

# **Environmental and Recreational Water Use Analysis for the Bear River Basin, Wyoming**

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## **Bear River Basin Plan Update**



**Prepared for:**  
**Wyoming Water Development Commission**

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## **EXECUTIVE SUMMARY**

In 2010, the Wyoming Water Development Commission (WWDC) requested a study to develop more robust and consistent methods for defining environmental and recreational (E&R) water uses for the River Basin Planning program. The study outlined that recreational and environmental uses needed to be identified and mapped, in a way that would assess their interactions with traditional water uses throughout the state of Wyoming.

Harvey Economics completed the study in 2012, with a report and handbook being produced to identify a consistent viewpoint and accounting process for E&R water demands and to help guide river basin planning efforts in moving forward. The methods developed in the handbook were implemented on the Bear River Basin (Basin), and the results of the Basin plan update are provided in this report. In addition to the handbook guidelines, Western Ecosystems Technology, Inc. coordinated with the WWDC to further the analysis through the development of three models: 1) protection, 2) environmental, and 3) recreation.

The Basin is located in northeast Utah, southeastern Idaho and southwestern Wyoming, and it covers an area of approximately 7,500 square miles, with 1,500 square miles (960,000 acres) occurring in the state of Wyoming. The Bear River is the largest tributary to the Great Salt Lake and its headwaters are in the Uinta Mountains of Utah. Several mountain ranges (Wyoming Range, Wasatch Range and Uinta Mountains) divide the Basin from the Green River Basin and other portions of the Great Salt Lake Basin.

Land ownership in the Basin is primarily federal and private. Federal land is composed of Bureau of Land Management (BLM; 40.7%), US Forest Service (USFS; 12.4%), US Fish and Wildlife Service (USFWS; less than 1%), and National Parks Service (less than 1%) managed land. The BLM managed land occurs throughout the Basin, while USFS land is consolidated to the upper reaches of the basin along the northern border. Private land occurs throughout the Basin, with larger expanses of private ownership present in the southern portion of the Basin.

Environmental uses are broken into state and federal environmental categories. Environmental water use in the Basin is demonstrated through permitted and protected resources and areas where environmental resources have been identified as important. State environmental uses include 17 instream flow filings, three distinct Wyoming Game and Fish Department (WGFD) crucial habitat priority areas, and over 50 miles of designated crucial stream corridors. Other WGFD designated areas occur in the Central Bear sub-basin and include key non-game areas and enhancement areas. Federal environmental uses include the Cokeville Meadows National Wildlife Refuge (NWR), USFWS listed species (one bird, three mammals, and two plants), and over 50,000 acres of National Wetlands Inventory polygons.

Recreation uses in the Basin include fishing, waterfowl hunting, boating, whitewater rafting, camping, hiking, general sightseeing (such as bird watching), and a variety of other passive and active recreation activities. Recreation activities associated with water use are fairly

concentrated and often occur on land specifically identified for public access, such as forest service land, state parks, and federal refuges. The USFS provides copious recreation opportunities near the Smiths Fork and Thomas Fork headwaters. Multiple reservoirs including Sulphur Creek and Woodruff Narrows provide recreation opportunities. The Bear River State Park is a 300-acre park located on the eastern edge of Evanston in southwestern Wyoming that has opportunities for fishing, hiking, wildlife viewing, bicycling, skiing, and many other activities. Other recreation opportunities are available, where access allows, throughout the Basin.

All of the potential E&R uses identified in the report were evaluated and categorized as protected, complementary, or competing. These categories were defined based on the definition provided in the handbook and additional discussion with the WWDC and Wyoming State Engineer's Office. A number of factors were considered to categorize the E&R uses including location in the Basin, land use and ownership, and existing permits, among other factors. The location and magnitude of diversions were specifically evaluated to determine the use categories. Categorization of uses included specific individual E&R use activities and categorizations were assigned to larger geographic areas where multiple uses may occur.

Protected E&R water uses in the Basin exist along the permitted instream flow sections. These areas are primarily located on USFS-managed land, which provides an additional layer of protection. E&R uses in the Cokeville Meadows NWR should also be considered protected as this is an area owned by the USFWS and designated specifically for E&R uses. Additionally, Cokeville Meadows NWR water uses are supported by water rights and therefore protected. All E&R uses along Salt Creek from the Idaho – Wyoming border upstream to the headwaters, all uses upstream from the confluence of the Smiths Fork and Dry Smiths Fork, and all uses above the Muddy Creek and Smiths Fork confluence are currently protected due to the location high in the watershed and lack of existing diversions. If new diversions or water storage were proposed in the future, these areas may no longer be protected.

