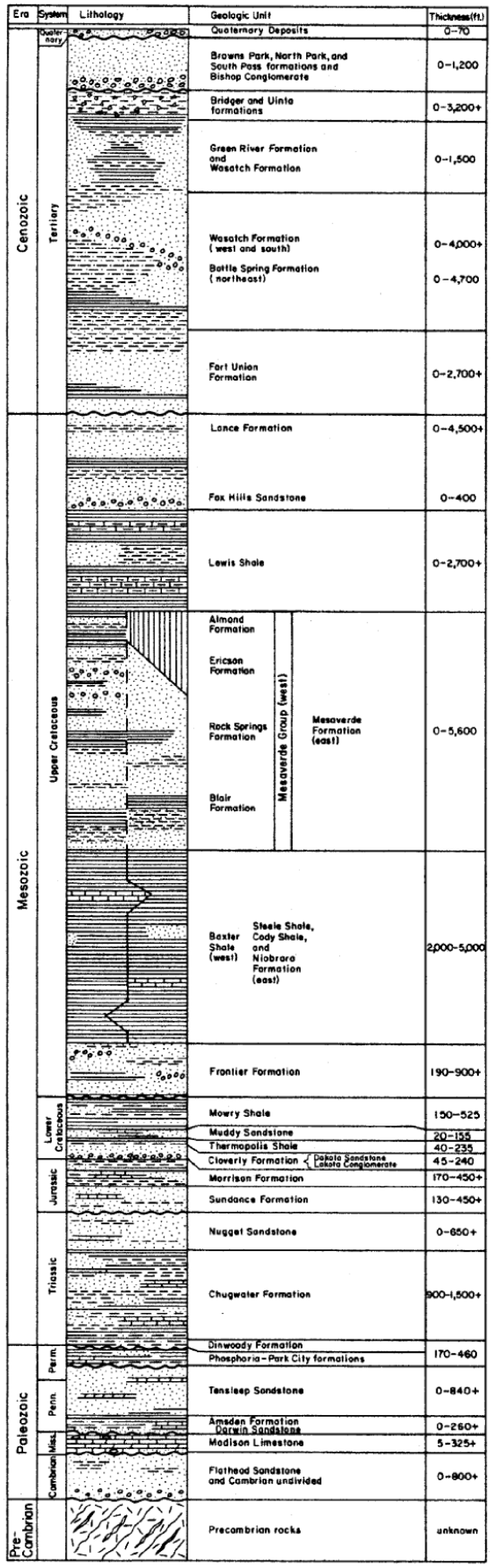


Figure 3.4-9 Generalized Geologic Column, Great Divide and Washakie Basins.

3.4.3.3 Structure

Figures 3.4-10 and 3.4-11 display the generalized geology, faults and structural features for Sweetwater (Mason and Miller, 2004) and Carbon (Bartos, et al, 2006) Counties, respectively. The following discussion of the geologic structure of the area was extracted from Collentine, et al, (1985). This narrative describes the Washakie Basin:

> *"The Great Divide and Washakie basins are structurally separated by the Wamsutter arch. The Wamsutter arch is a broad, east-west trending anticline with no surface expression (Berry, 960; Dana, 1962; and Welder and McGreevy, 1966); however, precambrian rocks along the arch are elevated as much as 9,000 feet above basement rocks of the Washakie basin and 3,000 feet above the Precambrian underlying the western platform of the Great Divide basin (Love, 1961).*
>
> *The Washakie basin is a deep structural depression, smaller in area and more symmetrical than the Great Divide basin. The axis of the syncline plunges to the southwest and is located close to the center of the basin (Figure 111-5). Paleozoic through Recent sedimentary rocks may have a thickness exceeding 25,000 feet in the central Washakie basin (Welder and McGreevy, 1966). On the east and west sides, the Washakie basin is bounded by anticlinal uplifts. Separating the basin from the Sand Wash basin south of the Wyoming-Colorado border is a complex series of east-west trending anticlines and normal faults (Keller and Thomaidis, 1971). Undeformed Tertiary strata extend across these structures (McDonald, 1975). The major structural features between the study area and basins to the west and east are the Rock Springs uplift, and the Sierra Madre and Rawlins uplifts, respectively.*
>
> *The north-south trending Rock Springs uplift is cut by numerous normal faults with throws commonly less than 100 feet and lengths exceeding 15 miles in some instances (Schultz, 1920). Maximum structural relief at the crest of the uplift is estimated at about 17,000 feet (Love, 1961).*
>
> *The Sierra Madre uplift is a westward thrust block of Precambrian through Early Cenozoic rocks which extends southeastward into the Park Range of Colorado. Anticlinal structures on the west flank of the uplift are genetically related to the westward thrusting of the Sierra Madre fault block (Ritzma, 1949). Vertical and horizontal displacements along faults associated with the Sierra Madre uplift are not known."*

3.4.3.4 Geologic Hazards

Conventional "geologic hazards" are minor in the Little Snake River / Vermillion Creek Study Area (Figure 3.4-12)

Landslide deposits are included with the mapping of general surficial geology. Landslide activity in the study area is relatively minor in any case, marking local occurrences where slope, permeability, pore pressure, and formation strength have combined to create slope failure. Future landslides are most

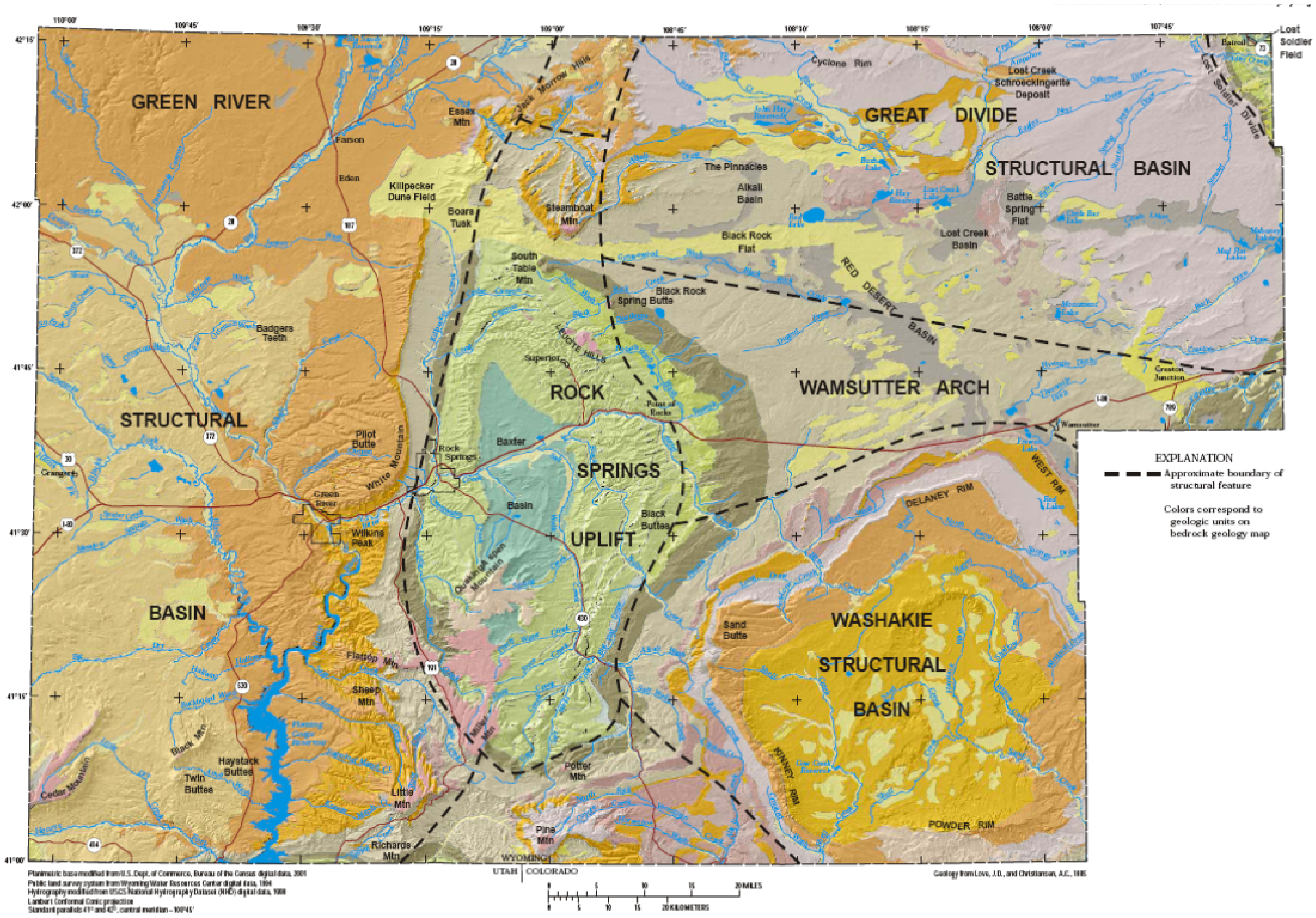


PLATE 1B. PHYSIOGRAPHIC AND STRUCTURAL FEATURES

Figure 3.4-10 Generalized Geologic Structure: Sweetwater County.

Base modified from U.S. Dept. of Commerce, Bureau of the Census digital data, 2001
Hydrography modified from USGS National Hydrography Dataset (NHD) digital data, 1999
Lambert Conformal Conic projection
Standard parallels 41° and 42°, central meridian 106°45′

Geology modified from Love and Christiansen, 1985

0 5 10 15 20 MILES
0 5 10 15 20 KILOMETERS

EXPLANATION

- **Quaternary unconsolidated deposits**
- **Tertiary basalt flows and igneous intrusive rocks**
- **Upper Tertiary rocks**
- **Lower Tertiary rocks**--Includes Ferris Formation which contains rocks of Paleocene and Cretaceous age
- **Upper Cretaceous rocks**
- **Lower Cretaceous rocks**--Includes Frontier Formation and Mowry Shale which are late Cretaceous in age
- **Triassic and Jurassic rocks**
- **Mesozoic and Paleozoic rocks**
- **Paleozoic rocks**--Includes Goose Egg Formation which contains rocks of both Triassic and Permian age
- **Precambrian rocks**
- **Shear zone**
- **Fault**--Dotted where concealed. Bar and ball on downthrown side
- **Thrust fault**--Dotted where concealed. Sawteeth on upper plate. Thrust fault approximately located on the basis of seismic data and drilling
- **Continental divide**

Figure 3.4-11 Generalized Geologic Structure: Carbon County.

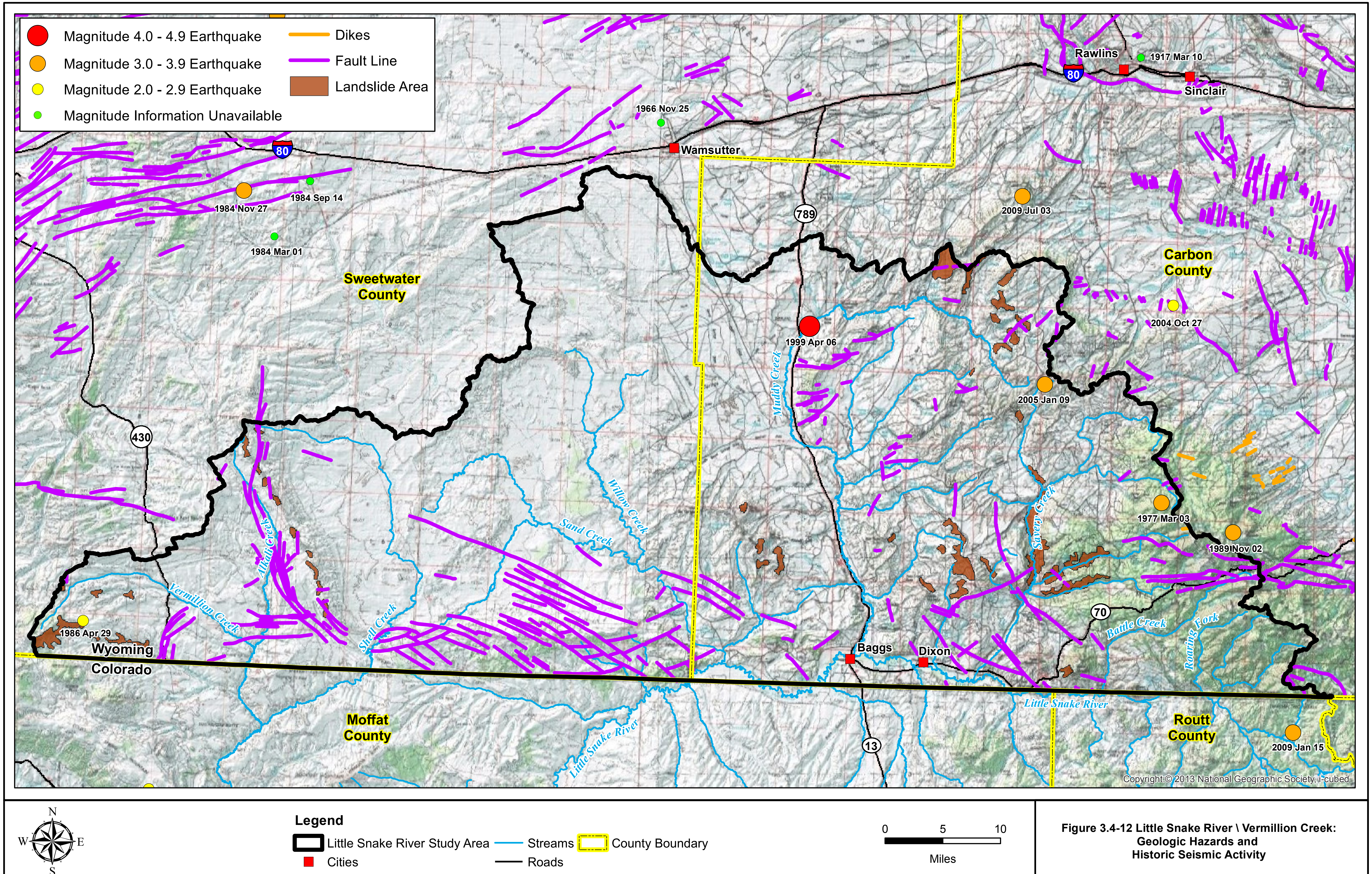


Figure 3.4-12 Little Snake River \ Vermillion Creek: Geologic Hazards and Historic Seismic Activity

likely to occur in association with areas of historical slope failure. Thus, while this potential hazard is not restricted to the areas mapped, those areas merit heightened concern.

Data compiled on U.S. earthquakes of magnitude 2.5 or greater over the last 100 years show four such occurrences within the Little Snake River / Vermillion Creek Study Area as indicated in Figure 3.4-12. The most significant of these occurred on April 6, 1999 and had a recorded magnitude of 4.3. The epicenter was located on Muddy Creek near Highway 789. A search of available information failed to reveal any reported damages. (A magnitude 4 earthquake is perceptible by people in motion, but is not destructive.)

The study area falls in zone 1 according to seismic risk mapping by the Uniform Building Code Seismic Zone Map. This zone is defined by the probability of having a ground shaking (horizontal acceleration) between 5% and 10% of gravity in 50 years.

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 are influenced more by parent material than by vegetation. The soils in the watershed area formed from limestone and sandstone on mountainsides and from interbedded sandstone. 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 3.4-13 displays a general soils map of the study area prepared using data mapped at the 1:250,000 level of detail and obtained from the NRCS. This level of detail is valuable for regional planning efforts such as this investigation; however, more detailed mapping is required for site-specific investigations and evaluation of specific projects.

Within the study area, detailed soils mapping was not available for the much of the area. As indicated in Figure 3.4-13, soils mapping coverage is good within the Muddy Creek region. In addition, the majority of the Vermillion Creek and Alkali Creek watersheds within the Vermillion / Shell Creek subregion have been mapped. The remainder of the project study area has not been mapped. The NRCS assigns its detailed soils mapping (1:24,000 scale) pertinent attributes, including the ESD. The 1:24,000 scale soils mapping is incorporated within the project GIS.

3.5 Watershed Hydrology

3.5.1 Groundwater

Groundwater is simply the underground component of the hydrologic cycle. Water enters the subsurface as rainfall, snowmelt, streamflow, irrigation water, etc. infiltrates, in a process called "recharge". Groundwater moves beneath the surface in response to groundwater gradients, much as surface water flows "downhill". And groundwater leaves the subsurface as "discharge" via springs, wells, baseflow into streams, uptake by deep-rooted vegetation, and evaporation from the ground surface.

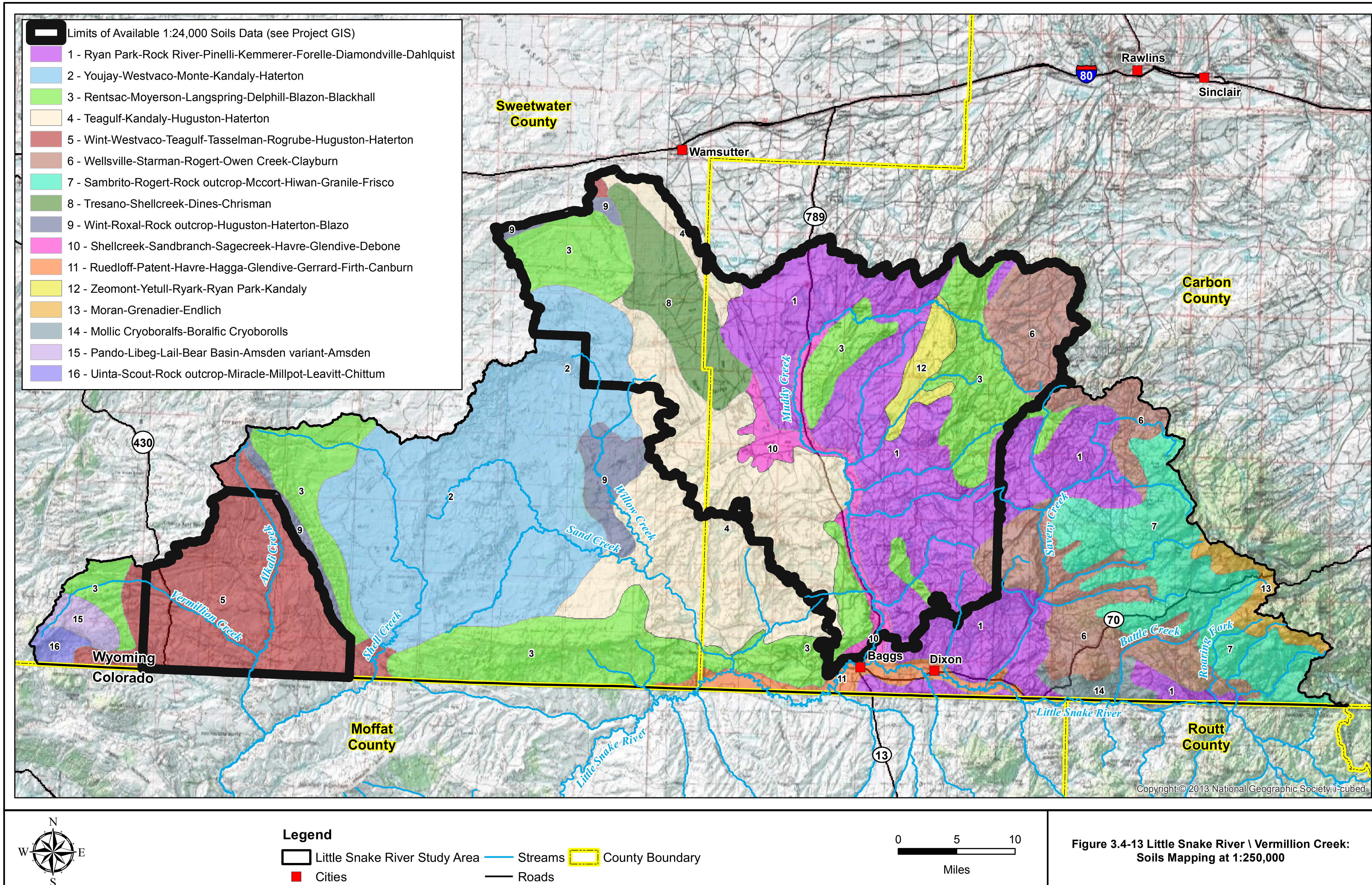


Figure 3.4-13 Little Snake River \ Vermillion Creek: Soils Mapping at 1:250,000

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).

Numerous small springs and a few large springs exist in the area. Figure 3.5-1 displays the location of springs mapped by the USGS and the BLM.

3.5.1.2 Alluvial Aquifers

A large number of existing stock and domestic wells within the study area are shallow wells completed in alluvial aquifers associated with the Little Snake River and its tributaries. The following description extracted from Collentine, et al, (1981) provides a general description:

> *"The Quaternary aquifers consist of unconsolidated sand and gravel formations, mainly of alluvial origin, interbedded with lake and windblown sediments. The Quaternary sediments occur in several localities throughout the Great Divide basin; in the Washakie basin, they occupy the flood plains of the Little Snake River and its major tributaries, Bitter Creek, Shell Creek, Vermillion Creek, and Alkali Creek. Maximum total thickness for the Quaternary sediments is estimated at 70 feet. Hundreds of water wells are completed in the coarse sand and gravel of the Little Snake River Valley where yields of 25 to 50 gallons per minute (gpm) are common*."

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. Table 3.5-1, extracted from Collentine et al, tabulates the lithology and water yielding characteristics of these and other members of the stratigraphic sequence. Figure 3.5-2, also extracted from Collentine, presents the generalized hydostratigraphic column of the Great Divide and Washakie Basins.

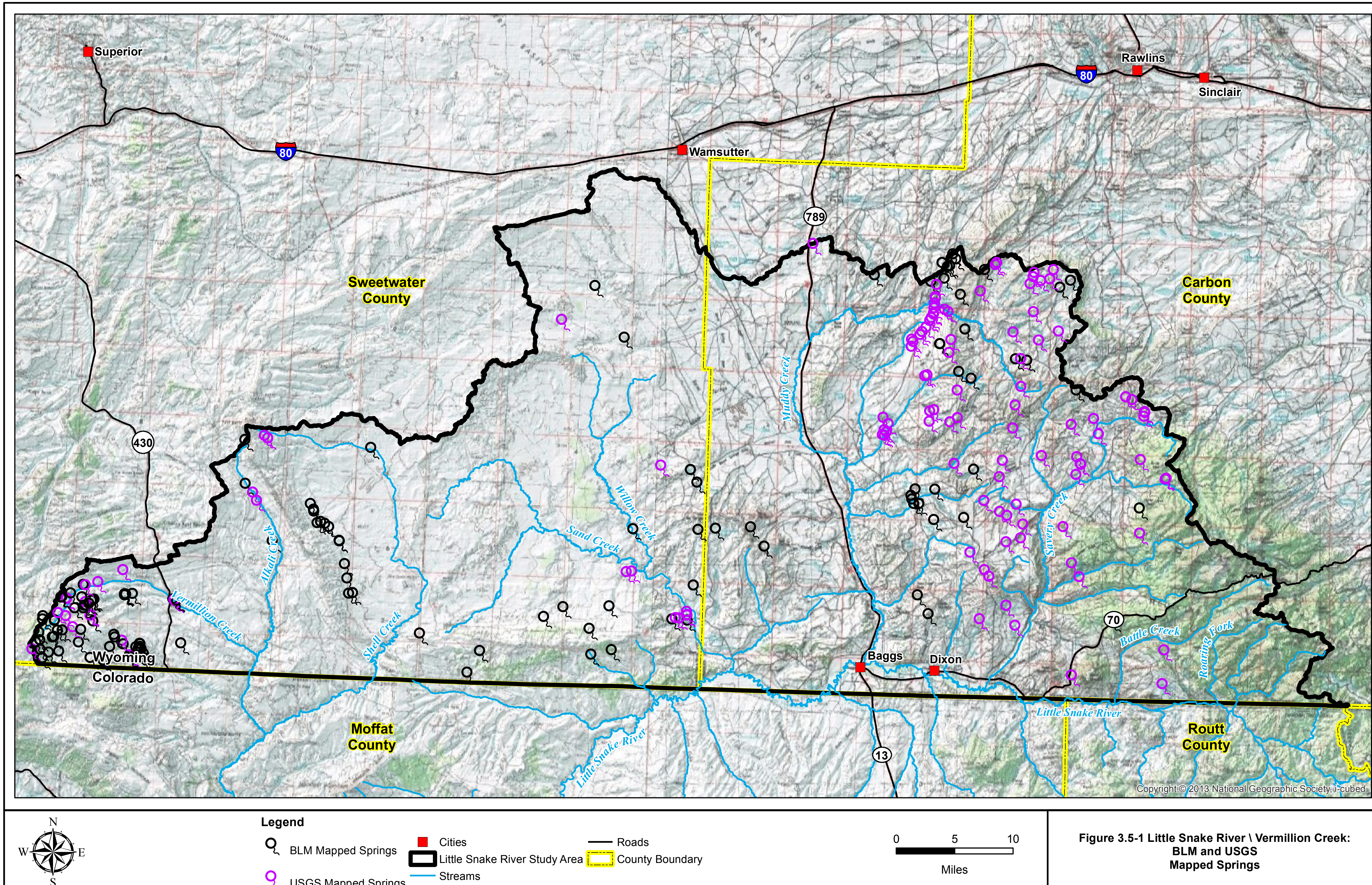


Figure 3.5-1 Little Snake River \ Vermillion Creek: BLM and USGS Mapped Springs

Table 3.5-1 Generalized Stratigraphy Lithology and Water-Bearing Characteristics of Geologic Formations in the Great Divide and Washakie Basins (From Collentine, et al., 1981).

Era	Period	Geologic Unit	Thickness	Lithologic Description	Hydrologic Properties
Cenozoic	Quaternary		0-70	Unconsolidated alluvial clay, silt sand and gravel along Little Snake River valley, playa lake deposits of clay, silt, and sand present in Great Divide basin, and sand dunes of northern Rock Springs uplift, west-central Great Divide basin and north of the Rawlins uplift. Also glacial clay, silt, sand, and gravel on the flanks of the Sierra Madre Mountains.	Sand and gravel deposits capable of supplying stock and domestic water supplies. Utilized extensively in Little Snake River valley and area north of Rawlins uplift. Well yields are generally less than 30 gpm. Springs south of Ferris Mountains flow up to 20 gpm. Trans-missivity estimates from area east of Rock Springs uplift are 168 to 560 gpd/ft. Calculated permeabilities in the same areas range from 21 to 62 gpd/ft2. Fine-grained lake deposits will produce poor yields.
	Tertiary	North Park Formation	0-800	Fine- to medium-grained sandstone, tuff and limestone with a basal con- glomerate member up to 100 feet thick. Present in the northwest Sierra Madre uplift.	Minor aquifer that supplies excellent quality spring water to City of Rawlins. Three wells yield 4 to 20 gpm. Transmissivity estimates from two pump tests are 150 and 1,000 gpd/ft. Specific capacity values from same tests are .06 and 1.43 gpm/ft.
		Browns Park Formation	0-1,200	Sandstone, tuffaceous, sandy clay- stone, and conglomerate. Present on the Rock Springs uplift, southern Washakie basin, western Sierra Madre uplift and possibly along the northern edge of the Great Divide basin. Basal conglomerate up to 100 feet thick. with quartz and quartzite boulders, cobbles, and pebbles in sandstone and volcanic ash. Uranium occurrences near Baggs, Wyoming.	Unit is considered an excellent aquifer with good interstitial permeability, particularly in the basal conglomerate zone. Well yields range from 3 to 30 gpm with specific capacities generally between 0.03 and 1.0 gpm/ft (10 wells). Transmissivity estimates are 100 to 10,000 gpd/ft. Numerous springs maintain base flow of streams south of the Rawlins area. One spring flows 343 gpm. Possible saturated zone 870 feet thick, based on water depths in wells.
		Bishop Conglomerate	0-200+	Conglomerate with well rounded boulders and cobbles of quartzite limestone and schist. Present in southern Rock Springs uplift area.	Major aquifer in Rock Springs uplift area, though absence of thick, saturated zones limits well yields. One well yields 42 gpm. Good interstitial permeability.
		Uinta Formation	0-3,200+	Tuffaceous claystone with tuffaceous fine-grained, lenticular sandstone and minor amounts of shale, lime-stone, and dolomite. Present mainly in central Washakie basin. Tuffaceous clastic sediments present in NW Great Divide basin.	Relatively impermeable unit with only one questionably identified well and no spring data reported. Very low yields are expected.

Table 3.5-1 Generalized Stratigraphy Lithology and Water-Bearing Characteristics of Geologic Formations in the Great Divide and Washakie Basins (From Collentine, et al., 1981) [Continued].

Cenozoic	Tertiary	Green River Formation	0-1,500	Generally, a thick lens of fine- grained, calcareous lake sediments- oil shale, mudstone, shale and sandy mudstone, with few, relatively thick sandstone lenses, particularly in the upper part of the unit (Sand Butte Bed of Laney Member), and some evaporite deposits in the middle part (Wilkins Peak Member).	Laney Member of the Green River Formation includes sandstone lenses which yield up to 200 gpm to wells, particularly in the western Washakie basin. Other members are relatively impermeable and would produce very low yields to wells. Laney transmissivities range from 110 to 300 gpd/ft. Permeability in the Laney averages around 10 gpd/ft 2 and the storage coefficient is between 3.4 x 10-5 and 5.9 x 10-4
Cenozoic	Tertiary	Wasatch Formation	0-4,000+	Claystone, siltstone, fine-to medium-grained, calcareous sandstone,carbonaceous shale, oil shale, andcoal. Grades eastward into BattleSpring Formation in eastern GreatDivide basin.	Major aquifer of Tertiary aquifer system. Numerous water-bearing sandstone lenses yield 5 to 250 gpm (90 wells) though most yields are 30 to 50 gpm. Wells tapping the lower sands are artesian in some areas. Trans-missivity estimates from 9 pump tests are 150to 10,000 gpd/ft. Specific capacities forsame wells range from 0.17 to more than 10 gpm/ft. Porosity and permeability from 6 oil field reports re 16 to 38 percent and 0.04to 18.2 gpd/ft , respectively. Yield-drawdownrelationships from 5 wells indicate possible yields of 500 gpm from thick, saturated sequences.
Cenozoic	Tertiary	Battle Spring Formation	0-4,700	Arkosic, fine-to coarse-grained sandstone and claystone with boulder conglomerate near the Green Mountains. Intertongues with Wasatch and Green River formations to the west. Uranium deposits in Crooks Gap area.	Major aquifer of eastern Great Divide basin. Well yields range from 1 to 157 gpm. Estimates of transmissivity are 29 to 3,157 gpd/ft from 26 test wells. Specific capacity is typically less than 1 gpm/ft. Pay zone porosity at one oil field is 15 to 25 percent. Estimated coefficient of storage is 1 x 10-3.

Table 3.5-1 Generalized Stratigraphy Lithology and Water-Bearing Characteristics of Geologic Formations in the Great Divide and Washakie Basins (From Collentine, et al., 1981) [Continued].

Cenozoic	Tertiary	Fort Union Formation	0-2,700+	Fine-to coarse-grained sandstone, carbonaceous shale, and coal with minor siltstone and claystone in · the upper part.	Major aquifer, particularly around the periphery of the basins. Water-bearing sandstones arlenticular causing discontinuous, isolated water-bearing zones.Well yields range from 3 to 300 gpm Transmissivity estimates are generally less than 2,500 gpd/ft. Porosity and permeability are 15 to 39 percent and less than 1 gpd/ft , respectively, based on oil field and coal mine reports. Specific capacity ranges from less than 0.001 to 75 gpm/ft (6 pump tests). Permeability is largely fault-related on east side of Rock Springs uplift.
Mesozoic	Upper Cretaceous	Lance Formation	0-4,500	very fine to fine grained clayey, calcareous sandstone with shale, coal and lignite. Sandstone lenses up to 20 feet thick at intervals within the formation near Rawlins	Minor aquifer of Tertiary system with well yields typically less than 25 gpm. Transmissivity estimates are generally less than 20 gpd/ft with two estimates of 150 and 200 gpd/ft. Oil field porosity and permeability are 12 to 26 percent and 0.007 to 8.2 gpd/ft 2, respectively.
		Fox Hills Sandstone	0-400	Fine-to medium-grained, cross-stratified, calcareous sandstone.	Minor aquifer at base of Lance Formation. Well and spring yields not available. Oil field reports indicate pay zone porosity,permeability , and transmissivity of 20 percent,0.9gpd/ft, andl0to20gpd/ft, respectively.
		Lewis Shale	0-2,700+	Calcareous to non-calcareous, carbonaceous shale, with numerous bedsof siltstone and very fine-grainedsandstone.	Aquitard between underlying Mesaverde aquifer and overlying Tertiary aquifer system.Mostly impermeable shale, but scattered sand-stone lenses may be capable of yielding stocksupplies. Porosity ranges from 6 to 24percenf, permeability from 0.002 to 0.9gpd/ft , and transmissivity from 0.03 to 50gpd/ft, based on oil field data.
		Mesa Verde Formation	0-2,800	Massive, very fine- to medium-grained sandstone with carbonaceous shale,lignite and coal.	Major aquifer throughout study area. Maximumwell yield is 470 gpm from Rock SpringsFormation. Most reported yields are less than100 gpm. Transmissivity estimates are generally less than 3,000 gpd/ft and muchlower in the uppermost part of the aquifer(Almond Fm). Porosity ranges from 8 to 26percent. Ericson Formation is best watersource near Rock Springs uplift.

Table 3.5-1 Generalized Stratigraphy Lithology and Water-Bearing Characteristics of Geologic Formations in the Great Divide and Washakie Basins (From Collentine, et al., 1981) [Continued].

Mesozoic	Upper Cretaceous	Baxter Shale	2,000 - 5,000	Shale with minor, interbedded sandstone,silstone and limestone	Major regional aquitard between Mesaverde and Frontier aquifers throughout area west of Rawlins uplift. Thin sandstone beds may yield small quantities of water; however, high TDS concentrations are likely.
		Frontier Formation	190-900+	Sandstone and shale with bentonite beds and lenses of chert-pebble conglomerate	Productive aquifer, particularly in the eastern part of the study area near outcrop.Yields range from 1 to more than 100 gpm withspecified capacities between 0.29 and 30 gpm/ft.Transmissivity estimates from water well pumptests were 15,000 to 20,000 gpd/ft; however,drill stem test transmissivities were generallyless than 100 gpd/ft with a maximum of 6,500gpd/ft. Variability probably due to varying percentage of bentonite and shale within thetested interval.
	Lower Cretaceous	Mowry Shale	150-525	Silicious shale with siltstone and bentonite	Unit is considered a regional aquitard. Well and spring data are not available
		Thermopolis Shale	40-235	Fissile shale containing a few thin beds of sandstone, siltstone, and bentonite. The Muddy Sandstone Member consists of fine-grained, shaly sandstone and interbedded siltstone and shale.	Unit is considered a leaky confining unit however, water is produced from the Muddy Sandstone Member at oilfields in the north-east Great Divide basin. Well and spring data are not available.
		Cloverly Formation	45-240	Sandstone, shale, conglomerate, and a lesser amount of siltstone	Major Mesozoic aquifer which crops out on Rawlins uplift. Deeply buried over most of the study area. Water well yields range from 25 to more than 120 gpm with specific capacities between 0.26 to 1.36 gpm/ft. Water well and drill stem test transmissivities are 340 to 1,700 and 1 to 177 gpd/ft, respectively.
	Upper Jurassic	Morrison Formation	170-450+	Variegated claystone, shale, lenticular sandstone, and minor conglomerate and limestone.	Confining unit between the Cloverly and Sundance-Nugget aquifers. Well and spring data unavailable.

Table 3.5-1 Generalized Stratigraphy Lithology and Water-Bearing Characteristics of Geologic Formations in the Great Divide and Washakie Basins (From Collentine, et al., 1981) [Continued].

Mesozoic	Upper Jurassic	Sundance Formation	130-450+	Sandstone, shale, siltstone, and limestone; upper part is glauconitic.	Upper unit of the Sundance-Nugget aquifer. Artesian flow to several wells in Rawlins area. Well yields between 27 and 35 gpm (3 wells). Specific capacity at one well is 0.17 gpd/ft. Transmissivity ranges from 12 to 3,500 gpd/ft.
	Lower Jurassic - Upper Triassic	Nugget Sandstone	0-650+	Fine- to medium-grained sandstone with minor, interbedded shale and siltstone.	Lower unit of the Sundance-Nugget aquifer. Two well yields reported, 35 and 200 gpm. Maximum transmissivity from drill stem tests was 2,166 gpd/ft.
	Triassic	Chugwater Formation	900-1,500+	Shale, siltstone and interbedded, fine-grained sandstone	Generally considered a confining unit between Sundance-Nugget aquifer and Paleozoic aquifer system. Hydrologic data not available for Chugwater.
Mesozoic-Paleozoic	Lower Triassic - Permian	Phosophoria Formation	170-460	Interbedded shale, siltstone, sand-stone, and limestone.	Water-bearing capabilities for these formations are unknown in the study area, but are probably poor, due to low permeability of the rock units,
Paleozoic	Permian - Pennsylvanian	Tensleep Formation	0-840+	Fine- to medium-grained, quartzitic sandstone and lesser amounts of thin, interbedded limestone and dolomite. Absent in the southeast part of the area. Crops out on Rawlins uplift.	Important water-bearing zone of Paleozoic aquifer system. \vell yields range from 24 to 400 gpm. One spring flows 200 gpm in Rawlins area. Transmissivity is generally low, ranging from 1 to 374 gpd/ft.

Table 3.5-1 Generalized Stratigraphy Lithology and Water-Bearing Characteristics of Geologic Formations in the Great Divide and Washakie Basins (From Collentine, et al., 1981) [Continued].

Paleozoic	Permian - Pennsylvanian	Amsden Formation	0+260+	Sandstone, shale, and siltstone with cherty limestone. Approximately 60 feet of basal, fine-grained sand-stone (Darwin Sandstone Member). Amsden is absent in the southeast part of the area.	Hydrologic data are not available; unit probably has poor water-bearing potential due to predominance of fine-grained sediments.
	Mississipian	Madison Limestone	5-3256+	Limestone, dolomite, and lesser amounts of thin-bedded sandstone and chert.	Major aquifer of Paleozoic system. Excellent secondary permeability development due to solution channeling, caverns, and fractures. Well yields up to 400 gpm are reported with specific capacities of 100 gpm/ft at two wells. Reported transmissivities are highly variable.
	Cambrian	Undifferentiated Cambrian rocks	0-800+	Quartzitic, conglomeratic sandstone in the lower part; upper part consists of glauconitic sandstone and inter-bedded siltstone, shale, and limestone	Major water-bearing zone, especially near Rawlins, where 13 wells are completed in Cambrian units. Wells yield between 4 and 250 gpm. Specific capacities at two wells were 0.67 and 150 gpm/ft. Transmissivity data are suspect.
Precambrian			Unknown	Granite, gneiss, and schist exposed in Sierra Madre and Rawlins uplifts, and along northern edge of Great Divide basin.	Frequently utilized aquifer in the north-western corner of the Great Divide basin, near South Pass City. Well yields typically range from 10 to 20 gpm with specific capacities between 0.5 and 2 gpm/ft. Most reported transmissivity values are less than 1,000 gpd/ft. Generally high permeability in fractured and weathered zone in upper 200 feet of the unit.

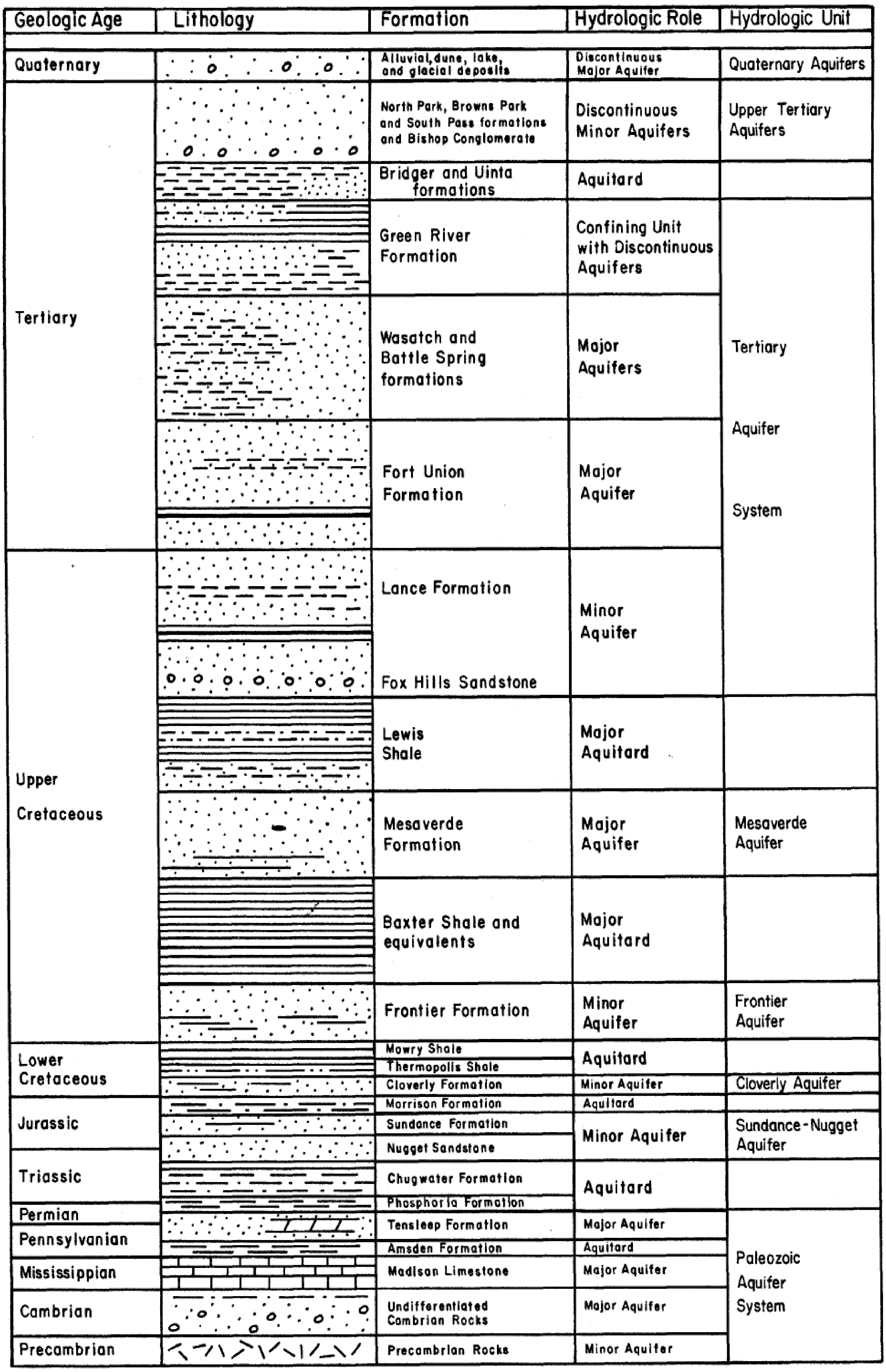


Figure 3.5-2 Hydrostratigraphic Column, Great Divide and Washakie basins.

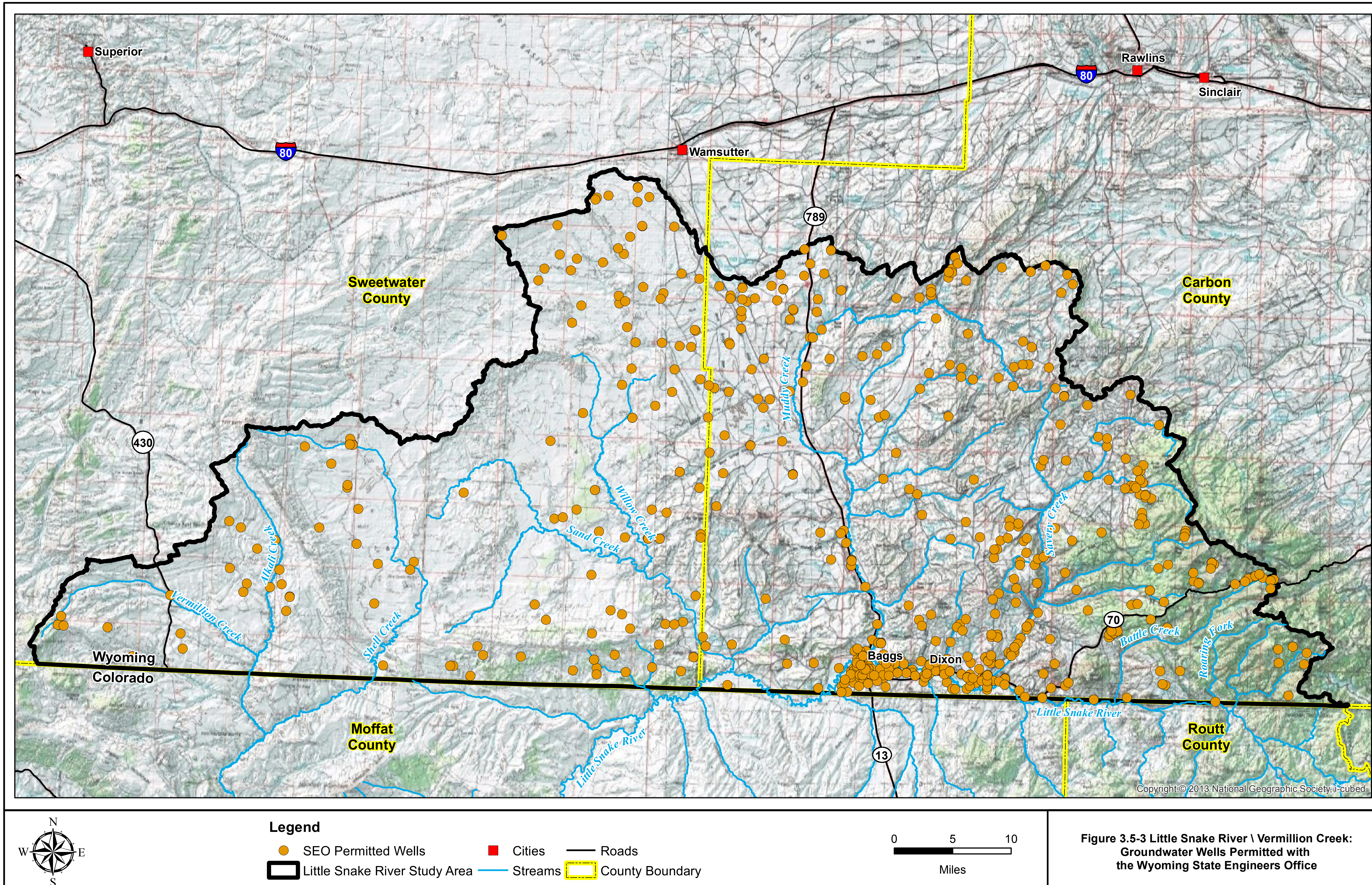


Figure 3.5-3 Little Snake River \ Vermillion Creek: Groundwater Wells Permitted with the Wyoming State Engineers Office

Collentine, et al (1981) describes the Wasatch and Green River Formations, which are primary aquifers within the study area as follows:

> *"The Wasatch Formation is an excellent source of water, particularly in the western Great Divide basin and along the axis of the Wamsutter arch. In these areas it crops out or underlies younger, permeable formations and has its highest percentage of sandstone (Welder and McGreevy, 1966). In the Washakie basin, the Wasatch intertongues with or underlies relatively impermeable claystone and shale beds of the Green River, Bridger, and Uinta formations.*
>
> *Water well yields from the Wasatch Formation are typically between 5 and 50 gpm, though several wells completed in thick saturated sequences produce between 200 and 325 gpm. Well specific capacities less than 1 gpm/ft are characteristic of the Wasatch aquifer. Transmissivity estimates from water well and oil field aquifer tests range from 1 to 100,000 gpd/ft, with the majority between 150 and 6,000 gpd/ft. Porosity and permeability estimates from Wasatch tests at oil fields across the southern Washakie basin are 16 to 38 percent and <1 to 18.2 gpd/ft , respectively (Wyoming Geological Association,1979).*
>
> *The Laney Member of the Green River Formation is present throughout the Washakie basin. A band of Laney outcrop 3 to 10 miles wide encircles the central basin area. Within the central basin, the Laney is buried by younger Tertiary age silts and shales. The Laney Member is composed of fine-grained, calcareous mudstone and shale with several relatively thick sandstone lenses. The thickness of the Laney Member ranges from 900 to 1,200 feet in the western part of the basin and from 500 to 900 feet in the east, with a maximum reported thickness of 1,800 feet (T. 14 N., R. 97 W.) in the south-central area (Roehler, 1973a)."*

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. Figure 3.5-3 displays the locations of the wells. This figure also indicates which wells were determined to be artesian and which have yields reported to be 50 gallons per minute or greater.

3.5.2 Surface Water

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 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 Little Snake River tributaries: Upper Savery Creek Creek.

Region:	14 Upper Colorado River	(Second order HUC)
Subregion:	1405 White - Yampa River	(Fourth Order HUC)
Accounting Unit:	140500 White - Yampa River	(Sixth Order HUC)
Cataloging Unit:	14050003 Little Snake River	(Eighth Order HUC)
Five subbasins:	14050003 Savery Creek	(Tenth Order HUC)
77 Sub-basins:	140500030404 Upper Savery Creek	(Twelfth Order HUC)

The Little Snake River / Vermillion Creek watershed study area was defined by the Wyoming portion of the Eighth order HUCs: 14040109 - Vermilion Creek, 14050004 - Muddy Creek, and 14050003 - Little Snake River. Table 3.5-2 summarizes the HUC system as it pertains to the Sweetwater River and its tributaries.

USGS Gaging Stations

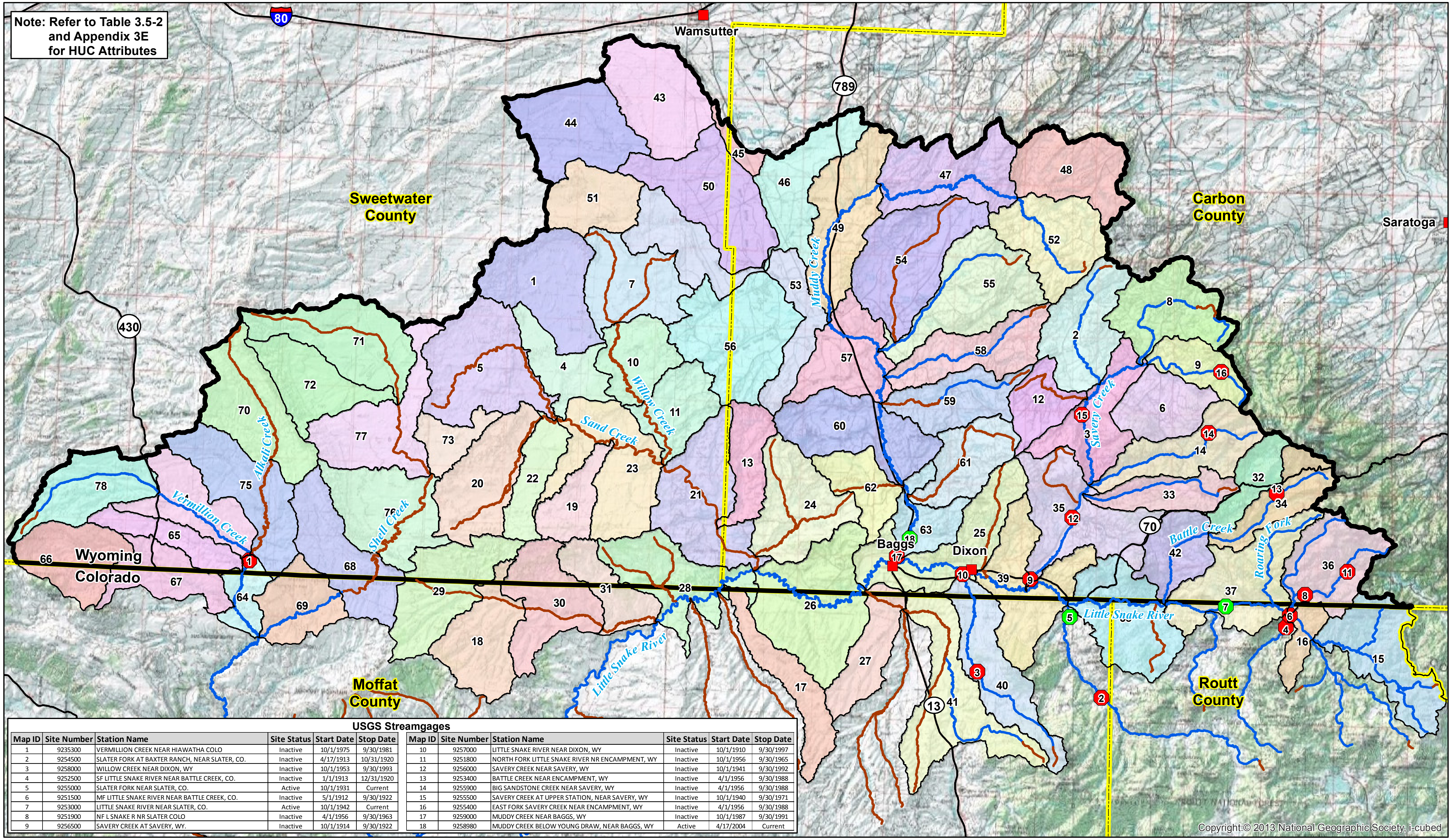
There are currently three active stream gaging stations within the watershed (Figure 3.5-4,). As indicated in Figure 3.5-5, historically, eighteen gages have been active with up to eleven active at one time (mid-1950’s). However, since the early 1990’s, gages have been discontinued by the USGS leaving the basin with currently active three gages.

Mean monthly discharges computed using the available data are presented in Table 3.5-3. The mean annual hydrographs at all of the gage locations reflect typical snowmelt driven runoff patterns. The bulk of the annual runoff occurs between May and July at all of the gages. The late summer through fall months (August through October) see steep declines in streamflow as the streams return to baseflow conditions through the winter. Figure 3.5-6 displays the mean annual hydrograph at three of the principal gages sited on the Little Snake River.

The stream reaches and tributaries in the study area 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. Figure 3.5-4 displays the approximate extent of intermittent and perennial stream reaches.

Table 3.5-2 Little Snake River/ Vermillion Creek 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.)
				Number	Name	Number	Name		
Region 14: Upper Colorado	Subregion 1404: Great Divide - Upper Green	Accounting Unit 140401: Upper Green	Cataloging Unit 14040109: Vermilion	1404010901	Vermillion Creek	140401090101	Vermillion Creek-North Fork Vermillion Creek	78	43.4
						140401090102	Vermillion Creek-McKnight Spring	74	39.5
						140401090103	Upper Alkali Creek-Vermillion Creek	70	58.3
						140401090104	Lower Alkali Creek-Vermillion Creek	75	54.6
						140401090105	Vermillion Creek-Town of Hiawatha	64	16.7
						140401090106	Horseshoe Wash	65	23.8
						140401090107	Upper Canyon Creek	66	41.8
						140401090108	Lower Canyon Creek-Vermillion Creek	67	33.0
				1404010902	Shell Creek	140401090201	Shell Creek-Kinney Creek	71	58.8
						140401090202	Carson Spring	72	39.9
						140401090203	Shell Creek-Cow Creek Reservoir	77	54.4
						140401090204	Twin Fork Reservoir	73	17.9
						140401090205	Shell Creek-Long Ridge Reservoir	76	56.1
						140401090206	Shell Creek-Crooked Wash	68	50.9
						140401090207	Shell Canyon-Hells Canyon	69	33.3
	Subregion 1405: White - Yampa	Accounting Unit 140500: White - Yampa	Cataloging Unit 14050004: Muddy	1405000401	Upper Muddy Creek	140500040101	Muddy Creek-Littlefield Creek	52	50.4
						140500040102	McKinney Creek	48	47.6
						140500040103	Muddy Creek-Alamosa Gulch	47	55.0
						140500040104	Muddy Creek-Antelope Creek	49	58.4
				1405000402	Barrel Springs Draw	140500040201	Upper Barrel Springs Draw	51	35.0
						140500040202	Lower Barrel Springs Draw	53	65.8
						140500040203	Upper North Barrel Springs Draw	44	57.0
						140500040204	Lower North Barrel Springs Draw	50	66.1
						140500040205	Red Lakes	43	57.9
						140500040206	Coal Gulch-Barrel Springs Draw	46	45.7
						140500040207	Windmill Draw	56	71.5
				1405000403	Lower Muddy Creek	140500040301	Muddy Creek-Blue Gap Draw	57	43.8
						140500040302	Cow Creek	55	62.6
						140500040303	Dry Cow Creek	54	67.5
						140500040304	Wild Cow Creek	58	43.3
						140500040305	Cherokee Creek	59	37.2
						140500040306	Muddy Creek-Robber's Gulch	60	55.8
						140500040307	Cottonwood Creek	62	26.2
						140500040308	Muddy Creek-Coal Mine Draw	63	24.7
						140500040309	Deep Creek	61	35.8
			Cataloging Unit 14050003: Little Snake	1405000301	Little Snake River-Battle Creek	140500030101	Little Snake River-Whiskey Creek	15	53.0
						140500030103	Little Snake River-Tennessee Creek	16	13.5
						140500030104	North Fork Little Snake River	36	45.9
						140500030106	Little Snake River-Roaring Fork	37	60.3
						140500030108	Upper Battle Creek	34	31.7
						140500030109	Haggarty Creek	32	22.2
						140500030110	Lower Battle Creek	42	29.4
				1405000302	Little Snake River-Willow Creek	140500030201	Little Snake River-Fly Creek	38	55.8
						140500030202	Little Snake River-Dutch Joe Creek	39	56.8
						140500030203	Little Snake River-Cottonwood Creek	25	56.7
						140500030204	Willow Creek-Spring Creek	40	49.6
						140500030205	Little Snake River-Thornburgh Gulch	26	77.7
				1405000304	Savery Creek	140500030401	Upper Savery Creek	9	24.1
						140500030402	Dirtyman Fork	6	33.5
						140500030403	Middle Savery Creek	3	40.9
						140500030404	North Fork Savery Creek	8	48.1
						140500030405	Little Savery Creek	2	48.4
						140500030406	Bird Gulch	12	23.9
						140500030407	Big Sandstone Creek	14	44.7
						140500030408	Lower Savery Creek	35	61.3
						140500030409	Little Sandstone Creek	33	27.6
				1405000305	Fourmile Creek	140500030501	Upper Fourmile Creek	41	69.3
						140500030504	Lower Fourmile Creek	27	31.7
				1405000306	Upper Sand Creek	140500030601	Sand Creek-Monument Valley	5	71.3
						140500030602	Upper Skull Creek-Sand Creek	20	52.1
						140500030603	Lower Skull Creek	22	26.1
						140500030604	Upper Haystack Wash	1	60.5
						140500030605	Lower Haystack Wash	4	30.0
						140500030606	Sand Creek-Reader Cabin Draw	23	64.2
						140500030607	Grindstone Wash	19	23.6
				1405000307	Lower Sand Creek	140500030701	West Branch Willow Creek	7	47.8
						140500030702	Upper Willow Creek	10	33.5
						140500030703	Lower Willow Creek	11	33.1
						140500030704	Hartt Cabin Draw	21	64.8
						140500030705	Hangout Wash	13	26.9
						140500030706	Red Creek	24	52.6
				1405000308	Little Snake River-Powder Wash	140500030801	Little Snake River-West Fork Cherokee Creek	28	52.3
						140500030802	Dry Gulch	17	33.8
						140500030806	Powder Wash-Eagle Rock Draw	29	54.5
						140500030807	Powder Wash-Reservoir Draw	18	44.7
						140500030808	Powder Wash-Horse Draw	30	48.1
						140500030809	Powder Wash-East Fork Anthill Draw	31	27.5



USGS Streamgages

Map ID	Site Number	Station Name	Site Status	Start Date	Stop Date
1	9235300	VERMILLION CREEK NEAR HIAWATHA COLO	Inactive	10/1/1975	9/30/1981
2	9254500	SLATER FORK AT BAXTER RANCH, NEAR SLATER, CO.	Inactive	4/17/1913	10/31/1920
3	9258000	WILLOW CREEK NEAR DIXON, WY	Inactive	10/1/1953	9/30/1993
4	9252500	SF LITTLE SNAKE RIVER NEAR BATTLE CREEK, CO.	Inactive	1/1/1913	12/31/1920
5	9255000	SLATER FORK NEAR SLATER, CO.	Active	10/1/1931	Current
6	9251500	MF LITTLE SNAKE RIVER NEAR BATTLE CREEK, CO.	Inactive	5/1/1912	9/30/1922
7	9253000	LITTLE SNAKE RIVER NEAR SLATER, CO.	Active	10/1/1942	Current
8	9251900	NF L SNAKE R NR SLATER COLO	Inactive	4/1/1956	9/30/1963
9	9256500	SAVERY CREEK AT SAVERY, WY.	Inactive	10/1/1914	9/30/1922

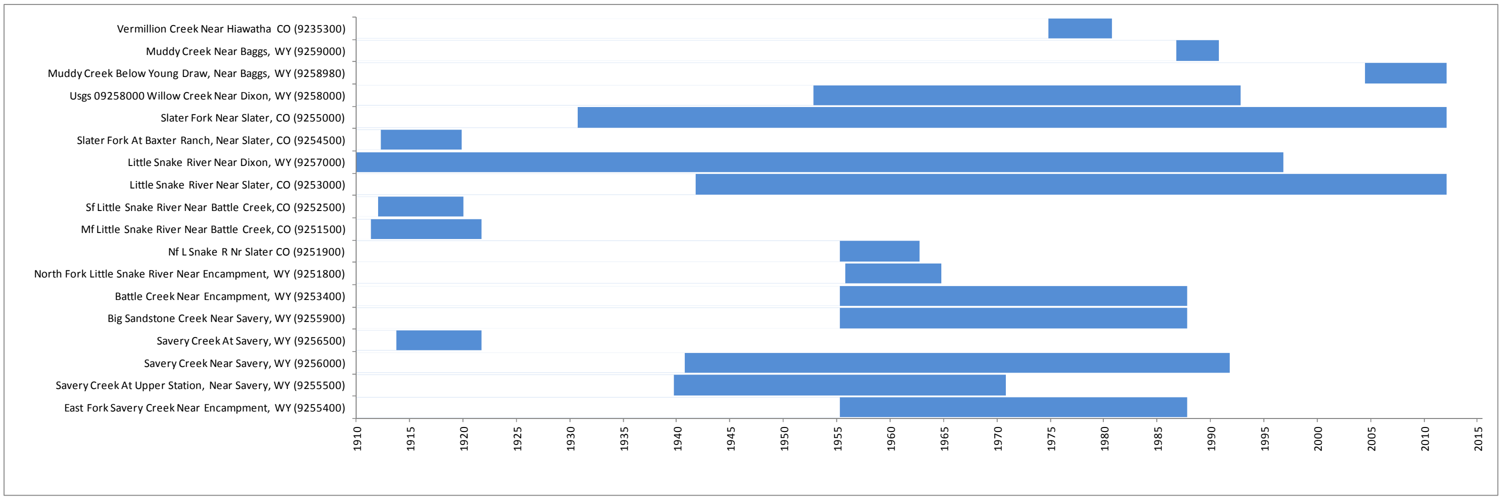
Map ID	Site Number	Station Name	Site Status	Start Date	Stop Date
10	9257000	LITTLE SNAKE RIVER NEAR DIXON, WY	Inactive	10/1/1910	9/30/1997
11	9251800	NORTH FORK LITTLE SNAKE RIVER NR ENCAMPMENT, WY	Inactive	10/1/1956	9/30/1965
12	9256000	SAVERY CREEK NEAR SAVERY, WY	Inactive	10/1/1941	9/30/1992
13	9253400	BATTLE CREEK NEAR ENCAMPMENT, WY	Inactive	4/1/1956	9/30/1988
14	9255900	BIG SANDSTONE CREEK NEAR SAVERY, WY	Inactive	4/1/1956	9/30/1988
15	9255500	SAVERY CREEK AT UPPER STATION, NEAR SAVERY, WY	Inactive	10/1/1940	9/30/1971
16	9255400	EAST FORK SAVERY CREEK NEAR ENCAMPMENT, WY	Inactive	4/1/1956	9/30/1988
17	9259000	MUDDY CREEK NEAR BAGGS, WY	Inactive	10/1/1987	9/30/1991
18	9258980	MUDDY CREEK BELOW YOUNG DRAW, NEAR BAGGS, WY	Active	4/17/2004	Current

Legend

- HUC 12 Subbasins
- Active USGS Streamgage
- Inactive USGS Streamgage
- Little Snake River Study Area
- Intermittent Stream
- Perennial Stream
- Cities
- Roads
- County Boundary

0 5 10
Miles

Figure 3.5-4 Little Snake River \ Vermillion Creek: Hydrologic Unit Codes and USGS Streamgage Locations



Site Number	Site Name	Period of Record	Drainage Area (sq. miles)	Gauge Elevation (ft, NGVD29)	Natural Flow
9255400	East Fork Savery Creek Near Encampment, WY (9255400)	4/1/1956 to 9/30/1988	5.57	8200	Yes
9255500	Savery Creek At Upper Station, Near Savery, WY (9255500)	10/1/1940 to 9/30/1971	200	7000	No
9256000	Savery Creek Near Savery, WY (9256000)	10/1/1941 to 9/30/1992	330	6680	No
9256500	Savery Creek At Savery, WY (9256500)	10/1/1914 to 9/30/1922	354	6460	No
9255900	Big Sandstone Creek Near Savery, WY (9255900)	4/1/1956 to 9/30/1988	9.85	8250	Yes
9253400	Battle Creek Near Encampment, WY (9253400)	4/1/1956 to 9/30/1988	13	8375	Yes
9251800	North Fork Little Snake River Near Encampment, WY (9251800)	10/1/1956 to 9/30/1965	9.64	8250	Yes
9251900	Nf L Snake R Nr Slater CO (9251900)	4/1/1956 to 9/30/1963	29.3	7350	Yes
9251500	Mf Little Snake River Near Battle Creek, CO (9251500)	5/1/1912 to 9/30/1922	120	7000	Yes
9252500	Sf Little Snake River Near Battle Creek, CO (9252500)	1/1/1913 to 12/31/1920	46	7060	Yes
9253000	Little Snake River Near Slater, CO (9253000)	10/1/1942 to present	252	6830	Yes
9257000	Little Snake River Near Dixon, WY (9257000)	10/1/1910 to 9/30/1997	988	6331	No
9254500	Slater Fork At Baxter Ranch, Near Slater, CO (9254500)	4/17/1913 to 10/31/1920	80	7070	Yes
9255000	Slater Fork Near Slater, CO (9255000)	10/1/1931 to present	151	6600	Yes
9258000	Usgs 09258000 Willow Creek Near Dixon, WY (9258000)	10/1/1953 to 9/30/1993	24	6700	Yes
9258980	Muddy Creek Below Young Draw, Near Baggs, WY (9258980)	5/27/2005 to present	1200	6270	No
9259000	Muddy Creek Near Baggs, WY (9259000)	10/1/1987 to 9/30/1991	1257	6250	No
9235300	Vermillion Creek Near Hiawatha CO (9235300)	10/1/1975 to 9/30/1981	196	6640	Yes

Figure 3.5-5 Period of Record for Study Area Stream Gages.

Table 3.5-3 Mean Monthly Streamflow for USGS Gages within the Study Area.

Month	Mean Stream Discharge									
	Vermillion Creek Near Hiawatha, CO	MF Little Snake River Near Battle Creek, CO	North Fork Little Snake River Near Encampment, WY	North Fork Little Snake River Near Slater, CO	South Fork Little Snake River Near Battle Creek, CO	Little Snake River Near Slater, CO	Battle Creek Near Encampment, WY	Slater Fork At Baxter Ranch Near Slater, CO	Slater Fork Near Slater, CO	East Fork Savery Creek Near Encampment, WY
	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
USGS Gage	9235300	9251500	9251800	9251900	9252500	9253000	9253400	9254500	9255000	9255400
Period of Record	10/1/1975 to 9/30/1981	5/1/1912 to 9/30/1922	10/1/1956 to 9/30/1965	4/1/1956 to 9/30/1963	1/1/1913 to 12/31/1920	10/1/1943 to Present	4/1/1956 to 9/30/1988	5/1/1913 to 10/31/1920	10/1/1931 to Present	4/1/1956 to 9/30/1988
Jan	0.69	14	2.6	5.4	8.1	32	3.8	17	17	1
Feb	1.1	14	2.9	6.6	8.4	33	3.9	15	19	0.98
Mar	3.5	40	3.1	6.9	25	53	4.1	38	30	1.1
Apr	8.8	153	12	37	62	271	13	95	124	2.7
May	7.9	746	96	204	141	1090	103	335	389	22
Jun	4	519	142	201	76	951	143	301	258	24
Jul	2.8	71	27	33	11	165	26	55	38	5.1
Aug	5	18	5.6	8.4	4.7	39	7.7	20	10	1.7
Sep	1.6	14	4.3	6.1	4.8	30	5.9	18	12	1.3
Oct	1	23	5.6	10	7.8	40	6.9	28	20	1.6
Nov	1.1	17	4.6	8.8	7.8	37	5.9	27	19	1.3
Dec	0.88	14	3.3	6.4	8.1	33	4.7	21	17	1.1
Annual	3.2	136.9	25.8	44.5	30.4	231.2	27.3	80.8	79.4	5.3

Month	Savery Creek at Upper Station Near Savery, WY	Big Sandstone Creek Near Savery, WY	Savery Creek Near Savery, WY	Savery Creek at Savery, WY	Little Snake River Near Dixon, WY	Willow Creek Near Dixon, WY	Muddy Creek Below Young Draw Near Baggs, WY	Muddy Creek Near Baggs, WY	USGS 09260000 Little Snake River near Lily, CO
	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
USGS Gage	9255500	9255900	9256000	9256500	9257000	9258000	9258980	9259000	90260000
Period of Record	10/1/1940 to 9/30/1971	4/1/1956 to 9/30/1988	10/1/1941 to 9/30/1992	10/1941 to 9/30/1992	10/1/1910 to 9/30/1971	10/1/1953 to 9/30/1993	5/1/2004 to 9/30/1991	5/1/2004 to Present	1921-10-01 to Present
Jan	14	2.1	26	37	85	2.5	9.7	0.49	95
Feb	17	2.2	31	35	101	2.7	11	0.42	126
Mar	33	2.2	56	165	215	5.8	59	64	383
Apr	130	6.9	270	298	879	20	87	37	1060
May	175	67	458	641	2560	34	81	33	2540
Jun	87	83	233	250	1830	35	38	16	1880
Jul	17	13	35	22	175	10	7.7	6.1	311
Aug	9.7	3.2	12	17	28	3.2	2.1	1.7	68
Sep	10	2.3	12	16	27	2.4	1.5	1.8	56
Oct	15	3.4	23	29	79	3.1	1.5	7	115
Nov	17	2.7	28	37	94	2.6	2.3	6.3	123
Dec	15	2.3	26	40	89	2.4	1.2	1.2	100
Annual	45.0	15.9	100.8	132.3	513.5	10.3	25.2	14.6	

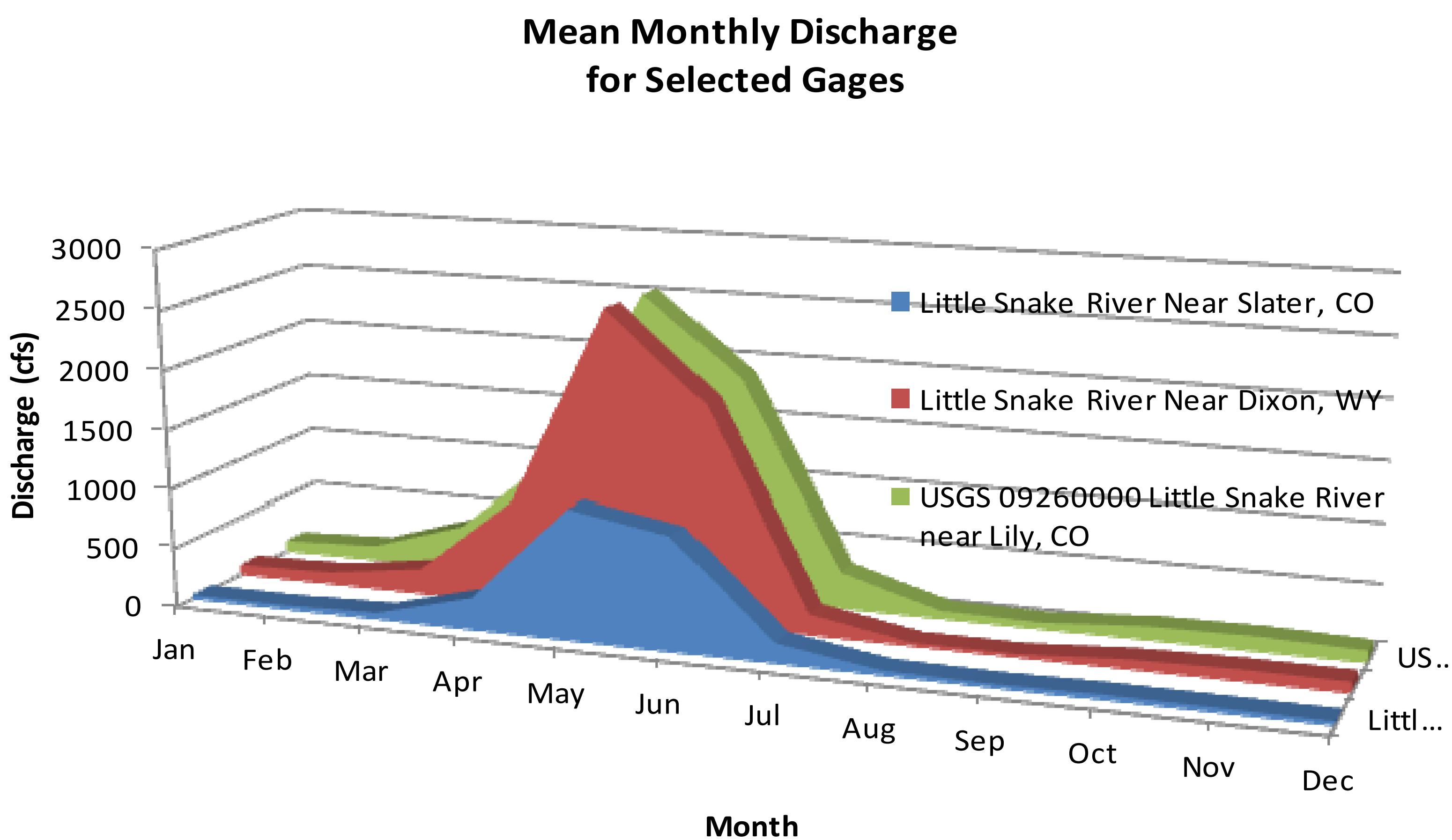


Figure 3.5-6 Mean Monthly Discharge at Selected USGS Stream Gages.

Using regional methods described by the USGS (Miller, 2003), peak flow characteristics were calculated for each of the 115 subwatersheds (HUC12) within the study area. The methodology used to compute these discharges is based upon regressional analyses of gaged data against basin characteristics for similar watersheds. Because anthropogenic influences can have significant influences upon peak discharge values (irrigation, diversion, reservoirs, etc), these values are intended to be used for regional planning efforts only. Project-specific estimates would be required before design of future watershed projects (ex. reservoir storage). Appendix 3E presents the results of this effort.

3.5.2.1 Temporary WWDC Gaging Stations

In an effort to gather additional streamflow data on the ungaged stream network, five temporary stream gages were installed in conjunction with this study:

- Little Snake River at Moffat County Road 4N (Colorado)
- Fourmile Creek
- Willow Creek
- Canyon Creek
- Vermillion Creek

The gages consist of pressure transducers and data loggers protected in a PVC housing fabricated onsite (Figure 3.5-7). The data loggers were programmed to collect depth of water data at fifteen minute intervals throughout the investigation period.

Figure 3.5-7 Temporary Stream Gage Installed in Willow Creek.

The Vermillion Creek and Canyon Creek gages were initially installed in spring 2011 by WWDC staff prior to the initiation of the project by ACE. Unfortunately, the 2011 data were lost due to equipment malfunction. The Willow Creek, Canyon Creek, and Little Snake River gages were installed in spring, 2012 based upon requests from the LSRCD to provide additional data for water budget computations associated with High Savery Dam releases. Following the 2011 field season, the instruments were retrieved by ACE staff and reinstalled in spring of 2012. The objective of the effort was to provide a minimal amount of hydrologic data in portions of the watershed lacking any historic gages. The information collected by the gages will help to reduce uncertainty associated with the existing hydrologic regime. Figure 3.5-8 displays their locations.

Initial rating curves were developed for each gage by completing hydraulic modeling flow conditions at each gage. Stream stage/discharge relationships were used to convert the depth data to stream discharge. Cross section surveys, channel slope, and observations of bed and overbank conditions were

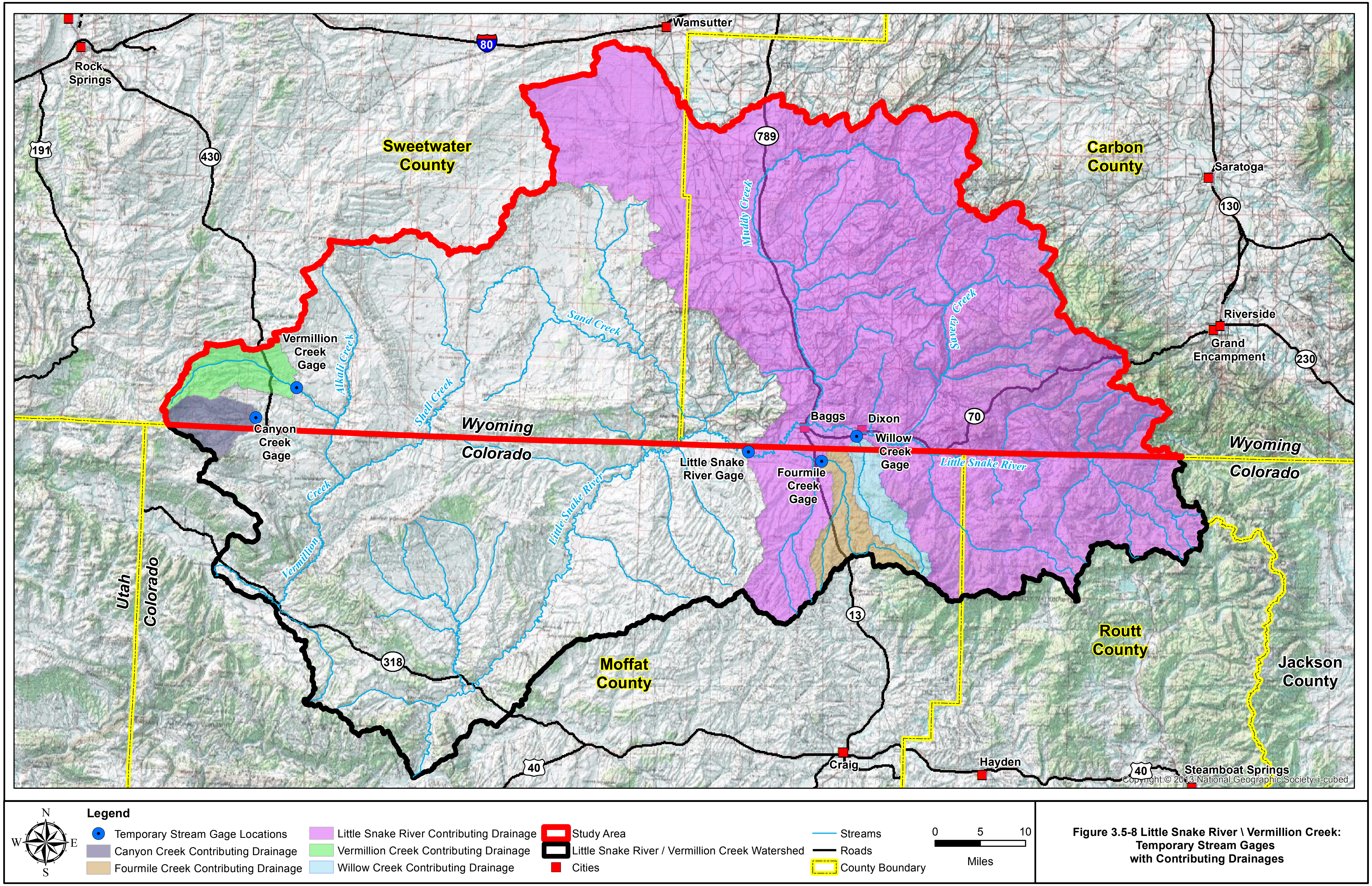


Figure 3.5-8 Little Snake River \ Vermillion Creek: Temporary Stream Gages with Contributing Drainages

made for model input. Stream gaging data measured at each site also provided information with respect to flow depth and velocities for model calibration. The initial rating curve provided a basis upon which to evaluate the depth data recorded by the pressure transducers. During the completion of the study, stream measurements were completed at each gage as they were serviced (battery replacement, data download, etc). These "real data" were then compared to the results of the hydraulic models and adjustment made as necessary. Table 3.5-4 summarizes the results of the temporary stream gaging effort.

Table 3.5-4 Summary of Temporary Stream Gage Hydrology.

Stream Gage	Little Snake River	Willow Creek	Fourmile Creek	Vermillion Creek	Canyon Creek
2012					
Average (cfs)	124.9	3.8	30.0	3.7	1.296
Peak (cfs)	368.6	30.2	26.0	127	5.86
Date of Peak	Feb 13	Mar 18	Mar 14	Jul 7	Mar 15
Yield (ac-ft)	61,887	1,134	1,250	205	684
Minimum (cfs)	1.8	0.0	0.8	.15	.15
Elev. Min (ft MSL)	6140	6260	6300	6960	6980
Elev.Max. (ft MSL)	11010	10650	10090	9550	9610
Basin Area (sq mi)	2332.7	48.6	66.7	61.6	44.7
Mean Annual Runoff (ac-ft/sq mi)	26.5	23.3	18.7	3.3	15.3

Little Snake River

The gage is located on the Little Snake River in Section 13, Township 12 North, Range 93 West approximately 9.5 miles downstream of Baggs, WY in Moffatt County, CO. The gage is installed on the left bank of the river at the Moffat County Road 4N bridge. The gage was established at this location at the request of the LSRCD in order to support their ongoing efforts to monitor water usage and irrigation return flows. As indicated in Figure 3.5-9, streamflow peaked in May during the snowmelt period and gradually drops to baseflow conditions throughout the rest of the summer. Peak streamflow was estimated to be approximately 370 cubic feet per second; however it is important to note that this value is extrapolated on the gage rating curve; there were no stream measurements were completed during high discharge conditions. By August, flows are consistently less than ten cubic feet per second. Total runoff for the study period was approximately 61,997 acre-feet.

Vermillion Creek

The Vermillion Creek gage is located in Section 36, Township 13 North, Range 101 West within a perennial streamflow reach in the upper Vermillion Creek watershed. As indicated in Figure 3.-5-10, with the exception of runoff associated with thunderstorm activity, the stream has little variation in magnitude of streamflow. During summer thunderstorms, however, rapid rise and fall of the hydrograph is evidence of the "flashy" nature of runoff in this portion of the watershed. The bulk of the runoff occurs between the onset of the snowmelt period which occurred in March and April of the study period. Peak runoff on Vermillion Creek occurred in mid-summer in association with localized thunderstorm events. The highest water surface elevation measured was 4.33 feet which translates to an estimated streamflow of approximately 38 cubic feet per second based upon the gage's rating curve. It must be noted, however, that this value lies well outside of the range of discharges actually measured to develop and calibrate the curve. Total annual runoff for the study period was 1,948 acre-feet.

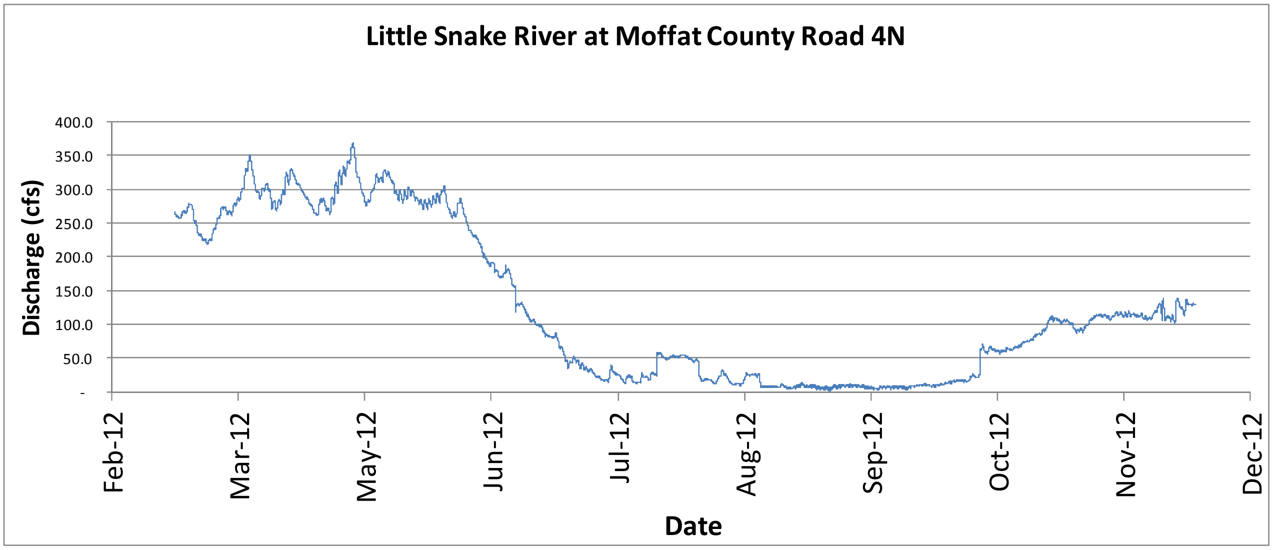


Figure 3.5-9 Temporary Stream Gage: Little Snake River Hydrograph.

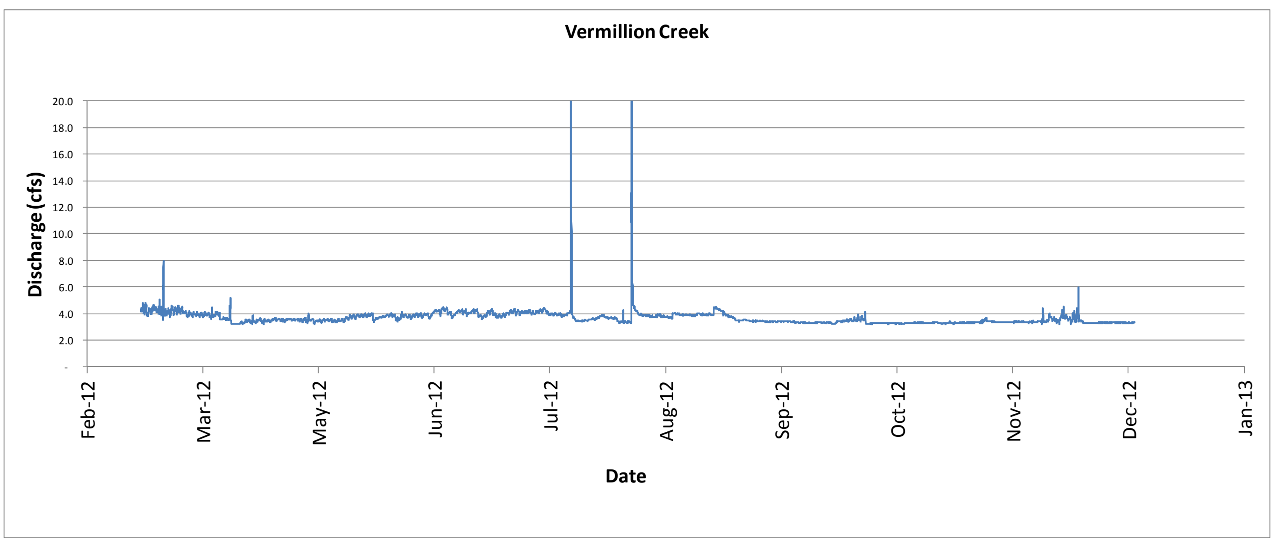


Figure 3.5-10 Temporary Stream Gage: Vermillion Creek Hydrograph.

Canyon Creek

The Canyon Creek gage is located in Section 18, Township 12 North, Range 101 West in an entrenched perennial streamflow reach upstream of Highway 430. As indicated in Figure 3.5-11, the general runoff pattern is consistent with the other streams in the study area with the bulk of the runoff occurring between the onset of the snowmelt period in early March and its completion by early June. Peak runoff on Canyon Creek crested at approximately 30 cfs in association with the snowmelt period. Flows gradually recede to baseflow conditions throughout the summer and remain relatively consistent at one cubic foot per second or less. Occasional `blips' occurring in result to precipitation events are evident in the hydrographs. The evident “rise” in the hydrograph beginning in late July and extending through the late October is likely the result of beaver activities. A small dam was built downstream of the gage which caused a rise in the water surface and consequently a shift in the rating curve that was not corrected. Total annual runoff for the study period was 684 acre-feet.

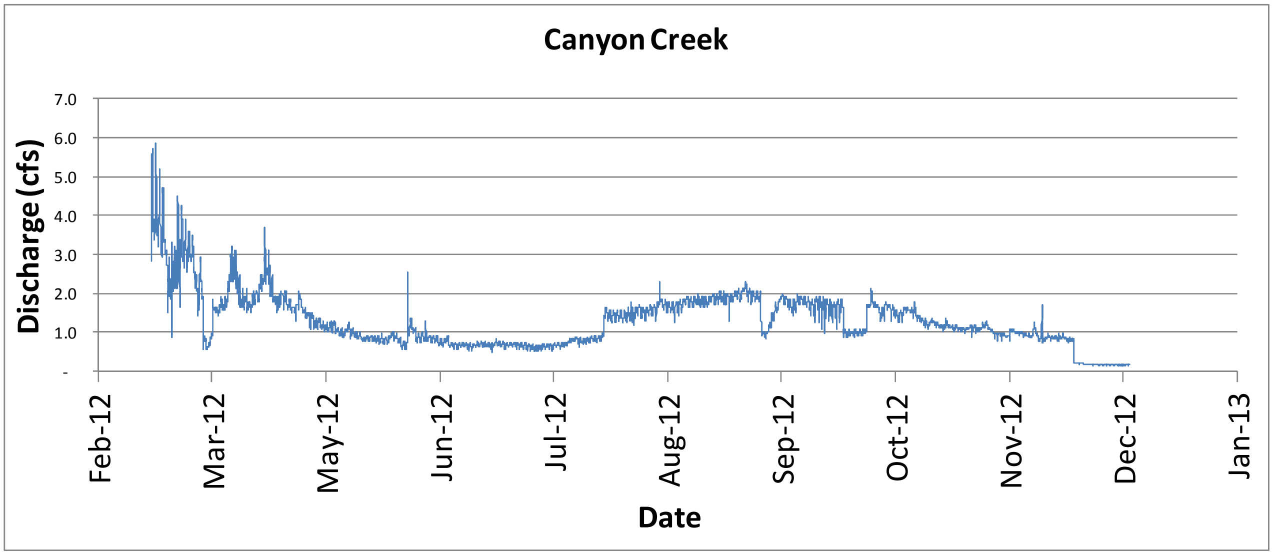


Figure 3.5-11 Temporary Stream Gage: Canyon Creek Hydrograph.

Willow Creek

The Willow Creek gage is located in Section 8, Township 12 North, Range 90 West in an entrenched perennial streamflow reach upstream of State Highway 70. As indicated in Figure 3.5-12, the general runoff pattern is consistent with the other streams in the study area with the bulk of the runoff occurring between the onset of the snowmelt period in early March and its completion by early June. Peak runoff on Willow Creek crested at approximately 23 cfs in association with the snowmelt period. Flows rapidly recede to baseflow conditions throughout the summer and remain relatively consistent at one cubic foot per second or less. Total annual runoff for the study period was 1,134 acre-feet.

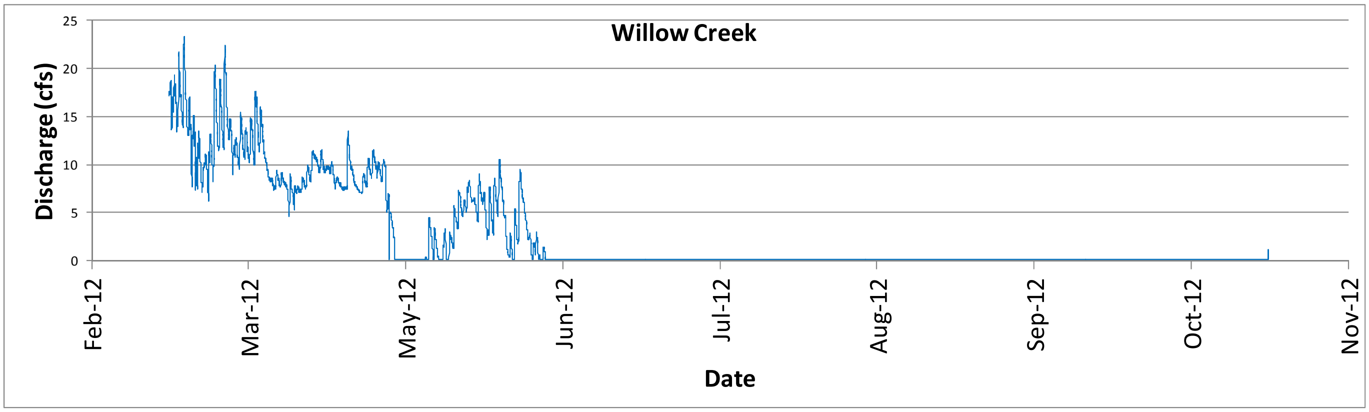


Figure 3.5-12 Temporary Stream Gage: Willow Creek Hydrograph.

Fourmile Creek

The Fourmile Creek gage is located in Section 21, Township 12 North, Range 91 West in an intermittent streamflow reach upstream of State Highway 789. As indicated in Figure 3.5-13, the general runoff pattern is consistent with the other streams in the study area with the bulk of the runoff occurring between the onset of the snowmelt period in early March and its completion by early June. The highest water surface elevation measured was 2.50 feet which translates to an estimated streamflow of approximately 26 cubic feet per second based upon the gage's rating curve. It must be noted, however, that this value lies well outside of the range of discharges actually measured to develop and calibrate the curve. Total annual runoff for the study period was 1,250 acre-feet

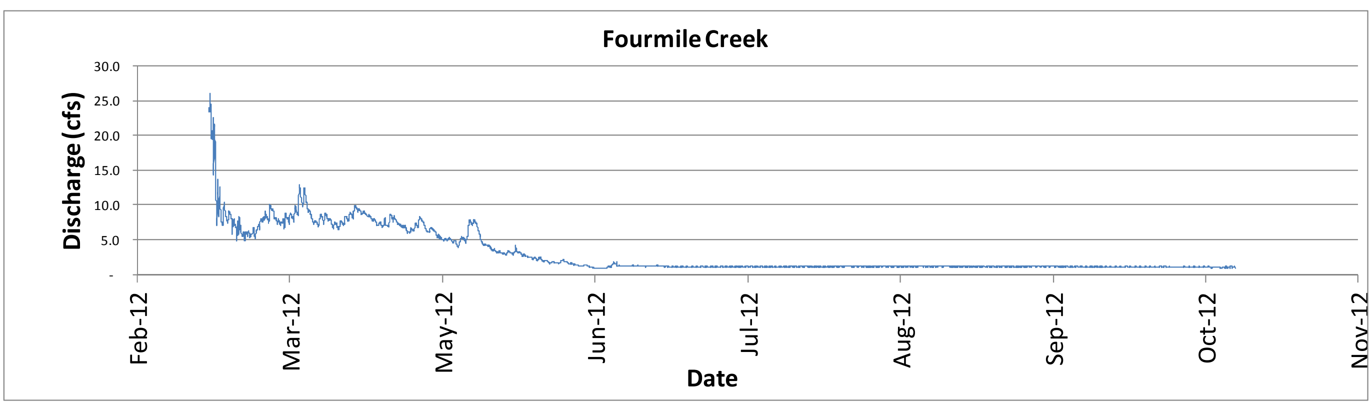


Figure 3.5-13 Temporary Stream Gage: Fourmile Creek Hydrograph.

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 3.6-1 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. 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 3.6-2). 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 Little Snake River / Vermillion Creek 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 Little Snake River / Vermillion Creek 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 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 3.6-3 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 3.6-4 Example Type B Channel: Battle Creek.

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 3.6-4). 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.

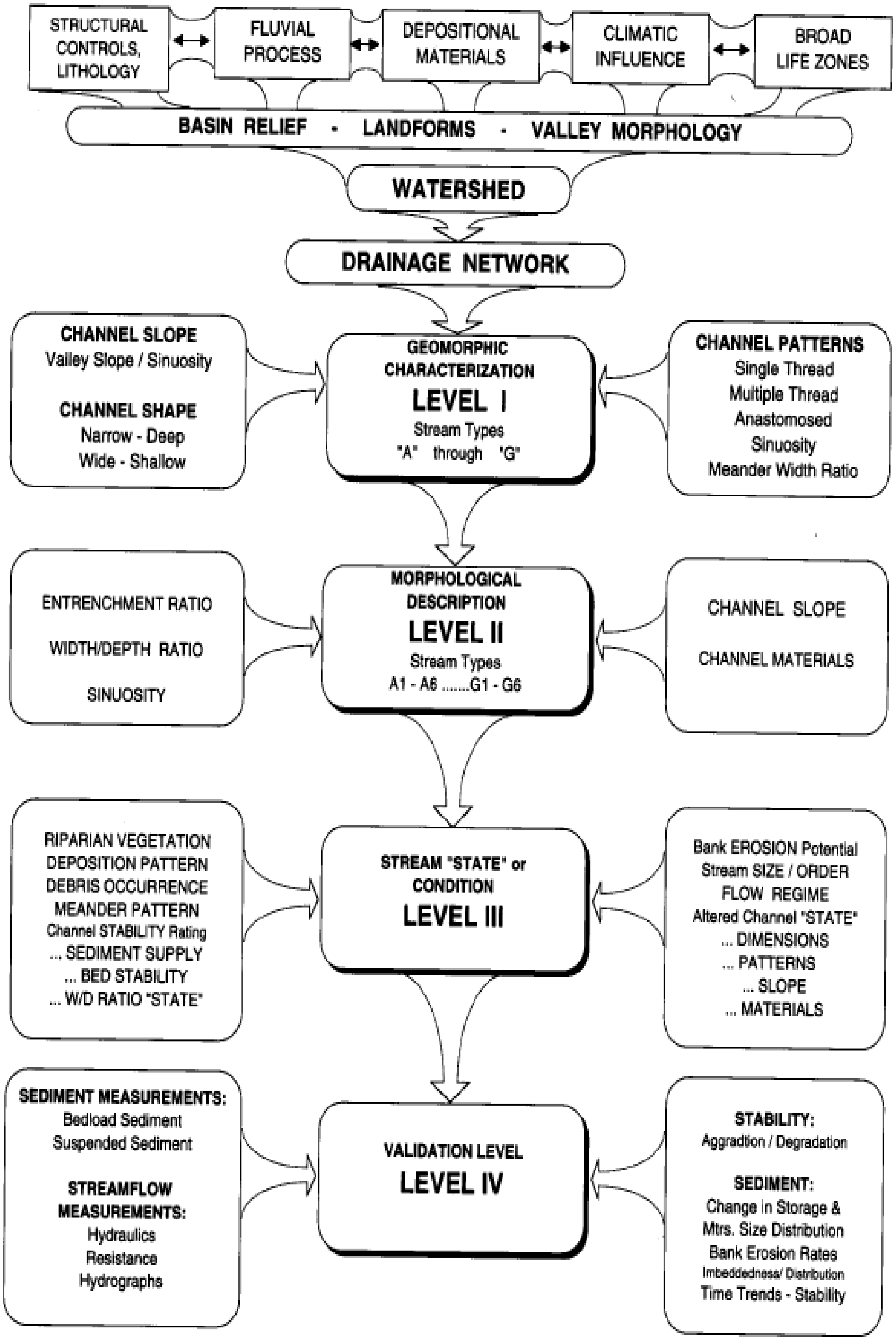


Figure 3.6-1 Hierarchy of the Rosgen Stream Classification System.

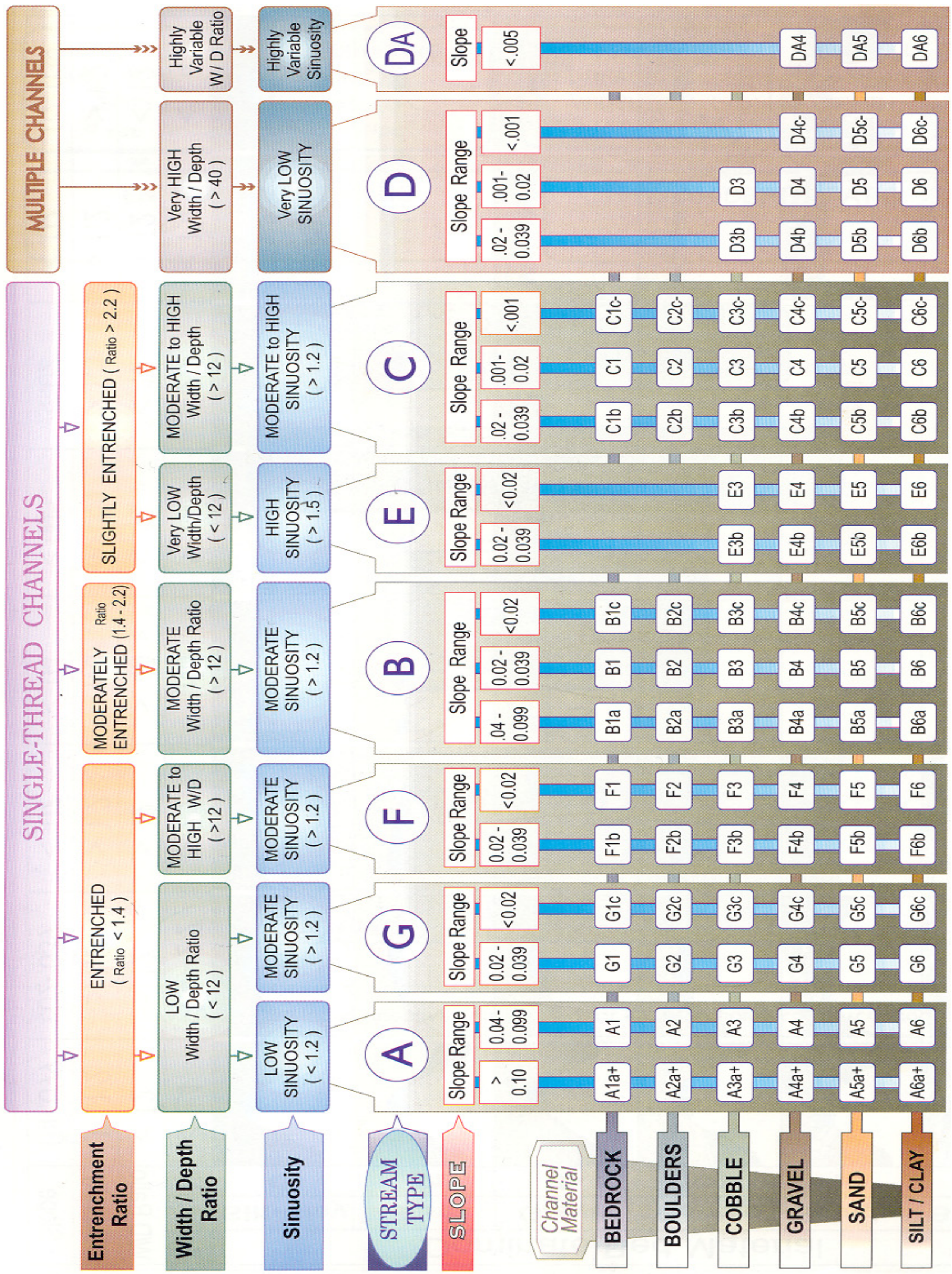


Figure 3.6-2 Rosgen Classification Matrix (Rosgen, 1996).

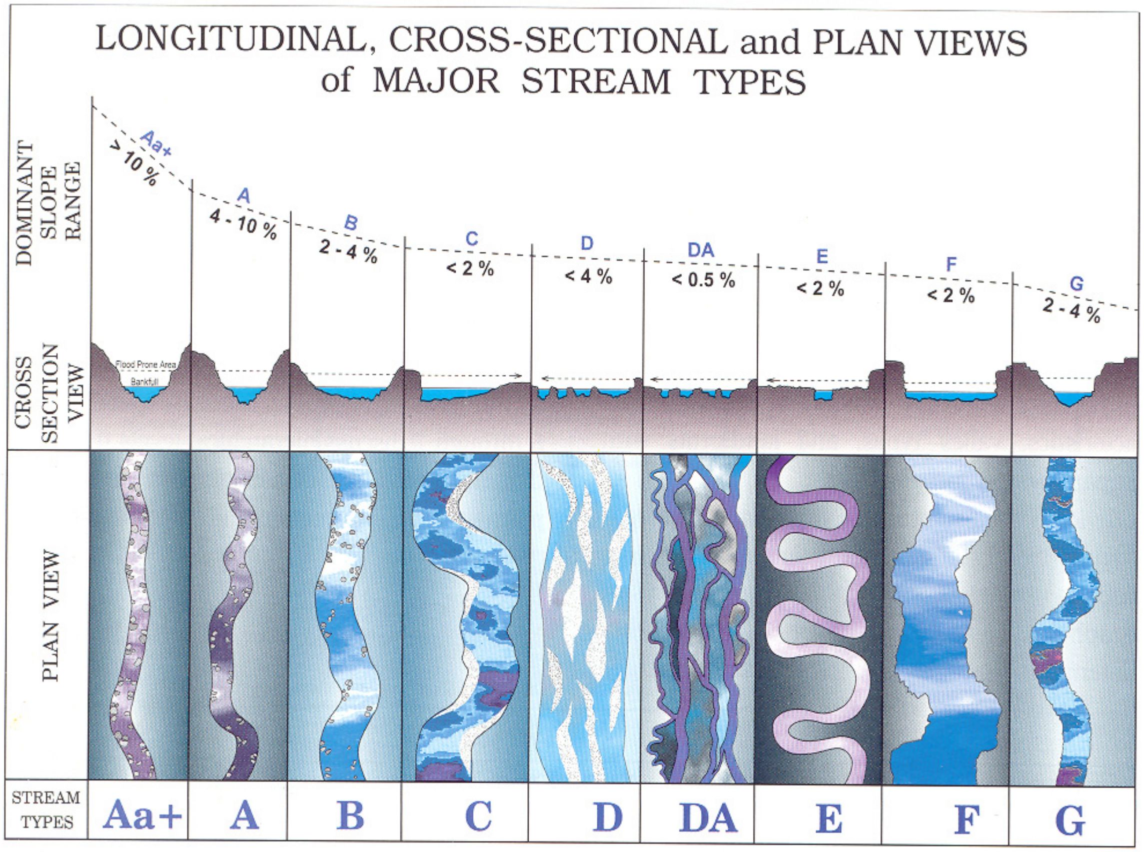


Figure 3.6-3 Major Stream Types within the Rosgen Classification System (Rosgen, 1996).

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 3.6-5). 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 3.6-5 Example Type C Channel: Savery Creek.

E-Type Channels are somewhat similar to C channels, as they form as single threads with defined, accessible floodplain areas. 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.

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 prone to instability, and channel widening commonly occurs within the entrenched channel cross section (Figure 3.6-6).

Figure 3.6-6 Example Type F Channel: Canyon Creek.

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 3.6-7).

Figure 3.6-7 Example Type G Channel: Unnamed Tributary to Canyon 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 2011 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 3.6-2, 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 effort are presented in Table 3.6-1 and graphically in Figure 3.6-8. 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.

The Little Snake River and its primary tributaries originate in the steeper slopes of the Sierra Madre Mountains. Within the mountainous areas, the channels are steep and bounded by very coarse, resistant materials that include hillslope colluvium and bedrock. As a result, the channels are laterally stable, and geomorphically resilient with respect to human impacts. Channel change in these upper subreaches typically results from punctuated hillslope processes rather than gradual channel migration. The channels are A-type or B-type channels which reflects their steep slope and stable boundaries.

As the major stream channels descend into the lower basin, the lateral confinement is reduced, the slope lessens and the boundary materials become less coarse. As a result of these downstream changes in boundary conditions, the lower subreaches tend to display meandering channel dynamics; that is, pool/riffle development and increased lateral channel migration. The channels transition from B-type channels, which are located in transition zones at the foot of the mountains, to C-type channels, which are gravel bed meandering streams that dominate the lower basin.

The Little Snake River was classified as a C-type channel for most of its extent. This classification is based upon the 'processes' observed and not strict adherence to classification based solely upon sinuosity, entrenchment, and slope. Throughout most of its extent, the Little Snake River appears to have access to its floodplain on at least one of its banks. Review of existing aerial photography distinctly shows evidence of the naturally occurring meandering pattern of the lower Little Snake River. In the reach between Savery and Baggs, a considerable amount of channel stabilization has taken place in recent years in an effort to minimize channel migration and its associated streambank erosion. Landowners state that large amounts of land have been lost due to channel migration/erosion. The LSRCD, in coordination with the NRCS, has completed several miles of bank stabilization using a combination of approaches including techniques, including placement of rock groins/veins, cross vane weirs, and bioengineered solutions.

Elsewhere in the watershed, private landowners have completed a range of stream channel stabilization and habitat improvement projects. For example, in the upper Little Snake River, the Three Forks Ranch, in coordination with Wildland Hydrology completed a channel/habitat improvement project on 14.4 miles of the Little Snake River near Slater. Other examples of stream channel rehabilitation efforts include the following:

- Hayrack Draw Stream Restoration on Savery Creek was completed by the Cobb Cattle Company, the LSRCD, and the NRCS,
- Battle Creek Restoration at the Fran Marsh Diversion Project was completed by the Ladder Livestock Company, the LSRCD and the NRCS, and
- Cobb Cattle Company Stream Reach of Savery Creek was completed by the Cobb Cattle Company, the LSRCD and the NRCS.