All other E&R water uses across the Basin are assumed to be complementary. This is based on the assumption that current water conditions will continue in a similar regime to historic water use. A number of large permitted diversions with senior water rights exist throughout the Basin. These diversions have the ability to affect E&R use if modification were to occur. The goal of this document is not to speculate; therefore, no competing categorizations were assigned.

The model results demonstrate a clear difference in protection, environmental uses, and recreation uses between the Central Bear and Upper Bear sub-basins. High scores were calculated in the Central Bear sub-basin for all three models. Land ownership and location in the watershed appear to be the driving factors for protection scores, with more public land and federal agency oversight in the Central Bear sub-basin and more private land in the Upper Bear sub-basin. Additionally, environmental use scores were lower in the Upper Bear sub-basin, due to a lack of WGFD designated priority areas and instream flow filings. Recreation scores were highest in the watershed on USFS land and along the Bear River. The Bear River is a focal point for recreation within the Basin due to the size of the features and the location of Bear River State Park and Cokeville Meadows NWR.

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## 1 INTRODUCTION

In 2016, the Wyoming Water Development Commission (WWDC) contracted Western EcoSystems Technology, Inc. (WEST) to identify, categorize, and evaluate environmental and recreational (E&R) water uses within the Bear River Basin (Basin) in Wyoming. Environmental water demand is the amount of water required to support a given water-dependent ecosystem or ecosystem function, and recreational water demand is the amount of water needed to support water-based recreation activities. In most instances, these demands are non-consumptive, but do require that the water be in place for the use to be sustained or for the activity to occur. To help identify areas with high environmental or recreation water use, WEST developed two use models. While these models do not quantify specific water demand requirements, they do provide a relative scale of E&R use throughout the Basin. WEST also developed a third model to identify the levels of institutional protection provided to E&R water uses across the Basin. This report provides results of the E&R use analysis, including water use identification, mapping, categorization, and assimilation.

In the late 1990's the WWDC began implementing its current basin planning framework which seeks to identify and describe existing water demands and supplies within each river basin, as well as potential future water development opportunities. Under this framework, a river basin plan has been developed for each of Wyoming's seven basins. The most recent *Bear River Basin Plan* was the 2011 update (WWDC 2012). Early versions that included E&R information were prepared in 2000 and 2001 (Forsgren Associates 2000a, 2000b). The goal of each basin plan is to estimate current water demand and project future water demands by type of use. The WWDC recognizes five unique categories of use:

1. Agricultural
2. Municipal and Rural Domestic
3. Industrial
4. Environmental
5. Recreational

Of the five water use categories, E&R water uses are the only categories that are almost exclusively non-consumptive in nature, so traditional methods for quantifying them do not apply. Thus, many of the E&R water uses identified in each basin plan are discussed solely in qualitative terms, which have resulted in inconsistencies in how E&R water uses are addressed across basin plans. Originally, E&R uses were mostly described without regard for how they interact with traditional uses; instead each use was summarized in terms of their overall impact on the water resources of the basin.

To develop a more consistent approach that provides a more detailed assessment of the interaction between traditional and non-consumptive uses, the WWDC obtained funding from the 2010 Legislature for an Environmental and Recreation Water Use Study to develop a procedure that could be applied in all the basins. Harvey Economics (HE) was contracted to

complete the study, and in 2012, HE published a new set of procedures to address E&R water uses in *The Environmental and Recreational Use Handbook* (Handbook; Harvey Economics 2012). This analysis adheres to the procedures outlined in the Handbook, which are described in the methods sections, and furthers the evaluation through the development of use and protection models.

## **2 STUDY AREA - BEAR RIVER BASIN**

***The follow study area description is from the 2011 Bear River Basin Plan Update.*** The Basin is located in northeast Utah, southeastern Idaho and southwestern Wyoming, and covers an area of approximately 7,500 square miles, with 1,500 square miles (960,000 acres) occurring in the state of Wyoming (Figures 2-1 and 2-2). The Bear River is the largest tributary to the Great Salt Lake and its headwaters are in the Uinta Mountains of Utah. Several mountain ranges (Wyoming Range, Wasatch Range and Uinta Mountains) divide the Basin from the Green River Basin and other portions of the Great Salt Lake Basin.

The Basin is located primarily within the Middle Rocky Mountains Province. In Wyoming, the Middle Rocky Mountains Province is made up of a series of north-to-south trending mountains, ridges, hills, plains, and valleys that expose the underlying geologic structures associated with the Overthrust Belt and the eastern boundary of the Basin and Range Province. Elevations of the Bear River main channel, within Wyoming, range from approximately 7,772 feet above mean sea level where the Bear River enters Wyoming at the Utah-Wyoming border, to approximately 6,055 feet above mean sea level where the Bear River enters Idaho near Border, Wyoming. The stream drainages generally follow the north-south geologic structural trend except that portions of Twin Creek, Smiths Fork, Water Canyon Creek, and Thomas Fork cut across the structural trend.

### **2.1 Unique Characteristics**

The waters of the Bear River are divided among users according to the framework established by the Bear River Compact (1958) and the Amended Bear River Compact (1980), in conjunction with the Bylaws of the Bear River Compact Commission, various court decrees, and the laws of the states of Wyoming, Idaho, and Utah. The original Bear River Compact divided the Basin into three main divisions for water management: the Upper Division, the Central Division, and the Lower Division.

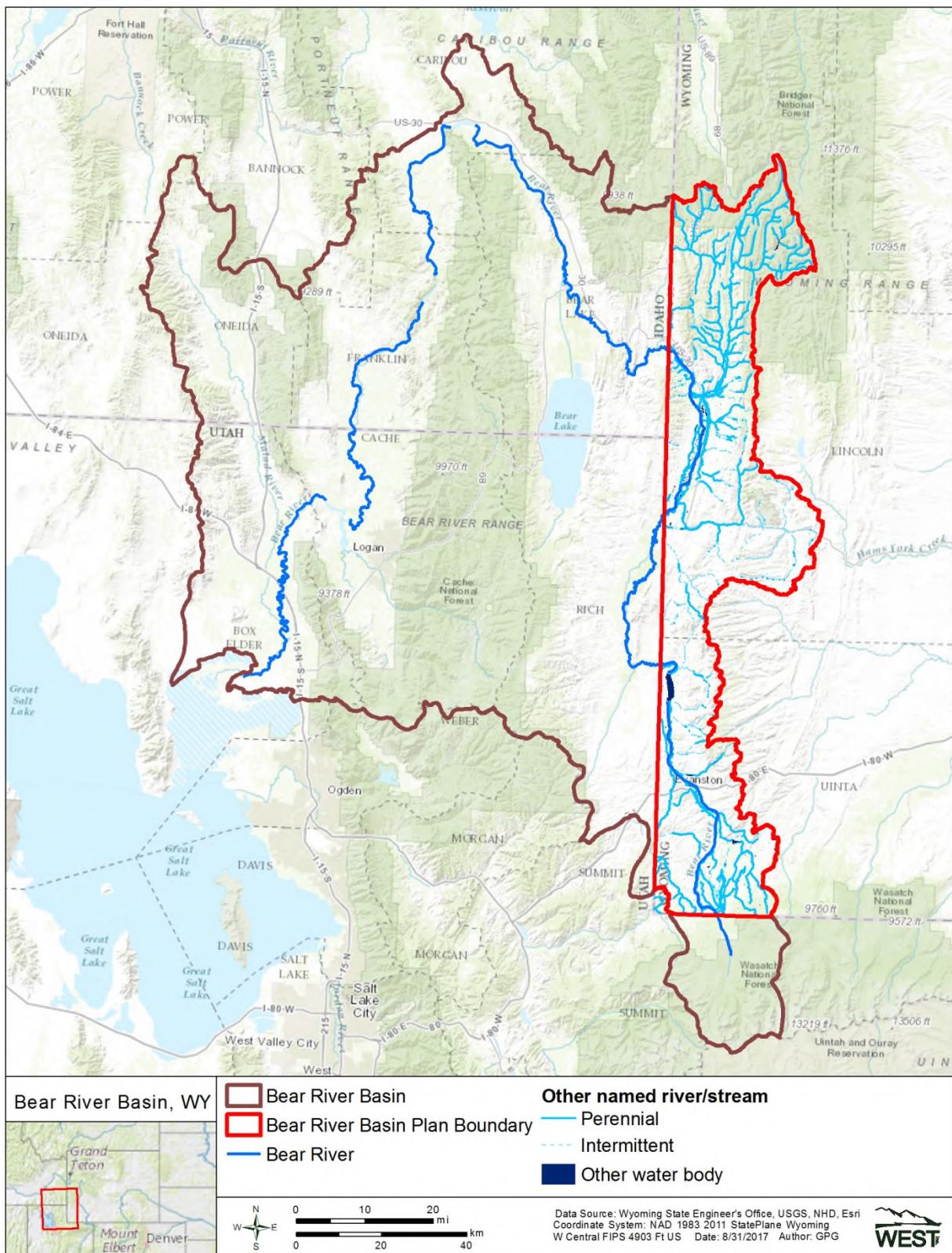


Figure 2-1. Location of the Bear River Basin in Wyoming, Idaho, and Utah.