Table 3.6-1 Summary of Rosgen Level I Classification Results.

Stream	Reach Number	Station (Distance from Mouth)		Reach Length (ft)	Sinuosity	Slope	Rosgen
		Station Start (ft)	Staion End (ft)				
Alkali Creek	1	0	115,777	115,777	1.75	0.004	C
	2	115,777	186,034	70,257	1.35	0.011	B
Barrel Springs Draw	1	0	82,679	82,679	1.50	0.001	F
	2	82,679	177,836	95,157	1.27	0.003	F
Battle Creek	1	0	61,420	61,420	1.18	0.012	B
	2	61,420	107,139	45,720	1.07	0.031	A
Canyon Creek	1	0	17,738	17,738	1.37	0.008	F
	2	17,738	75,311	57,574	1.13	0.018	A
Cherokee Creek	1	0	52,004	52,004	1.77	0.003	C
	2	52,004	69,285	17,281	1.19	0.013	B
Cow Creek	1	0	46,114	46,114	1.55	0.004	F
	2	46,114	96,107	49,993	1.15	0.013	B
Deep Creek	1	0	30,155	30,155	1.81	0.003	F
	2	30,155	69,527	39,371	1.99	0.005	F
Dry Cow Creek	1	0	28,547	28,547	1.42	0.002	F
	2	28,547	60,690	32,143	1.53	0.004	F
Little Savery Creek	1	0	36,443	36,443	1.97	0.004	C
	2	36,443	82,125	45,682	1.75	0.003	B
Little Snake River	1	0	183,294	183,294	2.05	0.001	E
	2	183,294	280,668	97,374	1.66	0.002	C
	3	280,668	380,874	100,205	1.55	0.002	C
	4	380,874	445,128	64,254	1.18	0.005	B
Muddy Creek	1	0	154,456	154,456	2.08	0.001	F
	2	154,456	170,963	170,963	2.03	0.001	F
	3	170,963	618,229	292,811	2.31	0.002	C
Sand Creek	1	0	88,371	88,371	1.16	0.002	C
	2	88,371	256,497	168,126	1.19	0.003	C
Savery Creek	1	0	58,436	58,436	1.18	0.006	C
	2	58,436	182,494	124,057	1.83	0.004	C
	3	182,494	242,317	59,823	1.18	0.017	A
Shell Creek	1	0	104,249	104,249	1.66	0.002	F
	2	104,249	162,486	58,237	1.22	0.001	F
	3	162,486	227,781	65,294	1.08	0.004	A
Vermillion Creek	1	0	92,070	92,070	1.65	0.005	F
	2	92,070	186,353	94,283	1.22	0.024	B
Wild Cow Creek	1	0	47,197	47,197	1.52	0.004	F
	2	47,197	80,234	33,037	1.41	0.007	F
Willow Creek	1	0	48,625	48,625	1.31	0.004	F
	2	48,625	119,605	70,981	1.68	0.003	F

Design reports associated with each of these projects are included in the Little Snake River Digital Library.

Also worth noting in this section of the report, is the stabilization structure located on upper Muddy Creek. The structure is reported to have been constructed in order to stabilize headcutting of Muddy Creek which was initiated by construction of Highway 789. Removal of a channel meander resulted in increased channel slope and water velocities. Ultimately, headcutting in excess of 20-ft occurred (Gregory, 2009). Figure 3.6-9 displays photos of the structure and view of both upstream and downstream conditions.

Figure 3.6-9 Muddy Creek Gradient Restoration Structure. From Left to right, view downstream, view of the structure, and view upstream.

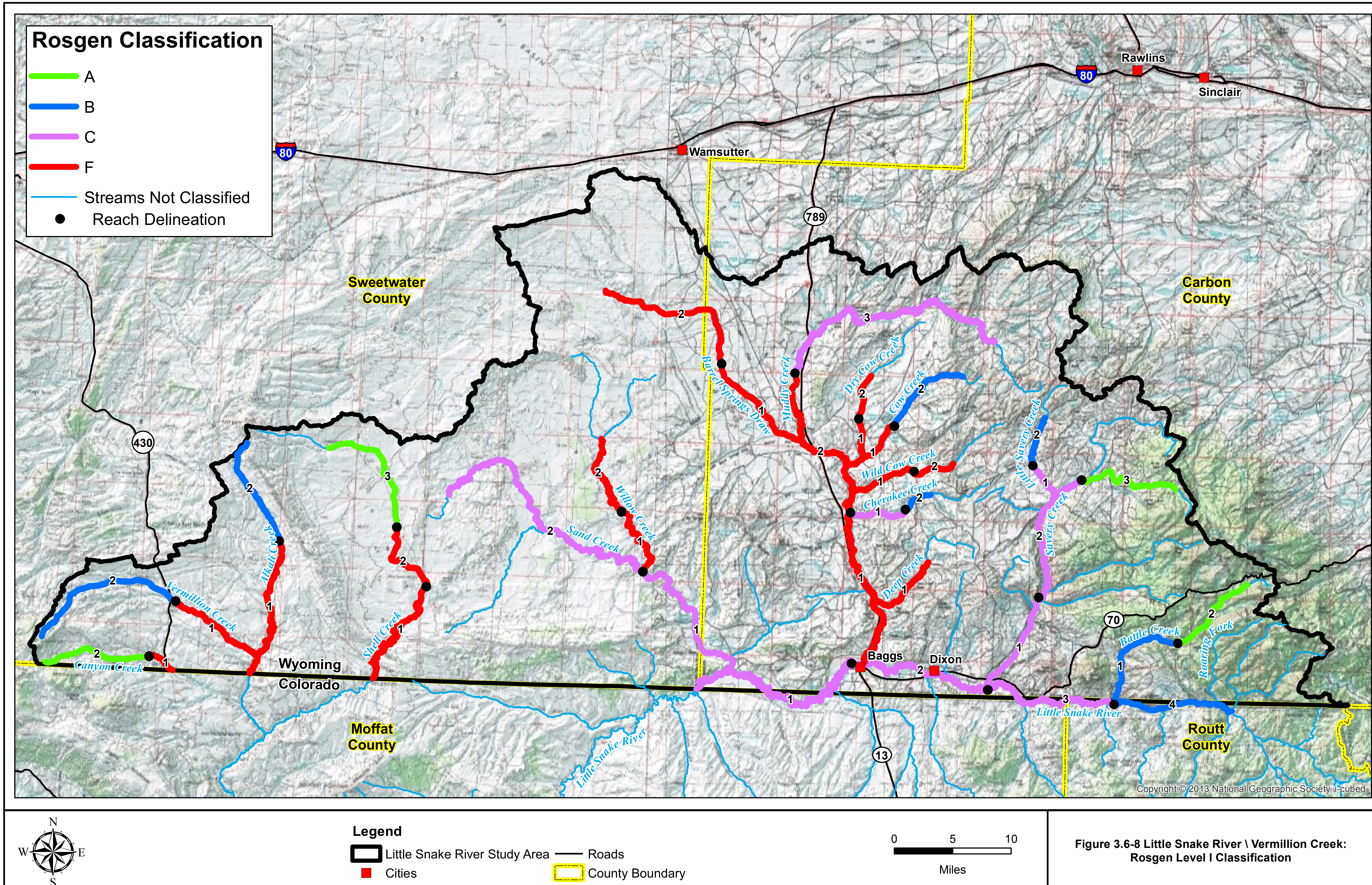


Figure 3.6-8 Little Snake River \ Vermillion Creek: Rosgen Level I Classification

Many of the first-order tributaries in the lower portions of the basin can be classified as G-Type channels, or gullies. These channels are highly erosive, generate high sediment volumes, and can result in the loss of productive lands and destabilize upland conditions. Observation of many of these channels indicates that while the major stream channels appear to have achieved a level of stability, the upper reaches of the watershed are still suffering a level of destabilization. These channels could be forming in response to one or more of numerous stimuli including but not necessarily limited to: channel realignment (straightening), road and culvert construction, range management practices, or base-level lowering associated with main channel incision.

It is evident that the differences in bedrock geology between the western and eastern slopes of the watershed are important factors controlling the character of stream channels formed within them. On the eastern side of the basin lie harder bedrock formations. Bed material of streams encountered here typically consists of boulders, cobbles, and gravels. In the western extent of the basin (i.e., Muddy Creek, Shell Creek, Sand Creek, Vermillion Creek, Canyon Creek, etc) lie softer sandstones and shales. These formations are less cohesive and consequently more easily eroded. Stream channels located here have bed materials consisting of finer gravels and sands. Headcuts encountered in this region are indicative of the erosive nature of the region.

3.6.3 Proper Functioning Condition

The condition of approximately 59 miles of stream channel on federal lands has been evaluated by BLM staff and the results incorporated herein. 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 assessment are shown on Figure 3.6-10. As evidenced in this figure, the PFC assessment results in evaluation of specific and frequently isolated stream reaches.

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, lateral channel migration would be the primary geomorphic concern associated with the Little Snake River. The lateral movement of the channel is associated with the river's natural tendency to meander within its floodplain. Although the floodplain is generally not heavily developed, channel migration injures land use activities and potentially land values (Figure 3.6-11).

Figure 3.6-11 Localized Streambank Erosion on the Little Snake River.

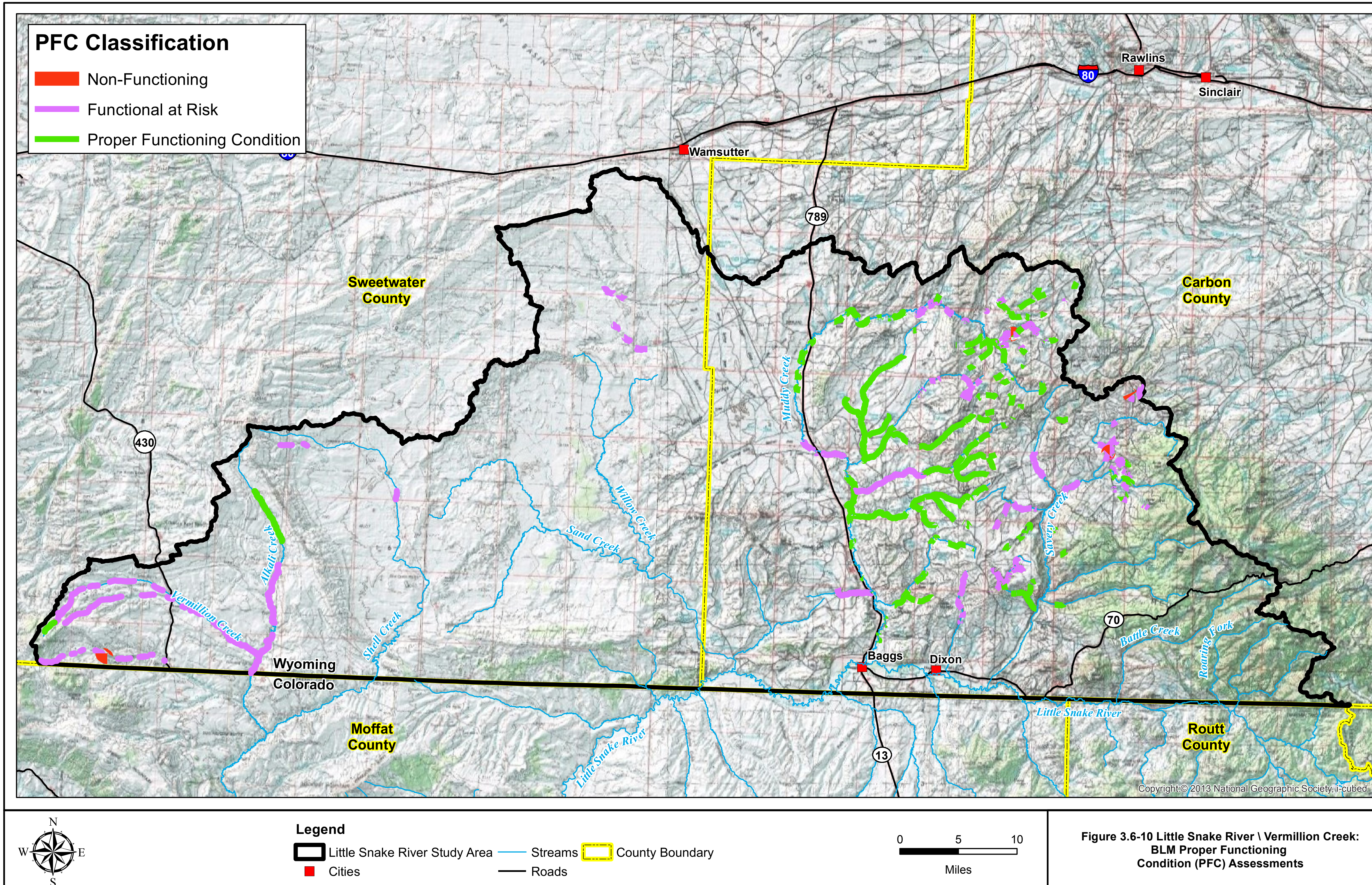


Figure 3.6-10 Little Snake River \ Vermillion Creek: BLM Proper Functioning Condition (PFC) Assessments

Reaches of perennial tributaries to the Little Snake River commonly displayed indications of riparian degradation as evidenced by bank erosion, loss of riparian habitat, channel widening, channel degradation, etc. For example, Savery Creek flows across lands owned by the WWDC. In this reach, the channel has experienced channel widening and loss of aquatic and riparian habitat. At the request of the WWDC, the project team conducted a more detailed evaluation of channel conditions and developed a channel restoration plan. This effort is discussed in Chapter 4 of this report.

Channels classified as F-type channels are common in the lower portions of the study area (ex. Muddy Creek – Figure 3.6-12). Reaches of these streams are entrenched and consequently have lost connection with their floodplains. Some streams are heavily incised and restoration could be problematic (ex. incised portions of Canyon Creek).

Figure 3.6-12 Incised Channel on Muddy Creek.

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.

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. This list is included in the project Digital Library for reference. Figure 3.7-1 displays the classifications within the Little Snake River / Vermillion Creek watershed 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:

> *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.*
>
> C*lass 2C waters are those known to support or have the potential to support only nongame fish populations or spawning and nursery areas at least seasonally including their perennial tributaries and adjacent wetlands. Class 2C waters include all permanent and seasonal nongame fisheries and are considered "warm water". Uses designated on Class 2C waters include nongame fisheries, fish consumption, aquatic life other than fish, recreation, wildlife, industry, agriculture, and scenic value.*
>
> *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."*

ID	WYPDES Permit Number	Permittee	Facility Name	Receiving Water Description	Permit Type
1	WY0022888	Baggs, Town of	Baggs Wastewater Lagoons	Ledford Slough (2C), Little Snake River Basin	Sanitary Wastewater
2	WY0021938	Dixon, Town of	Dixon Wastewater Lagoon	Little Snake River (2AB) via an unnamed slough (3B).	Sanitary Wastewater
3	WY0042145	Double Eagle Petroleum and Mining Company	Cow Creek Unit	Little Snake River (2AB) via Muddy Creek (2C) via Cow Creek (2C) via Dry Cow Creek (3B) via an on-channel "LSRCD Reservoir" (3B), located on an unnamed, ephemeral tributary (3B)	Coal Bed Methane
4	WY0042145	Double Eagle Petroleum and Mining Company	Cow Creek Unit	Little Snake River (2AB) via Muddy Creek (2C) via Cow Creek (2C) via Dry Cow Creek (3B) via an on-channel "LSRCD Reservoir" (3B), located on an unnamed, ephemeral tributary (3B)	Coal Bed Methane
5	WY0054038	Double Eagle Petroleum and Mining Company	Cow Creek CBNG Project	Little Snake River (2AB) via Muddy Creek (2C)	Coal Bed Methane
6	WY0054038	Double Eagle Petroleum and Mining Company	Cow Creek CBNG Project	Little Snake River (2AB) via Muddy Creek (2C)	Coal Bed Methane
7	WY0054038	Double Eagle Petroleum and Mining Company	Cow Creek CBNG Project	Little Snake River (2AB) via Muddy Creek (2C)	Coal Bed Methane

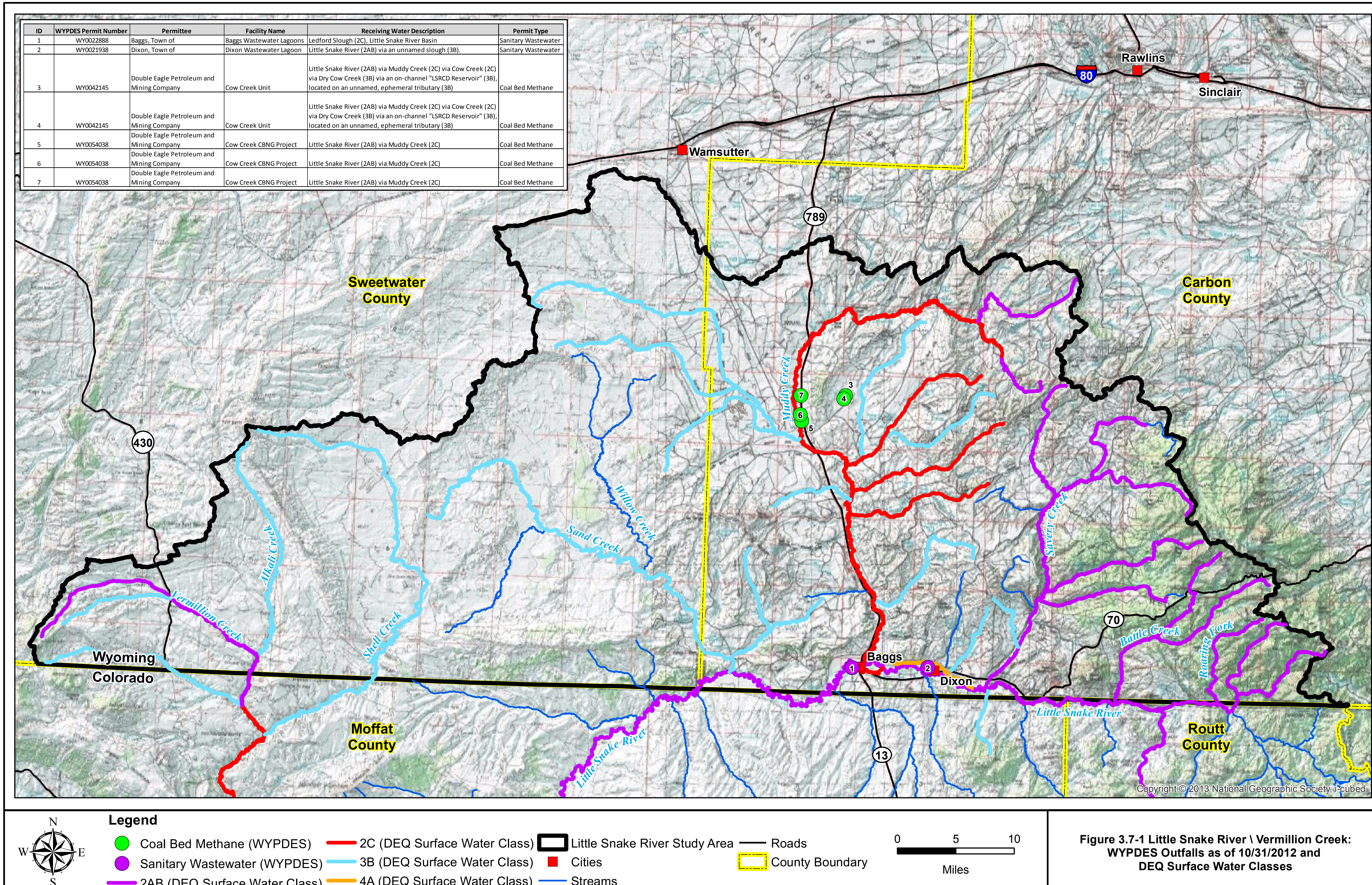


Figure 3.7-1 Little Snake River \ Vermillion Creek: WYPDES Outfalls as of 10/31/2012 and DEQ Surface Water Classes

3.7.2 WYPDES Permitted Discharges

A database of permitted discharges under the National Pollution Discharge Elimination System (NPDES) was obtained from the Wyoming Department of Environmental Quality. A total of four active (WYPDES) permitted discharges are present within the study area. Table 3.7-1 summarizes pertinent information regarding the permits. The locations of these discharges are shown on Figure 3.-7-1.

Table 3.7-1 Summary of WYPDES Permitted Discharge Locations.

WYPDES Permit Number	Permittee	Facility Name	Receiving
WY0021938	Dixon, Town of	Dixon Wastewater Lagoon	Little Snake River (2AB) via an unnamed slough (3B).
WY0022888	Baggs, Town of	Baggs Wastewater Lagoons	Ledford Slough (2C), Little Snake River Basin
WY0042145	Double Eagle Petroleum and Mining Company	Cow Creek Unit	Little Snake River (2AB) via Muddy Creek (2C) via Cow Creek (2C) via Dry Cow Creek (3B) via an on-channel "LSRCD Reservoir" (3B), located on an unnamed, ephemeral tributary (3B)
WY0054038	Double Eagle Petroleum and Mining Company	Cow Creek CBNG Project	Little Snake River (2AB) via Muddy Creek (2C)

3.7.3 Waters Requiring TMDLs

At this time, none of the water bodies within the project study area have been included in the 303(d) lists nor are there indications they will be in the foreseeable future.

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.

3.8 Irrigation System Inventory

3.8.1 Overview

Several previous investigations into the irrigation infrastructure within the study area have been completed on behalf of the WWDC, including:

- Little Snake River Basin Planning Study Volume II: Evaluation of Irrigation Diversion Dams and Principal Water Supply Ditches, Part A – Diversion Dams, Wester Water Consultants, 1992,
- Little Snake River Basin Planning Study Volume II: Evaluation of Irrigation Diversion Dams and Principal Water Supply Ditches, Part B – Principal Ditches, Wester Water Consultants, 1992,
- West Side Canal Rehabilitation of the Jon's Drop Structure and the Four Mile Flume, Level II study, States West Water Resources Consultants, 2002,
- Little Snake Canals, Level II Study, Aqua Engineering, 2002.

The most recent study, completed by Aqua Engineering in 2012, completed system inventories on the study area's four major irrigation ditch systems:

- West Side Ditch
- Stateline Ditch
- First Mesa Ditch, and the
- Baggs Ditch.

Consequently, in order to avoid redundancy in efforts, the irrigation system inventory phase of this Level I investigation did not re-inventory the previously evaluated systems. Results of those studies were incorporated directly into the watershed management plan, most notably the results of the study completed by Aqua Engineering (Chapter 4).

For the purposes of this study, specific irrigation structure inventories and evaluations were conducted at the request of irrigators/stakeholders at locations identified by them.

Specific tasks completed during this effort included the following:

- interviewing ditch representatives and users;
- field inventory of ditch structures;
- inventory of physical ditch conditions;
- assessment of hydraulic efficiency of existing ditch structures;
- photographic documentation of structures and an assessment of their condition;
- location of the structures using GPS technology; and
- incorporation of data into the project GIS.

With the exception of the larger ditches mentioned above, irrigation ditches within the Little Snake River / Vermillion Creek Study Area can generally be characterized as small, privately owned systems. Based upon a review of water rights within the basin, irrigated acreage under the existing systems ranges from less than 20 acres on small individually owned and managed systems to approximately 1,000 acres on the largest. According to representatives of the Wyoming State Engineers Office (WSEO), many of the ditches are equipped with discharge measuring devices of some sort (i.e., flumes, weirs, etc).

Possible improvements include rehabilitation or replacement of existing infrastructure, bank stabilization (particularly near structures), and installation of new structures. Many of the ditch system components inspected are significantly deteriorated and have exceeded their design life. Several ditches were built prior to statehood and have been nursed along over the years through the efforts of private landowners.

Due to the fact that only problematic structures were visited, results of the irrigation structure inventories are incorporated directly into the watershed management plan (Chapter 4).

3.9 Water Storage and Retention

A number of potential benefits of additional storage have been identified during the course of this study and are recommended for more detailed evaluation should a storage project(s) advance to the next level of study. The potential benefits of additional storage would vary as a function of the size and cost of the facility, but could include the following:

- Provision of a source of late season irrigation water,
- Enhancement/establishment of late-season stream flows to benefit aquatic and wildlife species, riparian habitat, and livestock,
- Provision of additional direct wildlife/livestock watering opportunities and potential to serve gravity-fed watering systems,
- Reduction of flooding impacts to the aquatic and riparian habitats downstream and potentially downstream municipalities,
- Improvement of stream bank/channel conditions,
- Establishment of a lake fishery,
- Provision of seasonal recreational opportunities (consistent with meeting other needs and achieving other benefits).

In the sections which follow, results from previous water resources investigations and the hydrologic modeling conducted in support of them are presented. It was beyond the scope of this project to update or develop hydrologic models associated with the project study area. Consequently, not all streams or subwatersheds within the Little Snake River / Vermillion Creek project study area are included in the results.

3.9.1 Surface Water Availability and Shortages

The evaluation of flows available for potential storage projects versus irrigation shortages within the watershed was conducted using a StateMod developed as part of the Little Snake River Supplemental Supply Study, Level II (SWWRC, 2013). StateMod is a monthly and daily surface water allocation and accounting model capable of simulating various historical and future water management policies in a river basin.

StateMod allocates water to a diversion, instream flow, or reservoir based upon physically available river flow, legally available flow (priority), decreed right, delivery capacity and demand. Following is an abbreviated description of the stream allocation scheme:

- Water availability is determined at each river node to include both native inflows and return flows accruing from a prior time step.
- The most senior direct, instream, storage, well or operational water right is identified.
- Diversions are estimated to be the minimum of the decreed water right, structure capacity, demand, and available flow in the river. For a direct flow or reservoir right, the available flow in the river is the minimum of the diverting or downstream node plus any of the diverting right's return flow to that node. For an instream right, the available flow in the river is the flow at each river node within the instream reach. For a well, pumping is not constrained by the available flow in the river since pumping may deplete ground water storage.
- Downstream flows are adjusted to reflect the senior diversion and its return flows.
- Return flows for future time periods are determined and stored.
- Well depletions for future time periods are determined and stored.
- The process is repeated by priority for each successive direct, instream, storage, well and operational water right.

Input to the model includes:

- Historical crop consumptive use
- Climate Data
- Irrigated acreage
- Diversion structure and diversion records
- Permitted water rights

3.9.1.1 StateMod Results

The initial model scenario was run to develop an estimate of baseline irrigation shortages and water availability based on current conditions. The Baseline Scenario utilizes the irrigation water requirement for current irrigated acreage divided by the monthly efficiency as irrigation demands, and uses current High Savery Reservoir operations with releases to downstream water users. Shortages of approximately

2,570 acre-feet were demonstrated using the StateMod model as indicated in Table 3.9-1 (SWWRC, 2013). Note that the StateMod model does not incorporate tributaries which join the Little Snake River in Colorado (i.e., Vermillion Creek, Canyon Creek, Shell Creek, or Alkali Creek).

Table 3.9-1 StateMod Model Results.

Location	Demand	Divert	Shortage	%Short
Little Snake Above Battle Creek	2,812	2,362	450	16%
Battle Creek	3,135	2,760	375	12%
Little Snake Above Savery Creek	865	682	183	21%
Savery Creek	12,109	10,658	1,451	12%
Savery Creek Above Upper Station	2,322	1,816	506	22%
Savery Creek Below Upper Station	9,787	8,842	945	10%
First Mesa Canal	12,402	12,348	54	0.40%
Westside Canal	17,240	17,222	18	0.10%
Little Snake Above Muddy Creek	3,067	3,053	14	0.50%
Little Snake Below Muddy Creek	3,043	3018	25	0.80%
TOTAL	54,673	52,103	2,570	5%

The model was then run to evaluate the available water for each of the reservoir alternatives evaluated in the study. The SWWRC report further indicates that "on average, there appears to be some available flow in the basin that could be captured for storage. Overall, the available peaks in the spring months of May and June, with some availability in July" (SWWRC, 2013). It must be kept in mind that the StateMod model evaluates availability at specific locations; in this case each of the nine potential reservoir locations they were evaluating. For basin-wide estimates of availability for storage, the WWDC's basin planning models are referenced.

3.9.1.2 Green River Basin Model

The Green River Basin Model is a water accounting spreadsheet that incorporates multiple diversions, gaging stations, and other water resources data within the Green River Basin. One of the primary purposes of the model is to provide a planning tool for Green River Basin water users and the State of Wyoming for use in determining those river reaches in which flows may be available to Wyoming water users for future development.

For the purposes of this study, the spreadsheet model was utilized without modification. The Green River model consists of four individual spreadsheet models, each representing a specific subbasin of the watershed. One of the individual spreadsheet models focused on the Little Snake River watershed. The individual spreadsheet models are linked to enable data generated in one model to be "passed along" to subsequent models. Furthermore, models were generated to reflect each of three hydrologic conditions: dry, normal, and wet year water supply.

The spreadsheets each represent one calendar year of streamflow data, on a monthly time step. Each spreadsheet relies on a calibration model that reflects available historical data from the 1971 to 2007 study period to estimate the hydrologic conditions. Streamflow, consumptive use, diversions, and irrigation return flows are the basic input data to the model. For all of these data, average values drawn from the dry, normal, or wet subset of the study period were computed for use in the spreadsheets. The model does not explicitly account for water rights, reservoir operations, compact allocations, or the management of the basin water supply based on these legal constraints. It is assumed that the historic discharge data reflect effects of any limitations that may have been placed upon water users by water rights or compact restrictions as well as reservoir operations.

To mathematically represent the Green River system subbasins, each basin was first divided into reaches based primarily upon the location of USGS gaging stations. Each reach was then sub-divided by identifying a series of individual nodes representing locations where diversions occur, basin imports are added, tributaries converge, or other significant water resource features are located.

At each node, a water budget computation is completed to determine the amount of water that flows out of the node. Total flow into the node and diversions or other losses from the node are calculated. The difference between total inflow and diversions/losses is the amount of flow available to the next node downstream. Mass balance, or water budget calculations, are repeated for all nodes in a reach, with the outflow of the last node being the inflow to the beginning node in the next reach. Figure 3.9-1 displays a graphical representation of the water balance approach. For each reach, ungaged stream gains (e.g., ungaged tributaries, groundwater inflow, and return flows from unspecified diversions) and losses (e.g., seepage, evaporation, and unspecified diversions) are taken as the difference between average historical gage flows (or outflows) and model-predicted outflow from the reach. Stream gains are input at the top of a reach to be available for diversion throughout the reach and losses are subtracted at the bottom of each reach.

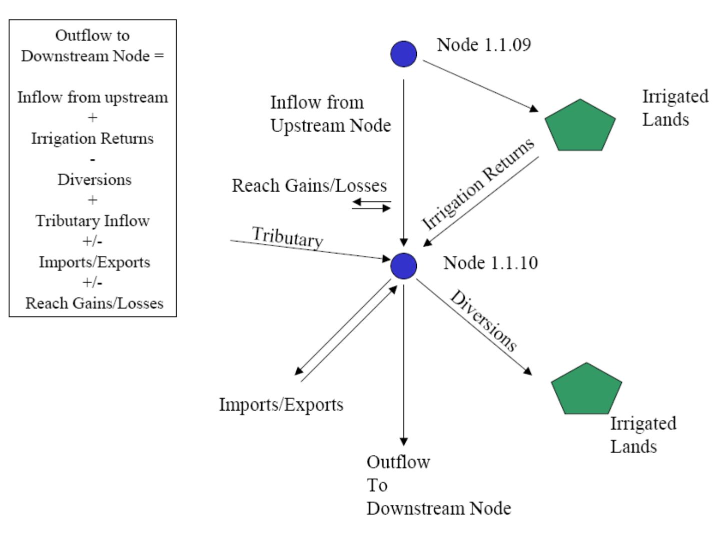


Figure 3.9-1 Diagram of Model Water Budget Computations.

3.9.1.3 Model Limitations

There are several limitations to the model, which must be considered when reviewing the model and results generated by its use. These limitations and their implications with respect to a determination of water availability are discussed below:

- Use of a monthly time step in the river simulation may result in the exclusion of peak flows on 'flashier' systems. These peaks would be incorporated within the monthly average streamflows within the model; however, in instances where peaks exceed demand, the monthly time step could result in underestimation of available flows.
- The spreadsheet model does not explicitly account for diversions from the river in accordance with Wyoming water law and is not operated on these legal principals. Simply stated, this means that the model cannot forego a diversion to an upstream junior water appropriator to satisfy a downstream senior water right.
- The basin planning model was originally developed under the assumption that if this situation occurred historically, the diversion data would reflect this occurrence and the junior appropriator would incur a shortage.
- The model does not incorporate reservoir operational rules for release or storage of water. Consequently, evaluation of changes in practices that accompany reservoirs is problematic. For each simulation condition (normal-, dry- and wet-year conditions), reservoir releases do not deviate from historic releases. For example, releases from Boysen Reservoir remain consistent with historic patterns despite changes to reservoir inflow and storage. The implication of this limitation is that Boysen Reservoir behaves as a "buffer" between the upper and lower portions of the basin.
- The model uses data generated outside of the program in several instances. Consequently, evaluation of different water usage scenarios involving this data is cumbersome. For example, the model does not directly facilitate evaluation of effects of improvements to farm irrigation practices resulting in increased irrigation efficiency without recalculation of input data outside of the model environment.
- The spreadsheet model does not contain logic to evaluate impacts upon the state's obligations under the Colorado River Compact (Compact).
- Comparison of historic data with full supply diversion estimates indicates that irrigators typically operate under supply-limited conditions. The model simulates diversion data related to a multitude of uses (irrigation, municipal, industrial, etc.). Given the magnitude of the irrigation diversions, however, special attention is devoted to the water requirements associated with irrigated lands. To fully understand this potential limitation, it is important to know that the spreadsheet model can be run in three different modes:
- *Calibration (Historical):* This mode simulates the historical diversions where data are available. This mode is typically used for model calibration because historic diversion data are utilized.

- *Full Supply for Existing Irrigated Lands:* This mode reflects full supply diversions, based on computed diversion requirements for existing irrigated lands (lands presently irrigated and mapped during the planning process).
- The spreadsheet model does not incorporate tributaries which join the Little Snake River in Colorado (i.e., Vermillion Creek, Canyon Creek, Shell Creek, or Alkali Creek).

3.9.1.4 Available Flows Analysis

To determine how much of the physical supply is actually available for storage at any given model node, "available water" was defined as that portion of the physically available streamflow that could be stored without causing a shortage to existing water users in any downstream river reach on the Little Snake River. *In other words, the water available at any node was determined as the minimum of the physically available flow at that point or the minimum available flow at any node downstream in the system.* As noted previously, this evaluation is made on a water budget basis (inherent to the Basin Plan model) and does not directly incorporate individual water rights.

Results of the availability analyses indicate that there is flow available for storage without incurring a shortage in downstream reaches as summarized in Table 3.9-2 (Dry Year Condition) and Table 3.9-3 (Normal Year Condition) for modeled stream nodes within the watershed. The total annual available flow for the entire Little Snake River watershed (represented by Node No. 16.14) is estimated in the model as over 177,000 ac-ft for a dry (2 out of 10 years) condition and over 406,000 ac-ft for a normal (6 out of 10 years) condition. The model results show that the large majority of available flows occur in April, May and June as would be expected in this hydrologic setting and consistent with the pattern of gaged flows as previously described.

Any availability evaluation must consider potential impacts of interstate compacts. The following excerpt from the Green River Basin Plan, Technical Memorandum: Available Surface Water Determination (AECOM, 2010) is presented:

"Compact considerations

> *The "Total" values … far exceed the remaining developable allowance as limited by the Colorado River Compact and Upper Colorado River Basin Compact. "Remaining developable allowance" is a value that depends on assumptions behind the calculation of the State's entitlement under the Compact (allowance), and the estimate of current depletions.*
>
> *Wyoming's allowance has been estimated variously by the State and Federal government. The Wyoming Water Development Office recently estimated Wyoming's allowance as either 947,800 or 842,800 af/yr, depending on the Upper Basin State's obligation under the Mexico Treaty. Since the Upper Basin States currently maintain that they have no*

Table 3.9-2 Dry Year Condition.

Node	Node Name	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Annual
1.02	Cheyenne State I & II diversions	441	431	838	3,509	7,004	3,239	750	389	347	528	485	446	18,409
1.04	North Fork Little Snake River nr Slater (09251900)	441	431	838	3,509	7,004	3,239	750	389	347	528	485	446	18,409
2.02	Middle Fork Little Snake River	688	669	1,507	7,003	14,064	6,025	1,035	534	491	868	780	700	34,364
2.04	CO diversions on Middle Fork Little Snake	688	669	1,507	7,003	14,064	6,025	1,035	534	491	868	780	700	34,364
3.01	Confluence of Middle Fork and North Fork Little Snake	1,425	1,384	3,119	14,500	29,605	14,042	2,777	1,393	1,054	1,797	1,616	1,449	74,161
4.02	South Fork Little Snake River	261	253	571	2,654	5,276	2,108	272	183	184	329	296	265	12,651
4.04	CO diversions on South Fork Little Snake	261	253	571	2,654	5,276	2,108	272	183	184	329	296	265	12,651
5.01	Confluence of South Fork Little Snake and Little Snake	1,686	1,638	3,690	17,154	34,769	15,791	2,777	1,393	1,213	2,126	1,911	1,715	85,864
5.04	CO diversions on Little Snake d/s of South Fork	1,686	1,638	3,690	17,154	34,769	15,791	2,777	1,393	1,213	2,126	1,911	1,715	85,864
6.01	Confluence of Roaring Fork Little Snake and Little Snake	1,686	1,638	3,690	17,154	34,769	15,791	2,777	1,393	1,213	2,126	1,911	1,715	85,864
6.04	CO diversions on Little Snake d/s of Roaring Fork	1,686	1,638	3,690	17,154	34,769	15,791	2,777	1,393	1,213	2,126	1,911	1,715	85,864
6.06	Little Snake River near Slater (09253000)	1,686	1,638	3,690	17,154	34,769	15,791	2,777	1,393	1,213	2,126	1,911	1,715	85,864
6.08	CO diversions below Little Snake nr Slater gage	1,686	1,638	8,224	17,154	42,953	20,525	2,777	1,393	1,213	2,126	1,911	1,715	103,316
7.04	Battle Creek near Slater (09253500)	934	934	2,058	8,268	11,072	3,208	401	227	374	1,272	1,193	1,057	30,998
8.01	Confluence of Battle Creek and Little Snake	2,162	2,572	10,282	25,422	50,260	20,525	2,777	1,568	1,581	2,986	3,105	2,511	125,751
8.04	CO diversions on Little Snake d/s of Battle Creek	2,162	2,572	10,282	25,422	50,260	20,525	2,777	1,568	1,581	2,986	3,105	2,511	125,751
9.02	Slater Creek near Slater, CO (09255000)	955	955	2,010	7,841	10,401	2,854	292	265	426	1,273	1,198	1,070	29,539
9.04	CO diversions on Slater Creek	955	955	2,010	7,841	10,401	2,854	292	265	426	1,273	1,198	1,070	29,539
10.01	Confluence of Slater Creek and Little Snake	2,162	2,804	12,292	33,263	50,260	20,525	2,777	1,814	1,596	2,986	3,742	2,511	136,732
10.04	CO diversions on Little Snake d/s of Slater Creek	2,162	2,804	12,292	33,263	50,260	20,525	2,777	1,814	1,596	2,986	3,742	2,511	136,732
10.06	WY diversions on Little Snake d/s of Slater Creek	2,162	2,804	12,292	33,263	50,260	20,525	2,777	1,814	1,596	2,986	3,742	2,511	136,732
11.02	Above High Savery Dam	778	685	228	1,934	0	1,619	982	677	690	692	735	764	9,784
11.04	High Savery Dam	778	685	228	1,934	0	1,619	2,026	6,696	1,596	790	735	764	17,850
11.06	WY diversions below High Savery and above Savery Creek at Upper Station	902	877	228	2,331	0	1,619	2,026	6,696	1,596	1,207	1,012	968	19,460
11.08	Savery Creek at Upper Station nr Savery (09255500)	902	877	228	2,331	0	1,619	2,026	6,696	1,596	1,207	1,012	968	19,460
11.10	WY diversions between Savery Creek at Upper Station and Savery Creek near Savery	1,495	1,469	1,943	8,938	6,553	2,882	2,026	6,696	1,596	1,877	1,731	1,659	38,865
11.12	Savery Creek near Savery (09256000)	1,495	1,469	1,943	8,938	6,553	2,882	2,026	6,696	1,596	1,877	1,731	1,659	38,865
11.14	WY diversions between Savery Creek near Savery and confluence	1,495	1,469	1,943	8,938	6,553	2,882	2,026	6,696	1,596	1,877	1,731	1,659	38,865
12.01	Confluence of Savery Creek and Little Snake	2,162	2,804	14,234	42,201	50,260	20,525	2,777	6,696	1,596	2,986	3,742	2,511	152,494
12.02	WY diversions between Savery Creek and First Mesa Canal	2,162	2,804	14,234	42,201	50,260	20,525	2,777	6,696	1,596	2,986	3,742	2,511	152,494
12.04	First Mesa Canal	2,162	2,804	14,234	42,201	50,260	20,525	2,777	6,696	1,596	2,986	3,742	2,511	152,494
12.06	Westside Canal	2,162	2,804	14,516	42,907	50,260	20,525	2,777	6,696	1,596	2,986	3,742	2,511	153,481
12.08	Town of Dixon	2,162	2,804	14,516	42,907	50,260	20,525	2,777	6,696	1,596	2,986	3,742	2,511	153,481
12.09	Little Snake River near Dixon (09257000)	2,162	2,804	14,516	42,907	50,260	20,525	2,777	6,696	1,596	2,986	3,742	2,511	153,481
13.02	Willow Creek near Dixon (09258000)	160	166	285	913	941	0	110	106	120	205	197	167	3,370
13.04	CO diversions on Willow Creek	160	166	285	913	941	0	110	106	120	205	197	167	3,370
13.06	WY diversions on Willow Creek	160	166	285	913	941	0	110	106	120	205	197	167	3,370
14.01	Little Snake River downstream of Dixon gage	3,424	4,115	14,516	42,907	50,260	20,525	2,777	6,696	1,596	3,285	4,696	3,780	158,576
14.04	WY diversions between Willow Creek and Muddy Creek	3,424	4,115	14,516	42,907	50,260	21,035	3,212	6,710	1,596	3,402	4,751	3,780	159,707
14.06	Town of Baggs	3,424	4,115	14,516	42,907	50,260	21,035	3,212	6,710	1,596	3,402	4,751	3,780	159,707
15.04	Muddy Creek near Baggs (9259000)	24	18	3,150	1,560	1,025	718	238	79	113	461	195	39	7,618
16.01	Confluence of Muddy Creek and Little Snake	3,447	4,133	16,713	43,672	50,260	24,776	4,216	6,710	1,596	4,021	5,014	3,819	168,378
16.04	WY diversions between Muddy Creek and state line	3,447	4,133	16,713	43,672	50,260	24,776	4,216	6,710	1,596	4,140	5,072	3,819	168,555
16.06	CO diversions on Little Snake d/s of Muddy Creek	3,447	4,133	16,713	43,672	50,260	24,776	4,216	6,710	1,596	4,140	5,072	3,819	168,555
16.08	WY diversions between state line and Little Snake near Baggs	3,447	4,133	16,713	43,672	50,260	25,322	4,216	6,710	1,596	4,259	5,130	3,819	169,279
16.10	Little Snake River near Baggs (09259700)	3,447	4,133	16,713	43,672	50,260	25,322	4,216	6,710	1,596	4,259	5,130	3,819	169,279
16.12	CO diversions below Little Snake nr Baggs gage	4,252	4,933	17,422	44,197	50,725	25,983	4,859	7,309	2,035	5,060	5,924	4,621	177,321
16.14	Little Snake River near Lily, CO (09260000)	4,252	4,933	17,422	44,197	50,725	25,983	4,859	7,309	2,035	5,060	5,924	4,621	177,321

NOTE: Results presented in units of acre-feet

Table 3.9-3 Normal Year Condition.

Node	Node Name	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
1.02	Cheyenne State I & II	506	489	805	3,243	13,497	10,553	1,999	587	457	618	570	521
1.04	North Fork Little Snake River nr Slater (09251900)	506	489	805	3,243	13,497	10,553	1,999	587	457	618	570	521
2.02	Middle Fork Little Snake	824	789	1,438	6,456	27,406	21,175	3,614	941	703	1,053	955	854
2.04	CO diversions on Middle	824	789	1,438	6,456	27,406	21,175	3,614	941	703	1,053	955	854
3.01	Confluence of Middle Fork	1,705	1,633	2,977	13,366	57,201	44,830	8,343	2,098	1,514	2,180	1,977	1,768
4.02	South Fork Little Snake River	312	299	545	2,447	10,325	7,892	1,253	336	259	399	362	324
4.04	CO diversions on South Fork	312	299	545	2,447	10,325	7,892	1,253	336	259	399	362	324
5.01	Confluence of South Fork	2,017	1,932	3,521	15,813	67,399	52,655	9,538	2,425	1,757	2,579	2,339	2,091
5.04	CO diversions on Little	2,017	1,932	3,521	15,813	67,399	52,655	9,538	2,425	1,757	2,579	2,339	2,091
6.01	Confluence of Roaring Fork	2,017	1,932	3,521	15,813	67,399	52,655	9,538	2,425	1,757	2,579	2,339	2,091
6.04	CO diversions on Little	2,017	1,932	3,521	15,813	67,399	52,655	9,538	2,425	1,757	2,579	2,339	2,091
6.06	Little Snake River near Slater	2,017	1,932	3,521	15,813	67,399	52,655	9,538	2,425	1,757	2,579	2,339	2,091
6.08	CO diversions below Little	2,017	2,907	11,973	16,741	67,399	62,681	14,455	2,820	1,757	2,579	2,339	2,091
7.04	Battle Creek near Slater	1,201	1,210	2,445	9,039	28,067	16,210	2,438	588	682	1,452	1,357	1,192
8.01	Confluence of Battle Creek and Little Snake	3,218	4,118	14,418	25,781	95,300	78,533	15,290	3,353	2,111	4,031	3,695	3,283
8.04	CO diversions on Little	3,218	4,118	14,418	25,781	95,300	78,533	15,290	3,353	2,111	4,031	3,695	3,283
9.02	Slater Creek near Slater, CO	1,205	1,214	2,373	8,565	26,348	15,119	2,211	602	708	1,442	1,352	1,197
9.04	CO diversions on Slater	1,205	1,214	2,373	8,565	26,348	15,119	2,211	602	708	1,442	1,352	1,197
10.01	Confluence of Slater Creek	4,424	5,332	16,791	34,346	121,590	93,526	15,290	3,936	2,111	5,473	5,047	4,327
10.04	CO diversions on Little	4,424	5,332	16,791	34,346	121,590	93,526	15,290	3,936	2,111	5,473	5,047	4,327
10.06	WY diversions on Little	4,424	5,332	16,791	34,346	121,590	93,526	15,290	3,936	2,111	5,473	5,047	4,327
11.02	Above High Savery Dam	778	685	310	1,934	3,855	4,693	982	677	690	692	735	764
11.04	High Savery Dam	778	685	310	1,934	3,855	4,693	2,638	7,320	1,802	790	735	764
11.06	WY diversions below High	1,057	1,027	310	2,942	8,978	7,658	3,432	7,503	2,018	1,356	1,117	1,038
11.08	Savery Creek at Upper	1,057	1,027	310	2,942	8,978	7,658	3,432	7,503	2,018	1,356	1,117	1,038
11.10	WY diversions between	1,885	1,847	2,148	10,470	29,037	18,228	4,556	7,692	2,111	2,251	1,995	1,834
11.12	Savery Creek near Savery	1,885	1,847	2,148	10,470	29,037	18,228	4,556	7,692	2,111	2,251	1,995	1,834
11.14	WY diversions between	1,885	1,847	2,148	10,470	29,037	18,228	4,556	7,692	2,111	2,251	1,995	1,834
12.01	Confluence of Savery Creek and Little Snake	4,590	7,179	18,939	44,816	142,755	98,642	15,290	7,692	2,111	5,609	6,093	4,327
12.02	WY diversions between	4,590	7,179	18,939	44,816	142,755	98,642	15,290	7,692	2,111	5,609	6,093	4,327
12.04	First Mesa Canal	4,590	7,179	18,939	44,816	142,755	98,642	15,290	7,692	2,111	5,609	6,093	4,327
12.06	Westside Canal	4,590	7,386	19,364	46,067	142,755	98,642	15,290	7,692	2,111	5,609	6,093	4,327
12.08	Town of Dixon	4,590	7,386	19,364	46,067	142,755	98,642	15,290	7,692	2,111	5,609	6,093	4,327
12.09	Little Snake River near Dixon	4,590	7,386	19,364	46,067	142,755	98,642	15,290	7,692	2,111	5,609	6,093	4,327
13.02	Willow Creek near Dixon	213	209	429	1,252	2,292	1,269	384	204	179	245	215	206
13.04	CO diversions on Willow	213	209	429	1,252	2,292	1,269	384	204	179	245	215	206
13.06	WY diversions on Willow	213	209	429	1,252	2,292	1,269	384	204	179	245	215	206
14.01	Little Snake River downstream of Dixon gage	5,999	8,989	19,364	50,653	146,308	98,840	15,290	7,692	2,111	5,627	6,586	5,646
14.04	WY diversions between	5,999	8,989	19,364	50,653	146,434	99,354	15,823	8,474	2,545	5,812	6,664	5,646
14.06	Town of Baggs	5,999	8,989	19,364	50,653	146,434	99,354	15,823	8,474	2,545	5,812	6,664	5,646
15.04	Muddy Creek near Baggs	36	30	4,765	2,871	3,080	1,180	518	132	101	400	551	109
16.01	Confluence of Muddy Creek	6,035	9,018	21,882	53,524	150,755	103,219	19,252	9,752	3,090	6,793	7,476	5,755
16.04	WY diversions between	6,035	9,018	21,882	53,524	150,755	103,219	19,252	9,752	3,090	6,981	7,556	5,755
16.06	CO diversions on Little	6,035	9,018	21,882	53,524	150,755	103,219	19,252	9,752	3,090	6,981	7,556	5,755
16.08	WY diversions between state line and Little Snake near	6,035	9,018	21,882	53,524	150,946	104,299	20,289	9,752	3,090	7,169	7,636	5,755
16.10	Little Snake River near	6,035	9,018	21,882	53,524	150,946	104,299	20,289	9,752	3,090	7,169	7,636	5,755
16.12	CO diversions below Little	6,823	9,786	22,557	53,983	150,946	104,441	20,995	10,450	3,768	7,951	8,413	6,545
16.14	Little Snake River near Lily, CO (09260000)	6,823	9,786	22,557	53,983	150,946	104,441	20,995	10,450	3,768	7,951	8,413	6,545

NOTE: Results presented in units of acre-feet *obligation under the Mexico Treaty, only the larger of these two numbers is shown as the Compact Allowance (WWDC Estimate) in Table 3 (*Table 3.9-4 in this report*). The U.S. Bureau of Reclamation calculated Wyoming's allowance as 834,400 af in its 2007 Hydrologic Determination report, executed in support of the Navajo-Gallup Water Supply Project as required to enable a contract for water from the Navajo Indian Irrigation Project. This value is shown as Compact Allowance (USBR Estimate) in Table 3 (*Table 3.9-4 in this report*). The increment between current basin use (computed in the Basin Use Profiles of this Green River Basin Plan update) and the Compact allowance is the amount of water that could be developed by Wyoming, strictly from the Compact perspective. These values are shown as Remaining Compact Allowance, for comparison with the available surface water estimation developed by way of the spreadsheet models.*

Table 3.9-4 Remaining Compact Allowance Compared with Available Flow from Spreadsheet Models.

	Dry Condition (af/yr)	Normal Condition (af/yr)	Wet Condition (af/yr)
Municipal Use (includes City of Cheyenne at 15,300 AF/Yr.)	n/a	22,800	n/a
Industrial Use	n/a	58,800	n/a
Agricultural Use	n/a	396,200	n/a
Domestic	n/a	3,000	n/a
Evaporation - Main Stem	n/a	88,500	n/a
Evaporation - In State	n/a	32,800	n/a
Recreation Use	n/a		
Environmental Use	n/a	2,000 +/-	n/a
Total Use	n/a	604,100	n/a
Compact Allowance (USBR Estimate)[1]	n/a	834,400	n/a
Compact Allowance (WWDC Estimate)[1]	n/a	947,800	n/a
RemainingCompact Allowance (USBR Estimate)	**230,300**		
RemainingCompact Allowance (WWDC Estimate)	**343,700**		
Available Water (from Table 2)	**863,000**	**1,792,000**	**2,964,000**

Water use values based upon normal year estimates of surface water and groundwater use

The spreadsheet models do not contain logic to operate curtailment to meet the state's obligations under the Upper Colorado River Basin Compact (the Compact). The models were developed to portray historical use over the study period 1971-2007. Never during that time, nor since the Compact was ratified, have diversions been curtailed pursuant to Article IV of the Compact. While the principles under which administration should be conducted are set forth in the Compact, actual details of their application have not been worked out by the Upper Colorado River Commission. Accordingly, simulation of curtailment was outside the scope of this effort.

Article XI of the Compact addresses the division of waters of the Little Snake River, whose tributaries lie on both sides of the Colorado-Wyoming state line, and whose mainstem crosses the boundary numerous times. The Compact identifies a point just below the mouth of Savery Creek, above which pre-Compact rights are not subject to calls emanating from below the point. This administrative nuance does not alter the definition *of available flow for new or future uses above the so-called Compact point, however, since they could be regulated to satisfy senior users below the Compact point. Post-Compact rights, including future uses, below the Compact point, "shall be administered on the basis of an interstate priority schedule prepared by the Commission in conformity with priority dates established by the laws of the respective States," according to Article XI. Therefore, calculation of "available water" in this part of the basin must take into consideration the needs of downstream users in Colorado. To summarize, the method of calculating available water described above, when applied to the Little Snake including the Colorado sections of the river, is in accordance with Article XI of the Compact."*

3.9.1.5 Summary

Results of the WWDC Spreadsheet Model availability analyses indicate that there is flow available for storage without incurring a shortage in downstream reaches as summarized in Table 3.20 for modeled stream nodes within the watershed. The total annual available flow for the entire Little Snake River watershed (represented by Node No. 16.14) is estimated in the model as over 177,000 ac-ft for a dry (2 out of 10 years) condition and over 406,000 ac-ft for a normal (6 out of 10 years) condition. The model results show that the large majority of available flows occur in April, May and June as would be expected in this hydrologic setting and consistent with the pattern of gaged flows as previously described. Likewise, the StateMod modeling effort displayed water available at specific locations within the upper watershed in support of reservoir feasibility investigations.

It is important to note that as previously stated, completion of hydrologic modeling was beyond the scope of this project. Because the previously completed modeling efforts did not include portions of the Little Snake River / Vermillion Creek watershed study area, estimates of storage availability are not available for all subwatersheds. Specifically, Vermillion Creek, Canyon Creek, Shell Creek and Alkali Creek were not modeled. These streams all lie in the lower and drier portions of the study area where runoff is generally low in relation to the eastern, higher subwatersheds. Previous investigations did not target these areas when evaluating potential large reservoir storage sites. In this dry and water-limited region, even small reservoirs would provide benefit to local stakeholders. Results of the temporary stream gaging effort (see Section 3.5.2.1 indicate that construction of small reservoirs on the order of 50 to 100 acre-feet may be feasible within this region.

IV. SAVERY CREEK GEOMORPHIC EVALUATION

4.1 Background and Purpose

At the request of the WWDC, the project team conducted a geomorphic assessment of a portion of Savery Creek. The stream reach is approximately 19,350 feet long beginning approximately 10.8 miles downstream of High Savery Reservoir and located on lands owned by the WWDC. The property is referred to as the McMillan Ranch after the previous owners.

The reservoir was completed in 2005 and provides an important source of late-season water for irrigated lands located downstream along Savery Creek and the Little Snake River. With the completion of the reservoir, the hydrologic regime and sediment transport characteristics of the system were modified: peak discharges are attenuated and late-season low-flows are supplemented with reservoir releases.

Numerous studies have documented the potential effects of reservoir construction on the condition of streams located downstream. Common impacts typically include increased channel degradation or bank erosion resulting from upsetting the dynamic equilibrium between available sediment and the sediment transport capability of the stream. Whether attributable to construction of High Savery Reservoir or not, increased bank erosion and loss of aquatic habitat have been noted in Savery Creek in recent years.

Consequently, the purpose and objectives of this study effort were to:

- assess the existing geomorphic characteristics of the study reach,
- determine the extent and magnitude of channel degradation indicators including bank erosion, bed degradation, etc.,
- develop a conceptual stream channel restoration plan to mitigate observed channel stability issues and to improve aquatic habitat.

The remainder of this chapter discusses the methodologies and results of these efforts.

4.1.1 Study Reach

The project study area is located within Section 36, Township 14 North, Range 89 West and Sections 1 and 2, Township 13 North, Range 89 West (Figure 4.1-1).

The Savery Creek watershed, as measured at the downstream end of the study reach, is approximately 293 square miles. As previously discussed, prior to 2005, the stream was essentially unregulated; there were no major storage facilities in the basin and irrigation diversions were relatively limited in magnitude. In 2005, construction of High Savery Reservoir was completed. The reservoir has a storage

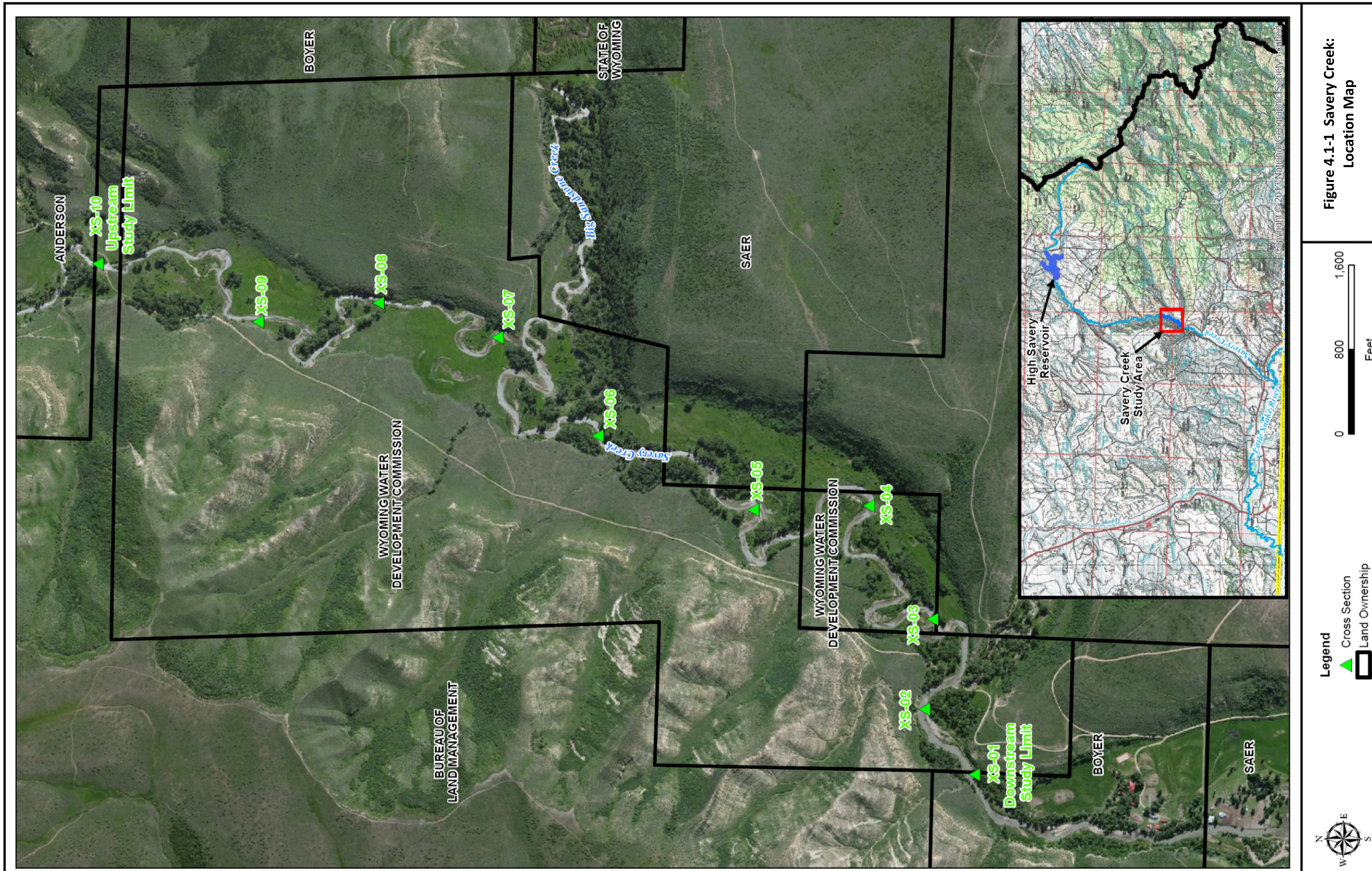


Figure 4.1-1 Savery Creek: Location Map

capacity of 22,400 acre-feet and serves as an important source of late-season irrigation water for irrigated lands downstream on Savery Creek and the Little Snake River.

4.1.2 Previous Channel Restoration Efforts

Two channel rehabilitation projects have been completed upstream of the study reach on behalf of the Cobb Cattle Company, the Little Snake River Conservation District and the NRCS:

- Cobb Cattle Company Stream Reach (River Fixers LLC, 2008).
  This project involved the restoration of approximately 6,000 feet of Savery Creek. The project was completed in 2008.
- Hayrack Draw Project (River Fixers LLC, 2010).
  This project involved the restoration of approximately 6,000 feet of Savery Creek. The project was completed in 2010.

Both projects are located upstream of the current study reach and downstream of High Savery Reservoir.

4.2 Geomorphic Background

As previously discussed in Chapter 3.6 of this report, 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.

A commonly used term today for this type of stability is ***dynamic equilibrium***. A stream in dynamic equilibrium has adjusted its width, depth and slope such that the channel is neither aggrading nor degrading. However, change may be occurring in the stream bank, erosion may result, and bank stabilization may be necessary, even on the banks of a stream in dynamic equilibrium.

The equilibrium concept of streams discussed above can also be described by various qualitative relationships. One of the most widely used relationships is the one proposed by Lane (1955) which states that:

$$Q_s D_{50} \propto Q_w S$$

Where Q_w is the water discharge, S is the slope, Qs is the bed material load, and D50 is the median size of the bed material. This relationship, commonly referred to as Lane's Balance, is illustrated in Figure 4.2-1.

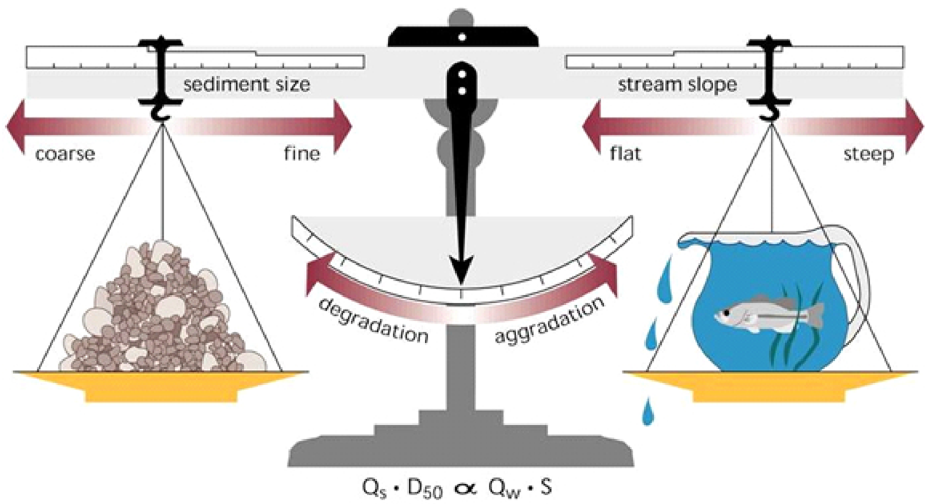


Figure 4.2-1 Graphical Rendition of Lane's Balance (Watson, et al, 1999)

This graphic indicates that a change in any of the four variables will cause a change in the others such that equilibrium is restored. When a channel is in equilibrium, it will have adjusted these four variables such that the sediment being transported into the reach is transported out, without significant deposition of sediment in the bed (aggradation), or excessive bed scour (degradation). It should be noted that by this definition of stability, a channel is free to migrate laterally by eroding one of its banks and accreting the one opposite at a similar rate.

In summary, a stable river, from a geomorphic perspective, is one that has adjusted its width, depth, and slope such that there is no significant aggradation or degradation of the stream bed or significant planform changes (meandering to braided, etc.) By this definition, a stable river is not in a static condition, but rather is in a state of dynamic equilibrium where it is free to adjust laterally through bank erosion and bar building (Watson, et al, 1999).

4.3 Hydrologic Regime and Design Discharge

Completion of High Savery Dam in 2005 has resulted in a quantifiable change in the hydrologic regime of the Savery Creek system. In addition and although not measured, sediment transport in Savery Creek has also been affected by essentially “shutting off” sediment delivered to the system from the higher reaches of its watershed

A 2012 study funded by the WWDC and completed by the University of Wyoming entitled “Savery Creek Geomorphic Study” evaluated stream channel condition and rates of lateral channel migration (Legleiter, 2013). Included in the investigation was a detailed evaluation of the pre- and post-construction of High Savery Dam was completed. According to the UW report (and anecdotal reports):

- The magnitudes of peak flows associated with spring snowmelt are lower following completion of the reservoir.
- Peak flows occur later in the year following completion of the reservoir.
- Prior to completion of the reservoir, peaks rapidly diminished to very low baseline conditions. Today, a lower peak is sustained for a longer duration.
- A second peak occurs in late August or September in association with reservoir releases to meet irrigation demands downstream.
- Depending upon the magnitude of irrigation demand, the second peak may exceed the spring snowmelt peak.

For the purposes this study, a design discharge must be determined. Typically, a design discharge associated with the bankfull discharge, or a discharge with a recurrence interval 1.5 to 2 years is used for channel design and stability. Completion of High Savery Reservoir complicates the process. The previously discussed restoration projects used a design discharge of approximately 150 to 200 cfs based upon review of the hydrologic record and reservoir release data associated with High Savery Reservoir. The decision was also based upon discussion with the WGF, the LSRCD and the NRCS. Based upon a review of the data supporting this decision, the design discharge appears to be a prudent determination for the portion of the current project located upstream of Big Sandstone Creek.

Based upon regional relationships between basin area and stream discharge, an additional 150 cfs can be expected to be conveyed by Big Sandstone Creek during the 1.5- to 2-year event. Consequently, a design discharge of approximately 350 cfs was determined for the reach of Savery Creek downstream of Big Sandstone Creek.

4.4 Savery Creek Assessment

A field investigation of the study reach was conducted by the project team during low-flow conditions in October 2012. During the field investigation, the entire study reach was walked and the following tasks completed:

- Observations were made of the general geomorphic condition of the stream channel including channel degradation, bank erosion, pool/riffle sequence, etc. GPS locations were measured corresponding to extent of bank erosion, pools, riffles, and other features affecting the geomorphic condition of the study reach.
- Detailed evaluations were conducted at ten locations. At each of these locations, the following tasks were completed:
  - Channel cross section and profile were surveyed.
  - Observations of bankfull and high water indicators were noted.
  - Bed material was characterized by taking pebble counts.
  - Photos documenting channel condition were taken
  - GPS locations measured
  - General observations of geomorphic conditions were noted and recorded.
  - Quantification of basic geomorphic parameters (width/depth ratios, entrenchment ratios, etc) and determination of stream type using the Rosgen stream classification system.
- Following the completion of the field investigation, a channel profile was surveyed of the entire reach using GPS RTK methodologies by Baker & Associates, of Craig, Colorado.
- Data collected during the field investigation was incorporated into the project GIS for evaluation. Within the GIS, the following tasks were completed:
  - Evaluation of channel alignment and sinuosity
  - Qualitative evaluation of channel migration by comparing aerial photography obtained in previous years.

It is important to note that the existing channel configuration (width/depth, entrenchment, etc.) was formed by channel forming discharges which prevailed prior to the completion of High Savery Reservoir. Today, channel forming discharges are governed to a large extent by controlled releases from the reservoir. Consequently, indicators of high water are no longer consistent with discharges that formed the present channel because it is in a period of adjustment. In order to determine the requisite geomorphic parameters, water surface elevations associated with the design discharges were determined using a hydraulic model. These elevations were then superimposed upon the surveyed cross sections to measure parameters such as width/depth and entrenchment ratios, among others.

4.5 Results of the Geomorphic Characterization

Rosgen Level II stream classifications were determined at each of the ten cross sections evaluated during the field investigation. Table 4.5-1 summarizes the results of this effort and the geomorphic parameters determined at each location. Appendix 4A displays graphically the results of the field investigation. As is evident in Table 4.5-1, Savery Creek is classified primarily as a C-type or F-type channel throughout the study reach. C-type channels are typically characterized by relatively low slopes, meandering planforms, and pool/riffle sequences. F-type channels share similar characteristics with the exception of connectivity to their floodplains. Where C-type channels are capable of spilling over their banks during flood events, F-type channels are entrenched and consequently have been disconnected from their floodplains. It is important to note that while F-type channels typically reflect entrenchment due to channel incision/degradation, Savery Creek's entrenchment is likely a result of reduction in peak flows due to construction of High Savery Reservoir. As a result of attenuated peak discharges, Savery Creek is now slightly to moderately entrenched through the study reach rendering an F-type stream classification.

Table 4.5-1 Summary of Geomorphic Parameters: Savery Creek

Floodprone Width (ft)	74.2	67.2	66.0	40.9	95.0	58.3	50.2	44.6
Bankfull Width (ft)	57.7	57.0	41.1	24.2	55.5	36.9	38.6	32.5
Entrenchment Ratio	1.3	1.2	1.6	1.7	1.7	1.6	1.3	1.4
Mean Depth (ft)	1.5	1.8	2.1	1.8	1.2	1.1	1.4	1.2
Maximum Depth (ft)	2.2	2.5	3.7	2.4	2.2	1.6	1.7	1.7
Width/Depth Ratio	38.0	31.0	19.5	13.6	45.9	32.7	28.6	26.4
Bankfull Area (sq ft)	87.7	105.1	86.6	43.1	67.0	41.7	51.9	39.8
Wetted Perimeter (ft)	58.4	57.7	43.0	25.8	56.3	37.4	39.2	33.1
Hydraulic Radius (ft)	1.5	1.8	2.0	1.7	1.2	1.1	1.3	1.2
Shear Stress (lb/ft2)	0.5	0.4	0.5	0.3	0.2	0.3	0.2	0.4
Movable Particle (mm)	27.3	22.4	25.5	14.4	10.5	17.5	10.2	19.0
D50 (mm)	51.9	54.5	30.7	15.0	66.0	54.5	22.6	73.8
D50 Class	Very Coarse Gravel	Very Coarse Gravel	Coarse Gravel	Medium Gravel	Small Cobble	Very Coarse Gravel	Coarse Gravel	Small Cobble
Entrencment Class	Entrenched	Entrenched	Moderately Entrenched	Moderately Entrenched	Moderately Entrenched	Moderately Entrenched	Entrenched	Entrenched
Width/Depth Class	Moderate to High	Moderate to High	Moderate to High	Moderate to High	Very High	Moderate to High	Moderate to High	Moderate to High
Rosgen Classification	F4	F4	C4/F4	C4/F4	C3	C4	F4	F3
Modified Pfankuch	Good	Good	Poor	Poor	Poor	Good	Fair	Fair

Bankfull width = width of water surface at bankfull stage
Floodprone width = width of water surface at twice the bankfull stage
Entrenchment ratio = floodprone width / bankfull width
Rosgen (1994)

Examination of Table 4.5-1 also displays the fact that width/depth (W/D) ratios in the study reach are typically high to very high (High width/depth ratios reflect wide and shallow stream cross sections). High W/D ratios are typically associated with accelerated streambank erosion, excess deposition/aggradation, or lateral stream migration. Bank erosion was prevalent throughout the study reach. Appendix 4A depicts a minimum of 7,000 linear feet of streambank the project team mapped as excessive streambank erosion. Figure 4.5-1 and 4.5-2 display photographs of typical streambanks within the study reach. These photos exemplify actively eroding streambanks which are devoid of vegetation and evidence of channel widening. Figure 4.5-3 displays a typical riffle with a very high W/D ratio.

Figure 4.5-1 Savery Creek as Viewed Upstream from XS-04 Showing Evidence of Significant Bank Erosion of the Left Bank.

Lateral migration of Savery Creek was also documented by the UW study (2012). The authors of that study concluded that Savery Creek is experiencing a greater amount of lateral migration following completion of High Savery Reservoir than it did prior to construction. This conclusion was presented with several caveats with respect to inconsistent stream flow in the pre- and post-construction time frames. For example, the 2011 runoff was significantly higher than any events observed in the pre-construction period evaluated. Despite the caveats however, extensive lengths of active vertical eroding banks were noted during the field investigation; primarily along the outside of bendways. This attests to the fact that the channel is actively widening and migrating. This is likely a result of sustained peaks associated with reservoir construction and irrigation releases.

Figure 4.5-2 Savery Creek as Viewed Downstream from XS-03 Showing Evidence of Significant Bank Erosion of the Left Bank.

A Pfankuch stability evaluation was conducted using the Modified Pfankuch rating system (Rosgen, 1996). Results of this analysis are included in Table 4.5-1. Based upon this analysis, Savery Creek stability rates from poor to good. Those sections where a 'poor' rating was determined tended to receive the lower rating due to extent and nature of erosive banks.

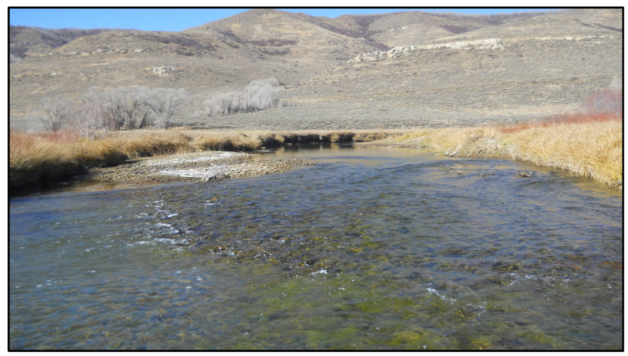


Figure 4.5-3 Savery Creek Reach Exhibiting a Very High Width/Depth Ratio.

Savery Creek is currently entrenched or moderately entrenched throughout the majority of the study reach. The entrenchment, or disconnection with its floodplain, appears to be a function of a modified streamflow regime instead of degradation of the stream channel. Due to a reduction in peaks resulting from construction of High Savery Reservoir and modification of the hydrologic regime (i.e., lower peak channel forming discharges, secondary peaks in the fall, etc.), the channel appears to be adjusting with accelerated bank erosion and channel widening.

In addition to the bank conditions and entrenchment discussed above, deep pools and distinct pool / riffle sequences were frequently lacking within the study reach. Figure 4.5-4 displays a photo of a pool located on the outside of a bendway which lacks desired characteristics with respect to depth and cover for aquatic habitat.

Figure 4.5-4 Poorly Defined Riffle/Pool Sequence

Throughout much of the study reach, woody riparian vegetation was distinctly lacking. This observation is consistent with vegetation monitoring conducted by WGF within the study reach in 2012 The WGF established three permanent riparian vegetation transects in 2001 with the objective of evaluating changes in riparian habitat conditions following construction of High Savery Reservoir. Results of the 2012 monitoring indicated that vertical growth of willow and cottonwood has been either suppressed or limited by ungulate browsing during the ten year period. Stem densities increased during the monitoring period which indicates there is a potential for improved height and diversity. However, stem heights decreased (WGF, 2012).

In summary:

- Savery Creek was characterized as either an F-type or C-type channel throughout the majority of the study reach.
- Entrenchment resulting from a modified flow regime has resulted in the channel being disconnected from its floodplain.
- Width / depth ratios generally exceed values desired to provide stable channel conditions as well as aquatic habitat.
- Streambank erosion is severe at several locations within the study area. Vertical and un-vegetated banks are common.
- Formation of adequate pool / riffle sequences are lacking at many locations
- Channel diversity elements beneficial to aquatic habitat (natural boulders, logs, etc) were generally lacking.

4.6 Channel Restoration Recommendations

Based upon the results of the field investigation and the analysis discussed above, restoration of Savery Creek is recommended. Channel modifications would be completed using strategies consistent with those utilized in the previously completed stream restoration projects located upstream on the Cobb property. The overall restoration strategy is to reduce channel width to lower its width/depth ratio (make it narrower and deeper), deepen pools, and maintain channel gradient by placing in-channel rock vanes at strategic locations.

Execution of the plan would result in a stream channel that would be reconnected to a floodplain within the existing channel cross section, thereby restoring the channel to a C-type classification. Deeper flow conditions would provide increased aquatic habitat, provide better thermal conditions, and reduce stream bank erosion by reducing shear stress. This strategy would be employed both upstream and downstream of Big Sandstone Creek using the appropriate design discharge for each segment. Guidelines of each component of this restoration strategy are presented in below.

Channel restriction would be accomplished by constructing in-channel terraces to confine flows to a narrow and slightly deeper channel. Detailed surveys would be required prior to final design and construction. The following general guidelines are provided:

- A desired width/depth ratio of approximately 20 would be used for channel configuration.
- Materials removed from the channel invert and pool enhancement locations would be used as fill to construct the channel restricting terraces.
- Vertical banks would be stabilized by reducing the bank angle to a slope of approximately 3:2 (Horizontal to vertical).
- In-channel rock vanes would be placed at the upstream end of a riffle/pool sequence in order to maintain the channel profile.

Figure 4.6-1 displays a cross section surveyed at XS-03 and the proposed channel configuration at that location. Following construction, average depths during low-flow periods would be increased thereby improving fish passage / habitat. Figure 4.6-2 displays a photo of a channel restricting terrace serving this function on the Cobb Ranch property located upstream of the study reach.

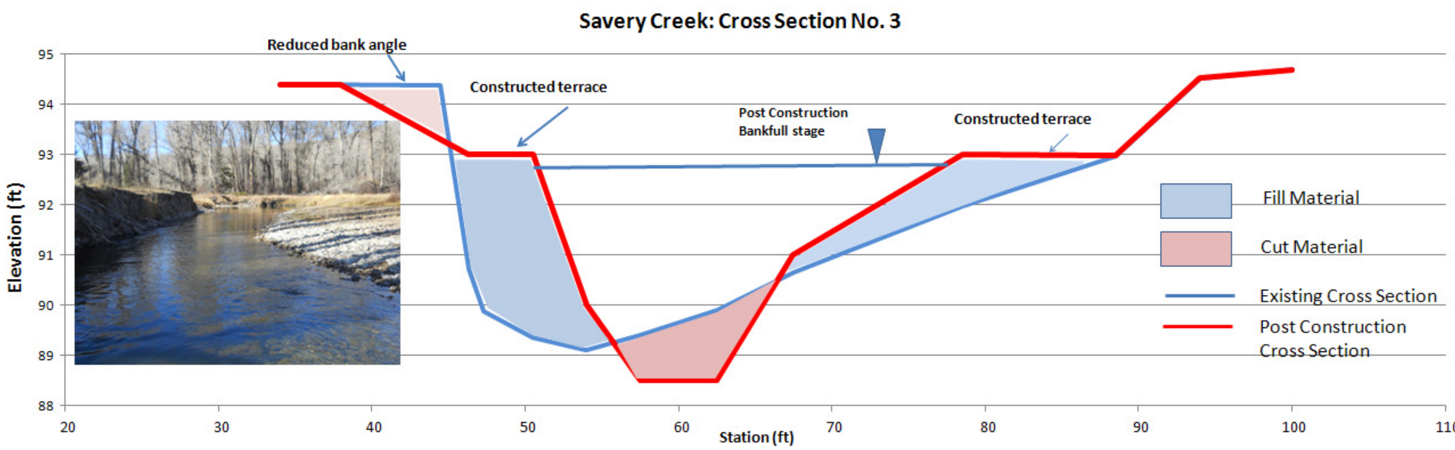


Figure 4.6-1 Example Modified Cross Section to Restrict Channel Width

Figure 4.6-2 Example Channel Restricting Terrace Constructed at the Cobb Ranch Channel Restoration Project

It is important to note that bank stabilization strategies would be required to be incorporated into the terrace construction. Without structural enhancement, terraces could potentially be damaged during high flow events. Consequently, bank stabilization methods including incorporation rocks and boulders, logs, large woody debris (Figure 4.6-3), flow deflection devices (Figure 4.6-4) would be required. Willow planting along restored streambanks and constructed terraces would provide additional protection against erosion and provided added cover enhancing riparian habitat.

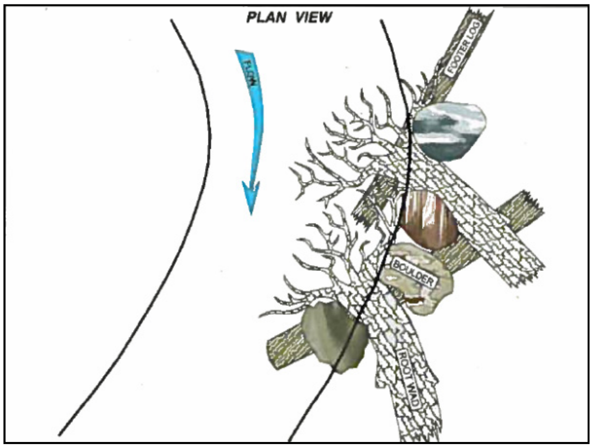


Figure 4.6-3 Utilization of Large Woody Debris to Stabilize Streambanks (Rosgen, 1993)

Figure 4.6-4 Flow Deflection Bank Stabilization on Cobb Ranch Section of Savery Creek

Pools should be excavated to a maximum depth of approximately 6 to 10 feet at bankfull stage. Materials removed from the pool locations should be used to construct the channel restricting terraces. Pool spacing would be expected to be approximately 200 to 300 feet based on field observations.

At the upstream end of pool enhancement locations, rock vanes should be constructed. Figure 4.6-5 displays a photo of a typical non-contiguous rock weir which was constructed on the Cobb property. Figure 4.6-6 displays a conceptual diagram of a W-vane.

Figure 4.6-5 Typical Rock Vane Located on the Cobb Property

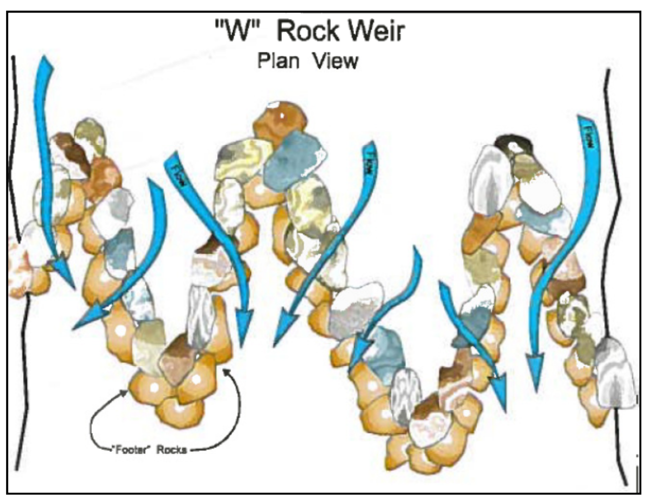


Figure 4.6-6 "W" Rock Weir Conceptual Design (Rosgen, 1993)

Vanes provide multiple benefits:

- The most pertinent function would be to provide adequate grade control by establishing a "hard point" fixing the channel profile in place.
- By increasing channel complexity, aquatic habitat is improved by providing depth and cover.
- Vanes can increase aeration by creating turbulence, particularly during low-flow conditions.
- By redirecting flows, shear stress on channel banks can be reduced.
- Sediment transport competence can be restored.

4.7 Summary

The geomorphic investigation concluded that Savery Creek within the project study area would benefit from completion of a channel restoration effort. The existing stream channel is adjusting to changes in the hydrologic regime following construction of High Savery Reservoir. The channel's response to attenuated peak discharges longer in duration, coupled with secondary peaks associated with irrigation releases includes widening of the channel and associated streambank erosion. In addition, distinct riffle/pool sequences are lacking in many locations. Finally, there is a distinct lack of woody riparian vegetation which has been attributed to ungulate grazing.

A conceptual stream restoration plan has been developed which is based on the premise of 'stream miniaturization'. That is, reducing the channel cross section by constructing width-restricting terraces from materials obtained from the channel invert and from pool enhancement/deepening efforts. The result would be a reduced channel with a more stable and desirable width/depth ratio (narrower and deeper) which would improve added benefits of enhanced aquatic habitat.

Rock vanes and strategically placed channel diversity elements (rocks/boulders, logs, etc) would provide additional habitat improvement as well as providing added bank erosion function providing additional stability. A modified wildlife and grazing management program would likely promote the ecological health and integrity of woody riparian vegetation.

Prior to construction of the conceptual stream restoration plan, detailed field investigations are recommended in order to determine precise locations and materials quantities.

Coordination with Wyoming Game and Fish, the Natural Resources Conservation Service, and the Little Snake River Conservation District should occur to best accommodate the needs and recommendations of these agencies.

V. WATERSHED MANAGEMENT AND REHABILITATION PLAN

5.1 Overview

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.

- **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.

- **BLM Recommendations**. The Bureau of Land Management, Rawlins and Rock Spring District Offices, provided a list of range improvement projects planned within their district. This list of recommendations includes a wide range of projects including: stock reservoir construction and rehabilitation, well construction, pipeline maintenance, installation of solar platforms, etc.

- **Storage Opportunities.** Results of previous investigations pertaining to development of water storage opportunities within the watershed are incorporated.

- **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.

- **Wetland Enhancement Opportunities.** Opportunities to establish new wetlands or enhance existing wetlands exist within the watershed.

- **Other Watershed Management Opportunities**
  For each of the categories described above, a series of recommended projects are prescribed in the following portions of this chapter. These plans have been 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 providing benefits to improving the existing water supply through conservation.

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 Section 5.2
- Project Components "L/W": Livestock / wildlife upland watering opportunities Section 5.3
- Project Components "G": Grazing management opportunities Section 5.4
- Project Components "BLM": BLM recommendations Section 5.5
- Project Components "S": Storage opportunities Section 5.6
- Project Components "C": Stream channel stability components Section 5.7
- Project Components "W": Wetland Enhancement opportunities Section 5.8
- Project Components "O": Other watershed management plan alternatives Section 5.9

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

5.2 Irrigation System Recommendations (Watershed Management Plan Component I)

As presented in Chapter 3, the irrigation system inventory effort associated with this project consisted of evaluation of structures and ditch conditions at the request of interested landowners and stakeholders. No ditch systems were inventoried in their entirety. Instead, and at the request of those individuals who came forward with requests to participate in the study, individual irrigation system components were inventoried. The recommendations included herein are not all-inclusive; there will be additional irrigation structures located throughout the watershed in need of rehabilitation or replacement. By virtue of their location within the geographic boundaries of this study, those potential projects involving those structures would still be considered eligible for application funding through the WWDC Small Water Project Program (SWPP).

The results of previous investigations conducted on behalf of the WWDC were reviewed and results incorporated herein. For example, in spring of 2012, an inventory and investigation of the four primary irrigation systems within the study area was completed by Aqua Engineering, Inc. Results of their investigations are incorporated in this report in their entirety.

The improvements that comprise this component of the watershed management plan include:

- 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 ditch owner / manager 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.

5.2.1 Irrigation System Projects

Based upon the results of the field inventory, conceptual rehabilitation plans were developed for each structure. In an effort to assist the ditch owner and the LSRCD 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.

In the following paragraphs, the individual structures inventoried and assessed are discussed. Each irrigation system improvement was assigned a unique identifier which identifies it within the watershed management plan. Within the rehabilitation plan, each line item is given a subsequent item number. The structures inventoried and their respective component identifiers in the watershed management plan summarized in Table 5.2-1. The locations of these components of the Little Snake River / Vermillion Creek Watershed Management Plan are indicated on Figure 5.2-1. This information has been incorporated within the Project GIS.

Table 5.2-1 Summary of Irrigation System Components of the Watershed Management Plan.

Watershed Management Plan Component	Structure Type		Priority	Replace / Rehabilitate / Install	Total Project Cost
First Mesa Canal Structures					
I-01	Bendway Weir		2	Replace	$51,900
I-02	Canal Headgate		1	Replace	$49,500
I-03	Cottonwood Creek Spill Rehabilitation		2	Replace	$28,100
I-05	Parshall Flume		1	Replace	$6,000
I-06	Telemetry		2	Replace	$15,000
I-07	Farm Turnout at McKee		3	Replace	$3,300
I-08	Farm Turnout at Marsella		3	Replace	$3,300
I-09	Farm Turnout at Wille		3	Replace	$3,300
I-10	Lining at Weber		2	Replace	$6,000
I-11	Lining at Ely		2	Replace	$6,000
I-12	Lining at Risner		2	Replace	$6,000
I-13	Culvert at Cottonwood Spill		2	Replace	$3,500
I-14	Culvert at Dolan Lane		2	Replace	$3,500
I-15	Culvert at CR 702		2	Replace	$3,500
Stateline Canal Components					
I-16	Ditch Headgate		1	Replace	$61,400
I-17	Measurement		1	Replace	$10,100
West Side Canal Components					
I-18	Measurement		2	Install	$6,000
I-04	Orchard Spill		2	Replace	$16,400
I-19	Spillway		2	Rehabilitate	
I-20	Spillway		2	Install	$16,400
I-21	Flume (4 Mile)		1	Replace	$50,000
I-22	Drop Outlet (Jon's Drop)		2	Replace	$92,000
Baggs Ditch Components					
I-23	Hillside Erosion		2	Install	$163,700
I-24	Measurement		2	Install	$10,100
I-25	Culvert		2	Install	$3,500
I-26	Culvert		2	Replace	$3,500
I-27	Culvert		2	Replace	$3,500
I-28	Culvert		2	Replace	$3,500
I-29	Culvert		2	Replace	$3,500
Miscellaneous Ditch Components					
I-30	Farm Turnout	Three Forks	2	Rehabilitate	$3,000
I-31	Diversion/headgate	Ladder Ranch	1	Rehabilitate	$15,000
I-32	Pipe Drop Structure	Focus Ranch	2	Install	$45,000
I-33	Flume	Waldron	2	Rehabilitate	$8,000
I-34	Diversion/headgate	Emmons	1	Install	$25,000
I-35	Diversion/headgate	Peter Hansen Trust	1	Install	$15,000
I-36	Pipeline	Three Forks	2	Replace	$8,000
I-37	Diversion/headgate	Three Forks	2	Rehabilitate	$45,000

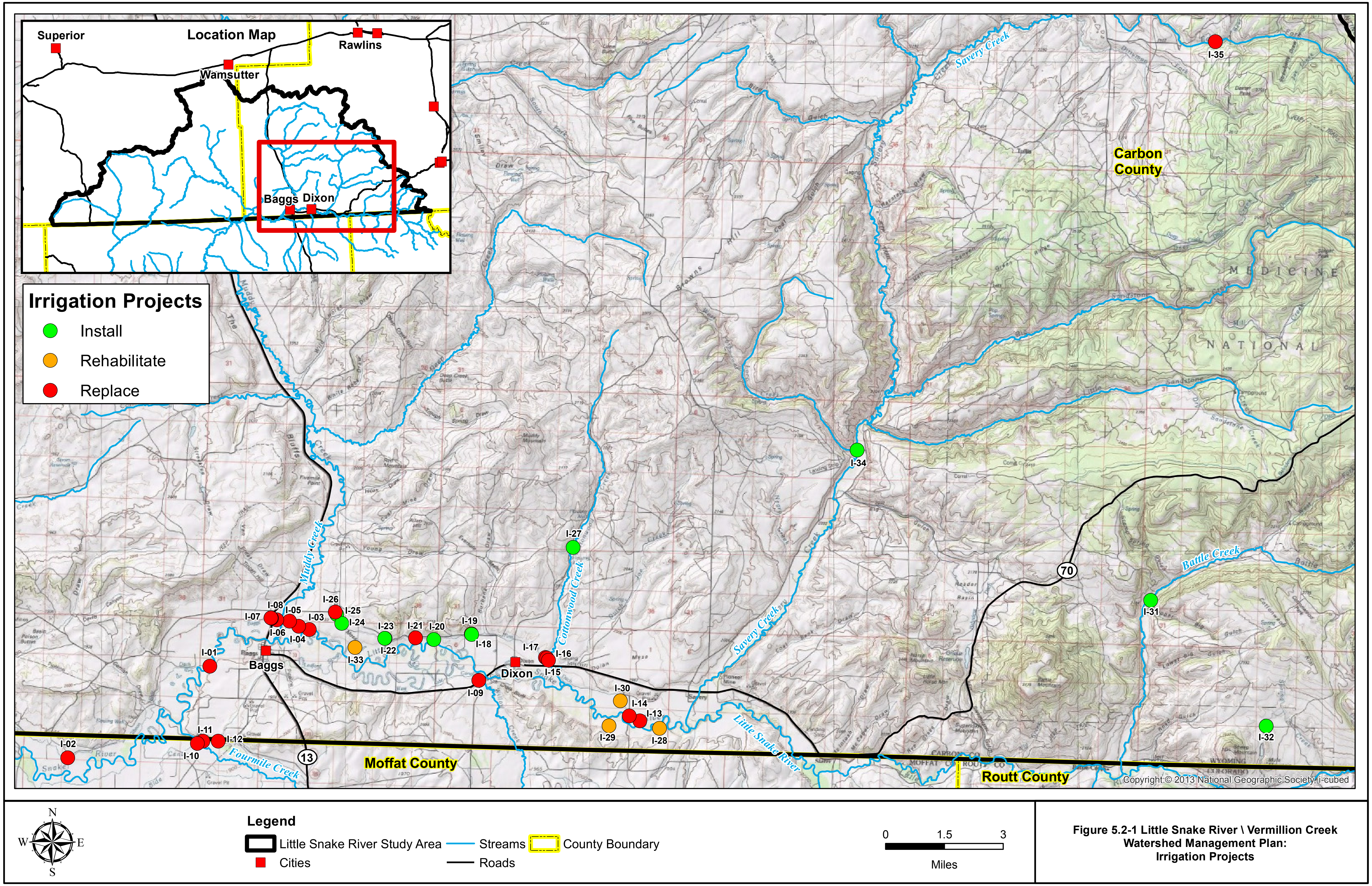


Figure 5.2-1 Little Snake River \ Vermillion Creek Watershed Management Plan: Irrigation Projects

5.2.1.1 Irrigation Components I-01 through I-15: First Mesa Ditch

Item I-01: Bendway Weir (Aqua)

This project was identified by Aqua (2012). The purpose of this project would be to mitigate potential erosion conditions of the Little Snake River at an area where the river impinges upon the First Mesa Ditch. According to Aqua, the proposed project would consist of construction of ten rock weirs in the bendway (Figure 5.2-2). Placement of the weirs would be dependent upon detailed site-specific evaluation of local conditions.

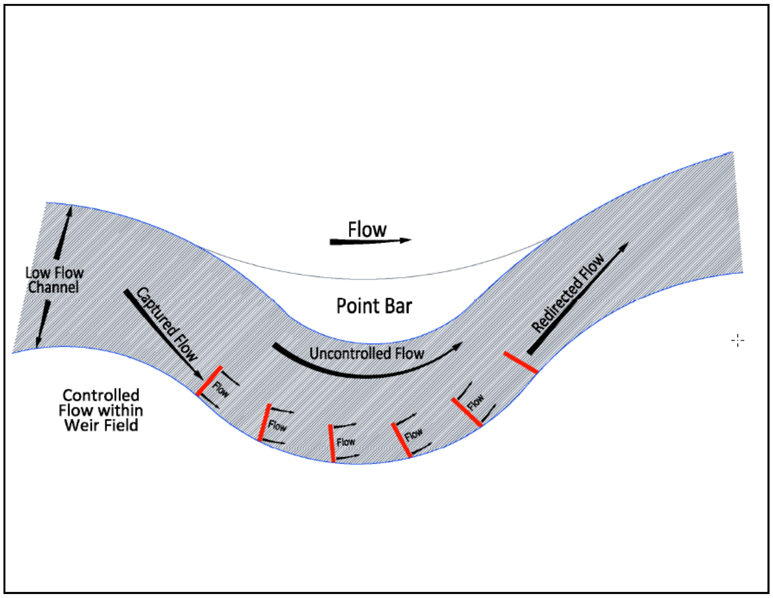


Figure 5.2-2. Generalized Diagram of Streambank Protection Alternative.

Item I-02: First Mesa Ditch Headgate (Aqua)

This project was identified by Aqua (2012). The purpose of this project is to restore operable conditions to the First Mesa Headgate. According to the Aqua investigation, the project would consist of replacement of gates on the First Mesa headgate structure. Four gates would be replaced under this alternative.

Item I-03: Cottonwood Creek Spill Structure (Aqua)

This project was identified by Aqua (2012). The purpose of this project is to replace leaking gates incorporated in the spill structure at Cottonwood Creek. Two gates would be replaced under this project.

Item I-05: Parshall Flume

Based upon interviews with representatives of the First Mesa Ditch, the need for a second Parshall flume was recognized in order to improve management of the ditch flows. A Parshall flume was recommended to be sited at a specific location to be determined.

Item I-06: Ditch Telemetry

The First Mesa Ditch headgate is currently equipped with telemetry by the Wyoming State Engineers Office. Under this alternative, the second flume installed under Item I-05 would be equipped with a telemetry system and included in the State's monitoring network.

Items I-07 through Item 1-09: Farm Turnouts (Aqua)

These projects were identified by Aqua (2012). Three farm headgates are recommended for replacement due to damage, deterioration, or inoperability. The farm turnouts recommended for replacement are:

- McKee
- Marsalla
- Wille

Items I-10 through I-12: Lining Projects

Under this alternative, three sections of the First Mesa Canal would be lined to mitigate seepage losses. Site specific determination of location and extent of the lining would be required at each location. The three properties where lining projects have been recommended are:

- Weber
- Ely
- Risner

Items I-13 through I-15: Culverts

Based upon interviews with ditch representatives, culvert replacement is recommended at three locations:

- Cottonwood Spill
- Dolan Lane
- CR 702

5.2.1.2 Irrigation Components I-16 through I-17: State Line Ditch

Item I-16: Stateline Ditch Headgate Replacement

According to the Aqua report, the gates incorporated within the ditch's headgate structure are in need of replacement. Under this alternative, the gates (3) would be replaced.

Item I-17: Stateline Ditch Measurement Device (Aqua)

According to the Aqua report, the Stateline Irrigation Company reports that flow measurement has been problematic. An existing 10-ft Parshall flume, owned by the ditch company, reportedly washed out and it is the desire of the company to reinstall it. Aqua recommended alternatives including Doppler measurement devices and alternative flume configuration.

It is our understanding that the company wishes to reinstall the existing flume. The Aqua report provides detailed design drawings reflecting this alternative.

5.2.1.3 Irrigation Components I-18 through I-22: West Side Canal

Item I-04: Orchard Spill (Aqua)

This project was identified by Aqua (2012). According to the Aqua report, "currently this structure is not usable and there is currently a concern over canal safety in the event of excessive flow being delivered through the canal or if debris were to block the canal." Under this alternative, the gate would be replaced in order to restore operable conditions and to eliminate seepage.

This project would be completed in conjunction with replacement of the Four-Mile Flume (Watershed Management Plan Component I-21). The structure has reportedly failed historically and replacement is warranted. Aqua presented detailed design drawings associated with this alternative.

I-21: Four-Mile Flume

As discussed in Chapter 3 of this report, the Four-Mile Flume has been identified in previous investigations as being in need of replacement. A level II study of the structure and the Four-Mile Flume was conducted in 2002 by States West Water Resources Corporation (SWWC) on behalf of the WWDC. The preferred alternative presented in that report was to replace the existing flume with an inverted siphon. However, as presented in the Aqua report which was completed after the SWWC report, it is our understanding that the ditch company would prefer construction of a larger flume of similar configuration to the existing flume.

Consequently, under this alternative, the flume would be replaced with a larger flume of similar configuration to the existing flume and the replacement of a spill structure (Watershed Management Plan Component I-20) upstream of the site as discussed in the Aqua report. Aqua presented detailed design drawings associated with this alternative.

I-22: Drop Outlet (Jon's Drop)

The Jon's Drop outlet has been the subject of previous investigations evaluating the potential for development of hydropower (Dahlgren, 2006) and Aqua (2012). Recommendations of those reports include various alternatives targeting various design alternatives, cost estimates, and potential energy generating configurations. Further investigation into power purchase agreements is recommended. For the purposes of this study, these efforts are beyond the scope of this effort.

A level II study of the structure and the Four-Mile Flume was conducted in 2002 by States West Water Resources Corporation (SWWC) on behalf of the WWDC. In accordance with the conclusions of that report, replacement of the structure is recommended.

5.2.1.4 Irrigation Components I-23 through I-29: Baggs Ditch

I-23: Hillside Erosion

Hillslope sloughing has reported cause maintenance problems for the ditch company and has resulted in relocation of the ditch alignment at a location approximately 800 feet downstream of the diversion structure on the Little Snake River. According to the Aqua report, “previous failures have filled the ditch, caused the collapse of ditch piping attempts, and have forced the relocation of the ditch”.

Aqua presented two alternatives to mitigate issues at this location.

- Construct a 60 inch diameter pipeline, 300-ft long through the problem area.
- Construct a retaining wall (gravity wall) through the problem area to hold the hillslope in place

Aqua noted in their report that irrigation upslope of the failure is either causing the failure or exacerbating it. Consequently, drainage improvement upslope of the failure zone is recommended regardless of which solution is ultimately selected. Irrigation returns should be directed away from the problem area and conveyed in a controlled manner away from it.

I-24: Measurement

The Aqua report identified replacement of the ditch’s Parshall flume as a high priority item. Based upon the information presented in that report, it is our understanding that the structure is in average condition but is submerged under normal operating conditions. Consequently, reinstallation of the flume is recommended. A site-specific investigation should be conducted to determine a feasible location that meets the operational needs of the ditch company as well as meeting the hydraulic conditions needed for accurate measurement.

I-25 through I-29: Culverts

Three culverts were identified in the Aqua study that were classified as high priority replacement or repair priority.

5.2.1.5 Irrigation Components I-30 through I-37: Miscellaneous Ditch Components

I-30: Farm Turnout: Three Forks Ranch

The Three Forks Ranch identified a farm turnout in need of rehabilitation on the First Mesa Ditch. Based upon a limited field evaluation of the structure, it appears that the structure is in good condition but in need of removal and reestablishment. Currently, the concrete box housing the turnout gate is tilted causing the slide gate to be situated lower than it should be.

I-31: Diversion/Headgate: Ladder Ranch

As discussed in Chapter 3 of this report, the Battle Creek Ditch currently lacks an adequate headgate. At this location, a diversion headgate structure and slide gate are recommended for construction. The headgate location would be on federally owned lands managed by the Medicine Bow National Forest.

It is our understanding that a diversion structure on Battle Creek is not desired by the ditch owner and that adequate flows in the ditch can be obtained given ambient flow conditions.

I-32: Sheep Mountain Supply Ditch Pipe Drop Structure: Focus Ranch/Ladder Ranch

The Focus Ranch manages the ditch which crosses lands owned by the Ladder Ranch (Section 15, Range 21 West, Township 87 North). As discussed in Chapter 3 of this report, significant erosion has occurred at a location where the ditch drops straight down the hillslope to Sheep Mountain Reservoir.

At this location, a pipe drop structure is recommended. The pipe would require a concrete inlet structure / headwall, a concrete outlet/energy dissipation structure and approximately 900 feet of 18-inch HDPE buried pipeline.

I-33: Waldron Flume

The Waldron family identified this structure for remediation. The existing flume, an 18-inch diameter CMP, leaks at the headwall transitions on both banks of the small slough it crosses. At this location, new headwalls are recommended and extensions of the existing pipe to accommodate the reconstruction.

I-34: Battle Creek Diversion / Headgate

As discussed in Chapter 3 of this report, recent changes in the alignment of Savery Creek have resulted in problems for an existing ditch to divert water during low flow conditions (Section 11, Township 13 North, Range 89 West). It is our understanding that waters diverted at this location are permitted under the Little Sandstone Ditch (Permit T1069). Prior to design and construction of improvements at this location, investigation of existing water rights should be completed and verification of points of diversion should be completed.

Providing that water rights are in order and not an issue at this location, the conceptual design of the project would include the following components:

- a diversion structure on Battle Creek,
- a headgate / slide gate structure on the east bank of Battle Creek, and
- reconfiguring of approximately 300 feet of the existing ditch to provide adequate flow conditions.

I-35: Hansen Ditch Diversion/Headgate

The Hansen Ditch diversion/headgate structure consists of an uncontrolled diversion incorporating tarpaulins and an earthen berm within the East Fork Savery Creek. At this location (Section 17, Township 15 North, Range 87 West), construction of a diversion structure and headgate with slide gate is recommended.

I-36: Three Forks Pipeline/Flume Project

On Three Forks Ranch property, a short 18-inch diameter CMP flume crosses a small slough (Section 14, Township 12 North, Range 90 West). The pipeline itself appears to be in fair condition, however, given the apparent age of the structure and evidence of corrosion, the entire structure is recommended for replacement.

The following components would be incorporated:

- Approximately 50 feet of CMP would be installed; and
- Concrete headwalls would be placed on the upstream and downstream end of the pipeline.

5.3 Upland Wildlife/Livestock Watering Sources (Watershed Management Plan Component LW)

5.3.1 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 5.3-1). 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.

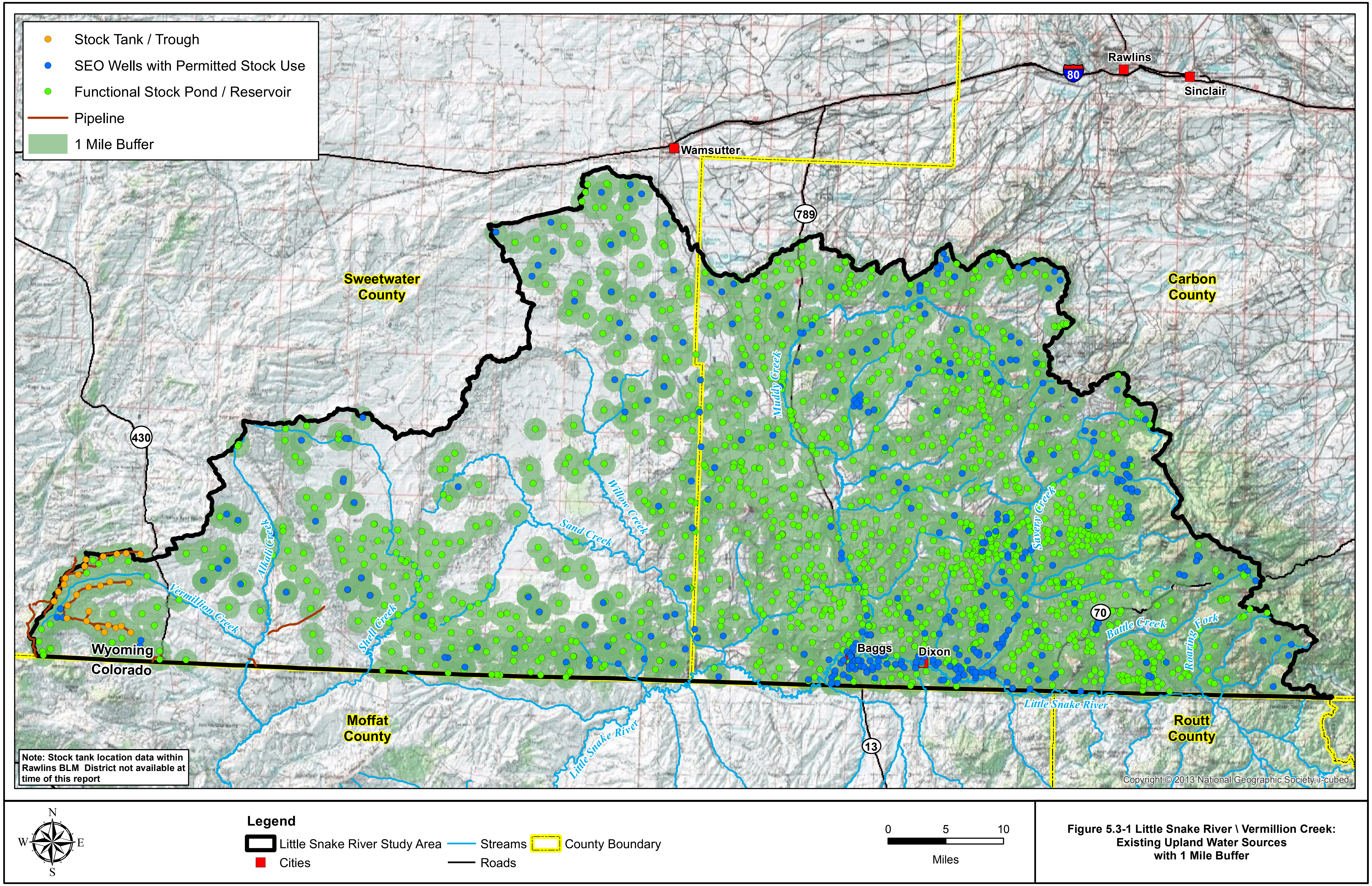


Figure 5.3-1 Little Snake River \ Vermillion Creek: Existing Upland Water Sources with 1 Mile Buffer

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 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. By incorporating closed storage tanks in a project design, greater use of existing water sources could be realized.

It must be kept in mind that designs presented in this report are conceptual only. The indicated alignments of pipelines and placement of livestock / wildlife watering facilities are general and intended to represent the concept behind the alternatives if implemented, detailed design would be required.

- Wildlife egress ramps would be installed in the proposed water tanks.
- Requisite valves and fittings would be incorporated to facilitate management of flows and water levels.

5.3.2 Upland Wildlife/Livestock Water Development Projects

A list of interested land owners and allotment permittees was generated based upon input obtained at project meetings. Individual meetings were scheduled and completed to gain their input on the water needs of 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, several 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 following paragraphs, several alternatives are presented 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. The projects and their respective component identifiers in the watershed management plan are summarized in Table 5.3-1. Figure 5.3-2 displays the general location of all livestock/wildlife water opportunity projects.

Federal lands are significant in extent within the project area. Consequently, many of the upland water development projects could involve coordination with the BLM in order for construction to occur. Additionally, pipeline projects have the potential to require cooperation among multiple landowners. Written agreements would be required which define the maintenance responsibility and ownership

Table 5.3-1 Summary of Livestock/Wildlife Water Supply Components of the Watershed Management Plan.

Watershed Plan Component: Livestock / Wildlife Water Supply Projects (L/W)									
Plan Component	Project Name	Solar Pump / Windmill	Well Construction	Spring Development	Pipeline	Stock Tank	Storage Tank	Stock Pond Rehabilitation	Stock Pond Construction
L/W-01A	Dexter Peak Ranch Pipeline 1			1	18,300	5			
L/W-01B	Dexter Peak Ranch Pipeline 2				12,700	3			
L/W-02	Dexter Peak Ranch Spring Development			1	450	1			
L/W-03	Dexter Peak Ranch Stock Reservoir								1
L/W-04	McAllister Well Rehabilitation	1							
L/W-05	Davis Pipeline	1			50,500	5	1		
L/W-06	Davis Spring Development 1			1		1			
L/W-07	Davis Spring Development 2			1		1			
L/W-08	Waldron Spring Development			1	500	1			
L/W-09	Waldron Stock Pond Rehabilitation							1	
L/W-10	Sheehan Pipeline				14,200	2			
L/W-11	Ladder Ranch Pipeline 1	1		1	5,500	2	1		
L/W-12	Ladder Ranch Pipeline 2			1	3,500	1			
L/W-13	Ladder Ranch Well Rehabilitation				150	1			
L/W-14	Ladder Ranch Stock Tank				150	1			
L/W-15	Weber Pipeline				25,000	5			
L/W-16	Upper Crooked Wash Project		1			1			
L/W-17	Lower Alkali Creek Well Project		1			1			
L/W-18	Upper Alkali Creek Well Project		1			1			
L/W-19	Upper Alkali Creek Stock Pond Project								1
L/W-20	Chicken Springs Basin Well Project		1			1			
L/W-21	Cow Creek Well					1			
L/W-22	Wild Horse Buttes Pipeline				57,100	7			
L/W-23	Alamosa Gulch Stock Pond								1
L/W-24	Dry Cow Creek Stock Pond 1								1
L/W-25	Dry Cow Creek Stock Pond 2								1
L/W-26	Dry Cow Creek Stock Pond 3								1
L/W-27	Dry Cow Creek Stock Pond 4							1	
L/W-28	Dry Cow Creek Stock Pond 5							1	
L/W-29	Dry Cow Creek Stock Pond 6							1	
L/W-30	Lower Barrel Springs Draw Stock Pond								1
L/W-31	White Rock Draw Stock Pond								1
L/W-32	Dad Stock Pond							1	
L/W-33	Deep Creek Stock Pond 1								1
L/W-34	Deep Creek Stock Pond 2								1
L/W-35	Deep Creek Stock Pond 3								1
L/W-36	Deep Creek Stock Pond 4								1
L/W-37	Deep Creek Stock Pond 5								1
L/W-38	Dirtyman Fork Stock Pond								1
L/W-39	Mill Creek Stock Pond								1
L/W-40	Little Savery Creek Stock Pond 1								1
L/W-41	Little Savery Creek Stock Pond 2								1
L/W-42	Middle Savery Creek Stock Pond								1
L/W-43	Hog Eye Ranch Stock Pond							1	
L/W-44	Bird Gulch Stock Pond							1	
L/W-45	Battle Creek Stock Pond							1	
	Totals:	3	4	7	188,050	41	2	8	18

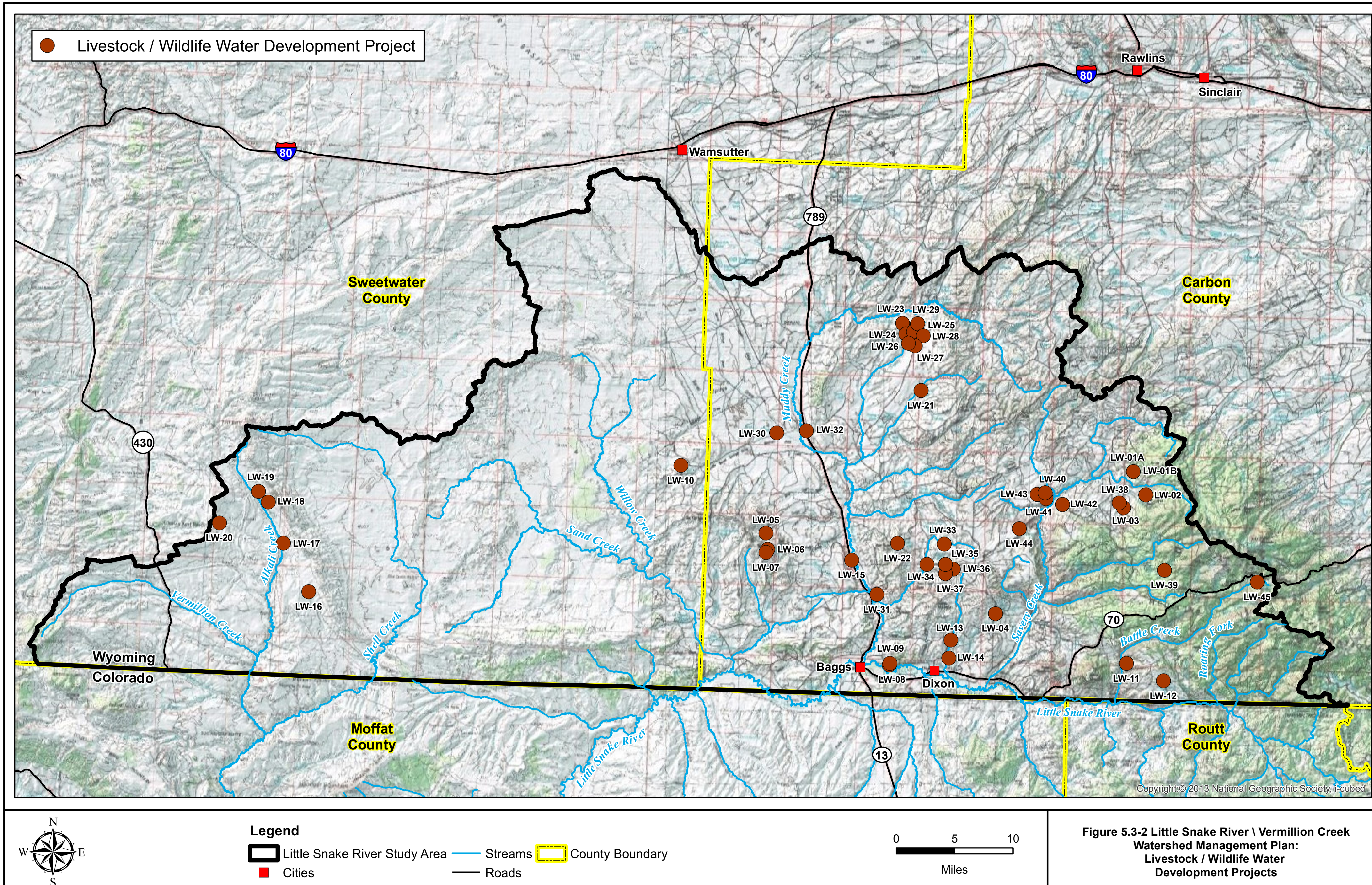


Figure 5.3-2 Little Snake River \ Vermillion Creek Watershed Management Plan: Livestock / Wildlife Water Development Projects

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.

5.3.2.1 L/W-01A: Dexter Peak Ranch Pipeline Project 1

This alternative would involve the development of an existing spring in the Upper East Fork Savery Creek watershed on Dexter Peak Ranch properties. The alternative would supply water to a portion of the watershed lacking adequate alternative livestock and wildlife upland water sources. Figure 5.3-3 displays the conceptual design of the project.

Under this alternative, the following components would be employed:

- An existing spring would be developed in Section 20, Township 15 North, Range 87 West. A valve would be included for management of pipeline flows.
- The spring vicinity would be fenced to prevent the spring development damage from livestock and wildlife.
- The buried 1 ½ inch HDPE low pressure pipeline (a total of approx. 18,300 feet) would be routed westerly and downslope from the spring to a series of stock tanks located away from the riparian corridor.
- As configured under this alternative, five (5) stock tanks (1,200 gallon capacity each) would be placed at sites determined during final design.
- Requisite valves and fittings would be incorporated to facilitate management of flows and water levels. Pressure reduction valves (PRVs) would be required to maintain pipeline pressures below 160 psi.
- Wildlife egress ramps would be installed in the proposed stock tanks.

Note that the proposed project as delineated would involve only privately owned lands. Stock tanks would be situated only on private lands.

5.3.2.2 L/W-01B: Dexter Peak Ranch Pipeline Project 2

This alternative would involve the addition of approximately 12,700 linear feet of pipeline and 3 stock tanks to a project which would be previously constructed (LW-01A above). The alternative would supply water to a portion of the watershed lacking adequate alternative livestock and wildlife upland water sources. Figure 5.3-4 displays the conceptual design of the project.

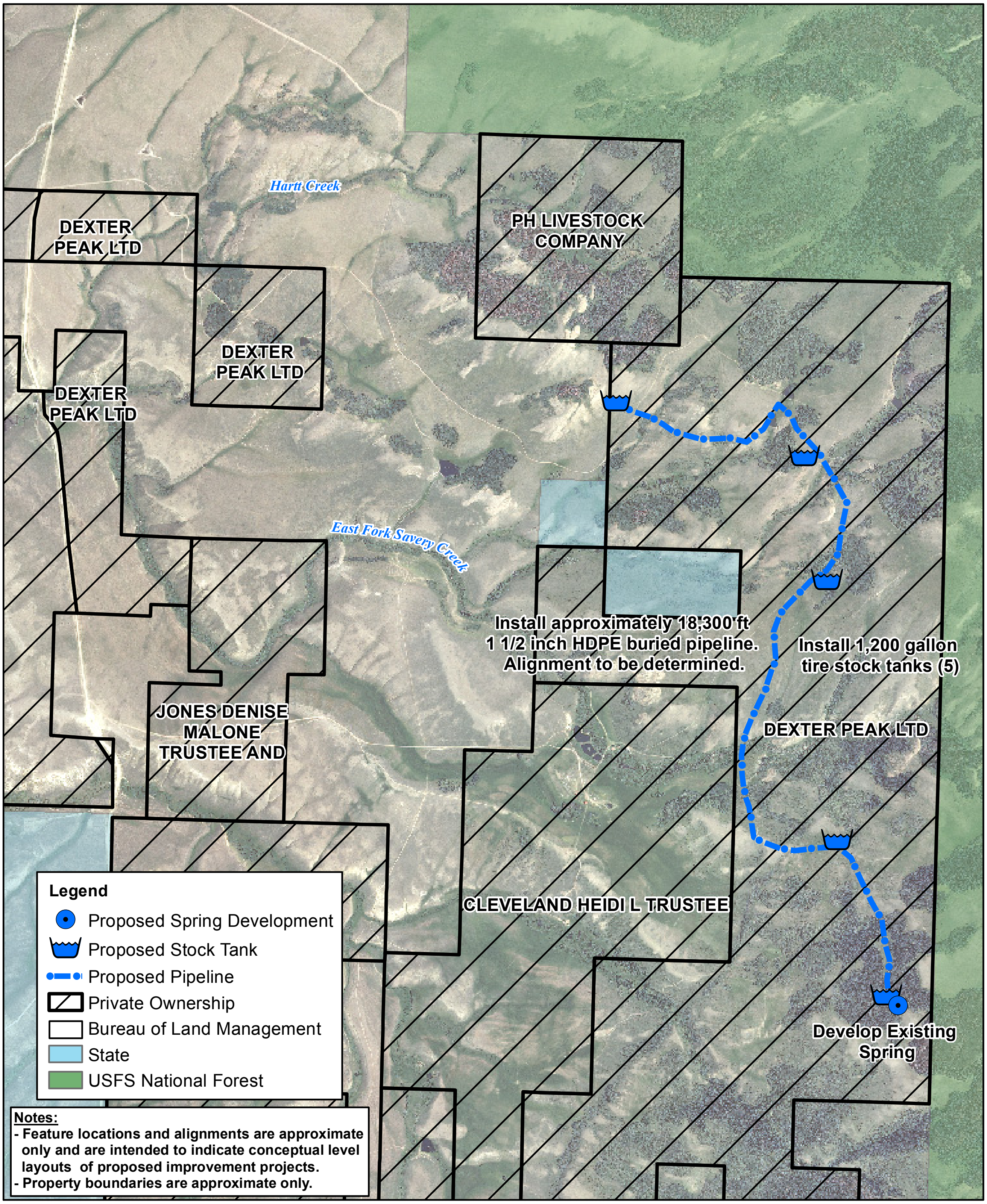


Figure 5.3-3 Conceptual Design: Dexter Peak Ranch Pipeline Project 1 (Project L/W-01A)

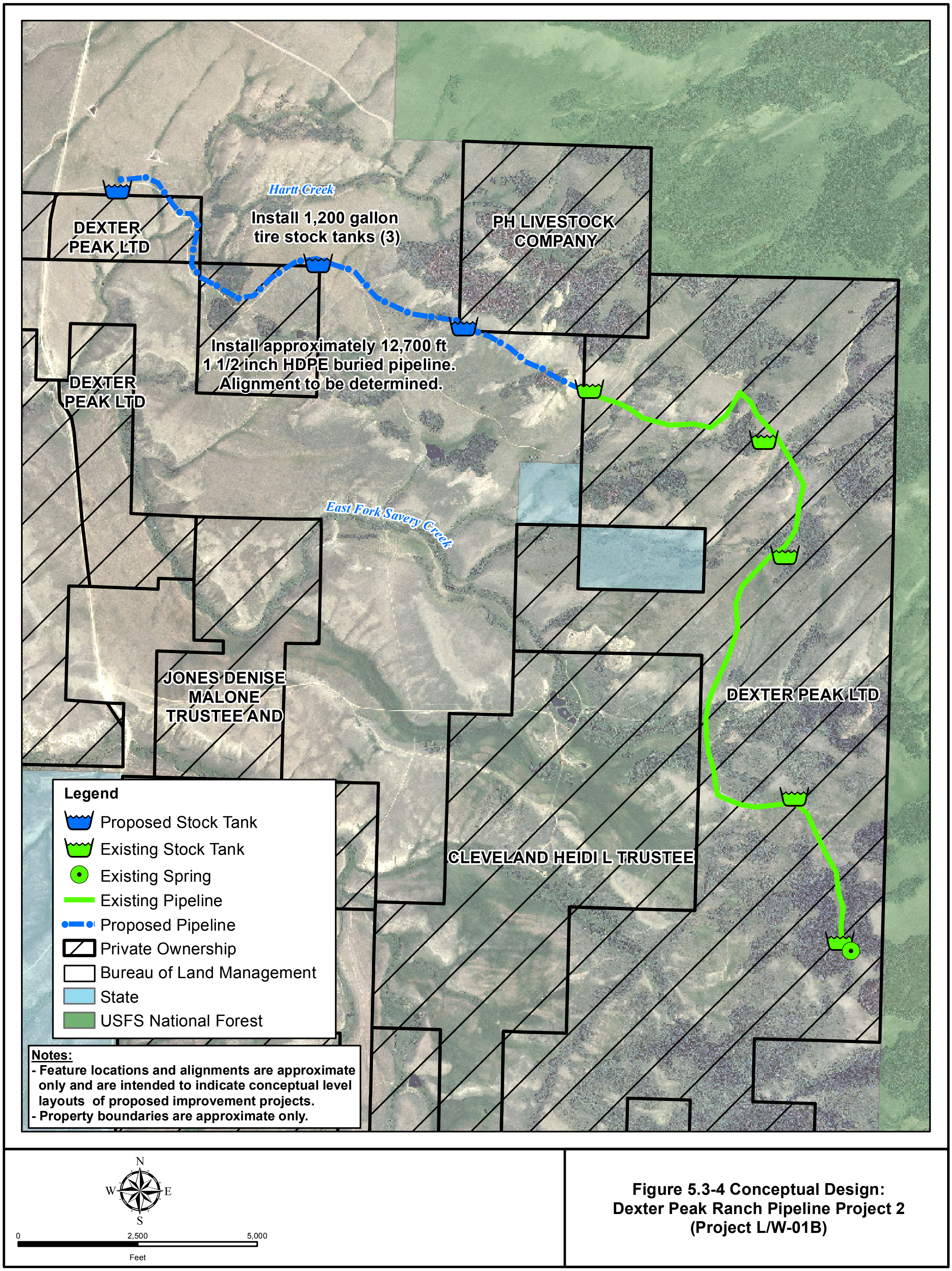


Figure 5.3-4 Conceptual Design: Dexter Peak Ranch Pipeline Project 2 (Project L/W-01B)

Under this alternative, the following components would be employed:

- An existing pipeline would be extended by adding approximately 12,700 feet of buried 1½ HDPE pipeline (Note, this project could be constructed contingent upon completion of project LW-1A discussed above).
- As configured under this alternative, three (3) stock tanks (1,200 gallon capacity each) would be placed at sites determined during final design.
- Requisite valves and fittings would be incorporated to facilitate management of flows and water levels. Pressure reduction valves (PRVs) would be required to maintain pipeline pressures below 160 psi.
- Wildlife egress ramps would be installed in the proposed stock tanks.

Note that the proposed project as delineated would involve only privately owned lands.

5.3.2.3 L/W-02: Dexter Peak Ranch Spring Development

This project consists of improvements to an existing spring located in Section 20, Township 15 North, Range 87 West. Under this proposed project, the spring would be redeveloped and collected flows conveyed downstream to a stock tank which would be installed as part of the project. Figure 5.3-5 displays the conceptual configuration of this project.

Under this alternative, the following components would be employed:

- A new spring development would be completed in the vicinity of the existing spring. The spring development would facilitate diversion of flows to a gravity pipeline.
- The spring vicinity would be fenced to prevent the spring development damage from livestock and wildlife.
- The buried 1 ½ inch HDPE low pressure pipeline (a total of approx. 450 feet) would be routed downslope from the spring to a stock tank.
- As configured under this alternative, one (1) stock tank (1,200 gallon capacity each) would be placed at a site determined during final design.

Note that the proposed project as delineated would involve only privately owned lands.

5.3.2.4 L /W-03: Dexter Peak Ranch Stock Reservoir

This project would involve the construction of a new stock reservoir downstream of one which failed in 2011. The site is located in Section 30, Township 15 North, Range 87 West. As indicated in Figure 5.3-6, the embankment of the existing reservoir failed sometime during spring runoff of 2011. Based upon a brief site investigation and review of existing mapping, it was determined that the most cost-effective means of mitigating the failure is to replace the reservoir with a new reservoir located approximately 500 feet downstream.

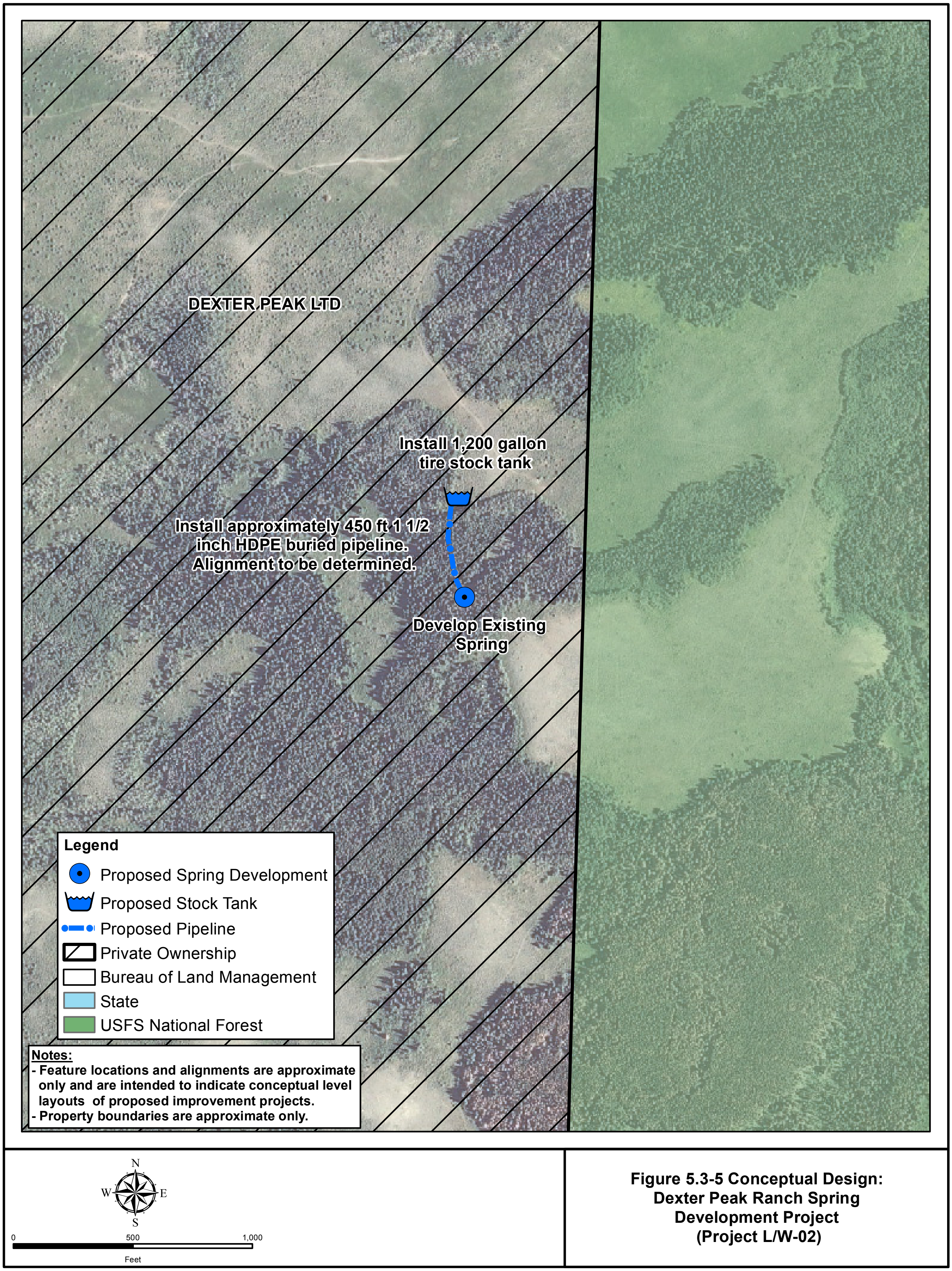
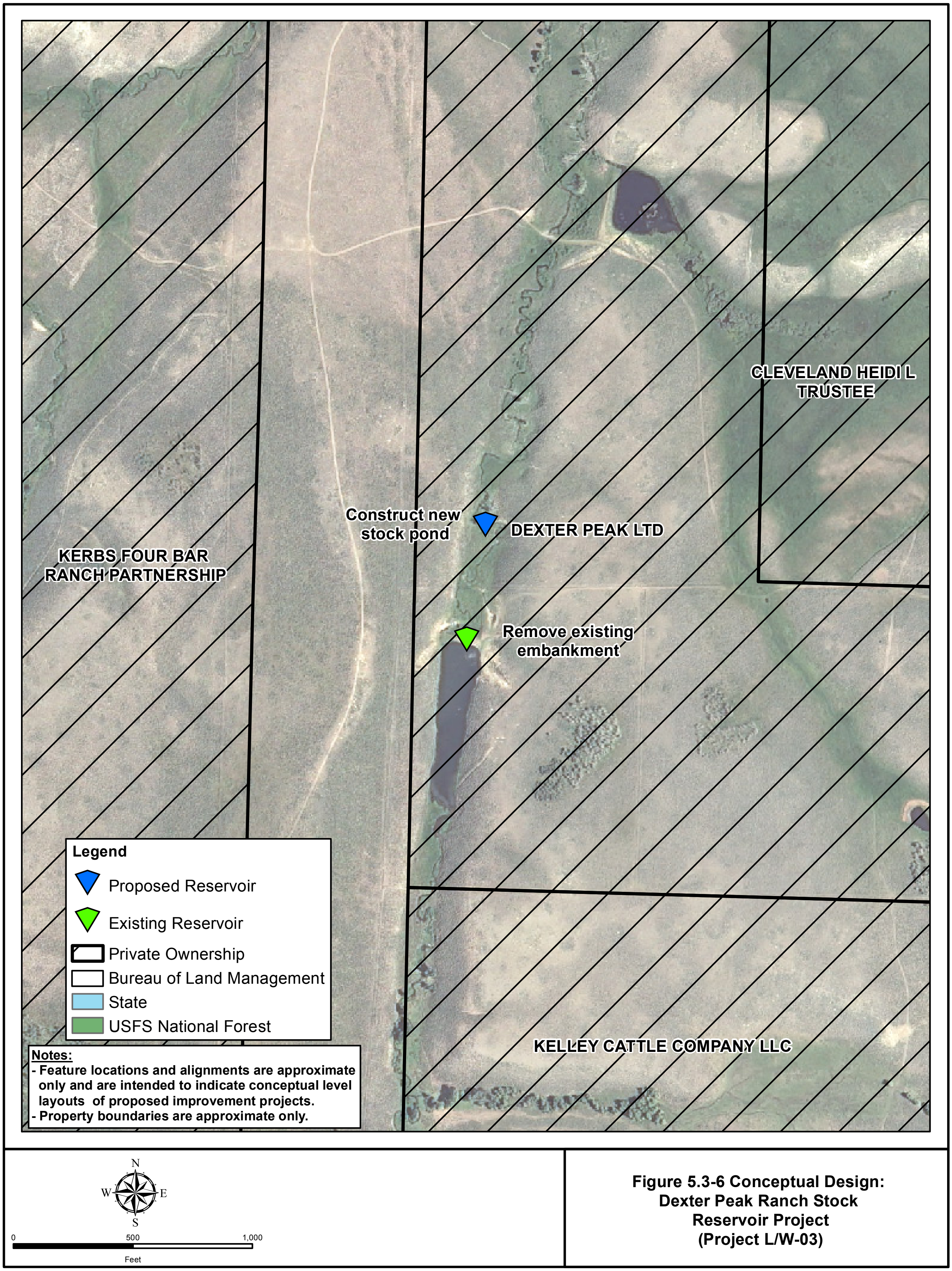


Figure 5.3-5 Conceptual Design: Dexter Peak Ranch Spring Development Project (Project L/W-02)



Notes:
- Feature locations and alignments are approximate only and are intended to indicate conceptual level layouts of proposed improvement projects.
- Property boundaries are approximate only.

Figure 5.3-6 Conceptual Design: Dexter Peak Ranch Stock Reservoir Project (Project L/W-03)

Under this alternative, the following primary components would be employed:

- An earthen embankment would be constructed approximately 500 feet downstream of the existing embankment. As conceptualized, the embankment would be approximately 200-feet long and 20-feet high requiring approximately 18,000 to 20,000 cubic yards of material.
- A reservoir water level control mechanism / outlet would be installed to manage water levels. A commercially available outlet could be utilized (e.g. Agri Drain Inline Water Level Control Structure).
- A riprap spillway would be constructed.

Note that the proposed project as delineated would involve only privately owned lands.

5.3.2.5 L/W-04: McAllister Well Rehabilitation

This project entails the placement of a windmill powered pump within a well located in Section 8, Township 13 North, Range 89 West in the Lower Savery Creek Subwatershed. The well is permitted to a private land owner (WSEO Permit P18516). According to records of the Wyoming State Engineers permit database, the well is approximately 150 feet deep with a yield of approximately 5 gallons per minute. The depth to static water level was not reported.

According to the landowner, solar platforms have suffered damage to vandalism; consequently a windmill would be preferable to provide an energy source to a pump under these conditions. Under this alternative the following components would be employed as indicated in Figure 5.3-7:

- One 10-ft diameter windmill and pump (e.g., Aeromoter brand) would be installed in the existing well.
- One metal windmill tower (33-ft) would be incorporated

Note that the proposed project as delineated would involve only privately owned lands.

5.3.2.6 L/W-05: Davis Pipeline

This alternative would utilize an existing well located on Flat Top Mountain in Section 24, Township 14 North, Range 93 West. Prior to initiation of this project, the well would need to be tested in order to verify its capacity and its permitting status verified.

The project would consist of a storage tank placed at the topographic divide between the east and west sides of Flat Top Mountain which would provide water via gravity flow to pipelines aligned on either side of the divide. This area is extremely dry and generally lacking in reliable water sources (Figure 5.3-8).

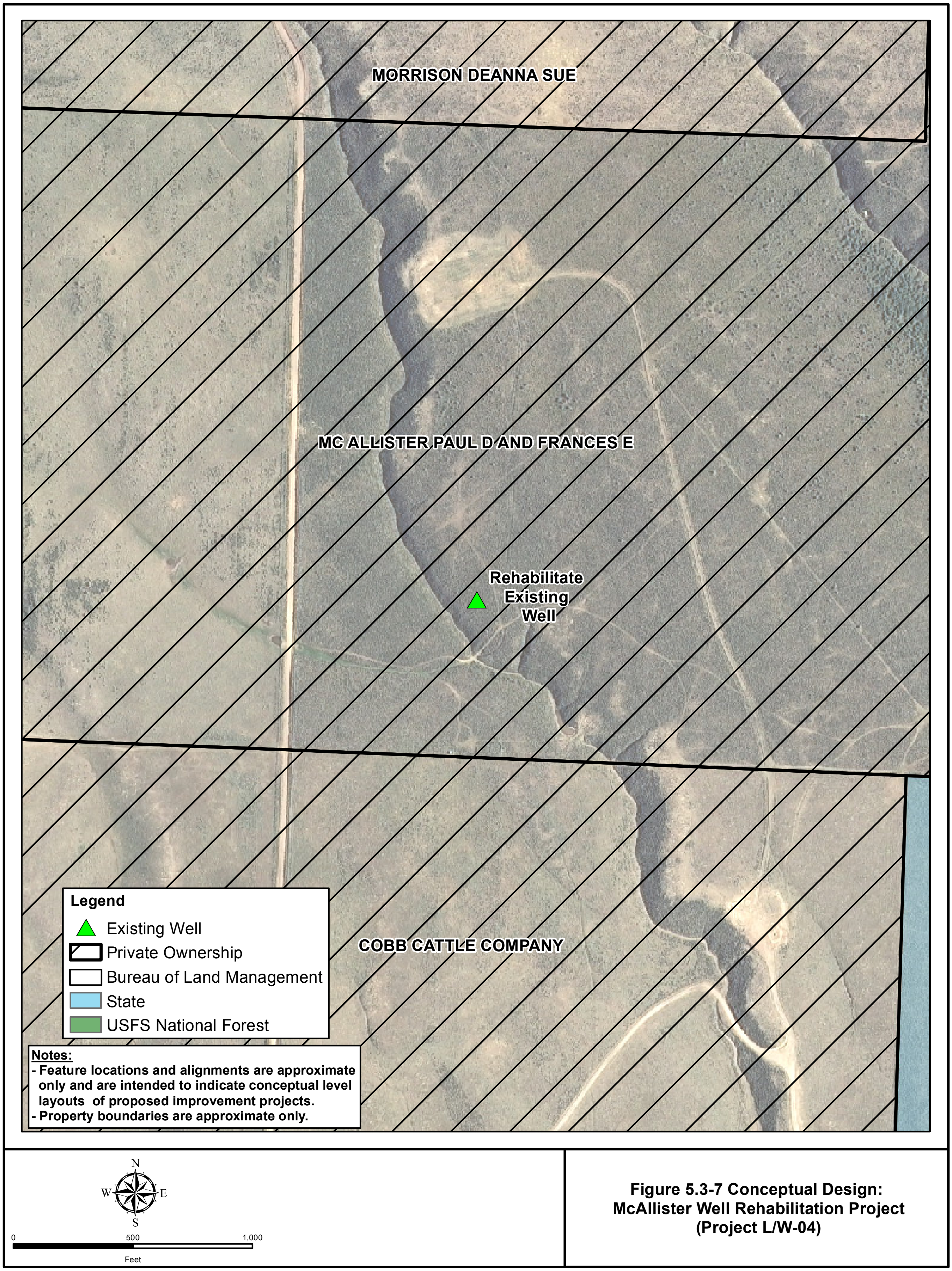


Figure 5.3-7 Conceptual Design: McAllister Well Rehabilitation Project (Project L/W-04)

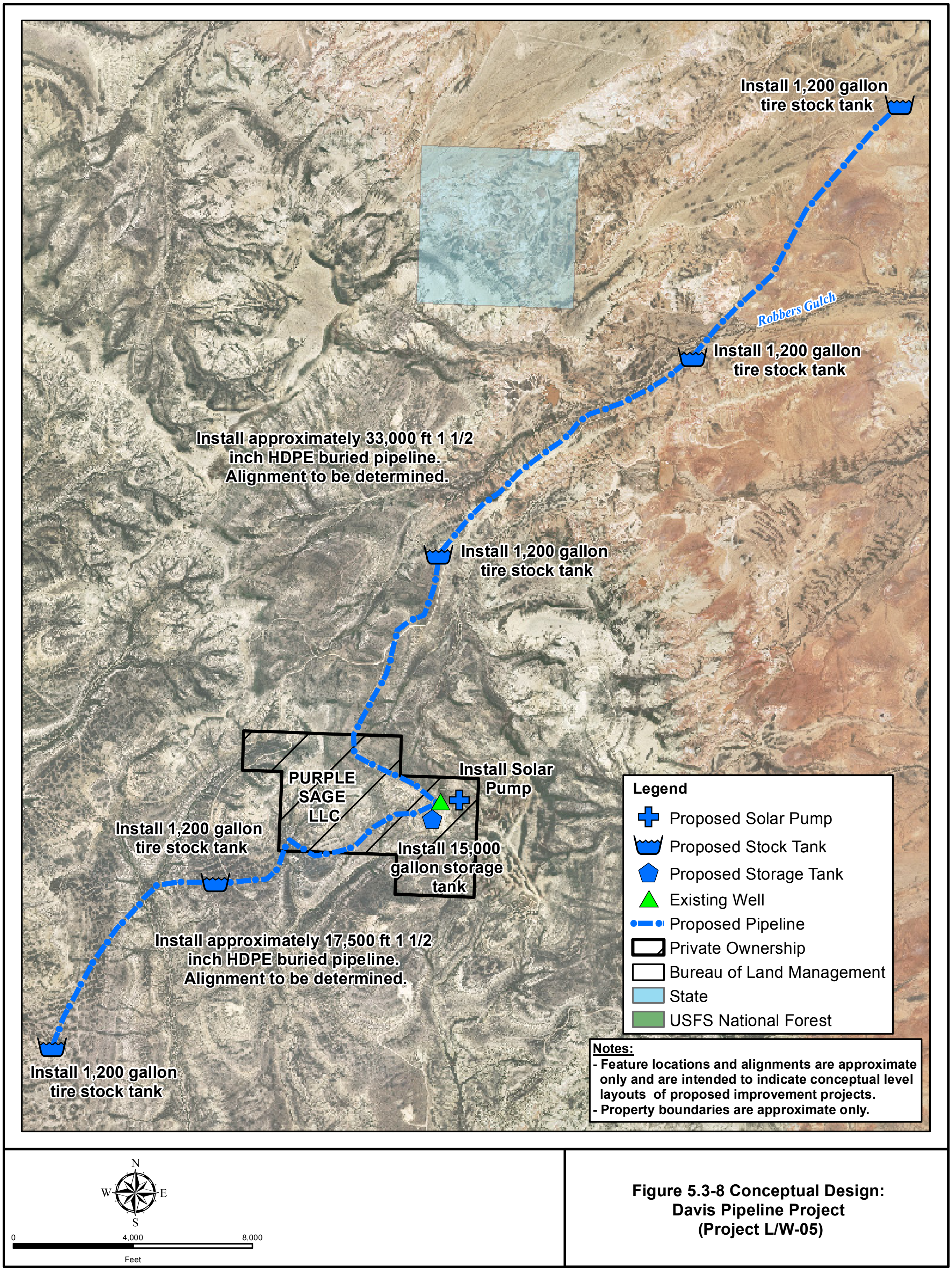


Figure 5.3-8 Conceptual Design: Davis Pipeline Project (Project L/W-05)

Under this alternative, the following components would be employed:

- The existing well would be equipped with a solar platform consisting of solar panels, solar powered pump, batteries, and all requisite regulators, connections and housings.
- A storage tank (15,000 gallon capacity) would be installed adjacent to the well head on the high point of the ridge.
- From the storage tank, two buried HDPE low pressure pipelines would be installed. One would be aligned down the northeasterly side of Flat Top Mountain to supply a series of 3 stock tanks (1,200 gallon capacity each). This pipeline would require the installation of approximately 33,000 linear feet of 1½ pipeline.
- From the storage tank, the second pipeline would be installed on an alignment running southwesterly to the opposite side of the Flat Top Mountain ridge. This pipeline would be approximately 17,500 feet long and supply two (2) stock tanks (1,200 gallon capacity each).
- Requisite valves and fittings would be incorporated to facilitate management of flows and water levels. Pressure reduction valves (PRVs) may be required to maintain pipeline pressures below 160 psi.
- Wildlife egress ramps would be installed in the proposed stock tanks.

Note that the proposed project as delineated would involve primarily federally owned lands administered by the BLM (Rock Springs District) for the pipeline and stock tank construction. The existing well, solar platform, and storage tank would be situated on deeded property.

5.3.2.7 L/W-06: Davis Spring Development 1

This project consists of development of existing spring located in Section 24, Township 14 North, Range 93 West. The spring is indicated on USGS topographic maps as Patterson Springs, however, preliminary search of the WSEO water right databases failed to provide information on water rights associated with it. Prior to construction of this project, water rights may need to be secured on its source. Figure 5.3-9 displays the conceptual design of the project.

Under this proposed project, the spring would be developed and collected flows conveyed downstream to a single stock tank.

Under this alternative, the following components would be employed:

- A new spring development would be completed in the vicinity of the existing spring. The spring development would facilitate diversion of flows to a gravity pipeline.
- Requisite valves and fittings would be incorporated to facilitate management of flows and water levels.
- The spring vicinity would be fenced to prevent the spring development damage from livestock and wildlife.

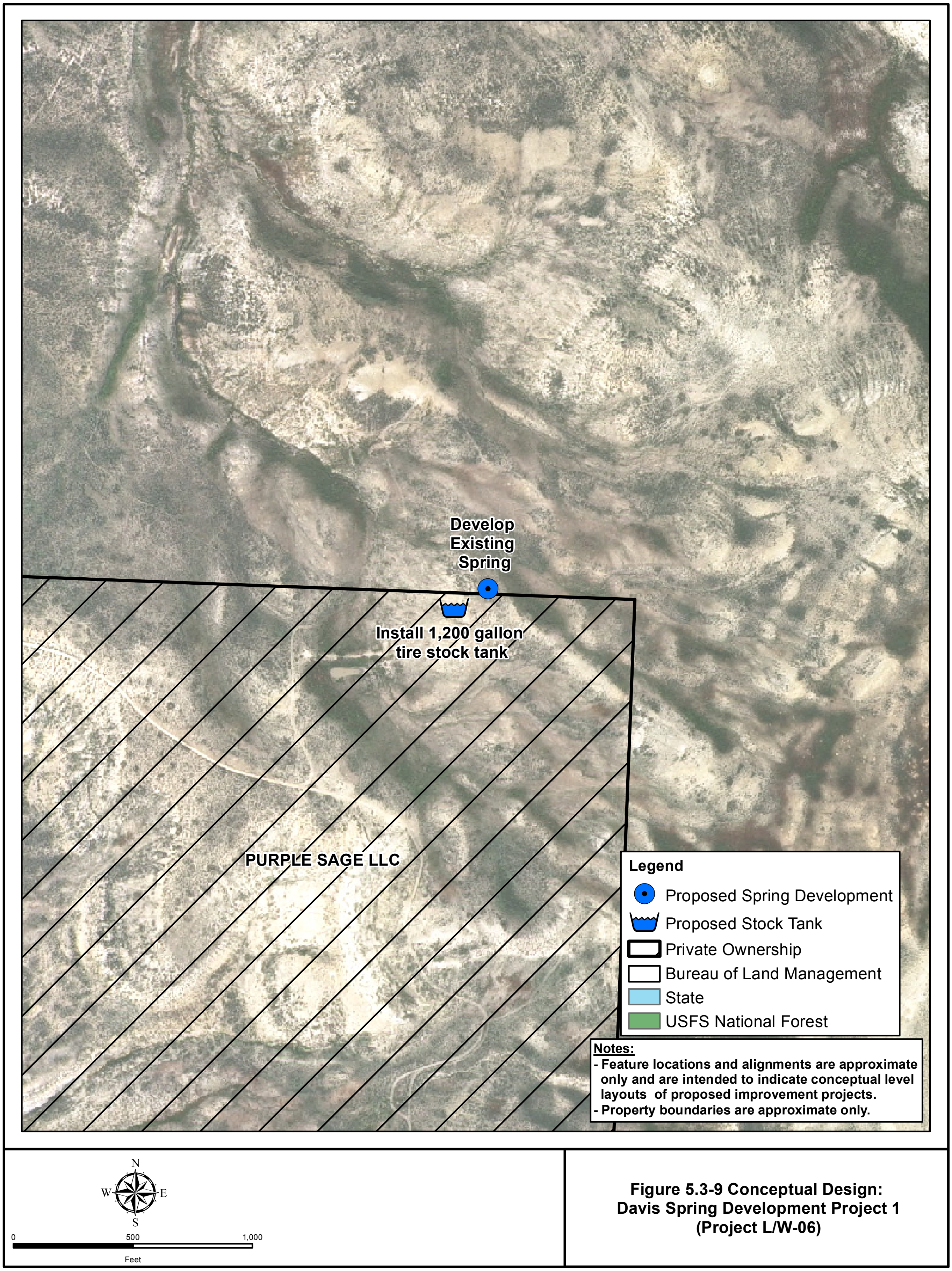


Figure 5.3-9 Conceptual Design: Davis Spring Development Project 1 (Project L/W-06)

Note that the proposed project as delineated would involve federally owned lands administered by the BLM (Rock Springs District) and deeded property

5.3.2.8 L/W-07: Davis Spring Development 2

This project consists of development of existing spring located in Section 24, Township 14 North, Range 93 West. Prior to construction of this project, water rights may need to be secured on its source. Figure 5.3-10 displays the conceptual design of the project.

Under this proposed project, the spring would be developed and collected flows conveyed downstream to a single stock tank.

Under this alternative, the following components would be employed:

- A new spring development would be completed in the vicinity of the existing spring. The spring development would facilitate diversion of flows to a gravity pipeline.
- Requisite valves and fittings would be incorporated to facilitate management of flows and water levels.
- The spring vicinity would be fenced to prevent the spring development damage from livestock and wildlife.

Note that the proposed project as delineated would involve only privately owned lands.

5.3.2.9 L/W-08: Waldron Spring Development

This project consists of development of existing spring located in Section 2, Township 12 North, Range 91 West. The spring is located downstream of a small stock reservoir and may consist of seepage from the reservoir. Figure 5.3-11 displays the conceptual design of the project.

Under this proposed project, the spring would be developed and collected flows conveyed downstream to a proposed stock tank. The land owner would have the option in the future of extending the existing pipeline or incorporating a new pipeline.

Under this alternative, the following components would be employed:

- A new spring development would be completed in the vicinity of the existing spring. The spring development would facilitate diversion of flows to a gravity pipeline.
- Requisite valves and fittings would be incorporated to facilitate management of flows and water levels.
- The spring vicinity would be fenced to prevent the spring development damage from livestock and wildlife.

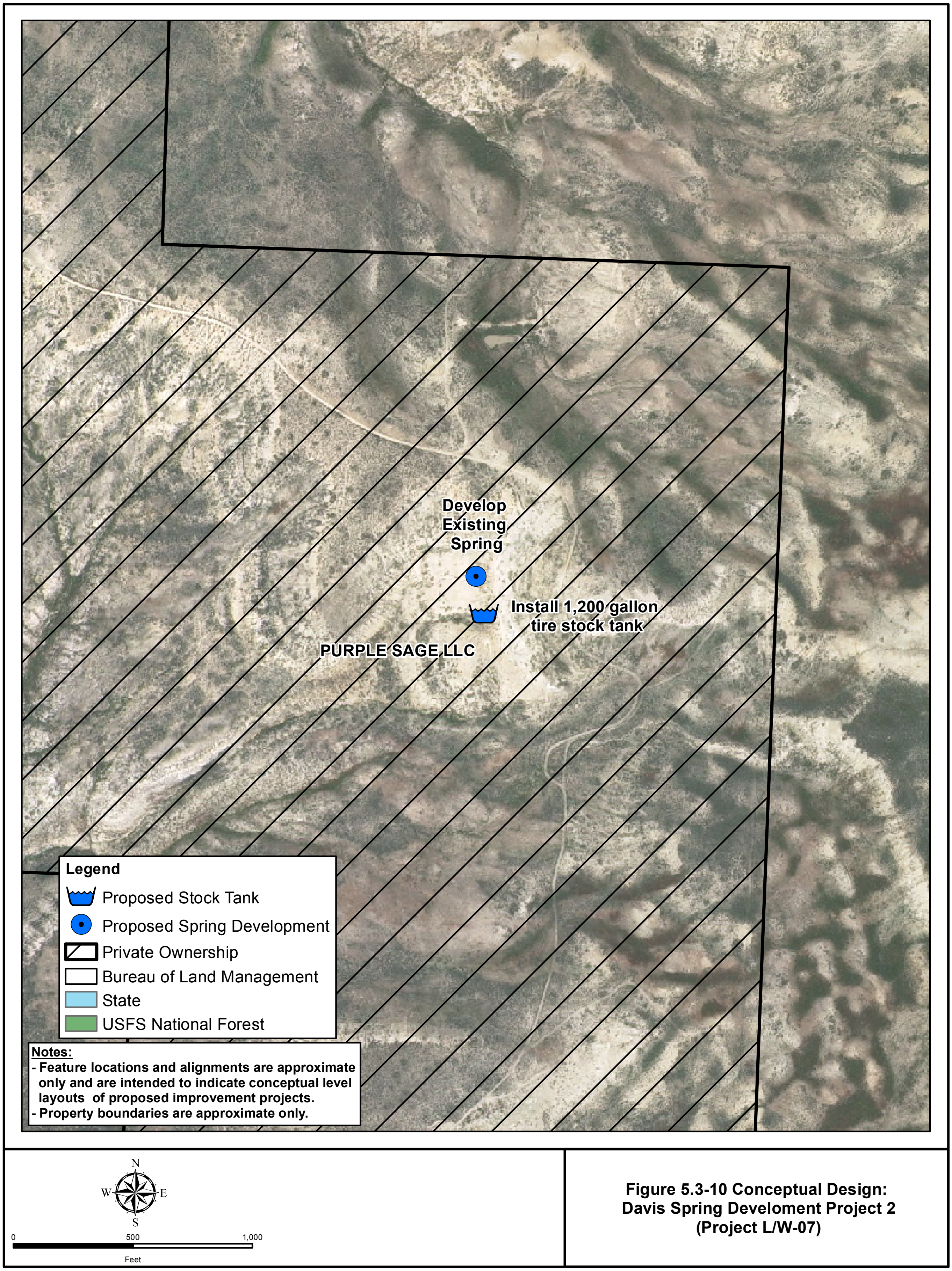


Figure 5.3-10 Conceptual Design: Davis Spring Develoment Project 2 (Project L/W-07)

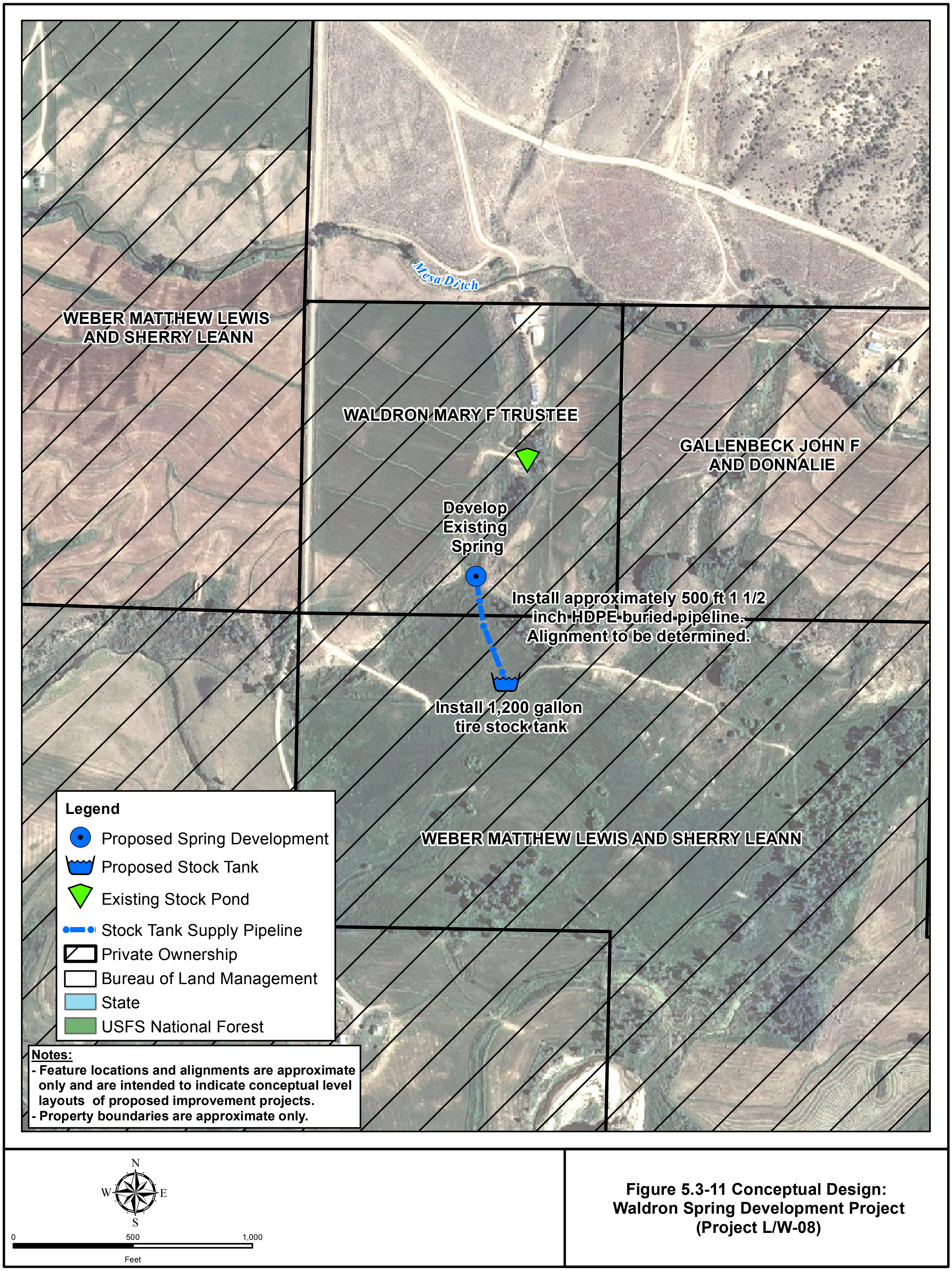


Figure 5.3-11 Conceptual Design: Waldron Spring Development Project (Project L/W-08)

- The buried 1 ½ inch HDPE low pressure pipeline (a total of approx. 500 feet) would be routed downslope from the spring to a stock tank.
- As configured under this alternative, one (1) stock tank (1,200 gallon capacity each) would be placed at a site determined during final design.

Note that the proposed project as delineated would involve only privately owned lands.

5.3.2.10 L/W-09: Waldron Stock Pond Rehabilitation

This project involves the rehabilitation of a stock reservoir in Section 2, Township 12 North, Range 91 West. According to the landowner, the leakage prevents it from holding water for a desirable time period. This project would entail inspection of the embankment, making necessary repairs if needed, removing sediment and installing a impermeable liner (Figure 5.3-12).

Under this alternative, the following components would be employed:

- Existing sediment would be excavated from the existing pond.
- The pond would be sealed with agricultural grade bentonite at a rate of 4 pounds per square foot based upon NRCS guidelines.

As delineated, the projects involve privately-owned lands only.

Note: Several options exist to reduce seepage in small stock reservoirs, including Geotextile liners, bentonite mat liners, or placement of agricultural grade bentonite. Options involving liners were deemed cost-prohibitive; costs associate with lining a stock reservoir using commercial lining products would range from approximately $2 to $4 per square foot depending upon the type of material. Typical lining projects would therefore be approximately $10,000 to $20,000 per site for a small stock reservoir. Bentonite fabrics (Bentomat) can sometimes be obtained free or at very low cost from distributors when there are over-runs or excess available. However, the reliability is not certain.

5.3.2.11 L/W-10: Sheehan Stock Tank Project

This alternative would utilize an existing storage tank located in Section 10, Township 15 North, Range 94 West. Water must be hauled to the tank by truck; there is no other economically viable means of water at this site.

This project consists of extending the potential area served with the storage tank by extending pipelines to the southwest and south east (Figure 5.3-13). Based upon review of the USGS topographic mapping, the storage tank may need to be moved to a higher location approximately one quarter mile southeast in order to facilitate gravity flow to both pipelines. Accurate elevation data would be recommended prior to completion of the project.

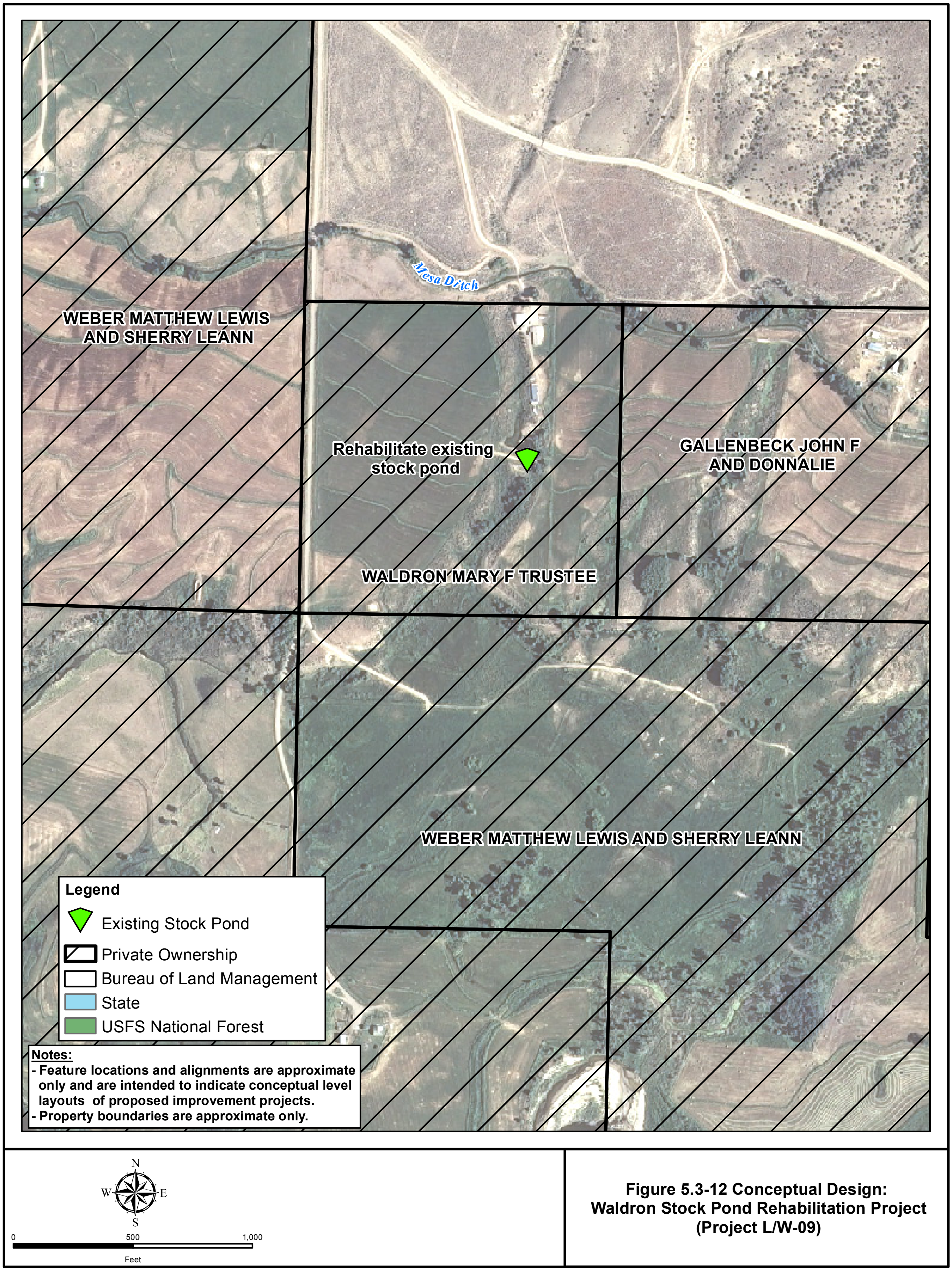


Figure 5.3-12 Conceptual Design: Waldron Stock Pond Rehabilitation Project (Project L/W-09)

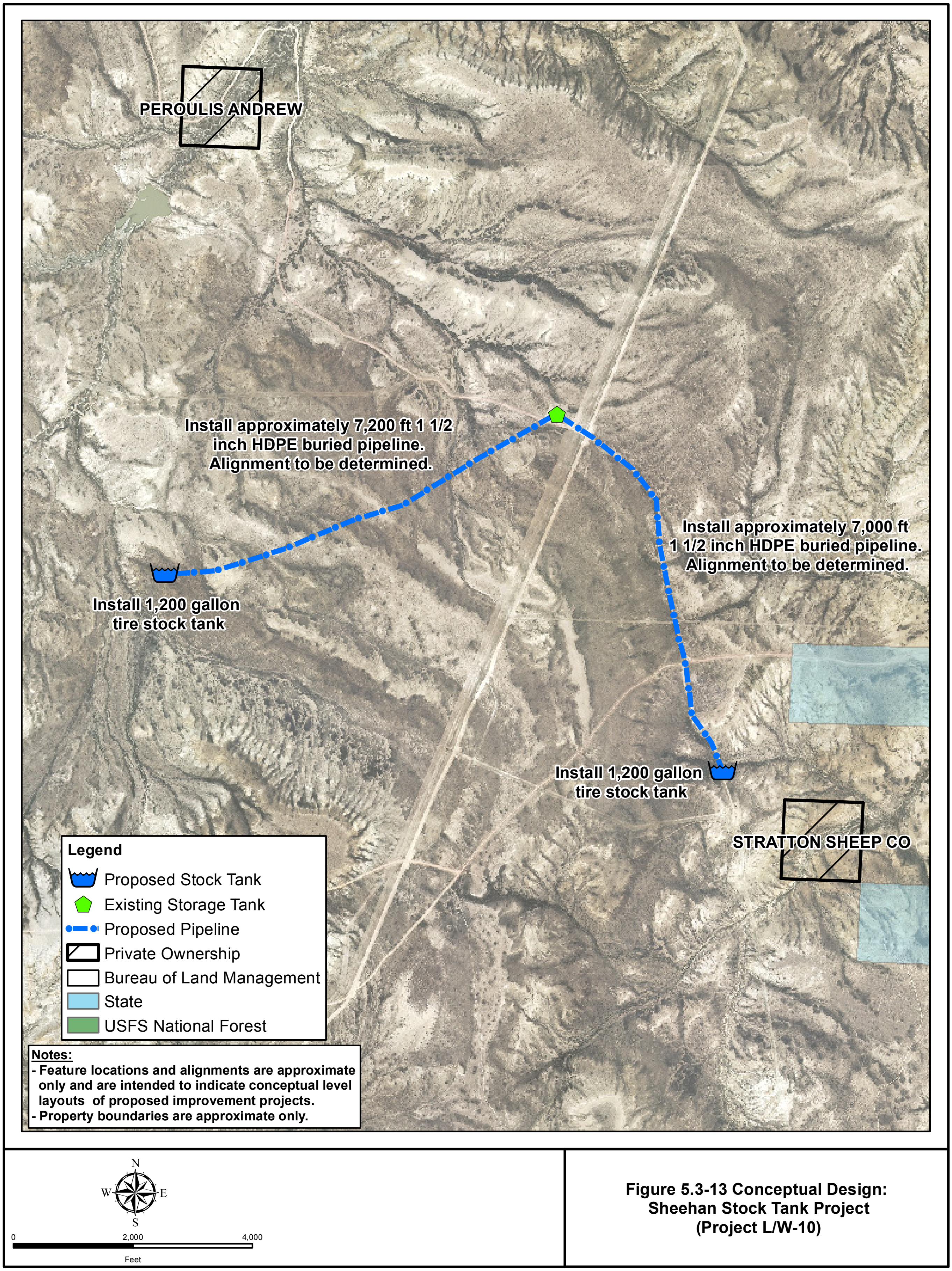


Figure 5.3-13 Conceptual Design: Sheehan Stock Tank Project (Project L/W-10)

Under this alternative, the following components would be employed:

- From the existing storage tank, two buried HDPE low pressure pipelines would be installed. One would be aligned southeasterly to supply a single stock tank (1,200 gallon capacity). This pipeline would require the installation of approximately 7,000 linear feet of 1½ pipeline.
- From the storage tank, the second pipeline would be installed on an alignment running southwesterly to another single stock tank (1,200 gallon capacity). This pipeline would be approximately 7,200 feet long.
- Requisite valves and fittings would be incorporated to facilitate management of flows and water levels.
- Wildlife egress ramps would be installed in the proposed stock tanks.

Note that the proposed project as delineated would involve federally owned lands administered by the BLM (Rock Springs District) for the pipeline and stock tank construction.

5.3.2.12 L/W-11: Ladder Ranch Pipeline 1

This alternative would involve the development of an existing spring in the Battle Creek watershed on Medicine Bow National Forest lands. The alternative would provide a source of water which would be an alternative to riparian sources. Figure 5.3-14 displays the conceptual design of the project.

Under this alternative, the following components would be employed:

- An existing spring would be developed in Section 31, Township 13 North, Range 87 West. A valve would be included for management of pipeline flows.
- The spring vicinity would be fenced to prevent the spring development damage from livestock and wildlife.
- The spring development would be equipped with a solar platform consisting of solar panels, solar powered pump, batteries, and all requisite regulators, connections and housings.
- From the spring, water would be pumped easterly and upslope to a storage tank (15,000 gallon).
- From the storage tank, water would be conveyed to a series of two 1,200 gallon capacity stock tanks.
- Approximately 5,500 linear feet of buried 1 ½ inch HDPE low pressure pipeline would be required.
- Requisite valves and fittings would be incorporated to facilitate management of flows and water levels.
- Wildlife egress ramps would be installed in the proposed stock tanks.

Note that the proposed project as delineated would involve only federally owned (USFS) lands for pipeline alignment and stock tank placement.

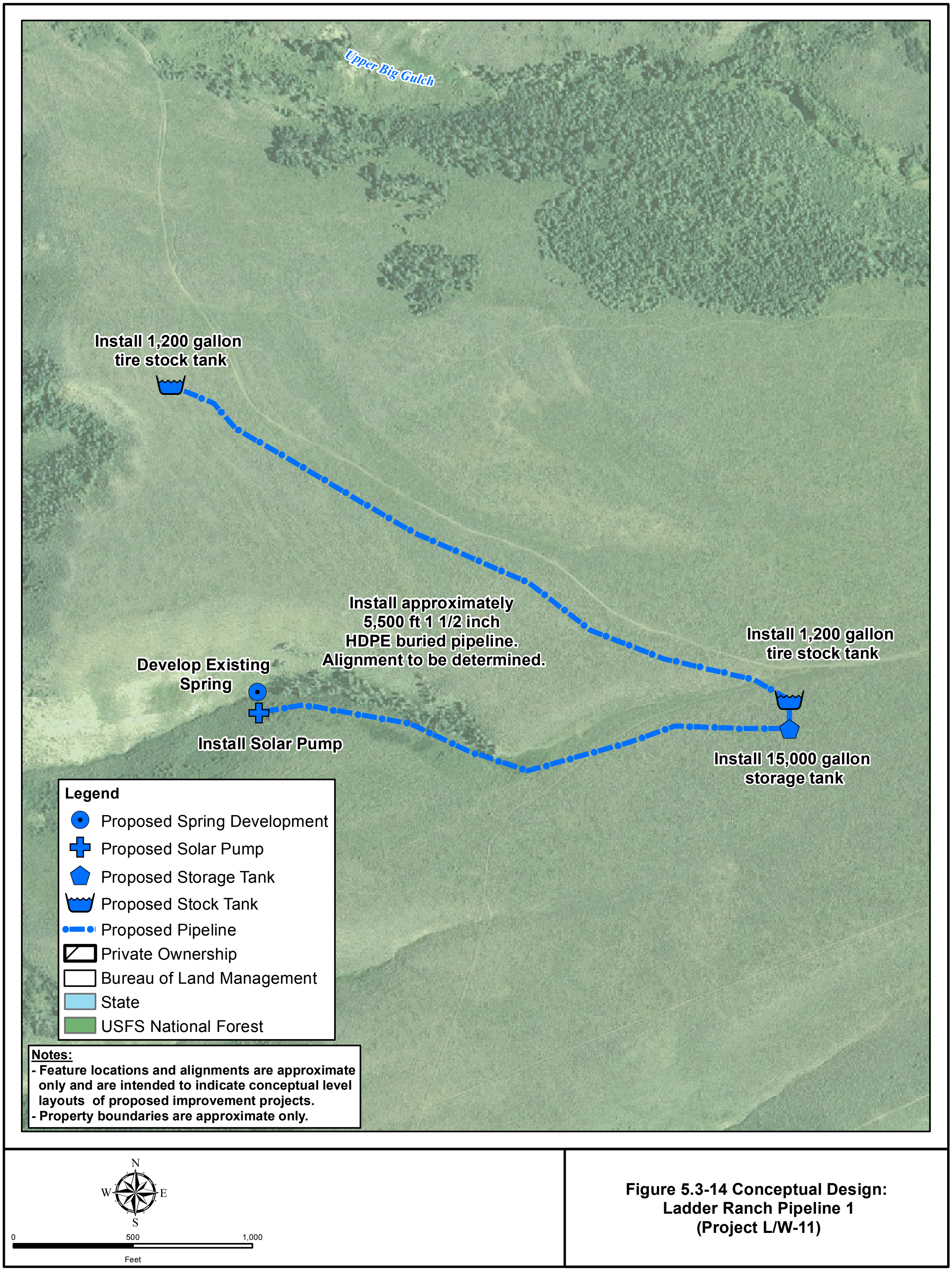


Figure 5.3-14 Conceptual Design: Ladder Ranch Pipeline 1 (Project L/W-11)

5.3.2.13 L/W-12: Ladder Ranch Pipeline 2

This alternative would involve the development of an existing spring in the Spring Creek watershed on Medicine Bow National Forest lands. Spring Creek is a small tributary to the Little Snake River near Savery, WY. The alternative would provide a source of water which would be an alternative to riparian sources. Figure 5.3-15 displays the conceptual design of the project.

Under this alternative, the following components would be employed:

- An existing spring would be developed in Section 10, Township 12 North, Range 87 West. A valve would be included for management of pipeline flows.
- The spring vicinity would be fenced to prevent the spring development damage from livestock and wildlife.
- From the spring, water would be southerly via gravity to a single stock tank (1,200 gallon capacity).
- Approximately 3,500 linear feet of buried 1 ½ inch HDPE low pressure pipeline would be required.
- Requisite valves and fittings would be incorporated to facilitate management of flows and water levels.
- Wildlife egress ramps would be installed in the proposed stock tanks.

Note that the proposed project as delineated would involve privately owned and federally owned (USFS) lands for pipeline alignment and stock tank placement.

5.3.2.14 L/W-13: Ladder Ranch Well Rehabilitation

This alternative would involve the modification of facilities associated with an existing well located within the Cottonwood Creek subwatershed (Section 27, Township 13 North, Range 90 West). The artesian well would be equipped with a stock tank and short pipeline under this project. The alternative would provide a source of water which would be an alternative to riparian sources. Figure 5.3-16 displays the conceptual design of the project.

Note that the proposed project as delineated would involve only privately owned lands.

5.3.2.15 L/W-14: Ladder Ranch Stock Tank

This alternative would involve the modification of facilities associated with an existing well located within the Cottonwood Creek subwatershed (Section 27, Township 13 North, Range 90 West). The well would be equipped with a stock tank and short pipeline under this project. The alternative would provide a source of water which would be an alternative to riparian sources. Figure 5.3-17 displays the conceptual design of the project.

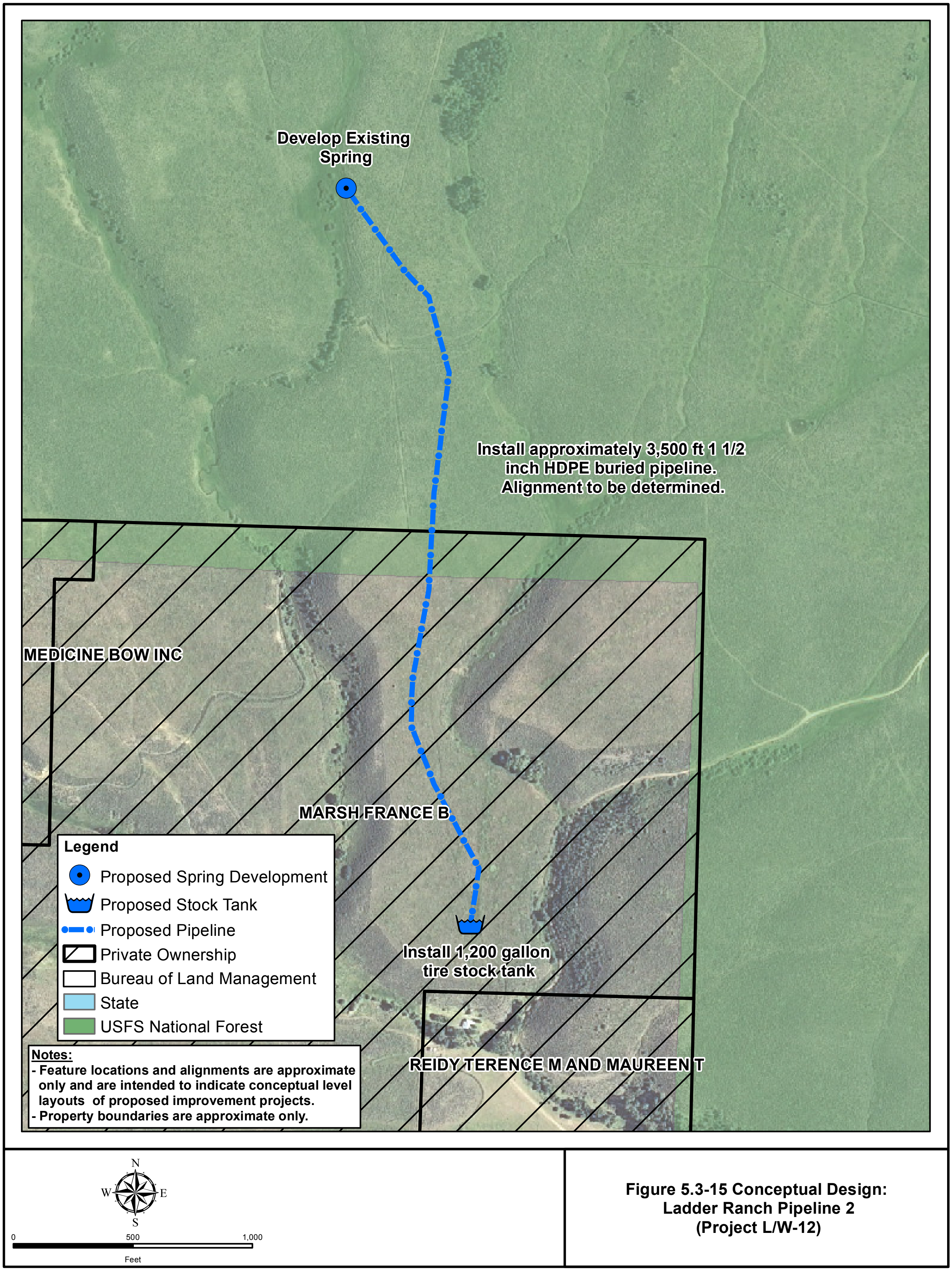


Figure 5.3-15 Conceptual Design: Ladder Ranch Pipeline 2 (Project L/W-12)

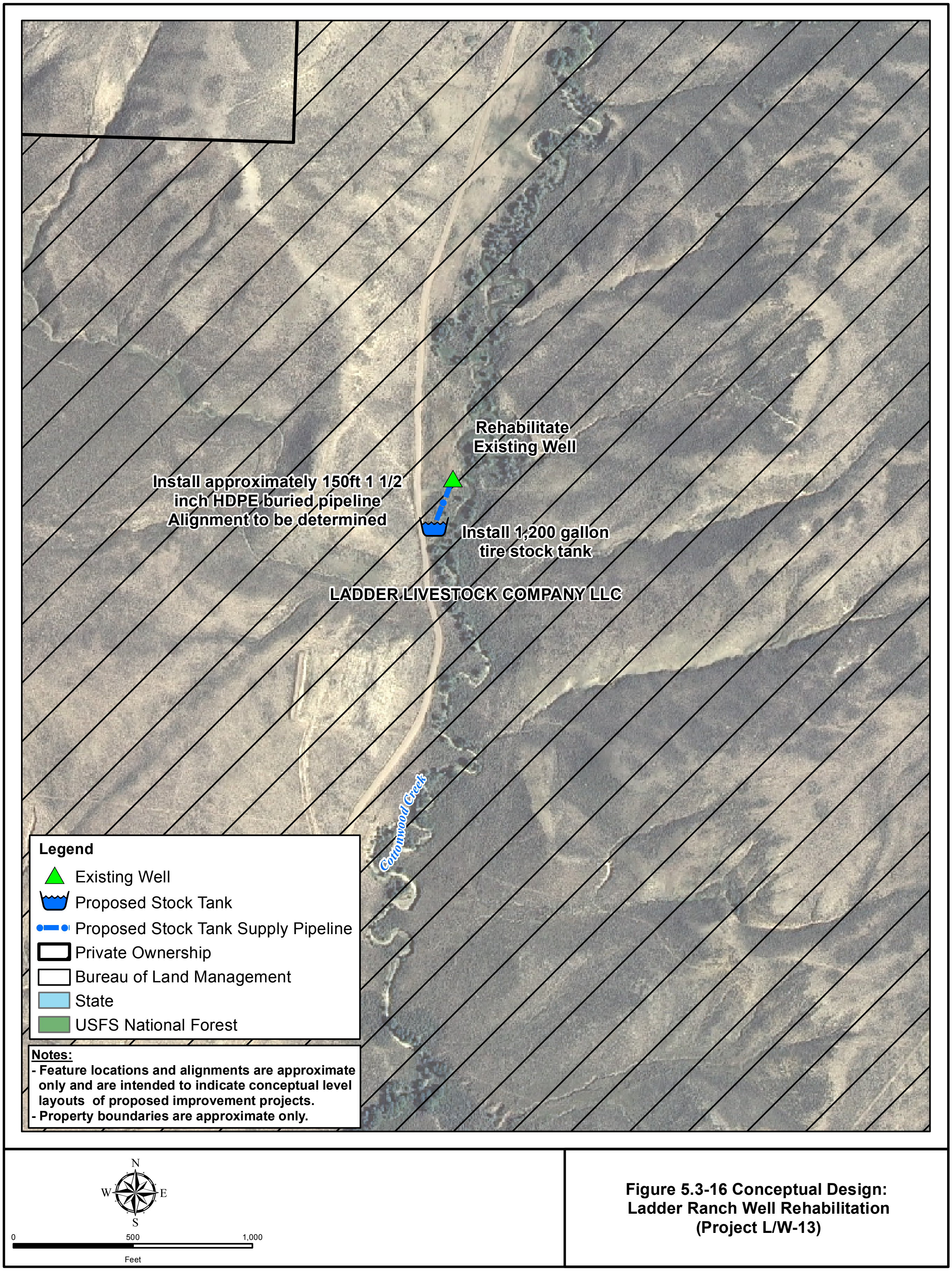


Figure 5.3-16 Conceptual Design: Ladder Ranch Well Rehabilitation (Project L/W-13)

Note that the proposed project as delineated would involve only privately owned lands.

5.3.2.16 L/W-15: Weber Pipeline

This alternative would involve utilizing an existing well located in Section 19, Township 14 North, Range 91 West along Highway 789 (Figure 5.3-18). The intent of the landowner is to construct a pipeline aligned easterly from the well to supply a series of stock reservoirs east of Muddy Creek. The land owner will provide plans for the pipeline; at the time of this writing, they were not available. For the purposes of this project, a pipeline length of approximately 25,000 feet was assumed to be required in order to provide sources of water to the hills east of Muddy Creek in this vicinity. In addition, a total of 5 stock tanks were assumed to be required.

Note that the proposed project as conceptualized would involve federally owned lands administered by the BLM and privately owned lands.

5.3.2.17 L/W-16: Upper Crooked Wash Well Project

This alternative would involve construction of a new well and installation of a 1,200 gallon stock tank in an area lacking viable year round sources of water. The proposed well would be located in the northwest quarter of Section 16, Township 13 North, Range 99 West. The scope of this project precluded an in-depth investigation of the local geology and depth to groundwater which would likely be encountered at this location. However, based upon a review of well data associated with other wells in the vicinity, a well depth of 700 to 900 feet could likely be required. Figure 5.3-19 displays the general location of this project.

Note that the proposed project as delineated would involve only State owned lands.

5.3.2.18 L/W-17: Lower Alkali Creek Well Project

This alternative would involve construction of a new well and installation of a 1,200 gallon stock tank in an area lacking viable year round sources of water. The proposed well would be located in the northeast quarter of Section 25, Township 14 North, Range 100 West. The scope of this project precluded an in-depth investigation of the local geology and depth to groundwater which would likely be encountered at this location. However, based upon a review of well data associated with other wells in the vicinity, a well depth of 1,000 feet could likely be required. Figure 5.3-20 displays the general location of this project.

Note that the proposed project as delineated would involve only State owned lands.

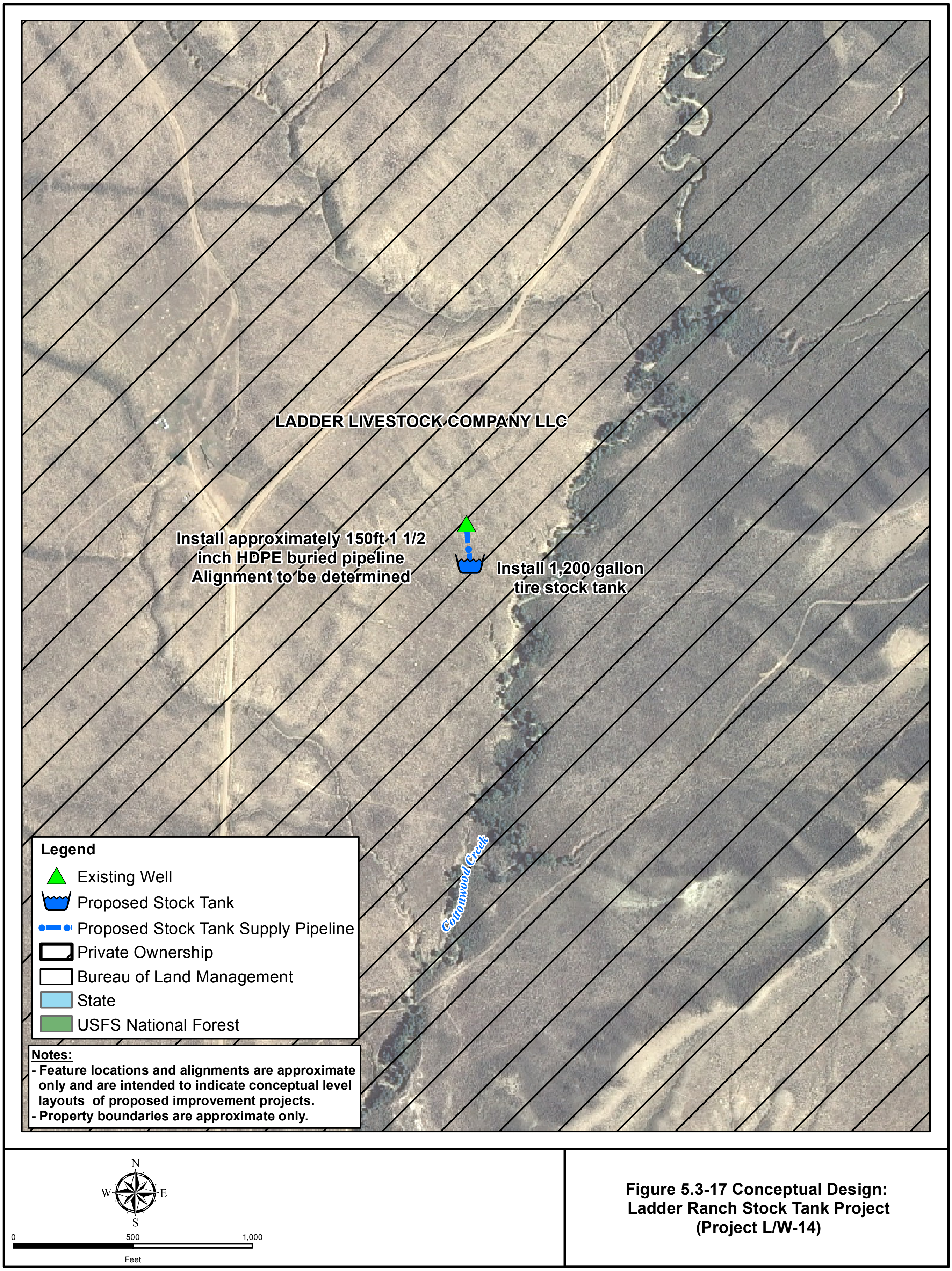


Figure 5.3-17 Conceptual Design: Ladder Ranch Stock Tank Project (Project L/W-14)

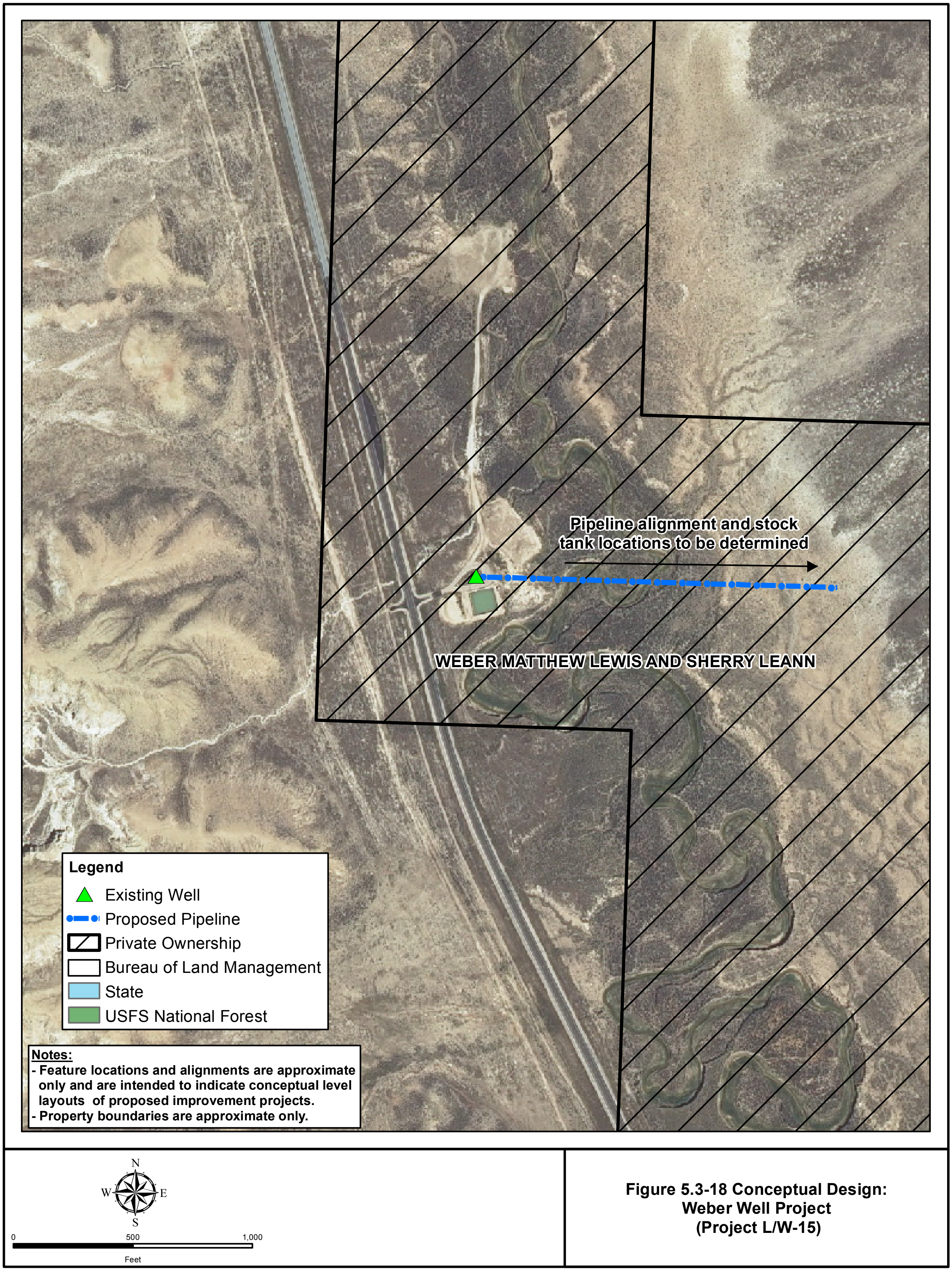


Figure 5.3-18 Conceptual Design: Weber Well Project (Project L/W-15)

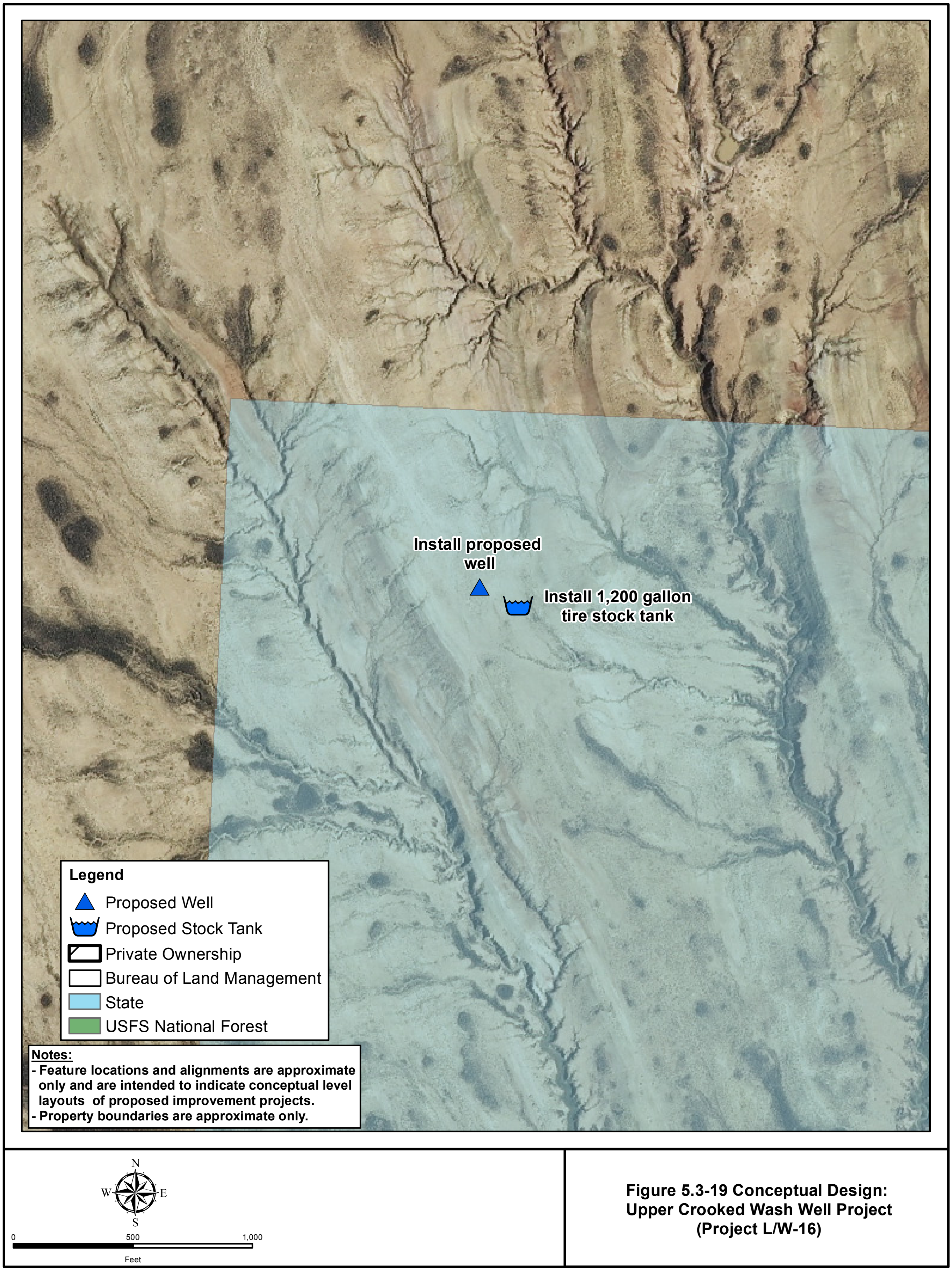


Figure 5.3-19 Conceptual Design: Upper Crooked Wash Well Project (Project L/W-16)

5.3.2.19 L/W-18: Upper Alkali Creek Well Project

This alternative would involve construction of a new well and installation of a 1,200 gallon stock tank in an area lacking viable year round sources of water. The proposed well would be located in the northwest quarter of Section 2, Township 14 North, Range 100 West. The scope of this project precluded an in-depth investigation of the local geology and depth to groundwater which would likely be encountered at this location. However, based upon a review of well data associated with other wells in the vicinity, a relatively well depth of 300 feet could likely be required. Figure 5.3-21 displays the general location of this project.

Note that the proposed project as conceptualized would involve federally owned lands administered by the BLM.

5.3.2.20 L/W-19: Upper Alkali Creek Stock Pond Project

This alternative would involve construction of a new stock pond in an area lacking viable year round sources of water. The proposed reservoir would be located in the northeast quarter of Section 3, Township 14 North, Range 100 West. The proposed stock reservoir would be sited on an unnamed tributary to Alkali Creek. Figure 5.3-22 displays the general location of this project.

Note that the proposed project as conceptualized would involve federally owned lands administered by the BLM.

5.3.2.21 L/W-20: Chicken Springs Basin Well Project

This alternative would involve construction of a new well and installation of a 1,200 gallon stock tank in an area lacking viable year round sources of water. The proposed well would be located in the southwest quarter of Section 8, Township 14 North, Range 100 West. The scope of this project precluded an in-depth investigation of the local geology and depth to groundwater which would likely be encountered at this location. However, based upon a review of well data associated with other wells in the vicinity, a relatively shallow well depth of 300 feet could likely be required. Figure 5.3-23 displays the general location of this project

Note that the proposed project as conceptualized would involve federally owned lands administered by the BLM.

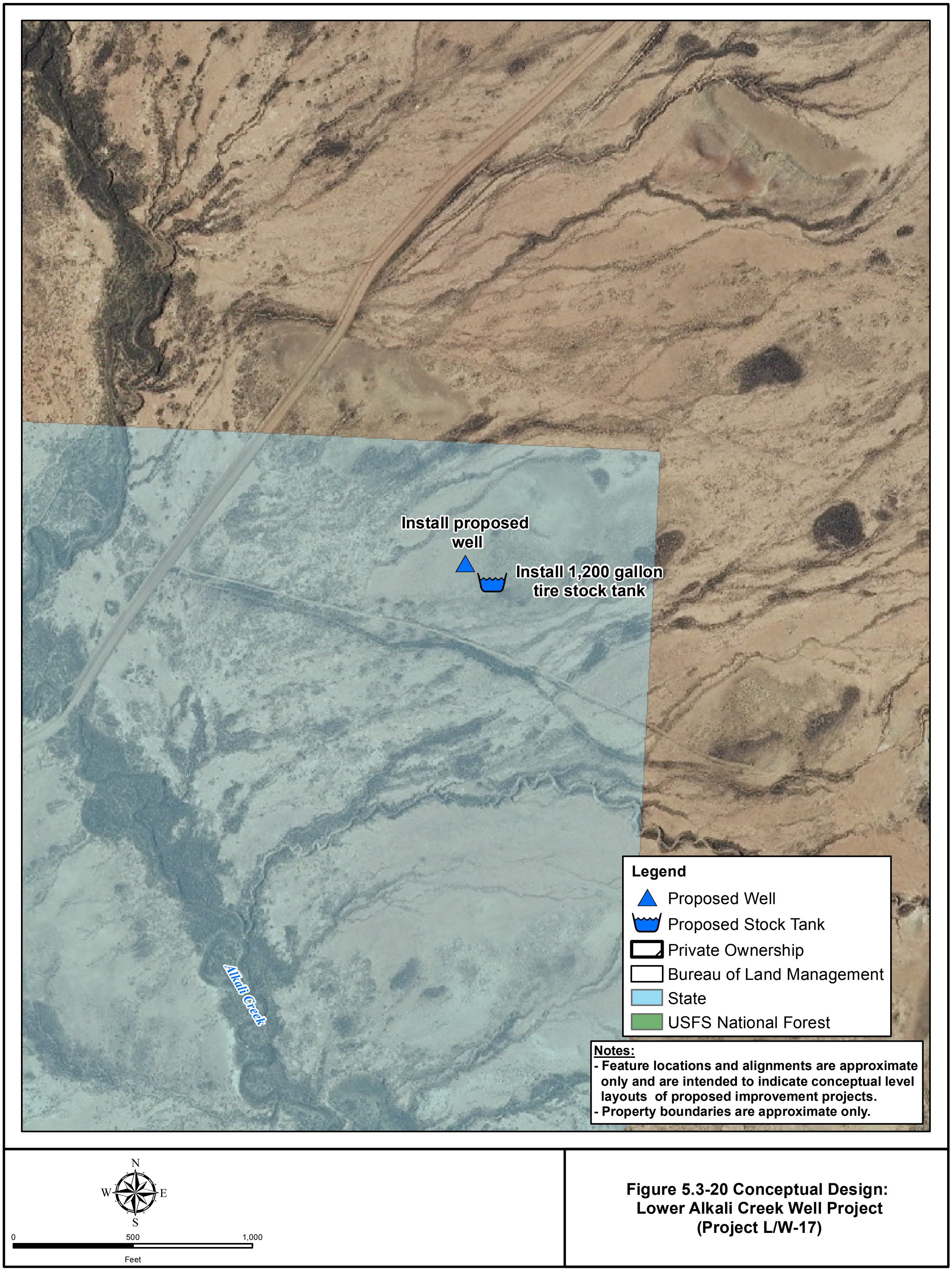


Figure 5.3-20 Conceptual Design: Lower Alkali Creek Well Project (Project L/W-17)

Figure 5.3-21 Conceptual Design: Upper Alkali Creek Well Project (Project L/W-18)

Figure 5.3-22 Conceptual Design: Upper Alkali Creek Stock Pond Project (Project L/W-19)

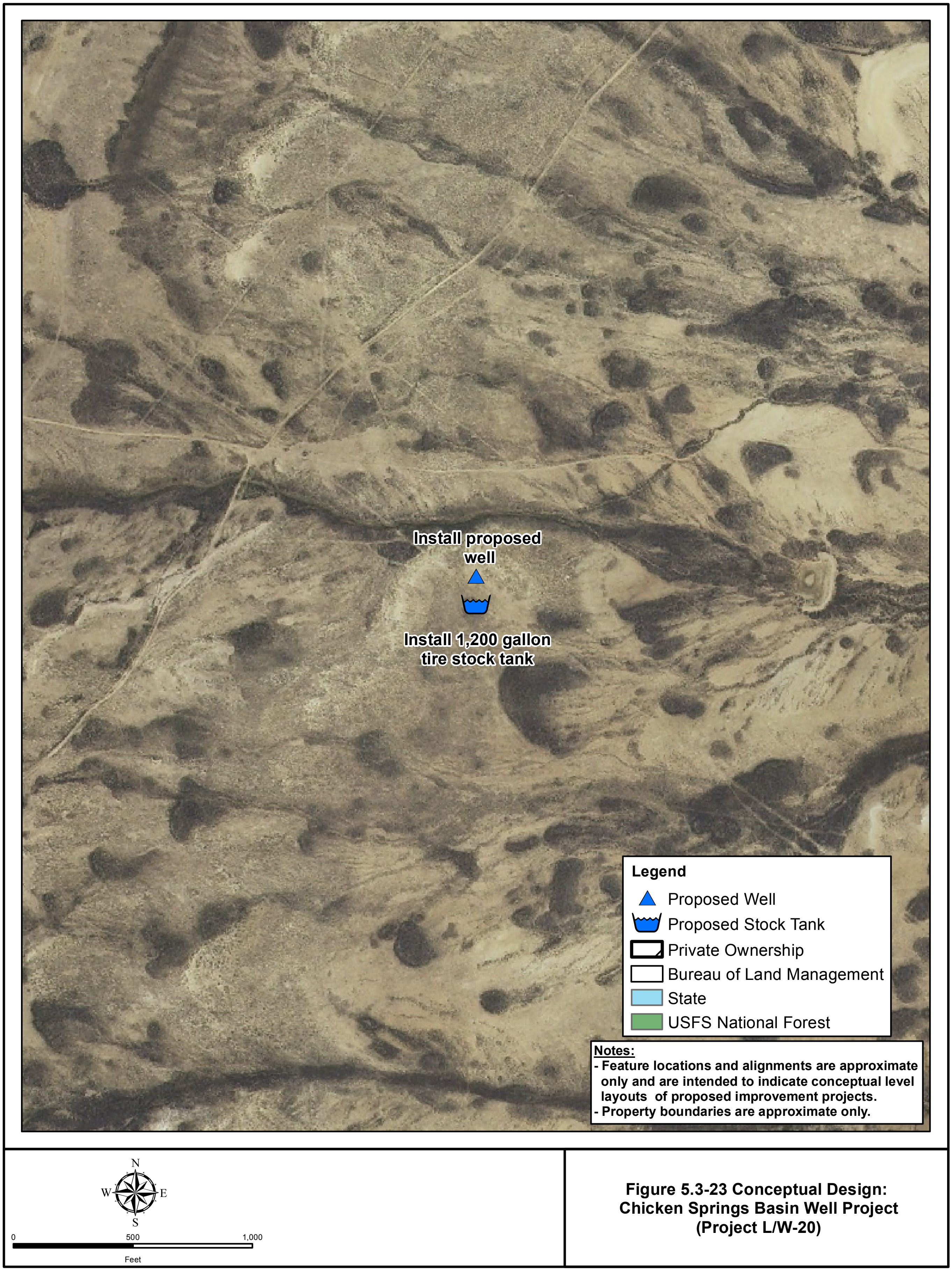


Figure 5.3-23 Conceptual Design: Chicken Springs Basin Well Project (Project L/W-20)

5.3.2.22 LSRCD Project Recommendations LW-21 through LW-45

The Little Snake River Conservation District (LSRCD) has recommended 25 individual upland water supply projects including well construction, stock pond construction, stock pond rehabilitation, and pipeline construction. At this time, detailed information was not available on individual projects other than their locations and the general action required. These projects (LW-21 through LW-45) are listed in Table 5.3.2. Locations of each project are included in Figures 5.3-24 through 5.3-48.

Note that the proposed project as conceptualized would involve federally owned lands administered by the BLM.

5.3.2.23 Additional Upland Management Opportunities

Guzzlers are artificial catchments providing sources of water in remote areas for wildlife. Larger systems could be employed for livestock watering purposes. They rely entirely upon direct precipitation; therefore, their reliability is only as good as can be expected in a water short region. Figure 5.3-49 displays a photo of a guzzler installed in the Cottonwood Creek watershed near Thermopolis, Wyoming. The option of installing a guzzler type water collection system with watering facilities may be considered in areas where wildlife water is needed, and alternative options are not available.

Figure 5.3-49 Wildlife Guzzler.

Guzzler watering systems utilize direct precipitation as a source of supply, with a storage tank of capacity suitable to the watering need. Wildlife guzzlers are typically designed to maximize use by wildlife and discourage use by livestock. A complete guzzler system is comprised of the following components:

- Catchment apron – typically made of textured HDPE; secured with rocks placed on a suitable grid spacing, and protected by suitable fencing from trampling by wildlife or livestock,
- Catchment outlet - pipe boot, clamps and well screen section,
- HDPE pipe – typically 1.5-2-inch, 160 psi, SDR 11,
- Catchment tank – HDPE tank sized to accommodate wildlife or livestock watering needs, with integral drinker (ideally with no float valve required), small animal escape ladder and overflow adapter, and
- Overflow pipe – with erosion protection at discharge.

Table 5.3-2 Tabulation of Upland Water Supply Projects Recommended by LSRCD.

Project	Project Name	Project Source	Type	Water Source	Action	Project Location		
						Section	Township	Range
LW-21	Cow Creek Well	LSRCD	Well Rehabilitation	Existing Well	Rehabilitate Existing Well	7	16N	90W
LW-22	Wild Horse Buttes Pipeline	LSRCD	Pipeline Project	Existing Well	Pipeline Construction	33	14N	91W
LW-23	Alamosa Gulch Stock Pond	LSRCD	Stock Pond	Proposed Reservoir	Construct	11	17N	91W
LW-24	Dry Cow Creek Stock Pond 1	LSRCD	Stock Pond	Proposed Reservoir	Construct	13	17N	91W
LW-25	Dry Cow Creek Stock Pond 2	LSRCD	Stock Pond	Proposed Reservoir	Construct	13	17N	91W
LW-26	Dry Cow Creek Stock Pond 3	LSRCD	Stock Pond	Proposed Reservoir	Construct	24	17N	91W
LW-27	Dry Cow Creek Stock Pond 4	LSRCD	Stock Pond	Existing Stock Pond	Rehabilitate Reservoir	19	17N	90W
LW-28	Dry Cow Creek Stock Pond 5	LSRCD	Stock Pond	Existing Stock Pond	Rehabilitate Reservoir	18	17N	90W
LW-29	Dry Cow Creek Stock Pond 6	LSRCD	Stock Pond	Existing Stock Pond	Rehabilitate Reservoir	7	17N	90W
LW-30	wer Barrel Springs Draw Stock Po	LSRCD	Stock Pond	Proposed Reservoir	Construct	25	16N	93W
LW-31	White Rock Draw Stock Pond	LSRCD	Stock Pond	Proposed Reservoir	Construct	4	13N	91W
LW-32	Dad Stock Pond	LSRCD	Stock Pond	Proposed Reservoir	Construct	28	16N	92W
LW-33	Deep Creek Stock Pond 1	LSRCD	Stock Pond	Proposed Reservoir	Construct	16	14N	90W
LW-34	Deep Creek Stock Pond 2	LSRCD	Stock Pond	Proposed Reservoir	Construct	20	14N	90W
LW-35	Deep Creek Stock Pond 3	LSRCD	Stock Pond	Proposed Reservoir	Construct	21	14N	90W
LW-36	Deep Creek Stock Pond 4	LSRCD	Stock Pond	Proposed Reservoir	Construct	27	14N	90W
LW-37	Deep Creek Stock Pond 5	LSRCD	Stock Pond	Proposed Reservoir	Construct	28	14N	90W
LW-38	Dirtyman Fork Stock Pond	LSRCD	Stock Pond	Existing Stock Pond	Rehabilitate Reservoir	25	15N	88W
LW-39	Mill Creek Stock Pond	LSRCD	Stock Pond	Proposed Reservoir	Construct	22	14N	87W
LW-40	Little Savery Creek Stock Pond 1	LSRCD	Stock Pond	Proposed Reservoir	Construct	24	15N	89W
LW-41	Little Savery Creek Stock Pond 2	LSRCD	Stock Pond	Proposed Reservoir	Construct	24	15N	89W
LW-42	Middle Savery Creek Stock Pond	LSRCD	Stock Pond	Proposed Reservoir	Construct	30	15N	88W
LW-43	Hog Eye Ranch Stock Pond	LSRCD	Stock Pond	Existing Stock Pond	Rehabilitate Reservoir	23	15N	89W
LW-44	Bird Gulch Stock Pond	LSRCD	Stock Pond	Existing Stock Pond	Rehabilitate Reservoir	4	14N	89W
LW-45	Battle Creek Stock Pond	LSRCD	Stock Pond	Existing Stock Pond	Rehabilitate Reservoir	25	14N	86W

These guzzlers would be installed at locations to be determined. The guzzler operates by intercepting direct rainfall or snowmelt on the catchment, routing the captured water via a pipe to the tank, and controlling the tank level via a simple overflow outlet pipe. Complete guzzler systems are commercially available.