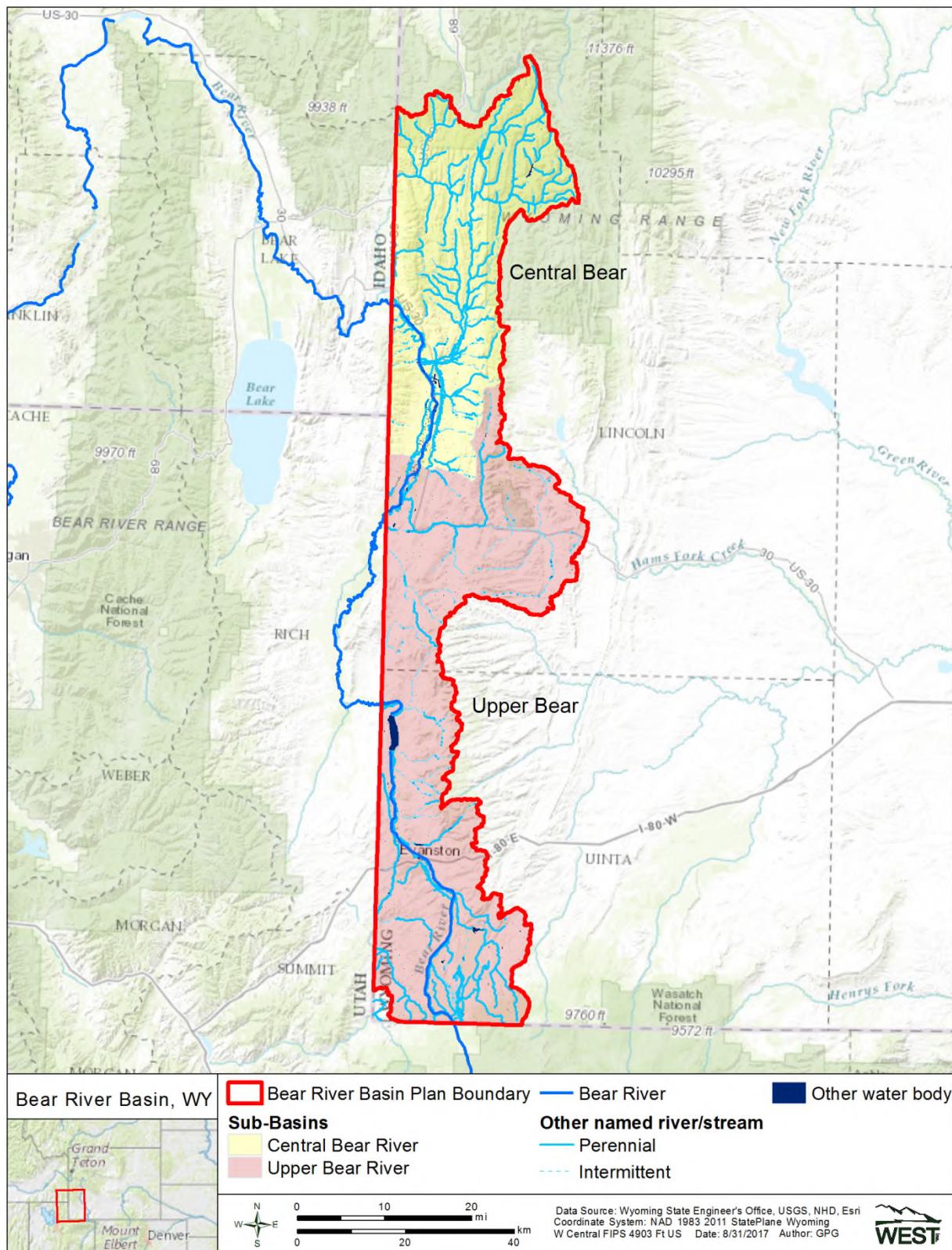


Figure 2-2. Location of the Bear River Basin in Wyoming.

The Upper Watershed of the Basin extends from the river's headwaters to Pixley Dam and includes parts of Lincoln and Uinta counties in Wyoming. About half of the land is privately owned, with the rest publicly owned and managed by the National Forest Service (USFS), Bureau of Land Management (BLM), and the states of Utah and Wyoming. Three-quarters of the land is used for grazing, with small areas of irrigated hay and small grain production in the valleys. There are also oil and gas production sites and areas of historic phosphate and coal mining. The headwaters are pristine, but the river picks up sediment, nutrients and other pollutants as it travels through lower gradient lands to Sulphur Creek. Above Sulphur Creek, the river is in good condition. From below this point to Woodruff Narrows Reservoir, channelization has caused excess sediment and resulted in a significant loss of trout habitat. Below the reservoir, the river continues through an open valley and crosses the Utah-Wyoming border twice before reaching the Pixley Dam.

The Central Watershed in the Basin includes lands draining to the Bear River as it travels from Pixley Dam, between Cokeville and Sage Creek Junction in Wyoming, to Stewart Dam, just northeast of Bear Lake in Idaho. Two-thirds of land in the watershed is federally managed, either by the BLM and USFS, and urban areas cover less than 1% of this watershed, making it the least urban of all of the Bear River Watersheds. Land uses in the watershed include historic phosphate mining, grazing, and irrigated agriculture. The water quality of the upper portion of the Smiths Fork and Salt Creek in Wyoming and Thomas Fork in Idaho is relatively good. However, as these tributaries travel through lower gradient lands, inputs from a variety of sources reduce the quality. By the time the Smiths Fork reaches the Bear River, it is impaired by excess sediments. Bank erosion and willow removal are the main causes of sedimentation.

Terrestrial habitats in the Upper Watershed are home to a variety of game and non-game species, including elk (*Cervus canadensis*), mule deer (*Odocoileus hemionus*), cougars (*Puma concolor*), and grouse. Forested areas in the headwaters of the Basin are part of a critical wildlife corridor for species migration in the western United States, offering the only major link between the Greater Yellowstone Ecosystem and the High Uintas Wilderness area. In Wyoming, wetlands cover less than 5% of the land area, so wetland communities along the Bear River are particularly important to wildlife. The Cokeville Meadows National Wildlife Refuge (NWR) supports one of the highest densities of nesting waterfowl in Wyoming and provides nesting habitat for 32 water bird species including sandhill cranes (*Antigone canadensis*), white-faced ibis (*Plegadis chihi*), black terns (*Chlidonias niger*), black-necked stilts (*Himantopus mexicanus*), American bitterns (*Botaurus lentiginosus*) and a variety of other waterfowl, marsh and shorebirds. The Thomas Fork and Smiths Fork and the stretch of the Bear River between these rivers, provide ideal habitat for the migratory Bonneville cutthroat trout (BCT, *Oncorhynchus clarki utah*). The tributaries support some of the most genetically pure species of the BCT in its native range. The Bear River links these tributary populations, supporting what may be the last connected large river habitat available to BCT.

### 3 METHODS

The Handbook describes the following five steps to address E&R water uses in the Basin:

- 1) **Identify E&R water uses in the Basin**: WEST gathered the Geographic Information System (GIS) data recommended in the Handbook and additional data to support the E&R use descriptions, as well as data for other E&R water uses included in the original Basin Plan and the 2010 update (Table 3-1).
- 2) **Map E&R water uses in the Basin**: WEST used the GIS data identified in the previous step to create maps depicting the land ownership, environmental water uses, and recreation water uses across the Basin. These maps were used to identify where specific E&R uses were occurring within the Basin.
- 3) **Locate divertible non-E&R water uses in the Basin**: WEST mapped existing non-E&R consumptive water uses in the Basin by diversion location and magnitude using GIS data obtained from the WWDC and previous basin plans.
- 4) **Categorize non-consumptive E&R water uses in the Basin**: WEST used the land ownership, E&R water use, and non-E&R water diversion maps to categorize each E&R water use as “protected”, “complementary”, or “competing” based on their proximity downstream to non-E&R water diversions and their location in the watershed. These categories are defined in the Handbook and are described below.
- 5) **Assimilate the results of the E&R water use analysis into Basin Plan**: WEST evaluated all of the information collected and developed three models. This information was used to discuss and inform future water planning relative to the Basin’s E&R uses.