5.4 Grazing Management Opportunities (Watershed Management Plan Component G)

5.4.1 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

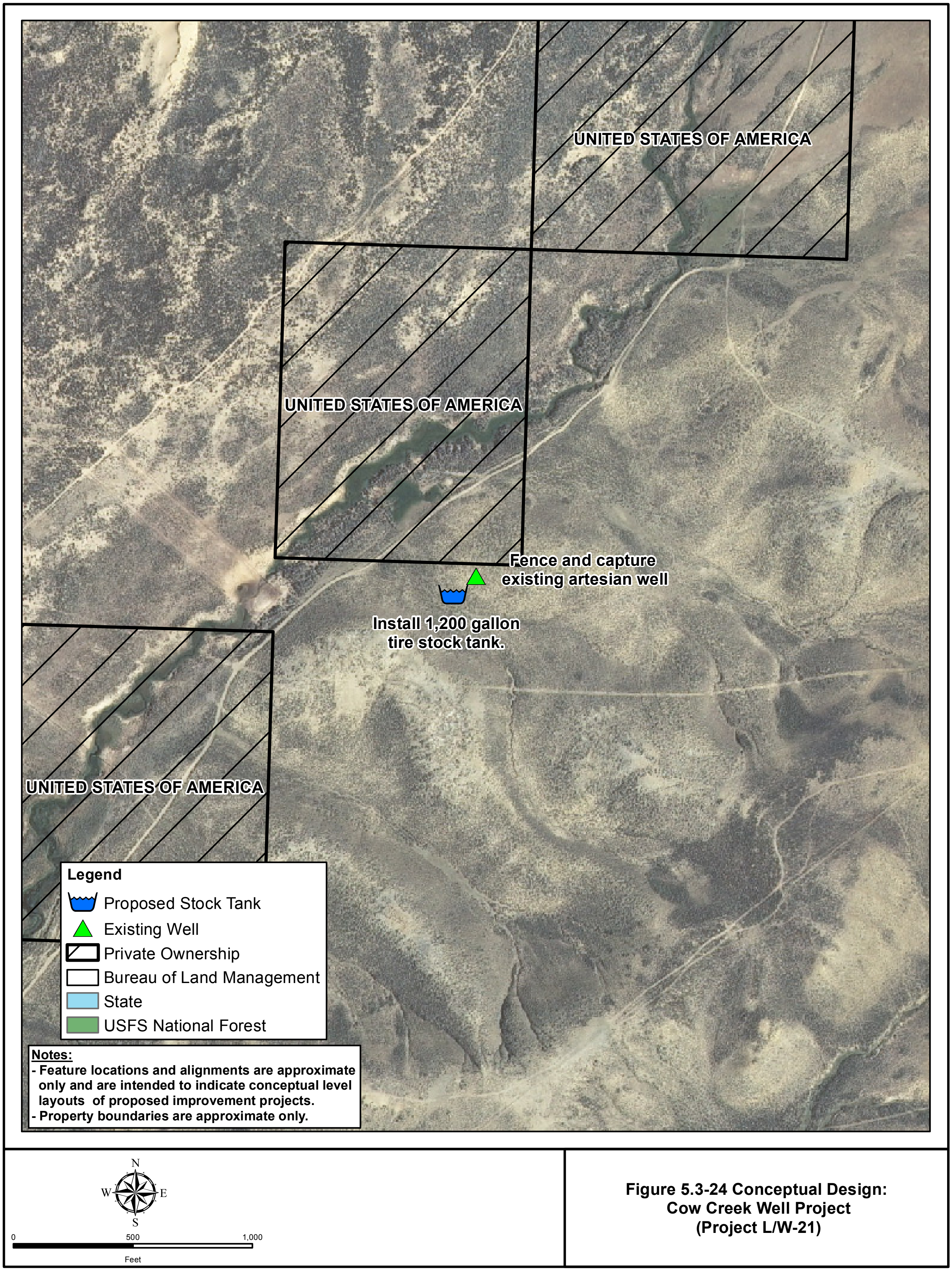


Figure 5.3-24 Conceptual Design: Cow Creek Well Project (Project L/W-21)

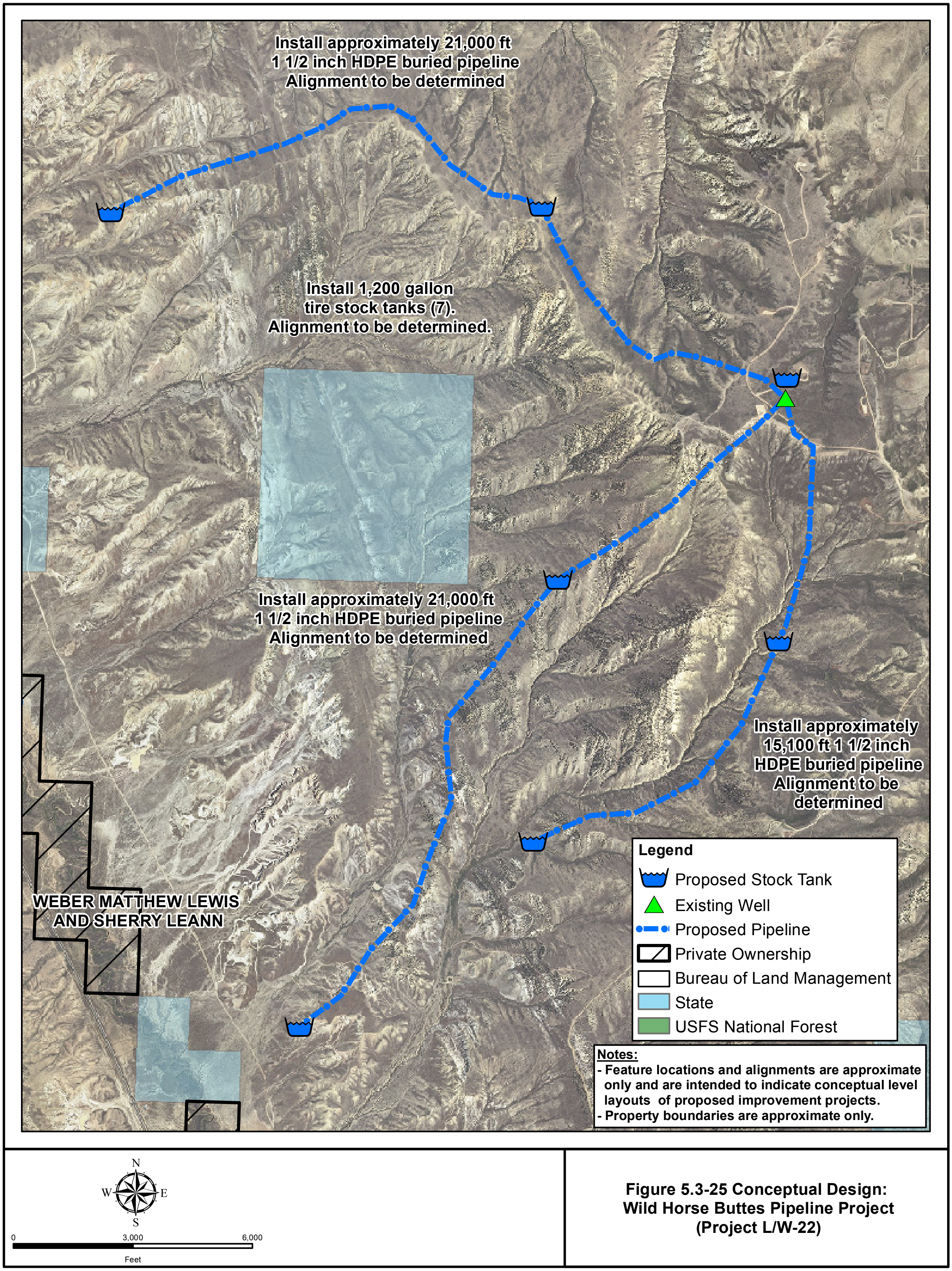
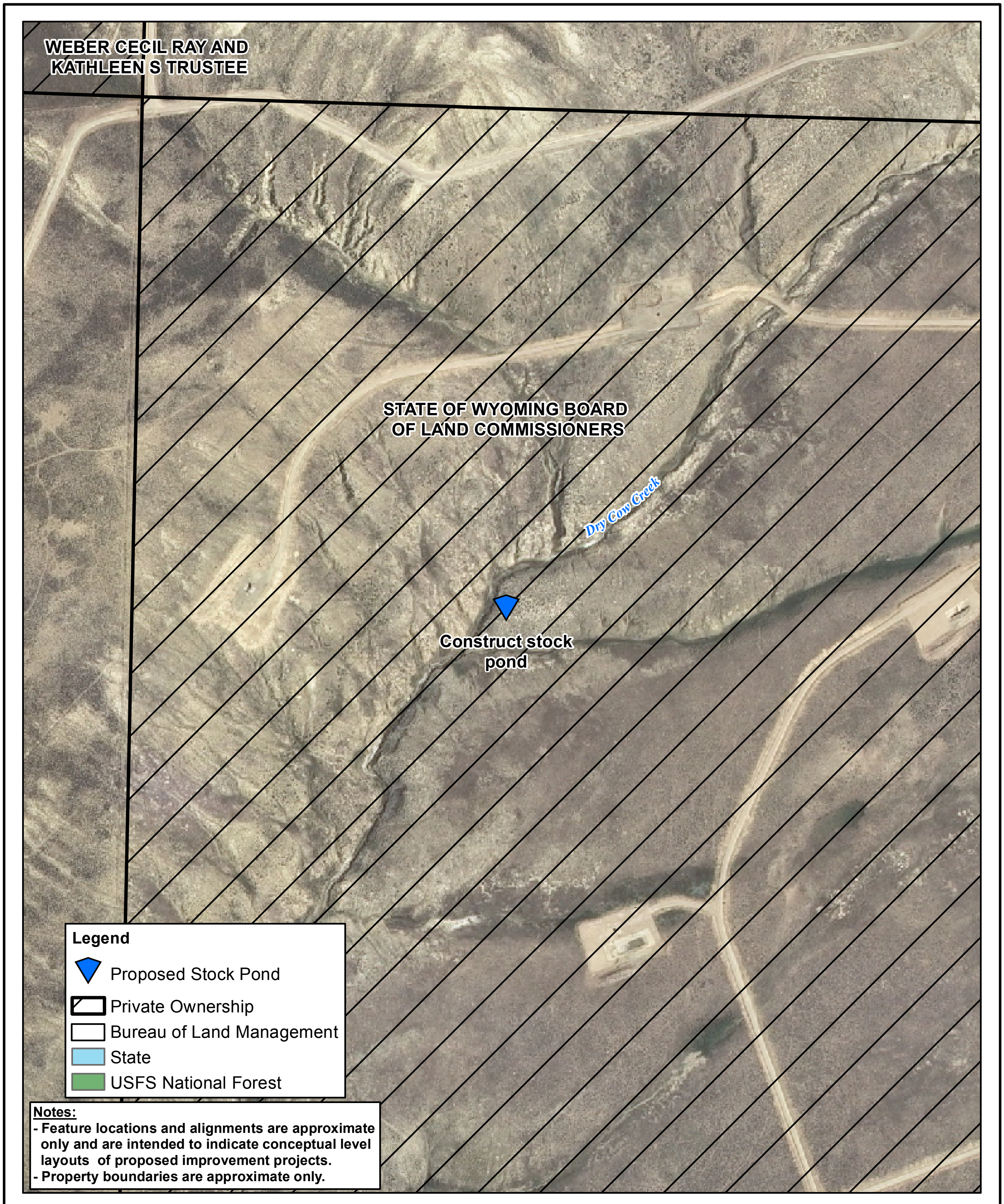


Figure 5.3-25 Conceptual Design: Wild Horse Buttes Pipeline Project (Project L/W-22)

Figure 5.3-26 Conceptual Design: Alamosa Gulch Stock Pond (Project L/W-23)



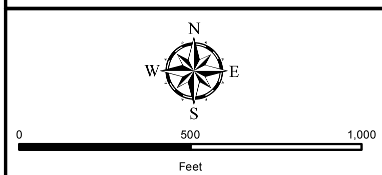


Figure 5.3-27 Conceptual Design:
Dry Cow Creek Stock Pond 1
(Project L/W-24)

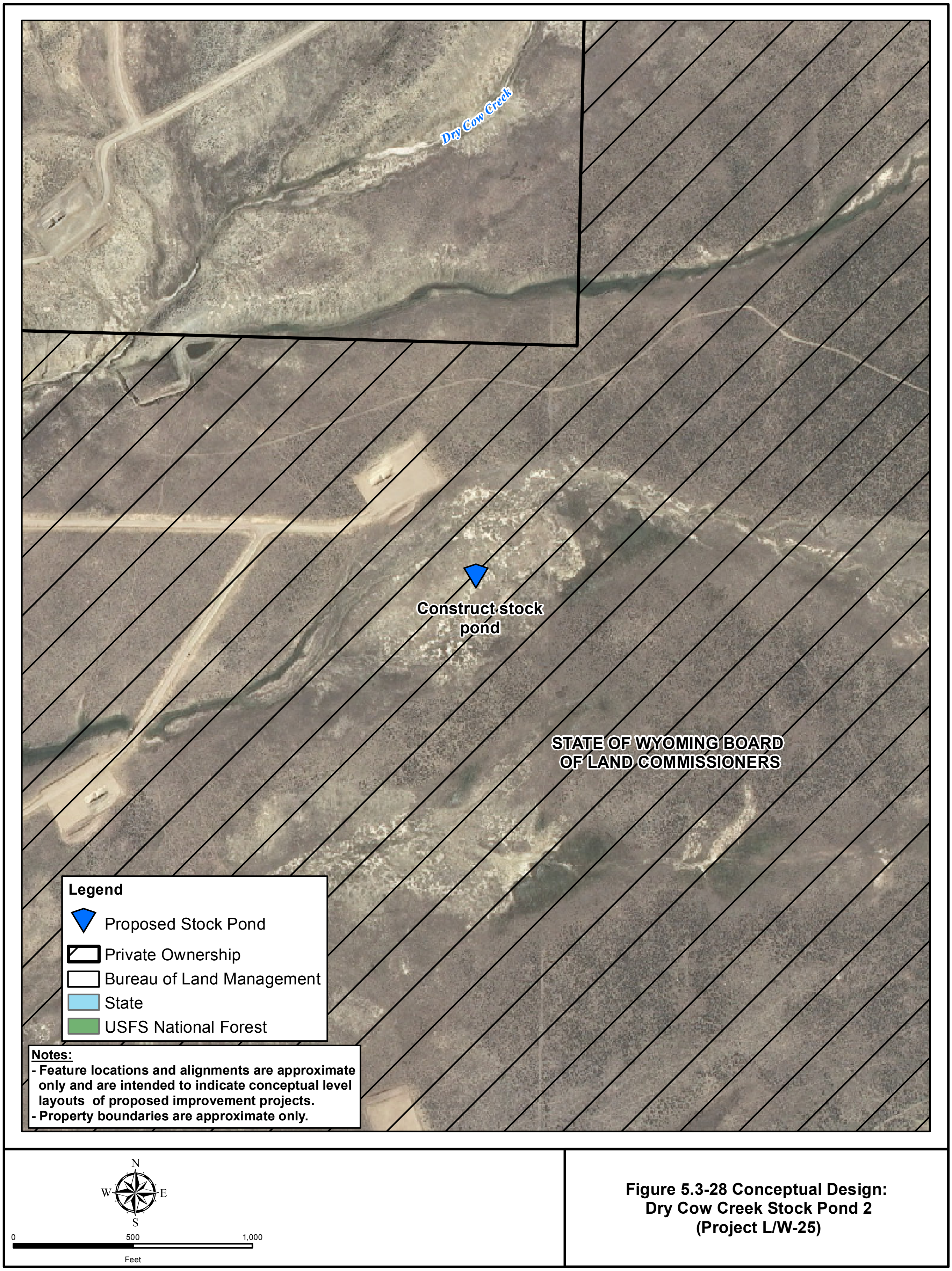


Figure 5.3-28 Conceptual Design: Dry Cow Creek Stock Pond 2 (Project L/W-25)

Figure 5.3-29 Conceptual Design: Dry Cow Creek Stock Pond 3 (Project L/W-26)

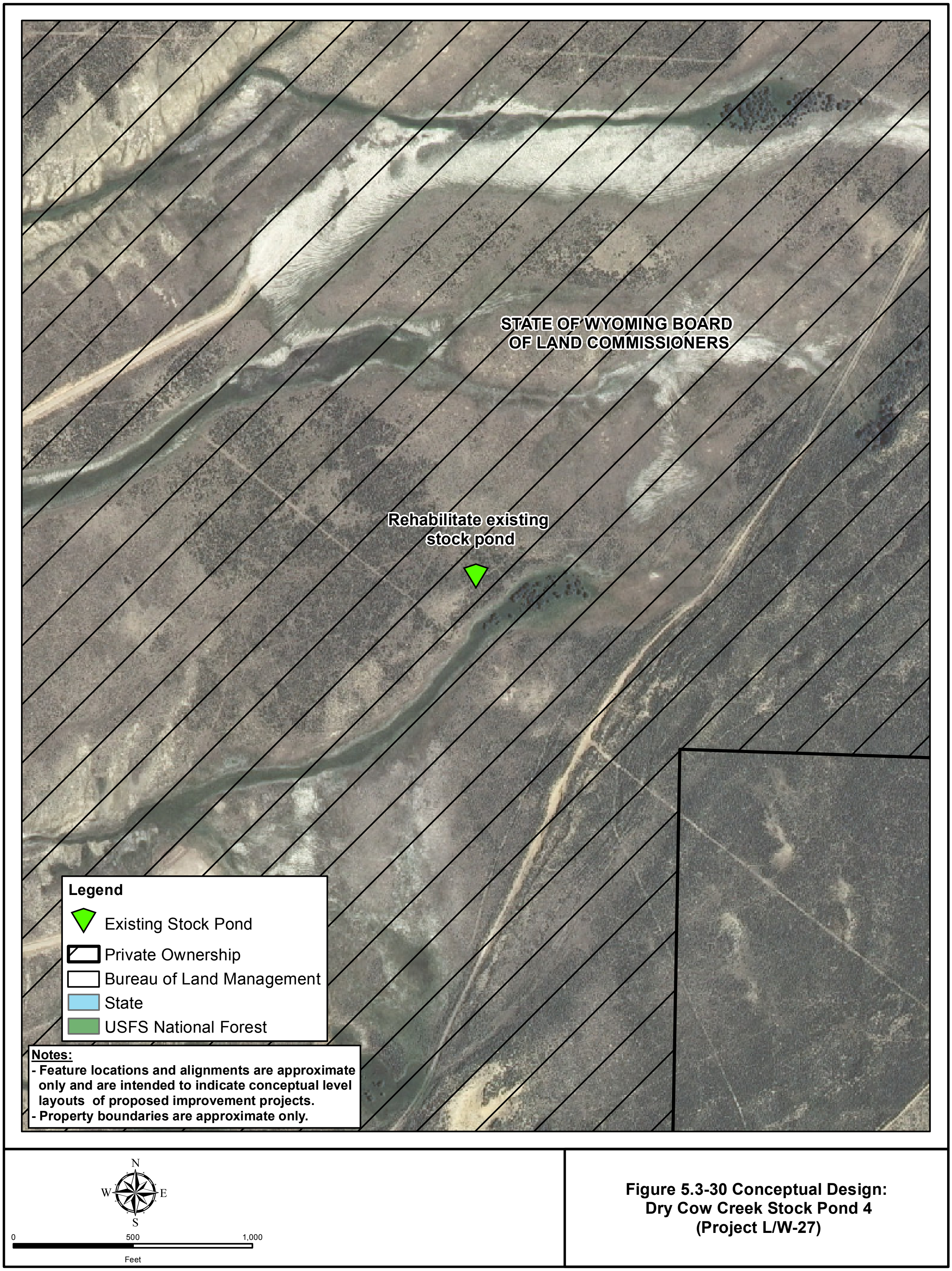


Figure 5.3-30 Conceptual Design: Dry Cow Creek Stock Pond 4 (Project L/W-27)

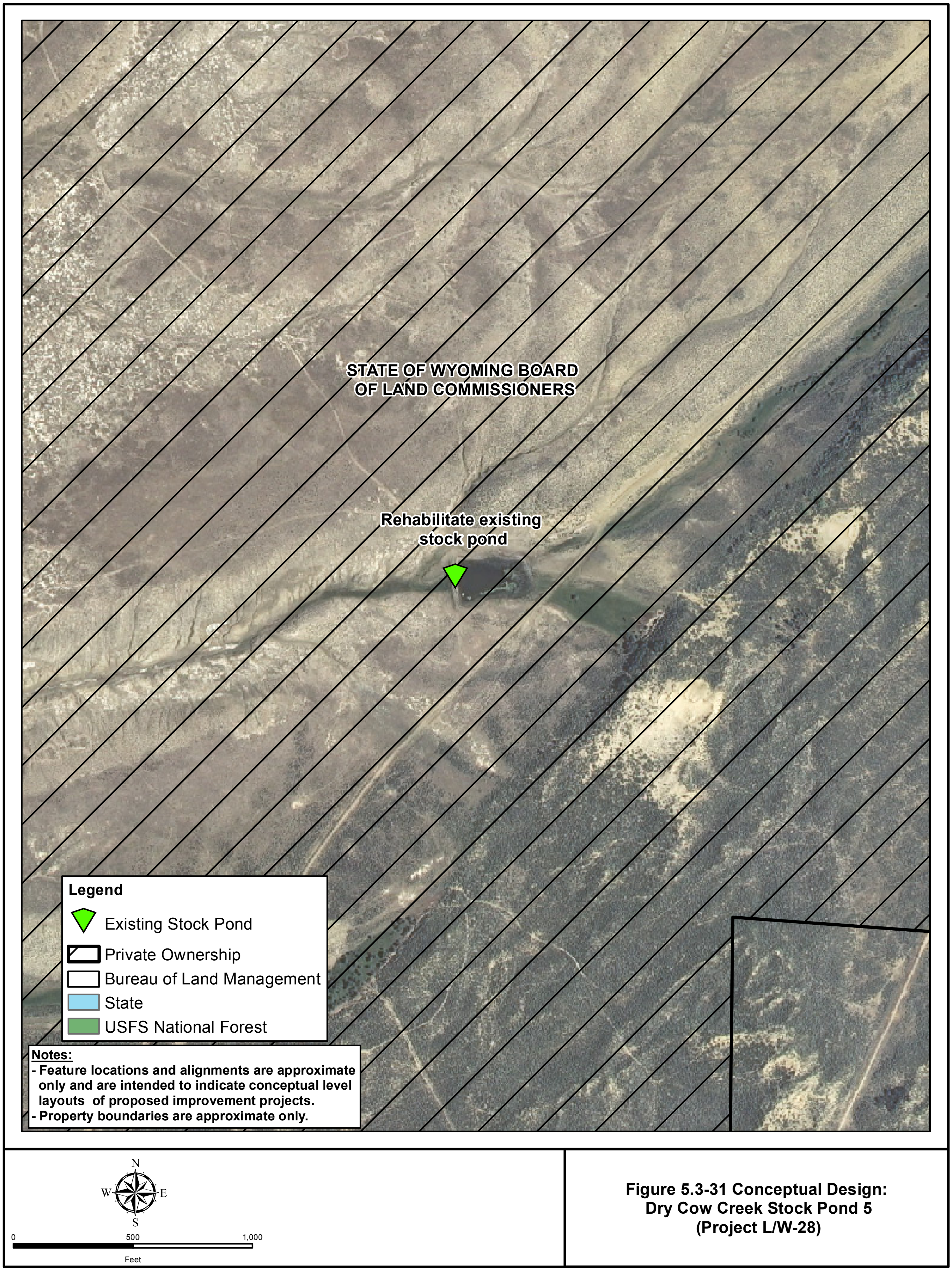


Figure 5.3-31 Conceptual Design: Dry Cow Creek Stock Pond 5 (Project L/W-28)

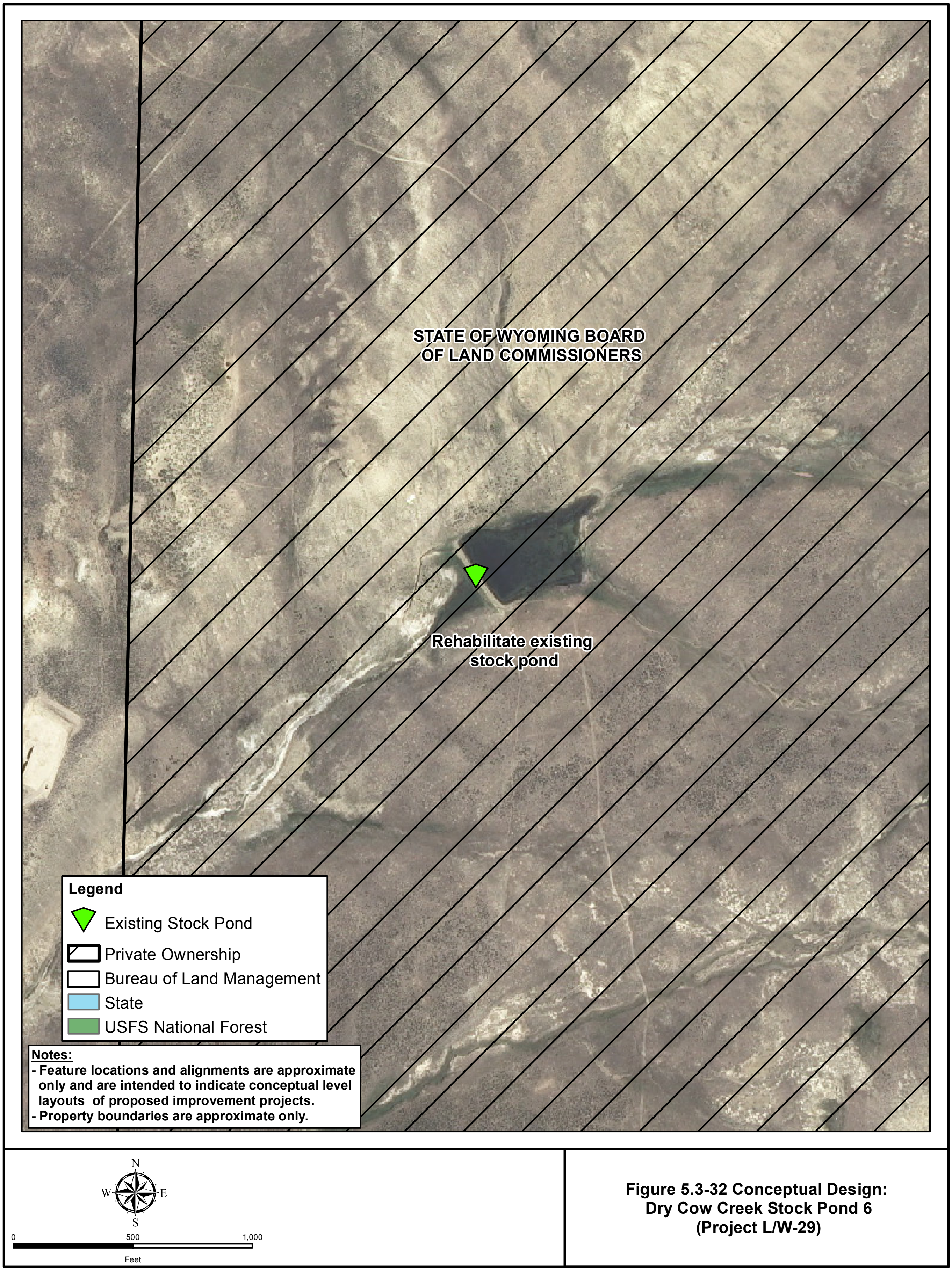


Figure 5.3-32 Conceptual Design: Dry Cow Creek Stock Pond 6 (Project L/W-29)

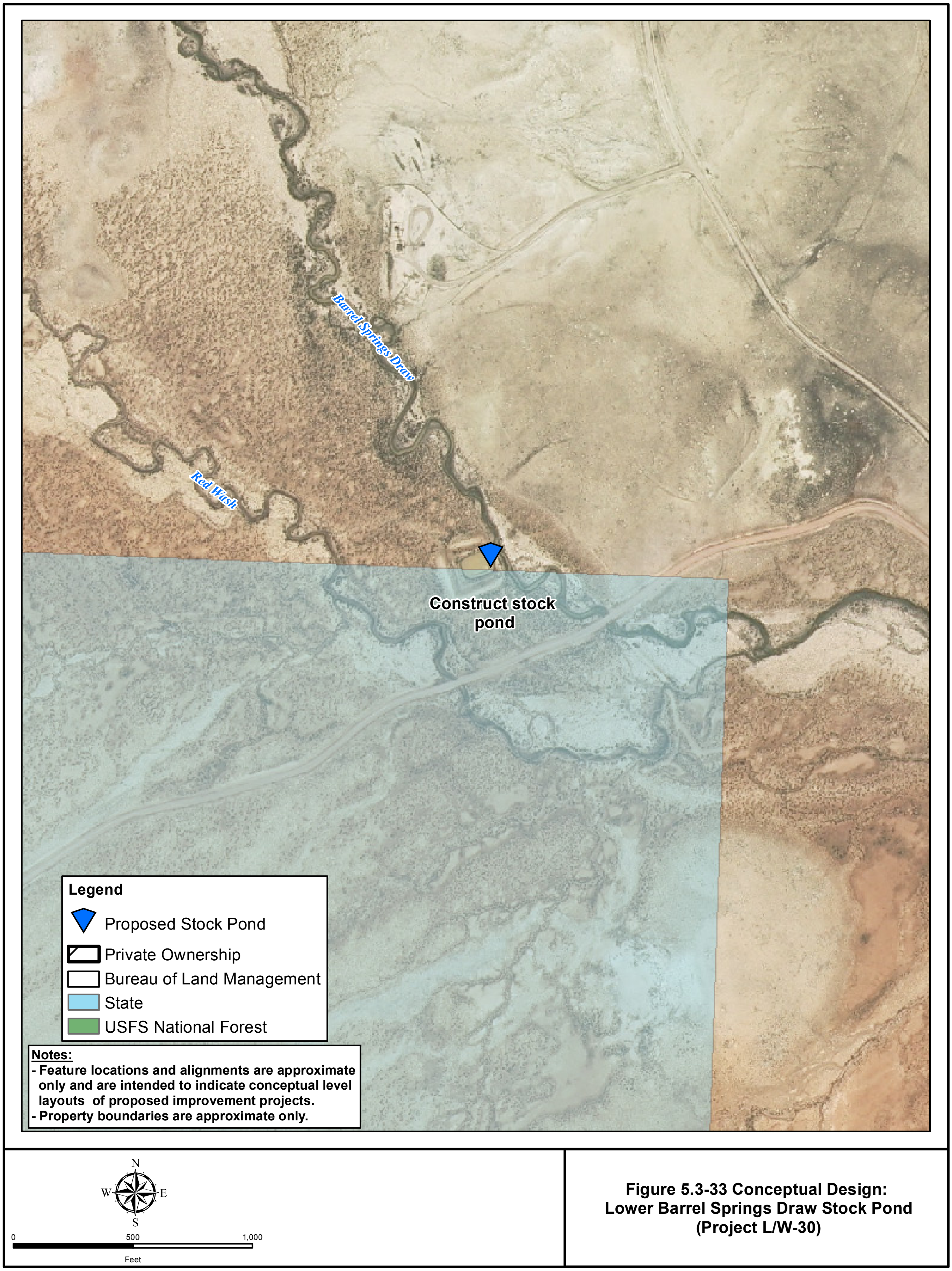


Figure 5.3-33 Conceptual Design: Lower Barrel Springs Draw Stock Pond (Project L/W-30)

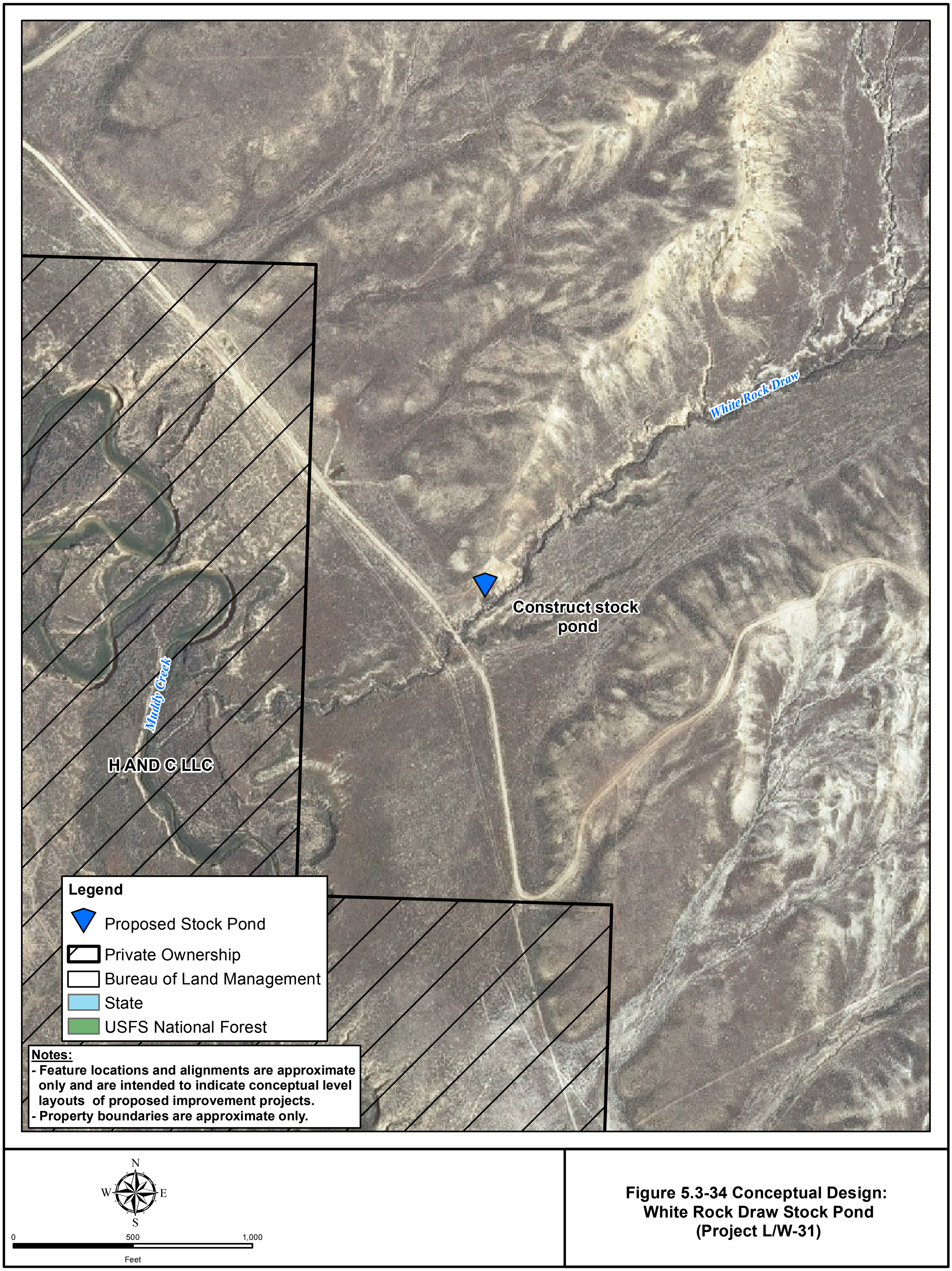


Figure 5.3-34 Conceptual Design: White Rock Draw Stock Pond (Project L/W-31)

Figure 5.3-35 Conceptual Design: Dad Stock Pond (Project L/W-32)

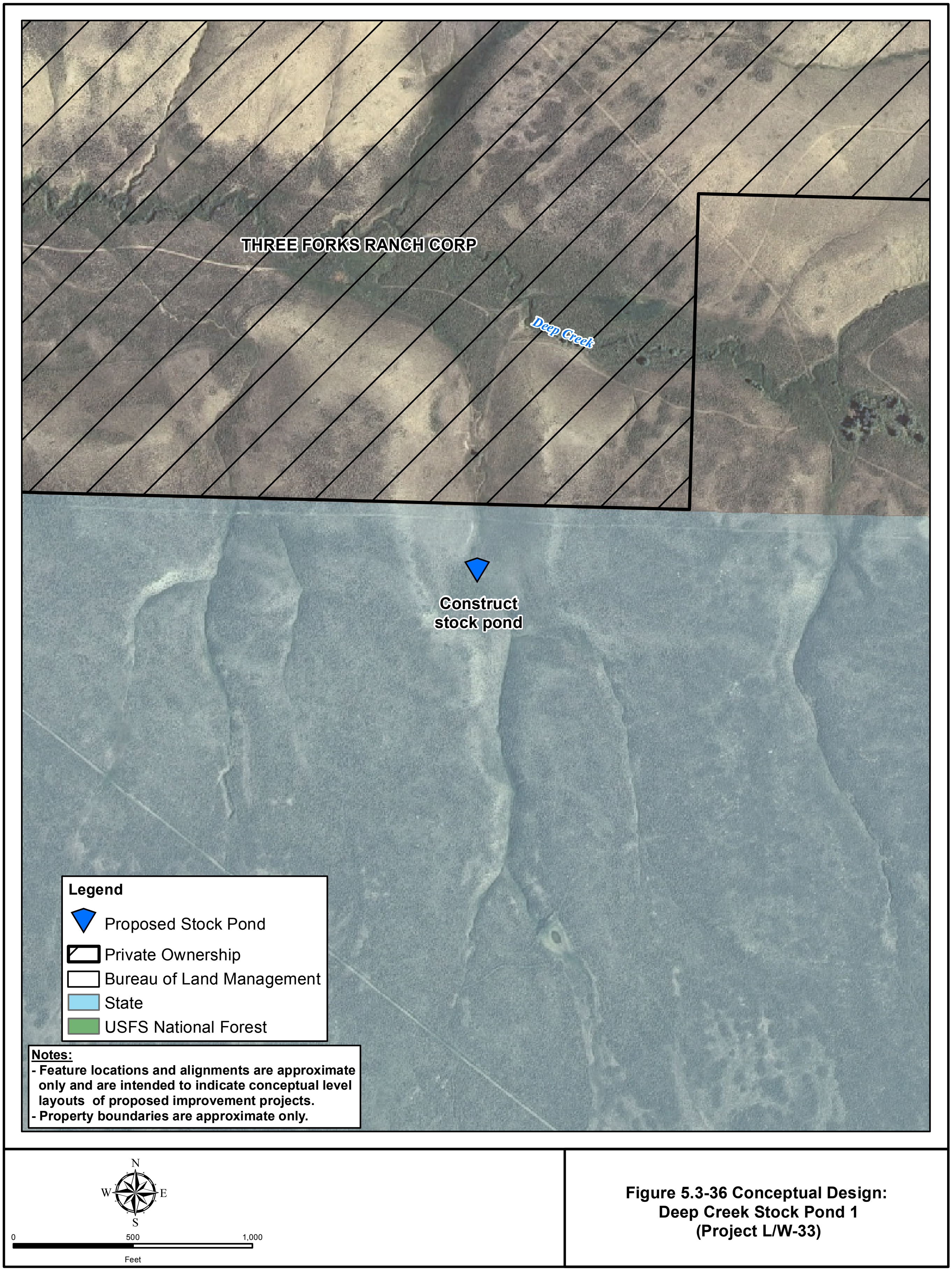


Figure 5.3-36 Conceptual Design: Deep Creek Stock Pond 1 (Project L/W-33)

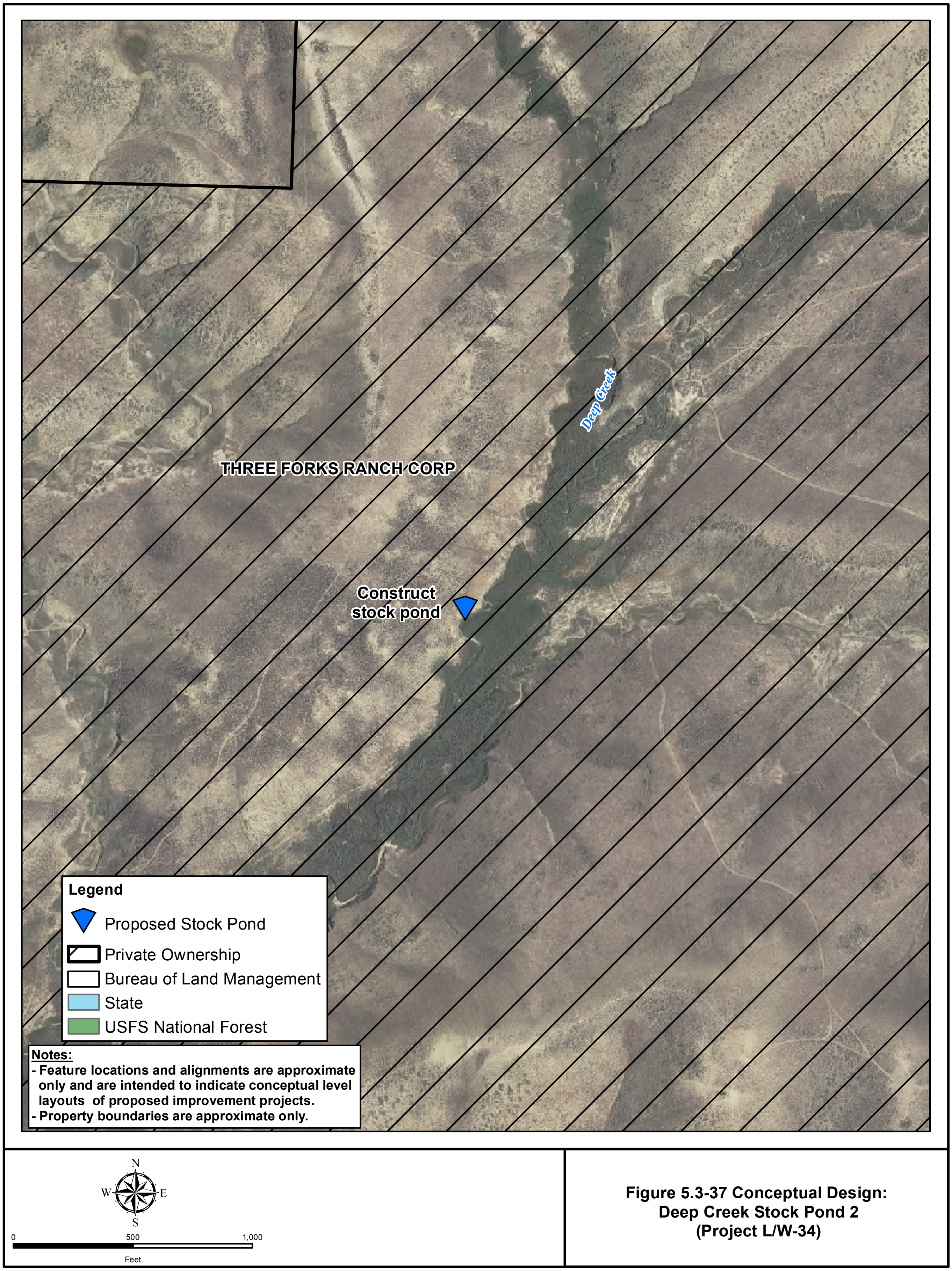


Figure 5.3-37 Conceptual Design: Deep Creek Stock Pond 2 (Project L/W-34)

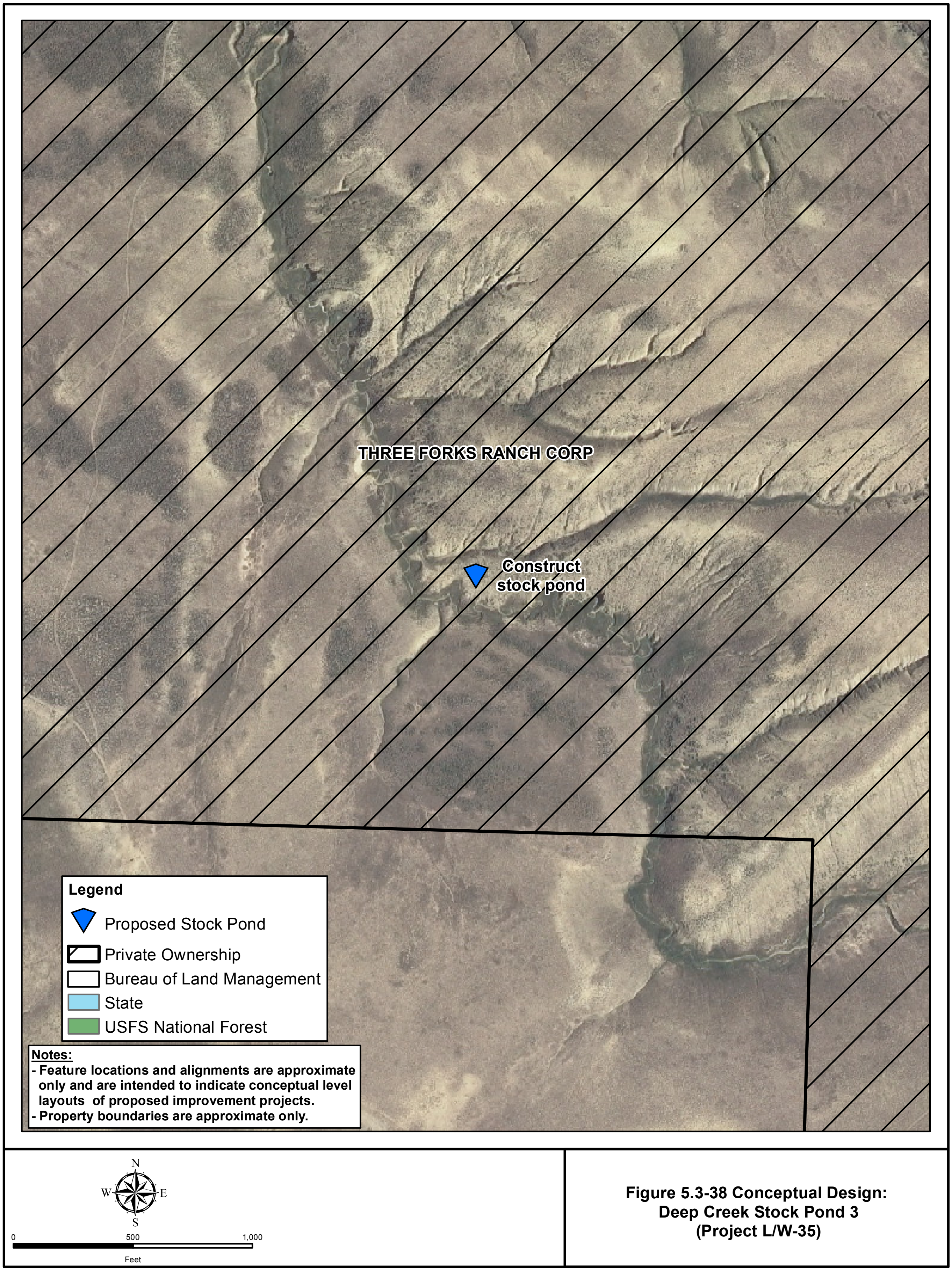


Figure 5.3-38 Conceptual Design: Deep Creek Stock Pond 3 (Project L/W-35)

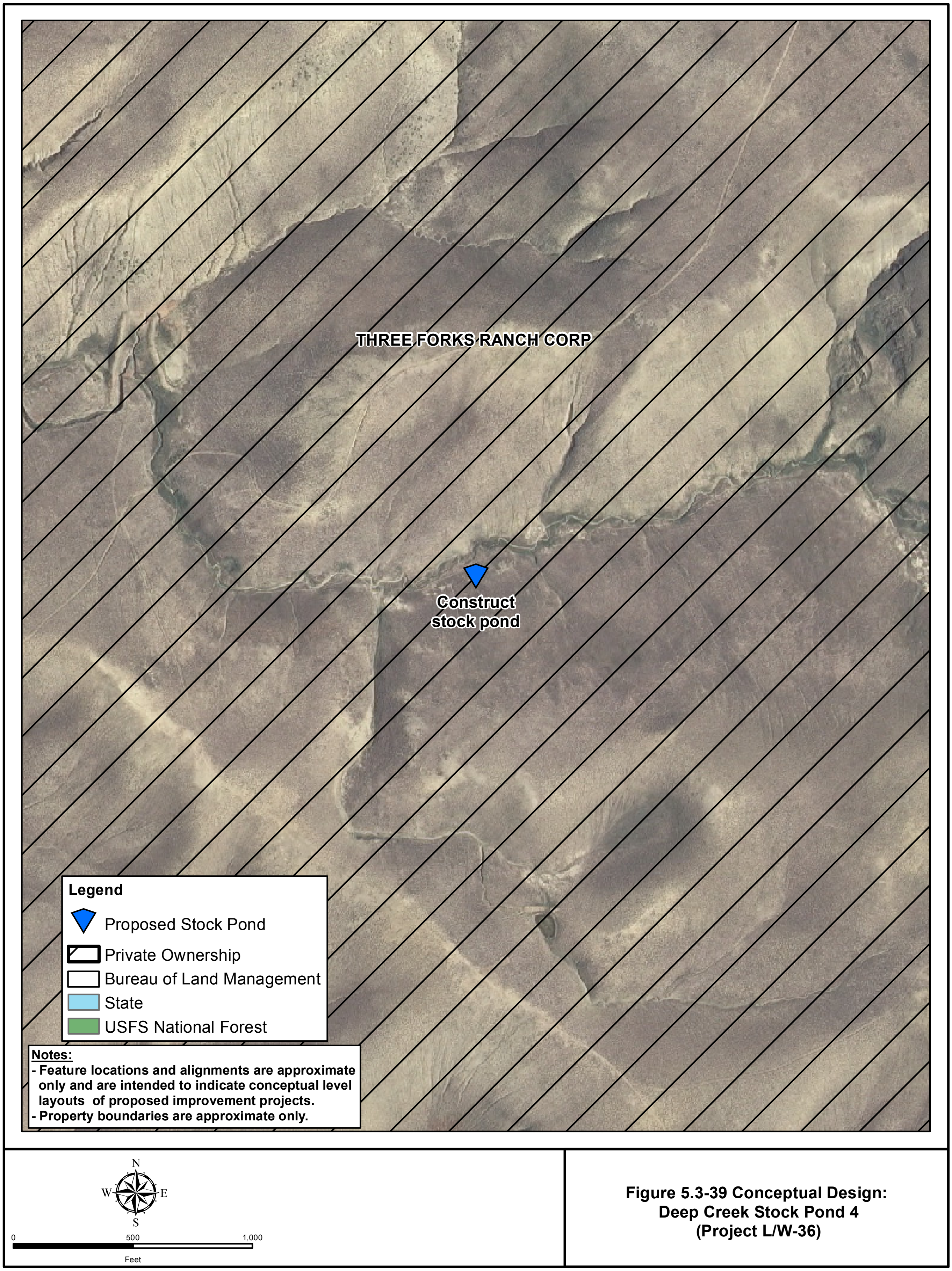


Figure 5.3-39 Conceptual Design: Deep Creek Stock Pond 4 (Project L/W-36)

Figure 5.3-40 Conceptual Design: Deep Creek Stock Pond 5 (Project L/W-37)

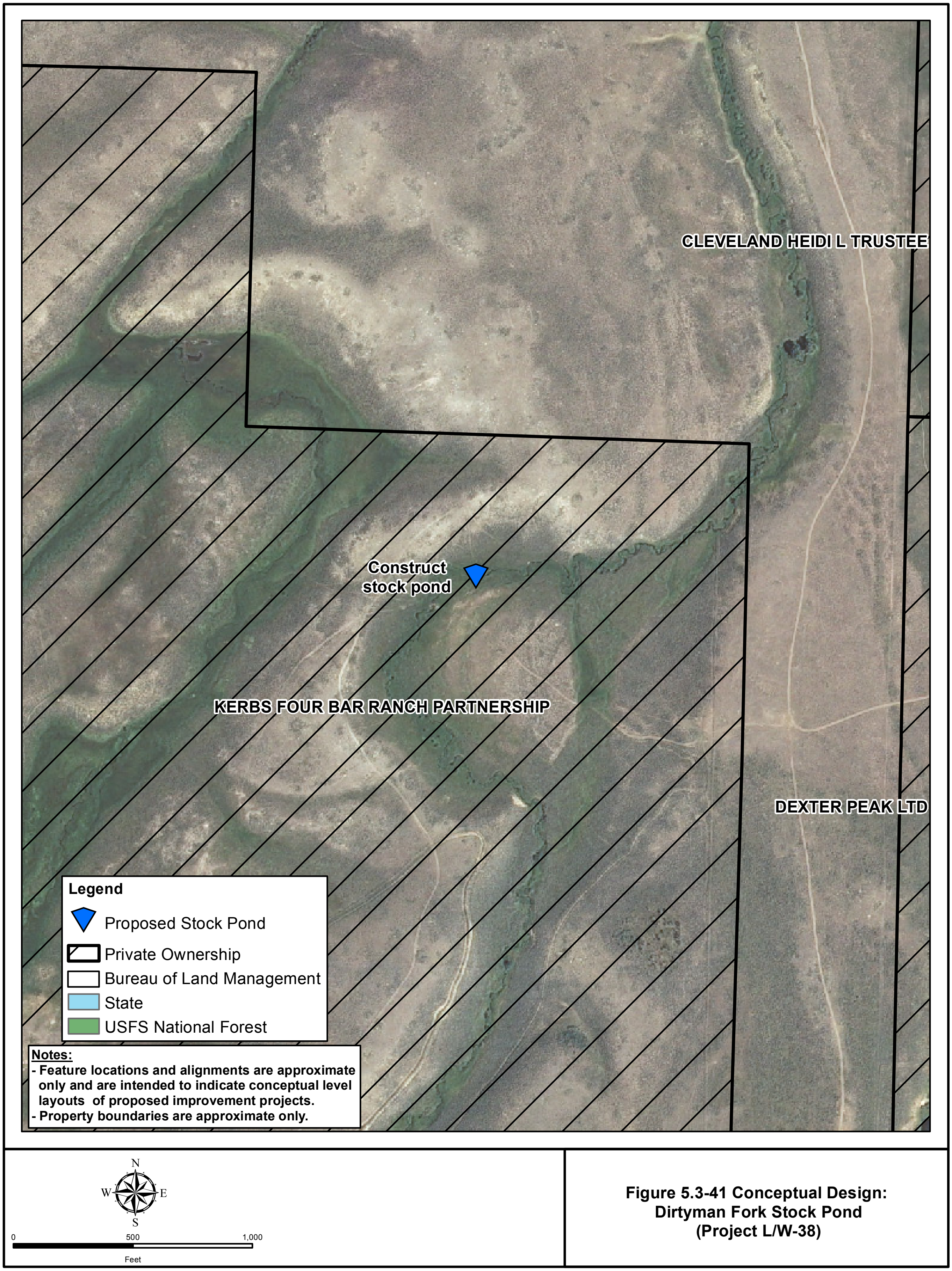


Figure 5.3-41 Conceptual Design: Dirtyman Fork Stock Pond (Project L/W-38)

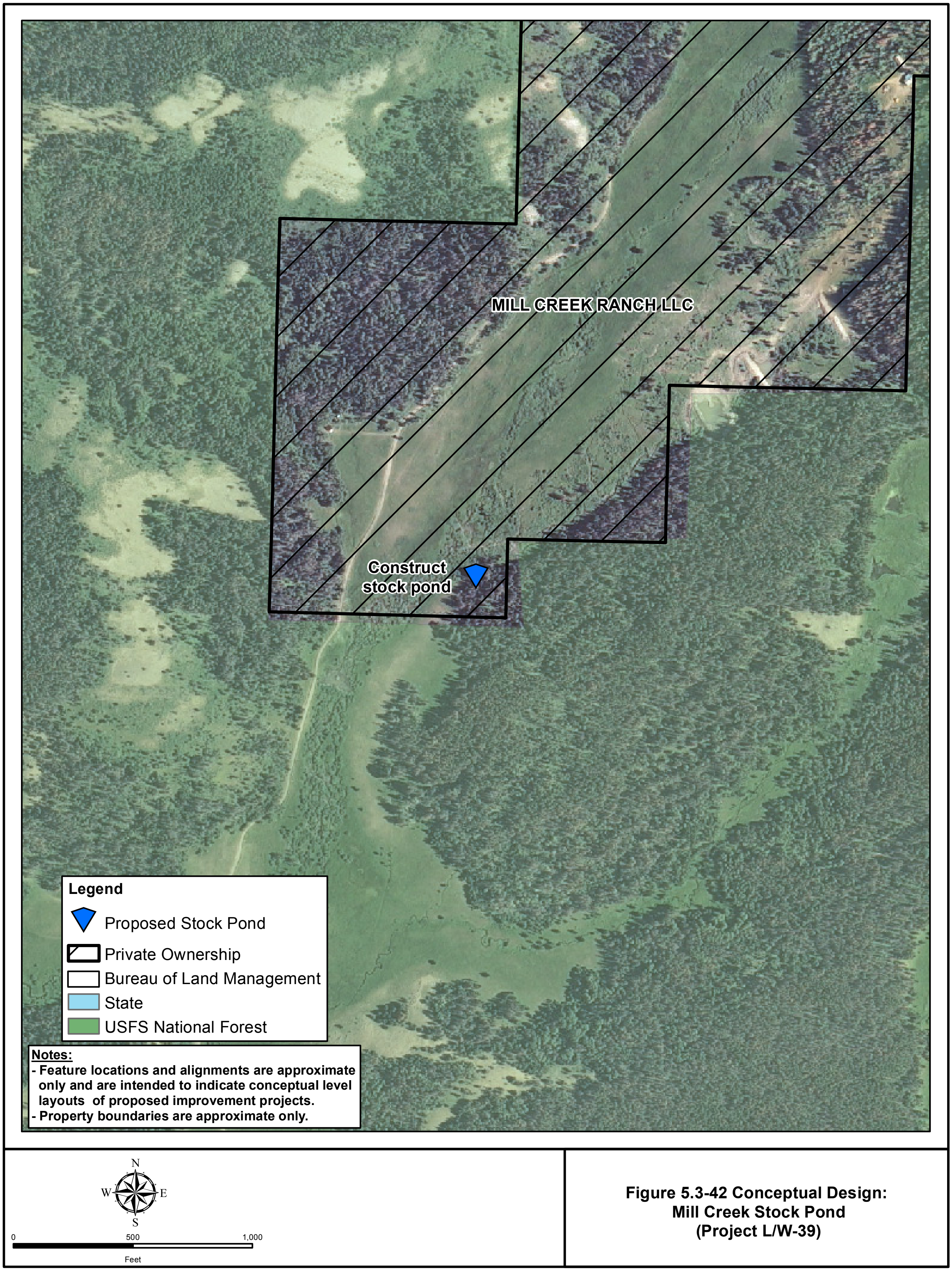


Figure 5.3-42 Conceptual Design: Mill Creek Stock Pond (Project L/W-39)

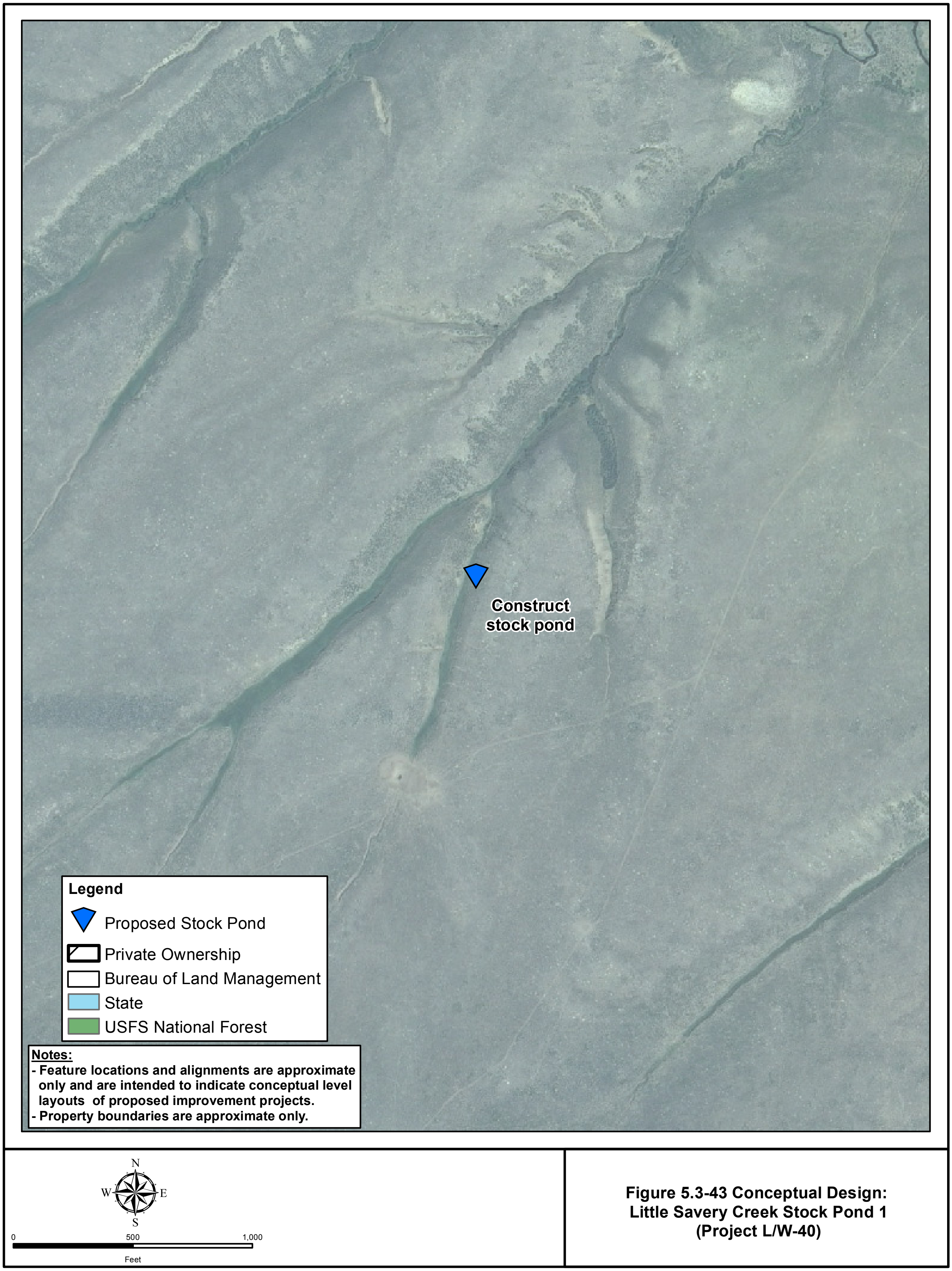


Figure 5.3-43 Conceptual Design: Little Savery Creek Stock Pond 1 (Project L/W-40)

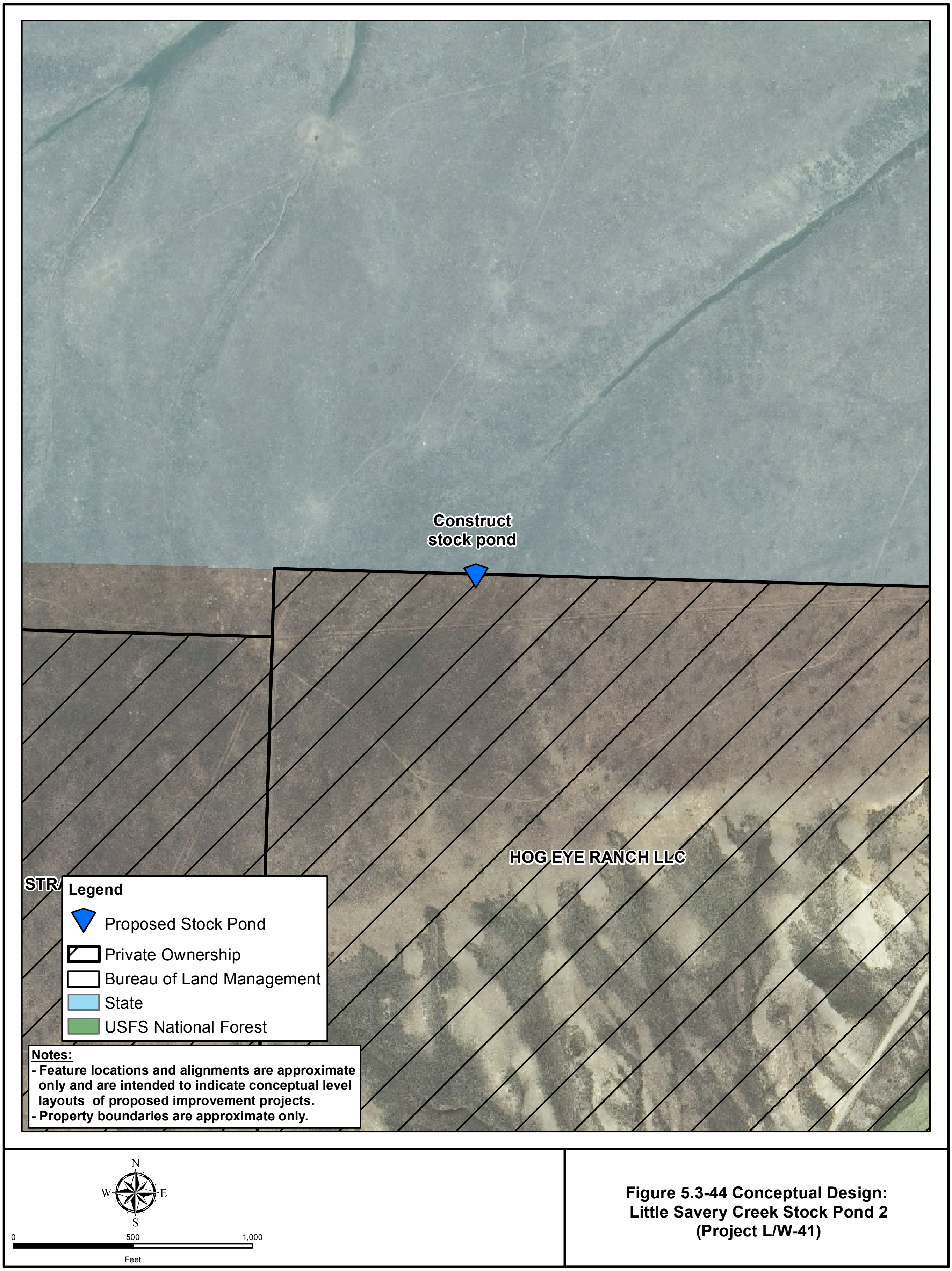


Figure 5.3-44 Conceptual Design: Little Savery Creek Stock Pond 2 (Project L/W-41)

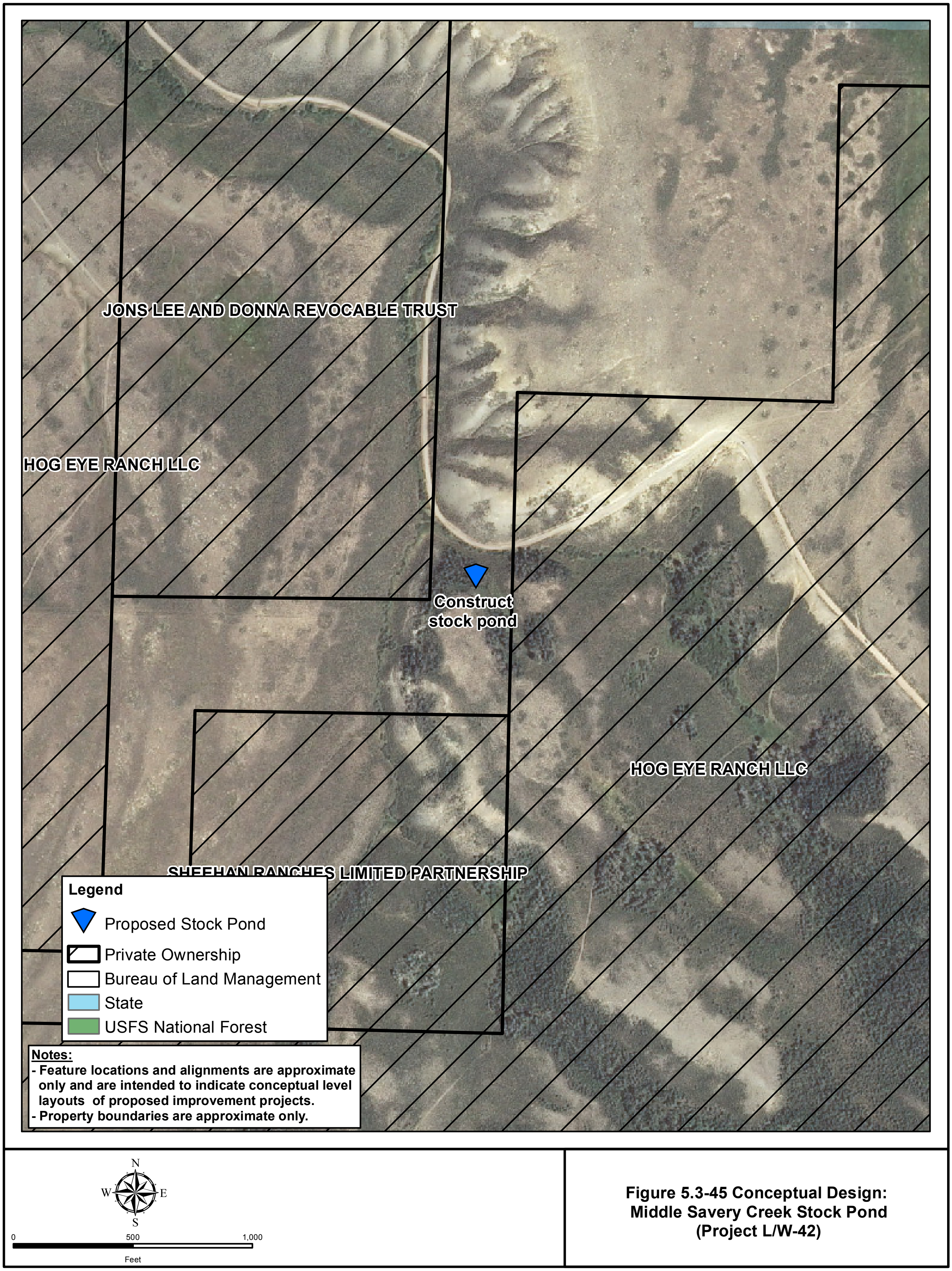


Figure 5.3-45 Conceptual Design: Middle Savery Creek Stock Pond (Project L/W-42)

Figure 5.3-46 Conceptual Design: Hog Eye Ranch Stock Pond (Project L/W-43)

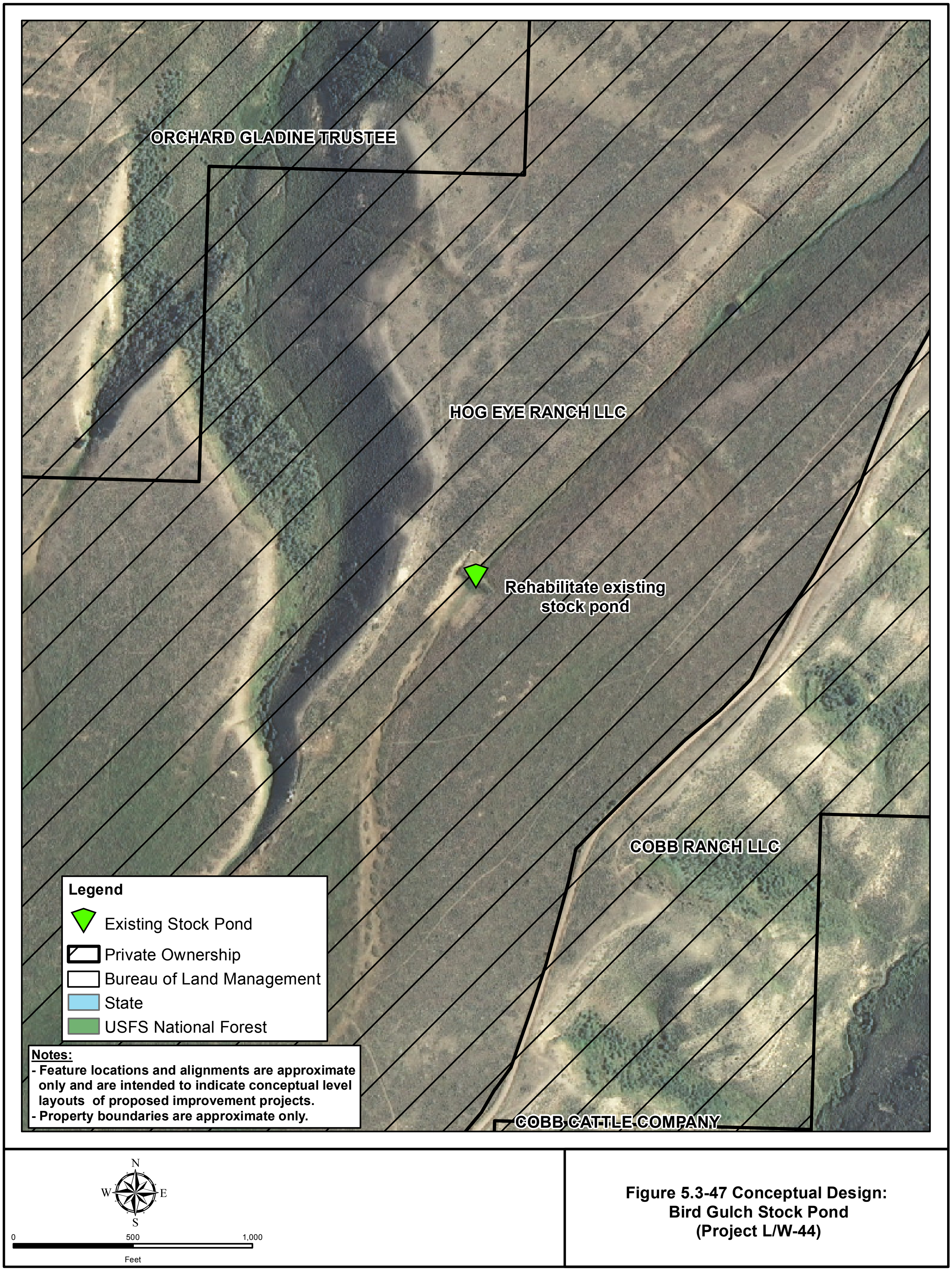


Figure 5.3-47 Conceptual Design: Bird Gulch Stock Pond (Project L/W-44)

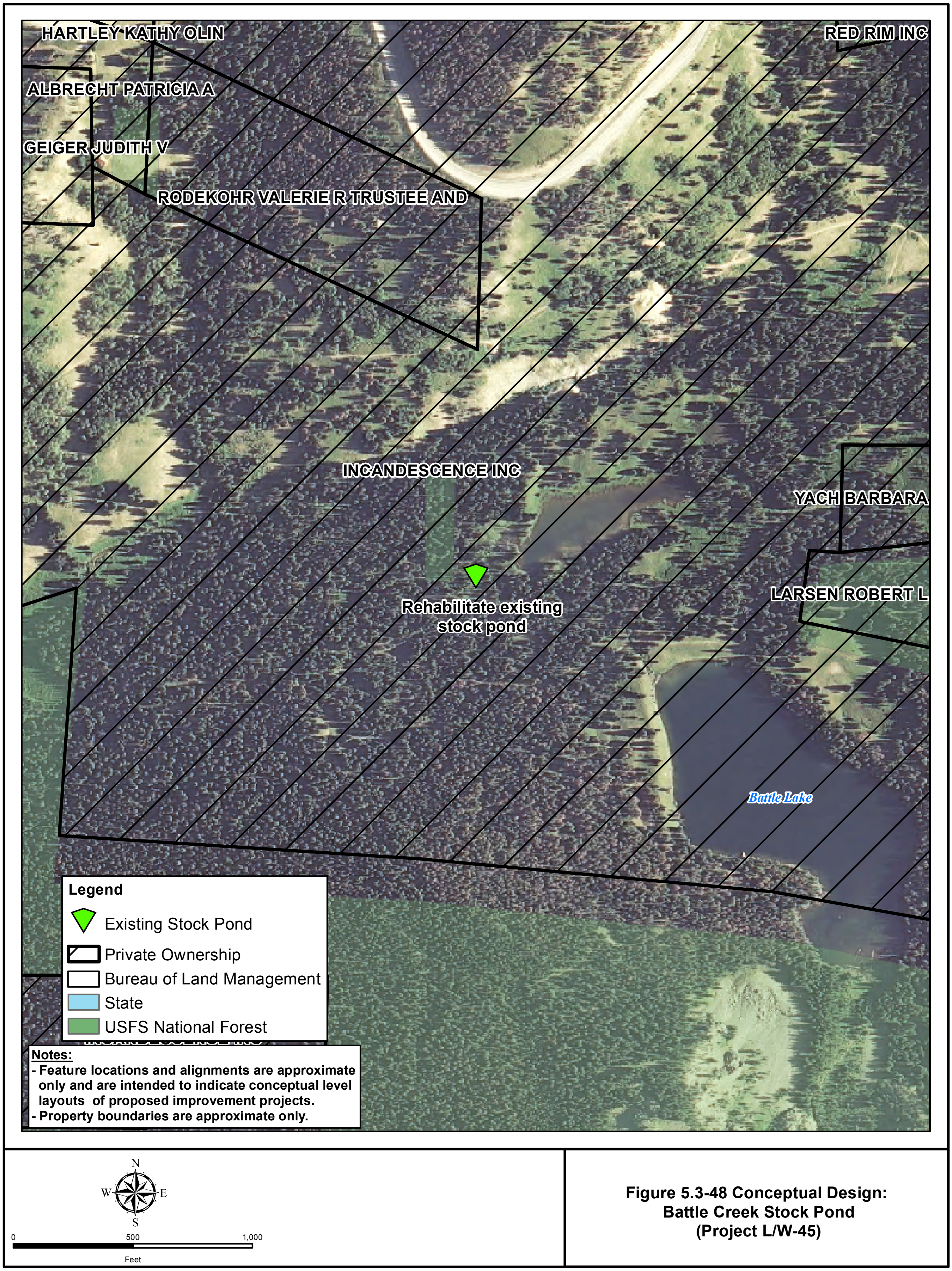


Figure 5.3-48 Conceptual Design: Battle Creek Stock Pond (Project L/W-45)

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 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 mapped portions of the Little Snake River / Vermillion Creek Watershed study area are likely to be the following:

R034AY122WY Loamy (Ly) 7-9" Green River and Great Divide Basins
R034XY144WY Saline Upland 7-9 inch precipitation zone, Green River and Great Divide Basins
R034AY176WY Very Shallow (VS) 7-9" Green River and Great Divide Basins

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.

5.4.1.1 ESD: Loamy (Ly) 7-9 Inch Green River and Great Divide Basins

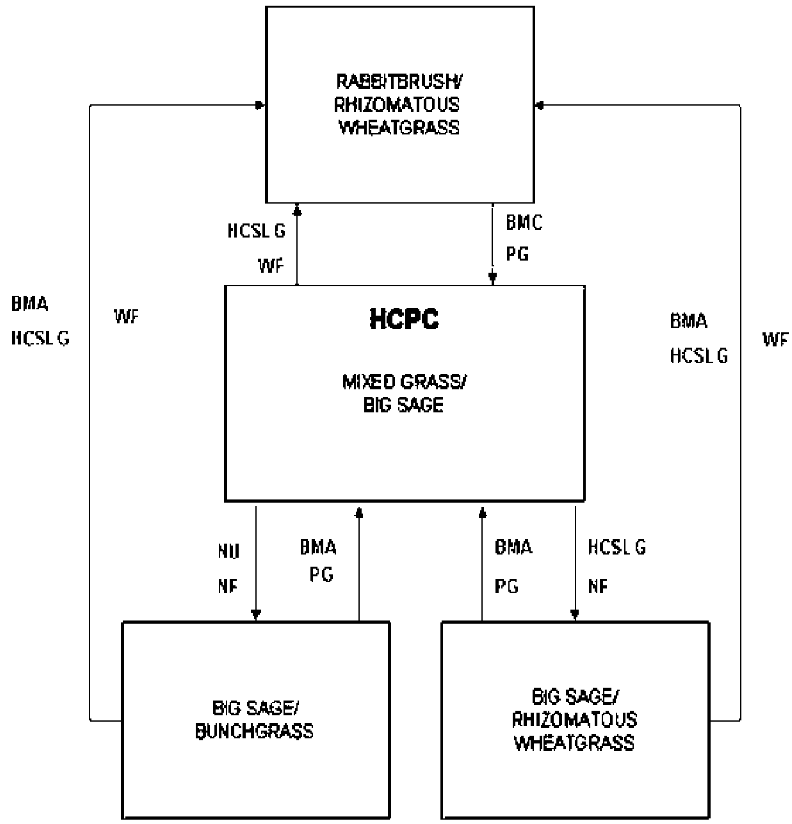
One of the most prevalent ecological sites within the mapped portions of the study area is the loamy 7-9 inch precipitation zone, Green River and Great Divide Basins site. Figure 5.4-1 displays the state and transition model for this site.

The following description of the ecological site's HCPC and transitions to and from it was extracted from the NRCS ESD for the site:

This state evolved with grazing by large herbivores and is well suited for grazing by domestic livestock. Potential vegetation is estimated at 75% grasses or grass-like plants, 10% forbs, and 15% woody plants.

The major grasses include thickspike wheatgrass, needleandthread, Indian ricegrass, bluebunch wheatgrass, prairie junegrass, and bottlebrush squirreltail. Other grasses occurring in the state may include Sandberg and Canby bluegrass, threadleaf and needleleaf sedge, and plains reedgrass. Wyoming big sagebrush is the dominant woody plant. Other woody species may include green rabbitbrush, bud sagebrush, shadscale, spiny hopsage, and winterfat.

A typical plant composition for this state consists of thickspike wheatgrass 10-30%, needleandthread 10-20%, Indian ricegrass 10-20%, up to 10% prairie junegrass, up to 10% bottlebrush squirreltail, up to 10% bluebunch wheatgrass, other grasses and grass-like plants 5-15%, perennial forbs 5-15%, Wyoming big sagebrush 5-15%, and 5-15% other woody species. The overstory of sagebrush and understory of grass and forbs provide a diverse plant community that will support domestic livestock and wildlife such as mule deer and antelope. Ground cover, by ocular estimate, varies from 20-35%.



BMA - Brush Management (all methods)	NF - No Fire
BMC - Brush Management (chemical)	NS - Natural Succession
BMF - Brush Management (fire)	NWC - Noxious Weed Control
BMM - Brush Management (Mechanical)	NWI - Noxious Weed Invasion
CSP - Chemical Seedbed Preparation	NU - Nonuse
DR - Drainage	P&C Plow & Crop (including hay)
CSG - Continuous Spring Grazing	PG - Prescribed Grazing
HB - Heavy Browse	RPT - Replant Trees
HCSLG - Heavy Continuous Season-Long Grazing	RS - Re-Seed
HI - heavy Inundation	SGD - Severe Ground Disturbance
LPG - Oong Term Prescribed Grazing	SHC - Severe Hoof Compaction
MT - Mechanical Treatment (chiseling, ripping, pitting)	WD - Wildlife Damage (Beaver)
	WF - WIldfire

Figure 5.4-1 State and Transition Model: Loamy (Ly) 7-9 Inch Precipitation Zone Green River and Great Divide Basins.

The total annual production (air-dry weight) of this state is about 500 lbs./acre, but it can range from about 300 lbs./acre in unfavorable years to about 700 lbs./acre in above average years.

This plant community is extremely stable and well adapted to the Cool Central Desertic Basins and Plateaus climatic conditions. The diversity in plant species allows for high drought tolerance. 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:

- *Nonuse and No Fire will convert this plant community to the Big Sagebrush/Bunchgrass State.*
- *Heavy Continuous Season-long Grazing and No Fire will convert this plant community to the Big Sagebrush/Rhizomatous Wheatgrass State.*
- *Wildfire with Heavy Continuous Season-long Grazing will convert this plant community to the Douglas Rabbitbrush/Rhizomatous Wheatgrass State.*

5.4.1.2 ESD: Saline Upland 7-9 Inch Precipitation Zone, Green River and Great Divide Basins

A prevalent ecological site within the lower portions of the study area is the saline upland sandy 10-14 inch precipitation zone, East site. Figure 5.4-2 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:

The interpretive plant community for this site is the Historic Climax Plant Community. Potential vegetation is about 50% grasses or grass-like plants, 5% forbs, and 45% woody plants.

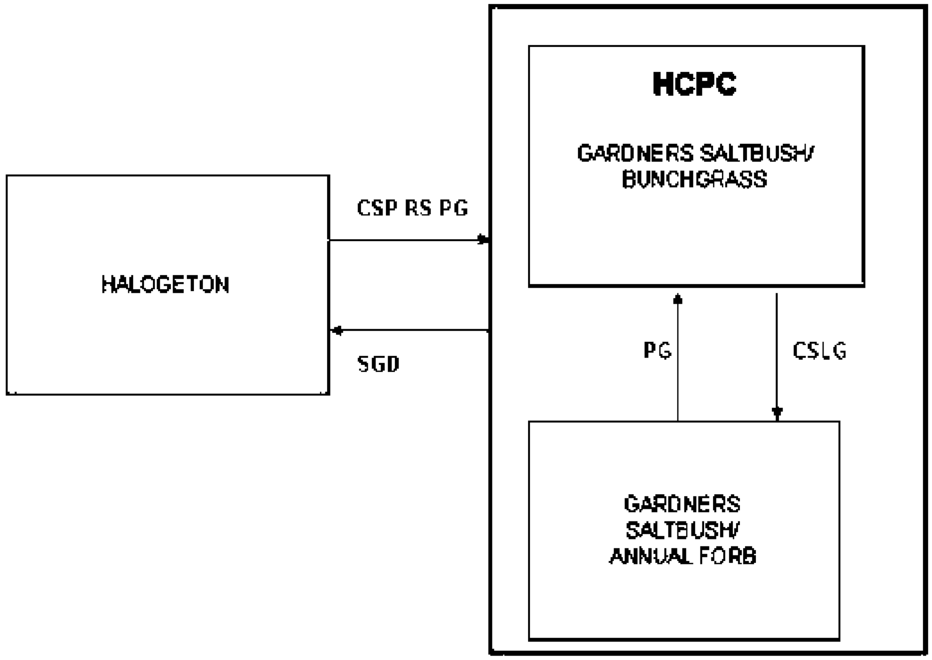
Saline tolerant plants dominate this site. The major grasses include bottlebrush squirreltail and Indian ricegrass. Other grasses may include rhizomatous wheatgrass, needleandthread, Sandberg bluegrass, and Salina wildrye. Gardner's saltbush and bud sagebrush are the dominant woody plants. Other woody plants may include greasewood and winterfat.

A typical plant composition for this state consists of bottlebrush squirreltail 15-30%, Indian ricegrass 15-25%, other grasses and grass-like plants 5-20%, perennial forbs 1-5%, Gardner's saltbush 25-45%, bud sagebrush 5-15%, and 5-10% other woody species. This state provides valuable winter grazing for domestic livestock. Ground cover, by ocular estimate, varies from 20-40%.

The total annual production (air-dry weight) of this state is about 400 pounds per acre, but it can range from about 200 lbs./acre in unfavorable years to about 600 lbs./acre in above average years.

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

- *Severe Ground Disturbance will convert this plant community to the Halogeton State.*
- *Continuous Season-long Grazing will convert this plant community to the Gardner's Saltbush/Annual Forb State*

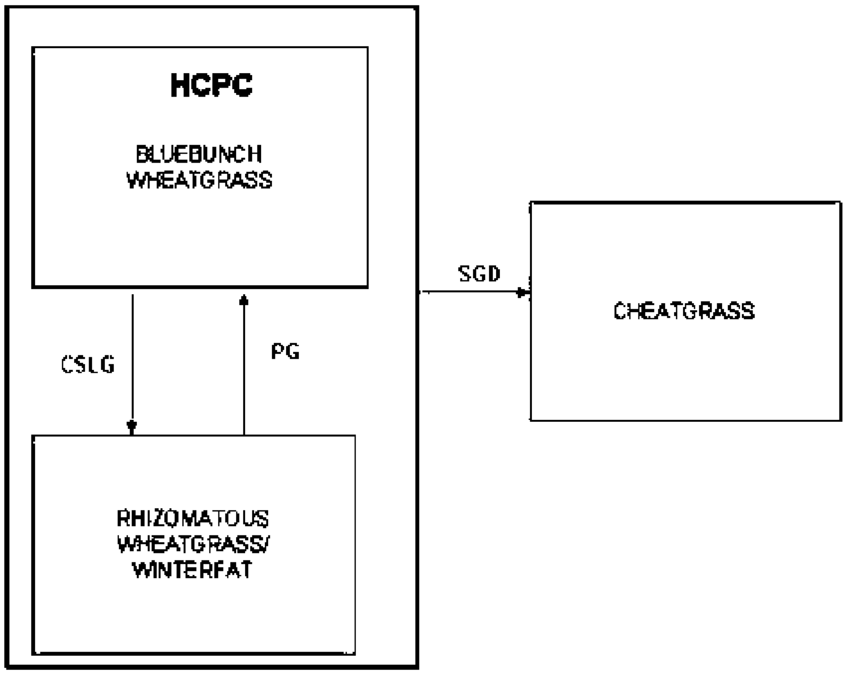


BMA - Brush Management (all methods)	NF - No Fire
BMC - Brush Management (chemical)	NS - Natural Succession
BMF - Brush Management (fire)	NWC - Noxious Weed Control
BMM - Brush Management (Mechanical)	NWI - Noxious Weed Invasion
CSP - Chemical Seedbed Preparation	NU - Nonuse
DR - Drainage	P&C Plow & Crop (including hay)
CSG - Continuous Spring Grazing	PG - Prescribed Grazing
HB - Heavy Browse	RPT - Replant Trees
HCSLG - Heavy Continuous Season-Long Grazing	RS - Re-Seed
HI - heavy Inundation	SGD - Severe Ground Disturbance
LPG - Oong Term Prescribed Grazing	SHC - Severe Hoof Compaction
MT - Mechanical Treatment (chiseling, ripping, pitting)	WD - Wildlife Damage (Beaver)
	WF - WIldfire

Figure 5.4-2 State and Transition Model: Saline Upland 7-9 Inch Precipitation Zone, Green River and Great Divide Basins.

5.4.1.3 ESD: Very Shallow (VS) 7-9 Inch Green River and Great Divide Basins

A third prevalent ecological site within the lower portions of the study area is the saline upland sandy 10-14 inch precipitation zone, East site. Figure 5.4-3 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:



BMA - Brush Management (all methods)
BMC - Brush Management (chemical)
BMF - Brush Management (fire)
BMM - Brush Management (Mechanical)
CSP - Chemical Seedbed Preparation
DR - Drainage
CSG - Continuous Spring Grazing
HB - Heavy Browse
HCSLG - Heavy Continuous Season-Long Grazing
HI - heavy Inundation
LPG - Oong Term Prescribed Grazing
MT - Mechanical Treatment (chiseling, ripping, pitting)
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 - Replant Trees
RS - Re-Seed
SGD - Severe Ground Disturbance
SHC - Severe Hoof Compaction
WD - Wildlife Damage (Beaver)
WF - WIldfire

Figure 5.4-3 State and Transition Model: Very Shallow (VS) 7-9 Inch Precipitation Zone Green River and Great Divide Basins.

"The interpretive plant community for this site is the Historic Climax Plant Community. Potential vegetation is estimated at 65% grasses or grass-like plants, 10% forbs, and 25% woody plants. The major grasses include bluebunch wheatgrass, thickspike wheatgrass, Indian ricegrass, bottlebrush squirreltail, and needleandthread. Other grasses include Sandberg bluegrass, prairie junegrass, needleleaf sedge, and threeawn. At higher elevations, juniper may occur as the dominant woody plant. Other woody plants may include bud, big, and low sagebrush, green rabbitbrush, winterfat, skunkbush sumac, limber pine, and spiny horsebrush.

A typical plant composition for this state consists of bluebunch wheatgrass 20-40%, thickspike wheatgrass 15-30%, needleandthread 10-20%, Indian ricegrass 10-20%, bottlebrush squirreltail 10-20%, other grasses and grass-like plants 10-20%, perennial forbs 5-10%, juniper 1-10%, and 5-15% other woody plants. When this occurs at lower elevations and on windswept ridges, the woody component may lean toward winterfat or be absent. Ground cover, by ocular estimate, varies from 15-20%.

The total annual production (air-dry weight) of this state is about 300 pounds per acre, but it can range from about 200 lbs./acre in unfavorable years to about 400 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:

- *Severe Ground Disturbance will convert this plant community to the Cheatgrass State.*
- *Continuous Season-long Grazing will convert the plant community to the Rhizomatous Wheatgrass/Winterfat State. "*

5.4.2 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.

Watershed Plan Component G-6: Prescribed fire may be utilized as a tool to assist in the restoration of range health areas benefitting by this treatment according to the state and transition models. Delineation of specific areas potentially benefitting from this practice was beyond the scope of this Level I project. However, based upon input from landowners and land managers and observations made during the completion of this investigation, it is evident that there are areas which would likely benefit from prescribed fires.

Watershed Plan Component G-7: Application of chemicals may be utilized as a tool to assist in the restoration of range health areas benefitting by this treatment according to the state and transition models. Delineation of specific areas potentially benefitting from this practice was beyond the scope of this Level I project. However, based upon input from landowners and land managers and observations made during the completion of this investigation, it is evident that there are areas which would likely benefit from chemical application for control of range (e.g. Big Sagebrush).

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

5.5 BLM Range Improvement Projects (Watershed Management Plan Component BLM)

Queries were made directly to both the Rock Springs and Rawlins BLM District Offices for a listing of projects proposed, conceptualized, or scheduled within the Little Snake / Vermillion Creek Watershed Study project area.

The Rock Springs District office responded with a list of eight (8) stock reservoirs currently not completed but scheduled for future construction. In addition, the Rock Springs Field Office included in their submittal reference to a pipeline/trough pipeline system in the Salt Wells pasture of the Pine Mountain Allotment at a location to be determined at a future date. The Rock Springs Field Office expects proposal of 4 to 10 additional wells within proposals within their portion of the watershed. They also anticipate rehabilitation of 10 to 15 stock reservoirs within the project area. Exact locations have not been determined at this time (D. Brock, pers. Comm. 2013). The eight Rock Springs District Office projects with specific locations were incorporated into the watershed management plan.

The Rock Springs and Rawlins District offices provided the project team with a list of range improvement projects planned for completion within the study area (A. Warren, pers. comm. 2012, D. Brock pers. Comm., 2013). These improvements include various recommendations which fall within several of the individual components of the watershed management Plan (i.e., livestock/wildlife water development opportunities, stream channel stabilization, etc). However, the group of projects was kept together as a separate component of the watershed management plan in lieu of splitting them among the various individual components. Table 5.5-1 tabulates the projects and the general type of each. Figure 5.5-1 displays the general locations of these projects.

Table 5.5-1 Summary of Range Improvement Projects Recommended by BLM.

Project	Name	Project Type	BLM District
BLM-001	McKinney Creek Spring Development	Spring Development	Rawlins
BLM-002	Poison Buttes Well Rehabilitation	Well Rehabilitation	Rawlins
BLM-003	Deep Gulch	Reservoir Rehabilitation	Rawlins
BLM-004	Exclosure (Beaver Dams)	Fence Exclosure	Rawlins
BLM-005	Cottonwood Hill Sheet Piling	Stream Stabilization	Rawlins
BLM-006	Cherokee Pipeline Project	Pipeline Project	Rawlins
BLM-007	Sweezy Spring Rehabilitation	Spring Rehabilitation	Rawlins
BLM-008	Loco Aspen Spring Rehabilitation	Spring Rehabilitation	Rawlins
BLM-009	Loco Creek Fencing	Fence Exclosure	Rawlins
BLM-010	Koala Bar	Reservoir Rehabilitation	Rawlins
BLM-011	Hangout Solar	Solar Platform	Rawlins
BLM-012	Red Flat Well Rehabilitation	Well Rehabilitation	Rawlins
BLM-013	Niland Well Rehabilitation	Well Rehabilitation	Rawlins
BLM-014	Little Draw Reservoir Rehabilitation	Reservoir Rehabilitation	Rawlins
BLM-015	Coal Gulch #2 Reservoir Rehabilitation	Reservoir Rehabilitation	Rawlins
BLM-016	South Echo Reservoir Rehabilitation	Reservoir Rehabilitation	Rawlins
BLM-017	Private	Reservoir Rehabilitation	Rawlins
BLM-018	Devils Canyon Reservoir Rehabilitation	Reservoir Rehabilitation	Rawlins
BLM-019	Gamblers Reservoir Rehabilitation	Reservoir Rehabilitation	Rawlins
BLM-020	Weber Reservoir #3 Rehabilitation	Reservoir Rehabilitation	Rawlins
BLM-021	No Name	Reservoir Rehabilitation	Rawlins
BLM-022	River Bottom Reservoir Rehabilitation	Reservoir Rehabilitation	Rawlins
BLM-023	No Name	Reservoir Rehabilitation	Rawlins
BLM-024	Greasewood Reservoir Rehabilitation	Reservoir Rehabilitation	Rawlins
BLM-025	Cherokee Creek #2 Reservoir Rehabilitation	Reservoir Rehabilitation	Rawlins
BLM-026	Clay Point Reservoir Rehabilitation	Reservoir Rehabilitation	Rawlins
BLM-027	Fenceline Reservoir Rehabilitation	Reservoir Rehabilitation	Rawlins
BLM-028	The Hill Allotment Well Rehabilitation	Well Rehabilitation	Rawlins
BLM-029	Mulligan Draw Well Rehabilitation	Well Rehabilitation	Rawlins
BLM-029	Mulligan Draw Well Rehabilitation	Well Rehabilitation	Rawlins
BLM-030	JO Solar Pump	Well Rehabilitation	Rawlins
BLM-031	Sulphur/Grizzly Pipeline Rehabilitation	Pipeline Rehabilitation	Rawlins
BLM-032	Cherokee Pit	Reservoir Rehabilitation	Rawlins
BLM-033	Holler Draw Headcut	Stream Stabilization	Rawlins
BLM-034	Bear Canyon Exclosures	Fence Exclosure	Rawlins
BLM-035	Shallow Creek Reservoir Rehabilitation	Reservoir Rehabilitation	Rawlins
BLM-036	Wheatgrass Pit	Reservoir Rehabilitation	Rawlins
BLM-037	Andy's Project Reservoir Rehabilitation	Reservoir Rehabilitation	Rawlins
BLM-038	Little Snake Well #2 Rehabilitation	Well Rehabilitation	Rawlins
BLM-039	Sand Creek Well #1 Rehabilitation	Well Rehabilitation	Rawlins
BLM-040	Powder Rim Spring #2 Rehabilitation	Spring Rehabilitation	Rawlins
BLM-041	Powder Rim Spring #1 Rehabilitation	Spring Rehabilitation	Rawlins
BLM-042	CD Fence Well Rehabilitation	Well Rehabilitation	Rawlins
BLM-043	New Pit	Reservoir Construction	Rawlins
BLM-044	New Pit	Reservoir Construction	Rawlins
BLM-045	New Pit	Reservoir Construction	Rawlins
BLM-046	Pasture B Pipeline Project	Pipeline Project	Rawlins
BLM-047	Cherokee Trails Pipeline Project	Pipeline Project	Rawlins
BLM-048	Morgan-Boyer Pit	Reservoir Rehabilitation	Rawlins
BLM-049	North Barrel Spring Reservoir Rehabilitation	Reservoir Rehabilitation	Rawlins
BLM-050	Detention Dam	Reservoir Rehabilitation	Rawlins
BLM-051	Highway Reservoir	Reservoir Construction	Rock Springs
BLM-052	Lower Horseshoe Reservoir	Reservoir Construction	Rock Springs
BLM-053	South Horseshoe Reservoir	Reservoir Construction	Rock Springs
BLM-054	Two Bar Trail Reservoir	Reservoir Construction	Rock Springs
BLM-055	Shipping Corral #2 Reservoir	Reservoir Construction	Rock Springs
BLM-056	Little Scrivener Butte Reservoir	Reservoir Construction	Rock Springs
BLM-057	Quaking Springs Reservoir	Reservoir Construction	Rock Springs
BLM-058	Goat Springs Reservoir	Reservoir Construction	Rock Springs

The list of proposed improvements includes the following types of projects:

- Stock reservoir construction,
- Stock reservoir rehabilitation,
- Well rehabilitation, including installation of solar platforms,
- Fence enclosures,
- Stream rehabilitations,
- Spring developments, and
- Pipeline projects.

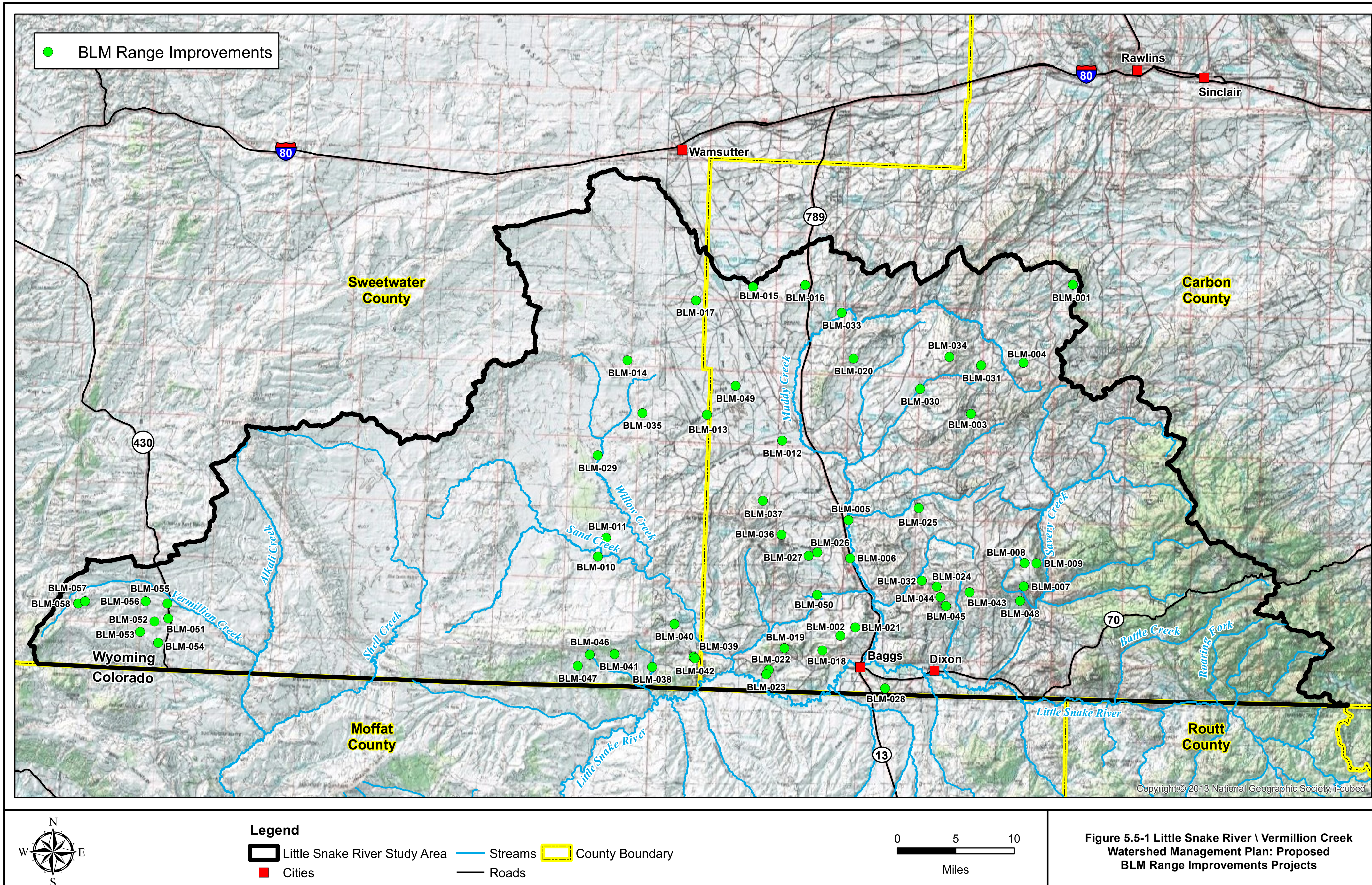


Figure 5.5-1 Little Snake River \ Vermillion Creek Watershed Management Plan: Proposed BLM Range Improvements Projects

5.6 Storage Opportunities (Watershed Management Plan Component S)

Identification and evaluation of opportunities to develop additional surface water storage in the Little Snake River / Vermillion Creek watershed is a key objective of previous and ongoing investigations within the study area. Selected previous investigations focusing on development of reservoir construction include the following:

- Little Snake River Water Management Project Feasibility Study, Banner Associates, 1980
- Little Snake River Water Management Project, WWDC, 1981
- Sandstone Dam and Reservoir Concept Design Report, Stone & Webster Engineering Corp., 1985
- Sandstone Dam Project Summary, WWDC, 1993
- Little Snake River Basin Small Reservoir Development Project Level II, Lidstone & Anderson, 1998
- Little Snake River Dams Level II Studies, Gannett Fleming, 2003
- Little Snake River Supplemental Storage, Level II Study (States West Water Resources Consultants, 2013)

The recently completed Little Snake River Supplemental Storage Level II Study, completed by States West Water Resources Corporation (SWWRC) on behalf of the WWDC, states that High Savery reservoir has yielded “a larger supply of water than had been predicted and, while this reservoir serves a large number of water users, it’s geographic location and size prevents service to a significant number of other irrigators. Additionally, High Savery does not meet all of the shortages downstream of the facility. The District (LSRCD) would like to construct a reservoir or a combination of two reservoirs, that would increase the benefits to these users and others” (SWWRC, 2013).

The SWWRC study evaluated nine reservoir alternatives within the study area for feasibility of construction for. Included in their effort were a basin hydrology study, site identification and initial screening, preliminary design and cost estimates for the most feasible site, and an economic analysis of the preferred site. Table 5.6-1 presents the results of the preliminary screening effort conducted by SWWRC. As indicated in this table, the West Battle Creek site scored highest and was selected as the preferred alternative. Appendix 5A contains the reservoir screening summary from the SWWRC study.

High Savery Dam was constructed by the State of Wyoming between 2001 and 2004. The purpose of the project was to serve as an agricultural and municipal water supply, as well as recreation, environmental enhancement, and mitigation for II trans-basin diversion water supply projects. High Savery Dam and Reservoir is located on Savery Creek. The drainage area of Savery Creek at the dam site is 107 square miles and comprises approximately 2.86 percent of the entire Little Snake River watershed area. According to landowners and water users interviewed during the completion of this project, the benefits of High Savery Dam have been tangible and realized with augmentation of late season flows.

Table 5.6-1 Little Snake River / Vermillion Creek Supplemental Supply Project, Level II: Initial Screening Scoring Matrix.

Site	Ability to Meet Needs 30	Access 10	Multiple Use Potential 20	Geotechnical Feasibility 10	Land Ownership 10	Cultural Resources 10	Environmental Impacts 20	Ability to Permit 20	Cost 20	Total Site Score	% of Possible Points
	Scoring Factor and Weight										
Big Gulch	3	7	7	6	5	8	2	1	2	590	39.3%
Lower Little Sandstone	4	7	5	5	5	5	2	3	3	600	40.0%
Upper Little Sandstone	4	8	5	5	5	5	5	7	7	830	55.3%
W. Fork Battle Creek	7	6	9	9	8	8	9	9	7	1200	80.0%
Haggarty Creek Near Copperton	6	6	9	6	6	0	9	1	2	780	52.0%
Battle Lake	0	3	5	8	5	9	6	5	2	610	40.7%
Lower Cottonwood Creek	7	4	8	7	5	5	2	2	6	780	52.0%
Upper Cottonwood Creek	7	5	8	8	5	0	2	1	3	670	44.7%
Roaring Fork Little Snake River	5	4	4	5	3	5	2	2	5	580	38.7%
Factor Weight as % of Total:	20.0%	6.7%	13.3%	6.7%	6.7%	6.7%	13.3%	13.3%	13.3%		

Note: Maximum Total Site Score Possible = 1500

Probable fatal flaw or very unfavorable characteristic

In addition to the sites discussed above, several smaller reservoir sites were identified within the drier western portion of the watershed on Canyon Creek and Vermillion Creek with the assistance of local landowners. These sites, while considerably more limited with respect to flows available for storage, could potentially provide added benefit to an area extremely water-limited. Additional hydrologic monitoring and modeling would be required in order to determine feasibility, flow availability and costs. However, based upon the preliminary hydrology obtained using the temporary stream gages described in Chapter 3 of this report, there may be minimal quantities of flow physically available for storage to augment irrigation and livestock reserves.

Figure 5.6-1 displays the collected locations of all the potential reservoir sites ultimately recommended in the prior investigations listed above. These sites were screened based upon their relative rankings in the respective investigations. Table 5.6-2 summarizes the screened reservoir sites and potential storage capacity of the subset of reservoir sites identified as preferred alternatives. Figure 5.6-2 displays their locations.

5.7 Stream Channel Condition and Stability (Watershed Management Plan Component C)

The general condition of the principal stream channels and primary tributaries were evaluated during the geomorphic investigation which included:

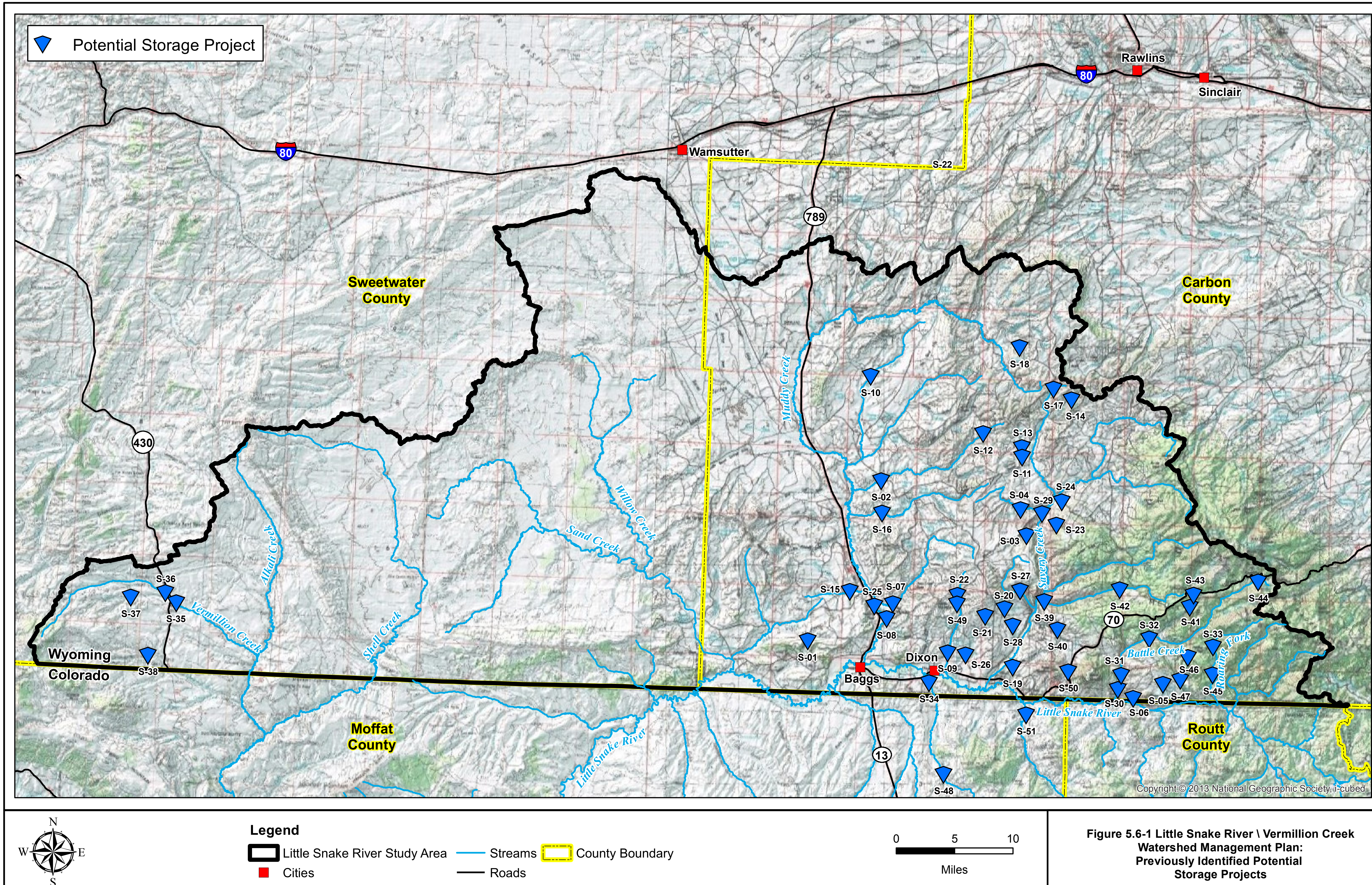


Figure 5.6-1 Little Snake River \ Vermillion Creek Watershed Management Plan: Previously Identified Potential Storage Projects

Table 5.6-2 Tabulation of Recommended Storage Opportunities.

Watershed Management Plan Component	Project Name	Potential Storage Capacity (ac-ft)
S-02	Blue Gap 16	375
S-12	Ketchum Buttes 25	81
S-13	Ketchum Buttes 34	19
S-15	Peach Orchard Flat 6	1,189
S-17	Pine Grove Ranch 1	56
S-26	Dutch Joe Creek (3)	10,000
S-35	Vermillion Creek	40-60
S-36	North Fork Vermillion Creek	60 - 100
S-37	Coyote Creek	150 - 200
S-38	Canyon Creek	50 - 60
S-40	Big Gulch	5,000
S-41	West Fork Battle Creek at Haggarty Creek	4,000 - 10,000
S-48	Upper Willow Creek	10,021
S-49	Upper Cottonwood Creek	3,229
S-50	Grieve Reservoir	2,899
S-51	Pot Hook Reservoir	60,000

- review of existing documentation of channel impairments, including an inventory of existing barriers to fish passage (Trout Unlimited, 2009),
- classification of approximately 587 miles of stream channel within the GIS environment,
- review of BLM Proper Functioning Condition assessments,
- field reconnaissance,
- delineation of Little Snake River stream bank erosion locations using 1-ft resolution aerial photography dated July, 2011, and
- detailed field mapping of stream channel conditions within a limited study reach of Savery Creek.

These efforts and their results are presented in Chapter 3. During the evaluation of existing channel conditions, several impaired reaches were identified and three general classes of impairments noted. The general categories of impairments were classified as indicated below:

- Channel degradation/incision;
- Bank erosion associated with channel migration and/or widening,
- Loss or reduction of riparian vegetation.

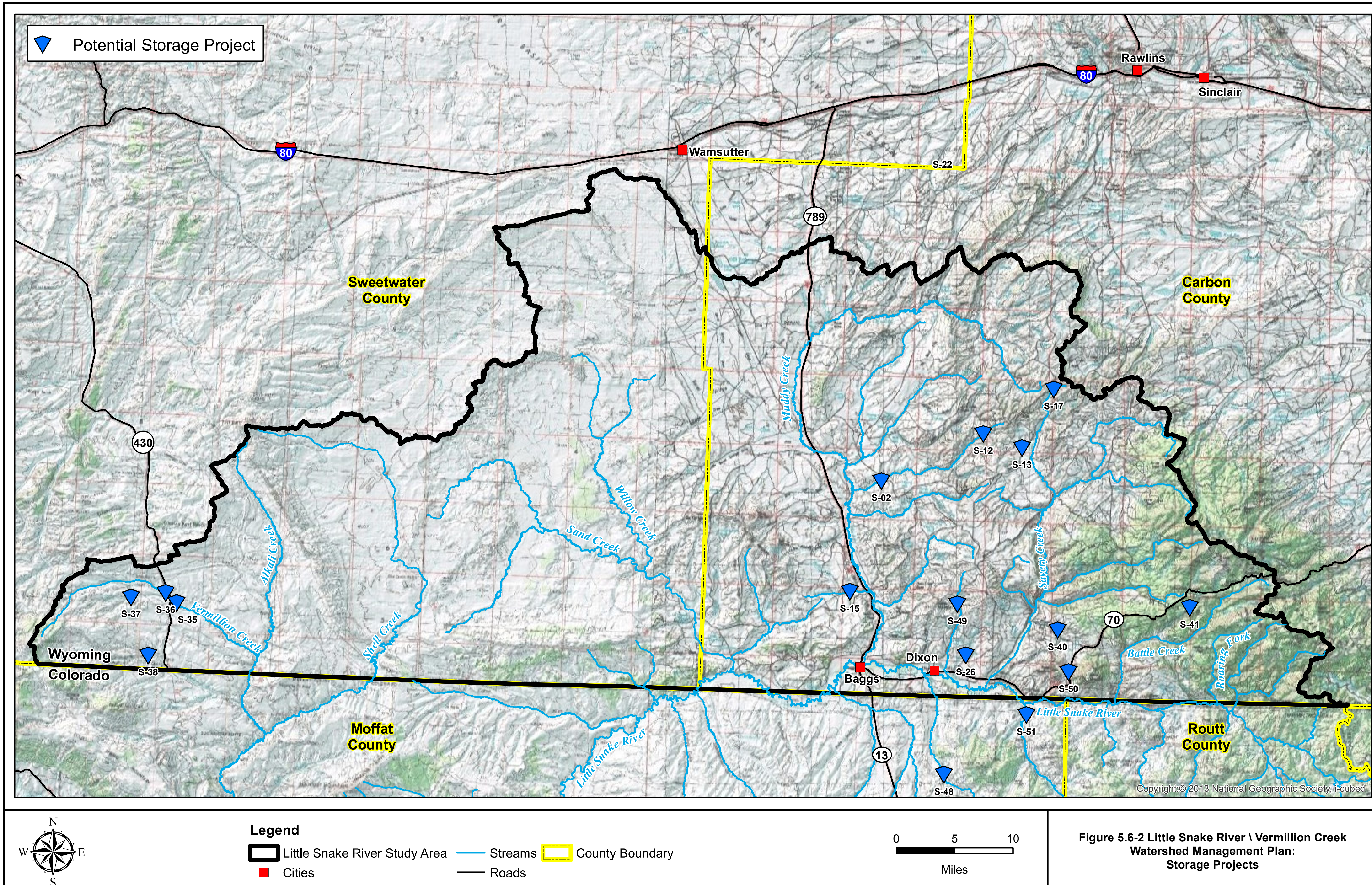


Figure 5.6-2 Little Snake River \ Vermillion Creek Watershed Management Plan: Storage Projects

In addition, as discussed in Chapter 3, Trout Unlimited recently conducted an inventory of diversion structures and other structures in the stream channels which may pose barriers to fish passage or entrainment. Consequently, a fourth impairment to stream channel condition is added here:

- Barriers to fish passage/entrainment by diversions.

5.7.1 Barriers to Fish Passage

As previously discussed in Chapter 3, the results of the Trout Unlimited inventory provided valuable insight into the location and magnitude of structures throughout the majority of the study area which pose barriers to fish migration or otherwise are negative attributes with respect to fisheries habitat. TU categorized each inventoried structure in relation to its potential to block passage and assigned priority ratings based upon the physical nature of the structure combined with the potential impact upon existing fish populations.

- **Very High Priority Barriers**: Barriers that had the potential to trap fish into locations where they would ultimately die. These included barriers immediately upstream from portions of seasonally dry river segments and barriers that isolated fish into areas they would need to leave to avoid temperatures higher than they could tolerate.
- **High Priority Barriers:** These barriers included those that blocked migrations of spawning fish during the spawning period. Therefore, barriers that occurred in areas where only trout were found, and were passable by spawning sized trout were not included in this category.
- **Medium Priority Barriers**: Barriers were any remaining barriers not already prioritized in higher priority classifications.
- **Low Priority Barriers**: Barriers that may have received a higher classification based on the criteria above were designated as Low Priority if the stream upstream from the barrier was considered ephemeral of if there was minimal habitat upstream from the barrier.
- **Necessary Barriers:** Within the assessment area, several barriers exist that function to protect isolated native populations of fish from invasive competitors and therefore should remain in place; these were classified as Necessary Barriers.

A total of two hundred eleven (211) structures were inventoried; seventy (70) of which were determined to be a barrier to fish migration. Of these, three (3) were classified as Very High Priority, twenty two (22) were High Priority, twenty four (24) were Medium Priority and eight (8) were Low Priority. The remaining thirteen (13) were classified as “necessary”. Note that one of the structures rated as Very High Priority (Savery Creek crossing), has been replaced since the completion of the TU study.

All structures classified as either Very High Priority or High Priority was incorporated into the Watershed Management Plan as components C-1 through C-24 Table 5.7-1. Figure 5.7-1 displays the location of these structures. Many of the barriers included in Table 5.7-1 are small and easily replaced with rock cross vane-type structures. Figure 5.7-2 displays a photo of a sheet pile grade control structure on upper Muddy Creek which could be replaced with a relatively minor effort. Others will require considerably greater amounts of design consideration and construction costs to replace (Figures 5.7-3 and 5.7-4).

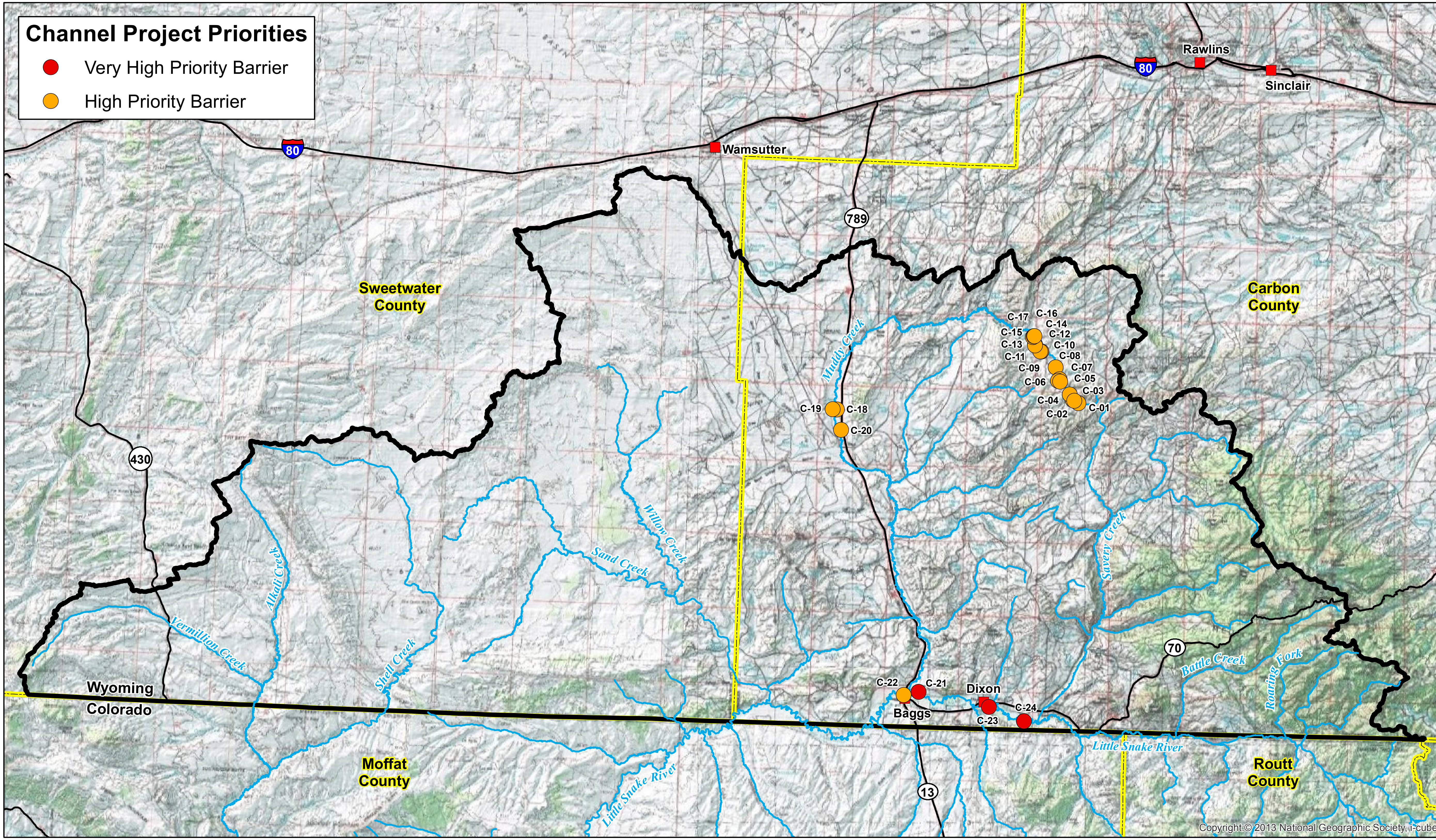
Table 5.7-1 Summary of Channel Barrier Mitigation Projects.

Watershed Management Plan Component	Trout Unlimited Identifier	Feature Type	Priority	Relative Structure Size	Affected Stream	Structure Components	Land Status
C-01	415	Grade Control	High	Very Small	Muddy Creek	Sheet Pile Grade Control	State
C-02	412	Grade Control	High	Very Small	Muddy Creek	Sheet Pile Grade Control	State
C-03	411	Grade Control	High	Very Small	Muddy Creek	Sheet Pile Grade Control	State
C-04	407	Grade Control	High	Very Small	Muddy Creek	Sheet Pile Grade Control	State
C-05	406	Grade Control	High	Very Small	Muddy Creek	Log Drop Structure	State
C-06	403	Grade Control	High	Very Small	Muddy Creek	Log Drop Structure	State
C-07	401	Grade Control	High	Very Small	Muddy Creek	Log Drop Structure	State
C-08	8	Road Crossing	High	Small	Muddy Creek	Culvert	BLM
C-09	378	Grade Control	High	Small	Muddy Creek	Sheet Pile Grade Control	BLM
C-10	377	Grade Control	High	Small	Muddy Creek	Sheet Pile Grade Control	BLM
C-11	379	Grade Control	High	Small	Muddy Creek	Sheet Pile Grade Control	BLM
C-12	380	Grade Control	High	Small	Muddy Creek	Sheet Pile Grade Control	Private
C-13	382	Grade Control	High	Small	Muddy Creek	Sheet Pile Grade Control	Private
C-14	383	Grade Control	High	Small	Muddy Creek	Sheet Pile Grade Control	Private
C-15	357	Grade Control	High	Small	Muddy Creek	Sheet Pile Grade Control	Private
C-16	385	Grade Control	High	Small	Muddy Creek	Sheet Pile Grade Control	Private
C-17	386	Grade Control	High	Small	Muddy Creek	Sheet Pile Grade Control	Private
C-18	346	Grade Control	High	Large	Muddy Creek	Rock Gabion Structure	State
C-19	345	Grade Control	High	Large	Muddy Creek	Rock Gabion Structure	State
C-20	36	Diversion	High	Large	Muddy Creek	Rock Structure	Private
C-21	58	Ready Ditch Diversion	High	Large	Little Snake River	Rock Structure	Private

5.7.2 Stream Channel Rehabilitation

With respect to overall stream stabilization efforts, 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" 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 5.7-5 displays a diagram of a typical stream channel stabilization strategy for a small channel experiencing minor downcutting or bank erosion. A vortex weir can be placed within a problematic reach to serve as a grade control structure as well as directing and centralizing streamflow. Weir configuration can be varied to provide additional functions such as facilitating irrigation diversions. Figure 5.7-6 displays a photograph of a typical installation.



Legend

Little Snake River Study Area
Cities
Streams
Roads
County Boundary

0 5 10
Miles

Figure 5.7-1 Little Snake River \ Vermillion Creek Watershed Management Plan: Channel Projects

Figure 5.7-2 Typical Sheet pile Grade Control Structure on Upper Muddy Creek.

Figure 5.7-3 Gabion Gradient Control Structure: Muddy Creek.

Figure 5.7-4 Sheet pile Diversion Structure: Little Snake River.

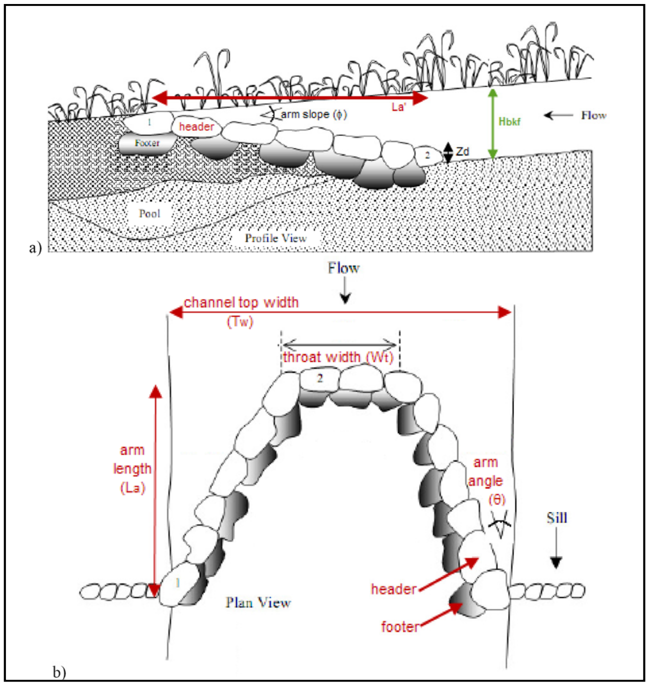


Figure 5.7-5 Rock Vortex Weir Structure Diagram (Adapted from Rosgen, 2006).

Figure 5.7-6 Stream Stabilization Structure: Rock Vortex Weir.

Re-establishment of pre-incision channel elevations can be accomplished by means of check dams. Figure 5.7-7 displays a photo of a large-scale check dam on Muddy Creek. This structure 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 5.7-7 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.

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 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 that have resulted from overutilization of riparian areas or adjacent upland range. Figure 5.7-8 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.

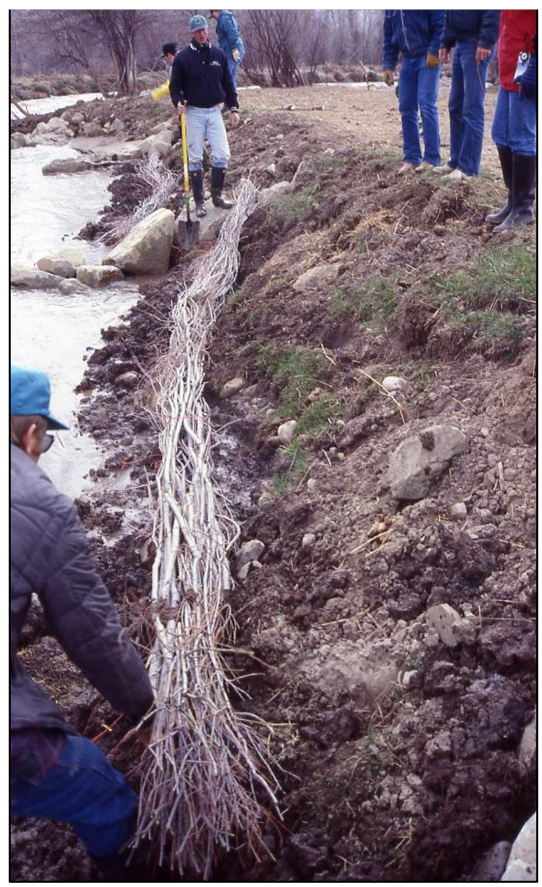


Figure 5.7-8 Stream Stabilization Measure: Willow Fascine Installation.

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 5.7-2 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.

Table 5.7-2 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

The Little Snake River Conservation District (LSRCD) has completed several stream channel stabilization projects in recent years which employ one or more of the stabilization strategies presented above. For example, in 2012, LSRCD and NRCS staff completed the design of several miles of channel stabilization efforts on the Little Snake River upstream of Baggs. Construction was completed for this project during the summer (low streamflow) period of 2012. In addition, the LSRCD has both sponsored or completed design and construction of stream stabilization projects elsewhere on the Little Snake River and within its watershed.

As would be recommended with any similar project, monitoring of the success of the project(s) is highly recommended. At a minimum, monitoring should include visual inspection of rehabilitation features to determine the effectiveness and ability of the rehabilitation to withstand high flow events. Evidence of existing or induced erosion, movement of rehabilitation features (rock, root wads, etc), sedimentation, vegetation establishment, etc. should be noted. In addition, long term monitoring of rehabilitation sites should include:

- Photographic documentation
- Cross sections
- Longitudinal profiles
- Bank surveys
- Bank erosion pins
- Scour chains
- Pebble counts

Several stream reaches were identified which would benefit from site-specific stream restoration strategies. These stream segments were either classified as F-type channels in the stream channel characterization phase of the project (see Chapter 3) or were brought to the attention of the project team during completion of field investigations or project meetings. This list is not intended to be all-inclusive. It is understood that there will be stream segments throughout the watershed that could benefit from stream restoration activities.

- Alkali Creek
- Barrel Springs Draw
- Canyon Creek
- Cottonwood Creek
- Cow Creek
- Deep Creek
- Dry Cow Creek
- Muddy Creek
- Savery Creek
- Shell Creek
- Vermillion Creek
- Wild Cow Creek
- Willow Creek

Based on the information presented above, the following items are presented for inclusion in the Little Snake River / Vermillion Creek Watershed Management Plan:

Watershed Plan Component C-26: 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 C-27: 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.

Watershed Plan Component C-28: Initiation of routine monitoring of completed stream restoration projects to determine their effectiveness and viability. Repairs should be made as necessary as soon as is practical.

5.7.3 Savery Creek Rehabilitation Plan

The geomorphic investigation concluded that Savery Creek within the project study area would benefit from completion of a channel restoration effort. As discussed in Chapter 4 of this report, a conceptual stream restoration plan was developed. The principal objective presented included:

- Complete pool enhancement / deepening efforts.
- Reduce channel width / depth ratios providing a more stable channel configuration and enhance aquatic habitat.
- Constructing width-restricting terraces from materials obtained from the channel invert and from pool enhancement/deepening efforts.
- Restore desirable riffle/pool sequences where lacking.
- Mitigate existing stream bank erosion through appropriate technologies (bioengineering, channel reconfiguration, vegetative restoration, rock placement, etc).
- Restore desirable woody riparian vegetation.

5.8 Wetlands Enhancement Opportunities (Watershed Management Plan Component W)

The LSRCD has identified several locations where wetlands enhancement opportunities exist. These locations represent a variety of sites where wetlands could either be established, or existing wetlands could be enhanced through modification of hydrologic conditions. Several of the sites consist of abandoned oxbows along the Little Snake River where diversion of water from the river would provide flushing flows to maintain the wetland integrity (Figure 5.8-1). Other sites would consist of establishment of wetlands in areas where there currently are none. These sites are located along the Muddy Creek corridor. Figure 5.8-2 displays the location of these potential projects. Table 5.8-1 summarizes pertinent information on these projects.

5.9 Other Upland Management Opportunities (Watershed Management Plan Component O)

5.9.1 Noxious Weed and Undesirable Plant Control

The Carbon and Sweetwater 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 Districts have 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.

Figure 5.8-1 Example Abandoned Oxbow Wetland Enhancement Candidate Site.

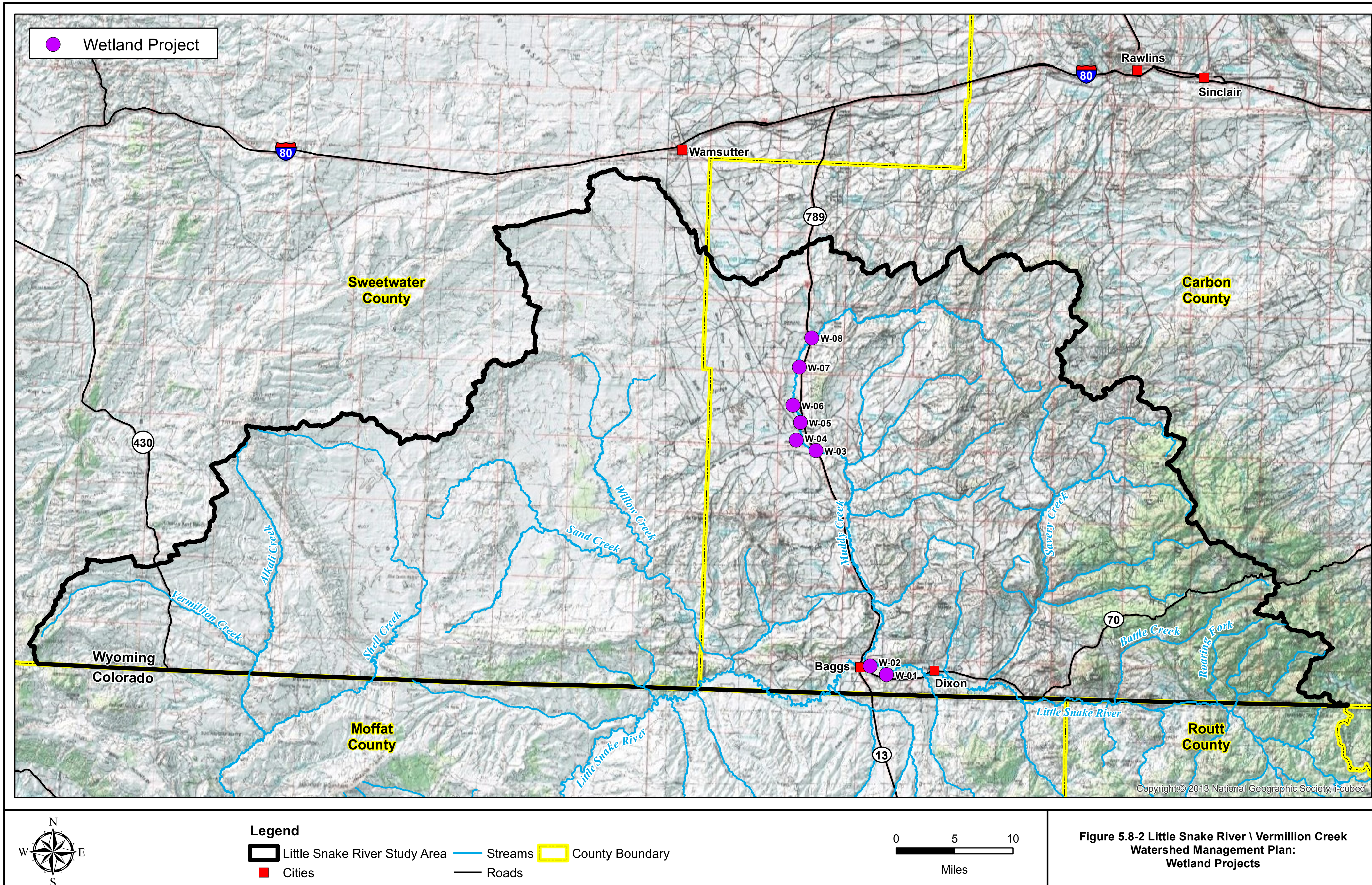


Figure 5.8-2 Little Snake River \ Vermillion Creek Watershed Management Plan: Wetland Projects

Table 5.8-1 Potential Wetland Restoration/Establishment Projects.

Watershed Management Plan Component	Acres	Priority	Affected Stream
W-01	10	Moderate	Little Snake River
W-02	12	Moderate	Little Snake River
W-03	15	Moderate	Muddy Creek
W-04	130	Moderate	Muddy Creek
W-05	10	Moderate	Muddy Creek
W-06	25	Moderate	Muddy Creek
W-07	30	Moderate	Muddy Creek
W-08	30	Moderate	Muddy Creek

5.10 The Little Snake River / Vermillion Creek Watershed Management Plan

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

- Irrigation system rehabilitation components
- Livestock / wildlife upland watering opportunities
- Grazing management opportunities
- BLM recommendations
- Storage opportunities
- Stream channel stability components
- Wetland Enhancement opportunities
- Other watershed management plan alternatives

These improvements focus on potential mitigation of several key issues that presently exist within the watershed. For the Little Snake River / Vermillion Creek watershed, the watershed management plan consists of a compilation of the recommendations for each category. The plan is summarized in Table 5.10-1.

Table 5.10-1 Little Snake River / Vermillion Creek Watershed Management Plan.

Watershed Plan Component: Irrigation Rehabilitation Projects (I)			
Watershed Management Plan Component	Structure Type		Replace / Rehabilitate / Install
First Mesa Canal Structures			
I-01	Bendway Weir		Replace
I-02	Canal Headgate		Replace
I-03	Cottonwood Creek Spill Rehabilitation		Replace
I-05	Parshall Flume		Replace
I-06	Telemetry		Replace
I-07	Farm Turnout at McKee		Replace
I-08	Farm Turnout at Marsella		Replace
I-09	Farm Turnout at Wille		Replace
I-10	Lining at Weber		Replace
I-11	Lining at Ely		Replace
I-12	Lining at Risner		Replace
I-13	Culvert at Cottonwood Spill		Replace
I-14	Culvert at Dolan Lane		Replace
I-15	Culvert at CR 702		Replace
Stateline Canal Components			
I-16	Ditch Headgate		Replace
I-17	Measurement		Replace
West Side Canal Components			
I-18	Measurement		Install
I-04	Orchard Spill		Replace
I-19	Spillway		Rehabilitate
I-20	Spillway		Install
I-21	Flume (4 Mile)		Replace
I-22	Drop Outlet (Jon's Drop)		Replace
Baggs Ditch Components			
I-23	Hillside Erosion		Install
I-24	Measurement		Install
I-25	Culvert		Install
I-26	Culvert		Replace
I-27	Culvert		Replace
I-28	Culvert		Replace
I-29	Culvert		Replace
Miscellaneous Ditch Components			
I-30	Farm Turnout	Three Forks	Rehabilitate
I-31	Diversion/headgate	Ladder Ranch	Rehabilitate
I-32	Pipe Drop Structure	Focus Ranch	Install
I-33	Flume	Waldron	Rehabilitate
I-34	Diversion/headgate	Emmons	Install
I-35	Diversion/headgate	Peter Hansen Trust	Install
I-36	Pipeline	Three Forks	Replace
I-37	Diversion/headgate	Three Forks	Rehabilitate

Watershed Plan Component: Livestock / Wildlife Water Supply Projects (L/W)									
Watershed Management Plan Component	Project Name	Solar Pump	Spring Development	Stream Diversion	Pipeline	Stock Tank	Storage Tank	Stock Reservoir Rehabilitation	Stock Reservoir Construction
LW-01A	Carrico Pipeline Project		1		31,000	8			
LW-01B	Carrico Pipeline Project								
LW-02	Carrico Spring Development		1		450	1			
LW-03	Carrico Stock Reservoir								1
LW-04	McAllister Well Rehabilitation	1							
LW-05	Davis Pipeline	1			50,500	5	1		
LW-06	Davis Spring Development 1		1			1			
LW-07	Davis Spring Development 2		1			1			
LW-08	Waldron Spring Development		1		500	1			
LW-09	Waldron Stock Pond Rehabilitation							1	
LW-10	Sheehan Pipeline				14,200	2			
LW-11	Ladder Ranch Pipeline 1	1	1		5,500	2	1		
LW-12	Ladder Ranch Pipeline 2		1		3,500	1			
LW-13	Ladder Ranch Well Rehabilitation					1			
LW-14	Ladder Ranch Stock Tank				150	1			
LW-15	Weber Pipeline				20,000	5			
LW-16	Cow Creek Well					1			
LW-17	Wild Horse Buttes Pipeline				57,100	7			
LW-18	Alamosa Gulch Stock Pond								1
LW-19	Dry Cow Creek Stock Pond 1								1
LW-20	Dry Cow Creek Stock Pond 2								1
LW-21	Dry Cow Creek Stock Pond 3								1
LW-22	Dry Cow Creek Stock Pond 4							1	
LW-23	Dry Cow Creek Stock Pond 5							1	
LW-24	Dry Cow Creek Stock Pond 6							1	
LW-25	Lower Barrel Springs Draw Stock Pond								1
LW-26	White Rock Draw Stock Pond								1
LW-27	Dad Stock Pond							1	
LW-28	Deep Creek Stock Pond 1								1
LW-29	Deep Creek Stock Pond 2								1
LW-30	Deep Creek Stock Pond 3								1
LW-31	Deep Creek Stock Pond 4								1
LW-32	Deep Creek Stock Pond 5								1
LW-33	Dirtyman Fork Stock Pond								1
LW-34	Mill Creek Stock Pond								1
LW-35	Little Savery Creek Stock Pond 1								1
LW-36	Little Savery Creek Stock Pond 2								1
LW-37	Middle Savery Creek Stock Pond								1
LW-38	Hog Eye Ranch Stock Pond							1	
LW-39	Bird Gulch Stock Pond							1	
LW-40	Battle Creek Stock Pond							1	

Watershed Plan Component: Grazing Management Opportunities (G)	
G-1	Expansion of grazing distribution / limited reliance on riparian areas.
G-2	Fencing to create pastures of similar ecological condition to enable a rest-rotation grazing system.
G-3	Strategic salting and herding are other tools that can be used to enhance grazing distribution.
G-4	Consideration of wildlife needs in upland water source development (escape ramps, wildlife watering facilities, etc).
G-5	Utilization of Ecological Site Description State and Transition Modeling to optimize range conditions.
G-6	Use of prescribed fire to assist in the restoration of range health areas benefitting by this treatment according to the state and transition models.
G-7	Application of chemicals may be utilized in the restoration of range health areas benefitting by this treatment according to the state/transition models.

Table 5.10-1 Little Snake River / Vermillion Creek Watershed Management Plan (Continued).

Watershed Plan Component: BLM Recommendations (BLM)		
Watershed Management Plan Component	**Name**	**Project Type**
BLM-001	McKinney Creek Spring Development	Spring Development
BLM-002	Poison Buttes Well Rehabilitation	Well Rehabilitation
BLM-003	Deep Gulch	Reservoir Rehabilitation
BLM-004	Exclosure (Beaver Dams)	Fence Exclosure
BLM-005	Cottonwood Hill Sheet Piling	Stream Stabilization
BLM-006	Cherokee Pipeline Project	Pipeline Project
BLM-007	Sweezy Spring Rehabilitation	Spring Rehabilitation
BLM-008	Loco Aspen Spring Rehabilitation	Spring Rehabilitation
BLM-009	Loco Creek Fencing	Fence Exclosure
BLM-010	Koala Bar	Reservoir Rehabilitation
BLM-011	Hangout Solar	Solar Platform
BLM-012	Red Flat Well Rehabilitation	Well Rehabilitation
BLM-013	Niland Well Rehabilitation	Well Rehabilitation
BLM-014	Little Draw Reservoir Rehabilitation	Reservoir Rehabilitation
BLM-015	Coal Gulch #2 Reservoir Rehabilitation	Reservoir Rehabilitation
BLM-016	South Echo Reservoir Rehabilitation	Reservoir Rehabilitation
BLM-017	Private	Reservoir Rehabilitation
BLM-018	Devils Canyon Reservoir Rehabilitation	Reservoir Rehabilitation
BLM-019	Gamblers Reservoir Rehabilitation	Reservoir Rehabilitation
BLM-020	Weber Reservoir #3 Rehabilitation	Reservoir Rehabilitation
BLM-021	No Name	Reservoir Rehabilitation
BLM-022	River Bottom Reservoir Rehabilitation	Reservoir Rehabilitation
BLM-023	No Name	Reservoir Rehabilitation
BLM-024	Greasewood Reservoir Rehabilitation	Reservoir Rehabilitation
BLM-025	Cherokee Creek #2 Reservoir Rehabilitation	Reservoir Rehabilitation
BLM-026	Clay Point Reservoir Rehabilitation	Reservoir Rehabilitation
BLM-027	Fenceline Reservoir Rehabilitation	Reservoir Rehabilitation
BLM-028	The Hill Allotment Well Rehabilitation	Well Rehabilitation
BLM-029	Mulligan Draw Well Rehabilitation	Well Rehabilitation
BLM-030	JO Solar Pump	Well Rehabilitation
BLM-031	Sulphur/Grizzly Pipeline Rehabilitation	Pipeline Rehabilitation
BLM-032	Cherokee Pit	Reservoir Rehabilitation
BLM-033	Holler Draw Headcut	Stream Stabilization
BLM-034	Bear Canyon Exclosures	Fence Exclosure
BLM-035	Shallow Creek Reservoir Rehabilitation	Reservoir Rehabilitation
BLM-036	Wheatgrass Pit	Reservoir Rehabilitation
BLM-037	Andy's Project Reservoir Rehabilitation	Reservoir Rehabilitation
BLM-038	Little Snake Well #2 Rehabilitation	Well Rehabilitation
BLM-039	Sand Creek Well #1 Rehabilitation	Well Rehabilitation
BLM-040	Powder Rim Spring #2 Rehabilitation	Spring Rehabilitation
BLM-041	Powder Rim Spring #1 Rehabilitation	Spring Rehabilitation
BLM-042	CD Fence Well Rehabilitation	Well Rehabilitation
BLM-043	New Pit	Reservoir Construction
BLM-044	New Pit	Reservoir Construction
BLM-045	New Pit	Reservoir Construction
BLM-046	Pasture B Pipeline Project	Pipeline Project
BLM-047	Cherokee Trails Pipeline Project	Pipeline Project
BLM-048	Morgan-Boyer Pit	Reservoir Rehabilitation
BLM-049	North Barrel Spring Reservoir Rehabilitation	Reservoir Rehabilitation
BLM-050	Detention Reservoir	Reservoir Rehabilitation
BLM-051	Highway Reservoir	Reservoir Construction
BLM-052	Lower Horseshoe Reservoir	Reservoir Construction
BLM-053	South Horseshoe Reservoir	Reservoir Construction
BLM-054	Two Bar Trail Reservoir	Reservoir Construction
BLM-055	Shipping Coral 2 Reservoir	Reservoir Construction
BLM-056	Little Scrivener Butte Reservoir	Reservoir Construction
BLM-057	Quaking Springs Reservoir	Reservoir Construction
BLM-058	Goat Springs Reservoir	Reservoir Construction
Watershed Plan Component: Storage Opportunities (S)		
Watershed Management Plan Component	**Name**	**Potential Capacity (ac ft)**
S-02	Blue Gap 16	375
S-12	Ketchum Buttes 25	81.2
S-13	Ketchum Buttes 34	19.3
S-15	Peach Orchard Flat 6	19.3
S-17	Pine Grove Ranch 1	55.8
S-26	Dutch Joe Creek (3)	10,000
S-35	Vermillion Creek	40 - 60
S-36	North Fork Vermillion Creek	60 - 100
S-37	Coyote Creek	150 - 200
S-38	Canyon Creek	50 - 60
S-40	Big Gulch	5,000
S-41	West Fork Battle Creek at Haggarty Creek	4,000 - 10,000
S-48	Upper Willow Creek	10,021
S-49	Upper Cottonwood Creek	3,229
S-50	Grieve Reservoir	2,889
S-51	Pot Hook Reservoir	60,000

Table 5.10-1 Little Snake River / Vermillion Creek Watershed Management Plan (Continued).

Watershed Plan Component: Stream Channel Improvements (C)						
Watershed Management Plan Component	**Trout Unlimited Identifier**	**Feature Type**	**Priority**	**Affected Stream**	**Structure Type**	**Structure Size**
C-01	415	Grade Control	High	Muddy Creek	Sheet Piling	Very Small
C-02	412	Grade Control	High	Muddy Creek	Sheet Piling	Very Small
C-03	411	Grade Control	High	Muddy Creek	Sheet Piling	Very Small
C-04	407	Grade Control	High	Muddy Creek	Sheet Piling	Very Small
C-05	406	Grade Control	High	Muddy Creek	Log Structure	Very Small
C-06	403	Grade Control	High	Muddy Creek	Log Structure	Very Small
C-07	401	Grade Control	High	Muddy Creek	Log Structure	Very Small
C-08	8	Road Crossing	High	Muddy Creek	Culvert	Small
C-09	378	Grade Control	High	Muddy Creek	Sheet Piling	Small
C-10	377	Grade Control	High	Muddy Creek	Sheet Piling	Small
C-11	379	Grade Control	High	Muddy Creek	Sheet Piling	Small
C-12	380	Grade Control	High	Muddy Creek	Sheet Piling	Small
C-13	382	Grade Control	High	Muddy Creek	Sheet Piling	Small
C-14	383	Grade Control	High	Muddy Creek	Sheet Piling	Small
C-15	357	Grade Control	High	Muddy Creek	Sheet Piling	Small
C-16	385	Grade Control	High	Muddy Creek	Sheet Piling	Small
C-17	386	Grade Control	High	Muddy Creek	Sheet Piling	Small
C-18	346	Grade Control	High	Muddy Creek	Rock Gabion	Large
C-19	345	Grade Control	High	Muddy Creek	Rock Gabion	Large
C-20	36	Diversion	High	Muddy Creek	Rock Gabion	Large
C-21	58	Ready Ditch Diversion	High	Little Snake River	Concrete	Large
C-22	59	Baggs Ditch Diversion	Very High	Little Snake River	Concrete	Large
C-23	63	Westside Ditch Diversion	Very High	Little Snake River	Concrete	Large
C-24	66	First Mesa Ditch Diversion	Very High	Little Snake River	Concrete	Large
C-25	166	Savery Creek Crossing	High	Savery Creek	Culvert	Large
C-26	Installation of stream channel degradation/incision mitigation measures based upon site-specific evaluation of conditions					
C-27	Installation of stream bank erosion mitigation measures based upon site-specific evaluation of condition					
C-28	Initiation of routine monitoring of completed stream restoration projects to determine their effectiveness and viability					

Watershed Plan Component: Wetland Enhancement Opportunities (W)				
Watershed Management Plan Component	**Acres**	**Enhancement / Establishment**	**Priority**	**Affected Stream**
W-01	10	Enhancement	Moderate	Little Snake River
W-02	12	Enhancement	Moderate	Little Snake River
W-03	15	Establishment	Moderate	Muddy Creek
W-04	130	Establishment	Moderate	Muddy Creek
W-05	10	Establishment	Moderate	Muddy Creek
W-06	25	Establishment	Moderate	Muddy Creek
W-07	30	Establishment	Moderate	Muddy Creek
W-08	30	Establishment	Moderate	Muddy Creek

Watershed Plan Component: Other Watershed Management Opportunities (O)	
Watershed Management Plan Component	**Action / Recommendation**
O-1	Continuaton of eradication efforts targeting noxious weeds and undesirable vegetation
O-2	Prescribed burns planned and executed in an effort to control juniper encroachment.
O-3	Mechanical treatment of juniper infestation should be completed in areas where prescribed burns are not feasible or practical.

VI. 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 5. 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 Thunder Basin Watershed Management Plan (Olsson Associated, 2009) and the Sweetwater River Watershed Study (Anderson Consulting Engineers, 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 Little Snake River / Vermillion Creek watershed.

6.1 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.

6.1.1 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 6.1.2 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 6.2. 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 6.2.

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.

6.1.2 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 6.1 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). Compliance with NEPA will be guided in large part by the Approved Rawlins Resource Management Plan (RRMP) and the Revised Rock Springs Resource Management Plan.

Other Local/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 Medicine Bow National Forest would presumably be led by the U.S. Forest Service. 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 5, 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.

6.2 Permitting/Clearances/Approvals

6.2.1 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 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 practical 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.

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), Carbon County and/or Sweetwater 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.).

6.2.2 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 6.2.1 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.

6.3 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.

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 Little Snake River / Vermillion Creek 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 it's 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. 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.

6.4 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 5. 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.

6.5 Medicine Bow National Forest (USDA)

Construction of projects within the boundary of the Medicine Bow 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.

6.6 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 who's lands would be used. Participation must be voluntary.***

VII. COST ESTIMATES

Conceptual-level costs have been developed for each of the alternative potential projects identified and described in Chapter 5. The bases for these costs are described in the following subsections for each of the overall project categories. Cost estimates presented represent 2013 dollars.

7.1 Irrigation System Components (Watershed Management Plan Component I)

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 7.1-1.

7.2 Upland Wildlife/Livestock Water Components (Watershed Management Plan Component LW)

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

Table 7.2-1 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 7.4 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 7.1-1 Conceptual Cost Estimates: Irrigation System Components (Watershed Management Plan Component I).

Watershed Management Plan Component	Structure Type		Replace / Rehabilitate / Install	Total Project Cost
First Mesa Canal Structures				
I-01	Bendway Weir		Replace	$51,900
I-02	Canal Headgate		Replace	$49,500
I-03	Cottonwood Creek Spill Rehabilitation		Replace	$28,100
I-05	Parshall Flume		Replace	$6,000
I-06	Telemetry		Replace	$15,000
I-07	Farm Turnout at McKee		Replace	$3,300
I-08	Farm Turnout at Marsella		Replace	$3,300
I-09	Farm Turnout at Wille		Replace	$3,300
I-10	Lining at Weber		Replace	$6,000
I-11	Lining at Ely		Replace	$6,000
I-12	Lining at Risner		Replace	$6,000
I-13	Culvert at Cottonwood Spill		Replace	$3,500
I-14	Culvert at Dolan Lane		Replace	$3,500
I-15	Culvert at CR 702		Replace	$3,500
Stateline Canal Components				
I-16	Ditch Headgate		Replace	$61,400
I-17	Measurement		Replace	$10,100
West Side Canal Components				
I-18	Measurement		Install	$6,000
I-04	Orchard Spill		Replace	$16,400
I-19	Spillway		Rehabilitate	
I-20	Spillway		Install	$16,400
I-21	Flume (4 Mile)		Replace	$50,000
I-22	Drop Outlet (Jon's Drop)		Replace	$92,000
Baggs Ditch Components				
I-23	Hillside Erosion		Install	$163,700
I-24	Measurement		Install	$10,100
I-25	Culvert		Install	$3,500
I-26	Culvert		Replace	$3,500
I-27	Culvert		Replace	$3,500
I-28	Culvert		Replace	$3,500
I-29	Culvert		Replace	$3,500
Miscellaneous Ditch Components				
I-30	Farm Turnout	Three Forks	Rehabilitate	$3,000
I-31	Diversion/headgate	Ladder Ranch	Rehabilitate	$15,000
I-32	Pipe Drop Structure	Focus Ranch	Install	$45,000
I-33	Flume	Waldron	Rehabilitate	$8,000
I-34	Diversion/headgate	Emmons	Install	$25,000
I-35	Diversion/headgate	Peter Hansen Trust	Install	$15,000
I-36	Pipeline	Three Forks	Replace	$8,000
I-37	Diversion/headgate	Three Forks	Rehabilitate	$45,000

(1) This structure is currently being designed and funded through the NRCS. Costs were not estimated herein.

Table 7.2-1 Conceptual Costs: Upland Wildlife/Livestock Water Components (Watershed Management Plan Component LW).

Project		1		2	3	4	5	6	7	8	9
		Watershed Component L/W-1A	Watershed Component L/W-1B	Watershed Component L/W-2	Watershed Component L/W-3	Watershed Component L/W-4	Watershed Component L/W-5	Watershed Component L/W-6	Watershed Component L/W-7	Watershed Component L/W-8	Watershed Component L/W-9
Description		Spring Development / Pipeline / Stock Tank Construction	Spring Development / Pipeline / Stock Tank Construction	Spring Development / Stock Tank	Stock Reservoir Reconstruction	Rehabilitation of Existing Well	Well / Pipeline / Stock Tank Construction	Spring Development / Pipeline / Stock Tank Construction	Spring Development / Pipeline / Stock Tank Construction	Spring Development / Pipeline / Stock Tank Construction	Rehabilitation of Existing Reservoir
Project Name		Dexter Peak Ranch Pipeline 1	Dexter Peak Ranch Pipeline 2	Dexter Peak Ranch Spring Development	Dexter Peak Ranch Stock Reservoir	McAllister Well Rehabilitation	Davis Pipeline	Davis Spring Development 1	Davis Spring Development 2	Waldron Spring Development	Waldron Stock Pond Rehabilitation
Water Source:		Existing Spring	Existing Pipeline	Existing Spring	Replacement Reservoir	Existing Well	Existing Well	Existing Spring	Existing Spring	Existing Spring	Existing Stock Resevoir
Well Construction / Spring Development	Mobilization	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000
	Source:	Existing Spring	Existing Pipeline	Existing Spring	Impound Drainage	Existing Well	Existing Well	Existing Spring	Existing Spring	Existing Spring	Existing Stock Resevoir
	Units (each)	1	0	1	0	0	0	1	1	1	0
	Depth Each	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Unit Cost ($/LF wells ror $/EA springs	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000
	Well Screen (LF each well)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Well Screen ($/LF)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Component Subtotal	$6,000	$3,000	$6,000	$3,000	$3,000	$3,000	$6,000	$6,000	$6,000	$3,000
Stock Pond / Guzzler Construction / Rehabilitation	Units (each)	NA	NA	NA	1	NA	NA	NA	NA	NA	
	Pond/Guzzler Const. Unit Cost ($ EA)				$125,000						
	Number of Ponds to Seal										1
	Bentonite Sealing (total square feet)										12,000
	Tons (4lbs/ft2)										24.00
	Bentonite Cost per Ton										$86
	Bentonite Cost										$2,064
	Transportation (15% of Bentonite)										$310
	Pond Component Subtotal				$125,000						$2,374
Pump	Units (EA)	NA	NA	NA	NA	1	1	NA	NA	NA	NA
	Type					Windmill	Solar Pump				
	Unit Cost (EA)					$6,000	$8,500				
	Component Subtotal					$6,000	$8,500				
Pipeline	**Low Pressure Pipe Diameter:**	1.5	1.5	1.5	NA	NA	1.5	1.5	1.5	1.5	NA
	Units (LF)	18,300	12,700	450			50,500	150	150	500	
	Unit Cost (EA)	$1.60	$1.60	$1.60			$1.60	$1.60	$1.60	$1.60	
	Component Subtotal	$29,280	$20,320	$720			$80,800	$240	$240	$800	
	High Pressure Pipe Diameter:	NA	NA	NA			NA	NA	NA	NA	
	Units (LF)										
	Unit Cost (EA)										
	Component Subtotal										
Additional Storage Tanks	Units (EA)	NA	NA	NA	NA	NA	1	NA	NA	NA	NA
	Size (gal)						$15,000				
	Unit Cost ($/gal)						$1				
	Component Subtotal						$15,000				
Livestock / Wildlife Water Tanks	Units (EA)	5	3	1	NA	NA	5	1	1	1	NA
	Size (gal)	1,200	1,200	1,200			1,200	1,200	1,200	1,200	
	Unit Cost	$3,000	$3,000	$3,000			$3,000	$3,000	$3,000	$3,000	
	Component	$15,000	$9,000	$3,000			$15,000	$3,000	$3,000	$3,000	
Miscellaneous	Item	Fencing	NA	Fencing	NA	NA	NA	Fencing	Fencing	Fencing	Clean Existing Stock Reservoir
	Units (Each)	500		500				500	500	500	1
	Unit Cost ($/ea)	$2.50		$2.50				$2.50	$2.50	$2.50	$3,000
	Component Subtotal	$1,250.00		$1,250.00				$1,250.00	$1,250.00	$1,250.00	$3,000
Construction Subtotal		$51,530	$32,320	$10,970	$128,000	$9,000	$122,300	$10,490	$10,490	$11,050	$8,374
Engineering (10%)		$5,153	$3,232	$1,097	$12,800	$900	$12,230	$1,049	$1,049	$1,105	$0
Constuction and Engineering Subtotal		$56,683	$35,552	$12,067	$140,800	$9,900	$134,530	$11,539	$11,539	$12,155	$8,374
Contingency (15%)		$8,502	$5,333	$1,810	$21,120	$1,485	$20,180	$1,731	$1,731	$1,823	$1,256
Total Construction Cost		$65,185	$40,885	$13,877	$161,920	$11,385	$154,710	$13,270	$13,270	$13,978	$9,630
Final Plans and Specs		$6,000	$5,000	$1,000	$10,000	$500	$5,000	$1,000	$1,000	$1,000	$1,000
Additional		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Permitting / Legal Fees / Access and Rights of Way		$0	$2,000	$0	$1,000	$0	$2,000	$500	$500	$500	$0
Total Project Cost		**$71,185**	**$47,885**	**$14,877**	**$172,920**	**$11,885**	**$161,710**	**$14,770**	**$14,770**	**$15,478**	**$10,630**

Table 7.2-1 Conceptual Costs: Upland Wildlife/Livestock Water Components (Watershed Management Plan Component LW) (Continued).

		10	11	12	13	14	15	16	17	18	19	20
Project		**Watershed Component L/W-10**	**Watershed Component L/W-11**	**Watershed Component L/W-12**	**Watershed Component L/W-13**	**Watershed Component L/W-14**	**Watershed Component L/W-15**	**Watershed Component L/W-16**	**Watershed Component L/W-17**	**Watershed Component L/W-18**	**Watershed Component L/W-19**	**Watershed Component L/W-20**
Description		**Storage Tank / Pipeline / Stock Tank Construction**	**Spring Development / Pipeline / Stock Tank Construction**	**Spring Development / Pipeline / Stock Tank Construction**	**Rehabilitation of Existing Well**	**Rehabilitation of Existing Well**	**Well / Pipeline / Stock Tank Construction**	**Well Construction**	**Well Construction**	**Well Constuction**	**Stock Pond Construction**	**Well Construction**
Project Name		**Sheehan Pipeline**	**Ladder Ranch Pipeline 1**	**Ladder Ranch Pipeline 2**	**Ladder Ranch Well Rehabilitation**	**Ladder Ranch Stock Tank**	**Weber Pipeline**	**Upper Crooked Wash Project**	**Lower Alkali Creek Well Project**	**Upper Alkali Creek Well Project**	**Upper Alkali Creek Stock Pond Project**	**Chicken Springs Basin Well Project**
Water Source:		Existing Storage Tank	Existing Spring	Existing Spring	Existing Well	Existing Well	Existing Well	Proposed Well	Proposed Well	Proposed Well	Proposed Stock Pond	Proposed Well
Well Construction / Spring Development	Mobilization	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000
	Source:	Existing Storage Tank	Existing Spring	Existing Spring	Existing Well	Existing Well	Existing Well	Proposed Well	Proposed Well	Proposed Well	Impound Drainage	Proposed Well
	Units (each)	0	1	1	0	0	0	1	1	1	0	1
	Depth Each	NA	NA	NA	NA	NA	NA	900	1,000	300	NA	300
	Unit Cost ($/LF wells ror $/EA springs	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$40	$40	$40	$3,000	$40
	Well Screen (LF each well)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Well Screen ($/LF)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Component Subtotal	$3,000	$6,000	$6,000	$3,000	$3,000	$3,000	$39,000	$43,000	$15,000	$3,000	$15,000
Stock Pond / Guzzler Construction / Rehabilitation	Units (each)										1	
	Pond/Guzzler Const. Unit Cost ($ EA)										$15,000	
	Number of Ponds to Seal											
	Bentonite Sealing (total square feet)											
	Tons (4lbs/ft2)	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA
	Bentonite Cost per Ton											
	Bentonite Cost											
	Transportation (15% of Bentonite)											
	Pond Component Subtotal										$15,000	
Pump	Units (EA)		1									
	Type	NA	Solar Pump	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Unit Cost (EA)		$8,500									
	Component Subtotal		$8,500									
Pipeline	**Low Pressure Pipe Diameter:**	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5		1.5
	Units (LF)	14,200	5,500	3,500	150	150	25,000	150	150	150		150
	Unit Cost (EA)	$1.60	$1.60	$1.60	$1.60	$1.60	$1.60	$1.60	$1.60	$1.60		$1.60
	Component Subtotal	$22,720	$8,800	$5,600	$240	$240	$40,000	$240	$240	$240	NA	$240
	High Pressure Pipe Diameter:											
	Units (LF)											
	Unit Cost (EA)	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA
	Component Subtotal											
Additional Storage Tanks	Units (EA)		1									
	Size (gal)	NA	15,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Unit Cost ($/gal)		$1									
	Component Subtotal		$15,000									
Livestock / Wildlife Water Tanks	Units (EA)	2	2	1	1	1	5	1	1	1		1
	Size (gal)	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	NA	1,200
	Unit Cost	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000		$3,000
	Component	$6,000	$6,000	$3,000	$3,000	$3,000	$15,000	$3,000	$3,000	$3,000		$3,000
Miscellaneous	Item		Fencing	Fencing								
	Units (Each)	NA	500	500	NA	NA	NA	NA	NA	NA	NA	NA
	Unit Cost ($/ea)		$2.50	$2.50								
	Component Subtotal		$1,250.00	$1,250.00								
Construction Subtotal		$31,720	$45,550	$15,850	$6,240	$6,240	$58,000	$42,240	$46,240	$18,240	$18,000	$18,240
Engineering (10%)		$3,172	$4,555	$1,585	$624	$624	$5,800	$4,224	$4,624	$1,824	$1,800	$1,824
Constuction and Engineering Subtotal		$34,892	$50,105	$17,435	$6,864	$6,864	$63,800	$46,464	$50,864	$20,064	$19,800	$20,064
Contingency (15%)		$5,234	$7,516	$2,615	$1,030	$1,030	$9,570	$6,970	$7,630	$3,010	$2,970	$3,010
Total Construction Cost		$40,126	$57,621	$20,050	$7,894	$7,894	$73,370	$53,434	$58,494	$23,074	$22,770	$23,074
Final Plans and Specs		$2,000	$3,000	$1,000	$500	$500	$500	$1,000	$1,000	$1,000	$2,000	$1,000
Additional		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Permitting / Legal Fees / Access and Rights of Way		$500	$1,000	$1,000	$500	$500	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000
Total Project Cost		**$42,626**	**$61,621**	**$22,050**	**$8,894**	**$8,894**	**$74,870**	**$55,434**	**$60,494**	**$25,074**	**$25,770**	**$25,074**

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.

7.3 BLM Recommendations (Watershed Management Plan Component BLM)

Conceptual cost estimates are presented for watershed improvements proposed by the Rawlins Field Office, BLM. It is important to note that these estimates are based upon previous experience with similar projects; there was not sufficient detail provided by the BLM to provide itemized cost estimates. These costs are presented in Table 7.3-1.

7.4 Stream Channel Condition and Stability (Watershed Management Plan Component C)

Conceptual costs are presented for channel improvements recommended in Trout Unlimited's investigation of barriers to fish and fish migration (Table 7.4-1).

7.5 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.

Table 7.3-1 Conceptual Costs: BLM Recommended Projects (Watershed Management Plan Component BLM).

Project	Name	Project Type	BLM District	Cost
BLM-001	McKinney Creek Spring Development	Spring Development	Rawlins	$5,000
BLM-002	Poison Buttes Well Rehabilitation	Well Rehabilitation	Rawlins	$12,000
BLM-003	Deep Gulch	Reservoir Rehabilitation	Rawlins	$11,000
BLM-004	Exclosure (Beaver Dams)	Fence Exclosure	Rawlins	$2,600
BLM-005	Cottonwood Hill Sheet Piling	Stream Stabilization	Rawlins	$4,000
BLM-006	Cherokee Pipeline Project	Pipeline Project	Rawlins	$80,000
BLM-007	Sweezy Spring Rehabilitation	Spring Rehabilitation	Rawlins	$20,000
BLM-008	Loco Aspen Spring Rehabilitation	Spring Rehabilitation	Rawlins	$20,000
BLM-009	Loco Creek Fencing	Fence Exclosure	Rawlins	$10,000
BLM-010	Koala Bar	Reservoir Rehabilitation	Rawlins	$13,000
BLM-011	Hangout Solar	Solar Platform	Rawlins	$16,000
BLM-012	Red Flat Well Rehabilitation	Well Rehabilitation	Rawlins	$12,000
BLM-013	Niland Well Rehabilitation	Well Rehabilitation	Rawlins	$12,000
BLM-014	Little Draw Reservoir Rehabilitation	Reservoir Rehabilitation	Rawlins	$22,000
BLM-015	Coal Gulch #2 Reservoir Rehabilitation	Reservoir Rehabilitation	Rawlins	$28,000
BLM-016	South Echo Reservoir Rehabilitation	Reservoir Rehabilitation	Rawlins	$5,000
BLM-017	Private	Reservoir Rehabilitation	Rawlins	$25,000
BLM-018	Devils Canyon Reservoir Rehabilitation	Reservoir Rehabilitation	Rawlins	$7,000
BLM-019	Gamblers Reservoir Rehabilitation	Reservoir Rehabilitation	Rawlins	$8,000
BLM-020	Weber Reservoir #3 Rehabilitation	Reservoir Rehabilitation	Rawlins	$15,000
BLM-021	No Name	Reservoir Rehabilitation	Rawlins	$12,000
BLM-022	River Bottom Reservoir Rehabilitation	Reservoir Rehabilitation	Rawlins	$4,000
BLM-023	No Name	Reservoir Rehabilitation	Rawlins	$5,000
BLM-024	Greasewood Reservoir Rehabilitation	Reservoir Rehabilitation	Rawlins	$10,000
BLM-025	Cherokee Creek #2 Reservoir Rehabilitation	Reservoir Rehabilitation	Rawlins	$12,000
BLM-026	Clay Point Reservoir Rehabilitation	Reservoir Rehabilitation	Rawlins	$28,000
BLM-027	Fenceline Reservoir Rehabilitation	Reservoir Rehabilitation	Rawlins	$3,000
BLM-028	The Hill Allotment Well Rehabilitation	Well Rehabilitation	Rawlins	$10,000
BLM-029	Mulligan Draw Well Rehabilitation	Well Rehabilitation	Rawlins	$10,000
BLM-030	JO Solar Pump	Well Rehabilitation	Rawlins	$10,000
BLM-031	Sulphur/Grizzly Pipeline Rehabilitation	Pipeline Rehabilitation	Rawlins	$8,000
BLM-032	Cherokee Pit	Reservoir Rehabilitation	Rawlins	$5,000
BLM-033	Holler Draw Headcut	Stream Stabilization	Rawlins	$5,000
BLM-034	Bear Canyon Exclosures	Fence Exclosure	Rawlins	$5,000
BLM-035	Shallow Creek Reservoir Rehabilitation	Reservoir Rehabilitation	Rawlins	$8,000
BLM-036	Wheatgrass Pit	Reservoir Rehabilitation	Rawlins	$8,000
BLM-037	Andy's Project Reservoir Rehabilitation	Reservoir Rehabilitation	Rawlins	$5,500
BLM-038	Little Snake Well #2 Rehabilitation	Well Rehabilitation	Rawlins	$8,000
BLM-039	Sand Creek Well #1 Rehabilitation	Well Rehabilitation	Rawlins	$20,000
BLM-040	Powder Rim Spring #2 Rehabilitation	Spring Rehabilitation	Rawlins	$3,000
BLM-041	Powder Rim Spring #1 Rehabilitation	Spring Rehabilitation	Rawlins	$7,000
BLM-042	CD Fence Well Rehabilitation	Well Rehabilitation	Rawlins	$10,000
BLM-043	New Pit	Reservoir Construction	Rawlins	$5,000
BLM-044	New Pit	Reservoir Construction	Rawlins	$5,000
BLM-045	New Pit	Reservoir Construction	Rawlins	$5,000
BLM-046	Pasture B Pipeline Project	Pipeline Project	Rawlins	$20,000
BLM-047	Cherokee Trails Pipeline Project	Pipeline Project	Rawlins	$20,000
BLM-048	Morgan-Boyer Pit	Reservoir Rehabilitation	Rawlins	$10,000
BLM-049	North Barrel Spring Reservoir Rehabilitation	Reservoir Rehabilitation	Rawlins	$23,000
BLM-050	Detention Dam	Reservoir Rehabilitation	Rawlins	$23,000
BLM-051	Highway Reservoir	Reservoir Construction	Rock Springs	$18,000-$25000
BLM-052	Lower Horseshoe Reservoir	Reservoir Construction	Rock Springs	$18,000-$25000
BLM-053	South Horseshoe Reservoir	Reservoir Construction	Rock Springs	$18,000-$25000
BLM-054	Two Bar Trail Reservoir	Reservoir Construction	Rock Springs	$18,000-$25000
BLM-055	Shipping Corral #2 Reservoir	Reservoir Construction	Rock Springs	$18,000-$25000
BLM-056	Little Scrivener Butte Reservoir	Reservoir Construction	Rock Springs	$18,000-$25000
BLM-057	Quaking Springs Reservoir	Reservoir Construction	Rock Springs	$18,000-$25000
BLM-058	Goat Springs Reservoir	Reservoir Construction	Rock Springs	$18,000-$25000

Table 7.4-1 Conceptual Costs: Fish Barrier Components (Watershed Management Plan Component C).

Watershed Management Plan Component	Trout Unlimited Identifier	Feature Type	Priority	Conceptual Cost Estimate
C-01	415	Grade Control	High	$3,000
C-02	412	Grade Control	High	$3,000
C-03	411	Grade Control	High	$3,000
C-04	407	Grade Control	High	$3,000
C-05	406	Grade Control	High	$3,000
C-06	403	Grade Control	High	$3,000
C-07	401	Grade Control	High	$3,000
C-08	8	Road Crossing	High	$6,000
C-09	378	Grade Control	High	$6,000
C-10	377	Grade Control	High	$6,000
C-11	379	Grade Control	High	$6,000
C-12	380	Grade Control	High	$6,000
C-13	382	Grade Control	High	$6,000
C-14	383	Grade Control	High	$6,000
C-15	357	Grade Control	High	$6,000
C-16	385	Grade Control	High	$6,000
C-17	386	Grade Control	High	$6,000
C-18	346	Grade Control	High	$25,000
C-19	345	Grade Control	High	$25,000
C-20	36	Diversion	High	$25,000
C-21	58	Ready Ditch Diversion	High	$75,000 - $100,000
C-22	59	Baggs Ditch Diversion	Very High	$75,000 - $100,000
C-23	63	Westside Ditch Diversion	Very High	$75,000 - $100,000
C-24	66	First Mesa Ditch Diversion	Very High	$75,000 - $100,000

VIII. FUNDING OPPORTUNITIES

8.1 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:

- Little Snake River Conservation District 383-7860
- Sweetwater County Conservation District 362-3062
- NRCS Saratoga Office (307.626.5657)
- NRCS Rock Springs Office (307.362.3062)
- Bureau of Land Management/Rock Springs District Office (307.352.0256)
- Bureau of Land Management/Rawlins District Office (307.328.4200)

Key aspects and information about the primary funding programs identified are discussed in the following sections and summarized in a matrix format (Table 8.1-1).

8.2 Local Agencies

8.2.1 Conservation Districts

The Little Snake River Conservation District and the Sweetwater County Conservation District serve as the local liaisons between local landowners and resource users and state and federal government agencies. 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.

8.2.2 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;

Table 8.1-1 Potential Funding Sources.

Agency/Entity	Program Name	Project Type(s)	Internet Site	Telephone	Email
Local					
Little Snake River Conservation District	n/a	Liaison, in-kind administrative and technical assistance, program coordination/partnering	http://www.facebook.com/pages/Little-Snake-River-Conservation-District/210109639017777	307.383.7860	lsrcd@yahoo.com
Sweetwater County Conservation District	n/a		http://www.swccd.us/	307.362.3062	admin@swccd.us
Saratoga-Encampment-Rawlins Conservation District	n/a		http://www.sercd.org/	307.326.8156	jarrunner@gmail.com
Sweetwater County Weed and Pest	n/a		www.wyoweed.org	307.273.9683	jcotterman@bvea.net
Carbon County Weed and Pest	n/a		http://www.carboncountyweed.com/	307.324.6584	larrykj@vcn.com
State					
Wyoming Department of Environmental Quality	Nonpoint Source Implementation Grants (319 Program)	Water quality BMPs	http://deq.state.wy.us/wqd/watershed/index.asp	307.777.6080	jennifer.zygmunt@wyo.gov
Wyoming Game and Fish Department	Riparian Habitat Improvement Grant	Stock water development; streambank stabilization; etc.	http://wgfd.wyo.gov/web2011/home.aspx	Scott Talbott Director 307.777.4600	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://wgfd.wyo.gov/web2011/fishing-1000182.aspx		
	Wyoming Sage Grouse Conservation Fund	Sage-grouse habitat protection or improvement	http://wgfd.wyo.gov/web2011/WILDLIFE-1000817.aspx		
Wyoming Office of State Lands and Investments	Regular Farm Loans	Projects involving most agricultural purposes	http://lands.state.wy.us/	307.777.7331	ryan.lance@wyo.gov
	Small Water Development Project Loans	Conversion 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	jon.wade@wyo.gov
	Small Water Project Program	Small reservoirs and stock ponds, wells,			ron.vore@wyo.gov
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	307.777.8024	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	307.328.4200 (Rawlins FO) 307.352.0256 (Rock Springs FO)	Rawlins_WYMail@blm.gov Rock_springs_wymail@blm.gov
	Cooperative Agreement for Range Improvements	Reservoirs, pits, spring developments, wells, and associated distribution pipelines	http://www.blm.gov/wy/st/en/info/offices.html	307.328.4200 (Rawlins FO) 307.352.0256 (Rock Springs FO)	Rawlins_WYMail@blm.gov Rock_springs_wymail@blm.gov
Bureau of Reclamation	WaterSMART Grants Program	Water conservation, efficiency and marketing	http://www.usbr.gov/WaterSMART/grants.html	307.261.5671	jlawson@gp.usbr.gov
Environmental Protection Agency	Targeted Watershed Grants Program	Riparian, wetland, aquatic and upland habitat protection and improvement	http://water.epa.gov/grants_funding/shedfund/watershedfunding.cfm	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	307.261.5009	gregor.goertz@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://www.fws.gov/partners/?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	http://wsfrprograms.fws.gov/Subpages/GrantPrograms/LIP/LIP.htm		
Natural Resources Conservation Service	Environmental Quality Incentives Program	Conservation planning, range management, irrigation rehabilitation, livestock watering, etc.	http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/eqip/	307.233.6750 (State Office) 307.383.2550 (Baggs Office)	astrid.martinez@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/wps/portal/nrcs/main/national/programs/landscape/wfpo/		
	Wildlife Habitat Incentives Program(WHIP)	See websites and/or local contacts for detailed information on these programs	http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/programs/financial/whip/?cid=nrcs143_008423		
	Wetlands Reserve Program (WRP)		http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/easements/wetlands/		
	Grassland Reserve Program (GRP)		http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/easements/grassland/		
	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/wps/portal/nrcs/main/national/programs/financial/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	406.542.3304	wcolyer@tu.org

- Facilitating work days attended by a broad base of stakeholders (e.g., Russian olive tree cutting); and
- Assistance in preparation of grant applications.

The Carbon County and Sweetwater Count Weed and Pest Districts should be contacted to determine the specific assistance available from each.

8.3 State Programs

8.3.1 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.

8.3.2 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.

8.3.3 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 5.

- **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 5, 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.

8.3.4 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.

8.3.4.1 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 5:

- *"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.

8.3.4.2 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;
- wetland developments;
- solar platforms; and
- irrigation infrastructure.

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 5 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.

8.3.5 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.

8.4 Federal Agencies

8.4.1 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.

8.4.2 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.

8.4.3 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.

8.4.4 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 5. 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.

8.4.5 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 of 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.

8.4.6 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 5. These programs are briefly described below and summarized in Table 8.1-1.

- **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 5 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 8.1-1.

8.4.7 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.
- **Floodplain 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.

8.4.8 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.

8.5 Non-Profit and Other Organizations

8.5.1 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.

8.5.2 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/.

8.5.3 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.

IX. CONCLUSIONS AND RECOMMENDATIONS

A multidisciplinary inventory of the Little Snake River / Vermillion Creek 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.

9.1 Conclusions

Upon completion of the watershed inventory phase of the project, the project team developed the watershed management plan. The plan was developed based upon findings of the inventory phase, a series of public meetings, questionnaires, and interaction with the project steering committee. In previous chapters, the key issues and problems were identified and ultimately, project goals and objectives were formulated 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,*
- *Stream Channel Condition and Stability,*
- *Surface Water Storage Opportunities,*
- *BLM range improvement recommendations,*
- *Wetland Enhancement Opportunities,*
- *Grazing Management Opportunities, and*
- *Other Upland Management Opportunities.*

In summary, the following conclusions are provided.

9.1.1 Irrigation System Components

1. Previous and ongoing investigations have identified improvements to numerous individual irrigation system components. These recommendations were incorporated directly into this report. Ditch system owners and managers should review the pertinent portions of this report and the specific recommendations reviewed for future planning efforts.

2. In addition to incorporation of results from previous investigations, several irrigation system rehabilitation needs were identified during the course of this investigation. Responsible individuals and ditch company owners should review the pertinent portions of this report and the specific recommendations reviewed for future planning efforts.

3. Completion of the channel restoration projects in conjunction with an irrigation headgate would likely not require a 404 permit through the USACE due to the irrigation infrastructure exclusion. Coordination with the COE Omaha District's Wyoming Regulatory Office in Cheyenne would be necessary to verify permit requirements.

4. Funding assistance for irrigation system rehabilitation projects within the study area is available from a number of sources, especially the WWDC Small Water Project Program and various programs administered by the NRCS.

9.1.2 Livestock/Wildlife Upland Watering Opportunities

1. 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.

2. 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.

3. A total of 40 potential wildlife/livestock water supply projects were identified based upon evaluation of available water sources and input from the LSRCD, local land owners and allotment permittees. Conceptual plans and conceptual level cost estimates were prepared for each project.

4. Any such improvements and practices must be fully implemented and maintained by the responsible landowner / agency to gain the maximum overall benefits to the watershed.

9.1.3 Stream Channel Condition and Stability

1. Based on the geomorphic assessment, several impaired channel reaches were identified within the watershed. The categories of impairments identified include, but are not limited to channel degradation and incision, degradation of riparian vegetation and degradation of riparian condition in the form of stream bank erosion and channel degradation.

2. Site-specific solutions should be developed to mitigate the channel impairment and ultimately included in the watershed management rehabilitation plan.

3. Locally-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.

4. Barriers to fish passage identified in previous investigations were included in the watershed management plan. The itemized sites consist of 24 sites rated as High or Very High priority sites.

9.1.4 Storage Opportunities

1. The results of the flow availability investigation confirmed that water is available for storage and is available primarily during the spring runoff period, predominantly during May and June.

2. Based upon the review of results of previous investigations, eleven (11) potential reservoir storage sites were included in the watershed management plan. These sites represent the collation of sites recommended storage development in each of the several investigations reviewed. These sites could provide storage opportunities ranging in size from small stock reservoirs with storage capacity of less than 100 acre feet, to larger multiple use reservoirs with storage capacity in excess of several thousand acre feet.

3. The Wyoming Water Development Office is currently evaluating feasibility and design options associated with the West Fork Battle Creek at Haggarty Creek reservoir site. The site, along with others, is described and evaluated as discussed in the Little Snake River Supplemental Storage, Level II investigation completed on behalf of the WWDO by State West Water Resources Corporation.

4. Permitting efforts and NEPA compliance associated with completion of reservoir projects will likely be complicated, lengthy, and involve coordination with several regulatory agencies.

9.1.5 BLM Range Improvement Recommendations

1. Potential range improvement projects were made by each of the two BLM districts within the project study area. The Rawlins Field Office presented 50 projects and the Rock Springs Field Office presented eight.

2. These 58 projects include:
   - Stock reservoir construction,
   - Stock reservoir rehabilitation,
   - Well rehabilitation, including installation of solar platforms,
   - Fence enclosures,
   - Stream rehabilitations,
   - Spring developments, and
   - Pipeline projects.

9.1.6 Wetland Enhancement Opportunities

1. The LSRCD has identified several locations where wetlands enhancement opportunities exist. These locations represent a variety of sites where wetlands could either be established, or existing wetlands could be enhanced through modification of hydrologic conditions. Several of the sites consist of abandoned oxbows along the Little Snake River where diversion of water from the river would provide flushing flows to maintain the wetland integrity. Other sites would consist of establishment of wetlands in areas where there currently are none. These sites are located along the Muddy Creek corridor.

9.1.7 Grazing Management Opportunities

1. 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.

9.2 Recommendations

Based upon the information presented throughout this report and the conclusions presented above, the recommendations listed below are presented for consideration:

The conservation districts have a proven track record of successfully obtaining funding through a variety of sources and completing range/watershed improvement projects. Many of the projects included in the watershed management plan lend themselves to potential procurement of financial and technical assistance by virtue of their multiple-benefit character. For instance, improvement of several irrigation diversion facilities could not only benefit the irrigation water user, but could provide benefit to instream fisheries through improvement of habitat conditions and facilitate fish passage.

Many of the livestock/wildlife upland watering alternatives fall within the constraints for funding eligibility of the WWDC's Small Water Project Program (SWPP). These projects should be reviewed and selected alternatives 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 but does require an entity sponsor such as the local conservation district. Consequently, individuals can seek funding through this program. As discussed in Chapter 8, 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.

Creative strategies for funding/financing of projects should be more fully investigated following identification of projects worthy of additional evaluation and potential implementation. *By combining funding sources, the owner could conceivably obtain grants for most, if not all, of the project costs.*

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APPENDIX 3A

LITTLE SNAKE RIVER / VERMILLION CREEK WATERSHED: GRAZING ALLOTMENT DATA TABULATION

Allotment Tabulation Data Provided by:
Rock Springs Field Office, Bureau of Land Management

Allotment	State Acreage	BLM Acreage	Private Acreage	Active AUMs	Suspended AUMs	Permitted Use AUMs	Grazing/Pasture Plan
Rife	0	21783	22960	508	408	916	NO
Vermillion Creek	7618	139551	2024	12140	5298	17438	NO
Alkali Creek	2331	26855	40	2283	767	3050	NO
Pine Mountain	7255	60961	2508	7763	2665	10428	YES
Corson Springs	1280	13862	40	1189	495	1684	NO

Pine Mountain Grazing Rotation

Years 1 & 2

Pasture	On Date	Off Date
Vermillion	5/1	6/30
Vermillion SUP	5/15	6/30
Salt Wells	7/1	7/31
Pine Mountain	8/1	8/15
4-J Basin	8/1	9/1
Horseshoe	9/1	4/30

Years 3& 4

Pasture	On Date	Off Date
Vermillion	5/1	6/30
Salt Wells	7/1	7/31
Pine Mountain	8/1	8/15
4-J Basin	8/1	9/15
Horseshoe	9/15	4/30

Operator	Allot #	Allot Name	Livestock Number	Livestock Kind	Begin	End	AUMS
John Eversole Living Trust	20507	CORSON SPRINGS	215	CATTLE	5/16	10/15	995
John Eversole Living Trust	20507	CORSON SPRINGS	102	CATTLE	10/16	11/15	96
John Eversole Living Trust	20507	CORSON SPRINGS	215	CATTLE	11/16	11/30	98
John Eversole Living Trust	04002	RIFE	114	CATTLE	5/16	10/15	424
John Eversole Living Trust	04002	RIFE	56	CATTLE	10/16	11/15	42
John Eversole Living Trust	04002	RIFE	114	CATTLE	11/16	11/30	42
Southfork Sheep Co	04003	VERMILLION CREEK	3430	SHEEP	3/1	4/30	1101
Southfork Sheep Co	04003	VERMILLION CREEK	3430	SHEEP	11/1	2/28	2165
Raftopoulos Brothers	04004	ALKALI CREEK	1509	SHEEP	3/1	4/15	457
Raftopoulos Brothers	04004	ALKALI CREEK	1509	SHEEP	11/16	2/28	1042
Raftopoulos Brothers	04007	PINE MOUNTAIN	122	CATTLE	5/1	9/30	608
Raftopoulos Brothers	04007	PINE MOUNTAIN	124	CATTLE	5/11	10/10	617
Mud Springs Livestock Co	04003	VERMILLION CREEK	8	CATTLE	3/1	2/28	96
Mud Springs Livestock Co	04003	VERMILLION CREEK	86	CATTLE	4/16	6/15	172
Mud Springs Livestock Co	04003	VERMILLION CREEK	101	CATTLE	9/1	10/15	149
Mud Springs Livestock Co	04003	VERMILLION CREEK	101	CATTLE	11/1	11/30	100
Vermillion Ranch LP	04003	VERMILLION CREEK	1044	CATTLE	3/1	3/31	872
Vermillion Ranch LP	04003	VERMILLION CREEK	228	CATTLE	3/1	4/30	457
Vermillion Ranch LP	04003	VERMILLION CREEK	792	CATTLE	4/1	4/30	641
Vermillion Ranch LP	04003	VERMILLION CREEK	315	CATTLE	5/1	5/31	263
Vermillion Ranch LP	04003	VERMILLION CREEK	131	CATTLE	6/1	6/12	42
Vermillion Ranch LP	04003	VERMILLION CREEK	463	CATTLE	9/16	9/30	187
Vermillion Ranch LP	04003	VERMILLION CREEK	332	CATTLE	10/1	10/15	134
Vermillion Ranch LP	04003	VERMILLION CREEK	794	CATTLE	10/16	10/31	342
Vermillion Ranch LP	04003	VERMILLION CREEK	1758	CATTLE	11/1	11/30	1422
Vermillion Ranch LP	04003	VERMILLION CREEK	228	CATTLE	11/1	2/28	900
Vermillion Ranch LP	04003	VERMILLION CREEK	1045	CATTLE	12/1	2/28	2535
Vermillion Ranch LP	04004	ALKALI CREEK	30	CATTLE	3/1	3/31	24
Vermillion Ranch LP	04004	ALKALI CREEK	230	CATTLE	4/1	5/1	183
Vermillion Ranch LP	04004	ALKALI CREEK	460	CATTLE	5/2	6/10	472
Vermillion Ranch LP	04004	ALKALI CREEK	31	CATTLE	11/1	2/28	95
Vermillion Ranch LP	04007	PINE MOUNTAIN	229	CATTLE	3/1	4/30	367
Vermillion Ranch LP	04007	PINE MOUNTAIN	354	CATTLE	5/1	5/31	289
Vermillion Ranch LP	04007	PINE MOUNTAIN	649	CATTLE	6/1	6/12	205
Vermillion Ranch LP	04007	PINE MOUNTAIN	1324	CATTLE	6/13	9/30	3831
Vermillion Ranch LP	04007	PINE MOUNTAIN	249	CATTLE	10/1	10/10	65
Vermillion Ranch LP	04007	PINE MOUNTAIN	221	CATTLE	10/11	10/13	17
Vermillion Ranch LP	04007	PINE MOUNTAIN	663	CATTLE	10/14	12/15	1099
Vermillion Ranch LP	04007	PINE MOUNTAIN	229	CATTLE	12/16	2/28	452

Little Snake River / Vermillion Creek Watershed: Pertinent Grazing Allotment Information

Allotment Tabulation Data Provided by:
Rawlins Field Office, Bureau of Land Management

Allotment Number	Field Office	Allotment Name	AUMs			Class	Date		Grazing Management Syatem
			Public	Private	State		On	Off	
403	BLM-Rawlins	Baggs Sub Unit	315	632		Cattle	1-Apr	15-Jun	Rotation
405	BLM-Rawlins	Beaver Dams	682	71	211	Cattle/ Sheep	1-Jun	30-Sep	Deferred Rotation
408	BLM-Rawlins	Cherokee	9,685	310	593	Cattle/ Sheep	15-Apr	15-Dec	Rotation
412	BLM-Rawlins	Deep Gulch	3,336	666	558	Cattle/ Sheep	15-May	27-Nov	Deferred Rotation
413	BLM-Rawlins	Dirty Man	20	50		Cattle	25-Jun	4-Oct	Deferred Rotation
415	BLM-Rawlins	Doty Mountain	7,503	2,396	703	Cattle	1-Apr	1-Dec	Deferred Rotation
417	BLM-Rawlins	Grizzly	6,112	162	441	Cattle/ Sheep	1-Mar	30-Oct	Rotation
418	BLM-Rawlins	Hartt Creek	940	981	192	Cattle	1-Jun	30-Sep	Deferred Rotation
420	BLM-Rawlins	Little Jack Creek	307	200	191	Cattle/ Sheep	1-Jun	7-Sep	Rotation
421	BLM-Rawlins	Mccarty Canyon	465	237	1,045	Cattle	15-May	25-Sep	Deferred Rotation
425	BLM-Rawlins	Morgan Creek	1,331	1,033	359	Cattle	30-May	1-Oct	Deferred Rotation
426	BLM-Rawlins	Morgan Ranch	263	212	42	Cattle/ Sheep	30-May	8-Nov	Deferred Rotation
430	BLM-Rawlins	Sage Creek	4,552	2,953	3,198	Cattle	10-May	25-Sep	Deferred Rotation
431	BLM-Rawlins	Savery Creek	436	1,816	457	Cattle	10-May	15-Oct	Deferred Rotation
433	BLM-Rawlins	Sulphur Springs	2,096	1,511	88	Cattle	1-May	4-Oct	Deferred Rotation
434	BLM-Rawlins	Twin Groves	20	1,098	180	Cattle	1-Mar	28-Feb	Yearlong Permit
435	BLM-Rawlins	Wild Cow	1,760	132	138	Cattle	16-Jun	30-Nov	Deferred Rotation
442	BLM-Rawlins	Dad	63			Cattle	1-Jun	15-Jun	Rotation
443	BLM-Rawlins	East Muddy	610	129		Sheep	1-Mar	10-Apr	Rotation
443	BLM-Rawlins	East Muddy	610	129		Sheep	1-Mar	10-Apr	Rotation
444	BLM-Rawlins	Truck Drivers Cre	30			Cattle	15-May	14-Oct	Permit Long
448	BLM-Rawlins	J O Pastures	399	1,028		Cattle/ Sheep	1-Sep	31-Dec	Deferred Rotation
456	BLM-Rawlins	Deep Creek Pastur	365	602	28	Cattle/ Sheep	1-May	31-Oct	Deferred Rotation
457	BLM-Rawlins	West Wild Cow	437		37	Cattle	16-Jun	30-Nov	Deferred Rotation
504	BLM-Rawlins	Hamilton Dome	799	33	41	Cattle	16-Jun	30-Nov	Deferred Rotation
505	BLM-Rawlins	Cherokee Trail	1,338			Cattle/ Sheep	1-Mar	31-Dec	Deferred Rotation
514	BLM-Rawlins	Little Robber	250			Cattle	1-May	30-Sep	Split Season
1101	BLM-Rawlins	Airheart Pasture	45	201	68	Cattle	16-Mar	15-Jul	Rotation
1102	BLM-Rawlins	Big Gulch	30	576		Cattle/ Sheep	3-Jun	1-Oct	Deferred Rotation
1104	BLM-Rawlins	Cedar Ridge	164	10		Cattle	16-Apr	31-Oct	Permit Long
1106	BLM-Rawlins	Cushing	51	180		Cattle	16-Jun	15-Sep	Permit Long
1107	BLM-Rawlins	Dolan	60		145	Cattle	1-May	30-Nov	Rotation
1108	BLM-Rawlins	Etherington	16			Cattle	10-Jun	30-Oct	Permit Long
1109	BLM-Rawlins	Fly Creek	100			Cattle	1-May	30-Jun	Deferred Rotation
1110	BLM-Rawlins	Hell Canyon	193	253		Cattle	1-Jun	30-Sep	Deferred Rotation
1111	BLM-Rawlins	Hill Pasture	31	147		Cattle	1-May	31-Oct	Rotation
1112	BLM-Rawlins	Little Horse Mtn	220	9		Cattle	1-May	24-Jun	Rotation
1113	BLM-Rawlins	Little Sandstone	162	71	96	Cattle/ Sheep	1-Jun	12-Oct	Rotation
1115	BLM-Rawlins	Mccary	71			Cattle	15-Jun	31-Oct	Permit Long
1117	BLM-Rawlins	Mexican Meadows	15	0	630	Cattle	1-May	15-Oct	Deferred Rotation
1118	BLM-Rawlins	Morgan-Boyer Subu	1,866	625	227	Cattle/ Sheep	15-May	30-Oct	Rotation
1119	BLM-Rawlins	North Rasmussen	248			Cattle	1-Jun	30-Oct	Deferred Rotation
1123	BLM-Rawlins	Rasmussen Sub Uni	931	2,687	589	Cattle	15-Jun	30-Nov	Deferred Rotation
1124	BLM-Rawlins	Reader	30			Cattle	1-May	31-May	Permit Long
1125	BLM-Rawlins	Reader Basin Past	466	1,480	574	Cattle	1-May	15-Oct	Rotation
1126	BLM-Rawlins	Road Gulch	213			Cattle/ Sheep	1-Mar	28-Feb	Permit Long
1127	BLM-Rawlins	Sheep Mountain	53			Cattle	16-May	15-Sep	Permit Long
1128	BLM-Rawlins	Short	240			Cattle	1-May	30-Jun	Rotation
1129	BLM-Rawlins	South Baggs	30			Cattle/ Sheep	1-May	31-Oct	Permit Long
1130	BLM-Rawlins	South Pasture	89	813		Cattle	1-Apr	30-Sep	Rotation
1132	BLM-Rawlins	Spring Gulch	110			Cattle	1-May	29-Sep	Deferred Rotation
1133	BLM-Rawlins	Standard	92			Cattle	15-Jun	30-Sep	Permit Long
1134	BLM-Rawlins	State Line 40	4			Cattle	1-May	31-May	Permit Long
1135	BLM-Rawlins	Cedars	12			Cattle	1-May	31-Oct	Rotation
1136	BLM-Rawlins	Battle Mtn Iso Tr	13			Cattle	1-May	18-Jun	Rotation
1138	BLM-Rawlins	M.J. Anderson Iso	9	114		Cattle	1-Jun	15-Oct	Deferred Rotation
1139	BLM-Rawlins	Cobb Cat Co Iso T	34			Cattle	16-May	18-Sep	Deferred Rotation
1140	BLM-Rawlins	Grieve Reservoir	31			Cattle	10-Oct	15-Nov	Rotation

Little Snake River / Vermillion Creek Watershed: Pertinent Grazing Allotment Information

Allotment Tabulation Data Provided by:
Rawlins Field Office, Bureau of Land Management

Allotment Number	Field Office	Allotment Name	AUMs			Class	Date		Grazing Management
			Public	Private	State		On	Off	Syatem
1142	BLM-Rawlins	East Browns Hill	106	372	131	Cattle	1-Jun	31-Oct	Deferred Rotation
1143	BLM-Rawlins	L U Grieve Pastur	49			Cattle	1-Mar	30-Apr	Rotation
1144	BLM-Rawlins	Coal Bank Draw	64	175		Cattle	1-May	2-Jul	Rotation
10400	BLM-Rawlins	North Savery Cree	31	175	486	Cattle	10-May	25-Sep	Rotation
10501	BLM-Rawlins	Adam"S Ranch	6	767		Cattle	1-Mar	28-Feb	Rotation
10502	BLM-Rawlins	Adobe Town	1,820		12	Cattle/ Sheep	1-Oct	28-Feb	Dormant Season
10503	BLM-Rawlins	Big Robber	1,623	3	67	Cattle	15-Apr	31-Oct	Permit Long
10506	BLM-Rawlins	Continental	2,812	3	2	Cattle	1-May	31-Oct	Rotation
10508	BLM-Rawlins	Cottonwood Hill	997			Cattle	1-Apr	31-Oct	Deferred Rotation
10509	BLM-Rawlins	Cow Creek	2,629	108	136	Cattle/ Sheep	1-Mar	31-Oct	Rotation
10510	BLM-Rawlins	Crooked Wash	754			Cattle	1-Jun	31-Oct	Rotation
10511	BLM-Rawlins	Espitalier	2,755	44	27	Cattle	1-Jun	31-Oct	Rotation
10512	BLM-Rawlins	Grindstone Spring	413		4	Sheep	1-Nov	28-Feb	Dormant Season
10513	BLM-Rawlins	Little Powder Mtn	2,042	20	55	Cattle/ Sheep	1-Mar	15-Dec	Rotation
10515	BLM-Rawlins	Mexican Flats	1,695		43	Cattle/ Sheep	15-Mar	30-Nov	Rotation
10517	BLM-Rawlins	Oppenheimer	1,084	141		Cattle	1-May	30-Sep	Deferred Rotation
10518	BLM-Rawlins	Poison Buttes	465	22	17	Cattle	1-Apr	31-Oct	Deferred Rotation
10519	BLM-Rawlins	Powder Mountain	1,305	75	46	Cattle/ Sheep	1-Apr	31-Oct	Permit Long
10520	BLM-Rawlins	Powder Rim Rotati	6,542	102		Cattle/ Sheep	1-Mar	30-Nov	Deferred Rotation
10521	BLM-Rawlins	Red Creek	3,003	33		Cattle/ Sheep	1-Mar	28-Feb	Yearlong Permit
10522	BLM-Rawlins	River Bottom	163			Cattle	1-Apr	15-Nov	Deferred Rotation
10523	BLM-Rawlins	Rotten Springs	1,439		5	Cattle/ Sheep	1-Dec	31-Aug	Rotation
10524	BLM-Rawlins	Sand Creek	2,839			Cattle/ Sheep	15-Nov	10-Apr	Dormant Season
10525	BLM-Rawlins	South Barrel	951	18	68	Cattle/ Sheep	25-Mar	5-Jun	Rotation
10526	BLM-Rawlins	South Flat Top	1,659	68	44	Cattle	15-Apr	15-Nov	Rotation
10527	BLM-Rawlins	V Spreaders	150			Cattle	1-Sep	24-Nov	Rotation
10528	BLM-Rawlins	Willow Creek	5,362	4	102	Cattle	1-Nov	28-Feb	Dormant Season
10529	BLM-Rawlins	Headquarters Ranc	25	454	533	Cattle/ Sheep	1-Mar	28-Feb	Rotation
10530	BLM-Rawlins	South Muddy	103	15		Cattle	1-Apr	31-Oct	Rotation
10531	BLM-Rawlins	George Dew	80	135		Cattle	1-Nov	28-Feb	Permit Long
10532	BLM-Rawlins	44 Ranch	59	129	8	Cattle	1-May	31-Oct	Rotation
10601	BLM-Rawlins	Badwater	1,247	1,274	141	Sheep	15-Apr	30-Nov	Dormant Season
10604	BLM-Rawlins	Coal Bank Wash	514	539		Cattle	1-Jun	31-Oct	Deferred Rotation
10607	BLM-Rawlins	Echo Springs	2,413	2,504	176	Cattle	1-Apr	31-Oct	Deferred Rotation
10609	BLM-Rawlins	Fillmore	2,839	3,539	44	Cattle	15-May	20-Sep	Deferred Rotation
10610	BLM-Rawlins	South Laclede	3,531	2,327	3	Sheep/ Cattle	1-Mar	28-Feb	Rotation
10611	BLM-Rawlins	North Barrel	2,930	3,945		Cattle	1-Nov	30-Apr	Dormant Season
10612	BLM-Rawlins	North Pine Butte	116	108		Cattle	1-Apr	31-Oct	Rotation
10613	BLM-Rawlins	North Laclede	2,000	2,168		Sheep	1-Mar	10-Apr	Rotation
10619	BLM-Rawlins	South Red Desert	756	924		Cattle	1-Mar	28-Feb	Rotation
10620	BLM-Rawlins	South Wamsutter	1,115	1,494	39	Cattle	15-Apr	30-Nov	Deferred Rotation
10621	BLM-Rawlins	Tipton	4,752	4,788		Cattle	1-Mar	28-Feb	Deferred Rotation
10623	BLM-Rawlins	Pine Grove/Bolten	12,800	4,839	367	Cattle	1-Jun	31-Oct	Deferred Rotation
10625	BLM-Rawlins	South Pine Butte	34	183		Cattle	7-Mar	28-Feb	Rotation

Allotment Tabulation Data Provided by:
Medicine Bow National Forest, USFS

Allotment Number	Field Office	Allotment Name	AUMs			Class	Date		Grazing Management Syatem
			Public	Private	State		On	Off	
2400	USFS	Battle Creek	2495			Cattle	1-Jul	7-Oct	Deferred
2401	USFS	Battle Mtn	112			Cattle	15-Jun	21-Jul	Deferred
2404	USFS	Big Sandstone	1068			Cattle	1-Jul	15-Oct	Deferred
2405	USFS	Blake	902			Sheep	2-Jul	29-Sep	Deferred
2408	USFS	Canyon Trail	2253			Cattle	1-Jul	20-Sep	Deferred
2409	USFS	Copperton	902			Sheep	1-Jul	28-Sep	Deferred
2406	USFS	Cottonwood	2359			Cattle	26-May	21-Jun	Deferred
3334	USFS	Fireline	808			Sheep	2-Jul	14-Sep	Deferred
2413	USFS	Forks	902			Sheep	3-Jul	30-Sep	Deferred
2422	USFS	Hartt Creek	827			Cattle	1-Jun	1-Oct	Deferred Rotation
2415	USFS	Jack Creek	1600			Cattle	10-Jul	10-Oct	Deferred
2416	USFS	Little Sandstone	1022			Cattle	1-Jul	15-Oct	Deferred
2425	USFS	Lovers Cabin	1081			Sheep	30-Jun	15-Sep	Deferred
2431	USFS	Lower Horse Pasture	53						
2432	USFS	McKee Su Past.	10						
2419	USFS	North Fork	392			Sheep	1-Jul	20-Aug	Deferred
2420	USFS	Roaring Fork	846			Sheep	25-Jun	15-Sep	Deferred
2430	USFS	Sandstone Work Cen.	21						
2427	USFS	Three Forks	569			Cattle	1-Jul	15-Sep	Rest Rotation
2426	USFS	Victoria	382			Sheep	21-Aug	30-Sep	Deferred
2428	USFS	West Sheep Mountain	2070			Both	15-Jun	15-Oct	Deferred

APPENDIX 3B

LITTLE SNAKE RIVER /
VERMILLION CREEK WATERSHED:
STOCK RESERVOIR DATA TABULATION

Little Snake River / Vermillion Creek Watershed: Stock Reservoir Database

GIS IDENT	BLM Database Info		Allotment	Source	ACE Review Notes			Township	Range	Section	Subwatershed (HUC-12)	Lat	Long	Surface Owner
	BLM Comment	BLM Inspection			Comment	Water Condition	Water Source							
1	Needs Legalized		Powder Mountain	BLM-RFO		Dry	Yes	012N	096W	20	Powder Wash-Horse Draw	41.00108	-108.23480	BLM
2	Little Powder West R		Little Powder Mtn	BLM-RFO		Dry	Yes	012N	098W	22	Shell Creek-Crooked Wash	41.00120	-108.42905	BLM
3	Border Reservoir		Powder Mountain	BLM-RFO		Wet	Yes	012N	097W	21	Powder Wash-Eagle Rock Draw	41.00144	-108.32056	BLM
4	Lost Reservoir		Powder Mountain	BLM-RFO		Dry	Yes	012N	096W	20	Powder Wash-Horse Draw	41.00160	-108.23974	BLM
5	Needs Legalized	2009	Cedar Ridge	BLM-RFO	Sediment	Dry	No	012N	090W	22	Willow Creek-Spring Creek	41.00264	-107.51050	BLM
6	State Line Reservoir		Cherokee Trail	BLM-RFO		Wet	Yes	012N	096W	23	Powder Wash-Horse Draw	41.00316	-108.16746	BLM
7	Hunter Reservoir		Powder Rim Rotation	BLM-RFO	Breached	Dry	No	012N	095W	22	Powder Wash-East Fork Anthill Draw	41.00354	-108.08963	BLM
8	Wild Horse Reservoir		Little Powder Mtn	BLM-RFO		Dry	Yes	012N	098W	13	Powder Wash-Eagle Rock Draw	41.00460	-108.39237	BLM
9	Sage Reservoir 23		Cherokee Trail	BLM-RFO		Dry	Yes	012N	095W	17	Powder Wash-East Fork Anthill Draw	41.00619	-108.12100	BLM
10	Artesian Reservoir		Oppenheimer	BLM-RFO	Looks Silty	Wet	Yes	012N	092W	14	Little Snake River-Thornburgh Gulch	41.00681	-107.72421	BLM
11	Cherokee Trail Res 4		Cherokee Trail	BLM-RFO		Wet	Yes	012N	095W	17	Powder Wash-East Fork Anthill Draw	41.00944	-108.11852	BLM
12	Cedar Ridge Res	2009	Cedar Ridge	BLM-RFO	Barely Wet	Wet	Yes	012N	090W	14	Little Snake River-Dutch Joe Creek	41.01031	-107.49487	BLM
13	Washout Reservoir		Little Powder Mtn	BLM-RFO		Dry	Yes	012N	097W	17	Powder Wash-Eagle Rock Draw	41.01076	-108.34149	BLM
14	Oppenhiemer Res #1		Oppenheimer	BLM-RFO		Wet	Yes	012N	092W	17	Little Snake River-Thornburgh Gulch	41.01111	-107.78045	BLM
15	Powder Rim Res 1		Powder Rim Rotation	BLM-RFO		Wet	Yes	012N	095W	14	Little Snake River-West Fork Cherokee Creek	41.01489	-108.06618	BLM
16	Ant Hill Reservoir		Powder Rim Rotation	BLM-RFO		Dry	Yes	012N	094W	16	Little Snake River-West Fork Cherokee Creek	41.01539	-107.97790	BLM
17	Spicer Res 338A		Powder Rim Rotation	BLM-RFO		Wet	Yes	012N	095W	14	Little Snake River-West Fork Cherokee Creek	41.01538	-108.06626	BLM
18			Powder Mountain	BLM-RFO	No Visible Reservoir	N/A	No	012N	096W	15	Powder Wash-Horse Draw	41.01696	-108.20185	BLM
19	South Battle Mtn Res		Spring Gulch	BLM-RFO		Wet	Yes	012N	088W	14	Little Snake River-Fly Creek	41.01703	-107.26615	BLM
20	Road Gulch Res #1		Road Gulch	BLM-RFO	Sediment	Dry	No	012N	087W	7	Lower Battle Creek	41.01929	-107.22701	BLM
21	Sand Reservoir		Powder Mountain	BLM-RFO		Dry	Yes	012N	096W	9	Powder Wash-Horse Draw	41.01961	-108.21282	BLM
22	Arrowhead Reservoir		Cherokee Trail	BLM-RFO		Wet	Yes	012N	096W	11	Powder Wash-Horse Draw	41.02084	-108.17237	BLM
23	Paintbrush Res		Oppenheimer	BLM-RFO		Dry	Yes	012N	092W	8	Little Snake River-Thornburgh Gulch	41.02197	-107.77291	BLM
24			Powder Mountain	BLM-RFO	No Visible Reservoir	N/A	No	012N	097W	9	Powder Wash-Eagle Rock Draw	41.02192	-108.32303	BLM
25	Dry Reservoir		Powder Rim Rotation	BLM-RFO		Wet	Yes	012N	094W	11	Little Snake River-West Fork Cherokee Creek	41.02206	-107.94686	BLM
26	Twin Reservoir		Powder Rim Rotation	BLM-RFO	Breached	Dry	No	012N	095W	9	Powder Wash-East Fork Anthill Draw	41.02278	-108.10632	BLM
27	Needs Legalized		Cherokee Trail	BLM-RFO		Wet	Yes	012N	096W	11	Powder Wash-East Fork Anthill Draw	41.02425	-108.16689	BLM
28	Chet Morgan Res.	2009	Little Horse Mtn	BLM-RFO	No Reservoir Visible	N/A	No	012N	089W	12	Little Snake River-Fly Creek	41.02454	-107.35194	BLM
29	Mccargar Reservoir	2009	Little Horse Mtn	BLM-RFO	No Reservoir Visible	N/A	No	012N	089W	12	Little Snake River-Fly Creek	41.02458	-107.35207	BLM
30	Road Gulch Res #2		Road Gulch	BLM-RFO		Wet	Yes	012N	087W	8	Little Snake River-Roaring Fork	41.02459	-107.20999	BLM
31	Needs Legalized		Oppenheimer	BLM-RFO		Dry	Yes	012N	093W	12	Little Snake River-Thornburgh Gulch	41.02466	-107.81038	BLM
32	Section Line Reservo		Little Powder Mtn	BLM-RFO		Wet	Yes	012N	098W	10	Shell Creek-Long Ridge Reservoir	41.02530	-108.41565	BLM
33			Powder Mountain	BLM-RFO	No Visible Reservoir	N/A	No	012N	097W	12	Powder Wash-Eagle Rock Draw	41.02527	-108.27833	BLM
34			Powder Mountain	BLM-RFO	No Visible Reservoir	N/A	No	012N	096W	7	Powder Wash-Reservoir Draw	41.02582	-108.24868	BLM
35	Short Wash Reservoir		Powder Rim Rotation	BLM-RFO		Dry	Yes	012N	095W	10	Little Snake River-West Fork Cherokee Creek	41.02578	-108.07848	BLM
36	Bird Nest Reservoir		Powder Rim Rotation	BLM-RFO		Wet	Yes	012N	094W	10	Little Snake River-West Fork Cherokee Creek	41.02629	-107.97097	BLM
37			Little Powder Mtn	BLM-RFO		Dry	Yes	012N	097W	7	Powder Wash-Eagle Rock Draw	41.02755	-108.36622	BLM
38	Cherokee Trail Res 3		Cherokee Trail	BLM-RFO		Wet	Yes	012N	095W	8	Powder Wash-East Fork Anthill Draw	41.02802	-108.11380	BLM
39	4 Saddles Pit	2009	Short	BLM-RFO		Wet	Yes	012N	089W	10	Little Snake River-Dutch Joe Creek	41.02841	-107.38598	BLM
40	River Bottom Res		Oppenheimer	BLM-RFO		Dry	Yes	012N	093W	12	Little Snake River-Thornburgh Gulch	41.02880	-107.80625	BLM
41			Powder Mountain	BLM-RFO	No Visible Reservoir	N/A	No	012N	096W	7	Powder Wash-Eagle Rock Draw	41.02933	-108.24703	BLM
42	Skull Res		Poison Buttes	BLM-RFO		Dry	Yes	012N	092W	11	Little Snake River-Thornburgh Gulch	41.02930	-107.72092	BLM
43	Grieve Reservoir	2009	Little Horse Mtn	BLM-RFO		Wet	Yes	012N	089W	12	Little Snake River-Fly Creek	41.02969	-107.34873	BLM
44	Needs Legalized		Powder Rim Rotation	BLM-RFO	Sediment	Dry	No	012N	094W	9	Little Snake River-West Fork Cherokee Creek	41.03015	-107.97805	BLM
45	Merlins Hideout Rese		Powder Mountain	BLM-RFO		Dry	Yes	012N	096W	7	Powder Wash-Eagle Rock Draw	41.02990	-108.25849	BLM
46	Salt Lick Reservoir		Powder Mountain	BLM-RFO		Wet	Yes	012N	096W	9	Powder Wash-Horse Draw	41.03043	-108.21265	BLM
47	Dropoff Res	2009	Short	BLM-RFO		Wet	Yes	012N	089W	10	Little Snake River-Dutch Joe Creek	41.03088	-107.39721	BLM
48	Juniper Reservoir 28		Cherokee Trail	BLM-RFO		Dry	Yes	012N	095W	7	Powder Wash-East Fork Anthill Draw	41.03095	-108.14666	BLM
49	Powder Wash Reservoi		Powder Mountain	BLM-RFO		Dry	Yes	012N	097W	11	Powder Wash-Eagle Rock Draw	41.03189	-108.28433	BLM
50	Hawk Nest Reservoir		Powder Mountain	BLM-RFO		Dry	Yes	012N	097W	10	Powder Wash-Eagle Rock Draw	41.03315	-108.31673	BLM
51	Needs Legalized	2009		BLM-RFO	No Visible Reservoir	N/A	No	012N	089W	1	Little Snake River-Fly Creek	41.03332	-107.34643	BLM
52	Needs Legalized		Cherokee Trail	BLM-RFO	Sediment	Dry	No	012N	096W	4	Powder Wash-Horse Draw	41.03345	-108.21378	BLM
53			Powder Mountain	BLM-RFO	No Visible Reservoir	N/A	No	012N	097W	1	Powder Wash-Eagle Rock Draw	41.03381	-108.27019	BLM
54			Powder Mountain	BLM-RFO			Yes	012N	097W	1	Powder Wash-Eagle Rock Draw	41.03558	-108.27550	BLM
55			Short	BLM-RFO		Wet	Yes	012N	089W	3	Little Snake River-Dutch Joe Creek	41.03419	-107.38563	BLM
56	Gooldy Reservoir #68	2009	Reader Basin Pasture	BLM-RFO	Sediment	Dry	No	012N	089W	1	Little Snake River-Fly Creek	41.03463	-107.35627	BLM
57	Brush Reservoir		Powder Rim Rotation	BLM-RFO		Dry	Yes	012N	094W	6	Little Snake River-West Fork Cherokee Creek	41.03625	-108.03248	BLM
58	Glow Pit		Oppenheimer	BLM-RFO	Sediment	Dry	No	012N	092W	5	Little Snake River-Thornburgh Gulch	41.03654	-107.77007	BLM
59	Two Draw Reservoir 2		Cherokee Trail	BLM-RFO		Dry	Yes	012N	096W	3	Powder Wash-Horse Draw	41.03713	-108.19458	BLM
60	White Reservoir 17		Cherokee Trail	BLM-RFO		Wet	Yes	012N	095W	5	Powder Wash-East Fork Anthill Draw	41.03788	-108.12675	BLM
61			Cherokee Trail	BLM-RFO	No Visible Reservoir	N/A	No	012N	096W	1	Powder Wash-East Fork Anthill Draw	41.03865	-108.15313	BLM
62	Uranium Reservoir		Poison Buttes	BLM-RFO		Wet	Yes	012N	092W	3	Little Snake River-Thornburgh Gulch	41.03969	-107.73322	BLM
63	Powder Reservoir		Cherokee Trail	BLM-RFO	Sediment	Dry	No	012N	096W	5	Powder Wash-Horse Draw	41.03978	-108.22528	BLM
64	Ridge Rock Reservoir		Powder Rim Rotation	BLM-RFO		Dry	Yes	012N	094W	5	Little Snake River-West Fork Cherokee Creek	41.04162	-108.00745	BLM
65	Sandy Draw Reservoir		Little Powder Mtn	BLM-RFO	Sediment	Dry	No	012N	097W	5	Shell Creek-Long Ridge Reservoir	41.04309	-108.35566	BLM