**Table 3-1. Geographic Information System data sources for environmental and recreational mapping in the Bear River Basin.**

Name	Source
Basin borders	WWDC
Hydrologic Unit Codes	USGS
Waters and reservoirs – National Hydrology Dataset	USGS
Land ownership	USGS
Instream Flows	WWDO, SEO, WGF
Crucial Habitat Priority Areas - Aquatic	WGFD
Crucial Habitat Priority Areas - Combined	WGFD
Enhancement Habitat Priority Areas	WGFD
Crucial Streams Corridors	WGFD
Wildlife Habitat Management Areas	WGFD
Key Nongame Wildlife Areas	WGFD
Wild and Scenic Rivers	WyGISC
Wilderness Areas	WyGISC
Threatened, Endangered, Candidate, and Sensitive Species	USFWS – Information for Planning and Consultation (IPaC) database
USFWS Critical Habitat	USFWS

**Table 3-1. Geographic Information System data sources for environmental and recreational mapping in the Bear River Basin.**

Name	Source
National Wetlands Inventory	USFWS
BLM Areas of Critical Environmental Concern	BLM
WGFD Stream Classifications	WGFD
National Parks	USGS
US Forest Service	USGS
State Parks <sup>2</sup>	WYO Parks
National Recreation Areas	USGS
Fishing Spots	WyGISC
Model Demand Nodes	WWDO (2003 Basin Plan- GIS products)
National Wildlife Refuges	USFWS
Whitewater Rafting Stream Segments	American Whitewater
Golf course locations	WyGISC
Ski resort locations	WyGISC
Lakes	WSGS
Partners for Fish and Wildlife Program <sup>1</sup>	USFWS
Reservoir Storage	SEO

<sup>1</sup>Partners for Fish & Wildlife 2017

<sup>2</sup>WYO Parks 2017

BLM=Bureau of Land Management; SEO=Wyoming State Engineer's Office; USFWS=US Fish and Wildlife Service; WDEQ=Wyoming Department of Environmental Quality; WGFD=Wyoming Game and Fish Department; WSGS=Wyoming State Geological Survey; WWDO=Wyoming Water Development Office; WyGISC=Wyoming Geographic Information Science Center

### 3.1 Identification of E&R Water Uses

WEST searched a variety of publically available resources for data identifying specific E&R uses in the Basin. Initially, WEST used the Handbook and previous Basin plan to identify specific primary and secondary sources. Beyond previously identified and reported sources, WEST concentrated on publically available datasets from state and federal agencies (primarily web-based) to gather additional datasets. Where possible, the datasets previously developed by the Wyoming Water Development Office (WWDO, <http://waterplan.state.wy.us/>) were used. An emphasis was put on state and federal resources, as these are typically referenced when evaluating potential project impacts. WEST contacted agency staff as appropriate to gather and interpret additional datasets.

### 3.2 Mapping of E&R Water Uses

WEST used ArcGIS to plot the identified E&R across the Basin and sub-basins. Prior to plotting information, the data were sorted between E&R uses and state and federal environmental uses. Additionally, any dataset that was not linked to water resources was removed or specifically identified. Datasets that were difficult to represent or not visible at reasonable scales were not plotted. These data were stored in GIS and in some cases used in the model development. In addition to plotting data for visual representation, GIS data were sorted and stored in an ArcGIS geodatabase for ease of use and sharing on future projects.

### 3.3 Separating Consumptive Uses

The next step in estimating non-consumptive E&R water demands was to separate consumptive E&R water demands from non-consumptive uses. In other words, if a diversion exists for a golf course, ski area or hot springs, those uses were identified in specific terms and aggregated as sub-elements of other uses. For example, golf course diversions may be classified as agricultural, municipal or recreational water by the Wyoming State Engineer's Office (SEO), and should be included in the divertible demands for the appropriate category. Divertible water uses with specific beneficial purposes that have received a water right in the state of Wyoming were treated in the same way as traditional water uses. Existing uses, as well as projected future uses for these diversions, were identified and estimated in the Basin planning process. Due to the non-consumptive nature of E&R uses, this task was fairly brief.

### 3.4 Non-Consumptive E&R Water Use Categories

The Handbook recommended that non-consumptive E&R water uses be categorized so that they can be more easily compared to traditional uses. The majority of E&R water uses are non-consumptive, because they usually occur in the stream channel and therefore, benefit from water being left in the channel; whereas, traditional uses divert water from the channel for consumption. WEST used the existing Basin Plan update and supporting technical memorandums to identify diversion locations and magnitudes. The location and magnitude of diversions were used to support the categorization of E&R uses. The Handbook proposed that E&R water uses be classified as "protected" from traditional water uses that dewater the channel, "complementary" with consumptive water uses without explicit protection, or "competing" with consumptive water uses. The Handbook provides the following descriptions for each of these categories:

**Protected** – Protected E&R water uses are both recognized and protected in some way from incursions by traditional water uses. The obvious example is an instream flow water right. However, protected wetlands, protected bypass flows, or any environmental water uses protected by federal agencies through permit or water right fall into the protected category. In addition, protected water uses may have a senior traditional water use diverter in a location which ensures the continuation of that non-divertible use.