Little Snake River / Vermillion Creek Watershed: Stock Reservoir Database

GIS IDENT	BLM Database Info		Allotment	Source	ACE Review Notes			Township	Range	Section	Subwatershed (HUC-12)	Lat	Long	Surface Owner
	BLM Comment	BLM Inspection			Comment	Water Condition	Water Source							
66	Roys Reservoir		Oppenheimer	BLM-RFO		Wet	Yes	012N	093W	1	Red Creek	41.04330	-107.80319	BLM
67	Cherokee Trail Res 1		Cherokee Trail	BLM-RFO	Sediment	Dry	No	012N	095W	6	Powder Wash-East Fork Anthill Draw	41.04361	-108.13957	BLM
68	Nw Powder Reservoir		Powder Mountain	BLM-RFO		Dry	Yes	012N	096W	6	Powder Wash-Eagle Rock Draw	41.04402	-108.24313	BLM
69			Little Powder Mtn	BLM-RFO	n Location 2000Ft East	Wet	Yes	012N	097W	6	Shell Creek-Long Ridge Reservoir	41.04524	-108.37312	Salisbury Livestock Co.
70	Clay Flat Reservoir		Powder Rim Rotation	BLM-RFO		Wet	Yes	012N	094W	3	Hartt Cabin Draw	41.04615	-107.96618	BLM
71	Knob Reservoir 27		Cherokee Trail	BLM-RFO		Dry	Yes	012N	096W	3	Powder Wash-Horse Draw	41.04706	-108.18835	BLM
72	Poison Basin Reservo		Poison Buttes	BLM-RFO	Large Embankment	Wet	Yes	013N	092W	33	Little Snake River-Thornburgh Gulch	41.04692	-107.74874	BLM
73	Airheart Res 163	2009	Airheart Pasture	BLM-RFO	Breached	Dry	No	013N	091W	35	Little Snake River-Cottonwood Creek	41.04734	-107.60753	BLM
74	Cherokee Trail Res 2		Cherokee Trail	BLM-RFO		Dry	Yes	012N	095W	5	Powder Wash-East Fork Anthill Draw	41.04738	-108.11886	BLM
75	Dead End Road Reserv		Little Powder Mtn	BLM-RFO		Wet	Yes	012N	098W	1	Shell Creek-Long Ridge Reservoir	41.04810	-108.39043	BLM
76	Stag Reservoir		Cherokee Trail	BLM-RFO		Dry	Yes	013N	096W	36	Powder Wash-East Fork Anthill Draw	41.04789	-108.15670	BLM
77	Agropyron Reservoir		Cow Creek	BLM-RFO		Dry	Yes	013N	097W	34	Upper Skull Creek-Sand Creek	41.05206	-108.31823	BLM
78	Needs Legalized		Adobe Town	BLM-RFO		Wet	Yes	013N	096W	34	Lower Skull Creek	41.05274	-108.20416	BLM
79	Adobe Reservoir		Powder Mountain	BLM-RFO		Wet	Yes	013N	097W	35	Powder Wash-Eagle Rock Draw	41.05324	-108.28690	BLM
80	Devils Canyon Res		Poison Buttes	BLM-RFO		Wet	Yes	013N	092W	35	Little Snake River-Thornburgh Gulch	41.05521	-107.71934	BLM
81	Cherokee Reservoir		Powder Rim Rotation	BLM-RFO		Dry	Yes	013N	094W	31	Little Snake River-West Fork Cherokee Creek	41.05525	-108.02497	BLM
82	Gamblers Res		Oppenheimer	BLM-RFO	Sediment	Dry	No	013N	092W	32	Little Snake River-Thornburgh Gulch	41.05627	-107.78127	BLM
83	Sand Creek Spring Re		Powder Rim Rotation	BLM-RFO		Wet	Yes	013N	093W	31	Hartt Cabin Draw	41.05656	-107.90985	BLM
84			Cow Creek	BLM-RFO		Wet	Yes	013N	097W	32	Upper Skull Creek-Sand Creek	41.05685	-108.34726	BLM
85	Flat Draw Reservoir		Powder Rim Rotation	BLM-RFO		Dry	Yes	013N	094W	32	Little Snake River-West Fork Cherokee Creek	41.05811	-108.00567	BLM
86	North Reservoir		Adobe Town	BLM-RFO		Dry	Yes	013N	096W	33	Lower Skull Creek	41.05947	-108.22066	BLM
87	Long Draw Reservoir		Cherokee Trail	BLM-RFO		Dry	Yes	013N	095W	31	Grindstone Wash	41.06144	-108.13468	BLM
88	Cow Cr Hg Road Res		Cow Creek	BLM-RFO		Wet	Yes	013N	097W	32	Upper Skull Creek-Sand Creek	41.06133	-108.35150	BLM
89	Virgin Reservoir		Espitalier	BLM-RFO		Wet	Yes	013N	098W	31	Shell Creek-Long Ridge Reservoir	41.06167	-108.47260	BLM
90		2010		BLM-RFO	n Holding Small Amoun	Wet	Yes	013N	090W	30	Little Snake River-Cottonwood Creek	41.06280	-107.55910	BLM
91	Forsaken Reservoir		Espitalier	BLM-RFO		Wet	Yes	013N	098W	28	Shell Creek-Long Ridge Reservoir	41.06319	-108.44583	BLM
92	Slope Reservoir		Cow Creek	BLM-RFO	No Visible Reservoir	N/A	No	013N	097W	29	Upper Skull Creek-Sand Creek	41.06554	-108.34949	BLM
93	Cow Creek Reservoir		Cow Creek	BLM-RFO	oir, This Can'T Be Right	Wet	Yes	013N	097W	29	Upper Skull Creek-Sand Creek	41.06607	-108.35053	BLM
94	Spicer Res 338B		Powder Rim Rotation	BLM-RFO		Wet	Yes	013N	095W	28	Sand Creek-Reader Cabin Draw	41.06802	-108.09654	BLM
95	West Pasture Pit	2009	Oppenheimer	BLM-RFO		Wet	Yes	013N	093W	26	Red Creek	41.06797	-107.82651	BLM
96		2010		BLM-RFO		Dry	Yes	013N	090W	30	Muddy Creek-Coal Mine Draw	41.06871	-107.57327	BLM
97	Long Ridge Reservoir		Cow Creek	BLM-RFO		Wet	Yes	013N	097W	30	Shell Creek-Long Ridge Reservoir	41.06885	-108.37546	BLM
98	Dinahs Pit Reservoir		Oppenheimer	BLM-RFO		Wet	Yes	013N	092W	30	Red Creek	41.07045	-107.79932	BLM
99	Pasture C Res 1		Powder Rim Rotation	BLM-RFO		Dry	Yes	013N	093W	28	Hartt Cabin Draw	41.07182	-107.87234	BLM
100	Roys Reservoir		Poison Buttes	BLM-RFO		Wet	Yes	013N	092W	26	Little Snake River-Thornburgh Gulch	41.07203	-107.71685	BLM
101	Spring Draw Res		Powder Rim Rotation	BLM-RFO		Wet	Yes	013N	094W	29	Hartt Cabin Draw	41.07319	-108.00432	BLM
102	Jebens Reservoir		Oppenheimer	BLM-RFO		Wet	Yes	013N	092W	28	Red Creek	41.07339	-107.75574	BLM
103	Red Creek Pit		Oppenheimer	BLM-RFO	No Visible Reservoir	N/A	No	013N	093W	25	Red Creek	41.07342	-107.80850	BLM
104	Poison Buttes Reserv		Poison Buttes	BLM-RFO		Wet	Yes	013N	092W	25	Cottonwood Creek	41.07407	-107.69048	BLM
105	Young Draw Reservoir	2010	South Pasture	BLM-RFO		Wet	Yes	013N	090W	30	Muddy Creek-Coal Mine Draw	41.07383	-107.57346	BLM
106	Poison Draw Pit Res		Poison Buttes	BLM-RFO		Wet	Yes	013N	092W	27	Little Snake River-Thornburgh Gulch	41.07420	-107.73744	BLM
107	Fence Reservoir	2010	Baggs Sub Unit	BLM-RFO		Wet	Yes	013N	091W	24	Muddy Creek-Coal Mine Draw	41.07593	-107.59109	BLM
108	Cherokee Rim Reservo		Powder Rim Rotation	BLM-RFO		Dry	Yes	013N	095W	24	Sand Creek-Reader Cabin Draw	41.07720	-108.04856	BLM
109	Corson Spring Reserv		Adobe Town	BLM-RFO	ossibly Two Reservoirs	Wet	Yes	013N	096W	20	Lower Skull Creek	41.07705	-108.23742	State Of Wyoming
110	Youngs Draw Res	2010	Baggs Sub Unit	BLM-RFO		Wet	Yes	013N	091W	22	Muddy Creek-Coal Mine Draw	41.07848	-107.62009	BLM
111			Adobe Town	NAIP		Wet	Yes	013N	096W	23	Grindstone Wash	41.08151	-108.17400	BLM
112	Needs Legalized		Adobe Town	BLM-RFO		Wet	Yes	013N	096W	20	Lower Skull Creek	41.07918	-108.22684	BLM
113	Brown Reservoir		Cottonwood Hill	BLM-RFO		Wet	Yes	013N	092W	22	Red Creek	41.07953	-107.74485	BLM
114	Cottonwood Road Res		Red Creek	BLM-RFO		Dry	Yes	013N	093W	21	Red Creek	41.07949	-107.87117	BLM
115	Highway Reservoir 2		Cottonwood Hill	BLM-RFO		Wet	Yes	013N	091W	21	Muddy Creek-Coal Mine Draw	41.08003	-107.63773	BLM
116	High Center Reservoi		Espitalier	BLM-RFO		Wet	Yes	013N	098W	22	Shell Creek-Long Ridge Reservoir	41.08294	-108.43030	BLM
117	Highwater Reservoir		Red Creek	BLM-RFO		Wet	Yes	013N	093W	22	Red Creek	41.08391	-107.84702	BLM
118	Long Walk Res		South Flat Top	BLM-RFO		Dry	Yes	013N	092W	21	Red Creek	41.08497	-107.75702	BLM
119	Haystack Reservoir		Cow Creek	BLM-RFO		Wet	Yes	013N	097W	19	Shell Creek-Long Ridge Reservoir	41.08529	-108.36993	BLM
120	Cedar Breaks Spr Res		Rotten Springs	BLM-RFO		Wet	Yes	013N	094W	20	Hartt Cabin Draw	41.08684	-108.00545	BLM
121		2009		BLM-RFO		Wet	Yes	013N	091W	21	Muddy Creek-Coal Mine Draw	41.08786	-107.64304	BLM
122	Highway Reservoir 1	2009	Brimmer Pastures	BLM-RFO		Wet	Yes	013N	091W	22	Muddy Creek-Coal Mine Draw	41.08874	-107.62760	BLM
123	Flat Draw Res		Red Creek	BLM-RFO		Dry	Yes	013N	093W	21	Hangout Wash	41.08909	-107.87154	BLM
124	Dryfus Draw Pit		Cottonwood Hill	BLM-RFO		Wet	Yes	013N	092W	24	Cottonwood Creek	41.08956	-107.70480	BLM
125	Last Reservoir		Cow Creek	BLM-RFO		Wet	Yes	013N	097W	24	Upper Skull Creek-Sand Creek	41.08963	-108.27516	BLM
126	Dom S Reservoir		Espitalier	BLM-RFO		Dry	Yes	013N	098W	14	Shell Creek-Long Ridge Reservoir	41.09267	-108.41033	BLM
127	Sheep Shed Reservoir		Red Creek	BLM-RFO		Wet	Yes	013N	093W	18	Hartt Cabin Draw	41.09296	-107.90647	BLM
128	Grindstone Spring Re		Grindstone Springs	BLM-RFO		Wet	Yes	013N	095W	18	Grindstone Wash	41.09345	-108.14170	BLM
129	Coal Mine Reservoir	2010	Baggs Sub Unit	BLM-RFO		Dry	Yes	013N	091W	14	Muddy Creek-Coal Mine Draw	41.09384	-107.59461	BLM
130	Broken Bottle Reserv		Red Creek	BLM-RFO		Wet	Yes	013N	093W	13	Red Creek	41.09439	-107.80782	BLM

Little Snake River / Vermillion Creek Watershed: Stock Reservoir Database

GIS IDENT	BLM Database Info		Allotment	Source	ACE Review Notes			Township	Range	Section	Subwatershed (HUC-12)	Lat	Long	Surface Owner
	BLM Comment	BLM Inspection			Comment	Water Condition	Water Source							
131	John Muir Reservoir		Espitalier	BLM-RFO		Wet	Yes	013N	098W	17	Shell Creek-Long Ridge Reservoir	41.09474	-108.45443	BLM
132	Bad Land Draw Reserv		Cottonwood Hill	BLM-RFO		Wet	Yes	013N	092W	15	Red Creek	41.09516	-107.74156	BLM
133	Three Woolies Reserv		Baggs Sub Unit	BLM-RFO	No Visible Reservoir	N/A	No	013N	091W	13	Muddy Creek-Coal Mine Draw	41.09574	-107.58394	BLM
134	Miserable Reservoir		Cow Creek	BLM-RFO		Wet	Yes	013N	097W	17	Upper Skull Creek-Sand Creek	41.09732	-108.35526	BLM
135	Wood Detention		Rotten Springs	BLM-RFO		Wet	Yes	013N	094W	16	Hartt Cabin Draw	41.09803	-107.99122	BLM
136	Hicox Draw Reservoir	2010	Baggs Sub Unit	BLM-RFO		Wet	Yes	013N	091W	14	Muddy Creek-Coal Mine Draw	41.09826	-107.59997	BLM
137	Dead Tree Res		Red Creek	BLM-RFO	Sediment	Dry	No	013N	093W	16	Hangout Wash	41.09921	-107.86697	BLM
138	Adobe Draw Reservoir		Cow Creek	BLM-RFO	Breached	Dry	No	013N	097W	16	Upper Skull Creek-Sand Creek	41.09934	-108.32419	BLM
139	Sandy Res		Cottonwood Hill	BLM-RFO	No Visible Reservoir	N/A	No	013N	091W	18	Cottonwood Creek	41.09917	-107.67200	BLM
140	Sheehan Reservoir	2010	Cherokee	BLM-RFO		Wet	Yes	013N	090W	17	Little Snake River-Cottonwood Creek	41.10008	-107.54335	BLM
141	Private		Espitalier	BLM-RFO		Wet	Yes	013N	099W	13	Shell Creek-Long Ridge Reservoir	41.10040	-108.49204	Raftopoulos Brothers Livestock
142	Needs Legalized		Adobe Town	BLM-RFO		Dry	Yes	013N	096W	15	Sand Creek-Reader Cabin Draw	41.10175	-108.19346	BLM
143	White Horse Reservoi		Adobe Town	BLM-RFO	Sediment	Dry	No	013N	096W	15	Sand Creek-Reader Cabin Draw	41.10244	-108.19142	BLM
144	Sheehan Reservoir #2	2010	Cherokee	BLM-RFO	Sediment	Dry	No	013N	090W	17	Little Snake River-Cottonwood Creek	41.10401	-107.54248	BLM
145	Pronghorn Reservoir		Cow Creek	BLM-RFO		Wet	Yes	013N	097W	18	Shell Creek-Long Ridge Reservoir	41.10491	-108.37390	BLM
146	Red Creek Reservoir		South Flat Top	BLM-RFO		Wet	Yes	013N	092W	9	Red Creek	41.10555	-107.75829	BLM
147	Spragg Reservoir		South Flat Top	BLM-RFO		Wet	Yes	013N	092W	7	Red Creek	41.10549	-107.78850	BLM
148	Big Bench Reservoir		Rotten Springs	BLM-RFO		Dry	Yes	013N	095W	12	Sand Creek-Reader Cabin Draw	41.10642	-108.04250	BLM
149	Adobe Butte Reservoi		Cow Creek	BLM-RFO	Breached	Dry	No	013N	097W	11	Upper Skull Creek-Sand Creek	41.10643	-108.29026	BLM
150	Humboldt Reservoir		Espitalier	BLM-RFO		Wet	Yes	013N	098W	10	Shell Creek-Long Ridge Reservoir	41.10729	-108.41737	BLM
151	Runway Pit	2009	Morgan-Boyer Subunit	BLM-RFO		Wet	Yes	013N	089W	10	Lower Savery Creek	41.10777	-107.39258	BLM
152	Cottonwood Res. A		Cottonwood Hill	BLM-RFO		Wet	Yes	013N	091W	7	Cottonwood Creek	41.11053	-107.68597	BLM
153	North Baggs Res	2010	Baggs Sub Unit	BLM-RFO		Wet	Yes	013N	091W	12	Deep Creek	41.11078	-107.58029	BLM
154	Muddy Mountain Pit	2010	Cherokee	BLM-RFO	Sediment	Dry	No	013N	090W	8	Muddy Creek-Coal Mine Draw	41.11124	-107.54960	BLM
155	Russell Reservoir 3		Red Creek	BLM-RFO	Sediment	Dry	No	013N	093W	9	Hangout Wash	41.11147	-107.86452	BLM
156	Pioneer Reservoir		Cottonwood Hill	BLM-RFO		Wet	Yes	013N	092W	10	Red Creek	41.11128	-107.73041	BLM
157	East Cherokee Res 2	2009	Cherokee	BLM-RFO		Wet	Yes	013N	090W	10	Little Snake River-Cottonwood Creek	41.11152	-107.50571	BLM
158	Dead Horse Reservoir		Adobe Town	BLM-RFO		Dry	Yes	013N	096W	7	Upper Skull Creek-Sand Creek	41.11227	-108.25877	BLM
159	Otoole Lambing Pit 1	2009	Cherokee	BLM-RFO		Wet	Yes	013N	090W	11	Little Snake River-Cottonwood Creek	41.11484	-107.48004	BLM
160	Adobe Res		South Flat Top	BLM-RFO		Wet	Yes	013N	092W	9	Red Creek	41.11461	-107.75672	BLM
161	Rocky Reservoir		Espitalier	BLM-RFO		Wet	Yes	013N	098W	8	Shell Creek-Long Ridge Reservoir	41.11582	-108.47061	BLM
162	Scraper Reservoir		Red Creek	BLM-RFO		Wet	Yes	013N	093W	8	Hangout Wash	41.11661	-107.89821	BLM
163	Detention Dam 1392 4		Cottonwood Hill	BLM-RFO		Wet	Yes	013N	092W	12	Cottonwood Creek	41.11755	-107.69486	BLM
164	Hangout Pit Reservoi		Red Creek	BLM-RFO		Wet	Yes	013N	094W	12	Hartt Cabin Draw	41.11853	-107.92422	BLM
165	Hartt Cabin Draw Pit		Red Creek	BLM-RFO		Wet	Yes	013N	094W	12	Hartt Cabin Draw	41.11857	-107.92509	BLM
166	No Name Reservoir		Cow Creek	BLM-RFO		Wet	Yes	013N	097W	7	Shell Creek-Long Ridge Reservoir	41.11878	-108.36223	BLM
167	Cecils Reservoir	2009	Cherokee	BLM-RFO		Wet	Yes	013N	090W	9	Little Snake River-Cottonwood Creek	41.11908	-107.52229	BLM
168	Boxelder Pit	2009	N/Amorgan-Boyersubunit	BLM-RFO		Wet	Yes	013N	089W	4	Lower Savery Creek	41.11970	-107.40412	BLM
169	Detention Dam 1392 3		Cottonwood Hill	BLM-RFO		Wet	Yes	013N	092W	1	Cottonwood Creek	41.12075	-107.69911	BLM
170	W Cow Creek Ranch Re		Espitalier	BLM-RFO		Wet	Yes	013N	098W	11	Shell Creek-Cow Creek Reservoir	41.12058	-108.39630	BLM
171	Browns Hill Pit	2009	Morgan-Boyer Subunit	BLM-RFO		Wet	Yes	013N	089W	6	Lower Savery Creek	41.12263	-107.45091	BLM
172				BLM-RFO	No Visible Reservoir	N/A	No	013N	089W	3	Lower Savery Creek	41.12312	-107.39983	BLM
173	Natural Spillway Res	2009	Cherokee	BLM-RFO		Wet	Yes	013N	090W	3	Little Snake River-Cottonwood Creek	41.12341	-107.51593	BLM
174	Lost Sheep Reservoir		Red Creek	BLM-RFO		Wet	Yes	013N	093W	1	Red Creek	41.12294	-107.80945	BLM
175	Gumbo Reservoir 1		Sand Creek	BLM-RFO	Sediment	Dry	No	013N	094W	4	Hartt Cabin Draw	41.12376	-107.98121	BLM
176	Exclosure Reservoir		Cottonwood Hill	BLM-RFO		Wet	Yes	013N	092W	3	Cottonwood Creek	41.12403	-107.73092	BLM
177	Cottonwood Res. B	2009	Cottonwood Hill	BLM-RFO		Wet	Yes	013N	091W	5	Cottonwood Creek	41.12428	-107.66223	BLM
178	Two-Track Pit	2009	Morgan-Boyer Subunit	BLM-RFO		Dry	Yes	013N	089W	4	Lower Savery Creek	41.12432	-107.41887	BLM
179	Rock Pit Reserv	2009	Cherokee	BLM-RFO		Wet	Yes	013N	091W	2	Deep Creek	41.12438	-107.60916	BLM
180	Snowpack Pit	2009	Morgan-Boyer Subunit	BLM-RFO		Wet	Yes	013N	089W	3	Lower Savery Creek	41.12444	-107.39267	BLM
181	Toad Stool Res	2009	Cottonwood Hill	BLM-RFO		Wet	Yes	013N	091W	4	Cottonwood Creek	41.12519	-107.64679	BLM
182	High Trail Reservoir	2009	Cherokee	BLM-RFO		Wet	Yes	013N	090W	5	Deep Creek	41.12619	-107.54466	BLM
183	Detention Dam 1392 2		Cottonwood Hill	BLM-RFO		Wet	Yes	013N	092W	1	Cottonwood Creek	41.12628	-107.70580	BLM
184	Mcintosh Reservoir		Red Creek	BLM-RFO		Wet	Yes	013N	093W	2	Red Creek	41.12677	-107.83062	BLM
185	Russell Reservoir 1		Adobe Town	BLM-RFO	Sediment	Dry	No	013N	096W	2	Sand Creek-Reader Cabin Draw	41.12794	-108.17081	BLM
186	Sandy Butte Reservoi		Rotten Springs	BLM-RFO		Wet	Yes	013N	095W	4	Sand Creek-Reader Cabin Draw	41.12709	-108.09539	BLM
187	Muddy Mtn Road Pit	2009	North Baggs	BLM-RFO		Wet	Yes	013N	091W	4	Muddy Creek-Coal Mine Draw	41.12775	-107.63511	BLM
188	G S Reservoir #1	2009	Cherokee	BLM-RFO		Dry	Yes	013N	090W	1	Little Snake River-Cottonwood Creek	41.12948	-107.47124	BLM
189	Otoole Lambing Pit 2	2009	Cherokee	BLM-RFO		Wet	Yes	013N	090W	1	Little Snake River-Cottonwood Creek	41.12956	-107.46646	BLM
190	Spring Pit 1	2009	Cherokee	BLM-RFO		Wet	Yes	013N	089W	6	Little Snake River-Cottonwood Creek	41.13008	-107.45795	BLM
191	Spring Pit 2	2009	Cherokee	BLM-RFO		Wet	Yes	013N	090W	1	Little Snake River-Cottonwood Creek	41.13043	-107.46135	BLM
192	Hangout Reservoir		Red Creek	BLM-RFO		Wet	Yes	013N	093W	4	Hangout Wash	41.13043	-107.87661	BLM
193	Sand Draw Reservoir		Sand Creek	BLM-RFO		Wet	Yes	013N	094W	2	Hartt Cabin Draw	41.13113	-107.95448	BLM
194	Moonstone Reservoir		Espitalier	BLM-RFO		Wet	Yes	013N	098W	4	Shell Creek-Cow Creek Reservoir	41.13153	-108.43467	BLM
195	Washout Reservoir		Cottonwood Hill	BLM-RFO		Wet	Yes	013N	092W	3	Cottonwood Creek	41.13199	-107.73157	BLM

Little Snake River / Vermillion Creek Watershed: Stock Reservoir Database

GIS IDENT	BLM Database Info		Allotment	Source	ACE Review Notes			Township	Range	Section	Subwatershed (HUC-12)	Lat	Long	Surface Owner
	BLM Comment	BLM Inspection			Comment	Water Condition	Water Source							
196	Trouble Reservoir		Espitalier	BLM-RFO		Wet	Yes	013N	098W	5	Shell Creek-Cow Creek Reservoir	41.13335	-108.46681	BLM
197	Deep Creek Butte Res	2009	Cherokee	BLM-RFO		Dry	Yes	013N	090W	6	Deep Creek	41.13327	-107.56365	BLM
198	Old Bones Stock Res	2009	Cherokee	BLM-RFO		Wet	Yes	013N	090W	3	Little Snake River-Cottonwood Creek	41.13422	-107.50920	BLM
199	Nw Muddy Mtn Reservo	2009	Cherokee	BLM-RFO		Dry	Yes	014N	090W	31	Deep Creek	41.13572	-107.55955	BLM
200	East Cow Cr Ranch Re		Cow Creek	BLM-RFO		Wet	Yes	014N	097W	32	Twin Fork Reservoir	41.13543	-108.34728	BLM
201	On State Land			BLM-RFO		Wet	Yes	014N	099W	36	Shell Creek-Cow Creek Reservoir	41.13665	-108.50072	State Of Wyoming
202	Needs Legalized		Rotten Springs	BLM-RFO		Wet	Yes	014N	095W	31	Grindstone Wash	41.13685	-108.13256	BLM
203	Loveland Contour Fur		Cottonwood Hill	BLM-RFO	bankment? Also One S	Wet	Yes	014N	092W	34	Cottonwood Creek	41.13621	-107.73618	BLM
204	B&Lreservoir		Rotten Springs	BLM-RFO		Wet	Yes	014N	095W	31	Grindstone Wash	41.13718	-108.13055	BLM
205	Greasewood Reservoir	2009	Cherokee	BLM-RFO		Wet	Yes	014N	090W	33	Deep Creek	41.13832	-107.53524	BLM
206	Meadowlark Res	2009	Cherokee	BLM-RFO		Dry	Yes	014N	091W	35	Muddy Creek-Coal Mine Draw	41.13843	-107.60571	BLM
207	South Flat Top Pit 2		South Flat Top	BLM-RFO		Wet	Yes	014N	092W	33	Cottonwood Creek	41.13851	-107.76463	BLM
208	Crested Pit		Cottonwood Hill	BLM-RFO		Wet	Yes	014N	092W	35	Cottonwood Creek	41.13895	-107.71629	BLM
209	South Fork Reservoir	2009	Cherokee	BLM-RFO	Breached	Dry	No	014N	090W	33	Deep Creek	41.14076	-107.52722	BLM
210	East Loco Cr Reservo	2009	Morgan-Boyer Subunit	BLM-RFO		Wet	Yes	014N	089W	35	Lower Savery Creek	41.14128	-107.37484	BLM
211	Reynolds Reservoir		Cow Creek	BLM-RFO		Wet	Yes	014N	098W	33	Shell Creek-Cow Creek Reservoir	41.14366	-108.45134	BLM
212	No Record Reservoir	2009	Cherokee	BLM-RFO		Wet	Yes	014N	090W	34	Little Snake River-Cottonwood Creek	41.14390	-107.50352	BLM
213	Spreaderdike Res		South Flat Top	BLM-RFO		Wet	Yes	014N	092W	33	Cottonwood Creek	41.14572	-107.74787	BLM
214	Dike View Reservoir		South Flat Top	BLM-RFO		Wet	Yes	014N	092W	32	Cottonwood Creek	41.14583	-107.76830	BLM
215	Detention Dam 1492 4		Big Robber	BLM-RFO		Wet	Yes	014N	092W	34	Cottonwood Creek	41.14670	-107.72906	BLM
216	Russell Reservoir 2		Adobe Town	BLM-RFO		Wet	Yes	014N	096W	36	Sand Creek-Reader Cabin Draw	41.14733	-108.16458	BLM
217	Sheep Reservoir	2009	Cherokee	BLM-RFO		Dry	Yes	014N	091W	26	Muddy Creek-Coal Mine Draw	41.14848	-107.60842	BLM
218	Dead Cow Reservoir		Cow Creek	BLM-RFO		Wet	Yes	014N	097W	32	Twin Fork Reservoir	41.14885	-108.33851	BLM
219	Pit 1491 #1	2009	Cherokee	BLM-RFO		Dry	Yes	014N	091W	28	Muddy Creek-Robber's Gulch	41.14965	-107.64507	BLM
220	Wild Horse Headcut Pit	2009	Cherokee	BLM-RFO		Wet	Yes	014N	091W	28	Muddy Creek-Robber's Gulch	41.15011	-107.63122	BLM
221	Two Fork Reservoir		Cow Creek	BLM-RFO		Wet	Yes	014N	097W	30	Twin Fork Reservoir	41.15056	-108.36105	BLM
222	Deep Creek Resr #3	2009	Deep Creek Pasture	BLM-RFO		Dry	Yes	014N	090W	29	Deep Creek	41.15125	-107.53653	Three Forks Ranch Corp
223	Detention Dam 1492 3		Big Robber	BLM-RFO		Dry	Yes	014N	092W	26	Cottonwood Creek	41.15094	-107.70871	BLM
224				BLM-RFO		Dry	Yes	014N	099W	25	Shell Creek-Cow Creek Reservoir	41.15135	-108.50568	BLM
225	Guthridge Reservoir		Cow Creek	BLM-RFO		Dry	Yes	014N	098W	30	Shell Creek-Cow Creek Reservoir	41.15198	-108.47285	BLM
226	Detention Res 1492 2		Big Robber	BLM-RFO		Wet	Yes	014N	092W	26	Cottonwood Creek	41.15286	-107.72504	BLM
227	Hangout Reservoir		Red Creek	BLM-RFO	Breached	Dry	No	014N	093W	28	Hangout Wash	41.15285	-107.87675	BLM
228	Gumbo Reservoir 2		Sand Creek	BLM-RFO	Sediment	Dry	No	014N	095W	27	Sand Creek-Reader Cabin Draw	41.15385	-108.08528	BLM
229	West Hangout Diversi		Red Creek	BLM-RFO		Wet	Yes	014N	093W	30	Hangout Wash	41.15444	-107.90687	BLM
230	G S Reservoir #2	2009	Cherokee	BLM-RFO		Wet	Yes	014N	090W	26	Little Snake River-Cottonwood Creek	41.15443	-107.49204	BLM
231	Deep Creek Reservoir	2009	Deep Creek Pasture	BLM-RFO		Wet	Yes	014N	090W	28	Deep Creek	41.15550	-107.52551	BLM
232	Deep Cr Rim Burn Res	2010	Cherokee	BLM-RFO		Wet	Yes	014N	091W	25	Deep Creek	41.15553	-107.58161	BLM
233	Reservoir 1493 A		Red Creek	BLM-RFO		Wet	Yes	014N	093W	25	Red Creek	41.15562	-107.81108	BLM
234	Tangled Chain Pit	2009	Cherokee	BLM-RFO		Wet	Yes	014N	091W	28	Muddy Creek-Robber's Gulch	41.15619	-107.63815	BLM
235	Salt Draw Reservoir		Sand Creek	BLM-RFO		Wet	Yes	014N	094W	26	Hartt Cabin Draw	41.15748	-107.94083	BLM
236	North Loco Cr Reserv	2009	Morgan-Boyer Subunit	BLM-RFO		Dry	Yes	014N	089W	28	Lower Savery Creek	41.15840	-107.40786	BLM
237	Pocket Res		South Flat Top	BLM-RFO		Wet	Yes	014N	092W	29	Cottonwood Creek	41.15898	-107.77104	BLM
238	Lunch Reservoir	2009	Cherokee	BLM-RFO		Dry	Yes	014N	091W	27	Muddy Creek-Robber's Gulch	41.15968	-107.62373	BLM
239	Deep Creek No2 Res	2010	Cherokee	BLM-RFO		Wet	Yes	014N	090W	30	Deep Creek	41.16174	-107.57197	BLM
240	Detention Res 1492 1		South Flat Top	BLM-RFO		Wet	Yes	014N	092W	28	Cottonwood Creek	41.16263	-107.75386	BLM
241	Deep Creek Resr. #4	2009	Deep Creek Pasture	BLM-RFO	Breached	Dry	No	014N	090W	21	Deep Creek	41.16347	-107.53256	Three Forks Ranch Corp
242	Petrified Wood Reser		Cow Creek	BLM-RFO		Wet	Yes	014N	098W	28	Shell Creek-Cow Creek Reservoir	41.16308	-108.44592	BLM
243	Sand Hill Reservoir		Cow Creek	BLM-RFO		Wet	Yes	014N	097W	28	Twin Fork Reservoir	41.16350	-108.32756	BLM
244				BLM-RFO		Wet	Yes	014N	099W	26	Shell Creek-Cow Creek Reservoir	41.16378	-108.51116	BLM
245	South Flat Top Res		Red Creek	BLM-RFO		Wet	Yes	014N	093W	24	Red Creek	41.16316	-107.81087	BLM
246	Reservoir 1491 E	2010	Cherokee	BLM-RFO		Wet	Yes	014N	091W	20	Muddy Creek-Robber's Gulch	41.16400	-107.66055	BLM
247	Big Ridge Reservoir		Red Creek	BLM-RFO		Wet	Yes	014N	093W	19	Hangout Wash	41.16402	-107.90910	BLM
248	Cut Reservoir		Cow Creek	BLM-RFO		Wet	Yes	014N	097W	20	Twin Fork Reservoir	41.16424	-108.34940	BLM
249	Trail Side Reservoir		Cow Creek	BLM-RFO		Wet	Yes	014N	098W	20	Shell Creek-Cow Creek Reservoir	41.16583	-108.47024	BLM
250	Windy Reservoir		Cow Creek	BLM-RFO		Wet	Yes	014N	097W	22	Twin Fork Reservoir	41.16616	-108.30793	BLM
251	Badlands Pit #2		Cherokee	BLM-RFO		Dry	Yes	014N	091W	21	Muddy Creek-Robber's Gulch	41.16643	-107.64390	BLM
252	Needs Legalized	2010	Cherokee	BLM-RFO		Dry	Yes	014N	091W	21	Muddy Creek-Robber's Gulch	41.16859	-107.64790	BLM
253	Fenceline Reservoir		Big Robber	BLM-RFO		Wet	Yes	014N	092W	21	Muddy Creek-Robber's Gulch	41.17162	-107.74657	BLM
254	Sand Creek Lake Res		Rotten Springs	BLM-RFO		Wet	Yes	014N	095W	20	Sand Creek-Reader Cabin Draw	41.17167	-108.11718	BLM
255	Wild Horse Butte Res	2010	Cherokee	BLM-RFO		Dry	Yes	014N	091W	23	Muddy Creek-Robber's Gulch	41.17222	-107.59736	BLM
256	Hardship Res	2010	Cherokee	BLM-RFO		Dry	Yes	014N	091W	21	Muddy Creek-Robber's Gulch	41.17157	-107.63571	BLM
257	Trail Reservoir		South Flat Top	BLM-RFO		Wet	Yes	014N	092W	20	Muddy Creek-Robber's Gulch	41.17360	-107.78186	BLM
258	Mitigation Fish Pit	2010	Cherokee	BLM-RFO		Wet	Yes	014N	090W	19	Deep Creek	41.17336	-107.56896	BLM
259	Rattlesnake Reservoi		Big Robber	BLM-RFO		Wet	Yes	014N	092W	23	Muddy Creek-Robber's Gulch	41.17419	-107.71712	BLM
260	Clay Point Reservoir		Big Robber	BLM-RFO		Wet	Yes	014N	092W	22	Muddy Creek-Robber's Gulch	41.17626	-107.73281	BLM

Little Snake River / Vermillion Creek Watershed: Stock Reservoir Database

GIS IDENT	BLM Database Info		Allotment	Source	ACE Review Notes			Township	Range	Section	Subwatershed (HUC-12)	Lat	Long	Surface Owner
	BLM Comment	BLM Inspection			Comment	Water Condition	Water Source							
261	Water Can Reservoir		Cow Creek	BLM-RFO		Wet	Yes	014N	097W	19	Twin Fork Reservoir	41.17710	-108.37320	BLM
262	State Reservoir		Cow Creek	BLM-RFO		Wet	Yes	014N	098W	21	Shell Creek-Cow Creek Reservoir	41.17727	-108.43357	BLM
263			Rotten Springs	BLM-RFO	No Visible Reservoir	N/A	No	014N	095W	20	Sand Creek-Reader Cabin Draw	41.17808	-108.11091	BLM
264	Mosquito Reservoir		Cow Creek	BLM-RFO		Wet	Yes	014N	098W	23	Shell Creek-Cow Creek Reservoir	41.17820	-108.41316	BLM
265	Snag Reservoir	2010	Cherokee	BLM-RFO		Dry	Yes	014N	091W	15	Muddy Creek-Robber's Gulch	41.17868	-107.61256	BLM
266	Basin Pit	2010	Cherokee	BLM-RFO		Dry	Yes	014N	091W	13	Muddy Creek-Robber's Gulch	41.17853	-107.59139	BLM
267	Pit Reservoir 1493 B		Red Creek	BLM-RFO		Dry	Yes	014N	093W	17	Hangout Wash	41.18122	-107.89705	BLM
268	Brush Reservoir		Sand Creek	BLM-RFO		Dry	Yes	014N	094W	13	Hartt Cabin Draw	41.18327	-107.93558	BLM
269	State Reservoir #2		Cow Creek	BLM-RFO		Wet	Yes	014N	098W	17	Shell Creek-Cow Creek Reservoir	41.18408	-108.45214	BLM
270	Cherokee Chief Pit		Continental	BLM-RFO		Dry	Yes	014N	094W	16	Lower Willow Creek	41.18624	-107.97599	BLM
271	Upper Draw Reservoir		Cow Creek	BLM-RFO		Wet	Yes	014N	097W	14	Twin Fork Reservoir	41.18635	-108.28368	BLM
272	Retention Reservoir	2010	Cherokee	BLM-RFO		Wet	Yes	014N	090W	18	Deep Creek	41.18634	-107.56568	BLM
273	Sw Flat Top Reservoi		Red Creek	BLM-RFO	Breached	Dry	No	014N	093W	15	Hangout Wash	41.18746	-107.85007	BLM
274	Thunder Pit Res	2010	Cherokee	BLM-RFO		Dry	Yes	014N	091W	17	Muddy Creek-Robber's Gulch	41.18846	-107.65683	BLM
275	Little Robber Detent		Big Robber	BLM-RFO		Wet	Yes	014N	092W	14	Muddy Creek-Robber's Gulch	41.18890	-107.71652	BLM
276	Tiptop Reservoir		South Flat Top	BLM-RFO	Breached	Dry	No	014N	093W	13	Muddy Creek-Robber's Gulch	41.18936	-107.80753	BLM
277	Row Res		Sand Creek	BLM-RFO		Wet	Yes	014N	094W	13	Hartt Cabin Draw	41.18957	-107.91996	BLM
278	Morgan Reservoir		South Flat Top	BLM-RFO		Dry	Yes	014N	093W	14	Muddy Creek-Robber's Gulch	41.18911	-107.83219	BLM
279	Big Robber Det Dam 1		South Flat Top	BLM-RFO		Wet	Yes	014N	092W	17	Muddy Creek-Robber's Gulch	41.19039	-107.77530	BLM
280	Wild Horse Reservoir		Big Robber	BLM-RFO		Wet	Yes	014N	092W	15	Muddy Creek-Robber's Gulch	41.19085	-107.73053	BLM
281	Reservoir 1491 F	2010	Cherokee	BLM-RFO		Wet	Yes	014N	091W	17	Muddy Creek-Robber's Gulch	41.19098	-107.65525	BLM
282	Cedar Pit	2010	Cherokee	BLM-RFO		Dry	Yes	014N	091W	10	Muddy Creek-Robber's Gulch	41.19271	-107.62709	BLM
283	Center Reservoir		Red Creek	BLM-RFO		Dry	Yes	014N	093W	10	Hangout Wash	41.19289	-107.85267	BLM
284	Little Robber Divers		Little Robber	BLM-RFO	Breached	Dry	No	014N	092W	12	Muddy Creek-Robber's Gulch	41.19380	-107.70207	BLM
285	Little Robber Pit		Little Robber	BLM-RFO	Breached	Dry	No	014N	092W	12	Muddy Creek-Robber's Gulch	41.19382	-107.70012	BLM
286	Deer Reservoir	2010	Cherokee	BLM-RFO		Dry	Yes	014N	091W	10	Cherokee Creek	41.19590	-107.61271	BLM
287	Horse Trap Reservoir		Continental	BLM-RFO		Wet	Yes	014N	094W	10	Lower Willow Creek	41.19598	-107.96935	BLM
288	Needs Legalized		Big Robber	BLM-RFO	No Visible Reservoir	Dry	No	014N	092W	9	Muddy Creek-Robber's Gulch	41.19805	-107.75780	BLM
289	Cherokee Reservoir 2	2010	Cherokee	BLM-RFO		Wet	Yes	014N	091W	12	Cherokee Creek	41.20018	-107.59089	BLM
290	Morgan Ranch Hdc Pit	2010	Morgan Ranch	BLM-RFO		Wet	Yes	014N	090W	8	Deep Creek	41.20076	-107.54212	BLM
291	Bottle Pit Res	2010	Cherokee	BLM-RFO		Wet	Yes	014N	091W	8	Muddy Creek-Robber's Gulch	41.20095	-107.65283	BLM
292	Rocky Ridge #2	2010	Cherokee	BLM-RFO		Wet	Yes	014N	091W	7	Muddy Creek-Robber's Gulch	41.20152	-107.67327	BLM
293	Needs Legalized		Big Robber	BLM-RFO		Wet	Yes	014N	092W	9	Muddy Creek-Robber's Gulch	41.20219	-107.75718	BLM
294	Cherokee Basin Res#1	2010	Cherokee	BLM-RFO	Breached	Dry	No	014N	091W	12	Cherokee Creek	41.20258	-107.58017	BLM
295	Big Robber Pit		Big Robber Spreaders	BLM-RFO		Wet	Yes	014N	092W	8	Muddy Creek-Robber's Gulch	41.20268	-107.77584	BLM
296	Dripping Rock Reserv		Continental	BLM-RFO		Wet	Yes	014N	093W	7	Hangout Wash	41.20312	-107.90384	BLM
297	Dripping Rock Res#2		Continental	BLM-RFO	No Visible Reservoir	N/A	No	014N	093W	7	Hangout Wash	41.20324	-107.90286	BLM
298	South Smiley Spr Res	2010	Cherokee	BLM-RFO	Breached	Dry	No	014N	090W	8	Cherokee Creek	41.20584	-107.55032	BLM
299	Big Robber Det Dam 1		Big Robber Spreaders	BLM-RFO		Wet	Yes	014N	092W	7	Muddy Creek-Robber's Gulch	41.20618	-107.78949	BLM
300	Sand Rock Pit	2010	Cherokee	BLM-RFO		Dry	Yes	014N	091W	9	Muddy Creek-Robber's Gulch	41.20623	-107.64046	BLM
301	Road Bend Reservoir	2010	Cherokee	BLM-RFO		Wet	Yes	014N	090W	6	Cherokee Creek	41.20683	-107.56184	BLM
302	Rocky Ridge Pit	2010	Cherokee	BLM-RFO		Wet	Yes	014N	091W	5	Muddy Creek-Robber's Gulch	41.20708	-107.65601	BLM
303	Flowing Well Pit		Corson Springs	BLM-RFO		Wet	Yes	014N	098W	6	Carson Spring	41.20879	-108.48833	BLM
304	V Spreaders Pit		V Spreaders	BLM-RFO		Wet	Yes	014N	092W	1	Muddy Creek-Robber's Gulch	41.21007	-107.69635	BLM
305	Lost Pencil Reservoi	2010	Cherokee	BLM-RFO		Dry	Yes	014N	091W	3	Cherokee Creek	41.21133	-107.62008	BLM
306	Needs Legalized	2010	Morgan Ranch	BLM-RFO	Sediment	Dry	No	014N	090W	3	Deep Creek	41.21137	-107.50295	BLM
307	Plugged Art Res	2010	Morgan Ranch	BLM-RFO		Dry	Yes	014N	090W	3	Deep Creek	41.21174	-107.51050	BLM
308	Detention Dam 1492 8		Big Robber	BLM-RFO		Wet	Yes	014N	092W	2	Muddy Creek-Robber's Gulch	41.21293	-107.72126	BLM
309	Continental Res 1		Continental	BLM-RFO		Wet	Yes	014N	094W	4	Lower Willow Creek	41.21270	-107.99149	BLM
310	Detention Dam 1493 1		South Flat Top	BLM-RFO		Wet	Yes	014N	093W	1	Muddy Creek-Robber's Gulch	41.21284	-107.80379	BLM
311	Rabbitbrush Stk Res	2010	Cherokee	BLM-RFO	Sediment	Dry	No	014N	091W	4	Cherokee Creek	41.21342	-107.63318	BLM
312	Continental Res #5		Continental	BLM-RFO	No Visible Reservoir	N/A	No	014N	094W	4	Lower Willow Creek	41.21341	-107.97617	BLM
313	Continental Res 3Pit		Continental	BLM-RFO		Wet	Yes	014N	094W	4	Lower Willow Creek	41.21377	-107.97752	BLM
314	Detention Dam 1492 6		Big Robber	BLM-RFO		Wet	Yes	014N	092W	3	Muddy Creek-Robber's Gulch	41.21405	-107.73948	BLM
315	Cherokee Reservoir 1	2010	Cherokee	BLM-RFO	Breached	Dry	No	014N	090W	6	Cherokee Creek	41.21415	-107.57221	BLM
316	Badlands Pit #4	2010	Cherokee	BLM-RFO	No Visible Reservoir	N/A	No	014N	091W	6	Muddy Creek-Robber's Gulch	41.21450	-107.67767	BLM
317	West Flat Top Pit		Continental	BLM-RFO	Breached	Dry	No	014N	093W	3	Lower Barrel Springs Draw	41.21483	-107.85218	BLM
318	Needs Legalized	2010	Smiley Draw	BLM-RFO		Dry	Yes	014N	090W	5	Cherokee Creek	41.21583	-107.54040	BLM
319	Corson Pit		Corson Springs	BLM-RFO		Wet	Yes	014N	099W	3	Carson Spring	41.21633	-108.53127	BLM
320	Retention Reservoir	2010	Cherokee	BLM-RFO		Wet	Yes	014N	091W	1	Cherokee Creek	41.21756	-107.58485	BLM
321	Spreaderdike #2 Pit		Big Robber	BLM-RFO		Wet	Yes	014N	092W	6	Muddy Creek-Robber's Gulch	41.21811	-107.79644	BLM
322	Detention Dam 1592 1		Big Robber	BLM-RFO		Wet	Yes	015N	092W	34	Muddy Creek-Robber's Gulch	41.22113	-107.73705	BLM
323	Snowbank Reservoir		Continental	BLM-RFO		Dry	Yes	015N	093W	32	Windmill Draw	41.22179	-107.88072	BLM
324	Continental Res 2		Continental	BLM-RFO		Wet	Yes	015N	094W	34	Lower Willow Creek	41.22168	-107.95859	BLM
325	School House Butte R		Continental	BLM-RFO		Wet	Yes	015N	094W	32	Lower Willow Creek	41.22198	-108.00000	BLM

Little Snake River / Vermillion Creek Watershed: Stock Reservoir Database

GIS IDENT	BLM Database Info		Allotment	Source	ACE Review Notes			Township	Range	Section	Subwatershed (HUC-12)	Lat	Long	Surface Owner
	BLM Comment	BLM Inspection			Comment	Water Condition	Water Source							
326	Bigrobber Res-Ne Pit		Big Robber	BLM-RFO		Wet	Yes	015N	092W	34	Muddy Creek-Robber's Gulch	41.22249	-107.73822	BLM
327	Boss Reservoir		Continental	BLM-RFO		Wet	Yes	015N	093W	34	Lower Barrel Springs Draw	41.22451	-107.85919	BLM
328	Paint Reservoir		Continental	BLM-RFO	Breached	Dry	No	015N	094W	35	Lower Willow Creek	41.22453	-107.94751	BLM
329	Pit Reservoir 1594 4		Continental	BLM-RFO		Dry	Yes	015N	094W	36	Windmill Draw	41.22543	-107.92138	BLM
330	Court House Butte Re		Continental	BLM-RFO		Wet	Yes	015N	094W	32	Lower Willow Creek	41.22605	-108.00581	BLM
331	Slip Tree Reservoir		Continental	BLM-RFO		Dry	Yes	015N	093W	31	Windmill Draw	41.22700	-107.90365	BLM
332	Mosquito Reservoir		Continental	BLM-RFO		Dry	Yes	015N	094W	36	Windmill Draw	41.22785	-107.92911	BLM
333	Reservoir 1591 G	2010	Cherokee	BLM-RFO		Dry	Yes	015N	091W	32	Cherokee Creek	41.22758	-107.66302	BLM
334	Upper Twin Pit		Continental	BLM-RFO	Sediment	Dry	No	015N	093W	33	Lower Barrel Springs Draw	41.23026	-107.86459	BLM
335	Red Gulch Detention Dam		Mexican Flats	BLM-RFO		Wet	Yes	015N	093W	36	Muddy Creek-Blue Gap Draw	41.23187	-107.80612	State Of Wyoming
336			Willow Creek	BLM-RFO	No Visible Reservoir	N/A	No	015N	094W	31	Lower Willow Creek	41.23211	-108.01582	BLM
337	Cheatgrass Pit	2010	Cherokee	BLM-RFO		Dry	Yes	015N	091W	33	Cherokee Creek	41.23443	-107.64650	BLM
338	Center Reservoir 15	2010	Cherokee	BLM-RFO		Dry	Yes	015N	091W	33	Cherokee Creek	41.23482	-107.63537	BLM
339	Cherokee Cr No2 Res	2010	Cherokee	BLM-RFO		Wet	Yes	015N	090W	31	Cherokee Creek	41.23492	-107.56853	BLM
340	Detention Dam 1592 2		Big Robber	BLM-RFO		Wet	Yes	015N	092W	33	Muddy Creek-Robber's Gulch	41.23502	-107.75685	BLM
341	Haystack Reservoir		Willow Creek	BLM-RFO		Wet	Yes	015N	094W	30	Lower Willow Creek	41.23655	-108.01541	BLM
342	Lowa Herold&Weber Re		Continental	BLM-RFO		Wet	Yes	015N	094W	27	Lower Willow Creek	41.23787	-107.97345	BLM
343	Dead Sheep Pit	2010	Cherokee	BLM-RFO		Wet	Yes	015N	091W	27	Cherokee Creek	41.24002	-107.61638	BLM
344	Detention Dam 1593 3		Continental	BLM-RFO		Dry	Yes	015N	093W	28	Windmill Draw	41.24401	-107.87894	BLM
345	So Fork Cherokee Res	2010	Cherokee	BLM-RFO	Breached	Dry	No	015N	091W	25	Cherokee Creek	41.24444	-107.57814	BLM
346	Cherokee Cr Res #1		Cherokee	BLM-RFO		Wet	Yes	015N	090W	27	Cherokee Creek	41.24602	-107.50624	BLM
347	Blue Gap Res Pit		Mexican Flats	BLM-RFO		Wet	Yes	015N	092W	29	Muddy Creek-Blue Gap Draw	41.24625	-107.77698	BLM
348	Flat Top Reservoir 1		Continental	BLM-RFO		Wet	Yes	015N	093W	27	Lower Barrel Springs Draw	41.24636	-107.84795	BLM
349	Red Gulch Detent Dam		Mexican Flats	BLM-RFO		Wet	Yes	015N	092W	29	Muddy Creek-Blue Gap Draw	41.24758	-107.77446	BLM
350	East Of Playa Pit	2010	Cherokee	BLM-RFO		Wet	Yes	015N	091W	26	Cherokee Creek	41.24738	-107.59215	BLM
351	S Fork Cherokee Res	2010	Cherokee	BLM-RFO		Wet	Yes	015N	090W	20	Cherokee Creek	41.25184	-107.54884	BLM
352			Willow Creek	BLM-RFO	No Visible Reservoir	N/A	No	015N	095W	22	Upper Willow Creek	41.25249	-108.07889	BLM
353	Upper Painted Pit		Continental	BLM-RFO		Wet	Yes	015N	093W	22	Windmill Draw	41.25334	-107.84729	BLM
354	Red Gulch Detent Dam		Mexican Flats	BLM-RFO		Wet	Yes	015N	092W	21	Muddy Creek-Blue Gap Draw	41.25354	-107.74781	BLM
355	Continental Res #6		Continental	BLM-RFO	No Visible Reservoir	N/A	No	015N	094W	24	Windmill Draw	41.25450	-107.93055	BLM
356	Five Coyote Reservoi		Continental	BLM-RFO		Wet	Yes	015N	093W	21	Windmill Draw	41.25585	-107.86827	BLM
357	Detention Dam 1593 2		Continental	BLM-RFO		Wet	Yes	015N	093W	20	Windmill Draw	41.25621	-107.88403	BLM
358	Sage Tick Reservoir		Continental	BLM-RFO	Sediment	Dry	No	015N	093W	21	Windmill Draw	41.25754	-107.86964	BLM
359	Boundary Line Reserv		Willow Creek	BLM-RFO		Wet	Yes	015N	095W	20	Upper Willow Creek	41.25891	-108.12245	BLM
360	Pit Reservoir 1591 2	2010	Cherokee	BLM-RFO		Wet	Yes	015N	091W	22	Wild Cow Creek	41.26140	-107.62873	BLM
361	Wildfire Res	2010	Cherokee	BLM-RFO		Wet	Yes	015N	090W	21	Cherokee Creek	41.26120	-107.51912	BLM
362	Blue Gap Pit		Cherokee	BLM-RFO		Wet	Yes	015N	092W	23	Muddy Creek-Blue Gap Draw	41.26261	-107.71422	BLM
363	Continental Res #4		Continental	BLM-RFO		Wet	Yes	015N	093W	20	Windmill Draw	41.26290	-107.89689	BLM
364	Wild Cow Ridge Res	2010	Cherokee	BLM-RFO	Breached	Dry	No	015N	091W	24	Wild Cow Creek	41.26286	-107.58924	BLM
365	Lower Painted Pit		Continental	BLM-RFO	Sediment	Dry	No	015N	093W	22	Windmill Draw	41.26382	-107.85689	BLM
366	Plugged Well Pit/Res	2010	Cherokee	BLM-RFO		Wet	Yes	015N	091W	14	Wild Cow Creek	41.26498	-107.60989	BLM
367	Wc Fence Corner Res	2010	Cherokee	BLM-RFO		Wet	Yes	015N	090W	18	Wild Cow Creek	41.26594	-107.57232	BLM
368	South Fork Seep Res	2010	Wild Cow	BLM-RFO		Wet	Yes	015N	090W	15	Wild Cow Creek	41.26629	-107.50466	BLM
369	Red Lake Reservoir		South Barrel	BLM-RFO		Wet	Yes	015N	093W	15	Windmill Draw	41.26740	-107.84390	BLM
370	South Barrel Pit #4		South Barrel	BLM-RFO		Wet	Yes	015N	093W	15	Windmill Draw	41.26767	-107.84174	BLM
371	Blank Reservoir		Willow Creek	BLM-RFO		Wet	Yes	015N	095W	18	Lower Haystack Wash	41.26895	-108.13943	BLM
372	Salazar Res		Willow Creek	BLM-RFO		Wet	Yes	015N	095W	15	Upper Willow Creek	41.27051	-108.07462	BLM
373	Courthouse Reservoir		Willow Creek	BLM-RFO		Wet	Yes	015N	095W	16	Upper Willow Creek	41.27100	-108.10461	BLM
374	Dad Larsen Det Dam 1		Mexican Flats	BLM-RFO		Wet	Yes	015N	093W	14	Lower Barrel Springs Draw	41.27160	-107.82477	BLM
375	Pit Reservoir 1593 5		South Barrel	BLM-RFO		Wet	Yes	015N	093W	18	Windmill Draw	41.27112	-107.90640	BLM
376	High Plains Pit		South Barrel	BLM-RFO		Wet	Yes	015N	093W	18	Windmill Draw	41.27347	-107.90866	BLM
377	Fall Reservoir	2010	West Wild Cow	BLM-RFO	Sediment	Dry	No	015N	090W	17	Wild Cow Creek	41.27437	-107.55268	BLM
378	Dad Dail Detention D		Willow Creek	BLM-RFO		Wet	Yes	015N	094W	13	Windmill Draw	41.27572	-107.92832	BLM
379	Reservoir 1591 1	2010	Cherokee	BLM-RFO		Wet	Yes	015N	091W	15	Wild Cow Creek	41.27616	-107.62806	BLM
380	Wild Cow Spring Resv	2010	Wild Cow	BLM-RFO		Wet	Yes	015N	090W	12	Wild Cow Creek	41.27941	-107.47746	BLM
381	Hard Pan Res		Mexican Flats	BLM-RFO		Wet	Yes	015N	092W	8	Muddy Creek-Blue Gap Draw	41.27987	-107.77923	BLM
382	Weber Reservoir	2010	Wild Cow	BLM-RFO		Wet	Yes	015N	090W	12	Wild Cow Creek	41.28023	-107.46221	BLM
383	Badland Hwy Res		Mexican Flats	BLM-RFO		Wet	Yes	015N	092W	10	Muddy Creek-Blue Gap Draw	41.28035	-107.73338	BLM
384			Willow Creek	BLM-RFO	No Visible Reservoir	N/A	No	015N	095W	9	Upper Willow Creek	41.28253	-108.09530	BLM
385	Little Cow Creek Pit	2010	Cherokee	BLM-RFO		Wet	Yes	015N	091W	8	Cow Creek	41.28454	-107.66123	BLM
386	Shale Point Reservoi		Willow Creek	BLM-RFO	Breached	Dry	No	015N	094W	9	Windmill Draw	41.28911	-107.98500	BLM
387	Horse Pasture Pit	2010	Wild Cow	BLM-RFO		Wet	Yes	015N	089W	7	Wild Cow Creek	41.28915	-107.45033	BLM
388	Chicken Poop Pit		South Barrel	BLM-RFO		Wet	Yes	015N	093W	8	Windmill Draw	41.29187	-107.89059	BLM
389	South Muddy Pit 2		South Muddy	BLM-RFO		Wet	Yes	015N	092W	11	Muddy Creek-Blue Gap Draw	41.29230	-107.72267	BLM
390	Wild Cow Shared Res	2010	Wild Cow	BLM-RFO		Wet	Yes	015N	090W	11	Wild Cow Creek	41.29311	-107.47908	BLM

Little Snake River / Vermillion Creek Watershed: Stock Reservoir Database

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	BLM Comment	BLM Inspection			Comment	Water Condition	Water Source							
391	Needs Legalized		South Muddy	BLM-RFO		Dry	Yes	015N	092W	1	Muddy Creek-Blue Gap Draw	41.29363	-107.70617	BLM
392	Mollys Nip Reservoir		Willow Creek	BLM-RFO	No Visible Reservoir	N/A	No	015N	095W	5	West Branch Willow Creek	41.29503	-108.11526	BLM
393	North Cherokee Res	2010	Cherokee	BLM-RFO		Dry	Yes	015N	091W	2	Wild Cow Creek	41.29555	-107.59486	BLM
394	Dutch John Stk Res		South Muddy	BLM-RFO		Wet	Yes	015N	092W	3	Muddy Creek-Blue Gap Draw	41.29692	-107.73022	BLM
395	Tricorner Reservoir	2010	Deep Gulch	BLM-RFO		Dry	Yes	015N	090W	6	Wild Cow Creek	41.29734	-107.56224	BLM
396	Diversion Pit		South Barrel	BLM-RFO		Wet	Yes	015N	093W	3	Windmill Draw	41.29805	-107.85871	BLM
397	Needs Legalized		West Wild Cow	BLM-RFO	Sediment	Dry	No	015N	090W	4	Wild Cow Creek	41.29838	-107.53511	BLM
398	Wingditch Pit		South Barrel	BLM-RFO		Wet	Yes	015N	093W	4	Windmill Draw	41.29863	-107.87534	BLM
399	Wild Cow Art. Res	2010	Cherokee	BLM-RFO		Wet	Yes	015N	091W	2	Wild Cow Creek	41.29868	-107.60940	BLM
400	South Grizzly Res	2010	Grizzly	BLM-RFO		Wet	Yes	015N	089W	5	Little Savery Creek	41.29918	-107.43389	BLM
401	Detention Dam 1594 3		Willow Creek	BLM-RFO		Wet	Yes	015N	094W	4	Windmill Draw	41.29955	-107.98051	BLM
402	Standard Road Res 2		Mexican Graves	BLM-RFO		Dry	Yes	015N	092W	6	Lower Barrel Springs Draw	41.29993	-107.79759	BLM
403	Needs Legalized		Hartt Creek	BLM-RFO		Wet	Yes	015N	088W	2	Upper Savery Creek	41.29988	-107.25160	BLM
404	Cow Creek Pit	2010	Cherokee	BLM-RFO		Wet	Yes	015N	091W	4	Cow Creek	41.30110	-107.63349	BLM
405	East Playa Pit		East Muddy	BLM-RFO		Wet	Yes	015N	091W	6	Cow Creek	41.30122	-107.67497	BLM
406	Needs Legalized		Hartt Creek	BLM-RFO		Wet	Yes	015N	088W	2	Upper Savery Creek	41.30256	-107.25657	BLM
407	Standard Road Res 1		Mexican Graves	BLM-RFO		Wet	Yes	015N	092W	5	Muddy Creek-Blue Gap Draw	41.30289	-107.77525	BLM
408	Ketchum Buttes Res 1	2010	Wild Cow	BLM-RFO		Dry	Yes	015N	089W	6	Wild Cow Creek	41.30434	-107.45013	BLM
409	South Muddy Hwy Pit		East Muddy	BLM-RFO	No Visible Reservoir	N/A	No	015N	092W	3	Muddy Creek-Blue Gap Draw	41.30442	-107.74097	BLM
410	Wild Cow Ridge Res 1	2010	West Wild Cow	BLM-RFO		Dry	Yes	015N	090W	5	Wild Cow Creek	41.30524	-107.54697	BLM
411	Retention Reservoir		East Muddy	BLM-RFO		Dry	Yes	015N	091W	6	Muddy Creek-Blue Gap Draw	41.30540	-107.68226	BLM
412	Deep Draw Res		West Wild Cow	BLM-RFO		Dry	Yes	015N	090W	4	Wild Cow Creek	41.30650	-107.53094	BLM
413	Mexican Flats Reserv		Mexican Graves	BLM-RFO		Wet	Yes	016N	093W	33	Windmill Draw	41.30859	-107.86805	BLM
414	Wild Cow Spring Pit		Wild Cow	BLM-RFO		Wet	Yes	016N	090W	34	Wild Cow Creek	41.31167	-107.51158	BLM
415	Niland Reservoir No1		East Muddy	BLM-RFO		Wet	Yes	016N	092W	35	Muddy Creek-Blue Gap Draw	41.31196	-107.71630	BLM
416	Niland Reservoir #3		East Muddy	BLM-RFO		Wet	Yes	016N	092W	36	Muddy Creek-Blue Gap Draw	41.31247	-107.70542	BLM
417	Deep Gulch Res	2010	Deep Gulch	BLM-RFO		Dry	Yes	016N	090W	31	Cow Creek	41.31338	-107.57102	BLM
418	South Border Pit		Mexican Graves	BLM-RFO		Dry	Yes	016N	093W	35	Windmill Draw	41.31558	-107.83742	BLM
419	Needs Authorized	2010	Grizzly	BLM-RFO		Wet	Yes	016N	089W	33	Little Savery Creek	41.31647	-107.42167	BLM
420	Steep Draw Reservoir	2010	Deep Gulch	BLM-RFO		Wet	Yes	016N	090W	34	Cow Creek	41.31695	-107.51446	BLM
421	Stratton Reservoir		Willow Creek	BLM-RFO		Wet	Yes	016N	095W	31	West Branch Willow Creek	41.31731	-108.12770	BLM
422	Niland Reservoir No2		East Muddy	BLM-RFO		Dry	Yes	016N	092W	35	Muddy Creek-Blue Gap Draw	41.31767	-107.71166	BLM
423			Willow Creek	BLM-RFO	No Visible Reservoir	N/A	No	016N	095W	31	West Branch Willow Creek	41.31915	-108.13029	BLM
424	Needs Authorized		Wild Cow	BLM-RFO		Wet	Yes	016N	090W	35	Wild Cow Creek	41.31966	-107.48092	BLM
425	Needs Legalized		Mexican Graves	BLM-RFO	Wetlands?	Wet	Yes	016N	092W	31	Lower Barrel Springs Draw	41.32052	-107.78751	BLM
426	Northwest Border Pit		East Muddy	BLM-RFO		Wet	Yes	016N	092W	34	Muddy Creek-Blue Gap Draw	41.32140	-107.74504	BLM
427	Lone Pit		Mexican Graves	BLM-RFO		Wet	Yes	016N	093W	25	Lower Barrel Springs Draw	41.32270	-107.80583	BLM
428	State			BLM-RFO		Wet	Yes	016N	089W	29	Wild Cow Creek	41.32299	-107.44160	State Of Wyoming
429	Mccarty Canyon Pit 1		Grizzly	BLM-RFO	No Visible Reservoir	N/A	No	016N	089W	25	Little Savery Creek	41.32361	-107.35814	BLM
430	Ne Gully Pit		East Muddy	BLM-RFO		Wet	Yes	016N	092W	25	Dry Cow Creek	41.32424	-107.68870	BLM
431			Willow Creek	BLM-RFO	No Visible Reservoir	N/A	No	016N	095W	27	West Branch Willow Creek	41.32530	-108.07743	BLM
432	Brood Rearing Pond		Grizzly	BLM-RFO		Wet	Yes	016N	089W	27	Little Savery Creek	41.32553	-107.40526	BLM
433	Eureka Pit Reservoir		Doty Mountain	BLM-RFO		Wet	Yes	016N	092W	28	Muddy Creek-Blue Gap Draw	41.32642	-107.75686	BLM
434	Needs Authorized		Grizzly	BLM-RFO		Wet	Yes	016N	090W	25	Wild Cow Creek	41.32663	-107.47021	BLM
435	Pit Reservoir 1694 1		South Laclede	BLM-RFO		Dry	Yes	016N	094W	27	Windmill Draw	41.32736	-107.95532	BLM
436	Mexican Flats Res 1		Mexican Graves	BLM-RFO		Wet	Yes	016N	093W	29	Windmill Draw	41.32750	-107.88026	BLM
437	Retention Reservoir		Willow Creek	BLM-RFO		Dry	Yes	016N	095W	25	West Branch Willow Creek	41.32854	-108.04532	BLM
438	Nine Horse Reservoir		South Laclede	BLM-RFO		Wet	Yes	016N	094W	28	Windmill Draw	41.32862	-107.98272	BLM
439	Draw Reservoir		South Laclede	BLM-RFO		Wet	Yes	016N	094W	26	Windmill Draw	41.33037	-107.94199	BLM
440	Adobe Cove Pit		Mexican Graves	BLM-RFO	No Visible Reservoir	N/A	No	016N	092W	30	Lower Barrel Springs Draw	41.33029	-107.78740	BLM
441	State			BLM-RFO		Wet	Yes	016N	089W	29	Wild Cow Creek	41.33095	-107.43129	State Of Wyoming
442				BLM-RFO		Wet	Yes	016N	089W	29	Wild Cow Creek	41.33121	-107.43986	State Of Wyoming
443	Ketchum Buttes Res11		Grizzly	BLM-RFO		Wet	Yes	016N	089W	27	Little Savery Creek	41.33179	-107.39411	BLM
444	Private			BLM-RFO		Dry	Yes	016N	089W	25	Little Savery Creek	41.33376	-107.35980	State Of Wyoming: WGF
445	Private			BLM-RFO		Wet	Yes	016N	089W	25	Little Savery Creek	41.33420	-107.36675	State Of Wyoming: WGF
446	Windmill Draw Pit		Mexican Graves	BLM-RFO		Wet	Yes	016N	094W	25	Windmill Draw	41.33489	-107.92987	BLM
447			Willow Creek	BLM-RFO	No Visible Reservoir	N/A	No	016N	095W	25	West Branch Willow Creek	41.33520	-108.03810	BLM
448	J O Reservoir 10	2010	Deep Gulch	BLM-RFO	No Visible Reservoir	N/A	No	016N	090W	30	Cow Creek	41.33552	-107.57325	BLM
449			Willow Creek	BLM-RFO	No Visible Reservoir	N/A	No	016N	095W	25	West Branch Willow Creek	41.33601	-108.04466	BLM
450	Pit Reservoir 1691-1		Doty Mountain	BLM-RFO		Dry	Yes	016N	091W	30	Dry Cow Creek	41.33636	-107.67797	BLM
451	Needs Legalized		Willow Creek	BLM-RFO	No Visible Reservoir	N/A	No	016N	095W	26	West Branch Willow Creek	41.33661	-108.05126	BLM
452	Crosby Reservoir		Willow Creek	BLM-RFO		Wet	Yes	016N	095W	27	West Branch Willow Creek	41.33748	-108.07855	BLM
453	Garden Spring Res	2010	Deep Gulch	BLM-RFO		Wet	Yes	016N	090W	20	Cow Creek	41.34049	-107.55091	BLM
454	Ketchum Buttes Res 8		Grizzly	BLM-RFO		Wet	Yes	016N	089W	20	Wild Cow Creek	41.34130	-107.43710	BLM
455	Irrigation Ditch Pit		Doty Mountain	BLM-RFO		Wet	Yes	016N	092W	21	Muddy Creek-Antelope Creek	41.34301	-107.76365	BLM

Little Snake River / Vermillion Creek Watershed: Stock Reservoir Database

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	BLM Comment	BLM Inspection			Comment	Water Condition	Water Source							
456	State			BLM-RFO		Wet	Yes	016N	089W	22	Little Savery Creek	41.34327	-107.40259	State Of Wyoming
457	Shallow Creek Reserv		North Barrel	BLM-RFO		Wet	Yes	016N	094W	19	West Branch Willow Creek	41.34448	-108.02644	BLM
458	State			BLM-RFO		Wet	Yes	016N	089W	22	Little Savery Creek	41.34476	-107.40659	State Of Wyoming
459	Ketchum Buttes Res 7		Grizzly	BLM-RFO		Dry	Yes	016N	089W	20	Cow Creek	41.34509	-107.44416	State Of Wyoming
460	Cow Creek Butte Res	2010	Deep Gulch	BLM-RFO		Dry	Yes	016N	090W	21	Cow Creek	41.34562	-107.52521	BLM
461	Mexican Graves Res		Mexican Graves	BLM-RFO		Wet	Yes	016N	093W	19	Windmill Draw	41.34597	-107.90344	BLM
462	State			BLM-RFO	Breached	Dry	No	016N	089W	19	Cow Creek	41.34653	-107.45651	State Of Wyoming
463	Doty Mtn Pothole Bla		Doty Mountain	BLM-RFO		Wet	Yes	016N	091W	22	Dry Cow Creek	41.34884	-107.62410	BLM
464	Needs Legalized		Mexican Graves	BLM-RFO	No Visible Reservoir	N/A	No	016N	093W	20	Windmill Draw	41.34967	-107.89819	BLM
465	Ketchum Buttes Res 6	2010	Grizzly	BLM-RFO		Wet	Yes	016N	090W	24	Cow Creek	41.34985	-107.47524	BLM
466	State			BLM-RFO	Sediment	Dry	No	016N	089W	19	Cow Creek	41.35040	-107.45263	State Of Wyoming
467	Mexican Flats Res 3		Mexican Graves	BLM-RFO		Dry	Yes	016N	093W	22	Windmill Draw	41.35095	-107.84285	BLM
468	Needs Authorized	2010	Grizzly	BLM-RFO		Wet	Yes	016N	090W	23	Cow Creek	41.35144	-107.47890	BLM
469	Needs Authorized		Grizzly	BLM-RFO		Wet	Yes	016N	089W	18	Cow Creek	41.35284	-107.44799	BLM
470	Needs Authorized	2010	Grizzly	BLM-RFO		Wet	Yes	016N	090W	14	Cow Creek	41.35324	-107.48758	BLM
471	Ketchum Buttes Res 5	2010	Grizzly	BLM-RFO		Wet	Yes	016N	090W	13	Cow Creek	41.35460	-107.46745	State Of Wyoming
472	Lower Windmill Res		Mexican Graves	BLM-RFO	Breached	Dry	No	016N	093W	17	Windmill Draw	41.35616	-107.88898	BLM
473	Trash Pit Stk Res		Doty Mountain	BLM-RFO		Wet	Yes	016N	092W	16	Muddy Creek-Antelope Creek	41.35670	-107.74751	BLM
474	Ketchum Buttes Res 3	2010	Grizzly	BLM-RFO		Wet	Yes	016N	089W	18	Cow Creek	41.35801	-107.45456	BLM
475	Ketchum Buttes Res 4		Grizzly	BLM-RFO		Wet	Yes	016N	089W	18	Cow Creek	41.35952	-107.44856	State Of Wyoming: WGF
476	Knobs Pit #1 Stk Res		South Laclede	BLM-RFO		Wet	Yes	016N	094W	14	Lower Barrel Springs Draw	41.35992	-107.93828	BLM
477	Reservoir 1691-B		Doty Mountain	BLM-RFO		Wet	Yes	016N	091W	16	Dry Cow Creek	41.36047	-107.64304	BLM
478	Cowcreek Butte Res 2	2010	Deep Gulch	BLM-RFO		Wet	Yes	016N	090W	15	Cow Creek	41.36195	-107.50964	BLM
479	Ketchum Lake Stock R		Grizzly	BLM-RFO		Wet	Yes	016N	089W	15	Muddy Creek-Littlefield Creek	41.36309	-107.40918	BLM
480	Mexican Flats Res 2		Mexican Graves	BLM-RFO		Wet	Yes	016N	093W	17	Windmill Draw	41.36367	-107.88595	BLM
481	Cedar Flats Res #12		Doty Mountain	BLM-RFO		Wet	Yes	016N	092W	14	Dry Cow Creek	41.36440	-107.71404	BLM
482			North Barrel	BLM-RFO		Wet	Yes	016N	095W	13	West Branch Willow Creek	41.36556	-108.03357	BLM
483	State			BLM-RFO		Wet	Yes	016N	089W	15	Muddy Creek-Littlefield Creek	41.36618	-107.40911	BLM
484	Ketchum Buttes Res 2		Grizzly	BLM-RFO	Looks Like A Reservoir	Dry	No	016N	089W	18	Cow Creek	41.36565	-107.45921	BLM
485	Needs Authorized	2010	Grizzly	BLM-RFO		Dry	Yes	016N	089W	18	Cow Creek	41.36592	-107.45206	BLM
486	Coyote Well Pit		Doty Mountain	BLM-RFO		Wet	Yes	016N	091W	8	Dry Cow Creek	41.36835	-107.65416	BLM
487	Drift Fence Res		Doty Mountain	BLM-RFO		Wet	Yes	016N	091W	10	Dry Cow Creek	41.36887	-107.62562	BLM
488	Compresser Stat Resv		Doty Mountain	BLM-RFO		Wet	Yes	016N	092W	12	Dry Cow Creek	41.37121	-107.69498	BLM
489		2010		BLM-RFO		Wet	Yes	016N	090W	11	Cow Creek	41.37257	-107.49545	BLM
490	Ketchum Buttes Res 1		Grizzly	BLM-RFO		Wet	Yes	016N	089W	9	Muddy Creek-Littlefield Creek	41.37288	-107.42388	BLM
491	State			BLM-RFO		Wet	Yes	016N	089W	8	Muddy Creek-Littlefield Creek	41.37416	-107.43101	State Of Wyoming
492	Hay Gulch Res	2010	Deep Gulch	BLM-RFO		Wet	Yes	016N	090W	8	Cow Creek	41.37443	-107.54830	BLM
493		2010		BLM-RFO	Sediment	Dry	No	016N	090W	11	Cow Creek	41.37516	-107.49724	BLM
494		2010	Deep Gulch	BLM-RFO		Wet	Yes	016N	090W	10	Cow Creek	41.37572	-107.51124	BLM
495	State			BLM-RFO		Wet	Yes	016N	089W	8	Muddy Creek-Littlefield Creek	41.37599	-107.42938	State Of Wyoming
496	Deep Gulch Pond 2&3	2010	Grizzly	BLM-RFO		Wet	Yes	016N	089W	7	Cow Creek	41.37664	-107.45098	BLM
497	Juniper Ridge Res		Doty Mountain	BLM-RFO	No Visible Reservoir	N/A	No	016N	092W	11	Dry Cow Creek	41.37674	-107.71300	BLM
498		2010		BLM-RFO		Wet	Yes	016N	090W	11	Cow Creek	41.37681	-107.49376	BLM
499	Cedar Reservoir 11		Doty Mountain	BLM-RFO	Sediment	Dry	No	016N	092W	9	Muddy Creek-Antelope Creek	41.37744	-107.74962	BLM
500	Needs Authorized	2010	Grizzly	BLM-RFO	Breached	Dry	No	016N	089W	7	Cow Creek	41.37785	-107.45507	BLM
501	Needs Authorized	2010	Grizzly	BLM-RFO	Breached	Dry	No	016N	089W	7	Cow Creek	41.37814	-107.45806	BLM
502	State			BLM-RFO		Wet	Yes	016N	090W	12	Cow Creek	41.37827	-107.47333	State Of Wyoming
503	North Barrel Spr Res		South Laclede	BLM-RFO		Wet	Yes	016N	093W	9	Lower North Barrel Springs Draw	41.37893	-107.87545	BLM
504	Mtn Brush Res	2010	Deep Gulch	BLM-RFO		Wet	Yes	016N	090W	10	Cow Creek	41.37932	-107.49936	BLM
505			Doty Mountain	BLM-RFO	Breached	Dry	No	016N	091W	4	Dry Cow Creek	41.38015	-107.64555	BLM
506	State			BLM-RFO		Wet	Yes	016N	089W	4	Muddy Creek-Littlefield Creek	41.38152	-107.42291	State Of Wyoming
507	East Doty Reservoir		Doty Mountain	BLM-RFO	Breached	Dry	No	016N	091W	3	Dry Cow Creek	41.38179	-107.61347	BLM
508	Needs Authorized		Grizzly	BLM-RFO		Wet	Yes	016N	089W	2	Muddy Creek-Littlefield Creek	41.38405	-107.37848	BLM
509			Doty Mountain	BLM-RFO		Wet	Yes	016N	091W	4	Dry Cow Creek	41.38419	-107.63801	BLM
510	West Of Gdew Pit		Doty Mountain	BLM-RFO		Wet	Yes	016N	093W	1	Coal Gulch-Barrel Springs Draw	41.38495	-107.80241	BLM
511	Canary Grove 1&2		Grizzly	BLM-RFO		Wet	Yes	016N	089W	5	Muddy Creek-Littlefield Creek	41.38512	-107.43590	BLM
512	New Pappy Fry Res		Doty Mountain	BLM-RFO		Wet	Yes	016N	091W	6	Dry Cow Creek	41.38539	-107.68242	BLM
513	Mccarty Canyon Res		Mccarty Canyon	BLM-RFO	Breached	Dry	No	016N	088W	5	Little Savery Creek	41.38576	-107.31094	BLM
514	Rawlins Road Res		Doty Mountain	BLM-RFO		Wet	Yes	016N	091W	2	Dry Cow Creek	41.38700	-107.60393	BLM
515	Dry Cow Flat Res		Doty Mountain	BLM-RFO		Wet	Yes	016N	091W	4	Dry Cow Creek	41.38782	-107.63314	BLM
516	Beaver Dam On Blm			BLM-RFO		Wet	Yes	016N	089W	5	Muddy Creek-Littlefield Creek	41.38862	-107.44225	BLM
517	Beaver Dam On Blm			BLM-RFO		Wet	Yes	016N	089W	5	Muddy Creek-Littlefield Creek	41.38889	-107.44292	BLM
518	Beaver Dam On Blm			BLM-RFO		Wet	Yes	016N	089W	5	Muddy Creek-Littlefield Creek	41.39007	-107.44284	BLM
519	Pole Gulch Res 4	2010	Deep Gulch	BLM-RFO		Wet	Yes	016N	090W	2	Cow Creek	41.39030	-107.48945	Three Forks Ranch Corp
520	Beaver Dam On Blm			BLM-RFO		Wet	Yes	016N	089W	5	Muddy Creek-Littlefield Creek	41.39082	-107.44322	BLM

Little Snake River / Vermillion Creek Watershed: Stock Reservoir Database

GIS IDENT	BLM Database Info		Allotment	Source	ACE Review Notes			Township	Range	Section	Subwatershed (HUC-12)	Lat	Long	Surface Owner
	BLM Comment	BLM Inspection			Comment	Water Condition	Water Source							
521	Beaver Dam On Blm			BLM-RFO		Wet	Yes	016N	089W	5	Muddy Creek-Littlefield Creek	41.39101	-107.44468	BLM
522	Grizzly Past 3 Res		Grizzly	BLM-RFO		Wet	Yes	016N	089W	5	Muddy Creek-Littlefield Creek	41.39278	-107.44058	BLM
523	Needs Legalized		Doty Mountain	BLM-RFO		Wet	Yes	016N	091W	6	Dry Cow Creek	41.39263	-107.68647	BLM
524	G&E Salisbury Reserv		Deep Gulch	BLM-RFO		Wet	Yes	016N	090W	3	Cow Creek	41.39392	-107.50848	BLM
525	Upper Cow Creek Res	2010	Deep Gulch	BLM-RFO		Wet	Yes	016N	090W	2	Cow Creek	41.39472	-107.48024	BLM
526	Upper Brazell Res		Doty Mountain	BLM-RFO		Wet	Yes	016N	091W	3	Dry Cow Creek	41.39565	-107.62488	BLM
527	Sand Road Reservoir		Doty Mountain	BLM-RFO		Wet	Yes	016N	091W	2	Dry Cow Creek	41.39710	-107.60698	BLM
528	Clay Flat Reservoir		Doty Mountain	BLM-RFO		Wet	Yes	016N	093W	1	Coal Gulch-Barrel Springs Draw	41.39769	-107.81425	BLM
529	Pole Gulch Res 1		Grizzly	BLM-RFO		Wet	Yes	017N	089W	31	Muddy Creek-Littlefield Creek	41.39921	-107.45309	BLM
530	Wallow Reservoir		Sage Creek	BLM-RFO		Wet	Yes	017N	087W	32	North Fork Savery Creek	41.40071	-107.22493	BLM
531	Needs Authorized		Grizzly	BLM-RFO		Wet	Yes	017N	088W	31	Muddy Creek-Littlefield Creek	41.40089	-107.35918	BLM
532	State			BLM-RFO	Sediment	Dry	No	017N	089W	36	Muddy Creek-Littlefield Creek	41.40118	-107.37492	State Of Wyoming
533	Slippery Slope Stk R		South Laclede	BLM-RFO		Dry	Yes	017N	094W	34	Lower Barrel Springs Draw	41.40412	-107.97803	BLM
534	Upper Pappy Fry Res		Doty Mountain	BLM-RFO		Wet	Yes	017N	091W	31	Dry Cow Creek	41.40458	-107.69181	BLM
535	Leaky Reservoir		Doty Mountain	BLM-RFO		Wet	Yes	017N	092W	32	Muddy Creek-Antelope Creek	41.40789	-107.79232	BLM
536	Little Draw Pit		North Barrel	BLM-RFO		Wet	Yes	017N	095W	36	Lower Barrel Springs Draw	41.40872	-108.06018	BLM
537	Doty Reservoir 7		Doty Mountain	BLM-RFO		Wet	Yes	017N	091W	32	Dry Cow Creek	41.40886	-107.66414	BLM
538	State			BLM-RFO	Sediment	Dry	No	017N	089W	36	Muddy Creek-Littlefield Creek	41.40968	-107.36594	State Of Wyoming
539	Littlefield Res.		Grizzly	BLM-RFO	Breached	Dry	No	017N	089W	35	Muddy Creek-Littlefield Creek	41.40975	-107.38345	BLM
540	Needs Authorized		Grizzly	BLM-RFO		Wet	Yes	017N	089W	32	Muddy Creek-Littlefield Creek	41.41051	-107.44533	BLM
541	Elect Well Reservoir		Doty Mountain	BLM-RFO		Wet	Yes	017N	092W	34	Muddy Creek-Antelope Creek	41.41036	-107.74053	BLM
542	West Doty Res #2		Doty Mountain	BLM-RFO		Wet	Yes	017N	093W	36	Coal Gulch-Barrel Springs Draw	41.41093	-107.81834	BLM
543	Private			BLM-RFO		Wet	Yes	017N	088W	30	Muddy Creek-Littlefield Creek	41.41168	-107.35095	State Of Wyoming: WGF
544	East Dry Cow Res 6		Doty Mountain	BLM-RFO		Wet	Yes	017N	091W	26	Dry Cow Creek	41.41248	-107.61648	BLM
545	Aspen Grove Res		Sulphur Springs	BLM-RFO		Dry	Yes	017N	090W	26	Muddy Creek-Littlefield Creek	41.41276	-107.49026	BLM
546	Private			BLM-RFO		Wet	Yes	017N	088W	30	Muddy Creek-Littlefield Creek	41.41265	-107.35865	State Of Wyoming: WGF
547	La Clede Res No 2		South Laclede	BLM-RFO		Wet	Yes	017N	093W	26	Coal Gulch-Barrel Springs Draw	41.41254	-107.84704	BLM
548	Pole Gulch Res 2		Grizzly	BLM-RFO		Wet	Yes	017N	089W	30	Muddy Creek-Littlefield Creek	41.41294	-107.45971	BLM
549	State			BLM-RFO		Dry	Yes	017N	089W	25	Muddy Creek-Littlefield Creek	41.41529	-107.36184	State Of Wyoming
550	Weber Reservoir #3		Doty Mountain	BLM-RFO		Wet	Yes	017N	091W	30	Dry Cow Creek	41.41647	-107.68698	BLM
551	Wooden Barrel Pit		Deep Gulch	BLM-RFO		Wet	Yes	017N	090W	30	Dry Cow Creek	41.41812	-107.57406	BLM
552	Needs Authorized		Grizzly	BLM-RFO		Wet	Yes	017N	089W	29	Muddy Creek-Littlefield Creek	41.41897	-107.43453	BLM
553	Bear Gulch Reservoir	2010	Deep Gulch	BLM-RFO		Wet	Yes	017N	090W	28	Cow Creek	41.41924	-107.53170	BLM
554	Cresent Pit		Sulphur Springs	BLM-RFO		Wet	Yes	017N	090W	26	Muddy Creek-Littlefield Creek	41.42083	-107.49554	BLM
555	Four Forks Reservoir		Sulphur Springs	BLM-RFO		Wet	Yes	017N	089W	30	Muddy Creek-Littlefield Creek	41.42114	-107.45905	BLM
556	Olson Well Reservoir		Doty Mountain	BLM-RFO		Wet	Yes	017N	091W	28	Dry Cow Creek	41.42081	-107.64266	BLM
557	Cottonwood Pit	2010	Deep Gulch	BLM-RFO		Wet	Yes	017N	090W	29	Cow Creek	41.42179	-107.55344	BLM
558	Closed Road Pit		Sulphur Springs	BLM-RFO		Wet	Yes	017N	090W	25	Muddy Creek-Littlefield Creek	41.42276	-107.47169	BLM
559	State			BLM-RFO		Wet	Yes	017N	089W	25	Muddy Creek-Littlefield Creek	41.42536	-107.36269	State Of Wyoming
560	Dry Cow Res/Fence	2010	Deep Gulch	BLM-RFO		Wet	Yes	017N	091W	25	Dry Cow Creek	41.42502	-107.60284	BLM
561	Branding Corral Res	2010	Doty Mountain	BLM-RFO		Wet	Yes	017N	091W	25	Dry Cow Creek	41.42620	-107.59295	BLM
562	Road Draw Reservoir		Sulphur Springs	BLM-RFO		Wet	Yes	017N	089W	20	Muddy Creek-Littlefield Creek	41.42690	-107.44745	BLM
563	West Doty Res #5		Doty Mountain	BLM-RFO		Wet	Yes	017N	092W	20	Muddy Creek-Antelope Creek	41.42702	-107.78566	BLM
564	Mckiel Pasture Pit		Sulphur Springs	BLM-RFO		Wet	Yes	017N	089W	20	Muddy Creek-Littlefield Creek	41.43057	-107.43478	BLM
565	Buck Spr Draw Res		Sulphur Springs	BLM-RFO		Wet	Yes	017N	090W	23	Muddy Creek-Littlefield Creek	41.43095	-107.49935	BLM
566	Pit Reservoir 1795 B		North Barrel	BLM-RFO		Wet	Yes	017N	095W	22	Upper Barrel Springs Draw	41.43356	-108.08486	BLM
567	Pipe Spring Pit	2010	Deep Gulch	BLM-RFO		Wet	Yes	017N	090W	21	Dry Cow Creek	41.43414	-107.53779	BLM
568	Olson Reservoir		Doty Mountain	BLM-RFO		Wet	Yes	017N	091W	22	Dry Cow Creek	41.43466	-107.62916	BLM
569	Needs Legalized		Doty Mountain	BLM-RFO	Sediment	Dry	No	017N	092W	16	Muddy Creek-Antelope Creek	41.44104	-107.77617	BLM
570	Overland #1 Stk Res		South Laclede	BLM-RFO		Wet	Yes	017N	094W	14	Lower North Barrel Springs Draw	41.44305	-107.96349	BLM
571	S Baldy Butte Res		Doty Mountain	BLM-RFO		Wet	Yes	017N	092W	14	Muddy Creek-Antelope Creek	41.44400	-107.72274	BLM
572	Dry Cow Reservoir		Doty Mountain	BLM-RFO		Wet	Yes	017N	091W	14	Dry Cow Creek	41.44392	-107.61450	BLM
573	Weber Reservoir #2		Doty Mountain	BLM-RFO		Wet	Yes	017N	091W	16	Dry Cow Creek	41.44581	-107.65978	BLM
574	Weber Reservoir #1		Doty Mountain	BLM-RFO		Wet	Yes	017N	091W	16	Dry Cow Creek	41.44590	-107.65744	BLM
575	Enberg Res		Sulphur Springs	BLM-RFO		Wet	Yes	017N	089W	18	Muddy Creek-Littlefield Creek	41.44926	-107.45299	BLM
576	Little Basin Pit		Sulphur Springs	BLM-RFO		Wet	Yes	017N	090W	14	Muddy Creek-Littlefield Creek	41.45090	-107.49226	BLM
577	West Doty Res #3		Doty Mountain	BLM-RFO	Sediment	Dry	No	017N	093W	14	Coal Gulch-Barrel Springs Draw	41.45222	-107.84155	BLM
578	Pit Reservoir 1795 A		North Barrel	BLM-RFO		Wet	Yes	017N	095W	14	Upper Barrel Springs Draw	41.45277	-108.07499	BLM
579	The Boy Pit		North Barrel	BLM-RFO		Wet	Yes	017N	095W	16	Upper Barrel Springs Draw	41.45488	-108.11370	BLM
580	Washout Road Pit		Sulphur Springs	BLM-RFO		Wet	Yes	017N	089W	8	Muddy Creek-Littlefield Creek	41.45497	-107.44641	BLM
581	Salt Bush Flat Res		Doty Mountain	BLM-RFO	Breached	Dry	No	017N	092W	9	Muddy Creek-Antelope Creek	41.45523	-107.77269	Weber Ranch Co
582	Big Basin Pit		Sulphur Springs	BLM-RFO		Wet	Yes	017N	089W	7	Muddy Creek-Littlefield Creek	41.45638	-107.45947	BLM
583	Big Flat Pit		Doty Mountain	BLM-RFO	Sediment	Dry	No	017N	093W	12	Coal Gulch-Barrel Springs Draw	41.45682	-107.81635	BLM
584	Doty-Overland Res		Doty Mountain	BLM-RFO	Sediment	Dry	No	017N	092W	8	Muddy Creek-Antelope Creek	41.45761	-107.79135	BLM
585	West Doty Res #4		Doty Mountain	BLM-RFO		Wet	Yes	017N	093W	10	Coal Gulch-Barrel Springs Draw	41.45773	-107.86059	BLM

Little Snake River / Vermillion Creek Watershed: Stock Reservoir Database

GIS IDENT	BLM Database Info		Allotment	Source	ACE Review Notes			Township	Range	Section	Subwatershed (HUC-12)	Lat	Long	Surface Owner
	BLM Comment	BLM Inspection			Comment	Water Condition	Water Source							
586	Needs Legalized		Doty Mountain	BLM-RFO		Dry	Yes	017N	093W	12	Coal Gulch-Barrel Springs Draw	41.45809	-107.82967	BLM
587	Pit Reservoir 1795 C		North Barrel	BLM-RFO		Dry	Yes	017N	095W	7	Upper Barrel Springs Draw	41.45791	-108.14228	Stratton Sheep Co
588	Pine Grove Res 1		Grizzly	BLM-RFO		Wet	Yes	017N	088W	8	McKinney Creek	41.45972	-107.33067	BLM
589	Pine Butte Reservoir	2010	North Pine Butte	BLM-RFO		Wet	Yes	017N	092W	10	Muddy Creek-Antelope Creek	41.45976	-107.74879	BLM
590	Pine Grove Res 2		Grizzly	BLM-RFO		Wet	Yes	017N	088W	8	McKinney Creek	41.46017	-107.32527	BLM
591	Beaver Dam			BLM-RFO		Wet	Yes	017N	088W	8	McKinney Creek	41.46030	-107.33325	BLM
592	Pine Grove Res 5		Grizzly	BLM-RFO		Wet	Yes	017N	088W	9	McKinney Creek	41.46278	-107.31777	BLM
593	Quit Claim Reservoir		Doty Mountain	BLM-RFO		Wet	Yes	017N	092W	8	Muddy Creek-Antelope Creek	41.46380	-107.79075	BLM
594	Pine Grove Res 4		Grizzly	BLM-RFO		Wet	Yes	017N	088W	9	McKinney Creek	41.46379	-107.31873	BLM
595	Pine Grove Res 6		Grizzly	BLM-RFO		Wet	Yes	017N	088W	9	McKinney Creek	41.46394	-107.31311	BLM
596	Willow Springs Res		Sulphur Springs	BLM-RFO		Wet	Yes	017N	090W	8	Muddy Creek-Alamosa Gulch	41.46456	-107.55649	BLM
597	West Doty Res #1		Doty Mountain	BLM-RFO		Wet	Yes	017N	093W	12	Coal Gulch-Barrel Springs Draw	41.46892	-107.82912	BLM
598	Dinky Pit Stock Res		Deep Gulch	BLM-RFO		Dry	Yes	017N	091W	12	Muddy Creek-Alamosa Gulch	41.46942	-107.59651	BLM
599	Jeep Res		Sulphur Springs	BLM-RFO		Wet	Yes	017N	089W	6	Muddy Creek-Littlefield Creek	41.47055	-107.46596	BLM
600	Bridger Road Pit		Sulphur Springs	BLM-RFO	Sediment	Dry	No	017N	090W	2	Muddy Creek-Alamosa Gulch	41.47473	-107.49012	BLM
601	West End Res		Sulphur Springs	BLM-RFO		Wet	Yes	017N	090W	6	Muddy Creek-Alamosa Gulch	41.47782	-107.56824	BLM
602	Adams Pit 1		North Laclede	BLM-RFO		Wet	Yes	017N	094W	6	Lower North Barrel Springs Draw	41.47923	-108.03666	BLM
603	Barrel Pit		North Barrel	BLM-RFO		Wet	Yes	017N	095W	2	Lower North Barrel Springs Draw	41.48535	-108.07362	BLM
604	Private		Sulphur Springs	BLM-RFO	Breached	Dry	No	018N	090W	35	Muddy Creek-Alamosa Gulch	41.48537	-107.50363	Jack Creek Land And Cattle Company
605	Laclede Boundary Res		South Laclede	BLM-RFO		Wet	Yes	018N	094W	36	Lower North Barrel Springs Draw	41.48638	-107.94414	BLM
606	Upper Soap Hole Res	2010	Echo Springs	BLM-RFO		Wet	Yes	018N	092W	34	Muddy Creek-Antelope Creek	41.49315	-107.74241	BLM
607	Needs Legalized		North Laclede	BLM-RFO		Wet	Yes	018N	094W	36	Lower North Barrel Springs Draw	41.49350	-107.94649	BLM
608	Stage #1 Stock Res	2010	Badwater	BLM-RFO		Wet	Yes	018N	091W	32	Muddy Creek-Alamosa Gulch	41.49355	-107.66795	BLM
609	Ruins #1 Stock Res	2010	Badwater	BLM-RFO		Dry	Yes	018N	091W	32	Muddy Creek-Alamosa Gulch	41.49474	-107.67821	BLM
610	Middle Hay Gulch Pit		Sulphur Springs	BLM-RFO		Dry	Yes	018N	090W	34	Muddy Creek-Alamosa Gulch	41.49602	-107.51260	BLM
611	Coal Gulch Res #1		South Laclede	BLM-RFO	No Visible Reservoir	N/A	No	018N	093W	34	Coal Gulch-Barrel Springs Draw	41.49745	-107.86987	BLM
612	Man And The Boy Pit		Tipton	BLM-RFO	Breached	Dry	No	018N	096W	36	Upper North Barrel Springs Draw	41.49825	-108.17033	BLM
613	South Echo Res #1		Echo Springs	BLM-RFO		Wet	Yes	018N	092W	30	Coal Gulch-Barrel Springs Draw	41.49968	-107.79653	BLM
614	Lower Hay Gulch Res		Sulphur Springs	BLM-RFO		Dry	Yes	018N	090W	28	Muddy Creek-Alamosa Gulch	41.50020	-107.53587	BLM
615	Badwater Res #13	2010	Badwater	BLM-RFO		Dry	Yes	018N	091W	30	Muddy Creek-Alamosa Gulch	41.50017	-107.68388	BLM
616	South Echo Res #2		Echo Springs	BLM-RFO	Breached	Dry	No	018N	092W	28	Muddy Creek-Antelope Creek	41.50024	-107.76188	BLM
617	Coal Gulch No2 Res		Echo Springs	BLM-RFO	Breached	Dry	No	018N	093W	26	Coal Gulch-Barrel Springs Draw	41.50225	-107.85243	BLM
618	Sulphur Reservoir 4		Sulphur Springs	BLM-RFO		Dry	Yes	018N	090W	30	Muddy Creek-Alamosa Gulch	41.50704	-107.57445	BLM
619	North Hay Gulch Res		Sulphur Springs	BLM-RFO	Sediment	Dry	No	018N	090W	26	Muddy Creek-Alamosa Gulch	41.50724	-107.50009	BLM
620	Double Cove Res	2009	Echo Springs	BLM-RFO		Wet	Yes	018N	092W	26	Muddy Creek-Antelope Creek	41.50747	-107.72658	BLM
621	Badwater Res #11	2010	Badwater	BLM-RFO		Wet	Yes	018N	091W	28	Muddy Creek-Alamosa Gulch	41.50779	-107.65195	BLM
622	Delaney Rim Pit		North Barrel	BLM-RFO		Dry	Yes	018N	095W	26	Upper North Barrel Springs Draw	41.51024	-108.08094	BLM
623	Snowshoe Canyon Res	2010	Fillmore	BLM-RFO		Wet	Yes	018N	090W	26	Muddy Creek-Alamosa Gulch	41.51189	-107.50691	BLM
624	Badwater Res #14	2010	Badwater	BLM-RFO	No Visible Reservoir	N/A	No	018N	091W	30	Muddy Creek-Antelope Creek	41.51300	-107.68872	BLM
625	Twelve Mile Pit		North Laclede	BLM-RFO		Wet	Yes	018N	093W	30	Coal Bank Lake	41.51365	-107.91812	BLM
626	Olson Draw Res 5		Fillmore	BLM-RFO		Wet	Yes	018N	091W	25	Muddy Creek-Alamosa Gulch	41.51432	-107.60200	Weber Ranch Co
627	Badwater Res #10	2010	Badwater	BLM-RFO		Wet	Yes	018N	091W	22	Muddy Creek-Alamosa Gulch	41.51448	-107.64098	BLM
628	Badwater Res #8	2010	Badwater	BLM-RFO		Dry	Yes	018N	091W	20	Muddy Creek-Alamosa Gulch	41.51672	-107.67438	BLM
629	Miller Hill Res		Pine Grove/Bolten	BLM-RFO		Wet	Yes	018N	089W	22	McKinney Creek	41.52108	-107.40835	BLM
630	Adams Pit 2		North Laclede	BLM-RFO		Wet	Yes	018N	094W	20	Red Lakes	41.52111	-108.02559	BLM
631	Middle Fork Res 2		Fillmore	BLM-RFO		Wet	Yes	018N	090W	22	Muddy Creek-Alamosa Gulch	41.52217	-107.51173	BLM
632	Badwater #9 Stk Res	2010	Badwater	BLM-RFO		Dry	Yes	018N	091W	22	Muddy Creek-Alamosa Gulch	41.52438	-107.64007	BLM
633	Eagle Creek Res		Pine Grove/Bolten	BLM-RFO		Wet	Yes	018N	089W	22	McKinney Creek	41.52622	-107.41099	BLM
634	Upper Coal Gulch Res	2009	Echo Springs	BLM-RFO		Wet	Yes	018N	092W	22	Coal Gulch-Barrel Springs Draw	41.52684	-107.75522	BLM
635	South Echo Res #3		Echo Springs	BLM-RFO		Wet	Yes	018N	092W	18	Coal Gulch-Barrel Springs Draw	41.53218	-107.79769	BLM
636	Badwater Res #7	2010	Badwater	BLM-RFO		Wet	Yes	018N	091W	18	Muddy Creek-Antelope Creek	41.53255	-107.68403	BLM
637	Holler Reservoir 1		Fillmore	BLM-RFO		Wet	Yes	018N	090W	14	Muddy Creek-Alamosa Gulch	41.53505	-107.49886	BLM
638	Bridgerpass Res #3		Pine Grove/Bolten	BLM-RFO		Wet	Yes	018N	089W	8	McKinney Creek	41.54326	-107.43635	BLM
639	Two Draw Reservoir		North Barrel	BLM-RFO		Wet	Yes	018N	095W	8	Upper North Barrel Springs Draw	41.54543	-108.12973	BLM
640	Bypassed Stock Res		Pine Grove/Bolten	BLM-RFO		Wet	Yes	018N	089W	8	McKinney Creek	41.54621	-107.43801	BLM
641	Rabbit Brush Pit		Tipton	BLM-RFO		Wet	Yes	018N	096W	10	Upper North Barrel Springs Draw	41.54828	-108.20102	BLM
642	Red Lake Pit		North Laclede	BLM-RFO	Sediment	Dry	No	018N	094W	8	Red Lakes	41.55575	-108.00920	BLM
643	Stratton Nw Pit		North Barrel	BLM-RFO		Dry	Yes	018N	095W	6	Upper North Barrel Springs Draw	41.56605	-108.15622	BLM
644	Red Flat Pit		North Laclede	BLM-RFO		Wet	Yes	019N	095W	36	Red Lakes	41.57914	-108.06395	BLM
645	Jolley Pit		North Laclede	BLM-RFO		Wet	Yes	019N	095W	28	Red Lakes	41.59071	-108.10440	BLM
646				NAIP	Cow Creek Reservoir	Wet	Yes	014N	098W	35	Shell Creek-Cow Creek Reservoir	41.14930	-108.41404	Raftopoulos Brothers Livestock
647			Cow Creek	NAIP		Wet	Yes	014N	098W	17	Shell Creek-Cow Creek Reservoir	41.18399	-108.45338	BLM
648			Cow Creek	BLM-RFO		Wet	Yes	014N	097W	13	Upper Skull Creek-Sand Creek	41.19109	-108.26280	BLM
649				NAIP		Dry	Yes	012N	096W	14	Powder Wash-Horse Draw	41.00612	-108.18432	Salisbury Livestock Co.
650				NAIP		Dry	Yes	012N	101W	20	Lower Canyon Creek-Vermillion Creek	41.00354	-108.79840	BLM

Little Snake River / Vermillion Creek Watershed: Stock Reservoir Database

GIS IDENT	BLM Database Info		Allotment	Source	ACE Review Notes			Township	Range	Section	Subwatershed (HUC-12)	Lat	Long	Surface Owner
	BLM Comment	BLM Inspection			Comment	Water Condition	Water Source							
651			Cherokee Trail	NAIP	Large Embankment	Wet	Yes	012N	095W	8	Powder Wash-East Fork Anthill Draw	41.02775	-108.11447	BLM
652				NAIP/TOPO		Wet	Yes	012N	094W	10	Little Snake River-West Fork Cherokee Creek	41.02626	-107.97172	BLM
653				NAIP/TOPO		Wet	Yes	012N	087W	8	Little Snake River-Roaring Fork	41.02563	-107.20409	Usfs
654				NAIP/TOPO		Wet	Yes	012N	087W	8	Little Snake River-Roaring Fork	41.02363	-107.19623	Medicine Bow Inc. C/O Salisbury Georoge
655				NAIP		Dry	Yes	015N	090W	32	Cherokee Creek	41.23003	-107.54937	Three Forks Ranch Corp
656				NAIP		Dry	Yes	012N	096W	19	Powder Wash-Horse Draw	41.00164	-108.24897	BLM
657				NAIP		Wet	Yes	012N	103W	22	Upper Canyon Creek	41.00504	-108.99054	State Of Wyoming
658				NAIP		Wet	Yes	012N	103W	22	Upper Canyon Creek	41.00695	-108.99257	State Of Wyoming
659				NAIP		Wet	Yes	012N	103W	22	Upper Canyon Creek	41.00261	-108.99099	BLM
660				NAIP		Wet	Yes	012N	103W	23	Upper Canyon Creek	41.01158	-108.98091	Vermillion Ranch Ltd Part
661				NAIP		Wet	Yes	012N	103W	23	Upper Canyon Creek	41.01074	-108.97921	Vermillion Ranch Ltd Part
662				NAIP		Wet	Yes	012N	101W	23	Lower Canyon Creek-Vermillion Creek	41.00408	-108.75503	BLM
663				NAIP	Sediment	Dry	No	012N	100W	18	Horseshoe Wash	41.00815	-108.70636	BLM
664				NAIP		Wet	Yes	012N	095W	20	Powder Wash-Horse Draw	41.00152	-108.12579	BLM
665				NAIP		Wet	Yes	012N	090W	14	Little Snake River-Dutch Joe Creek	41.00578	-107.47914	Three Forks Ranch Corp
666				NAIP/TOPO		Wet	Yes	012N	087W	15	Little Snake River-Roaring Fork	41.00694	-107.17069	Medicine Bow Inc. C/O Salisbury Georoge
667				NAIP		Wet	Yes	012N	087W	13	Little Snake River-Roaring Fork	41.00638	-107.12606	Usfs
668				NAIP		Wet	Yes	012N	087W	14	Little Snake River-Roaring Fork	41.01542	-107.13873	Usfs
669				NAIP/TOPO		Wet	Yes	012N	087W	11	Little Snake River-Roaring Fork	41.01907	-107.14684	Stratton Sheep Company
670				NAIP		Wet	Yes	012N	087W	14	Little Snake River-Roaring Fork	41.01103	-107.14570	Reidy
671				NAIP/TOPO		Wet	Yes	012N	087W	15	Little Snake River-Roaring Fork	41.01546	-107.15892	Medicine Bow Inc. C/O Salisbury Georoge
672				NAIP/TOPO		Wet	Yes	012N	087W	15	Little Snake River-Roaring Fork	41.01288	-107.16999	Medicine Bow Inc.
673				NAIP/TOPO		Wet	Yes	012N	087W	9	Little Snake River-Roaring Fork	41.01854	-107.17862	Medicine Bow Inc. C/O Salisbury Georoge
674				NAIP/TOPO		Wet	Yes	012N	087W	9	Little Snake River-Roaring Fork	41.02063	-107.18092	Medicine Bow Inc. C/O Salisbury Georoge
675				NAIP/TOPO		Wet	Yes	012N	087W	10	Little Snake River-Roaring Fork	41.02083	-107.17306	Medicine Bow Inc. C/O Salisbury Georoge
676				NAIP/TOPO		Wet	Yes	012N	087W	9	Little Snake River-Roaring Fork	41.01996	-107.18782	Medicine Bow Inc. C/O Salisbury Georoge
677				NAIP/TOPO		Wet	Yes	012N	087W	8	Little Snake River-Roaring Fork	41.01902	-107.20514	Medicine Bow Inc. C/O Salisbury Georoge
678				NAIP		Wet	Yes	012N	087W	17	Little Snake River-Roaring Fork	41.01749	-107.20229	Medicine Bow Inc. C/O Salisbury Georoge
679				NAIP/TOPO		Wet	Yes	012N	087W	8	Little Snake River-Roaring Fork	41.01872	-107.19528	Medicine Bow Inc. C/O Salisbury Georoge
680				NAIP/TOPO		Wet	Yes	012N	088W	14	Little Snake River-Fly Creek	41.01580	-107.25110	Salisbury Livestock Company
681				NAIP		Wet	Yes	012N	088W	12	Lower Battle Creek	41.01856	-107.23934	Salisbury Livestock Company
682				NAIP		Wet	Yes	012N	088W	17	Little Snake River-Fly Creek	41.01029	-107.32049	C And C Cattle LLC
683				NAIP		Wet	Yes	012N	088W	18	Little Snake River-Fly Creek	41.01745	-107.34148	Battle Mountain Company
684				NAIP/TOPO		Wet	Yes	012N	089W	13	Little Snake River-Fly Creek	41.01557	-107.36028	Mc Kee Cody Franklin
685				NAIP/TOPO		Wet	Yes	012N	090W	17	Willow Creek-Spring Creek	41.00900	-107.55226	Shiner Kirk A And Kristine A
686				NAIP		Wet	Yes	012N	090W	18	Willow Creek-Spring Creek	41.00489	-107.55509	Shiner Kirk A And Kristine A
687				NAIP		Wet	Yes	012N	090W	18	Willow Creek-Spring Creek	41.01416	-107.56204	Shiner Kirk A And Kristine A
688				NAIP/TOPO		Wet	Yes	012N	090W	18	Little Snake River-Cottonwood Creek	41.01792	-107.57264	Montgomery Livestock Company Etal
689				NAIP		Wet	Yes	012N	091W	13	Little Snake River-Cottonwood Creek	41.01381	-107.58657	Roberts James K And Sharon G Co Trustees
690				NAIP/TOPO		Wet	Yes	012N	091W	14	Little Snake River-Cottonwood Creek	41.00808	-107.60026	Purple Sage LLC
691				NAIP/TOPO		Wet	Yes	012N	091W	15	Little Snake River-Cottonwood Creek	41.01046	-107.61509	Purple Sage LLC
692				NAIP/TOPO		Dry	Yes	012N	091W	16	Lower Fourmile Creek	41.00780	-107.64955	State Of Wyoming
693				NAIP		Wet	Yes	012N	091W	17	Little Snake River-Cottonwood Creek	41.01458	-107.65615	Corson Kathleen J Trustee
694				NAIP		Wet	Yes	012N	092W	18	Little Snake River-Thornburgh Gulch	41.01758	-107.80036	Four Mile Livestock Company LLC
695				NAIP		Wet	Yes	012N	097W	14	Powder Wash-Eagle Rock Draw	41.00638	-108.29461	Salisbury Livestock Co
696				NAIP	Sediment	Dry	No	012N	100W	18	Horseshoe Wash	41.01757	-108.70885	BLM
697	Unknown			BLM-RSFO	Sediment	Dry	No	012N	101W	13	Horseshoe Wash	41.02488	-108.73582	BLM
698				NAIP		Wet	Yes	012N	101W	17	Lower Canyon Creek-Vermillion Creek	41.01378	-108.79944	State Of Wyoming
699				NAIP		Wet	Yes	012N	102W	15	Upper Canyon Creek	41.02200	-108.87807	BLM
700				NAIP		Wet	Yes	012N	103W	15	Upper Canyon Creek	41.01911	-108.99922	BLM
701				NAIP		Wet	Yes	012N	103W	10	Vermillion Creek-North Fork Vermillion Creek	41.03478	-108.99608	BLM
702				NAIP		Wet	Yes	012N	103W	11	Vermillion Creek-North Fork Vermillion Creek	41.04144	-108.98208	BLM
703				NAIP		Wet	Yes	012N	102W	11	Upper Canyon Creek	41.02771	-108.86244	Pasin Beverly A & Anthony R
704	outh Horseshoe Reservoir 1			BLM-RSFO		Wet	Yes	012N	101W	5	Horseshoe Wash	41.04567	-108.80987	BLM
705	North Horseshoe Pit			BLM-RSFO		Wet	Yes	013N	101W	32	Vermillion Creek-McKnight Spring	41.06872	-108.80667	BLM
706				NAIP		Wet	Yes	013N	101W	31	Horseshoe Wash	41.05986	-108.83063	BLM
707	Mystery Reservoir			BLM-RSFO		Wet	Yes	013N	102W	34	Horseshoe Wash	41.05829	-108.87923	BLM
708				NAIP		Wet	Yes	013N	103W	36	Vermillion Creek-North Fork Vermillion Creek	41.06127	-108.96614	BLM
709				NAIP		Wet	Yes	013N	101W	27	Vermillion Creek-McKnight Spring	41.07908	-108.77074	BLM
710				NAIP		Wet	Yes	013N	101W	18	Vermillion Creek-North Fork Vermillion Creek	41.10715	-108.82518	Vermillion Ranch Ltd Part
711	Snowstorm Reservoir			BLM-RSFO		Dry	Yes	013N	101W	13	Vermillion Creek-McKnight Spring	41.10526	-108.73025	BLM
712				NAIP/TOPO	Sediment	Dry	No	013N	101W	4	Vermillion Creek-McKnight Spring	41.13731	-108.78428	BLM
713	Unknown			BLM-RSFO		Dry	Yes	014N	101W	36	Lower Alkali Creek-Vermillion Creek	41.14382	-108.73227	State Of Wyoming
714				NAIP		Wet	Yes	012N	099W	10	Shell Creek-Crooked Wash	41.02198	-108.53406	BLM
715				NAIP/TOPO	Sediment	Dry	No	012N	103W	3	Vermillion Creek-North Fork Vermillion Creek	41.05353	-108.99198	State Of Wyoming

Little Snake River / Vermillion Creek Watershed: Stock Reservoir Database

GIS IDENT	BLM Database Info		Allotment	Source	ACE Review Notes			Township	Range	Section	Subwatershed (HUC-12)	Lat	Long	Surface Owner
	BLM Comment	BLM Inspection			Comment	Water Condition	Water Source							
716				NAIP/TOPO		Dry	Yes	013N	102W	9	Vermillion Creek-North Fork Vermillion Creek	41.11975	-108.90618	BLM
717	Guy T Rife Well And Tank			BLM-RSFO	Sediment	Dry	No	013N	101W	9	Vermillion Creek-McKnight Spring	41.11440	-108.79070	BLM
718				NAIP/TOPO	Sediment	Dry	No	012N	087W	15	Little Snake River-Roaring Fork	41.00687	-107.16419	Medicine Bow Inc C/O Salisbury George
719				NAIP/TOPO	Breached	Dry	No	012N	091W	15	Little Snake River-Cottonwood Creek	41.01049	-107.62371	Purple Sage LLC
720				NAIP/TOPO		Wet	Yes	012N	091W	18	Lower Fourmile Creek	41.00691	-107.68587	Lee H B Family Limited Partnership
721				NAIP/TOPO		Dry	Yes	012N	092W	14	Little Snake River-Thornburgh Gulch	41.01211	-107.71420	BLM
722				NAIP/TOPO		Wet	Yes	012N	095W	17	Powder Wash-East Fork Anthill Draw	41.01841	-108.12532	BLM
723				NAIP/TOPO	Oxbow Lake	Wet	Yes	012N	093W	8	Little Snake River-West Fork Cherokee Creek	41.01929	-107.88102	State Of Wyoming
724				NAIP/TOPO		Wet	Yes	012N	091W	8	Little Snake River-Cottonwood Creek	41.03183	-107.65715	Buchanan Edward N And Karen L
725				NAIP/TOPO		Wet	Yes	012N	089W	11	Little Snake River-Fly Creek	41.02526	-107.36811	C And C Cattle LLC
726				NAIP/TOPO		Dry	Yes	012N	088W	9	Little Snake River-Fly Creek	41.02760	-107.30667	USFS
727				NAIP/TOPO		Wet	Yes	012N	088W	11	Lower Battle Creek	41.02423	-107.25743	USFS
728				NAIP/TOPO		Wet	Yes	012N	088W	12	Lower Battle Creek	41.02684	-107.24033	USFS
729				NAIP/TOPO		Wet	Yes	012N	087W	9	Little Snake River-Roaring Fork	41.02947	-107.17775	USFS
730				NAIP/TOPO		Wet	Yes	012N	087W	12	Little Snake River-Roaring Fork	41.02955	-107.12186	Stratton Sheep Company
731				NAIP/TOPO		Wet	Yes	012N	086W	7	Little Snake River-Roaring Fork	41.02985	-107.09896	USFS
732				NAIP/TOPO	Breached	Dry	No	012N	086W	7	Little Snake River-Roaring Fork	41.02804	-107.10433	USFS
733				NAIP/TOPO		Wet	Yes	012N	086W	7	Little Snake River-Roaring Fork	41.02935	-107.10117	USFS
734				NAIP/TOPO		Wet	Yes	012N	086W	7	Little Snake River-Roaring Fork	41.02399	-107.10792	USFS
735				NAIP		Wet	Yes	012N	086W	8	Little Snake River-Roaring Fork	41.02618	-107.09514	USFS
736				NAIP/TOPO		Wet	Yes	012N	086W	10	Little Snake River-Roaring Fork	41.01953	-107.05924	Three Forks Ranch Corp
737				NAIP/TOPO		Wet	Yes	012N	086W	15	Little Snake River-Roaring Fork	41.01769	-107.05246	Three Forks Ranch Corp
738				NAIP/TOPO		Wet	Yes	012N	086W	11	North Fork Little Snake River	41.02390	-107.03265	Mattern Mary Lou
739				NAIP/TOPO	Sediment	Dry	No	012N	086W	11	North Fork Little Snake River	41.02270	-107.02818	Mattern Mary Lou
740				NAIP/TOPO		Wet	Yes	012N	086W	6	Little Snake River-Roaring Fork	41.04275	-107.09802	USFS
741				NAIP/TOPO		Wet	Yes	012N	086W	6	Little Snake River-Roaring Fork	41.03443	-107.11229	USFS
742				NAIP/TOPO		Wet	Yes	012N	086W	6	Little Snake River-Roaring Fork	41.03603	-107.09842	USFS
743				NAIP/TOPO		Wet	Yes	012N	087W	2	Little Snake River-Roaring Fork	41.04389	-107.13656	Stratton Sheep Company
744				NAIP		Wet	Yes	012N	087W	2	Little Snake River-Roaring Fork	41.04095	-107.13560	Stratton Sheep Company
745				NAIP/TOPO		Wet	Yes	012N	087W	2	Little Snake River-Roaring Fork	41.03567	-107.15312	Stratton Sheep Company
746				NAIP		Wet	Yes	012N	087W	2	Little Snake River-Roaring Fork	41.03374	-107.15412	USFS
747				NAIP/TOPO		Wet	Yes	012N	087W	5	Lower Battle Creek	41.03921	-107.19284	USFS
748	Grieve Reservoir			NAIP/TOPO		Wet	Yes	012N	088W	5	Little Snake River-Fly Creek	41.03657	-107.31503	BLM
749				NAIP/TOPO		Wet	Yes	012N	090W	5	Little Snake River-Cottonwood Creek	41.03809	-107.54469	Dillon Martha Ann And
750				NAIP/TOPO		Wet	Yes	012N	090W	5	Little Snake River-Cottonwood Creek	41.03295	-107.53787	Waldron Mary F Trustee
751				NAIP/TOPO		Dry	Yes	012N	091W	2	Little Snake River-Cottonwood Creek	41.04138	-107.60548	Gallenbeck John F And Donnalie
752				NAIP/TOPO		Dry	Yes	012N	091W	2	Little Snake River-Cottonwood Creek	41.04172	-107.60880	Waldron Mary F Trustee
753				NAIP/TOPO		Wet	Yes	012N	095W	2	Little Snake River-West Fork Cherokee Creek	41.04329	-108.05742	Sheehan Michael R
754				NAIP/TOPO		Dry	Yes	012N	099W	3	Shell Creek-Crooked Wash	41.04311	-108.54710	Vermillion Ranch Ltd Part
755				NAIP/TOPO		Dry	Yes	013N	095W	36	Little Snake River-West Fork Cherokee Creek	41.05068	-108.04959	BLM
756				NAIP/TOPO		Wet	Yes	013N	091W	31	Little Snake River-Cottonwood Creek	41.05240	-107.67928	Battle Mountain Company
757				NAIP/TOPO		Dry	Yes	013N	091W	32	Little Snake River-Cottonwood Creek	41.06071	-107.66671	BLM
758				NAIP/TOPO		Wet	Yes	013N	091W	32	Little Snake River-Cottonwood Creek	41.05792	-107.65721	Wille Lesa Lee And William Ronald
759				NAIP/TOPO		Wet	Yes	013N	090W	31	Little Snake River-Cottonwood Creek	41.05007	-107.56948	Sheehan Velma M
760				NAIP/TOPO		Dry	Yes	013N	090W	33	Little Snake River-Cottonwood Creek	41.05619	-107.53487	Sheehan Brett And C/O Sheehan Velma Cotton
761				NAIP/TOPO		Wet	Yes	013N	090W	36	Little Snake River-Dutch Joe Creek	41.04973	-107.47621	State Of Wyoming
762				NAIP/TOPO		Wet	Yes	013N	089W	35	Little Snake River-Dutch Joe Creek	41.05550	-107.36826	Page Martha S Trustee
763				NAIP		Wet	Yes	013N	089W	35	Little Snake River-Dutch Joe Creek	41.05158	-107.37810	Page Martha S Trustee
764				NAIP/TOPO		Wet	Yes	013N	088W	31	Little Snake River-Dutch Joe Creek	41.04800	-107.34417	C And C Cattle LLC
765				NAIP/TOPO		Wet	Yes	013N	089W	36	Little Snake River-Dutch Joe Creek	41.04947	-107.35081	State Of Wyoming
766				NAIP/TOPO		Wet	Yes	013N	088W	34	Lower Savery Creek	41.05917	-107.28271	Kaisler Trevor N And Linda
767				NAIP/TOPO		Wet	Yes	013N	088W	35	Lower Battle Creek	41.05391	-107.26474	USFS
768				NAIP/TOPO		Wet	Yes	013N	088W	35	Lower Battle Creek	41.05328	-107.25529	Webb Charles A And Jill K
769				NAIP		Wet	Yes	013N	088W	31	Lower Savery Creek	41.05735	-107.33252	State Of Wyoming
770				NAIP		Wet	Yes	013N	088W	32	Lower Savery Creek	41.05779	-107.32527	State Of Wyoming
771				NAIP		Wet	Yes	013N	089W	9	Lower Savery Creek	41.11890	-107.40341	Raught Ranches LLC
772				NAIP		Wet	Yes	014N	092W	17	Muddy Creek-Robber's Gulch	41.18895	-107.77482	BLM
773				NAIP		Wet	Yes	014N	092W	17	Muddy Creek-Robber's Gulch	41.18926	-107.77552	BLM
774				NAIP		Wet	Yes	018N	091W	30	Muddy Creek-Alamosa Gulch	41.50091	-107.68442	BLM
775				NAIP		Wet	Yes	012N	091W	18	Lower Fourmile Creek	41.01094	-107.67652	Adams, Stephen F & Carolyn L.
776				NAIP		Wet	Yes	012N	087W	11	Little Snake River-Roaring Fork	41.02639	-107.15325	USFS
777				NAIP		Wet	Yes	012N	087W	10	Little Snake River-Roaring Fork	41.01857	-107.16988	Medicine Bow Inc C/O Salisbury George
778				NAIP		Wet	Yes	012N	088W	11	Lower Battle Creek	41.03190	-107.25114	USFS
779				NAIP		Wet	Yes	012N	088W	12	Lower Battle Creek	41.02978	-107.25052	USFS
780				NAIP/TOPO	Sediment	Dry	No	012N	088W	11	Little Snake River-Fly Creek	41.02156	-107.26529	USFS

Little Snake River / Vermillion Creek Watershed: Stock Reservoir Database

GIS IDENT	BLM Database Info		Allotment	Source	ACE Review Notes			Township	Range	Section	Subwatershed (HUC-12)	Lat	Long	Surface Owner
	BLM Comment	BLM Inspection			Comment	Water Condition	Water Source							
781				NAIP		Wet	Yes	012N	090W	12	Little Snake River-Dutch Joe Creek	41.02996	-107.46668	Cobb Cattle Company C/O Galloway Frank Eldor
782				NAIP		Wet	Yes	012N	090W	11	Little Snake River-Dutch Joe Creek	41.03059	-107.48984	Three Forks Ranch Corp
783				NAIP		Wet	Yes	012N	090W	2	Little Snake River-Dutch Joe Creek	41.03348	-107.48390	Three Forks Ranch Corp
784				NAIP		Wet	Yes	012N	090W	2	Little Snake River-Dutch Joe Creek	41.03618	-107.48320	Three Forks Ranch Corp
785				NAIP		Wet	Yes	012N	090W	2	Little Snake River-Dutch Joe Creek	41.03477	-107.49677	Three Forks Ranch Corp
786				NAIP		Wet	Yes	012N	090W	8	Willow Creek-Spring Creek	41.01967	-107.54587	Montgomery Livestock Company Etal
787				NAIP		Wet	Yes	012N	091W	12	Little Snake River-Cottonwood Creek	41.02646	-107.58723	Purple Sage LLC
788				NAIP		Wet	Yes	012N	091W	8	Little Snake River-Cottonwood Creek	41.03053	-107.65049	Grieve Thomas Patrick And Anita Lynn
789				NAIP		Wet	Yes	012N	092W	12	Little Snake River-Cottonwood Creek	41.02170	-107.70583	Four Mile Livestock Company LLC
790				NAIP		Wet	Yes	012N	095W	14	Little Snake River-West Fork Cherokee Creek	41.01858	-108.06213	BLM
791				NAIP	Sediment	Dry	No	012N	096W	16	Powder Wash-Horse Draw	41.01383	-108.21931	State Of Wyoming
792				NAIP		Wet	Yes	012N	090W	9	Little Snake River-Cottonwood Creek	41.02349	-107.53018	Raught Ranches LLC
793				NAIP/TOPO		Wet	Yes	012N	087W	3	Little Snake River-Roaring Fork	41.04202	-107.16570	USFS
794				NAIP		Wet	Yes	012N	087W	3	Little Snake River-Roaring Fork	41.04496	-107.15662	USFS
795				NAIP		Wet	Yes	012N	087W	2	Little Snake River-Roaring Fork	41.04263	-107.15268	USFS
796				NAIP		Wet	Yes	013N	087W	34	Lower Battle Creek	41.04855	-107.16904	USFS
797				NAIP		Wet	Yes	013N	087W	33	Lower Battle Creek	41.04776	-107.18079	USFS
798				NAIP		Wet	Yes	012N	089W	3	Little Snake River-Dutch Joe Creek	41.04389	-107.38571	Webb Charles A And Jill K
799				NAIP		Wet	Yes	013N	089W	34	Little Snake River-Dutch Joe Creek	41.04785	-107.38860	State Of Wyoming
800				NAIP		Wet	Yes	012N	090W	2	Little Snake River-Dutch Joe Creek	41.03998	-107.49380	Three Forks Ranch Corp
801				NAIP		Wet	Yes	012N	090W	5	Little Snake River-Cottonwood Creek	41.04496	-107.54184	Sheehan Brett And C/O Sheehan Velma Cotton
802				NAIP		Wet	Yes	012N	091W	1	Little Snake River-Cottonwood Creek	41.04213	-107.57929	Shepard Troy A And Andrea M Trustees
803				NAIP		Wet	Yes	012N	091W	2	Little Snake River-Cottonwood Creek	41.03914	-107.59756	Risner Jack E
804				NAIP		Wet	Yes	013N	098W	34	Shell Creek-Long Ridge Reservoir	41.06211	-108.42200	Raftopoulos Brothers Livestock
805				NAIP		Wet	Yes	013N	092W	32	Little Snake River-Thornburgh Gulch	41.04918	-107.77253	Sheehan Brett And C/O Sheehan Velma Cotton
806				NAIP		Wet	Yes	013N	091W	32	Little Snake River-Cottonwood Creek	41.04755	-107.66835	Criswell Harry Dennis And
807				NAIP		Wet	Yes	013N	091W	32	Little Snake River-Cottonwood Creek	41.05481	-107.65851	Wille Lesa Lee And William Ronald
808				NAIP		Wet	Yes	013N	090W	32	Little Snake River-Cottonwood Creek	41.05411	-107.55011	Sheehan Brett And C/O Sheehan Velma Cotton
809				NAIP		Dry	Yes	013N	089W	31	Little Snake River-Dutch Joe Creek	41.05244	-107.45750	Lee H B Family Limited Partnership
810				NAIP		Wet	Yes	013N	089W	31	Little Snake River-Dutch Joe Creek	41.06078	-107.44724	Stocks Bo Jason
811				NAIP		Wet	Yes	013N	089W	31	Little Snake River-Dutch Joe Creek	41.06108	-107.44621	Stocks Bo Jason
812				NAIP		Wet	Yes	013N	089W	31	Little Snake River-Dutch Joe Creek	41.05819	-107.45246	Lee H B Family Limited Partnership
813				NAIP		Wet	Yes	013N	089W	31	Little Snake River-Dutch Joe Creek	41.05959	-107.45070	Lee H B Family Limited Partnership
814				NAIP		Wet	Yes	013N	089W	31	Little Snake River-Dutch Joe Creek	41.06020	-107.44951	Stocks Bo Jason
815				NAIP	Sediment	Dry	No	013N	089W	32	Lower Savery Creek	41.05807	-107.43285	Page Martha S Trustee
816				NAIP		Wet	Yes	013N	089W	36	Little Snake River-Dutch Joe Creek	41.06075	-107.36196	State Of Wyoming
817				NAIP		Wet	Yes	013N	088W	31	Lower Savery Creek	41.05875	-107.33932	C And C Cattle LLC
818				NAIP		Wet	Yes	013N	088W	29	Lower Savery Creek	41.06149	-107.31222	C And C Cattle LLC
819				NAIP		Wet	Yes	013N	087W	33	Lower Battle Creek	41.05918	-107.18423	USFS
820				NAIP		Wet	Yes	013N	087W	33	Lower Battle Creek	41.05950	-107.18679	USFS
821				NAIP		Wet	Yes	013N	087W	33	Lower Battle Creek	41.05473	-107.18185	USFS
822				NAIP		Wet	Yes	013N	087W	34	Lower Battle Creek	41.05376	-107.17344	USFS
823				NAIP/TOPO		Wet	Yes	012N	086W	4	Little Snake River-Roaring Fork	41.03430	-107.06468	USFS
824				NAIP/TOPO		Wet	Yes	013N	086W	33	Little Snake River-Roaring Fork	41.05038	-107.06275	USFS
825				NAIP/TOPO		Wet	Yes	013N	086W	31	Little Snake River-Roaring Fork	41.04773	-107.11654	USFS
826				NAIP/TOPO		Wet	Yes	013N	087W	35	Little Snake River-Roaring Fork	41.05416	-107.13998	USFS
827				NAIP/TOPO		Wet	Yes	013N	087W	35	Little Snake River-Roaring Fork	41.04934	-107.14395	Stratton Sheep Company
828				NAIP/TOPO		Dry	Yes	013N	088W	35	Lower Battle Creek	41.05873	-107.26199	Kaisler Todd N And Darcy C
829				NAIP/TOPO		Wet	Yes	013N	086W	27	Little Snake River-Roaring Fork	41.06492	-107.05262	USFS
830				NAIP/TOPO		Wet	Yes	013N	086W	29	Little Snake River-Roaring Fork	41.06401	-107.08771	USFS
831				NAIP/TOPO		Wet	Yes	013N	087W	26	Little Snake River-Roaring Fork	41.06163	-107.14625	USFS
832				NAIP/TOPO		Wet	Yes	013N	087W	27	Little Snake River-Roaring Fork	41.06166	-107.15529	USFS
833				NAIP/TOPO		Wet	Yes	013N	087W	27	Little Snake River-Roaring Fork	41.06434	-107.15952	USFS
834				NAIP/TOPO		Wet	Yes	013N	087W	26	Upper Battle Creek	41.06838	-107.15286	USFS
835				NAIP/TOPO		Wet	Yes	013N	087W	29	Lower Battle Creek	41.06397	-107.20379	USFS
836				NAIP		Wet	Yes	013N	087W	28	Lower Battle Creek	41.06609	-107.19287	USFS
837				NAIP		Wet	Yes	013N	088W	23	Lower Battle Creek	41.07658	-107.25288	USFS
838				NAIP		Wet	Yes	013N	088W	25	Lower Battle Creek	41.07590	-107.24907	USFS
839				NAIP		Wet	Yes	013N	088W	23	Lower Battle Creek	41.07681	-107.25586	USFS
840				NAIP/TOPO		Wet	Yes	013N	088W	26	Lower Battle Creek	41.06612	-107.26272	Kaisler Todd N And Darcy C
841				NAIP/TOPO		Wet	Yes	013N	088W	26	Lower Battle Creek	41.06206	-107.25782	State Of Wyoming
842				NAIP		Wet	Yes	013N	088W	27	Lower Savery Creek	41.07492	-107.27052	State Of Wyoming
843				NAIP		Dry	Yes	013N	088W	27	Lower Savery Creek	41.06642	-107.28509	Kaisler Trevor N And Linda
844				NAIP		Wet	Yes	013N	088W	27	Lower Savery Creek	41.07565	-107.28420	State Of Wyoming
845				NAIP		Wet	Yes	013N	088W	28	Lower Savery Creek	41.07296	-107.28941	State Of Wyoming

Little Snake River / Vermillion Creek Watershed: Stock Reservoir Database

GIS IDENT	BLM Database Info		Allotment	Source	ACE Review Notes			Township	Range	Section	Subwatershed (HUC-12)	Lat	Long	Surface Owner
	BLM Comment	BLM Inspection			Comment	Water Condition	Water Source							
846				NAIP		Wet	Yes	013N	088W	28	Lower Savery Creek	41.06868	-107.29439	State Of Wyoming
847				NAIP/TOPO		Wet	Yes	013N	088W	30	Lower Savery Creek	41.07145	-107.33616	C And C Cattle LLC
848				NAIP/TOPO		Wet	Yes	013N	088W	30	Lower Savery Creek	41.06675	-107.33251	C And C Cattle LLC
849				NAIP		Wet	Yes	013N	089W	25	Lower Savery Creek	41.07558	-107.35846	Mc Kee Ned R
850				NAIP		Wet	Yes	013N	089W	26	Lower Savery Creek	41.07480	-107.36627	State Of Wyoming
851				NAIP/TOPO		Wet	Yes	013N	089W	24	Lower Savery Creek	41.07639	-107.35721	C And C Cattle LLC
852				NAIP/TOPO		Wet	Yes	013N	089W	26	Lower Savery Creek	41.06902	-107.36815	State Of Wyoming
853				NAIP		Wet	Yes	013N	089W	29	Little Snake River-Dutch Joe Creek	41.06362	-107.44055	Morgan Samuel D
854				NAIP/TOPO		Wet	Yes	013N	089W	30	Little Snake River-Dutch Joe Creek	41.07280	-107.45451	State Of Wyoming
855				NAIP		Wet	Yes	013N	090W	28	Little Snake River-Cottonwood Creek	41.06957	-107.51927	Ladder Livestock Company LLC
856				NAIP		Wet	Yes	013N	090W	28	Little Snake River-Cottonwood Creek	41.06512	-107.53242	Sheehan Brett And C/O Sheehan Velma Cotton
857				NAIP/TOPO		Wet	Yes	013N	090W	29	Little Snake River-Cottonwood Creek	41.07032	-107.54896	Sheehan Brett And C/O Sheehan Velma Cotton
858				NAIP	Sediment	Dry	No	013N	091W	25	Muddy Creek-Coal Mine Draw	41.06998	-107.58376	Sheehan Brett And C/O Sheehan Velma Cotton
859				NAIP	Sediment	Dry	No	013N	091W	26	Muddy Creek-Coal Mine Draw	41.06258	-107.60637	Crawford Ronald W
860				NAIP		Wet	Yes	013N	091W	26	Muddy Creek-Coal Mine Draw	41.07303	-107.60342	Weber Matthew Lewis And Sherry Leann
861				NAIP		Wet	Yes	013N	091W	28	Muddy Creek-Coal Mine Draw	41.06708	-107.64638	Wille Lesa Lee And William Ronald
862				NAIP		Wet	Yes	013N	091W	29	Little Snake River-Cottonwood Creek	41.06595	-107.66134	Wille Lesa Lee And William Ronald
863				NAIP		Wet	Yes	013N	096W	28	Lower Skull Creek	41.07467	-108.21155	BLM
864				NAIP		Wet	Yes	013N	097W	24	Upper Skull Creek-Sand Creek	41.07702	-108.27053	BLM
865				NAIP		Wet	Yes	013N	097W	28	Upper Skull Creek-Sand Creek	41.06855	-108.32645	BLM
866				NAIP		Wet	Yes	013N	098W	26	Shell Creek-Long Ridge Reservoir	41.07128	-108.40675	Raftopoulos Brothers Livestock
867	Coyote Pack Reservoir			BLM-RSFO		Wet	Yes	013N	099W	28	Shell Creek-Crooked Wash	41.07499	-108.55225	BLM
868	Rough Ride Pit			BLM-RSFO		Wet	Yes	013N	100W	26	Lower Alkali Creek-Vermillion Creek	41.06973	-108.63542	BLM
869	Dry Well Pit			BLM-RSFO		Wet	Yes	013N	100W	29	Vermillion Creek-McKnight Spring	41.07272	-108.68742	BLM
870				NAIP		Wet	Yes	013N	097W	22	Upper Skull Creek-Sand Creek	41.08908	-108.30187	BLM
871				NAIP		Wet	Yes	013N	097W	23	Upper Skull Creek-Sand Creek	41.08502	-108.28852	BLM
872				NAIP		Wet	Yes	013N	093W	22	Red Creek	41.08463	-107.84802	BLM
873				NAIP		Wet	Yes	013N	092W	19	Red Creek	41.08813	-107.80226	BLM
874				NAIP/TOPO		Wet	Yes	013N	092W	24	Cottonwood Creek	41.08861	-107.68876	Lee H B Family Limited Partnership
875				NAIP		Wet	Yes	013N	091W	20	Little Snake River-Cottonwood Creek	41.08467	-107.66709	BLM
876				NAIP	ached, But Holding Wa	Wet	Yes	013N	091W	22	Muddy Creek-Coal Mine Draw	41.07813	-107.62625	Weber Matthew Lewis And Sherry Leann
877				NAIP		Wet	Yes	013N	091W	22	Muddy Creek-Coal Mine Draw	41.07838	-107.62732	Weber Matthew Lewis And Sherry Leann
878				NAIP		Wet	Yes	013N	090W	19	Muddy Creek-Coal Mine Draw	41.09013	-107.56643	Sheehan Brett And C/O Sheehan Velma Cotton
879				NAIP	Sediment	Dry	No	013N	090W	19	Muddy Creek-Coal Mine Draw	41.08445	-107.56328	Sheehan Brett And C/O Sheehan Velma Cotton
880				NAIP		Wet	Yes	013N	090W	20	Little Snake River-Cottonwood Creek	41.08441	-107.54808	Sheehan Brett And C/O Sheehan Velma Cotton
881				NAIP/TOPO		Dry	Yes	013N	090W	20	Little Snake River-Cottonwood Creek	41.07812	-107.53892	Sheehan Brett And C/O Sheehan Velma Cotton
882				NAIP		Dry	Yes	013N	090W	21	Little Snake River-Cottonwood Creek	41.08381	-107.53269	Sheehan Brett And C/O Sheehan Velma Cotton
883				NAIP		Wet	Yes	013N	090W	24	Little Snake River-Dutch Joe Creek	41.08247	-107.47684	Anderson, Stephanie B Trustee
884				NAIP		Wet	Yes	013N	089W	18	Little Snake River-Dutch Joe Creek	41.09136	-107.45314	Cobb Cattle Company C/O Galloway Frank Eldor
885				NAIP		Wet	Yes	013N	089W	19	Little Snake River-Dutch Joe Creek	41.08930	-107.45620	Anderson, Stephanie B Trustee
886				NAIP		Wet	Yes	013N	089W	19	Little Snake River-Dutch Joe Creek	41.08496	-107.45694	Anderson, Stephanie B Trustee
887				NAIP		Wet	Yes	013N	089W	19	Little Snake River-Dutch Joe Creek	41.07883	-107.44257	Nicholson Edward M
888				NAIP		Wet	Yes	013N	089W	20	Little Snake River-Dutch Joe Creek	41.07946	-107.43540	Nicholson Edward M
889				NAIP	Breached	Dry	No	013N	089W	20	Little Snake River-Dutch Joe Creek	41.07920	-107.43629	Nicholson Edward M
890				NAIP		Wet	Yes	013N	089W	20	Lower Savery Creek	41.08740	-107.43267	Nicholson Edward M
891				NAIP		Wet	Yes	013N	089W	24	Lower Savery Creek	41.08993	-107.36160	C And C Cattle LLC
898				NAIP		Wet	Yes	013N	087W	19	Lower Battle Creek	41.07944	-107.21282	USFS
899				NAIP/TOPO		Wet	Yes	013N	087W	23	Upper Battle Creek	41.08374	-107.14332	USFS
900				NAIP/TOPO		Wet	Yes	013N	086W	20	Little Snake River-Roaring Fork	41.08513	-107.07869	USFS
901				NAIP/TOPO		Wet	Yes	013N	086W	20	Little Snake River-Roaring Fork	41.07704	-107.08367	Hill James J Iii And Tracy
902				NAIP		Wet	Yes	013N	086W	13	Little Snake River-Roaring Fork	41.10135	-107.01221	USFS
903				NAIP/TOPO		Wet	Yes	013N	086W	13	North Fork Little Snake River	41.10171	-107.00754	USFS
904				NAIP/TOPO		Wet	Yes	013N	086W	13	Little Snake River-Roaring Fork	41.10283	-107.00560	USFS
905				NAIP		Wet	Yes	013N	087W	13	Upper Battle Creek	41.09594	-107.12120	USFS
906				NAIP/TOPO		Wet	Yes	013N	087W	14	Haggarty Creek	41.09049	-107.14038	USFS
907				NAIP		Wet	Yes	013N	087W	17	Lower Battle Creek	41.10265	-107.21176	USFS
908				NAIP		Wet	Yes	013N	087W	18	Lower Battle Creek	41.09082	-107.21468	USFS
909				NAIP		Wet	Yes	013N	088W	13	Lower Battle Creek	41.09689	-107.24013	Omstrom Lc
910				NAIP/TOPO		Wet	Yes	013N	088W	15	Lower Savery Creek	41.09399	-107.27846	USFS
911				NAIP/TOPO		Wet	Yes	013N	088W	15	Lower Savery Creek	41.10460	-107.28686	USFS
912				NAIP/TOPO		Wet	Yes	013N	088W	16	Lower Savery Creek	41.09498	-107.30312	USFS
913				NAIP/TOPO		Wet	Yes	013N	088W	18	Lower Savery Creek	41.10358	-107.32781	Mc Donough William N Trustee
914				NAIP/TOPO		Wet	Yes	013N	088W	17	Lower Savery Creek	41.10496	-107.32471	USFS
915				NAIP/TOPO		Wet	Yes	013N	088W	17	Lower Savery Creek	41.10272	-107.31494	USFS
916				NAIP/TOPO		Wet	Yes	013N	088W	17	Lower Savery Creek	41.09796	-107.31535	USFS

Little Snake River / Vermillion Creek Watershed: Stock Reservoir Database

GIS IDENT	BLM Database Info		Allotment	Source	ACE Review Notes			Township	Range	Section	Subwatershed (HUC-12)	Lat	Long	Surface Owner
	BLM Comment	BLM Inspection			Comment	Water Condition	Water Source							
917				NAIP		Wet	Yes	013N	089W	16	Lower Savery Creek	41.09427	-107.41272	State Of Wyoming
918				NAIP/TOPO		Wet	Yes	013N	089W	17	Lower Savery Creek	41.09351	-107.43360	Cobb Cattle Company C/O Galloway Frank Eldor
919				NAIP		Wet	Yes	013N	089W	17	Lower Savery Creek	41.10011	-107.43279	Cobb Cattle Company C/O Galloway Frank Eldor
920				NAIP		Wet	Yes	013N	089W	18	Lower Savery Creek	41.09749	-107.44076	Cobb Cattle Company C/O Galloway Frank Eldor
921				NAIP		Dry	Yes	013N	089W	18	Little Snake River-Dutch Joe Creek	41.10316	-107.45293	Cobb Cattle Company C/O Galloway Frank Eldor
922				NAIP		Wet	Yes	013N	089W	18	Little Snake River-Dutch Joe Creek	41.10063	-107.45603	Cobb Cattle Company C/O Galloway Frank Eldor
923				NAIP		Wet	Yes	013N	089W	18	Little Snake River-Dutch Joe Creek	41.10192	-107.45474	Cobb Cattle Company C/O Galloway Frank Eldor
924				NAIP		Wet	Yes	013N	089W	18	Little Snake River-Dutch Joe Creek	41.10385	-107.45233	Cobb Cattle Company C/O Galloway Frank Eldor
925				NAIP/TOPO		Wet	Yes	013N	089W	18	Little Snake River-Dutch Joe Creek	41.09507	-107.45956	State Of Wyoming
926				NAIP		Wet	Yes	013N	090W	13	Little Snake River-Dutch Joe Creek	41.10215	-107.46270	Cobb Cattle Company C/O Galloway Frank Eldor
927				NAIP/TOPO		Wet	Yes	013N	090W	13	Little Snake River-Dutch Joe Creek	41.09605	-107.47235	Cobb Cattle Company C/O Galloway Frank Eldor
928				NAIP		Dry	Yes	013N	090W	15	Little Snake River-Cottonwood Creek	41.09699	-107.50950	Salisbury Livestock Company
929				NAIP/TOPO		Wet	Yes	013N	090W	16	Little Snake River-Cottonwood Creek	41.10095	-107.52841	State Of Wyoming
930				NAIP/TOPO		Wet	Yes	013N	091W	13	Muddy Creek-Coal Mine Draw	41.10307	-107.57730	Weber Matthew Lewis And Sherry Leann
931				NAIP		Wet	Yes	013N	091W	13	Muddy Creek-Coal Mine Draw	41.09380	-107.58182	Weber Matthew Lewis And Sherry Leann
932				NAIP		Wet	Yes	013N	091W	16	Muddy Creek-Coal Mine Draw	41.09895	-107.63312	State Of Wyoming
933				NAIP/TOPO		Dry	Yes	013N	091W	18	Cottonwood Creek	41.10013	-107.67576	BLM
934				NAIP/TOPO	Sediment	Dry	No	013N	091W	17	Cottonwood Creek	41.09861	-107.66888	Four Mile Livestock Company LLC
935				NAIP/TOPO		Wet	Yes	013N	092W	13	Cottonwood Creek	41.09528	-107.69014	Lee H B Family Limited Partnership
936				NAIP		Wet	Yes	013N	092W	13	Cottonwood Creek	41.09514	-107.70121	Lee H B Family Limited Partnership
937				NAIP		Wet	Yes	013N	092W	13	Cottonwood Creek	41.09757	-107.69963	Lee H B Family Limited Partnership
938				NAIP		Wet	Yes	013N	092W	13	Cottonwood Creek	41.09748	-107.69074	Lee H B Family Limited Partnership
939				NAIP		Wet	Yes	013N	092W	14	Red Creek	41.09587	-107.71829	BLM
940				NAIP/TOPO	Strom Reservoir	Wet	Yes	013N	092W	16	Red Creek	41.10211	-107.75275	State Of Wyoming
941				NAIP/TOPO		Wet	Yes	013N	095W	14	Sand Creek-Reader Cabin Draw	41.09778	-108.06559	BLM
942				NAIP		Wet	Yes	013N	097W	15	Upper Skull Creek-Sand Creek	41.09326	-108.31657	BLM
943				NAIP/TOPO		Wet	Yes	013N	099W	15	Shell Creek-Crooked Wash	41.09680	-108.54378	Vermillion Ranch Ltd Part
944	Blowout Pit			BLM-RSFO		Wet	Yes	013N	099W	18	Lower Alkali Creek-Vermillion Creek	41.09510	-108.59264	BLM
945				NAIP/TOPO		Wet	Yes	013N	100W	16	Lower Alkali Creek-Vermillion Creek	41.10315	-108.66610	State Of Wyoming
946				NAIP		Wet	Yes	013N	099W	9	Shell Creek-Crooked Wash	41.10987	-108.56015	BLM
947				NAIP		Wet	Yes	013N	098W	12	Shell Creek-Long Ridge Reservoir	41.11025	-108.37756	Unknown
948				NAIP		Wet	Yes	013N	092W	8	Red Creek	41.11689	-107.78124	BLM
949				NAIP		Dry	Yes	013N	091W	7	Cottonwood Creek	41.10722	-107.67085	Four Mile Livestock Company LLC
950				NAIP		Dry	Yes	013N	091W	7	Cottonwood Creek	41.10606	-107.67687	Four Mile Livestock Company LLC
951				NAIP		Wet	Yes	013N	091W	9	Muddy Creek-Coal Mine Draw	41.10742	-107.63541	H And C LLC
952				NAIP/TOPO		Wet	Yes	013N	091W	11	Deep Creek	41.10833	-107.59418	Weber Matthew Lewis And Sherry Leann
953				NAIP/TOPO		Wet	Yes	013N	091W	12	Deep Creek	41.11366	-107.57667	Weber Matthew Lewis And Sherry Leann
954				NAIP/TOPO		Dry	Yes	013N	090W	7	Muddy Creek-Coal Mine Draw	41.11338	-107.56330	Sheehan Brett And C/O Sheehan Velma Cotton
955				NAIP/TOPO	Breached	Dry	No	013N	090W	10	Little Snake River-Cottonwood Creek	41.11467	-107.50548	BLM
956				NAIP		Wet	Yes	013N	089W	8	Lower Savery Creek	41.10549	-107.43618	Mc Allister Paul D And Frances E
957				NAIP/TOPO	Breached	Dry	No	013N	089W	9	Lower Savery Creek	41.10817	-107.41007	Morgan Samuel D
958				NAIP/TOPO	Breached	Dry	No	013N	089W	9	Lower Savery Creek	41.11163	-107.41487	Morgan Samuel D
959				NAIP		Wet	Yes	013N	089W	10	Lower Savery Creek	41.11598	-107.39347	Raught Ranches LLC
960				NAIP		Wet	Yes	013N	089W	10	Lower Savery Creek	41.11129	-107.39744	Morgan Samuel D
961				NAIP		Wet	Yes	013N	089W	11	Lower Savery Creek	41.11799	-107.36995	Saer Joyce B Trustee
962				NAIP/TOPO		Wet	Yes	013N	088W	9	Little Sandstone Creek	41.11396	-107.29685	USFS
963				NAIP/TOPO		Wet	Yes	013N	088W	10	Little Sandstone Creek	41.11719	-107.28661	USFS
964				NAIP		Wet	Yes	013N	088W	9	Little Sandstone Creek	41.11111	-107.30814	USFS
965				NAIP		Wet	Yes	013N	088W	10	Lower Savery Creek	41.11099	-107.27776	USFS
966				NAIP/TOPO		Wet	Yes	013N	088W	11	Little Sandstone Creek	41.11867	-107.25477	USFS
967				NAIP/TOPO		Wet	Yes	013N	087W	7	Lower Battle Creek	41.10558	-107.22426	USFS
968				NAIP		Wet	Yes	013N	087W	8	Lower Battle Creek	41.10604	-107.20979	USFS
969				NAIP		Wet	Yes	013N	087W	11	Haggarty Creek	41.11446	-107.14997	USFS
970				NAIP/TOPO		Wet	Yes	013N	085W	7	North Fork Little Snake River	41.11196	-106.99591	USFS
971				NAIP		Wet	Yes	013N	085W	8	North Fork Little Snake River	41.10791	-106.96736	USFS
972				NAIP/TOPO		Wet	Yes	013N	086W	3	Upper Battle Creek	41.12230	-107.04584	USFS
973				NAIP/TOPO		Wet	Yes	013N	086W	3	Upper Battle Creek	41.12381	-107.04411	USFS
974				NAIP/TOPO		Wet	Yes	013N	086W	3	Upper Battle Creek	41.12193	-107.04333	USFS
975				NAIP/TOPO		Wet	Yes	013N	086W	2	Upper Battle Creek	41.12325	-107.03825	USFS
976				NAIP/TOPO		Wet	Yes	013N	086W	2	Upper Battle Creek	41.12452	-107.03454	USFS
977				NAIP/TOPO		Wet	Yes	013N	087W	1	Haggarty Creek	41.12002	-107.12688	USFS
978				NAIP		Wet	Yes	013N	087W	3	Little Sandstone Creek	41.12853	-107.16827	Bould Luray LLC
979				NAIP		Wet	Yes	013N	087W	5	Little Sandstone Creek	41.12592	-107.20273	USFS
980				NAIP		Wet	Yes	013N	088W	1	Little Sandstone Creek	41.12222	-107.24076	USFS
981				NAIP		Wet	Yes	013N	088W	2	Little Sandstone Creek	41.12172	-107.26674	USFS

Little Snake River / Vermillion Creek Watershed: Stock Reservoir Database

GIS IDENT	BLM Database Info		Allotment	Source	ACE Review Notes			Township	Range	Section	Subwatershed (HUC-12)	Lat	Long	Surface Owner
	BLM Comment	BLM Inspection			Comment	Water Condition	Water Source							
982				NAIP		Wet	Yes	013N	088W	3	Little Sandstone Creek	41.12123	-107.27404	USFS
983				NAIP		Wet	Yes	013N	088W	2	Little Sandstone Creek	41.12540	-107.25749	USFS
984				NAIP/TOPO		Wet	Yes	013N	088W	4	Little Sandstone Creek	41.12328	-107.30420	USFS
985				NAIP		Wet	Yes	013N	088W	5	Little Sandstone Creek	41.13258	-107.31579	USFS
986				NAIP/TOPO		Wet	Yes	013N	088W	6	Big Sandstone Creek	41.13145	-107.33995	Saer Joyce B Trustee
987				NAIP		Wet	Yes	013N	090W	6	Deep Creek	41.12097	-107.56793	BLM
988				NAIP		Wet	Yes	013N	091W	4	Muddy Creek-Coal Mine Draw	41.11974	-107.63854	H And C LLC
989				NAIP		Wet	Yes	013N	091W	4	Muddy Creek-Coal Mine Draw	41.11980	-107.63421	H And C LLC
990				NAIP		Wet	Yes	013N	097W	6	Shell Creek-Cow Creek Reservoir	41.12535	-108.37586	State Of Wyoming
991				NAIP		Wet	Yes	013N	098W	1	Shell Creek-Cow Creek Reservoir	41.13423	-108.38332	Raftopoulos Brothers Livestock
992				NAIP/TOPO		Wet	Yes	013N	099W	5	Upper Alkali Creek-Vermillion Creek	41.12499	-108.58423	BLM
993	Roadside Pit			BLM-RSFO		Wet	Yes	013N	100W	5	Lower Alkali Creek-Vermillion Creek	41.13171	-108.69550	BLM
994				NAIP		Wet	Yes	014N	100W	36	Upper Alkali Creek-Vermillion Creek	41.13977	-108.61865	State Of Wyoming
995				NAIP/TOPO		Wet	Yes	014N	099W	31	Upper Alkali Creek-Vermillion Creek	41.14665	-108.59393	BLM
996				NAIP		Wet	Yes	014N	099W	32	Upper Alkali Creek-Vermillion Creek	41.14433	-108.56777	State Of Wyoming
997				NAIP		Wet	Yes	014N	098W	35	Shell Creek-Cow Creek Reservoir	41.13885	-108.40134	BLM
998				NAIP		Wet	Yes	014N	098W	35	Shell Creek-Cow Creek Reservoir	41.13967	-108.39567	Raftopoulos Brothers Livestock
999				NAIP		Wet	Yes	014N	098W	36	Shell Creek-Cow Creek Reservoir	41.14065	-108.39493	State Of Wyoming
1000				NAIP		Wet	Yes	014N	098W	35	Shell Creek-Cow Creek Reservoir	41.13785	-108.39814	BLM
1001				NAIP		Dry	Yes	014N	098W	35	Shell Creek-Cow Creek Reservoir	41.14109	-108.40579	BLM
1002				NAIP		Wet	Yes	014N	095W	33	Sand Creek-Reader Cabin Draw	41.13970	-108.10198	BLM
1003				NAIP		Wet	Yes	014N	092W	36	Cottonwood Creek	41.13926	-107.70355	State Of Wyoming
1004				NAIP		Wet	Yes	014N	092W	36	Cottonwood Creek	41.13636	-107.70402	State Of Wyoming
1005				NAIP		Wet	Yes	014N	091W	32	Muddy Creek-Robber's Gulch	41.14004	-107.66355	BLM
1006				NAIP		Wet	Yes	014N	091W	33	Muddy Creek-Robber's Gulch	41.13664	-107.64671	H And C LLC
1007				NAIP		Wet	Yes	014N	091W	32	Muddy Creek-Robber's Gulch	41.13434	-107.65123	H And C LLC
1008				NAIP/TOPO	Breached	Dry	No	014N	090W	34	Little Snake River-Cottonwood Creek	41.13939	-107.50324	BLM
1009				NAIP/TOPO		Wet	Yes	014N	090W	35	Little Snake River-Cottonwood Creek	41.14651	-107.48919	BLM
1010				NAIP		Wet	Yes	014N	090W	36	Little Snake River-Cottonwood Creek	41.14550	-107.46679	State Of Wyoming
1011				NAIP/TOPO		Wet	Yes	014N	089W	30	Lower Savery Creek	41.15023	-107.45163	Banjo Sheep Company LLC
1012				NAIP		Wet	Yes	014N	089W	31	Little Snake River-Cottonwood Creek	41.13893	-107.45837	Wille Lesa Lee And William Ronald
1013				NAIP		Wet	Yes	014N	089W	31	Lower Savery Creek	41.14864	-107.44502	Wille Dale And Ann Trustees And
1014				NAIP		Wet	Yes	014N	089W	31	Lower Savery Creek	41.13968	-107.44632	Wille Lesa Lee And William Ronald
1015				NAIP		Wet	Yes	014N	089W	31	Lower Savery Creek	41.14060	-107.44439	Wille Dale And Ann Trustees And
1016				NAIP		Wet	Yes	014N	089W	31	Lower Savery Creek	41.14499	-107.44908	Wille Lesa Lee And William Ronald
1017				NAIP		Wet	Yes	014N	089W	31	Lower Savery Creek	41.13517	-107.44578	State Of Wyoming
1018				NAIP/TOPO		Wet	Yes	014N	088W	32	Big Sandstone Creek	41.14088	-107.32571	USFS
1019				NAIP/TOPO		Wet	Yes	014N	088W	32	Big Sandstone Creek	41.13917	-107.32584	USFS
1020				NAIP/TOPO		Wet	Yes	014N	088W	32	Big Sandstone Creek	41.13971	-107.31674	USFS
1021				NAIP		Wet	Yes	014N	088W	31	Big Sandstone Creek	41.13866	-107.32862	Boyer Winston Swift Trustee
1022				NAIP/TOPO		Wet	Yes	014N	088W	32	Big Sandstone Creek	41.14148	-107.31823	USFS
1023				NAIP		Wet	Yes	014N	088W	28	Big Sandstone Creek	41.14952	-107.29389	USFS
1024				NAIP		Wet	Yes	014N	088W	28	Big Sandstone Creek	41.14813	-107.29822	USFS
1025				NAIP		Wet	Yes	014N	088W	33	Little Sandstone Creek	41.13657	-107.30455	USFS
1026				NAIP		Wet	Yes	014N	088W	33	Little Sandstone Creek	41.13879	-107.29752	USFS
1027				NAIP		Wet	Yes	014N	088W	33	Little Sandstone Creek	41.13746	-107.29818	USFS
1028				NAIP		Wet	Yes	014N	088W	34	Little Sandstone Creek	41.14241	-107.28530	USFS
1029				NAIP/TOPO		Wet	Yes	014N	088W	34	Little Sandstone Creek	41.13993	-107.28741	USFS
1030				NAIP/TOPO		Wet	Yes	014N	088W	34	Little Sandstone Creek	41.14153	-107.27661	USFS
1031				NAIP		Wet	Yes	014N	088W	34	Little Sandstone Creek	41.13422	-107.28133	USFS
1032				NAIP/TOPO		Wet	Yes	014N	088W	36	Little Sandstone Creek	41.14181	-107.23967	USFS
1033				NAIP		Wet	Yes	014N	087W	31	Little Sandstone Creek	41.13775	-107.21500	USFS
1034				NAIP		Wet	Yes	014N	087W	34	Little Sandstone Creek	41.14660	-107.16163	USFS
1035				NAIP/TOPO		Wet	Yes	014N	086W	25	Upper Battle Creek	41.15517	-107.00864	escence Inc C/O Ronnie Roberts Milliken And Co
1036				NAIP/TOPO		Wet	Yes	014N	085W	30	Upper Battle Creek	41.15652	-107.00258	escence Inc C/O Ronnie Roberts Milliken And Co
1037				NAIP/TOPO	Battle Lake	Wet	Yes	014N	086W	25	Upper Battle Creek	41.15335	-107.00706	escence Inc C/O Ronnie Roberts Milliken And Co
1038				NAIP/TOPO		Wet	Yes	014N	086W	27	Upper Battle Creek	41.15584	-107.05129	USFS
1039				NAIP/TOPO		Wet	Yes	014N	086W	27	Upper Battle Creek	41.16079	-107.05491	USFS
1040				NAIP		Wet	Yes	014N	087W	26	Big Sandstone Creek	41.15412	-107.15384	USFS
1041				NAIP		Wet	Yes	014N	087W	26	Big Sandstone Creek	41.15333	-107.15284	USFS
1042				NAIP		Wet	Yes	014N	087W	26	Big Sandstone Creek	41.15258	-107.15177	USFS
1043				NAIP		Wet	Yes	014N	088W	25	Big Sandstone Creek	41.15375	-107.24080	USFS
1044				NAIP		Wet	Yes	014N	088W	25	Little Sandstone Creek	41.14886	-107.23414	USFS
1045				NAIP		Wet	Yes	014N	087W	30	Big Sandstone Creek	41.14957	-107.22828	USFS
1046				NAIP		Wet	Yes	014N	088W	26	Big Sandstone Creek	41.15864	-107.26661	USFS

Little Snake River / Vermillion Creek Watershed: Stock Reservoir Database

GIS IDENT	BLM Database Info		Allotment	Source	ACE Review Notes			Township	Range	Section	Subwatershed (HUC-12)	Lat	Long	Surface Owner
	BLM Comment	BLM Inspection			Comment	Water Condition	Water Source							
1047				NAIP/TOPO		Wet	Yes	014N	089W	25	Middle Savery Creek	41.15605	-107.35382	Anderson, Stephanie B Trustee
1048				NAIP/TOPO		Wet	Yes	014N	089W	25	Middle Savery Creek	41.15478	-107.35251	Anderson, Stephanie B Trustee
1049				NAIP/TOPO		Wet	Yes	014N	088W	30	Middle Savery Creek	41.15743	-107.34385	Anderson, Stephanie B Trustee
1050				NAIP		Wet	Yes	014N	089W	27	Lower Savery Creek	41.15201	-107.39603	Loco Place LLC The
1051				NAIP		Wet	Yes	014N	089W	22	Lower Savery Creek	41.16376	-107.38945	Cobb Cattle Company C/O Galloway Frank Eldor
1052				NAIP/TOPO		Wet	Yes	014N	089W	27	Lower Savery Creek	41.15731	-107.38343	Hollembeak Lisa A And Eric C
1053				NAIP		Wet	Yes	014N	089W	30	Lower Savery Creek	41.16098	-107.44341	Wille William Ronald
1054				NAIP/TOPO		Wet	Yes	014N	090W	25	Little Snake River-Cottonwood Creek	41.15284	-107.47038	Banjo Sheep Company LLC
1055				NAIP/TOPO		Wet	Yes	014N	089W	30	Lower Savery Creek	41.15545	-107.45509	Banjo Sheep Company LLC
1056				NAIP		Wet	Yes	014N	090W	26	Little Snake River-Cottonwood Creek	41.15594	-107.48235	BLM
1057				NAIP		Wet	Yes	014N	090W	26	Little Snake River-Cottonwood Creek	41.15415	-107.48532	BLM
1058				NAIP/TOPO		Wet	Yes	014N	090W	25	Little Snake River-Cottonwood Creek	41.15887	-107.47489	BLM
1059				NAIP/TOPO		Wet	Yes	014N	090W	27	Deep Creek	41.15685	-107.50766	Three Forks Ranch Corp
1060				NAIP/TOPO		Wet	Yes	014N	090W	27	Deep Creek	41.15190	-107.50995	Three Forks Ranch Corp
1061				NAIP/TOPO	Breached	Dry	No	014N	090W	27	Deep Creek	41.16310	-107.51442	Three Forks Ranch Corp
1062				NAIP/TOPO	Sediment	Dry	No	014N	090W	29	Deep Creek	41.15436	-107.54880	Three Forks Ranch Corp
1063				NAIP/TOPO	Breached	Dry	No	014N	090W	29	Deep Creek	41.15209	-107.54435	Three Forks Ranch Corp
1064				NAIP		Wet	Yes	014N	096W	26	Lower Skull Creek	41.16301	-108.17941	BLM
1065	Unknown			BLM-RSFO		Wet	Yes	014N	100W	24	Upper Alkali Creek-Vermillion Creek	41.16533	-108.62142	BLM
1066	Rife Estate Reservoir			BLM-RSFO		Dry	Yes	014N	099W	19	Upper Alkali Creek-Vermillion Creek	41.17583	-108.60335	BLM
1067				NAIP/TOPO	Breached	Dry	No	014N	090W	21	Deep Creek	41.17223	-107.52575	Three Forks Ranch Corp
1068				NAIP/TOPO		Wet	Yes	014N	090W	22	Deep Creek	41.17255	-107.51373	Three Forks Ranch Corp
1069				NAIP/TOPO		Wet	Yes	014N	090W	22	Deep Creek	41.17327	-107.50921	Three Forks Ranch Corp
1070				NAIP/TOPO		Wet	Yes	014N	090W	22	Deep Creek	41.17593	-107.50862	Three Forks Ranch Corp
1071				NAIP/TOPO		Dry	Yes	014N	090W	22	Deep Creek	41.17442	-107.50074	Three Forks Ranch Corp
1072				NAIP/TOPO		Dry	Yes	014N	090W	22	Deep Creek	41.16860	-107.50067	Three Forks Ranch Corp
1073				NAIP		Wet	Yes	014N	090W	23	Deep Creek	41.16602	-107.48469	BLM
1074				NAIP/TOPO		Wet	Yes	014N	090W	24	Bird Gulch	41.17587	-107.46547	Morgan Samuel D
1075				NAIP/TOPO		Wet	Yes	014N	090W	24	Bird Gulch	41.17337	-107.46520	Raught Ranches LLC
1076				NAIP/TOPO		Wet	Yes	014N	090W	24	Lower Savery Creek	41.17050	-107.46139	Raught Ranches LLC
1077				NAIP		Dry	Yes	014N	090W	24	Bird Gulch	41.17110	-107.46903	Raught Ranches LLC
1078				NAIP/TOPO		Wet	Yes	014N	089W	20	Middle Savery Creek	41.17056	-107.43488	Stratton Sheep Company
1079				NAIP/TOPO		Wet	Yes	014N	089W	20	Lower Savery Creek	41.16467	-107.43164	Stratton Sheep Company
1080				NAIP/TOPO		Wet	Yes	014N	089W	19	Middle Savery Creek	41.17680	-107.45296	Dillon Martha Ann And
1081				NAIP/TOPO		Wet	Yes	014N	089W	19	Middle Savery Creek	41.17717	-107.44519	Dillon Martha Ann And
1082				NAIP		Wet	Yes	014N	089W	19	Lower Savery Creek	41.16876	-107.45492	State Of Wyoming
1083				NAIP		Wet	Yes	014N	089W	19	Lower Savery Creek	41.17151	-107.45783	Lee H B Family Limited Partnership
1084				NAIP		Wet	Yes	014N	089W	19	Lower Savery Creek	41.16888	-107.45149	Lee H B Family Limited Partnership
1085				NAIP		Wet	Yes	014N	089W	19	Lower Savery Creek	41.16490	-107.45023	State Of Wyoming
1086				NAIP		Wet	Yes	014N	089W	19	Middle Savery Creek	41.16924	-107.44235	Cobb Cattle Company C/O Galloway Frank Eldor
1087				NAIP/TOPO		Wet	Yes	014N	089W	18	Bird Gulch	41.18679	-107.45777	Dillon Martha Ann And
1088				NAIP/TOPO		Wet	Yes	014N	089W	18	Bird Gulch	41.18667	-107.45121	Dillon Martha Ann And
1089				NAIP/TOPO		Wet	Yes	014N	089W	18	Bird Gulch	41.18245	-107.45389	Dillon Martha Ann And
1090				NAIP/TOPO		Wet	Yes	014N	089W	18	Bird Gulch	41.18982	-107.44430	Dillon Martha Ann And
1091				NAIP		Wet	Yes	014N	089W	18	Middle Savery Creek	41.17853	-107.44894	Dillon Martha Ann And
1092				NAIP		Wet	Yes	014N	089W	18	Middle Savery Creek	41.17814	-107.44427	Cobb Cattle Company C/O Galloway Frank Eldor
1093				NAIP		Wet	Yes	014N	089W	19	Middle Savery Creek	41.17535	-107.44136	Cobb Cattle Company C/O Galloway Frank Eldor
1094				NAIP		Wet	Yes	014N	089W	20	Middle Savery Creek	41.17526	-107.43996	Cobb Cattle Company C/O Galloway Frank Eldor
1095				NAIP		Wet	Yes	014N	089W	20	Middle Savery Creek	41.17352	-107.43819	Cobb Cattle Company C/O Galloway Frank Eldor
1096				NAIP		Wet	Yes	014N	089W	20	Middle Savery Creek	41.17333	-107.43203	Stratton Sheep Company
1097				NAIP		Wet	Yes	014N	089W	17	Middle Savery Creek	41.18646	-107.43876	Cobb Cattle Company C/O Galloway Frank Eldor
1098				NAIP/TOPO		Wet	Yes	014N	089W	21	Middle Savery Creek	41.17308	-107.42010	Stratton Sheep Company
1099				NAIP		Wet	Yes	014N	089W	21	Lower Savery Creek	41.17075	-107.41806	Stratton Sheep Company
1100				NAIP		Wet	Yes	014N	089W	21	Lower Savery Creek	41.16666	-107.41783	Stratton Sheep Company
1101				NAIP		Wet	Yes	014N	089W	21	Lower Savery Creek	41.17192	-107.41001	BLM
1102				NAIP/TOPO		Wet	Yes	014N	089W	22	Lower Savery Creek	41.17251	-107.39037	Cobb Cattle Company C/O Galloway Frank Eldor
1103				NAIP/TOPO		Wet	Yes	014N	089W	23	Middle Savery Creek	41.16916	-107.37531	Cobb Cattle Company C/O Galloway Frank Eldor
1104				NAIP		Wet	Yes	014N	089W	22	Lower Savery Creek	41.17126	-107.38574	Cobb Cattle Company C/O Galloway Frank Eldor
1105				NAIP/TOPO		Wet	Yes	014N	089W	23	Middle Savery Creek	41.16739	-107.36520	BLM
1106				NAIP		Wet	Yes	014N	088W	19	Middle Savery Creek	41.16902	-107.34210	Anderson, Stephanie B Trustee
1107				NAIP		Wet	Yes	014N	088W	20	Middle Savery Creek	41.17505	-107.31343	USFS
1108				NAIP		Wet	Yes	014N	088W	20	Middle Savery Creek	41.17587	-107.32400	USFS
1109				NAIP		Wet	Yes	014N	088W	22	Big Sandstone Creek	41.17481	-107.28730	USFS
1110				NAIP		Wet	Yes	014N	088W	16	Big Sandstone Creek	41.17786	-107.29229	USFS
1111				NAIP		Wet	Yes	014N	087W	19	Big Sandstone Creek	41.16572	-107.23002	USFS

Little Snake River / Vermillion Creek Watershed: Stock Reservoir Database

GIS IDENT	BLM Database Info		Allotment	Source	ACE Review Notes			Township	Range	Section	Subwatershed (HUC-12)	Lat	Long	Surface Owner
	BLM Comment	BLM Inspection			Comment	Water Condition	Water Source							
1112				NAIP		Wet	Yes	014N	088W	13	Big Sandstone Creek	41.18100	-107.23638	USFS
1113				NAIP		Wet	Yes	014N	087W	18	Big Sandstone Creek	41.18130	-107.22821	USFS
1114				NAIP/TOPO		Wet	Yes	014N	088W	13	Big Sandstone Creek	41.17904	-107.24520	USFS
1115				NAIP		Wet	Yes	014N	088W	14	Big Sandstone Creek	41.18071	-107.26278	USFS
1116				NAIP		Wet	Yes	014N	088W	14	Big Sandstone Creek	41.18584	-107.26855	USFS
1117				NAIP		Wet	Yes	014N	088W	15	Big Sandstone Creek	41.18647	-107.27725	USFS
1118				NAIP		Wet	Yes	014N	088W	15	Big Sandstone Creek	41.18565	-107.28672	USFS
1119				NAIP		Wet	Yes	014N	088W	16	Big Sandstone Creek	41.18275	-107.29420	USFS
1120				NAIP		Wet	Yes	014N	088W	17	Middle Savery Creek	41.18670	-107.30973	USFS
1121				NAIP		Wet	Yes	014N	088W	17	Middle Savery Creek	41.19063	-107.32701	USFS
1122				NAIP		Wet	Yes	014N	088W	18	Middle Savery Creek	41.18860	-107.33967	Anderson, Stephanie B Trustee
1123				NAIP/TOPO		Wet	Yes	014N	089W	15	Middle Savery Creek	41.17892	-107.38320	Cobb Cattle Company C/O Galloway Frank Eldor
1124				NAIP		Wet	Yes	014N	089W	14	Middle Savery Creek	41.18014	-107.38170	Cobb Cattle Company C/O Galloway Frank Eldor
1125				NAIP		Wet	Yes	014N	089W	15	Middle Savery Creek	41.18372	-107.38474	Cobb Cattle Company C/O Galloway Frank Eldor
1126				NAIP		Wet	Yes	014N	089W	15	Middle Savery Creek	41.18313	-107.38589	Cobb Cattle Company C/O Galloway Frank Eldor
1127				NAIP		Wet	Yes	014N	089W	16	Middle Savery Creek	41.18557	-107.40379	State Of Wyoming
1128				NAIP		Wet	Yes	014N	089W	15	Middle Savery Creek	41.18446	-107.40135	Cobb Cattle Company C/O Galloway Frank Eldor
1129				NAIP		Wet	Yes	014N	089W	17	Middle Savery Creek	41.17965	-107.42169	Cobb Cattle Company C/O Galloway Frank Eldor
1130				NAIP		Wet	Yes	014N	089W	17	Middle Savery Creek	41.18139	-107.42692	Cobb Cattle Company C/O Galloway Frank Eldor
1131				NAIP		Wet	Yes	014N	089W	16	Middle Savery Creek	41.18486	-107.41860	State Of Wyoming
1132				NAIP		Wet	Yes	014N	089W	17	Middle Savery Creek	41.18887	-107.42912	Cobb Cattle Company C/O Galloway Frank Eldor
1133				NAIP/TOPO		Wet	Yes	014N	090W	16	Deep Creek	41.18738	-107.52384	State Of Wyoming
1134				NAIP/TOPO		Dry	Yes	014N	091W	16	Muddy Creek-Robber's Gulch	41.18041	-107.63649	State Of Wyoming
1135				NAIP/TOPO		Wet	Yes	014N	091W	18	Muddy Creek-Robber's Gulch	41.18732	-107.68245	BLM
1136				NAIP		Wet	Yes	014N	092W	17	Muddy Creek-Robber's Gulch	41.18531	-107.78158	BLM
1137	Long Search Pit			BLM-RSFO		Dry	Yes	014N	100W	18	Upper Alkali Creek-Vermillion Creek	41.18548	-108.70886	BLM
1138	Chicken Basin Reservoir			BLM-RSFO		Wet	Yes	014N	100W	17	Upper Alkali Creek-Vermillion Creek	41.18951	-108.69560	BLM
1139				NAIP/TOPO		Wet	Yes	014N	099W	9	Carson Spring	41.20138	-108.55217	BLM
1140				NAIP		Wet	Yes	014N	096W	9	Upper Skull Creek-Sand Creek	41.20385	-108.21663	BLM
1141				NAIP		Wet	Yes	014N	092W	7	Muddy Creek-Robber's Gulch	41.19645	-107.79248	BLM
1142				NAIP/TOPO		Dry	Yes	014N	092W	9	Muddy Creek-Robber's Gulch	41.20034	-107.74849	BLM
1143				NAIP		Wet	Yes	014N	090W	12	Bird Gulch	41.20463	-107.47101	Bartlett Family Corporation
1144				NAIP		Wet	Yes	014N	090W	12	Bird Gulch	41.19933	-107.46431	Wenger W J Corporation C/O Perue
1145				NAIP		Wet	Yes	014N	090W	12	Bird Gulch	41.19927	-107.45998	Wenger W J Corporation C/O Perue
1146				NAIP		Wet	Yes	014N	089W	8	Bird Gulch	41.20443	-107.42264	Wagner Lester And Thelma Co Trustees
1147				NAIP/TOPO		Wet	Yes	014N	089W	8	Bird Gulch	41.20356	-107.43631	Stratton Sheep Company
1148				NAIP		Wet	Yes	014N	089W	7	Bird Gulch	41.19340	-107.44474	Dillon Martha Ann And
1149				NAIP		Wet	Yes	014N	089W	9	Middle Savery Creek	41.19620	-107.41707	Ready Justin And Nichole Renee
1150				NAIP		Wet	Yes	014N	089W	8	Middle Savery Creek	41.19575	-107.42640	Wenger W J Corporation C/O Perue
1151				NAIP		Wet	Yes	014N	089W	8	Middle Savery Creek	41.19402	-107.42534	Cobb Cattle Company C/O Galloway Frank Eldor
1152				NAIP		Wet	Yes	014N	089W	8	Middle Savery Creek	41.19448	-107.42862	Wenger W J Corporation C/O Perue
1153				NAIP		Wet	Yes	014N	089W	17	Middle Savery Creek	41.19194	-107.42939	Cobb Cattle Company C/O Galloway Frank Eldor
1154				NAIP		Wet	Yes	014N	089W	8	Middle Savery Creek	41.19759	-107.42146	Ready Justin And Nichole Renee
1155				NAIP		Wet	Yes	014N	089W	8	Middle Savery Creek	41.19786	-107.42249	Ready Justin And Nichole Renee
1156				NAIP		Wet	Yes	014N	089W	15	Middle Savery Creek	41.19020	-107.39868	Cobb Cattle Company C/O Galloway Frank Eldor
1157				NAIP/TOPO		Wet	Yes	014N	089W	10	Middle Savery Creek	41.20479	-107.38882	Cobb Cattle Company C/O Galloway Frank Eldor
1158				NAIP/TOPO		Wet	Yes	014N	089W	10	Middle Savery Creek	41.19659	-107.39506	Cobb Cattle Company C/O Galloway Frank Eldor
1159				NAIP		Wet	Yes	014N	089W	10	Middle Savery Creek	41.20628	-107.38736	Cobb Cattle Company C/O Galloway Frank Eldor
1160				NAIP		Wet	Yes	014N	089W	11	Middle Savery Creek	41.20219	-107.36415	Cobb Cattle Company C/O Galloway Frank Eldor
1161				NAIP/TOPO		Wet	Yes	014N	088W	7	Middle Savery Creek	41.19992	-107.33470	Cobb Cattle Company C/O Galloway Frank Eldor
1162				NAIP/TOPO		Wet	Yes	014N	088W	7	Middle Savery Creek	41.19323	-107.33423	Cobb Cattle Company C/O Galloway Frank Eldor
1163				NAIP		Wet	Yes	014N	088W	7	Middle Savery Creek	41.20548	-107.33908	BLM
1164				NAIP		Wet	Yes	014N	088W	7	Middle Savery Creek	41.20367	-107.33418	BLM
1165				NAIP		Wet	Yes	014N	088W	5	Middle Savery Creek	41.20610	-107.32158	Mc Grew Laura M Corporation
1166				NAIP		Wet	Yes	014N	088W	9	Middle Savery Creek	41.20015	-107.29885	USFS
1167				NAIP		Wet	Yes	014N	088W	9	Middle Savery Creek	41.19354	-107.29717	USFS
1168				NAIP		Wet	Yes	014N	088W	9	Dirtyman Fork	41.20037	-107.29356	USFS
1169				NAIP		Wet	Yes	014N	088W	10	Dirtyman Fork	41.19929	-107.27845	USFS
1170				NAIP		Wet	Yes	014N	088W	10	Dirtyman Fork	41.20589	-107.28017	USFS
1171				NAIP		Wet	Yes	014N	088W	9	Dirtyman Fork	41.20555	-107.28930	USFS
1172				NAIP		Wet	Yes	014N	088W	10	Dirtyman Fork	41.20390	-107.27330	USFS
1173				NAIP		Wet	Yes	014N	088W	11	Dirtyman Fork	41.19378	-107.26859	USFS
1174				NAIP		Wet	Yes	014N	088W	11	Dirtyman Fork	41.20022	-107.26673	USFS
1175				NAIP		Wet	Yes	014N	088W	11	Dirtyman Fork	41.19353	-107.25825	USFS
1176				NAIP		Wet	Yes	014N	088W	11	Dirtyman Fork	41.19651	-107.25909	USFS

Little Snake River / Vermillion Creek Watershed: Stock Reservoir Database

GIS IDENT	BLM Database Info		Allotment	Source	ACE Review Notes			Township	Range	Section	Subwatershed (HUC-12)	Lat	Long	Surface Owner
	BLM Comment	BLM Inspection			Comment	Water Condition	Water Source							
1177				NAIP		Wet	Yes	014N	088W	11	Dirtyman Fork	41.19854	-107.25851	USFS
1178				NAIP		Wet	Yes	014N	088W	10	Dirtyman Fork	41.19215	-107.28423	USFS
1179				NAIP		Wet	Yes	014N	088W	11	Dirtyman Fork	41.19869	-107.25334	USFS
1180				NAIP		Wet	Yes	014N	088W	12	Dirtyman Fork	41.19678	-107.24905	USFS
1181				NAIP		Wet	Yes	014N	088W	12	Dirtyman Fork	41.19359	-107.24608	USFS
1182				NAIP/TOPO		Wet	Yes	014N	087W	7	Dirtyman Fork	41.19926	-107.23050	USFS
1183				NAIP/TOPO		Wet	Yes	014N	088W	12	Dirtyman Fork	41.19923	-107.24136	USFS
1184				NAIP/TOPO		Wet	Yes	014N	086W	8	Haggarty Creek	41.19121	-107.08439	American Milling LP
1185				NAIP/TOPO		Wet	Yes	014N	087W	5	Dirtyman Fork	41.21617	-107.20131	State Of Wyoming
1186				NAIP		Wet	Yes	014N	087W	6	Dirtyman Fork	41.21057	-107.21850	State Of Wyoming
1187				NAIP/TOPO		Wet	Yes	014N	087W	6	Dirtyman Fork	41.21880	-107.23079	State Of Wyoming
1188				NAIP/TOPO		Wet	Yes	014N	087W	6	Dirtyman Fork	41.21370	-107.22859	State Of Wyoming
1189				NAIP		Wet	Yes	014N	088W	2	Dirtyman Fork	41.22010	-107.25727	Forest Edge Ranch
1190				NAIP		Wet	Yes	014N	088W	2	Dirtyman Fork	41.21513	-107.25732	Forest Edge Ranch
1191				NAIP		Wet	Yes	014N	088W	2	Dirtyman Fork	41.20841	-107.26783	Kelly Kurt Trustee
1192				NAIP		Wet	Yes	014N	088W	2	Dirtyman Fork	41.20885	-107.26714	Kelly Kurt Trustee
1193				NAIP/TOPO		Wet	Yes	014N	088W	3	Dirtyman Fork	41.22091	-107.27751	Forest Edge Ranch
1194				NAIP		Wet	Yes	014N	088W	4	Dirtyman Fork	41.20705	-107.29721	USFS
1195				NAIP/TOPO		Wet	Yes	014N	088W	4	Dirtyman Fork	41.21504	-107.30412	Wenger Family Corporation
1196				NAIP		Wet	Yes	014N	088W	6	Middle Savery Creek	41.21903	-107.33995	Cobb Cattle Company C/O Galloway Frank Eldor
1197				NAIP		Wet	Yes	014N	089W	1	Middle Savery Creek	41.20717	-107.35598	BLM
1198				NAIP/TOPO		Wet	Yes	014N	089W	2	Middle Savery Creek	41.20941	-107.36568	State Of Wyoming
1199				NAIP		Wet	Yes	014N	089W	2	Middle Savery Creek	41.21505	-107.36832	State Of Wyoming
1200				NAIP		Wet	Yes	014N	089W	2	Middle Savery Creek	41.21629	-107.36806	State Of Wyoming
1201				NAIP		Wet	Yes	014N	089W	2	Middle Savery Creek	41.21289	-107.37672	Cobb Cattle Company C/O Galloway Frank Eldor
1202				NAIP/TOPO		Dry	Yes	014N	089W	4	Bird Gulch	41.21306	-107.40243	Hog Eye Ranch LLC
1203				NAIP/TOPO		Wet	Yes	014N	089W	3	Bird Gulch	41.21626	-107.39851	Hog Eye Ranch LLC
1204				NAIP/TOPO		Wet	Yes	014N	089W	3	Bird Gulch	41.21896	-107.39509	Hog Eye Ranch LLC
1205				NAIP		Wet	Yes	014N	089W	3	Middle Savery Creek	41.20866	-107.38315	Cobb Cattle Company C/O Galloway Frank Eldor
1206				NAIP/TOPO		Wet	Yes	014N	089W	4	Bird Gulch	41.21174	-107.41451	Stratton Sheep Company
1207				NAIP/TOPO		Wet	Yes	014N	090W	1	Bird Gulch	41.21115	-107.46967	Mc Grew Laura M Corporation
1208				NAIP		Wet	Yes	014N	090W	1	Bird Gulch	41.20807	-107.46161	Mc Grew Laura M Corporation
1209				NAIP/TOPO		Wet	Yes	014N	090W	2	Cherokee Creek	41.21116	-107.48017	Stratton Sheep Company
1210				NAIP		Wet	Yes	014N	092W	4	Muddy Creek-Robber's Gulch	41.21219	-107.76129	BLM
1211				NAIP/TOPO		Dry	Yes	014N	099W	5	Carson Spring	41.21371	-108.56654	BLM
1212				NAIP/TOPO		Wet	Yes	015N	097W	32	Sand Creek-Monument Valley	41.22441	-108.33944	BLM
1213				NAIP/TOPO		Wet	Yes	014N	097W	4	Sand Creek-Monument Valley	41.21993	-108.33031	BLM
1214				NAIP/TOPO		Wet	Yes	015N	093W	36	Muddy Creek-Blue Gap Draw	41.23025	-107.80944	State Of Wyoming
1215				NAIP		Wet	Yes	015N	089W	33	Bird Gulch	41.22251	-107.40508	Orchard Gladine Trustee
1216				NAIP		Wet	Yes	015N	089W	34	Bird Gulch	41.22494	-107.39692	Hog Eye Ranch LLC
1217				NAIP/TOPO		Wet	Yes	015N	088W	31	Middle Savery Creek	41.23511	-107.35139	Hog Eye Ranch LLC
1218				NAIP/TOPO		Wet	Yes	015N	088W	32	Dirtyman Fork	41.23202	-107.31543	Kerbs Four Bar Ranch Partnership
1219				NAIP/TOPO		Wet	Yes	015N	088W	32	Dirtyman Fork	41.22704	-107.31992	Hog Eye Ranch LLC
1220				NAIP/TOPO		Wet	Yes	015N	088W	33	Dirtyman Fork	41.22988	-107.30580	Kerbs Four Bar Ranch Partnership
1221				NAIP/TOPO		Wet	Yes	015N	088W	33	Dirtyman Fork	41.22340	-107.30400	Forest Edge Ranch
1222				NAIP/TOPO		Wet	Yes	015N	088W	33	Dirtyman Fork	41.22215	-107.30528	Forest Edge Ranch
1223				NAIP/TOPO		Wet	Yes	015N	088W	33	Dirtyman Fork	41.22763	-107.30387	Forest Edge Ranch
1224				NAIP/TOPO		Wet	Yes	015N	088W	29	Middle Savery Creek	41.23604	-107.32071	Hog Eye Ranch LLC
1225				NAIP/TOPO		Wet	Yes	015N	088W	33	Dirtyman Fork	41.23548	-107.29670	Kerbs Four Bar Ranch Partnership
1226				NAIP/TOPO		Wet	Yes	015N	088W	33	Dirtyman Fork	41.22664	-107.29326	Forest Edge Ranch
1227				NAIP/TOPO		Wet	Yes	015N	088W	35	Dirtyman Fork	41.23452	-107.25858	State Of Wyoming
1228				NAIP		Wet	Yes	015N	088W	36	Dirtyman Fork	41.23353	-107.24981	State Of Wyoming
1229				NAIP/TOPO		Wet	Yes	015N	087W	32	Dirtyman Fork	41.22672	-107.21114	State Of Wyoming
1230				NAIP		Wet	Yes	015N	087W	31	Dirtyman Fork	41.23579	-107.22428	Kelley Cattle Company LLC
1231				NAIP		Wet	Yes	015N	087W	31	Dirtyman Fork	41.22590	-107.22056	State Of Wyoming
1232				NAIP/TOPO		Wet	Yes	015N	087W	30	Dirtyman Fork	41.24195	-107.21478	Dexter Peak Ltd
1233				NAIP		Wet	Yes	015N	087W	30	Dirtyman Fork	41.24063	-107.22559	Dexter Peak Ltd
1234				NAIP		Wet	Yes	015N	087W	30	Dirtyman Fork	41.24237	-107.23256	Dexter Peak Ltd
1235				NAIP		Wet	Yes	015N	087W	30	Dirtyman Fork	41.24750	-107.23030	Dexter Peak Ltd
1236				NAIP/TOPO		Wet	Yes	015N	088W	27	Dirtyman Fork	41.24976	-107.27919	State Of Wyoming
1237				NAIP/TOPO		Wet	Yes	015N	088W	28	Dirtyman Fork	41.24444	-107.30000	State Of Wyoming
1238				NAIP		Wet	Yes	015N	088W	20	Middle Savery Creek	41.25050	-107.31822	State Of Wyoming
1239				NAIP		Wet	Yes	015N	088W	20	Middle Savery Creek	41.25181	-107.31160	State Of Wyoming
1240				NAIP		Wet	Yes	015N	092W	28	Muddy Creek-Robber's Gulch	41.23918	-107.75818	BLM
1241				NAIP		Wet	Yes	015N	093W	26	Lower Barrel Springs Draw	41.23816	-107.82495	BLM

Little Snake River / Vermillion Creek Watershed: Stock Reservoir Database

GIS IDENT	BLM Database Info		Allotment	Source	ACE Review Notes			Township	Range	Section	Subwatershed (HUC-12)	Lat	Long	Surface Owner
	BLM Comment	BLM Inspection			Comment	Water Condition	Water Source							
1242				NAIP		Wet	Yes	015N	093W	26	Lower Barrel Springs Draw	41.24505	-107.83538	BLM
1243				NAIP		Wet	Yes	015N	096W	27	Lower Haystack Wash	41.24270	-108.19182	BLM
1244				NAIP		Wet	Yes	015N	088W	20	Middle Savery Creek	41.26451	-107.31052	State Of Wyoming
1245				NAIP		Wet	Yes	015N	088W	19	Middle Savery Creek	41.26091	-107.32781	State Of Wyoming
1246				NAIP		Wet	Yes	015N	089W	23	Little Savery Creek	41.25120	-107.38243	Hog Eye Ranch LLC
1247				NAIP		Wet	Yes	015N	089W	23	Little Savery Creek	41.25620	-107.37036	State Of Wyoming
1248				NAIP/TOPO	Breached	Wet	No	015N	089W	23	Little Savery Creek	41.25608	-107.37509	Hog Eye Ranch LLC
1249				NAIP/TOPO		Wet	Yes	015N	089W	21	Little Savery Creek	41.25889	-107.40520	Stratton Sheep Company
1250				NAIP/TOPO		Wet	Yes	015N	089W	22	Little Savery Creek	41.25491	-107.38748	Stratton Sheep Company
1251				NAIP		Wet	Yes	015N	089W	22	Little Savery Creek	41.25790	-107.38947	Stratton Sheep Company
1252				NAIP		Wet	Yes	015N	089W	22	Little Savery Creek	41.25694	-107.38497	Stratton Sheep Company
1253				NAIP/TOPO		Wet	Yes	015N	089W	19	Bird Gulch	41.25534	-107.45354	Stratton Sheep Company
1254				NAIP/TOPO		Wet	Yes	015N	090W	24	Bird Gulch	41.25143	-107.46388	Stratton Sheep Company
1255				NAIP/TOPO	Twin Reservoirs	Wet	Yes	015N	093W	24	Muddy Creek-Blue Gap Draw	41.25477	-107.80595	State Of Wyoming
1256				NAIP/TOPO		Dry	Yes	015N	094W	23	Windmill Draw	41.25649	-107.94404	BLM
1257				NAIP		Wet	Yes	015N	096W	22	Lower Haystack Wash	41.26213	-108.19809	BLM
1258				NAIP/TOPO		Wet	Yes	015N	097W	20	Sand Creek-Monument Valley	41.25607	-108.33903	BLM
1259				NAIP		Wet	Yes	015N	097W	20	Sand Creek-Monument Valley	41.25606	-108.34732	BLM
1260				NAIP/TOPO		Wet	Yes	015N	099W	19	Carson Spring	41.26473	-108.58834	Rock Springs Grazing Assn
1261				NAIP		Wet	Yes	015N	099W	20	Carson Spring	41.25767	-108.57943	BLM
1262				NAIP/TOPO		Wet	Yes	015N	100W	17	Upper Alkali Creek-Vermillion Creek	41.27736	-108.68269	Rock Springs Grazing Assn
1263				NAIP/TOPO		Wet	Yes	015N	100W	17	Upper Alkali Creek-Vermillion Creek	41.27506	-108.68439	Rock Springs Grazing Assn
1264				NAIP/TOPO	Sediment	Dry	No	015N	099W	13	Shell Creek-Kinney Creek	41.26747	-108.50535	Eversole Family Trust & Eversole Lois M Trust
1265				NAIP/TOPO		Wet	Yes	015N	097W	16	Sand Creek-Monument Valley	41.26891	-108.33579	State Of Wyoming
1266				NAIP		Wet	Yes	015N	097W	16	Sand Creek-Monument Valley	41.27702	-108.32326	State Of Wyoming
1267				NAIP/TOPO		Wet	Yes	015N	095W	18	Lower Haystack Wash	41.27663	-108.13377	BLM
1268				NAIP		Wet	Yes	015N	093W	15	Windmill Draw	41.27390	-107.84797	BLM
1269				NAIP		Wet	Yes	015N	093W	15	Windmill Draw	41.27734	-107.84643	BLM
1270				NAIP		Wet	Yes	015N	093W	15	Windmill Draw	41.27904	-107.84763	BLM
1271				NAIP/TOPO		Dry	Yes	015N	093W	15	Windmill Draw	41.27654	-107.85928	BLM
1272				NAIP/TOPO		Dry	Yes	015N	093W	16	Windmill Draw	41.27142	-107.86040	State Of Wyoming
1273				NAIP		Wet	Yes	015N	093W	13	Lower Barrel Springs Draw	41.27174	-107.81701	BLM
1274				NAIP		Wet	Yes	015N	093W	13	Lower Barrel Springs Draw	41.27144	-107.81641	BLM
1275				NAIP		Wet	Yes	015N	090W	16	Cherokee Creek	41.26744	-107.53483	State Of Wyoming
1276				NAIP		Wet	Yes	015N	089W	16	Little Savery Creek	41.26556	-107.40665	State Of Wyoming
1277				NAIP		Wet	Yes	015N	089W	15	Little Savery Creek	41.26618	-107.39313	Hornbeck Mary Jane Revocable Trust And
1278				NAIP		Wet	Yes	015N	089W	15	Little Savery Creek	41.26748	-107.38853	Stratton Sheep Company
1279				NAIP	High Savery	Wet	Yes	015N	088W	16	Middle Savery Creek	41.27383	-107.30026	State Of Wyoming
1280				NAIP/TOPO	Private?	Wet	Yes	015N	087W	18	Upper Savery Creek	41.26837	-107.21862	Cleveland Heidi L Trustee
1281				NAIP/TOPO	Private?	Wet	Yes	015N	087W	18	Upper Savery Creek	41.26876	-107.21927	Cleveland Heidi L Trustee
1282				NAIP/TOPO	Private?	Wet	Yes	015N	087W	18	Upper Savery Creek	41.26953	-107.21997	Cleveland Heidi L Trustee
1283				NAIP/TOPO	Private?	Wet	Yes	015N	087W	18	Upper Savery Creek	41.26589	-107.21790	Cleveland Heidi L Trustee
1284				NAIP		Wet	Yes	015N	087W	8	Upper Savery Creek	41.28748	-107.19835	Dexter Peak Ltd
1285				NAIP		Wet	Yes	015N	087W	8	Upper Savery Creek	41.28626	-107.20688	Dexter Peak Ltd
1286				NAIP/TOPO		Wet	Yes	015N	087W	8	Upper Savery Creek	41.28792	-107.20598	Dexter Peak Ltd
1287				NAIP/TOPO		Wet	Yes	015N	088W	12	Upper Savery Creek	41.29018	-107.24034	Dexter Peak Ltd
1288				NAIP		Wet	Yes	015N	088W	12	Upper Savery Creek	41.28828	-107.24642	Dexter Peak Ltd
1289				NAIP		Wet	Yes	015N	087W	7	Upper Savery Creek	41.28325	-107.23018	BLM
1290				NAIP		Wet	Yes	015N	088W	12	Upper Savery Creek	41.28332	-107.24696	BLM
1291				NAIP/TOPO		Wet	Yes	015N	088W	8	Middle Savery Creek	41.27959	-107.31842	State Of Wyoming
1292				NAIP/TOPO		Wet	Yes	015N	089W	12	Little Savery Creek	41.29184	-107.35875	Sandstone Ranches
1293				NAIP/TOPO		Wet	Yes	015N	089W	8	Little Savery Creek	41.28514	-107.43530	Stratton Sheep Company
1294				NAIP		Wet	Yes	015N	089W	7	Wild Cow Creek	41.27965	-107.45738	Stratton Sheep Company
1295				NAIP/TOPO		Dry	Yes	015N	099W	11	Shell Creek-Kinney Creek	41.28866	-108.51796	Eversole Family Trust & Eversole Lois M Trust
1296				NAIP/TOPO	Sediment	Dry	No	015N	099W	10	Shell Creek-Kinney Creek	41.28561	-108.54260	BLM
1297				NAIP/TOPO		Wet	Yes	015N	100W	12	Shell Creek-Kinney Creek	41.28434	-108.60619	BLM
1298				NAIP/TOPO		Wet	Yes	015N	100W	1	Shell Creek-Kinney Creek	41.29893	-108.60604	Rock Springs Grazing Assn
1299				NAIP		Wet	Yes	015N	099W	11	Shell Creek-Kinney Creek	41.29510	-108.51745	Eversole Family Trust & Eversole Lois M Trust
1300				NAIP		Dry	Yes	015N	099W	5	Shell Creek-Kinney Creek	41.30383	-108.57133	Rock Springs Grazing Assn
1301	Sand Branch Reservoir			BLM-RSFO	Sediment	Dry	No	015N	096W	5	Lower Haystack Wash	41.29977	-108.23108	BLM
1302				NAIP		Wet	Yes	015N	093W	1	Lower Barrel Springs Draw	41.29692	-107.82048	BLM
1303				NAIP		Wet	Yes	015N	093W	1	Lower Barrel Springs Draw	41.29755	-107.81333	BLM
1304				NAIP/TOPO		Dry	Yes	015N	092W	3	Muddy Creek-Blue Gap Draw	41.30191	-107.73054	BLM
1305				NAIP		Wet	Yes	015N	090W	1	Wild Cow Creek	41.30202	-107.46299	Montgomery Livestock Company Etal
1306				NAIP/TOPO		Wet	Yes	015N	089W	4	Little Savery Creek	41.29690	-107.41476	Mc Grew Laura M Corporation

Little Snake River / Vermillion Creek Watershed: Stock Reservoir Database

GIS IDENT	BLM Database Info		Allotment	Source	ACE Review Notes			Township	Range	Section	Subwatershed (HUC-12)	Lat	Long	Surface Owner
	BLM Comment	BLM Inspection			Comment	Water Condition	Water Source							
1307				NAIP/TOPO		Wet	Yes	015N	088W	6	Little Savery Creek	41.30382	-107.33362	Sandstone Ranches
1308				NAIP/TOPO		Wet	Yes	015N	088W	4	North Fork Savery Creek	41.30185	-107.29192	Waeckerlin Rodney F Trustee
1309				NAIP		Wet	Yes	015N	088W	4	North Fork Savery Creek	41.29806	-107.29077	Chapman Gwendolyn S (Hall)
1310				NAIP/TOPO		Wet	Yes	015N	088W	1	Upper Savery Creek	41.29857	-107.23905	BLM
1311				NAIP/TOPO		Wet	Yes	016N	087W	30	North Fork Savery Creek	41.32752	-107.22778	Kelley Cattle Company LLC
1312				NAIP/TOPO		Wet	Yes	016N	087W	31	North Fork Savery Creek	41.32127	-107.22283	Kelley Cattle Company LLC
1313				NAIP/TOPO		Wet	Yes	016N	088W	33	North Fork Savery Creek	41.31588	-107.29404	Sandstone Ranches
1314				NAIP/TOPO		Wet	Yes	016N	088W	32	Little Savery Creek	41.30884	-107.32084	Sandstone Ranches
1315				NAIP/TOPO		Wet	Yes	016N	088W	31	Little Savery Creek	41.31296	-107.34909	Sandstone Ranches
1316				NAIP		Wet	Yes	016N	089W	31	Wild Cow Creek	41.31026	-107.45302	BLM
1317				NAIP		Wet	Yes	016N	090W	36	Wild Cow Creek	41.31676	-107.46214	State Of Wyoming
1318				NAIP		Wet	Yes	016N	091W	36	Cow Creek	41.31338	-107.58582	State Of Wyoming
1319				NAIP/TOPO		Dry	Yes	016N	094W	36	Windmill Draw	41.31567	-107.93034	State Of Wyoming
1320				NAIP		Wet	Yes	016N	094W	31	Upper Willow Creek	41.31101	-108.02468	BLM
1321	N-T Reservoir			BLM-RSFO	N-T Reservoir	Wet	Yes	016N	096W	34	Upper Haystack Wash	41.31094	-108.19124	BLM
1322				NAIP/TOPO		Wet	Yes	016N	093W	27	Windmill Draw	41.33668	-107.85568	State Of Wyoming
1323				NAIP		Wet	Yes	016N	092W	29	Muddy Creek-Antelope Creek	41.33349	-107.76494	Hog Eye Ranch LLC
1324				NAIP/TOPO		Wet	Yes	016N	088W	25	North Fork Savery Creek	41.32641	-107.24759	Kelley Cattle Company LLC
1325				NAIP		Wet	Yes	016N	087W	22	North Fork Savery Creek	41.34043	-107.16980	USFS
1326				NAIP/TOPO		Wet	Yes	016N	087W	20	North Fork Savery Creek	41.34268	-107.20042	State Of Wyoming
1327				NAIP/TOPO		Wet	Yes	016N	087W	21	North Fork Savery Creek	41.35134	-107.18562	Arrow Shield Land and Cattle LLC
1328				NAIP/TOPO		Wet	Yes	016N	087W	21	North Fork Savery Creek	41.34804	-107.18020	Arrow Shield Land and Cattle LLC
1329				NAIP/TOPO		Wet	Yes	016N	087W	19	North Fork Savery Creek	41.34001	-107.21585	Kelley Cattle Company LLC
1330				NAIP/TOPO		Wet	Yes	016N	088W	20	North Fork Savery Creek	41.34615	-107.30974	Sandstone Ranches
1331				NAIP		Wet	Yes	016N	088W	19	Little Savery Creek	41.34459	-107.34569	Mc Carty Canyon Ranch Company LLC
1332				NAIP		Wet	Yes	016N	092W	20	Muddy Creek-Antelope Creek	41.34001	-107.76711	Hog Eye Ranch LLC
1333				NAIP		Wet	Yes	016N	092W	20	Muddy Creek-Antelope Creek	41.34466	-107.76885	Three Forks Ranch Corp
1334				NAIP		Dry	Yes	016N	094W	24	Windmill Draw	41.34251	-107.92126	J Peroulis & Sons
1335				NAIP/TOPO		Wet	Yes	016N	093W	16	Windmill Draw	41.35722	-107.86211	State Of Wyoming
1336				NAIP/TOPO		Wet	Yes	016N	093W	15	Windmill Draw	41.35457	-107.85716	BLM
1337				NAIP		Wet	Yes	016N	092W	13	Dry Cow Creek	41.36237	-107.69816	BLM
1338				NAIP/TOPO		Wet	Yes	016N	090W	16	Cow Creek	41.35260	-107.52789	State Of Wyoming
1339				NAIP		Wet	Yes	016N	089W	13	Little Savery Creek	41.36134	-107.36644	State Of Wyoming
1340				NAIP/TOPO	Sediment	Dry	No	016N	088W	17	North Fork Savery Creek	41.36084	-107.30822	State Of Wyoming
1341				NAIP		Wet	Yes	016N	087W	17	North Fork Savery Creek	41.36539	-107.20745	State Of Wyoming
1342				NAIP/TOPO		Wet	Yes	016N	087W	16	North Fork Savery Creek	41.35491	-107.19075	State Of Wyoming
1343				NAIP		Wet	Yes	016N	087W	8	North Fork Savery Creek	41.36950	-107.20601	State Of Wyoming
1344				NAIP		Wet	Yes	016N	088W	7	Little Savery Creek	41.37989	-107.33579	State Of Wyoming
1345				NAIP		Wet	Yes	016N	092W	5	Muddy Creek-Antelope Creek	41.38035	-107.78393	BLM
1346				NAIP		Wet	Yes	016N	092W	8	Muddy Creek-Antelope Creek	41.37640	-107.78217	BLM
1347				NAIP		Wet	Yes	016N	092W	8	Muddy Creek-Antelope Creek	41.37125	-107.78367	Adams, Stephen F & Carolyn L.
1348				NAIP/TOPO		Wet	Yes	016N	094W	9	Lower Barrel Springs Draw	41.37008	-107.98015	Stratton Sheep Co
1349				NAIP		Wet	Yes	016N	093W	5	Lower North Barrel Springs Draw	41.38982	-107.88869	Peroulis Andrew
1350				NAIP		Wet	Yes	016N	092W	5	Muddy Creek-Antelope Creek	41.38746	-107.78168	BLM
1351				NAIP		Wet	Yes	016N	092W	5	Muddy Creek-Antelope Creek	41.39071	-107.78195	BLM
1352				NAIP/TOPO		Wet	Yes	017N	090W	34	Cow Creek	41.39991	-107.52077	State Of Wyoming
1353				NAIP/TOPO		Wet	Yes	017N	090W	33	Cow Creek	41.40078	-107.53181	State Of Wyoming
1354				NAIP/TOPO	Breached	Dry	No	017N	090W	33	Cow Creek	41.39819	-107.54215	State Of Wyoming
1355				NAIP		Wet	Yes	017N	092W	36	Dry Cow Creek	41.40172	-107.70656	State Of Wyoming
1356	Duck Lake			NAIP/TOPO		Dry	Yes	017N	093W	35	Coal Gulch-Barrel Springs Draw	41.39972	-107.83733	Anadarko Land Corp
1357				NAIP/TOPO		Wet	Yes	017N	093W	31	Lower North Barrel Springs Draw	41.41129	-107.92851	Cahill Terence And
1358				NAIP/TOPO		Wet	Yes	017N	094W	35	Lower Barrel Springs Draw	41.40205	-107.95687	Sapounakis Diane M
1359				NAIP/TOPO		Dry	Yes	017N	094W	34	Lower Barrel Springs Draw	41.40642	-107.98007	BLM
1360				NAIP/TOPO		Dry	Yes	017N	093W	26	Coal Gulch-Barrel Springs Draw	41.42068	-107.85184	BLM
1361				NAIP/TOPO		Wet	Yes	017N	093W	25	Coal Gulch-Barrel Springs Draw	41.42307	-107.82919	Anadarko Land Corp
1362				NAIP/TOPO		Wet	Yes	017N	092W	25	Dry Cow Creek	41.42186	-107.70713	Weber Cecil Ray And Kathleen S Trustee
1363				NAIP		Wet	Yes	017N	091W	29	Dry Cow Creek	41.42023	-107.66833	Weber Ranch Co
1364				NAIP/TOPO		Dry	Yes	017N	090W	27	Cow Creek	41.41410	-107.51512	State Of Wyoming
1365				NAIP/TOPO	Sediment	Dry	No	017N	090W	27	Cow Creek	41.41275	-107.50833	State Of Wyoming
1366				NAIP/TOPO		Wet	Yes	017N	090W	27	Cow Creek	41.42285	-107.52614	State Of Wyoming
1367				NAIP		Wet	Yes	017N	090W	36	Muddy Creek-Littlefield Creek	41.41154	-107.47161	State Of Wyoming
1368				NAIP		Wet	Yes	017N	089W	27	Muddy Creek-Littlefield Creek	41.41816	-107.40360	Stratton Sheep Company
1369				NAIP		Wet	Yes	017N	090W	24	Muddy Creek-Littlefield Creek	41.42765	-107.48048	Jack Creek Land And Cattle Company
1370				NAIP/TOPO		Wet	Yes	017N	090W	23	Muddy Creek-Littlefield Creek	41.43909	-107.50570	Jack Creek Land And Cattle Company
1371				NAIP/RESERVOIR		Wet	Yes	017N	091W	24	Dry Cow Creek	41.43026	-107.58512	State Of Wyoming Board Of Land Commissioner

Little Snake River / Vermillion Creek Watershed: Stock Reservoir Database

GIS IDENT	BLM Database Info		Allotment	Source	ACE Review Notes			Township	Range	Section	Subwatershed (HUC-12)	Lat	Long	Surface Owner
	BLM Comment	BLM Inspection			Comment	Water Condition	Water Source							
1372				NAIP/TOPO	Breached	Dry	No	017N	092W	20	Muddy Creek-Antelope Creek	41.44036	-107.78225	BLM
1373				NAIP/TOPO		Wet	Yes	017N	092W	19	Coal Gulch-Barrel Springs Draw	41.43480	-107.81171	Weber Ranch Co
1374				NAIP/TOPO		Dry	Yes	017N	093W	23	Coal Gulch-Barrel Springs Draw	41.43509	-107.84204	Anadarko Land Corp
1375				NAIP/TOPO		Wet	Yes	017N	093W	17	Lower North Barrel Springs Draw	41.44827	-107.90545	Heath Land And Energy Lllp
1376				NAIP/TOPO		Wet	Yes	017N	093W	13	Coal Gulch-Barrel Springs Draw	41.44954	-107.82535	Anadarko Land Corp
1377				NAIP/TOPO		Wet	Yes	017N	092W	17	Muddy Creek-Antelope Creek	41.44709	-107.77877	Weber Ranch Co
1378				NAIP		Wet	Yes	017N	092W	15	Muddy Creek-Antelope Creek	41.44403	-107.75382	Adams, Stephen F & Carolyn L.
1379				NAIP		Wet	Yes	017N	091W	17	Dry Cow Creek	41.44300	-107.67680	Weber Ranch Co
1380				NAIP/TOPO		Wet	Yes	017N	091W	13	Dry Cow Creek	41.45549	-107.59063	State Of Wyoming Board Of Land Commissioner
1381				NAIP/TOPO		Wet	Yes	017N	090W	18	Dry Cow Creek	41.44392	-107.57477	State Of Wyoming Board Of Land Commissioner
1382				NAIP/TOPO		Wet	Yes	017N	090W	18	Dry Cow Creek	41.44863	-107.56974	State Of Wyoming Board Of Land Commissioner
1383				NAIP		Wet	Yes	017N	090W	13	Muddy Creek-Littlefield Creek	41.45294	-107.48802	Jack Creek Land And Cattle Company
1384				NAIP/TOPO		Wet	Yes	017N	089W	16	Muddy Creek-Littlefield Creek	41.45157	-107.41831	State Of Wyoming
1385				NAIP		Wet	Yes	017N	089W	16	Muddy Creek-Littlefield Creek	41.44216	-107.41488	State Of Wyoming
1386				NAIP/TOPO		Wet	Yes	017N	090W	7	Dry Cow Creek	41.46341	-107.57942	State Of Wyoming Board Of Land Commissioner
1387				NAIP		Wet	Yes	017N	091W	9	Muddy Creek-Alamosa Gulch	41.45750	-107.64263	Weber Ranch Co
1388				NAIP/TOPO		Wet	Yes	017N	092W	11	Muddy Creek-Antelope Creek	41.46266	-107.73128	Weber Ranch Co
1389				NAIP		Wet	Yes	017N	092W	11	Muddy Creek-Antelope Creek	41.45710	-107.73626	Weber Ranch Co
1390				NAIP		Wet	Yes	017N	094W	10	Lower North Barrel Springs Draw	41.46671	-107.97411	BLM
1391				NAIP		Wet	Yes	017N	094W	9	Lower North Barrel Springs Draw	41.46466	-107.98744	Hardy Richard
1392				NAIP		Wet	Yes	017N	095W	5	Upper Barrel Springs Draw	41.48238	-108.13395	Stratton Sheep Co
1393				NAIP/TOPO		Dry	Yes	017N	093W	3	Coal Gulch-Barrel Springs Draw	41.47568	-107.86047	Anadarko Land Corp
1394				NAIP/TOPO		Wet	Yes	017N	093W	1	Coal Gulch-Barrel Springs Draw	41.48381	-107.82890	Anadarko Land Corp
1395				NAIP		Wet	Yes	017N	092W	5	Muddy Creek-Antelope Creek	41.47875	-107.78602	Weber Ranch Co
1396				NAIP/TOPO	Breached	Dry	No	017N	092W	3	Muddy Creek-Antelope Creek	41.46998	-107.75795	Weber Ranch Co
1397				NAIP/TOPO		Wet	Yes	018N	091W	31	Muddy Creek-Antelope Creek	41.48858	-107.69720	Swanson And Johnson
1398				NAIP		Wet	Yes	018N	092W	36	Muddy Creek-Antelope Creek	41.48962	-107.70933	State Of Wyoming
1399				NAIP/TOPO		Wet	Yes	018N	093W	25	Coal Gulch-Barrel Springs Draw	41.50044	-107.81942	Norwest Bank Colorado
1400				NAIP/TOPO	Sediment	Dry	No	018N	093W	35	Coal Gulch-Barrel Springs Draw	41.49154	-107.84215	Anadarko Land Corp
1401				NAIP/TOPO	Sediment	Dry	No	018N	093W	35	Coal Gulch-Barrel Springs Draw	41.49146	-107.84707	Anadarko Land Corp
1402				NAIP		Wet	Yes	018N	095W	32	Upper North Barrel Springs Draw	41.49668	-108.12465	BLM
1403				NAIP		Wet	Yes	018N	096W	35	Upper North Barrel Springs Draw	41.49290	-108.18296	P H Livestock Co
1404				NAIP		Wet	Yes	018N	093W	27	Coal Gulch-Barrel Springs Draw	41.50268	-107.86727	Anadarko Land Corp
1405				NAIP		Wet	Yes	018N	093W	25	Coal Gulch-Barrel Springs Draw	41.51209	-107.81885	Norwest Bank Colorado
1406				NAIP/TOPO		Wet	Yes	018N	093W	25	Coal Gulch-Barrel Springs Draw	41.50537	-107.83292	Norwest Bank Colorado
1407				NAIP/TOPO		Wet	Yes	018N	092W	29	Coal Gulch-Barrel Springs Draw	41.50302	-107.78962	Norwest Bank Colorado
1408				NAIP		Wet	Yes	018N	091W	29	Muddy Creek-Alamosa Gulch	41.50997	-107.67701	Swanson And Johnson
1409				NAIP		Dry	Yes	018N	091W	29	Muddy Creek-Alamosa Gulch	41.50648	-107.67545	Swanson And Johnson
1410				NAIP/TOPO		Wet	Yes	018N	091W	29	Muddy Creek-Alamosa Gulch	41.50362	-107.66138	Swanson And Johnson
1411				NAIP/TOPO		Wet	Yes	018N	090W	29	Muddy Creek-Alamosa Gulch	41.50837	-107.54825	Jack Creek Land And Cattle Company
1412				NAIP		Wet	Yes	018N	090W	27	Muddy Creek-Alamosa Gulch	41.50987	-107.52137	Ph Livestock Company
1413				NAIP/TOPO		Wet	Yes	018N	090W	36	McKinney Creek	41.49876	-107.48105	State Of Wyoming
1414				NAIP/TOPO		Wet	Yes	018N	090W	25	McKinney Creek	41.50196	-107.47128	Jack Creek Land And Cattle Company
1415				NAIP		Wet	Yes	018N	088W	19	McKinney Creek	41.52334	-107.35037	Overland Trail Cattle Company LLC
1416				NAIP		Wet	Yes	018N	089W	23	McKinney Creek	41.52344	-107.38611	Overland Trail Cattle Company LLC
1417				NAIP		Wet	Yes	018N	089W	24	McKinney Creek	41.52648	-107.36580	BLM
1418				NAIP/TOPO		Wet	Yes	018N	089W	21	McKinney Creek	41.51762	-107.41496	Overland Trail Cattle Company LLC
1419				NAIP/TOPO		Wet	Yes	018N	089W	21	McKinney Creek	41.51481	-107.41331	Overland Trail Cattle Company LLC
1420				NAIP/TOPO		Wet	Yes	018N	089W	19	McKinney Creek	41.51914	-107.46114	Overland Trail Cattle Company LLC
1421				NAIP/TOPO		Wet	Yes	018N	090W	24	McKinney Creek	41.51726	-107.47062	Overland Trail Cattle Company LLC
1422				NAIP/TOPO		Wet	Yes	018N	089W	19	McKinney Creek	41.52742	-107.46765	Overland Trail Cattle Company LLC
1423				NAIP/TOPO	Sediment	Dry	No	018N	091W	21	Muddy Creek-Alamosa Gulch	41.52276	-107.65834	Ph Livestock Company
1424				NAIP/TOPO		Wet	Yes	018N	091W	19	Muddy Creek-Antelope Creek	41.52380	-107.69482	Swanson And Johnson
1425				NAIP		Wet	Yes	018N	091W	19	Muddy Creek-Antelope Creek	41.52525	-107.69873	Swanson And Johnson
1426				NAIP/TOPO		Wet	Yes	018N	092W	21	Coal Gulch-Barrel Springs Draw	41.52169	-107.77569	Norwest Bank Colorado
1427				NAIP/TOPO	Breached	Dry	No	018N	092W	20	Coal Gulch-Barrel Springs Draw	41.52037	-107.79312	BLM
1428				NAIP		Wet	Yes	018N	092W	19	Coal Gulch-Barrel Springs Draw	41.51853	-107.79943	Norwest Bank Colorado
1429				NAIP/TOPO		Wet	Yes	018N	092W	17	Coal Gulch-Barrel Springs Draw	41.52934	-107.78170	Norwest Bank Colorado
1430				NAIP/TOPO		Dry	Yes	018N	092W	16	Coal Gulch-Barrel Springs Draw	41.53083	-107.76485	State Of Wyoming
1431				NAIP/TOPO		Wet	Yes	018N	092W	15	Coal Gulch-Barrel Springs Draw	41.53595	-107.75619	Norwest Bank Colorado
1432				NAIP/TOPO		Wet	Yes	018N	092W	15	Coal Gulch-Barrel Springs Draw	41.53125	-107.73887	Norwest Bank Colorado
1433				NAIP/TOPO	Breached	Dry	No	018N	092W	13	Muddy Creek-Antelope Creek	41.53654	-107.71808	Norwest Bank Colorado
1434				NAIP/TOPO	Breached	Dry	No	018N	091W	18	Muddy Creek-Antelope Creek	41.53338	-107.68898	BLM
1435				NAIP/TOPO		Dry	Yes	018N	091W	18	Muddy Creek-Antelope Creek	41.53331	-107.68456	BLM
1436				NAIP/TOPO		Wet	Yes	018N	089W	17	McKinney Creek	41.53348	-107.44718	Overland Trail Cattle Company LLC

Little Snake River / Vermillion Creek Watershed: Stock Reservoir Database

GIS IDENT	BLM Database Info		Allotment	Source	ACE Review Notes			Township	Range	Section	Subwatershed (HUC-12)	Lat	Long	Surface Owner
	BLM Comment	BLM Inspection			Comment	Water Condition	Water Source							
1437				NAIP/TOPO		Wet	Yes	018N	089W	16	McKinney Creek	41.54060	-107.42669	State Of Wyoming
1438				NAIP/TOPO		Wet	Yes	018N	092W	9	Coal Gulch-Barrel Springs Draw	41.55095	-107.75823	Anadarko Land Corp
1439				NAIP/TOPO		Wet	Yes	018N	094W	9	Red Lakes	41.54904	-107.99049	Feterl Family LLC
1440				NAIP/TOPO		Dry	Yes	018N	094W	10	Red Lakes	41.54570	-107.98715	BLM
1441				NAIP/TOPO		Wet	Yes	018N	094W	7	Red Lakes	41.55458	-108.03552	Heath Land & Energy L L L P Etal
1442				NAIP		Wet	Yes	018N	095W	11	Red Lakes	41.54862	-108.07936	Stratton Sheep Co
1443				NAIP/TOPO		Wet	Yes	018N	096W	9	Upper North Barrel Springs Draw	41.54366	-108.23674	P H Livestock Co
1444				NAIP		Wet	Yes	018N	094W	6	Red Lakes	41.56414	-108.03946	BLM
1445				NAIP		Wet	Yes	019N	095W	29	Red Lakes	41.59788	-108.12746	Heath Land & Energy L L L P
1446				NAIP		Wet	Yes	019N	095W	27	Red Lakes	41.59196	-108.09059	Feterl Family LLC
1447				NAIP		Wet	Yes	019N	095W	25	Red Lakes	41.59295	-108.05270	Stenberg Family 2005 Trust
1448				NAIP/TOPO		Wet	Yes	019N	095W	20	Red Lakes	41.61021	-108.12211	BLM
1449				NAIP/TOPO		Wet	Yes	019N	095W	20	Red Lakes	41.60973	-108.12212	BLM
1450				NAIP/TOPO		Wet	Yes	019N	095W	16	Red Lakes	41.61964	-108.11898	BLM
1451				NAIP		Dry	Yes	019N	095W	15	Red Lakes	41.62016	-108.08422	Adams, Stephen F & Carolyn L.
1452				NAIP		Dry	Yes	019N	095W	15	Red Lakes	41.62153	-108.08706	Adams, Stephen F & Carolyn L.
1453				NAIP		Wet	Yes	019N	095W	13	Red Lakes	41.62005	-108.05119	Adams, Stephen F & Carolyn L.
1454				NAIP		Wet	Yes	012N	095W	5	Powder Wash-East Fork Anthill Draw	41.04594	-108.11090	BLM
1455				LSRCD	Lidstone Anderson Re	Wet	Yes	015N	089W	35	Middle Savery Creek	41.22738	-107.37019	Montgomery Livestock Co
1456				LSRCD	Lidstone Anderson Re	Wet	Yes	016N	091W	27	Cow Creek	41.32597	-107.62429	BLM
1457				LSRCD	Lidstone Anderson Re	Wet	Yes	015N	090W	3	Wild Cow Creek	41.30215	-107.50028	Montgomery Livestock Co
1458				LSRCD	Lidstone Anderson Re	Wet	Yes	016N	090W	32	Cow Creek	41.32058	-107.53964	BLM
1459	orseshoe Wash Reservoir			BLM-RSFO	Sediment	Dry	No	012N	101W	12	Horseshoe Wash	41.02805	-108.72533	BLM
1460	Two Bar Trail Reservoir			BLM-RSFO	Breached	Dry	No	012N	101W	8	Lower Canyon Creek-Vermillion Creek	41.03344	-108.80589	BLM
1461	outh Horseshoe Reserovir			BLM-RSFO	No Visible Reservoir	N/A	No	012N	102W	1	Horseshoe Wash	41.04608	-108.83597	BLM
1462	ower Horseshoe Reservoir			BLM-RSFO	No Visible Reservoir	N/A	No	013N	101W	32	Horseshoe Wash	41.05976	-108.81322	BLM
1463	Highway Reservoir			BLM-RSFO	No Visible Reservoir	N/A	No	013N	101W	33	Vermillion Creek-McKnight Spring	41.06444	-108.79096	BLM
1464	Goat Spring Reservoir #1			BLM-RSFO	No Visible Reservoir	N/A	No	013N	102W	29	Vermillion Creek-North Fork Vermillion Creek	41.08089	-108.92838	BLM
1465	hipping Corral #2 Reservoir			BLM-RSFO	No Visible Reservoir	N/A	No	013N	101W	28	Vermillion Creek-McKnight Spring	41.08269	-108.79351	BLM
1466	tle Scrivener Butte Reservoir			BLM-RSFO	No Visible Reservoir	N/A	No	013N	101W	30	Vermillion Creek-North Fork Vermillion Creek	41.08432	-108.82918	BLM
1467	Young Reservoir			BLM-RSFO	No Visible Reservoir	N/A	No	013N	103W	24	Vermillion Creek-North Fork Vermillion Creek	41.09691	-108.95379	BLM
1468	North Coyote Reservoir			BLM-RSFO		Dry	Yes	013N	102W	23	Vermillion Creek-North Fork Vermillion Creek	41.09789	-108.85409	BLM
1469	orth Vermillion Reservoir			BLM-RSFO		Dry	Yes	013N	102W	17	Vermillion Creek-North Fork Vermillion Creek	41.10744	-108.92576	BLM
1470	Rife Rim Reservoir # 4			BLM-RSFO		Dry	Yes	013N	102W	8	Vermillion Creek-North Fork Vermillion Creek	41.12379	-108.91616	BLM
1471	Rife Rim Reservoir # 3			BLM-RSFO		Dry	Yes	013N	102W	10	Vermillion Creek-North Fork Vermillion Creek	41.12565	-108.88569	BLM
1472	Five Forks Pit			BLM-RSFO		Wet	Yes	013N	100W	7	Lower Alkali Creek-Vermillion Creek	41.12118	-108.71842	BLM
1473	Rife Rim Reservoir # 2			BLM-RSFO		Dry	Yes	013N	102W	11	Vermillion Creek-North Fork Vermillion Creek	41.12469	-108.85784	BLM
1474	Antelope Band Pit			BLM-RSFO		Dry	Yes	013N	101W	3	Lower Alkali Creek-Vermillion Creek	41.13736	-108.76231	BLM
1475	Seepy Draw Reservoir			BLM-RSFO		Dry	Yes	014N	100W	31	Lower Alkali Creek-Vermillion Creek	41.14658	-108.70140	BLM
1476	Unknown			BLM-RSFO	No Visible Reservoir	N/A	No	014N	100W	26	Upper Alkali Creek-Vermillion Creek	41.16318	-108.62498	BLM
1477	Unknown			BLM-RSFO	Breached	Dry	No	014N	100W	26	Upper Alkali Creek-Vermillion Creek	41.16483	-108.62816	BLM
1478	Unknown			BLM-RSFO	No Visible Reservoir	N/A	No	014N	100W	23	Upper Alkali Creek-Vermillion Creek	41.16653	-108.62510	BLM
1479	Unknown			BLM-RSFO		Dry	Yes	014N	099W	19	Upper Alkali Creek-Vermillion Creek	41.17073	-108.60322	BLM
1480	Unknown			BLM-RSFO	No Visible Reservoir	N/A	No	014N	097W	3	Sand Creek-Monument Valley	41.21121	-108.31397	BLM
1481	etention Reservoir 1497 # 1			BLM-RSFO	Breached	N/A	No	014N	097W	3	Sand Creek-Monument Valley	41.21408	-108.31029	BLM
1482	etention Reservoir 1597 # 1			BLM-RSFO	No Name Reservoir	Wet	Yes	015N	097W	26	Sand Creek-Monument Valley	41.23854	-108.28236	BLM
1483	etention Reservoir 1596 # 2			BLM-RSFO	Breached	N/A	No	015N	096W	20	Sand Creek-Monument Valley	41.25337	-108.23493	BLM
1484	etention Reservoir 1596 # 1			BLM-RSFO	Breached	N/A	No	015N	096W	13	Upper Haystack Wash	41.27848	-108.15697	BLM
1485	Cloud Reservoir			BLM-RSFO	Breached	Dry	No	015N	096W	9	Lower Haystack Wash	41.28137	-108.20612	BLM
1486	Chicken Creek Pit			BLM-RSFO		Dry	Yes	014N	100W	21	Upper Alkali Creek-Vermillion Creek	41.17917	-108.67942	BLM
1487				NAIP		Wet	Yes	013N	090W	11	Little Snake River-Cottonwood Creek	41.11299	-107.48064	BLM
1488				NAIP/TOPO		Dry	Yes	014N	098W	26	Shell Creek-Cow Creek Reservoir	41.16303	-108.40833	BLM

APPENDIX 3C

LITTLE SNAKE RIVER / VERMILLION CREEK WATERSHED: TABULATION OF FISH BARRIERS (TROUT UNLIMITED)

Appendix A – Dams, diversions, grade control structures, road crossings, and constructed fish barriers that were observed during this survey.