*Example:* If the most senior water right downstream is larger than or equal to the recreational or environmental water use immediately above that senior water diversion in the stream system, that recreational water use is protected and should be recognized as such in the Basin planning process.

**Complementary** – Complementary E&R water uses exist without explicit protection, but exist and will continue to exist typically by their location or linkage with a traditional water use. For instance, environmental water uses are often located at the highest reaches within a watershed, and intervening uses are very unlikely to occur. Environmental water uses which occur at high elevations or in a forest high in the watershed are unlikely to be disturbed by water users below.

Without future intervening water uses, those complementary water uses are likely to continue and should be recognized as such in the river basin planning process.

Another example or sub-category of complementary water use stems from the incidental linkage of certain environmental or recreation water uses to traditional uses. For example, fisheries and spawning habitat may be supported by subsurface irrigation return flows, which would be lost if irrigation stops or the method is changed. These incidentally linked water uses are without explicit protection and will expand or contract with the linked traditional use.

**Competing** – Competing E&R water uses are located in areas where other traditional water use diversions may constrain or eliminate the environmental or recreational use at any point in time. These water uses are incidental and subject to elimination. These uses should also be recognized in the Basin planning process, but with the explicit understanding that such water uses can and will disappear when future appropriators step forward.

WEST concluded that the three non-consumptive E&R water use categories represent different points on a spectrum of stream protection. For example, blue ribbon stream segments that occur high up in a watershed in a designated wilderness area are afforded nearly the same level of protection as a stream segment with a permitted instream flow water right located on a higher order stream lower down in the watershed. However, using the E&R water use categories defined by the Handbook, the former stream segment would be classified as “complementary”, while the latter stream segment would be classified as “protected”. Furthermore, non-consumptive water uses in direct competition with traditional consumptive water uses could be considered to have little or no protection. Due to the potential difficulties categorizing individual E&R uses, WEST applied a general approach to categorize uses across large segments of the Basin, but looked to further the evaluation by assigning relative scales of protection. Building on this notion and work completed for the Snake and Salt River Plan (Wyoming Water Development Office 2013), WEST developed models to identify and categorize areas with varying degrees of environmental or recreational uses within the Basin, as well as areas with varying degrees of protection for non-consumptive E&R water uses.

### **3.5 Model Development**

The evaluation areas for the models followed the methods identified in the Snake and Salt River Plan where NHD data were used to identify stream corridors and these corridors were buffered by 0.25 miles. After the evaluation areas were identified, the E&R water use models were created by combining a series of GIS data layers into a single map, where objects in each of the data layers were assigned different values based on their environmental or recreational significance. For example, the WGFD stream classification GIS data layer includes different classes of spatial data for blue ribbon streams, red ribbon streams, yellow ribbon streams, and so on. Because blue ribbon streams are the most productive streams, they are considered to have the highest recreational value and were accordingly assigned a higher numerical value than red ribbon streams, yellow ribbon streams, and so on. Similar values were assigned to other recreational features such as designated whitewater stream segments, state parks, public access areas, etc. All of these GIS data layers were then combined into a single raster map.

Where two or more GIS data layers overlapped, the assigned numerical values for recreational features in each layer were added together for that raster point. The result was a raster map populated with a range of spatially distributed numerical values. These values were then classified as high, moderate-high, moderate-low, or low value using a defined range of values for each class, and then overlaid on a map of the Basin.

A third model was developed to identify areas that were afforded varying degrees of protection using the same method described above. The protection model evaluated the institutional protection afforded to waters throughout the Basin based on land management, land ownership, and other regulatory protections.

### **3.6 Assimilation of E&R Water Use Data into Basin Plans**

The last step recommended by the Handbook is interpreting the E&R uses in an overall basin plan. To complete this task, the E&R models in combination with the E&R use maps were compared to the protection models to identify areas of high value that may not be afforded the appropriate level of protection. These results were summarized in this report to inform WWDC where these “at risk” areas occur, so they can be taken into account in future water development planning. Additionally, WEST reviewed the updated Basin Plan to identify if water shortages or excesses exist in the Basin or are assumed to occur in the future, and then evaluate how this situation may affect E&R uses.