#	Stream	Obstruction Type	Name	Barrier	Priority	Easting	Northing
0	Muddy Creek	Dam	Headwaters Dam	Not Viewed		300,565	4,584,083
1	Muddy Creek	Dam	Headwaters Dam	Not Viewed		300,626	4,584,101
2	Muddy Creek	Dam	Headwaters Dam	Not Viewed		301,107	4,584,133
3	Muddy Creek	Dam	Headwaters Dam	Not Viewed		298,490	4,581,868
4	Muddy Creek	Dam	Headwaters Dam	Not Viewed		298,491	4,582,166
8	Muddy Creek	Road Crossing	Culvert	Complete	High	296,195	4,588,888
9	Muddy Creek	Diversion		No		294,933	4,591,091
10	Muddy Creek	Road Crossing	Bridge	No		294,427	4,590,993
11	Muddy Creek	Road Crossing	Bridge	No		293,470	4,592,088
12	Muddy Creek	Road Crossing	Bridge	No		292,020	4,593,739
13	Muddy Creek	Diversion		Seasonal	Medium	288,456	4,595,248
14	Muddy Creek	Road Crossing	Bridge	No		287,450	4,595,957
17	Muddy Creek	Road Crossing	Ford	No		281,804	4,594,620
24	Muddy Creek	Road Crossing	Bridge			271,073	4,592,263
26	Muddy Creek	Road Crossing	Bridge	No		269,696	4,590,944
27	Muddy Creek	Diversion		No		267,792	4,586,339
29	Muddy Creek	Dam	Off-channel dam	No		267,475	4,585,852
30	Muddy Creek	Dam	Off-channel dam			267,562	4,585,505
31	Muddy Creek	Dam	Off-channel dam	No		267,337	4,584,876
32	Muddy Creek	Dam	Off-channel dam	No		267,308	4,584,272
33	Muddy Creek	Dam	Off-channel dam			267,186	4,583,719
34	Muddy Creek	Diversion		Not Viewed		268,047	4,581,017
35	Muddy Creek	Diversion		Not Viewed		268,129	4,580,998
36	Muddy Creek	Diversion	1st tour site	Complete	High	268,464	4,580,815
38	Muddy Creek	Diversion		Not Viewed		268,317	4,580,594
39	Muddy Creek	Road Crossing	Bridge	No		268,372	4,578,661
40	Muddy Creek	Dam	Off-channel dam			268,879	4,577,137
41	Muddy Creek	Dam	Off-channel dam			268,465	4,577,656
42	Muddy Creek	Road Crossing	Bridge			270,568	4,575,829
45	Muddy Creek	Road Crossing		Not Viewed		275,152	4,565,375
46	Muddy Creek	Road Crossing		Not Viewed		275,331	4,563,248
47	Muddy Creek	Road Crossing		Not Viewed		277,858	4,556,809
51	Muddy Creek	Road Crossing		Not Viewed		278,889	4,549,644
54	Little Snake	Diversion		Not Viewed		264,659	4,541,925
55	Little Snake	Diversion		Not Viewed		266,647	4,542,055
56	Little Snake	Diversion	Trowel	Seasonal	Medium	271,008	4,541,425
57	Little Snake	Diversion	State Line	Seasonal	Medium	274,426	4,545,466
58	Little Snake	Diversion	Ready	Seasonal	High	276,526	4,546,571
59	Little Snake	Diversion	Baggs	Complete	Very High	278,486	4,546,955
60	Little Snake	Diversion	Steve Adams	Seasonal	Medium	279,122	4,546,341
61	Little Snake	Road Crossing	Bridge	No		285,734	4,545,089
63	Little Snake	Diversion	Westside	Seasonal	Very High	287,565	4,545,007
65	Little Snake	Road Crossing	Bridge	No		291,545	4,543,123
66	Little Snake	Diversion	First Mesa	Seasonal	Very High	292,102	4,543,160
67	Little Snake	Diversion	Snow	No		292,860	4,542,972
68	Little Snake	Road Crossing	Bridge	No		299,890	4,541,151
69	Little Snake	Diversion		No		301,485	4,541,653
70	Little Snake	Road Crossing	Bridge	No		301,584	4,541,630
71	Little Snake	Road Crossing	Ford	No		307,302	4,541,318
79	Little Snake	Diversion		No		309,963	4,541,369
80	Little Snake	Road Crossing	Bridge	No		310,496	4,541,403
81	Little Snake	Diversion		No		311,356	4,540,877

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#	Stream	Obstruction Type	Name	Barrier	Priority	Easting	Northing
83	Battle Creek	Diversion		No		312,685	4,544,325
89	Battle Creek	Diversion		No		312,354	4,543,794
91	Battle Creek	Diversion		No		312,037	4,542,428
92	Battle Creek	Road Crossing	Bridge	No		311,756	4,541,530
93	Battle Creek	Diversion		No		312,502	4,547,400
94	Cottonwood Creek	Road Crossing	Bridge	No		290,388	4,553,047
95	Cottonwood Creek	Diversion		Complete	Low	288,193	4,545,804
96	Dutch Joe Creek	Dam	Headwaters Dam	Not Viewed		290,383	4,546,197
97	Dutch Joe Creek	Dam	Headwaters Dam	Not Viewed		290,559	4,546,275
98	Dutch Joe Creek	Road Crossing	Culvert	Not Viewed		290,097	4,546,079
99	Dutch Joe Creek	Road Crossing	Culvert	Not Viewed		289,561	4,545,921
100	Dutch Joe Creek	Road Crossing	Birdge	No		288,820	4,545,439
101	Dutch Joe Creek	Diversion		Complete	Low	288,797	4,545,391
102	Dutch Joe Creek	Dam	Headwaters Dam	Not Viewed		294,067	4,553,183
103	Dutch Joe Creek	Dam	Headwaters Dam	Not Viewed		294,010	4,553,110
104	Dutch Joe Creek	Dam	Headwaters Dam	Not Viewed		293,864	4,552,974
105	Dutch Joe Creek	Dam	Headwaters Dam	Not Viewed		293,752	4,552,834
106	Dutch Joe Creek	Dam	Headwaters Dam	Not Viewed		293,439	4,552,228
107	Dutch Joe Creek	Road Crossing	Culvert	Not Viewed		293,235	4,551,376
108	Savory Creek	Road Crossing	Bridge	No		294,470	4,544,406
109	Savory Creek	Diversion	Cobb-Morgan	Seasonal	Medium	295,259	4,545,176
110	Savory Creek	Diversion	Cobb	Seasonal	Medium	296,017	4,545,712
112	Savory Creek	Diversion		No		298,411	4,548,543
113	Savory Creek	Road Crossing	Bridge	No		298,430	4,548,633
115	Savory Creek	Diversion		No		299,588	4,550,945
116	Savory Creek	Road Crossing	Bridge	No		300,059	4,552,377
117	Savory Creek	Diversion		No		300,286	4,553,255
126	Savory Creek	Grade Control		No		304,598	4,570,480
127	Savory Creek	Diversion		Seasonal	Medium	305,138	4,570,579
130	Savory Creek	Road Crossing	Ford	No		303,584	4,569,725
131	Savory Creek	Diversion		Seasonal	Medium	303,550	4,569,681
132	Savory Creek	Road Crossing	Bridge	No		303,246	4,569,296
150	Savory Creek	Road Crossing	Ford	No		302,153	4,561,204
162	Savory Creek	Road Crossing	Ford	No		302,552	4,557,906
165	Savory Creek	Road Crossing	Ford	No		301,353	4,555,479
166	Savory Creek	Road Crossing	Culvert	Seasonal	High	300,844	4,554,286
167	North Fork Savery Creek	Constructed barrier	Constructed barrier	On purpose	Necessary	309,492	4,573,589
175	North Fork Savery Creek	Road Crossing	Culvert			308,854	4,577,960
176	North Fork Savery Creek	Road Crossing	Culvert	No		311,136	4,579,724
177	North Fork Savery Creek	Road Crossing	Culvert	No		313,601	4,580,414
184	North Fork Savery Creek	Dam	Headwaters Dam	Not Viewed		317,616	4,579,711
193	North Fork Savery Creek	Dam	Headwaters Dam	Not Viewed		317,694	4,579,793
196	Truckdrivers Creek	Road Crossing	Culvert	No		311,346	4,577,301
197	Truckdrivers Creek	Dam	Headwaters Dam	Not Viewed		311,371	4,577,308
198	Truckdrivers Creek	Dam	Headwaters Dam	Not Viewed		311,903	4,577,422
199	Truckdrivers Creek	Road Crossing	Culvert	Not Viewed		312,688	4,578,717
205	Mill Creek	Dam	Headwaters Dam	Not Viewed		315,918	4,579,137
209	Cottonwood Creek	Road Crossing	Bridge	No		287,644	4,545,471
210	Battle Creek	Diversion	Fran-Marsh	No		311,775	4,541,780
211	Savery Creek	Dam	High Savery Dam	Complete	Necessary	307,365	4,571,636

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#	Stream	Obstruction Type	Name	Barrier	Priority	Easting	Northing
220	Little Savery Creek	Road Crossing	Culvert	No		300,200	4,575,020
226	Little Savery Creek	Road Crossing	Culvert	No		301,059	4,578,326
233	Little Savery Creek	Diversion		Not Viewed		302,795	4,580,745
234	Hatch Creek	Road Crossing	Ford	No		315,539	4,572,697
235	Hatch Creek	Dam	Headwaters Dam	Not Viewed		315,924	4,572,997
255	Hartt Creek	Road Crossing	Culvert	No		311,742	4,574,114
256	Hartt Creek	Road Crossing	Culvert	Not Viewed		314,897	4,574,933
278	Unnamed stream	Dam	Headwaters Dam	Not Viewed		313,119	4,568,635
279	Unnamed stream	Dam	Headwaters Dam	Not Viewed		312,925	4,568,066
283	Dirtyman Fork	Road Crossing	Culvert	Partial	Medium	311,321	4,570,762
284	Dirtyman Fork	Diversion		Seasonal	Low	314,394	4,569,565
296	East Fork Savery Creek	Constructed barrier	Constructed barrier	On purpose	Necessary	310,837	4,573,023
297	East Fork Savery Creek	Road Crossing	Culvert	No		310,875	4,573,039
298	East Fork Savery Creek	Road Crossing	Culvert	Not Viewed		314,201	4,570,935
299	East Fork Savery Creek	Diversion		Not Viewed		314,457	4,570,849
300	East Fork Savery Creek	Road Crossing	Ford	No		315,169	4,570,992
316	Loco Creek	Dam	Headwaters Dam	Not Viewed		297,374	4,552,030
317	Loco Creek	Dam	Headwaters Dam	Not Viewed		297,634	4,553,557
318	Loco Creek	Dam	Headwaters Dam	Not Viewed		297,234	4,553,959
319	Loco Creek	Road Crossing	Culvert	No		298,195	4,549,635
320	Negro Creek	Diversion		Complete	Low	298,208	4,549,626
323	Loco Creek	Dam	Headwaters Dam	Not Viewed		297,828	4,560,634
324	Loco Creek	Dam	Headwaters Dam	Not Viewed		298,863	4,560,899
325	Loco Creek	Dam	Headwaters Dam	Not Viewed		298,895	4,560,883
326	Loco Creek	Dam	Headwaters Dam	Not Viewed		299,486	4,560,667
327	Loco Creek	Dam	Headwaters Dam	Not Viewed		299,865	4,560,526
330	West Fork Loco Creek	Dam	Headwaters Dam	Not Viewed		295,008	4,559,510
331	West Fork Loco Creek	Dam	Headwaters Dam	Not Viewed		294,462	4,559,978
332	West Fork Loco Creek	Dam	Headwaters Dam	Not Viewed		294,340	4,560,395
333	West Fork Loco Creek	Dam	Headwaters Dam	Not Viewed		294,056	4,560,400
334	West Fork Loco Creek	Dam	Headwaters Dam	Not Viewed		293,816	4,560,698
335	West Fork Loco Creek	Dam	Headwaters Dam	Not Viewed		293,518	4,560,603
336	Little Snake	Road Crossing	Bridge	No		276,670	4,546,559
338	Little Snake River	Road Crossing	Bridge	No		266,662	4,541,751
341	Dirty Man Creek	Constructed barrier	Constructed barrier	On purpose	Necessary	315,327	4,568,559
342	Dirty Man Creek	Road Crossing	Proposed Barrier	Seasonal	Necessary	314,528	4,569,469
343	N. Fk. Savery Trib.	Road Crossing	Culvert	Partial	Low	311,330	4,576,237
344	Truckdrivers Trib	Road Crossing	Culvert	No		311,191	4,577,497
345	Muddy Creek	Grade Control	George Dew East	Complete	High	267,913	4,583,423
346	Muddy Creek	Grade Control	George Dew west	Complete	High	267,374	4,583,470
347	Little Savery Creek	Diversion		No		303,404	4,570,095
348	Savery Creek	Grade Control		No		304,871	4,570,592
349	Savery Creek	Grade Control		No		305,791	4,570,979
350	Savery Creek	Grade Control		No		305,982	4,571,062
351	Savery Creek	Grade Control		No		306,138	4,571,147
352	Savery Creek	Grade Control		No		306,282	4,571,308
353	East Fork Savery Creek	Diversion		No		315,584	4,571,063
354	Andy Johnson Creek	Road Crossing	Culvert	Partial	Medium	313,034	4,568,583
355	Muddy Creek	Road Crossing	Culvert	No		297,968	4,585,323
356	Muddy Creek	Constructed barrier	Constructed barrier	On purpose	Necessary	292,956	4,593,537
357	Muddy Creek	Grade Control	MCGP4	Complete	High	293,288	4,592,834
358	Littlefield Creek	Road Crossing	Culvert	No		295,523	4,590,879
359	Littlefield Creek	Constructed barrier	Constructed barrier	On purpose	Necessary	296,448	4,591,690

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#	Stream	Obstruction Type	Name	Barrier	Priority	Easting	Northing
360	East Muddy Creek	Constructed barrier	Constructed barrier	On purpose	Necessary	296,886	4,590,693
361	East Muddy Creek	Constructed barrier	Constructed barrier	On purpose	Necessary	296,920	4,590,705
362	Muddy Creek	Road Crossing	Bridge	No		296,176	4,588,776
363	Battle Creek	Diversion		No		312,952	4,548,180
364	Battle Creek	Diversion		No		312,697	4,546,765
366	Big Gulch	Road Crossing	Culvert	Partial	Medium	300,386	4,552,605
367	Loco Creek	Road Crossing	Culvert	Partial	Medium	300,671	4,554,292
368	Savery Creek	Diversion		No		300,913	4,554,437
369	Savery Creek	Diversion		No		301,286	4,555,525
370	Haggerty Creek	Constructed barrier	Constructed barrier	On purpose	Necessary	321,940	4,556,820
371	Haggerty Creek	Diversion		Partial	Medium	322,137	4,557,479
372	Lost Creek	Road Crossing	Culvert	No		325,501	4,556,485
373	Little Sandstone Creek	Road Crossing	Culvert	No		316,347	4,557,028
374	Big Sandstone Creek	Road Crossing	Culvert	Partial	Medium	314,177	4,560,148
375	Deep Creek	Constructed barrier	Culvert	On purpose	Necessary	313,223	4,562,239
376	Muddy Creek	Grade Control	Muddy Creek Drop	Complete	Necessary	271,622	4,593,173
377	Muddy Creek	Grade Control	MCGP12	Complete	High	294,328	4,590,960
378	Muddy Creek	Grade Control	MCGP11	Complete	High	294,335	4,590,950
379	Muddy Creek	Grade Control	MCGP10	Complete	High	294,220	4,590,933
380	Muddy Creek	Grade Control	MCGP8	Complete	High	293,534	4,591,698
381	Muddy Creek	Grade Control	MCGP7	Seasonal	Medium	293,492	4,591,815
382	Muddy Creek	Grade Control	MCGP6	Complete	High	293,523	4,591,816
383	Muddy Creek	Grade Control	MCGP5	Complete	High	293,236	4,592,800
384	Muddy Creek	Grade Control	MCGP3	Seasonal	Medium	293,342	4,592,918
385	Muddy Creek	Grade Control	MCGP2	Complete	High	293,374	4,592,919
386	Muddy Creek	Grade Control	MCGP1	Complete	High	293,421	4,592,921
387	Muddy Creek	Constructed barrier	Permiable barrier	On purpose	Necessary	294,204	4,590,932
388	Muddy Creek	Grade Control		Partial	Medium	296,198	4,588,859
389	Muddy Creek	Grade Control		No		296,204	4,588,832
390	Muddy Creek	Grade Control		No		296,174	4,588,786
391	Muddy Creek	Grade Control		No		296,144	4,588,780
393	Muddy Creek	Grade Control		Partial	Medium	296,134	4,588,684
394	Muddy Creek	Grade Control		No		296,112	4,588,671
395	Muddy Creek	Grade Control		Partial	Medium	296,119	4,588,660
396	Muddy Creek	Grade Control		Partial	Medium	296,146	4,588,566
397	Muddy Creek	Grade Control		No		296,183	4,588,501
398	Muddy Creek	Grade Control		Partial	Medium	296,206	4,588,488
399	Muddy Creek	Grade Control		Partial	Medium	296,148	4,588,164
400	Muddy Creek	Grade Control		No		296,330	4,587,765
401	Muddy Creek	Grade Control		Seasonal	High	296,667	4,587,327
402	Muddy Creek	Grade Control		No		296,639	4,587,300
403	Muddy Creek	Grade Control		Seasonal	High	296,496	4,587,169
404	Muddy Creek	Grade Control		Partial	Medium	296,480	4,587,133
405	Muddy Creek	Grade Control		No		296,573	4,586,950
406	Muddy Creek	Grade Control		Partial	High	296,753	4,587,045
407	Muddy Creek	Grade Control		Partial	High	297,983	4,585,383
408	Muddy Creek	Grade Control		No		297,996	4,585,381
409	Muddy Creek	Grade Control		No		298,337	4,584,975
411	Muddy Creek	Grade Control		Partial	High	298,379	4,584,692
412	Muddy Creek	Grade Control		Partial	High	298,566	4,584,578
413	Muddy Creek	Grade Control		Partial	Medium	298,736	4,584,487
415	Muddy Creek	Grade Control		Seasonal	High	299,129	4,584,253
416	Muddy Creek	Grade Control		No		299,136	4,584,242
417	Muddy Creek	Grade Control		Complete	Low	300,208	4,584,085
418	Muddy Creek	Grade Control		Complete	Low	300,218	4,584,091
419	Muddy Creek	Grade Control		Complete	Low	300,222	4,584,083

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APPENDIX 3D

LITTLE SNAKE RIVER /
VERMILLION CREEK WATERSHED:
LANDFIRE DATA ANALYSIS FOR LITTLE SNAKE
RIVER / VERMILLION CREEK WATERSHED
BY SUBREGION

LANDFIRE Data Analysis for Little Snake River Watershed by Subregion

Subregion: Little Snake River			
Existing Vegetation Type	**Acres**	**Percent of Subregion**	**Cumulative Percent**
Inter-Mountain Basins Big Sagebrush Shrubland	64,980	43.2%	43.2%
Artemisia tridentata ssp. vaseyana Shrubland Alliance	17,152	11.4%	54.5%
Inter-Mountain Basins Big Sagebrush Steppe	14,239	9.5%	64.0%
Agriculture-Pasture and Hay	11,841	7.9%	71.9%
Inter-Mountain Basins Mixed Salt Desert Scrub	4,677	3.1%	75.0%
Rocky Mountain Montane Riparian Systems	3,530	2.3%	77.3%
Rocky Mountain Foothill Limber Pine-Juniper Woodland	3,491	2.3%	79.6%
Western Great Plains Floodplain Systems	3,373	2.2%	81.9%
Inter-Mountain Basins Greasewood Flat	3,369	2.2%	84.1%
Inter-Mountain Basins Mat Saltbush Shrubland	3,039	2.0%	86.1%
Rocky Mountain Aspen Forest and Woodland	2,536	1.7%	87.8%
Inter-Mountain Basins Semi-Desert Grassland	2,440	1.6%	89.4%
Rocky Mountain Lower Montane-Foothill Shrubland	2,405	1.6%	91.0%
Quercus gambelii Shrubland Alliance	1,962	1.3%	92.3%
Wyoming Basins Dwarf Sagebrush Shrubland and Steppe	1,669	1.1%	93.4%
Rocky Mountain Subalpine/Upper Montane Riparian Systems	1,207	0.8%	94.2%
Introduced Upland Vegetation-Annual and Biennial Forbland	1,135	0.8%	95.0%
Developed-Open Space	1,052	0.7%	95.7%
Inter-Mountain Basins Semi-Desert Shrub-Steppe	797	0.5%	96.2%
Inter-Mountain Basins Juniper Savanna	738	0.5%	96.7%
Southern Rocky Mountain Ponderosa Pine Woodland	512	0.3%	97.0%
Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland and Shrubland	473	0.3%	97.4%
Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	423	0.3%	97.6%
Northern Rocky Mountain Montane-Foothill Deciduous Shrubland	419	0.3%	97.9%
Inter-Mountain Basins Montane Sagebrush Steppe	413	0.3%	98.2%
Colorado Plateau Pinyon-Juniper Woodland	304	0.2%	98.4%
Introduced Upland Vegetation-Annual Grassland	278	0.2%	98.6%
Rocky Mountain Gambel Oak-Mixed Montane Shrubland	260	0.2%	98.8%
Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	228	0.2%	98.9%
Inter-Mountain Basins Sparsely Vegetated Systems	221	0.1%	99.1%
Agriculture-Cultivated Crops and Irrigated Agriculture	208	0.1%	99.2%
Southern Colorado Plateau Sand Shrubland	208	0.1%	99.3%
Northern Rocky Mountain Lower Montane-Foothill-Valley Grassland	197	0.1%	99.5%
Open Water	176	0.1%	99.6%
Western Great Plains Depressional Wetland Systems	157	0.1%	99.7%
Developed-Low Intensity	123	0.1%	99.8%
Barren	97	0.1%	99.8%
Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	94	0.1%	99.9%
Rocky Mountain Lodgepole Pine Forest	62	0.0%	99.9%
Introduced Upland Vegetation-Perennial Grassland and Forbland	49	0.0%	100.0%
Northwestern Great Plains Mixedgrass Prairie	18	0.0%	100.0%
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	12	0.0%	100.0%
Developed-Medium Intensity	11	0.0%	100.0%
Rocky Mountain Subalpine-Montane Mesic Meadow	8	0.0%	100.0%
Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland	3	0.0%	100.0%
Colorado Plateau Mixed Low Sagebrush Shrubland	3	0.0%	100.0%
Southern Rocky Mountain Montane-Subalpine Grassland	2	0.0%	100.0%
Middle Rocky Mountain Montane Douglas-fir Forest and Woodland	1	0.0%	100.0%

Subregion: Muddy Creek			
Existing Vegetation Type	**Acres**	**Percent of Subregion**	**Cumulative Percent**
Inter-Mountain Basins Big Sagebrush Shrubland	312,635	48.2%	48.2%
Artemisia tridentata ssp. vaseyana Shrubland Alliance	85,795	13.2%	61.4%
Introduced Upland Vegetation-Annual and Biennial Forbland	53,828	8.3%	69.7%
Inter-Mountain Basins Big Sagebrush Steppe	44,648	6.9%	76.6%
Inter-Mountain Basins Mat Saltbush Shrubland	31,782	4.9%	81.5%
Inter-Mountain Basins Semi-Desert Grassland	17,729	2.7%	84.2%
Wyoming Basins Dwarf Sagebrush Shrubland and Steppe	15,610	2.4%	86.6%
Inter-Mountain Basins Semi-Desert Shrub-Steppe	11,648	1.8%	88.4%
Rocky Mountain Lower Montane-Foothill Shrubland	11,634	1.8%	90.2%
Rocky Mountain Montane Riparian Systems	11,148	1.7%	92.0%
Western Great Plains Floodplain Systems	10,934	1.7%	93.6%
Inter-Mountain Basins Montane Sagebrush Steppe	9,206	1.4%	95.1%
Inter-Mountain Basins Mixed Salt Desert Scrub	7,919	1.2%	96.3%
Inter-Mountain Basins Sparsely Vegetated Systems	5,807	0.9%	97.2%
Rocky Mountain Aspen Forest and Woodland	2,908	0.4%	97.6%
Northern Rocky Mountain Lower Montane-Foothill-Valley Grassland	2,518	0.4%	98.0%
Barren	2,192	0.3%	98.4%
Rocky Mountain Subalpine/Upper Montane Riparian Systems	2,188	0.3%	98.7%
Developed-Open Space	2,102	0.3%	99.0%
Rocky Mountain Foothill Limber Pine-Juniper Woodland	1,306	0.2%	99.2%
Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland and Shrubland	1,304	0.2%	99.4%
Inter-Mountain Basins Greasewood Flat	1,264	0.2%	99.6%
Agriculture-Pasture and Hay	996	0.2%	99.8%
Rocky Mountain Subalpine-Montane Mesic Meadow	451	0.1%	99.8%
Western Great Plains Depressional Wetland Systems	339	0.1%	99.9%
Introduced Upland Vegetation-Perennial Grassland and Forbland	183	0.03%	99.9%
Southern Rocky Mountain Ponderosa Pine Woodland	101	0.02%	99.9%
Middle Rocky Mountain Montane Douglas-fir Forest and Woodland	69	0.01%	99.9%
Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	68	0.01%	99.9%
Northern Rocky Mountain Montane-Foothill Deciduous Shrubland	57	0.01%	100.0%
Developed-Low Intensity	49	0.01%	100.0%
Introduced Upland Vegetation-Annual Grassland	49	0.01%	100.0%
Northwestern Great Plains Mixedgrass Prairie	43	0.01%	100.0%
Rocky Mountain Gambel Oak-Mixed Montane Shrubland	38	0.01%	100.0%
Open Water	31	0.005%	100.0%
Southern Rocky Mountain Montane-Subalpine Grassland	24	0.004%	100.0%
Colorado Plateau Pinyon-Juniper Woodland	18	0.003%	100.0%
Inter-Mountain Basins Juniper Savanna	7	0.001%	100.0%
Northern Rocky Mountain Subalpine-Upper Montane Grassland	6	0.001%	100.0%
Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	3	0.0004%	100.0%
Northern Rocky Mountain Subalpine Woodland and Parkland	2	0.0004%	100.0%
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	2	0.0004%	100.0%
Developed-Medium Intensity	0	0.00003%	100.0%
Agriculture-Cultivated Crops and Irrigated Agriculture	0	0.00003%	100.0%

Subregion: Sand/Willow Creek			
Existing Vegetation Type	**Acres**	**Percent of Subregion**	**Cumulative Percent**
Inter-Mountain Basins Big Sagebrush Shrubland	167,377	44.64%	44.64%
Introduced Upland Vegetation-Annual and Biennial Forbland	66,826	17.82%	62.46%
Inter-Mountain Basins Sparsely Vegetated Systems	38,369	10.23%	72.69%
Inter-Mountain Basins Semi-Desert Grassland	36,135	9.64%	82.33%
Inter-Mountain Basins Big Sagebrush Steppe	20,806	5.55%	87.88%
Inter-Mountain Basins Mat Saltbush Shrubland	20,056	5.35%	93.23%
Inter-Mountain Basins Greasewood Flat	5,672	1.51%	94.74%
Inter-Mountain Basins Mixed Salt Desert Scrub	5,638	1.50%	96.24%
Wyoming Basins Dwarf Sagebrush Shrubland and Steppe	3,666	0.98%	97.22%
Artemisia tridentata ssp. vaseyana Shrubland Alliance	2,192	0.58%	97.81%
Barren	1,720	0.46%	98.27%
Inter-Mountain Basins Semi-Desert Shrub-Steppe	1,533	0.41%	98.67%
Rocky Mountain Lower Montane-Foothill Shrubland	1,246	0.33%	99.01%
Western Great Plains Floodplain Systems	864	0.23%	99.24%
Inter-Mountain Basins Montane Sagebrush Steppe	781	0.21%	99.45%
Rocky Mountain Foothill Limber Pine-Juniper Woodland	596	0.16%	99.60%
Northern Rocky Mountain Lower Montane-Foothill-Valley Grassland	355	0.09%	99.70%
Northwestern Great Plains Mixedgrass Prairie	290	0.08%	99.78%
Rocky Mountain Montane Riparian Systems	207	0.06%	99.83%
Introduced Upland Vegetation-Annual Grassland	202	0.05%	99.89%
Inter-Mountain Basins Juniper Savanna	123	0.03%	99.92%
Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland and Shrubland	86	0.02%	99.94%
Rocky Mountain Subalpine/Upper Montane Riparian Systems	69	0.02%	99.96%
Rocky Mountain Aspen Forest and Woodland	54	0.01%	99.97%
Southern Rocky Mountain Ponderosa Pine Woodland	31	0.01%	99.98%
Colorado Plateau Pinyon-Juniper Woodland	27	0.01%	99.99%
Southern Rocky Mountain Montane-Subalpine Grassland	21	0.01%	100.00%
Introduced Upland Vegetation-Perennial Grassland and Forbland	9	0.00%	100.00%
Rocky Mountain Subalpine-Montane Mesic Meadow	4	0.00%	100.00%
Western Great Plains Depressional Wetland Systems	2	0.00%	100.00%
Open Water	0	0.00%	100.00%

Subregion: Savery/Battle Creek			
Existing Vegetation Type	**Acres**	**Percent of Subregion**	**Cumulative Percent**
Inter-Mountain Basins Big Sagebrush Shrubland	51,257	15.2%	15.2%
Artemisia tridentata ssp. vaseyana Shrubland Alliance	48,675	14.5%	29.7%
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	39,198	11.7%	41.4%
Rocky Mountain Aspen Forest and Woodland	36,539	10.9%	52.3%
Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	32,426	9.6%	61.9%
Rocky Mountain Lower Montane-Foothill Shrubland	24,599	7.3%	69.2%
Rocky Mountain Lodgepole Pine Forest	18,828	5.6%	74.8%
Agriculture-Pasture and Hay	10,717	3.2%	78.0%
Rocky Mountain Montane Riparian Systems	10,588	3.1%	81.2%
Quercus gambelii Shrubland Alliance	9,509	2.8%	84.0%
Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	8,153	2.4%	86.4%
Inter-Mountain Basins Big Sagebrush Steppe	6,916	2.1%	88.5%
Agriculture-Cultivated Crops and Irrigated Agriculture	6,821	2.0%	90.5%
Wyoming Basins Dwarf Sagebrush Shrubland and Steppe	3,750	1.1%	91.6%
Western Great Plains Floodplain Systems	3,455	1.0%	92.7%
Rocky Mountain Subalpine/Upper Montane Riparian Systems	3,215	1.0%	93.6%
Rocky Mountain Gambel Oak-Mixed Montane Shrubland	2,423	0.7%	94.3%
Inter-Mountain Basins Montane Sagebrush Steppe	2,284	0.7%	95.0%
Rocky Mountain Foothill Limber Pine-Juniper Woodland	2,166	0.6%	95.7%
Southern Rocky Mountain Ponderosa Pine Woodland	1,841	0.5%	96.2%
Introduced Upland Vegetation-Perennial Grassland and Forbland	1,680	0.5%	96.7%
Rocky Mountain Subalpine-Montane Mesic Meadow	1,663	0.5%	97.2%
Southern Rocky Mountain Montane-Subalpine Grassland	1,536	0.5%	97.7%
Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	1,276	0.4%	98.0%
Developed-Open Space	942	0.3%	98.3%
Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland	866	0.3%	98.6%
Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland	744	0.2%	98.8%
Western Great Plains Depressional Wetland Systems	678	0.2%	99.0%
Northern Rocky Mountain Lower Montane-Foothill-Valley Grassland	534	0.2%	99.2%
Barren	492	0.1%	99.3%
Inter-Mountain Basins Semi-Desert Grassland	448	0.1%	99.4%
Colorado Plateau Pinyon-Juniper Woodland	345	0.1%	99.5%
Rocky Mountain Alpine Turf	345	0.1%	99.6%
Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland and Shrubland	232	0.1%	99.7%
Northern Rocky Mountain Montane-Foothill Deciduous Shrubland	207	0.1%	99.8%
Open Water	199	0.1%	99.8%
Southern Colorado Plateau Sand Shrubland	175	0.1%	99.9%
Inter-Mountain Basins Semi-Desert Shrub-Steppe	121	0.04%	99.9%
Inter-Mountain Basins Mixed Salt Desert Scrub	57	0.02%	99.9%
Inter-Mountain Basins Mat Saltbush Shrubland	54	0.02%	99.9%
Developed-Low Intensity	50	0.02%	100.0%
Southern Rocky Mountain Ponderosa Pine Savanna	47	0.01%	100.0%
Introduced Upland Vegetation-Annual and Biennial Forbland	18	0.01%	100.0%
Colorado Plateau Mixed Low Sagebrush Shrubland	18	0.01%	100.0%
Inter-Mountain Basins Greasewood Flat	12	0.004%	100.0%
Middle Rocky Mountain Montane Douglas-fir Forest and Woodland	7	0.002%	100.0%
Rocky Mountain Alpine Dwarf-Shrubland	5	0.002%	100.0%
Southern Rocky Mountain Juniper Woodland and Savanna	5	0.002%	100.0%
Introduced Upland Vegetation-Annual Grassland	5	0.002%	100.0%
Northwestern Great Plains Mixedgrass Prairie	2	0.001%	100.0%
Inter-Mountain Basins Sparsely Vegetated Systems	2	0.001%	100.0%
Northern Rocky Mountain Subalpine-Upper Montane Grassland	2	0.001%	100.0%
Northern Rocky Mountain Subalpine Woodland and Parkland	2	0.001%	100.0%
Southern Rocky Mountain Pinyon-Juniper Woodland	2	0.0005%	100.0%
Inter-Mountain Basins Juniper Savanna	1	0.0004%	100.0%
Developed-Medium Intensity	0	0.0001%	100.0%

Subregion: Vermillion/Shell Creek			
Existing Vegetation Type	**Acres**	**Percent of Subregion**	**Cumulative Percent**
Inter-Mountain Basins Big Sagebrush Shrubland	143461	42.8%	42.8%
Inter-Mountain Basins Big Sagebrush Steppe	54172	16.2%	58.9%
Inter-Mountain Basins Mixed Salt Desert Scrub	33098	9.9%	68.8%
Inter-Mountain Basins Mat Saltbush Shrubland	28755	8.6%	77.4%
Introduced Upland Vegetation-Annual and Biennial Forbland	16034	4.8%	82.2%
Artemisia tridentata ssp. vaseyana Shrubland Alliance	12812	3.8%	86.0%
Inter-Mountain Basins Semi-Desert Grassland	10482	3.1%	89.1%
Wyoming Basins Dwarf Sagebrush Shrubland and Steppe	7415	2.2%	91.3%
Inter-Mountain Basins Greasewood Flat	6379	1.9%	93.2%
Western Great Plains Floodplain Systems	4603	1.4%	94.6%
Inter-Mountain Basins Sparsely Vegetated Systems	4293	1.3%	95.9%
Inter-Mountain Basins Montane Sagebrush Steppe	2911	0.9%	96.7%
Inter-Mountain Basins Semi-Desert Shrub-Steppe	2348	0.7%	97.4%
Northern Rocky Mountain Lower Montane-Foothill-Valley Grassland	1727	0.5%	97.9%
Barren	814	0.2%	98.2%
Rocky Mountain Aspen Forest and Woodland	735	0.2%	98.4%
Developed-Open Space	717	0.2%	98.6%
Rocky Mountain Montane Riparian Systems	612	0.2%	98.8%
Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland and Shrubland	610	0.2%	99.0%
Rocky Mountain Foothill Limber Pine-Juniper Woodland	553	0.2%	99.2%
Rocky Mountain Subalpine/Upper Montane Riparian Systems	484	0.1%	99.3%
Rocky Mountain Lower Montane-Foothill Shrubland	397	0.1%	99.4%
Northwestern Great Plains Mixedgrass Prairie	350	0.1%	99.5%
Rocky Mountain Lodgepole Pine Forest	327	0.1%	99.6%
Rocky Mountain Subalpine-Montane Mesic Meadow	317	0.1%	99.7%
Introduced Upland Vegetation-Perennial Grassland and Forbland	225	0.1%	99.8%
Developed-Low Intensity	151	0.05%	99.8%
Colorado Plateau Pinyon-Juniper Woodland	115	0.03%	99.9%
Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	106	0.03%	99.9%
Middle Rocky Mountain Montane Douglas-fir Forest and Woodland	85	0.03%	99.9%
Agriculture-Pasture and Hay	75	0.02%	99.9%
Southern Rocky Mountain Montane-Subalpine Grassland	67	0.02%	100.0%
Western Great Plains Depressional Wetland Systems	43	0.01%	100.0%
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	30	0.01%	100.0%
Southern Rocky Mountain Ponderosa Pine Woodland	24	0.01%	100.0%
Inter-Mountain Basins Juniper Savanna	19	0.01%	100.0%
Introduced Upland Vegetation-Annual Grassland	15	0.004%	100.0%
Rocky Mountain Poor-Site Lodgepole Pine Forest	11	0.003%	100.0%
Open Water	4	0.001%	100.0%
Agriculture-Cultivated Crops and Irrigated Agriculture	1	0.0004%	100.0%
Rocky Mountain Gambel Oak-Mixed Montane Shrubland	1	0.0004%	100.0%
Northern Rocky Mountain Subalpine Woodland and Parkland	1	0.0003%	100.0%
Northern Rocky Mountain Montane-Foothill Deciduous Shrubland	0	0.0001%	100.0%
Developed-Medium Intensity	0	0.0001%	100.0%

APPENDIX 3E

LITTLE SNAKE RIVER /
VERMILLION CREEK WATERSHED:
UNGAGED WATERSHED HYDROLOGY -
REGIONAL APPROACH

Little Snake River Watershed Study, Level I

Ungaged Watershed Hydrology : Regional Approach

Map ID on Figure 3.5-4	HUC 12	HUC 12 Name	Sum of Areas	Area (sq mi)	Weighted Preciitation	Lat	Long	$Q_{1.5}$	Q_2	$Q_{2.33}$	Q_5	Q_{10}	Q_{25}	Q_{50}	Q_{100}	Q_{200}	Q_{500}	Q_a
78	140500030407	Big Sandstone Creek	28628.24	44.7	32.76	41.135780	-107.357943	117.99	191.14	234.10	482.41	767.33	1225.54	1635.23	2095.87	2624.37	3403.87	3.78
74	140500030406	Bird Gulch	15279.51	23.9	23.64	41.235406	-107.364958	72.12	117.57	144.47	301.66	484.75	783.33	1053.98	1362.52	1718.63	2251.14	1.48
70	140401090202	Carson Spring	25552.42	39.9	10.47	41.202502	-108.425704	102.73	166.19	203.49	418.76	665.92	1064.04	1420.70	1822.98	2284.74	2967.40	0.88
75	140500031003	Cat Wash	25944.42	40.5	13.56	40.786699	-108.338184	171.11	283.88	350.51	749.01	1216.20	1975.86	2660.00	3426.91	4312.35	5623.20	1.21
64	140500040305	Cherokee Creek	23798.03	37.2	16.66	41.223716	-107.682017	96.25	155.74	190.74	392.82	625.15	999.90	1336.12	1715.98	2152.25	2798.21	1.44
65	140402000402	Coal Bank Lake	4573.339	7.1	7.73	41.506125	-107.909363	26.83	44.16	54.58	116.49	190.57	314.50	429.70	564.51	721.88	963.22	0.14
66	140500040206	Coal Gulch-Barrel Springs Draw	29235.89	45.7	9.25	41.373507	-107.866736	95.53	152.95	186.59	377.72	594.83	942.36	1252.20	1601.39	2000.84	2589.29	0.86
67	140500040307	Cottonwood Creek	16782.36	26.2	13.02	41.130154	-107.643137	84.96	139.00	170.98	358.77	577.86	935.02	1258.43	1625.98	2050.27	2683.64	0.79
72	140500040302	Cow Creek	40060.82	62.6	18.49	41.283532	-107.689364	126.04	201.48	245.49	494.83	776.26	1223.84	1620.24	2063.70	2569.68	3309.90	2.58
77	140500040309	Deep Creek	22881.25	35.8	16.92	41.119257	-107.636912	104.34	169.86	208.47	433.35	693.35	1114.01	1492.19	1919.26	2410.58	3138.98	1.42
73	140500030402	Dirtyman Fork	21434.21	33.5	27.94	41.277716	-107.272393	85.67	138.53	169.65	349.23	555.92	889.87	1190.06	1530.13	1920.92	2500.83	2.43
76	140500040303	Dry Cow Creek	43195.75	67.5	13.10	41.295030	-107.663034	130.75	208.60	253.97	510.25	798.70	1256.50	1661.18	2113.26	2628.58	3381.14	1.83
68	140500030802	Dry Gulch	21609.57	33.8	13.84	41.006842	-107.915209	114.06	187.06	230.17	483.96	779.47	1259.41	1692.08	2180.53	2743.69	3580.00	1.06
69	140500031004	Dugout Draw	15240.93	23.8	13.12	40.701062	-108.370385	140.51	236.99	294.55	647.23	1070.03	1768.86	2407.23	3129.72	3970.27	5230.19	0.73
45	140500031007	East Boone Draw	18107.93	28.3	12.49	40.619181	-108.368853	181.22	306.99	381.97	843.96	1398.40	2313.61	3147.71	4086.96	5179.42	6811.55	0.80
15	140401090109	G Wash	11166.33	17.4	13.80	40.974230	-108.713420	78.43	130.43	161.45	347.97	569.95	936.82	1272.87	1657.18	2103.84	2777.01	0.59
16	140500030902	Greasewood Gulch	39327.3	61.4	15.04	40.860880	-108.135065	199.61	326.92	401.59	839.62	1344.28	2154.47	2876.03	3678.87	4600.29	5951.03	1.98
36	140500030607	Grindstone Wash	15083.18	23.6	11.11	41.171124	-108.096578	76.19	124.64	153.34	321.85	518.74	840.32	1132.10	1464.57	1848.66	2423.27	0.59
37	140500030109	Haggarty Creek	14192.93	22.2	39.26	41.084045	-107.172605	80.35	132.19	162.96	345.12	559.19	909.97	1229.02	1592.64	2013.45	2644.07	2.53
34	140500030705	Hangout Wash	17193.98	26.9	12.98	41.072634	-107.927892	91.74	150.50	185.29	390.31	629.95	1020.85	1374.84	1776.68	2240.77	2933.30	0.80
32	140500030704	Hartt Cabin Draw	41461.92	64.8	11.26	41.024480	-107.870430	168.03	272.08	332.93	684.06	1084.41	1723.73	2291.10	2923.24	3646.55	4704.82	1.47
42	140401090302	Headwaters Douglas Draw	30433.09	47.6	12.07	40.687039	-108.691706	221.86	370.01	457.52	984.46	1603.48	2609.18	3513.15	4521.35	5685.46	7403.65	1.22
38	140401090209	Headwaters Dry Creek	26715.1	41.7	13.19	40.884958	-108.559523	151.68	249.74	307.56	649.67	1048.00	1693.41	2273.33	2924.03	3673.81	4782.54	1.21
39	140500031001	Headwaters Sand Wash	25776.28	40.3	13.07	40.744973	-108.469473	181.73	302.53	373.97	803.22	1307.99	2129.95	2870.87	3700.96	4660.14	6080.69	1.16
25	140401090106	Horseshoe Wash	15232.17	23.8	13.10	41.001010	-108.654650	92.26	152.32	187.98	400.04	649.69	1058.82	1430.72	1853.53	2343.00	3075.58	0.73
40	140500030102	King Solomon Creek	31312.96	48.9	29.95	40.962606	-107.008393	151.70	247.81	304.29	634.58	1015.65	1629.40	2178.18	2792.63	3498.54	4538.28	3.68
26	140500030409	Little Sandstone Creek	17637.67	27.6	28.32	41.126011	-107.366069	88.02	143.92	176.98	370.86	596.76	964.59	1297.29	1675.01	2110.81	2760.64	2.08
9	140500030405	Little Savery Creek	31000.31	48.4	23.43	41.253300	-107.345842	110.41	177.57	216.90	441.87	698.11	1108.48	1474.25	1885.43	2356.10	3048.79	2.72
6	140500030203	Little Snake River-Cottonwood Creek	36276.44	56.7	13.97	41.007990	-107.697286	157.54	255.95	313.63	648.19	1031.56	1646.06	2193.25	2804.47	3505.03	4533.26	1.69
3	140500030202	Little Snake River-Dutch Joe Creek	36358.14	56.8	16.71	41.030602	-107.527536	153.68	249.35	305.40	629.87	1001.23	1596.17	2125.76	2717.47	3395.45	4390.39	2.10
8	140500030201	Little Snake River-Fly Creek	35700.89	55.8	21.10	40.995477	-107.386020	158.28	257.43	315.56	653.27	1040.66	1662.05	2215.68	2834.19	3543.36	4584.64	2.72
2	140500030106	Little Snake River-Roaring Fork	38581.14	60.3	26.91	40.999190	-107.236660	165.43	268.63	329.05	679.23	1079.88	1721.23	2291.55	2927.72	3656.46	4724.58	3.89
12	140500030103	Little Snake River-Tennessee Creek	8669.358	13.5	26.64	40.993050	-107.047280	65.45	109.21	135.40	293.76	483.51	798.97	1089.56	1423.65	1812.97	2402.93	1.03
14	140500030205	Little Snake River-Thornburgh Gulch	49717.71	77.7	11.63	41.024013	-107.870273	188.36	304.02	371.47	758.71	1197.76	1895.67	2512.34	3196.83	3978.44	5117.24	1.79
35	140500030801	Little Snake River-West Fork Cherokee Creek	33496.6	52.3	11.01	40.961330	-108.015630	158.49	258.60	317.38	660.48	1055.54	1690.75	2257.82	2891.86	3619.72	4690.16	1.19
33	140500030101	Little Snake River-Whiskey Creek	33918.2	53.0	39.10	40.962800	-107.008050	159.45	260.08	319.16	663.81	1060.48	1698.05	2267.04	2903.07	3633.11	4706.44	5.42
41	140401090104	Lower Alkali Creek-Vermillion Creek	34953.82	54.6	12.32	41.020910	-108.642980	151.62	246.32	301.84	623.87	993.06	1585.23	2112.92	2702.91	3379.31	4372.85	1.41
27	140500040202	Lower Barrel Springs Draw	42094.41	65.8	9.97	41.315726	-107.767067	126.27	201.35	245.12	492.18	770.27	1211.76	1602.18	2038.67	2536.25	3263.28	1.29
5	140500030110	Lower Battle Creek	18823.02	29.4	24.57	40.999220	-107.237150	105.56	173.63	213.91	452.14	730.80	1185.07	1595.96	2061.08	2598.24	3398.44	1.86
20	140500030805	Lower Bighole Gulch	18480.34	28.9	12.85	40.990110	-107.965210	105.48	173.66	214.02	453.02	732.87	1189.38	1602.53	2070.34	2610.77	3416.20	0.85
22	140401090108	Lower Canyon Creek-Vermillion Creek	21105.21	33.0	13.24	40.960030	-108.664670	118.88	195.61	240.96	509.22	822.56	1332.32	1792.42	2311.76	2911.08	3801.74	0.98
1	140500030504	Lower Fourmile Creek	20282.75	31.7	12.69	41.007890	-107.697160	109.49	179.76	221.30	466.23	751.96	1216.77	1636.41	2110.77	2658.07	3471.99	0.90
4	140500030605	Lower Haystack Wash	19208.41	30.0	9.03	41.191764	-108.169819	86.84	141.28	173.42	360.53	577.36	929.22	1246.59	1606.58	2021.18	2638.10	0.57
23	140500040204	Lower North Barrel Springs Draw	42326.22	66.1	8.42	41.377233	-107.871897	120.05	190.90	232.17	464.19	724.71	1137.84	1502.95	1911.37	2376.63	3056.22	1.06
19	140500031008	Lower Sand Wash	15825.9	24.7	11.77	40.591903	-108.357150	175.66	299.10	372.89	830.94	1384.21	2301.69	3141.08	4088.43	5192.71	6847.77	0.66
7	140500030408	Lower Savery Creek	39215.65	61.3	21.41	41.010184	-107.449436	164.99	267.65	327.74	675.48	1072.94	1708.75	2273.85	2904.07	3625.77	4683.10	3.01
10	140500030603	Lower Skull Creek	16693.86	26.1	10.43	41.192509	-108.180330	79.48	129.63	159.29	332.68	534.47	863.06	1160.43	1498.67	1888.86	2471.26	0.60
11	140500030303	Lower Slater Creek	39398.24	61.6	25.38	40.995330	-107.385910	168.38	273.38	334.85	690.95	1098.20	1749.81	2329.01	2974.75	3714.34	4797.83	3.70
21	140500030503	Lower Timberlake Creek	19973.76	31.2	13.36	40.985050	-107.638780	111.41	183.23	225.69	476.71	770.02	1247.60	1679.06	2166.78	2729.77	3567.39	0.95
13	140500030703	Lower Willow Creek	21210.04	33.1	11.37	41.143387	-108.012826	97.02	157.97	193.91	403.32	645.75	1038.53	1392.19	1792.29	2252.86	2936.75	0.83
24	140500040102	McKinney Creek	30438.31	47.6	23.69	41.468040	-107.480912	90.57	144.33	175.78	353.24	553.92	874.36	1159.55	1481.02	1848.25	2388.60	2.72
28	140500031006	Middle Sand Wash	25293.97	39.5	12.80	40.685217	-108.373922	198.22	331.74	410.83	889.62	1455.39	2378.99	3212.88	4146.50	5226.80	6827.99	1.11
17	140500030403	Middle Savery Creek	26160.31	40.9	24.53	41.135756	-107.358034	111.52	180.95	221.78	458.39	730.63	1169.45	1562.64	2005.55	2514.21	3266.00	2.48
29	140500030302	Middle Slater Creek	29711.23	46.4	35.03	40.880020	-107.316720	163.19	268.26	330.13	695.26	1119.12	1804.12	2418.11	3105.48	3896.61	5063.71	4.23

Little Snake River Watershed Study, Level I

Ungaged Watershed Hydrology : Regional Approach

Map ID on Figure 3.5-4	HUC 12	HUC 12 Name	Sum of Areas	Area (sq mi)	Weighted Preciitation	Lat	Long	$Q_{1.5}$	Q_2	$Q_{2.33}$	Q_5	Q_{10}	Q_{25}	Q_{50}	Q_{100}	Q_{200}	Q_{500}	Q_a
18	140500040103	Muddy Creek-Alamosa Gulch	35172.37	55.0	14.94	41.479129	-107.693471	98.28	156.13	189.89	379.54	592.95	932.47	1233.56	1572.02	1957.98	2524.00	1.78
30	140500040104	Muddy Creek-Antelope Creek	37360.39	58.4	10.64	41.315872	-107.767097	117.16	187.24	228.16	459.92	721.75	1138.68	1508.44	1922.82	2395.84	3088.88	1.25
31	140500040301	Muddy Creek-Blue Gap Draw	28042.32	43.8	11.88	41.223704	-107.682124	106.66	172.09	210.48	431.13	683.53	1088.99	1451.36	1859.39	2327.15	3017.18	1.11
52	140500040308	Muddy Creek-Coal Mine Draw	15796.03	24.7	12.79	41.039634	-107.652627	90.26	148.59	183.17	388.02	628.45	1021.77	1378.82	1784.64	2253.99	2955.79	0.73
48	140500040101	Muddy Creek-Littlefield Creek	32265.83	50.4	24.22	41.468003	-107.480798	93.94	149.54	182.04	365.12	571.79	901.31	1194.18	1523.92	1900.34	2453.48	2.94
47	140500040306	Muddy Creek-Robber's Gulch	35723.02	55.8	13.41	41.130224	-107.643185	136.32	220.02	269.02	550.57	871.50	1384.82	1841.40	2352.42	2937.28	3795.60	1.59
49	140500030905	Nipple Gulch-Little Snake River	22718.58	35.5	11.50	40.761189	-108.183461	163.71	272.79	337.40	726.30	1184.89	1933.68	2610.48	3370.94	4250.64	5557.09	0.89
51	140500030104	North Fork Little Snake River	29387.08	45.9	41.38	40.993450	-107.047370	140.47	229.28	281.51	586.63	938.79	1506.49	2014.66	2584.63	3239.61	4205.61	5.11
53	140500030404	North Fork Savery Creek	30814.2	48.1	26.56	41.276870	-107.281952	107.61	172.88	211.11	429.43	677.91	1075.76	1430.34	1829.10	2285.46	2957.13	3.15
44	140401090210	Outlet Dry Creek	22664.66	35.4	12.29	40.814516	-108.664022	150.91	250.46	309.37	661.96	1076.33	1751.87	2361.92	3048.02	3840.97	5018.31	0.96
50	140500031103	Outlet Little Snake River	21389.58	33.4	12.65	40.452377	-108.455142	291.31	501.35	626.89	1416.98	2375.88	3964.61	5413.45	7033.27	8921.98	11737.06	0.94
43	140500030806	Powder Wash-Eagle Rock Draw	34881.72	54.5	12.96	40.982170	-108.283830	158.50	258.10	316.52	656.55	1047.15	1674.24	2233.37	2858.18	3574.92	4627.93	1.49
46	140500030809	Powder Wash-East Fork Anthill Draw	17570.16	27.5	11.50	40.961372	-108.016184	105.82	174.68	215.49	458.09	743.03	1208.75	1630.91	2109.21	2662.32	3487.68	0.71
56	140500030808	Powder Wash-Horse Draw	30815.64	48.1	12.15	40.951340	-108.098030	152.29	249.02	305.88	638.92	1023.57	1643.52	2198.13	2819.23	3533.00	4584.77	1.24
57	140500030807	Powder Wash-Reservoir Draw	28621.29	44.7	13.14	40.971320	-108.218600	141.88	232.02	285.06	595.75	955.05	1534.95	2054.50	2637.38	3307.60	4296.78	1.28
55	140500030706	Red Creek	33670.12	52.6	12.25	41.040681	-107.867791	144.80	235.12	288.09	595.16	947.27	1512.33	2016.19	2580.12	3226.74	4177.29	1.35
54	140500040205	Red Lakes	37085.39	57.9	7.00	41.498673	-108.013346	100.03	158.63	192.81	384.24	599.17	940.55	1242.88	1582.43	1969.34	2536.02	0.76
58	140500030904	Red Wash	24674.93	38.6	14.97	40.780707	-108.168325	167.32	277.97	343.41	735.55	1196.19	1946.29	2622.69	3381.66	4258.51	5558.15	1.31
59	140500030601	Sand Creek-Monument Valley	45626.09	71.3	9.10	41.193440	-108.180683	149.00	238.65	290.91	587.70	922.54	1454.17	1923.97	2447.56	3044.71	3915.96	1.24
60	140500030606	Sand Creek-Reader Cabin Draw	41101.69	64.2	10.47	41.142797	-108.013621	146.90	236.34	288.58	587.31	926.15	1466.05	1944.62	2478.77	3089.08	3981.80	1.34
62	140500030803	Scandinavian Gulch	27732.46	43.3	13.84	40.998440	-107.924370	134.66	219.97	270.18	563.84	903.30	1451.27	1942.40	2493.98	3128.18	4064.75	1.32
63	140500030908	Sevenmile Draw	14648.8	22.9	12.84	40.657927	-108.276261	147.73	250.30	311.58	689.50	1144.57	1898.71	2588.86	3370.00	4280.01	5645.61	0.69
61	140500030907	Shaffers Draw-Little Snake River	35985.45	56.2	12.81	40.658126	-108.275809	259.22	432.13	534.08	1147.28	1865.51	3028.57	4070.43	5227.64	6562.13	8524.60	1.51
N/A	140401090207	Shell Canyon-Hells Canyon	21314.73	33.3	12.45	40.925850	-108.625260	124.84	205.84	253.73	537.77	870.04	1410.95	1899.28	2450.10	3086.01	4030.98	0.92
N/A	140401090203	Shell Creek-Cow Creek Reservoir	34843.06	54.4	10.25	41.123230	-108.371418	135.19	218.38	267.10	547.41	867.26	1379.25	1834.96	2345.20	2929.40	3787.26	1.13
N/A	140401090206	Shell Creek-Crooked Wash	32598.29	50.9	12.68	40.981610	-108.503210	152.02	247.86	304.14	632.31	1010.09	1617.65	2160.24	2767.43	3464.47	4490.14	1.37
N/A	140401090201	Shell Creek-Kinney Creek	37608.92	58.8	9.36	41.202701	-108.425672	130.82	210.17	256.55	521.24	821.55	1300.59	1725.84	2201.71	2745.56	3542.55	1.08
N/A	140401090205	Shell Creek-Long Ridge Reservoir	35921.52	56.1	11.62	41.028584	-108.447016	152.88	248.13	303.94	627.23	997.41	1590.65	2118.91	2709.26	3385.79	4378.88	1.35
N/A	140500030909	Simsberry Draw-Little Snake River	23925.66	37.4	11.74	40.590518	-108.355122	228.16	385.67	479.25	1053.70	1738.89	2863.19	3881.77	5021.41	6343.66	8307.18	0.95
N/A	140500030105	South Fork Little Snake River	28436.27	44.4	27.94	40.991680	-107.051870	137.89	225.24	276.63	577.18	924.45	1484.76	1986.70	2550.07	3197.71	4153.61	3.11
N/A	140500030906	South Nipple Gulch	19954.41	31.2	13.24	40.756558	-108.186035	152.03	254.01	314.54	680.38	1113.62	1823.49	2467.14	3192.24	4032.34	5283.66	0.94
N/A	140500031005	South Sand Wash	19921.54	31.1	12.08	40.685245	-108.373750	170.69	286.90	355.98	776.94	1278.04	2101.10	2848.44	3689.35	4665.00	6118.87	0.84
N/A	140401090208	Talamantes Creek	25657.46	40.1	15.92	40.894030	-108.668247	146.12	240.61	296.36	626.27	1010.68	1634.03	2194.59	2824.18	3549.85	4623.88	1.46
N/A	140500031101	Thompson Draw	22489.89	35.1	12.60	40.571539	-108.473571	228.12	386.78	481.19	1063.23	1760.00	2906.06	3946.37	5111.38	6464.63	8477.27	0.98
N/A	140500031102	Thompson Draw-Little Snake River	21197.73	33.1	11.42	40.548551	-108.424458	230.74	392.60	489.06	1086.74	1805.07	2989.61	4067.02	5274.49	6678.80	8770.53	0.83
N/A	140401090204	Twin Fork Reservoir	11483.08	17.9	10.67	41.123927	-108.370797	67.43	111.12	137.12	291.49	473.73	773.72	1047.79	1361.63	1725.52	2273.31	0.45
N/A	140401090103	Upper Alkali Creek-Vermillion Creek	37287.06	58.3	11.28	41.133122	-108.618039	139.60	225.11	275.13	562.17	888.87	1410.81	1874.58	2393.20	2986.47	3856.25	1.34
N/A	140500040201	Upper Barrel Springs Draw	22416.92	35.0	8.86	41.435754	-108.067564	76.78	123.19	150.46	306.04	483.84	770.05	1026.68	1317.64	1651.28	2145.64	0.64
N/A	140500030108	Upper Battle Creek	20306.4	31.7	42.04	41.083893	-107.172517	100.56	164.38	202.07	422.92	679.62	1096.49	1472.48	1897.91	2388.25	3117.21	3.76
N/A	140500030804	Upper Bighole Gulch	23880.49	37.3	16.51	40.856780	-107.931650	146.89	242.82	299.51	636.86	1031.66	1673.66	2252.31	2902.82	3653.66	4766.93	1.43
N/A	140401090107	Upper Canyon Creek	26741.52	41.8	16.35	41.017000	-108.821830	128.80	210.30	258.28	538.76	863.05	1386.79	1856.51	2384.55	2991.79	3889.22	1.56
N/A	140401090303	Upper Conway Draw	13937.49	21.8	11.34	40.718581	-108.751608	129.05	217.69	270.61	595.08	984.62	1629.55	2219.72	2889.09	3668.37	4838.65	0.57
N/A	140500030501	Upper Fourmile Creek	44360.69	69.3	17.39	40.985340	-107.638530	183.54	297.53	364.15	749.15	1188.07	1888.39	2509.20	3199.52	3989.23	5143.06	2.62
N/A	140500030604	Upper Haystack Wash	38700.29	60.5	9.09	41.267966	-108.182796	125.13	200.30	244.18	493.29	774.93	1223.36	1620.89	2065.85	2573.82	3317.59	1.07
N/A	140500040203	Upper North Barrel Springs Draw	36481.72	57.0	8.48	41.491368	-108.094792	99.58	158.01	192.10	383.20	597.92	939.15	1241.47	1581.10	1968.19	2535.38	0.94
N/A	140500031002	Upper Sand Wash	28178.66	44.0	12.91	40.729207	-108.401455	197.07	327.95	405.28	869.60	1414.69	2300.75	3098.00	3989.28	5018.44	6539.70	1.23
N/A	140500030401	Upper Savery Creek	15451.67	24.1	30.97	41.277716	-107.272393	69.80	113.53	139.40	290.09	465.25	750.62	1009.10	1303.84	1643.82	2152.01	2.06
N/A	140500030602	Upper Skull Creek-Sand Creek	33345.11	52.1	10.95	41.193274	-108.202596	122.46	197.26	241.06	492.07	778.02	1235.63	1643.05	2100.05	2623.09	3391.73	1.18
N/A	140500030301	Upper Slater Creek	28081.22	43.9	31.33	40.846030	-107.231190	165.02	272.19	335.38	710.14	1146.82	1854.20	2489.44	3201.05	4021.06	5232.51	3.53
N/A	140500030502	Upper Timberlake Creek	34763.78	54.3	16.82	40.869190	-107.661820	182.69	299.71	368.46	772.82	1240.25	1992.86	2665.04	3414.97	4276.74	5543.56	2.03
N/A	140500030702	Upper Willow Creek	21440.84	33.5	9.76	41.216115	-108.048117	90.83	147.31	180.58	373.39	595.84	955.65	1279.28	1645.65	2066.97	2692.28	0.69
N/A	140401090102	Vermillion Creek-McKnight Spring	25300.16	39.5	13.00	41.021061	-108.642748	123.83	202.33	248.58	519.30	832.77	1339.70	1794.91	2307.25	2896.78	3769.11	1.13
N/A	140401090101	Vermillion Creek-North Fork Vermillion Creek	27768.9	43.4	14.36	41.087969	-108.788587	121.79	197.91	242.66	502.49	801.55	1283.33	1714.66	2199.62	2756.56	3578.71	1.38
N/A	140401090105	Vermillion Creek-Town of Hiawatha	10677.33	16.7	12.54	40.925952	-108.625470	80.98	135.19	167.56	363.34	597.25	984.76	1340.32	1747.06	2220.36	2934.54	0.51

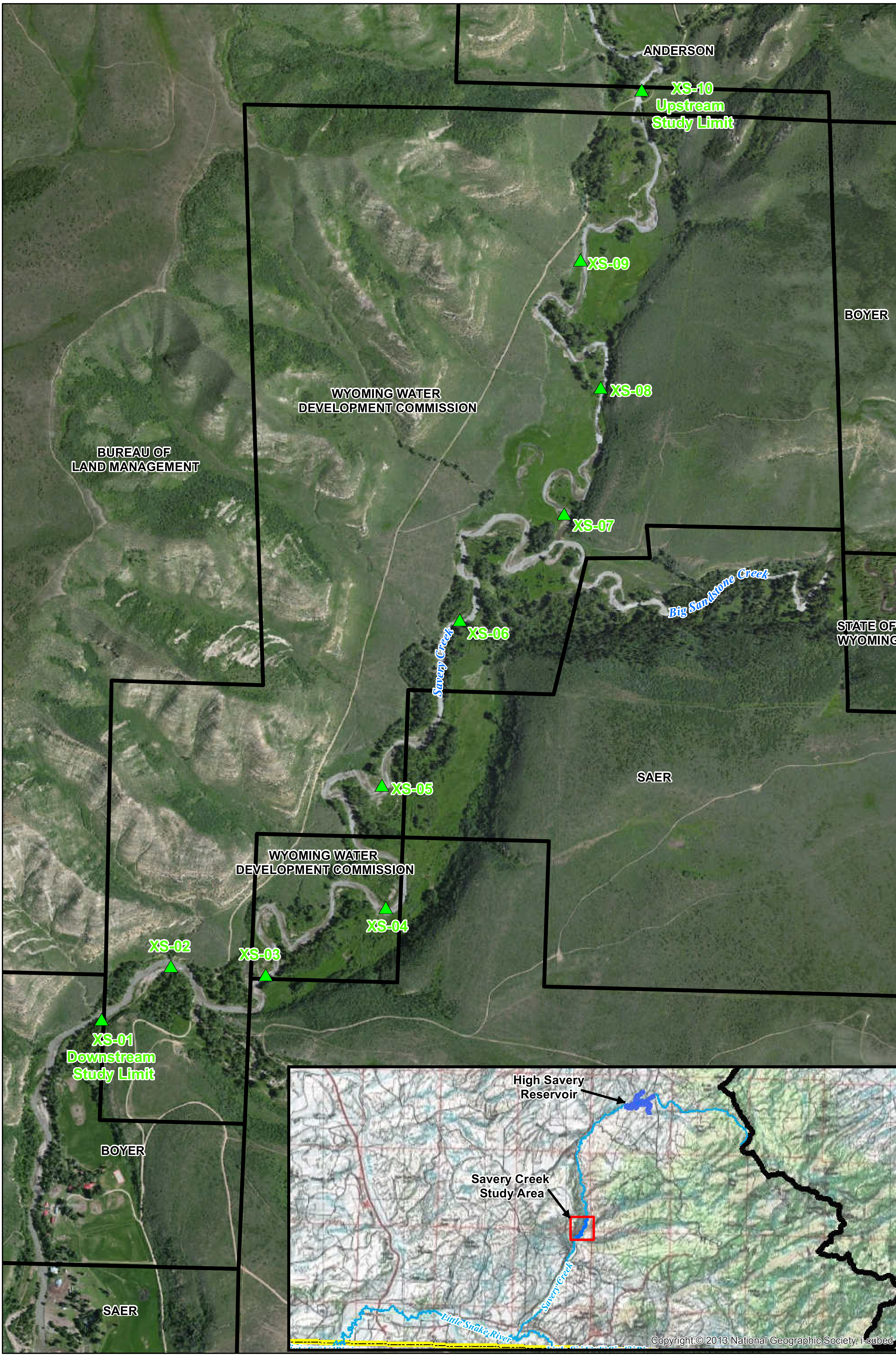
Little Snake River Watershed Study, Level I

Ungaged Watershed Hydrology : Regional Approach

Map ID on Figure 3.5-4	HUC 12	HUC 12 Name	Sum of Areas	Area (sq mi)	Weighted Preciitation	Lat	Long	$Q_{1.5}$	Q_2	$Q_{2.33}$	Q_5	Q_{10}	Q_{25}	Q_{50}	Q_{100}	Q_{200}	Q_{500}	Q_a
N/A	140401090301	West Boone Draw	15946.5	24.9	12.30	40.687244	-108.691653	147.98	249.69	310.34	682.14	1127.69	1863.64	2535.39	3294.77	4178.02	5500.73	0.70
N/A	140500030701	West Branch Willow Creek	30570.94	47.8	9.17	41.307680	-108.093077	104.10	167.03	203.89	413.96	652.83	1035.18	1375.90	1759.27	2197.91	2843.56	0.88
N/A	140500040304	Wild Cow Creek	27705	43.3	17.70	41.254678	-107.679545	102.78	165.61	202.48	413.98	655.70	1043.90	1390.83	1781.73	2229.75	2890.77	1.77
N/A	140500030107	Willow Creek-Brown Creek	22922.31	35.8	25.26	40.991980	-107.174060	120.44	197.50	242.97	510.57	821.81	1326.74	1781.39	2293.94	2884.59	3760.64	2.28
N/A	140500030204	Willow Creek-Spring Creek	31716.45	49.6	21.88	41.029816	-107.552786	141.22	229.70	281.64	583.53	930.53	1488.37	1986.56	2544.75	3185.32	4128.29	2.56
N/A	140500040207	Windmill Draw	45775.82	71.5	11.27	41.321813	-107.801642	132.35	210.67	256.27	512.94	801.02	1257.37	1660.11	2109.63	2621.54	3368.07	1.61

APPENDIX 4A

LITTLE SNAKE RIVER / VERMILLION CREEK WATERSHED: FIELD MAPPING



Legend

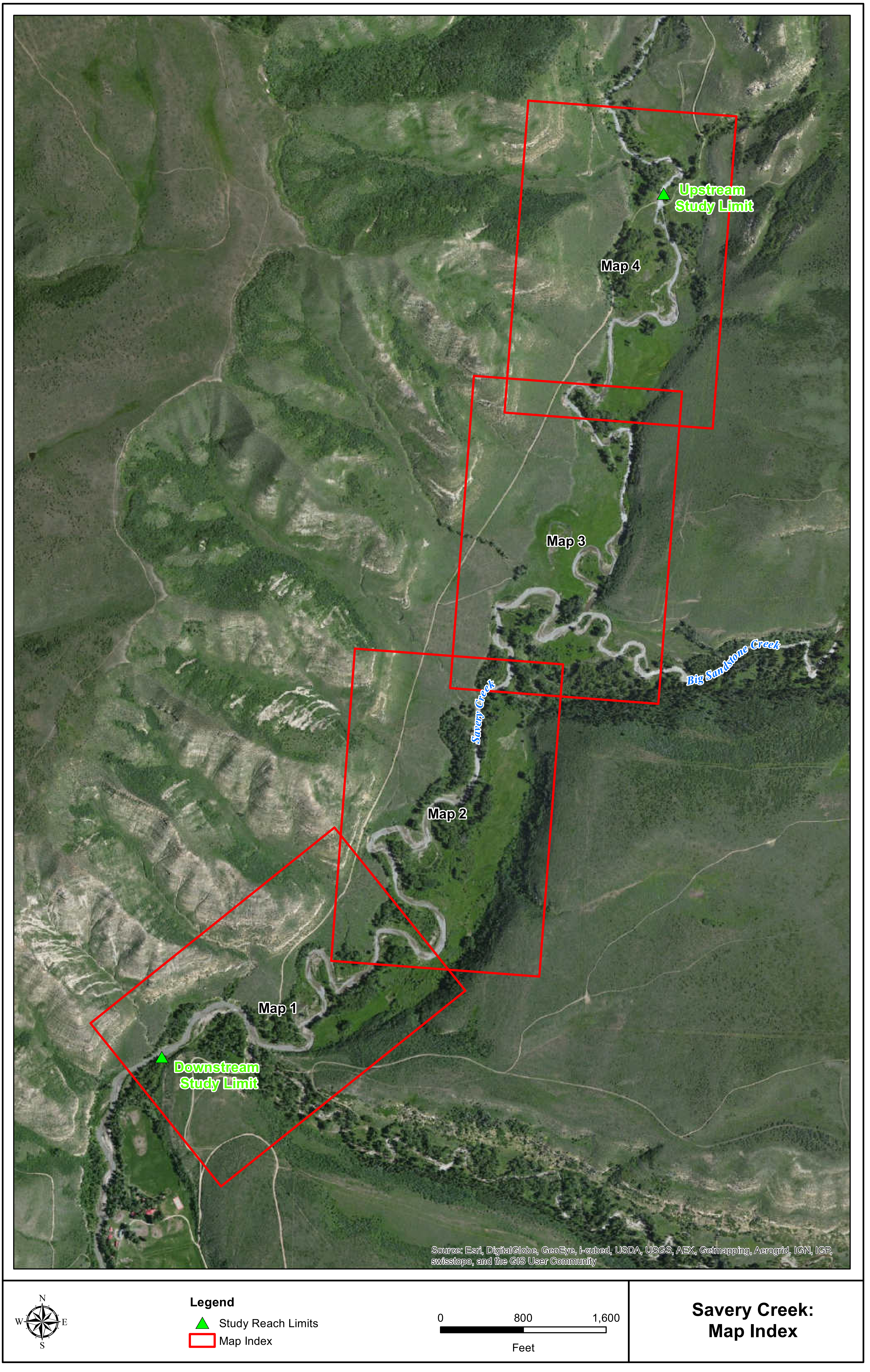
Cross Section

Land Ownership

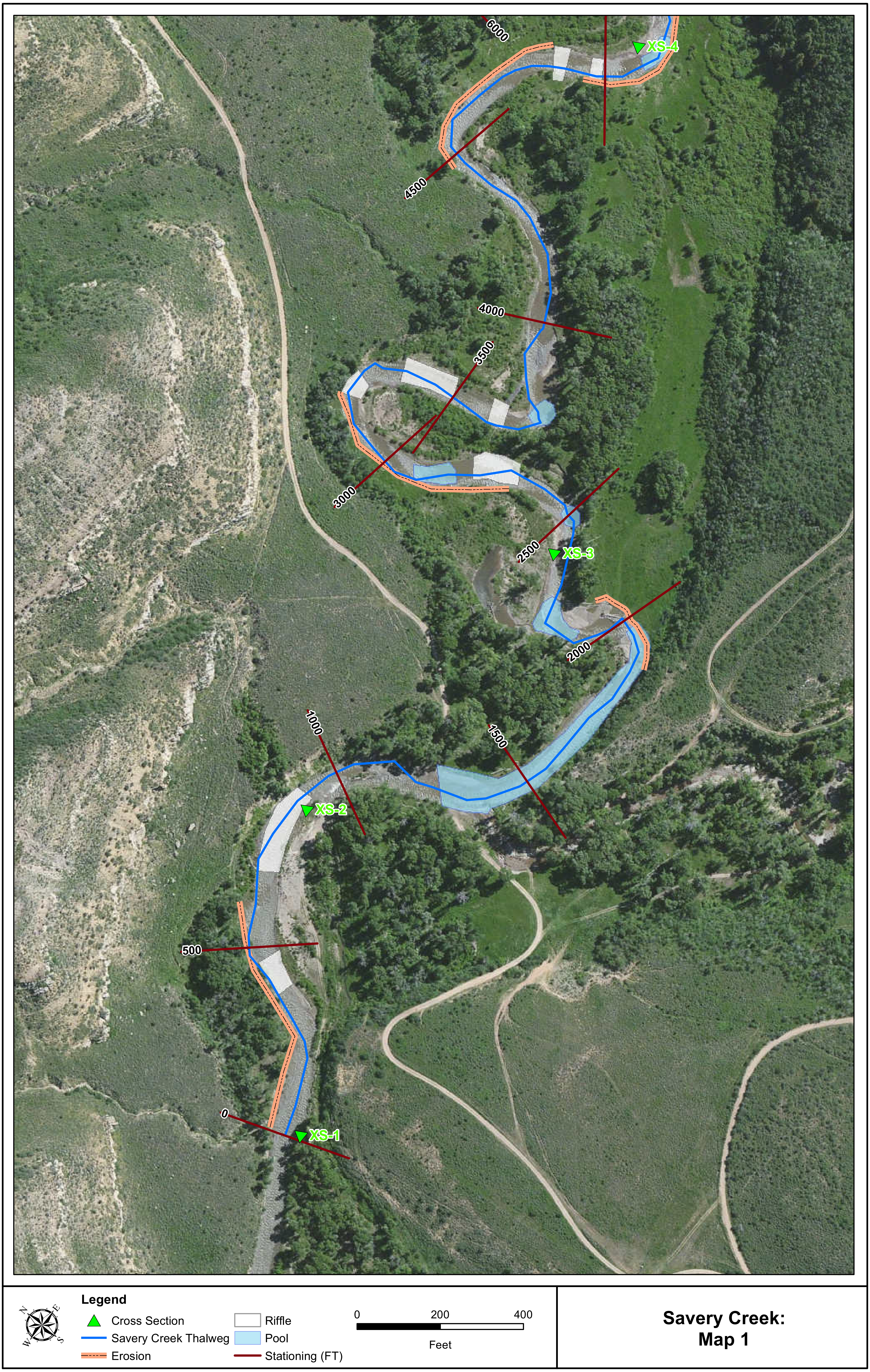
0 800 1,600

Feet

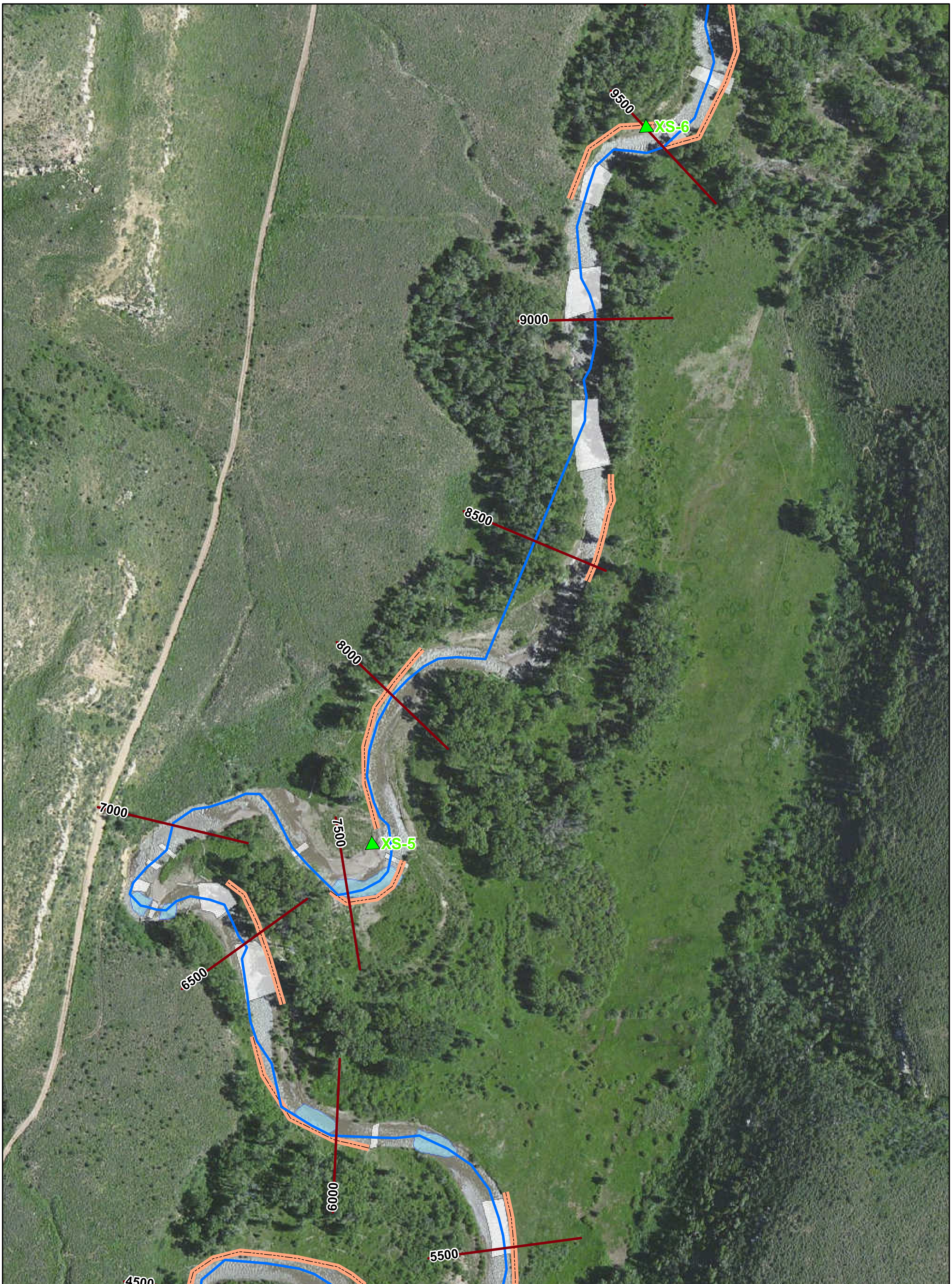
Savery Creek: Location Map



Savery Creek: Map Index



**Savery Creek:
Map 1**



Legend

- Cross Section
- Savery Creek Thalweg
- Erosion
- Riffle
- Pool
- Stationing (FT)

0 200 400

Feet

Savery Creek: Map 2

Legend

- Cross Section
- Savery Creek Thalweg
- Erosion
- Riffle
- Pool
- Stationing (FT)

0 200 400
Feet

Savery Creek:
Map 3

Legend

Cross Section
Savery Creek Thalweg
Erosion
Riffle
Pool
Stationing (FT)

0 200 400
Feet

Savery Creek:
Map 4

APPENDIX 5A

LITTLE SNAKE RIVER / VERMILLION CREEK SUPPLEMENTAL SUPPLY STUDY SITE ANALYSIS SUMMARY (SWRCC, 2012)

Table III-2: Reservoir Screening Summary

Site Name	Big Gulch			Lower Little Sandstone	Upper Little Sandstone			
Location (Section, Township N, Range W)	19, 13, 88			1, 13, 89	36, 14, 88			
Direct Reservoir Supply	Big Gulch			Little Sandstone Creek	Little Sandstone Creek			
Indirect Reservoir Supply	Haggerty Creek via Belvidere Ditch			N/A	N/A			
Reservoir Storage Capacity (AF)	299	1,068	3,045	9,204	2,863	4,603	7,698	13,027
Reservoir Water Surface Area (Ac)	19	58	139	148	70	104	205	327
Reservoir Water Surface Elevation	7000	7020	7040	7000	7700	7720	7740	7760
Reservoir Service Area	Same as High Savery			Same as High Savery	Same as High Savery			
Reservoir Permitted Uses	Irrigation			Irrigation	Irrigation			
Other Benefits	Recreation; Downstream Fishery Improvement			Recreation	Recreation			
Dam Type	Earth			Earth	Earth			
Borrow Material Availability	Process surficial and bedrock materials for earth fill. Import of slope protection and filter materials may be required. Concrete aggregate may be available onsite.			Limited availability of fine grained borrow material. Likely sufficient coarse grained earth fill.	Not Evaluated.			
Dam Height (ft)	60	80	100	205	145	165	185	205
Crest Elevation (ft)	7005	7025	7045	7005	7705	7725	7745	7765
Crest Length (ft)	375	500	600	1,125	1,025	1,100	1,225	1,950
Crest Width (ft)	22	26	30	50	40	44	48	50
Dam Footprint (sqft)	67,989	127,866	202,268	656,656	430,260	555,975	695,949	894,767
Embankment Volume (CY)	50,125	122,751	248,922	1,844,554	757,857	1,134,454	1,612,480	2,200,825
Efficiency (Capacity/Fill) (CY/CY)	9.6	14.0	19.7	8.1	6.1	6.5	7.7	9.5
Efficiency (Fill/Capacity) (CY/AF)	168	115	82	200	265			
Direct Drainage Area (sq-mi)	14.3			15.1	14.6			
Indirect Drainage Area (sq-mi)	7.7			N/A	N/A			
Average Precipitation (in)	21.0			26.5	30.5			
Potential for Flood Control	Significant in Big Gulch to Savery Creek (2.6 mile)			Significant in Little Sandstone Creek to Savery Creek (0.8 mile)	Significant in Little Sandstone Creek to Savery Creek (8.7 mile)			
Outlet Works	Not Designed			Not Designed	Not Designed			
Spillways	Not Designed			Not Designed	Not Designed			
Geology	Bedrock was not exposed. Depth to competent bedrock is unknown. Bedrock would be composed of siltstone, claystone, and conglomerate of the Browns Park Formation. Sandstone, shale, siltstone, and conglomerate of the Mesa Verde group along with shale and sandstone of the Steele Shale may also be present. Alluvial fan is located on right abutment.			Cretaceous sandstone and shale of the Haystack Mountain Formation. An unknown thickness of sandy alluvium is located in the valley bottom.	Not Evaluated.			
Land Ownership	State; Private			BLM; Private; USFS (minimal)	USFS			
Irrigated Acreage Inundated (acre)	2.9			0.0	0.0			
Inundated Infrastructure	0.8mile County Road			High Savery Big Game Mitigation Area	None			
Cultural/Archaeological impacts	One Site within Reservoir Limits			Not Evaluated	Not Evaluated			
NWI Wetlands impacts (ac)	9.4			1.2	4.7			
Riparian impacts	Minimal			Extensive Cottonwood Gallery and Willows	Minimal			
Species of concern	Sage Grouse Core Population Area			Flannelmouth Sucker	Canada Lynx; Boreal Western Toad			
Big Game impacts - crucial winter	Elk; Mitigation Requirements Likely			Elk; Mitigation Requirements Likely	None			
WGFD Stream Class	Green			Green	Green			
Access	County Road (Big Gulch)			Sandstone Divide Trail	Sage Creek Road + New Roads			

Favorable characteristic | Unfavorable characteristic | Neither Favorable Nor Unfavorable

Probable fatal flaw or very unfavorable characteristic

Table III-2: Reservoir Screening Summary

Site Name	W. Fork Battle Creek & Haggarty Creek - RCC				W. Fork Battle Creek & Haggarty Creek - Earth			
Location (Section, Township N, Range W)	1, 13, 87				1, 13, 87			
Direct Reservoir Supply	Haggarty Creek and Lost Creek				Haggarty Creek and Lost Creek			
Indirect Reservoir Supply	N/A				N/A			
Reservoir Storage Capacity (AF)	3,086	5,697	9,752	16,372	3,086	5,697	9,752	16,372
Reservoir Water Surface Area (Ac)	51	79	124	207	51	79	124	207
Reservoir Water Surface Elevation	8120	8160	8200	8240	8120	8160	8200	8240
Reservoir Service Area	Battle Creek below confluence with West Fork; Little Snake River below confluence with Battle Creek				Battle Creek below confluence with West Fork; Little Snake River below confluence with Battle Creek			
Reservoir Permitted Uses	Irrigation				Irrigation			
Other Benefits	Recreation; Copper Mitigation; Downstream Fishery Improvement				Recreation; Copper Mitigation; Downstream Fishery Improvement			
Dam Type	RCC				Earth			
Borrow Material Availability	Aggregate borrow from bedrock probably could be processed to produce onsite materials into suitable aggregate for concrete because weathered material generally breaks down into spherical shapes instead of elongated flat shapes.				Borrow for earth fill is limited. Aggregate borrow from bedrock probably could be processed to produce onsite materials into suitable aggregate for concrete because weathered material generally breaks down into spherical shapes instead of elongated flat shapes.			
Dam Height (ft)	190	230	280	330	220	270	320	370
Crest Elevation (ft)	8125	8165	8205	8245	8125	8165	8205	8245
Crest Length (ft)	525	625	750	975	525	625	750	975
Crest Width (ft)	20	20	20	20	50	50	50	50
Dam Footprint (sqft)	38,120	57,037	81,035	112,051	330,528	506,074	722,189	1,008,285
Embankment Volume (CY)	86,766	156,822	258,279	400,092	707,225	1,324,854	2,224,299	3,511,255
Efficiency (Capacity/Fill) (CY/CY)	57.4	58.6	60.9	66.0	7.0	6.9	7.1	7.5
Efficiency (Fill/Capacity) (CY/AF)	28	28	26	24	229	233	228	214
Direct Drainage Area (sq-mi)	15.8				15.8			
Indirect Drainage Area (sq-mi)	N/A				N/A			
Average Precipitation (in)	38.1				38.1			
Potential for Flood Control	Significant on West Fork to Battle Creek (4.1 miles) only				Significant on West Fork to Battle Creek (4.1 miles) only			
Outlet Works	Concrete Encased Steel Pipe in Access Adit				Not Designed			
Spillways	Integral with RCC Dam				Not Designed			
Geology	Bedrock geology at the dam site is metasedimentary and metavolcanics including Precambrian gneiss and schist.				Bedrock geology at the dam site is metasedimentary and metavolcanics including Precambrian gneiss and schist.			
Land Ownership	USFS; Private				USFS; Private			
Irrigated Acreage Inundated (acre)	0.0				0.0			
Inundated Infrastructure	None				None			
Cultural/Archaeological impacts	Multiple Sites Near Dam and Reservoir (Mitigation Requirements Unlikely)				Multiple Sites Near Dam and Reservoir (Mitigation Requirements Unlikely)			
NWI Wetlands impacts (ac)	1.2 (over 9500AF only)				1.2 (over 9500AF only)			
Riparian impacts	Minimal				Minimal			
Species of concern	Canada Lynx; Boreal Wester Toad				Canada Lynx; Boreal Western Toad			
Big Game impacts - crucial winter	None				None			
WGFD Stream Class	Yellow				Yellow			
Access	Existing Unimproved Access Trail + New Road (1/2 mile)				Existing Unimproved Access Trail + New Road (1/2 mile)			

Favorable characteristic | Unfavorable characteristic | Neither Favorable Nor Unfavorable

Probable fatal flaw or very unfavorable characteristic

Table III-2: Reservoir Screening Summary

Site Name	Haggarty Creek Near Copperton - Site A - RCC Dam			Haggarty Creek Near Copperton - Site A - Earth Dam		
Location (Section, Township N, Range W)	31, 14, 86			31, 14, 86		
Direct Reservoir Supply	Haggery Creek			Haggery Creek		
Indirect Reservoir Supply	N/A			N/A		
Reservoir Storage Capacity (AF)	767	1,709	3,367	767	1,709	3,367
Reservoir Water Surface Area (Ac)	34	60	106	34	60	106
Reservoir Water Surface Elevation	8340	8360	8380	8340	8360	8380
Reservoir Service Area	Battle Creek below confluence with West Fork; Little Snake River below confluence with Battle Creek			Battle Creek below confluence with West Fork; Little Snake River below confluence with Battle Creek		
Reservoir Permitted Uses	Irrigation			Irrigation		
Other Benefits	Recreation; Copper Mitigation; Downstream Fishery Improvement			Recreation; Copper Mitigation; Downstream Fishery Improvement		
Dam Type	RCC			Earth		
Borrow Material Availability	Borrow for concrete may not be preferable due to the probability the rock will disaggregate into elongated flat shapes instead of spherical shapes.			Borrow material for earth fill is limited. Borrow for concrete may not be preferable due to the probability the rock will disaggregate into elongated flat shapes instead of spherical shapes.		
Dam Height (ft)	90	110	130	95	115	140
Crest Elevation (ft)	8345	8365	8385	8345	8365	8385
Crest Length (ft)	350	525	725	350	525	725
Crest Width (ft)	20	20	20	30	34	38
Dam Footprint (sqft)	15,148	23,551	35,783	104,604	147,897	200,815
Embankment Volume (CY)	21,395	34,830	57,047	140,413	236,471	379,168
Efficiency (Capacity/Fill) (CY/CY)	57.8	79.2	95.2	8.8	11.7	14.3
Efficiency (Fill/Capacity) (CY/AF)	28	20	17	183	138	113
Direct Drainage Area (sq-mi)	10.0			10.0		
Indirect Drainage Area (sq-mi)	N/A			N/A		
Average Precipitation (in)	36.5			36.5		
Potential for Flood Control	Significant on West Fork to Battle Creek (6.0 miles) only			Significant on West Fork to Battle Creek (6.0 miles) only		
Outlet Works	Not Designed			Not Designed		
Spillways	Integral with RCC Dam			Not Designed		
Geology	Bedrock geology at the dam site is the Libby Creek Group, which is primarily composed of Precambrian metamorphic schist.			Bedrock geology at the dam site is the Libby Creek Group, which is primarily composed of Precambrian metamorphic schist.		
Land Ownership	USGS; Private			USGS; Private		
Irrigated Acreage Inundated (acre)	0.0			0.0		
Inundated Infrastructure	Possible Residence; Approx. 1/2 miles of Hwy 70 at largest size			Possible Residence; Approx. 1/2 miles of Hwy 70 at largest size		
Cultural/Archaeological impacts	Two Sites Within Dam and Reservoir - Mitigation Requirements Highly Likely			Two Sites Within Dam and Reservoir - Mitigation Requirements Highly Likely		
NWI Wetlands impacts (ac)	0.0			0.0		
Riparian impacts	Minimal			Minimal		
Species of concern	Canada Lynx; Boreal Western Toad			Canada Lynx; Boreal Western Toad		
Big Game impacts - crucial winter	None			None		
WGFD Stream Class	Green			Green		
Access	Existing Unimproved Access Trail + New Road (1/2 mile)			Existing Unimproved Access Trail + New Road (1/2 mile)		

Favorable characteristic | Unfavorable characteristic | Neither Favorable Nor Unfavorable
Probable fatal flaw or very unfavorable characteristic

Table III-2: Reservoir Screening Summary

Site Name	Haggarty Creek Near Copperton - Site B - RCC Dam			Haggarty Creek Near Copperton - Site B - Earth Dam		
Location (Section, Township N, Range W)	31, 14, 86			31, 14, 86		
Direct Reservoir Supply	Haggery Creek			Haggery Creek		
Indirect Reservoir Supply	N/A			N/A		
Reservoir Storage Capacity (AF)	2,849	4,486	6,956	2,849	4,486	6,956
Reservoir Water Surface Area (Ac)	66	98	149	66	98	149
Reservoir Water Surface Elevation	8340	8360	8380	8340	8360	8380
Reservoir Service Area	Battle Creek below confluence with West Fork; Little Snake River below confluence with Battle Creek			Battle Creek below confluence with West Fork; Little Snake River below confluence with Battle Creek		
Reservoir Permitted Uses	Irrigation			Irrigation		
Other Benefits	Recreation; Copper Mitigation; Downstream Fishery Improvement			Recreation; Copper Mitigation; Downstream Fishery Improvement		
Dam Type	RCC			Earth		
Borrow Material Availability	Not Evaluated.			Not Evaluated.		
Dam Height (ft)	150	170	190	165	185	210
Crest Elevation (ft)	8345	8365	8385	8345	8365	8385
Crest Length (ft)	725	850	975	725	850	975
Crest Width (ft)	20	20	20	44	48	52
Dam Footprint (sqft)	15,148	20,857	27,263	317,096	406,277	513,636
Embankment Volume (CY)	105,066	145,577	196,097	678,967	955,005	1,306,040
Efficiency (Capacity/Fill) (CY/CY)	43.7	49.7	57.2	6.8	7.6	8.6
Efficiency (Fill/Capacity) (CY/AF)	37	32	28	238	213	188
Direct Drainage Area (sq-mi)	10.5			10.5		
Indirect Drainage Area (sq-mi)	N/A			N/A		
Average Precipitation (in)	36.5			36.5		
Potential for Flood Control	Significant on West Fork to Battle Creek (5.6 miles) only			Significant on West Fork to Battle Creek (5.6 miles) only		
Outlet Works	Not Designed			Not Designed		
Spillways	Integral with RCC Dam			Not Designed		
Geology	Not Evaluated.			Not Evaluated.		
Land Ownership	USGS; Private			USGS; Private		
Irrigated Acreage Inundated (acre)	0.0			0.0		
Inundated Infrastructure	Possible Residence; Approx. 1/2 miles of Hwy 70 at largest size			Possible Residence; Approx. 1/2 miles of Hwy 70 at largest size		
Cultural/Archaeological impacts	Two Sites Within Dam and Reservoir - Mitigation Requirements Highly Likely			Two Sites Within Dam and Reservoir - Mitigation Requirements Highly Likely		
NWI Wetlands impacts (ac)	0.0			0.0		
Riparian impacts	Minimal			Minimal		
Species of concern	Canada Lynx; Boreal Western Toad			Canada Lynx; Boreal Western Toad		
Big Game impacts - crucial winter	None			None		
WGFD Stream Class	Green			Green		
Access	Existing Unimproved Access Trail + New Road (1/2 mile)			Existing Unimproved Access Trail + New Road (1/2 mile)		

Favorable characteristic | Unfavorable characteristic | Neither Favorable Nor Unfavorable

Probable fatal flaw or very unfavorable characteristic

Table III-2: Reservoir Screening Summary

Site Name	Battle Lake				Lower Cottonwood Creek						Upper Cottonwood Creek		
Location (Section, Township N, Range W)	25, 14, 86				12, 12, 87						36, 13, 87		
Direct Reservoir Supply	Natural Runoff				Cottonwood Creek						Cottonwood Creek		
Indirect Reservoir Supply	N/A				Roaring Fork via the Sheep Mountain Ditch						Roaring Fork via Sheep Mountain Supply Ditch		
Reservoir Storage Capacity (AF)	94	407	792	1,707	2,192	3,217	4,666	6,729	9,733	14,199	763	2,347	5,813
Reservoir Water Surface Area (Ac)	27	36	41	50	43	60	85	121	179	267	43	116	231
Reservoir Water Surface Elevation	9240	9250	9260	9280	7460	7480	7500	7520	7540	7560	8000	8020	8040
Reservoir Service Area	Battle Creek				Little Snake River below Cottonwood Creek						Little Snake River below Cottonwood Creek		
Reservoir Permitted Uses	Irrigation				Irrigation						Irrigation		
Other Benefits	Recreation				Recreation; Downstream Fishery Improvement						Recreation; Downstream Fishery Improvement		
Dam Type	Earth				Earth						Earth		
Borrow Material Availability	Except for riprap slope protection and possibly low permeability fill, suitable borrow materials for earth fill should be available onsite.				Fine grained materials should be available from surficial and bedrock materials. A source of filter and slope protection materials was not identified.						Borrow materials for low permeability fill could be limited.		
Dam Height (ft)	60	75	90	110	185	205	230	250	275	295	75	100	120
Crest Elevation (ft)	9245	9255	9265	9285	7465	7485	7505	7525	7545	7565	8005	8025	8045
Crest Length (ft)	1,275	1,825	2,250	2,875	650	725	800	900	1,125	1,400	550	750	1,175
Crest Width (ft)	22	26	28	32	48	52	56	60	66	70	26	30	34
Dam Footprint (sqft)	180,457	300,402	451,058	793,727	375,571	466,547	568,377	683,269	826,587	1,000,836	128,751	211,281	327,486
Embankment Volume (CY)	96,366	189,980	338,061	809,891	820,867	1,143,019	1,538,661	2,017,426	2,602,383	3,297,594	125,267	254,960	466,539
Efficiency (Capacity/Fill) (CY/CY)	1.6	3.5	3.8	3.4	4.3	4.5	4.9	5.4	6.0	6.9	9.8	14.9	20.1
Efficiency (Fill/Capacity) (CY/AF)	1,027	467	427	474	374	355	330	300	267	232	164	109	80
Direct Drainage Area (sq-mi)	0.4				3.9						1.7		
Indirect Drainage Area (sq-mi)	N/A				5.2						5.2		
Average Precipitation (in)	52.2				27.8						30.0		
Potential for Flood Control	Negligible				Significant on Cottonwood Creek; Neglible on Little Snake River						Negligible		
Outlet Works	Not Designed				Not Designed						Not Designed		
Spillways	Not Designed				Not Designed						Not Designed		
Geology	Bedrock was not exposed but should likely be metasedimentary and metavolcanics including Precambrian gneiss, amphibolite, and metavolcanics. Quaternary glacial till covers bedrock and consists of sand, gravel, and boulders.				Bedrock was not exposed but should likely be Steele Shale.						The general bedrock geology is Miocene sandstone, marl, and conglomerate. The upper portion of the upper reservoir is Precambrian granite.		
Land Ownership	Private; USFS				USFS; Private						USFS; Private		
Irrigated Acreage Inundated (acre)	0.0				0.0						0.0		
Inundated Infrastructure	None				None						None		
Cultural/Archaeological impacts	Multiple sites near dam and reservoir; mitigation requirements unlikely				Not Studied						Multiple Sites Within Reservoir Limits		
NWI Wetlands impacts (ac)	1.6				2.1						1.9		
Riparian impacts	Minimal				Extensive Cottonwood Gallery Forest						Minimal		
Species of concern	Canada Lynx; Boreal Western Toad; Preble's Meadow Jumping Mouse				Canada Lynx; Boreal Western Toad; Colroado River Cutthroat Trout (in Roaring Fork)						Canada Lynx; Boreal Western Toad; Colroado River Cutthroat Trout (in Roaring Fork)		
Big Game impacts - crucial winter	None				None						None		
WGFD Stream Class	Yellow				Clear						Clear		
Access	Existing Unpaved Roads (1.2 miles) - Seasonal				Unimproved Roads and Trails (3.0 miles)						Unimproved Roads and Trails (6.7 miles)		

Favorable characteristic | Unfavorable characteristic | Neither Favorable Nor Unfavorable

Probable fatal flaw or very unfavorable characteristic

Table III-2: Reservoir Screening Summary

Site Name	Roaring Fork Little Snake River
Location (Section, Township N, Range W)	5, 12, 86
Direct Reservoir Supply	Roaring Fork Little Snake River
Indirect Reservoir Supply	N/A
Reservoir Storage Capacity (AF)	3,419
Reservoir Water Surface Area (Ac)	85
Reservoir Water Surface Elevation	7640
Reservoir Service Area	Little Snake below Roaring Fork; Hackmaster Ditch
Reservoir Permitted Uses	Irrigation
Other Benefits	Negligible
Dam Type	Earth
Borrow Material Availability	Not Evaluated.
Dam Height (ft)	165
Crest Elevation (ft)	7645
Crest Length (ft)	625
Crest Width (ft)	44
Dam Footprint (sqft)	363,626
Embankment Volume (CY)	696,178
Efficiency (Capacity/Fill) (CY/CY)	7.9
Efficiency (Fill/Capacity) (CY/AF)	204
Direct Drainage Area (sq-mi)	11.7
Indirect Drainage Area (sq-mi)	N/A
Average Precipitation (in)	37.8
Potential for Flood Control	Significant on Roaring Fork(3.4 miles); Neglible on Little Snake River
Outlet Works	Not Designed
Spillways	Not Designed
Geology	Not Evaluated.
Land Ownership	USFS
Irrigated Acreage Inundated (acre)	0.0
Inundated Infrastructure	None
Cultural/Archaeological impacts	Not Studied
NWI Wetlands impacts (ac)	5.0
Riparian impacts	Minimal
Species of concern	Canada Lynx; Boreal Western Toad; Colroado River Cutthroat Trout
Big Game impacts - crucial winter	None
WGFD Stream Class	Yellow
Access	Unimproved Roads and Trails (7.0 miles) + New Roads (3.8 miles)

Favorable characteristic | Unfavorable characteristic | Neither Favorable Nor Unfavorable
Probable fatal flaw or very unfavorable characteristic

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