## **4 SECTION ORGANIZATION AND MAPS**

The Basin was divided into two sub-basins to help convey information in a more meaningful and less congested manner. The two sub-basins were delineated in the same manner as previous basin plan reports; Central Bear sub-basin and Upper Bear sub-basin (Figure 2-2). Portions of the Basin extend outside of the Wyoming state limits (Figure 2-1); however, these sections will not be specifically discussed in this report.

To maintain a consistent terminology throughout this report, the following terms are used when referring to the areas or resources of study:

- Study Area or Basin: Refers to the all the sub-basins together, including the complete Bear River Basin within Wyoming.
- Sub-basin: Will be used to describe any of the smaller contributing drainages or partial basins that make up the Bear River Basin (Figure 2-2).
- Waters: Is used in reference to individual streams or reservoirs. In some instances, it may refer to all stream or reservoir features in the Basin or sub-basin.

A map was created for each of the sub-basins that display all gathered data including: 1) land ownership, 2) state – environmental uses, 3) federal – environmental uses, 4) recreational uses, and 5) diversions. These maps provide a landscape-level view of the specific use categories and demonstrate the wide range of uses across individual sub-basins. Separate maps also were created to depict the three model results. These maps were determined to be important for

depicting water uses related to E&R in the Basin. Each of these maps is discussed in more detail in the following sections. In most cases, the E&R information was available for the entire Basin (or state); and was therefore presented for the entire river basin. Exceptions are specifically noted.

## **5 RESULTS**

### **5.1 Bear River Basin Overview**

These sections discuss the land ownership, environmental water use, and recreational water use identified throughout the Basin. Each of the sections is outlined in a manner generally consistent with the Handbook. The goal of this section is to identify the use factors that are supported by water across the Basin. This foundation supports subsequent categorization and model development.

### **5.2 Land Ownership**

The Basin is comprised of nearly 1,000,000 acres of land, with the Upper Bear sub-basin containing over 500,000 acres and the Central Bear sub-basin containing nearly 400,000 acres. Land ownership in the Basin is primarily federal and private (Table 5-1, Figure 5-1). Federal land is composed of BLM (40.7%), USFS (12.4%), US Fish and Wildlife Service (USFWS, less than 1%), and National Parks Service (NPS; less than 1%) managed land. Land managed by the BLM occurs throughout the Basin, while USFS land is consolidated in the upper reaches of the Basin along the northern border (Figure 5-1). The USFWS-managed land is the Cokeville Meadows NWR and the NPS-managed land is the Fossil Butte National Monument. Private land occurs throughout the Basin, with larger expanses of private ownership present in the southern portion of the Basin. Wyoming State Trust land occurs primarily in checkerboard pattern throughout the Basin. Other landowners manage land throughout the Basin, but these owners represent less than 1% of the total Basin area.

Land ownership is often a driving factor for water use and distribution. As described in more detail below, E&R activities occur more frequently on public lands that provide a greater level of protection for environmental factors and allow more access for recreation opportunities. This is evident in the Environmental and Recreation Use Models Sections 8.3. Additionally, traditional water uses, such as agriculture, are more likely to be consolidated on private land. Potential water development projects may occur on either public or private land; however, the development and evaluation process is commonly more rigorous when public land is involved, which provides greater protection. The protection model demonstrates the difference between private and public land and is discussed in section 8.3.

**Table 5-1. Land ownership in the Bear River Basin and sub-basins.**

Basins & Sub-Basins	Bureau of Land Management		Private Land		US Forest Service		National Park Service		State Land Board		US Fish and Wildlife Service		City Land	
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
Bear River Basin	389,810	40.7	357,184	37.3	119,044	12.4	8,322	0.9	72,265	7.5	6,329	0.7	58	0
Central Bear	143,687	37.9	80,480	21.2	119,044	31.4	0	0.	30,186	8.0	4,795	1.3	1	0
Upper Bear	246,124	42.5	276,704	47.8	0	0	8,322	1.4	42,078	7.3	1,534	0.3	58	0

**Table 5-1 (continued). Land ownership in the Bear River Basin and sub-basins.**

Basins & Sub-Basins	State Park & Recreation		The Nature Conservancy		Easement		Total
	Acres	%	Acres	%	Acres	%	
Bear River Basin	328	0	1	0	4,624	0.5	957,966
Central Bear	0	0	0	0	1,075	0.3	379,267
Upper Bear	328	0.1	1	0	3,549	0.6	578,699

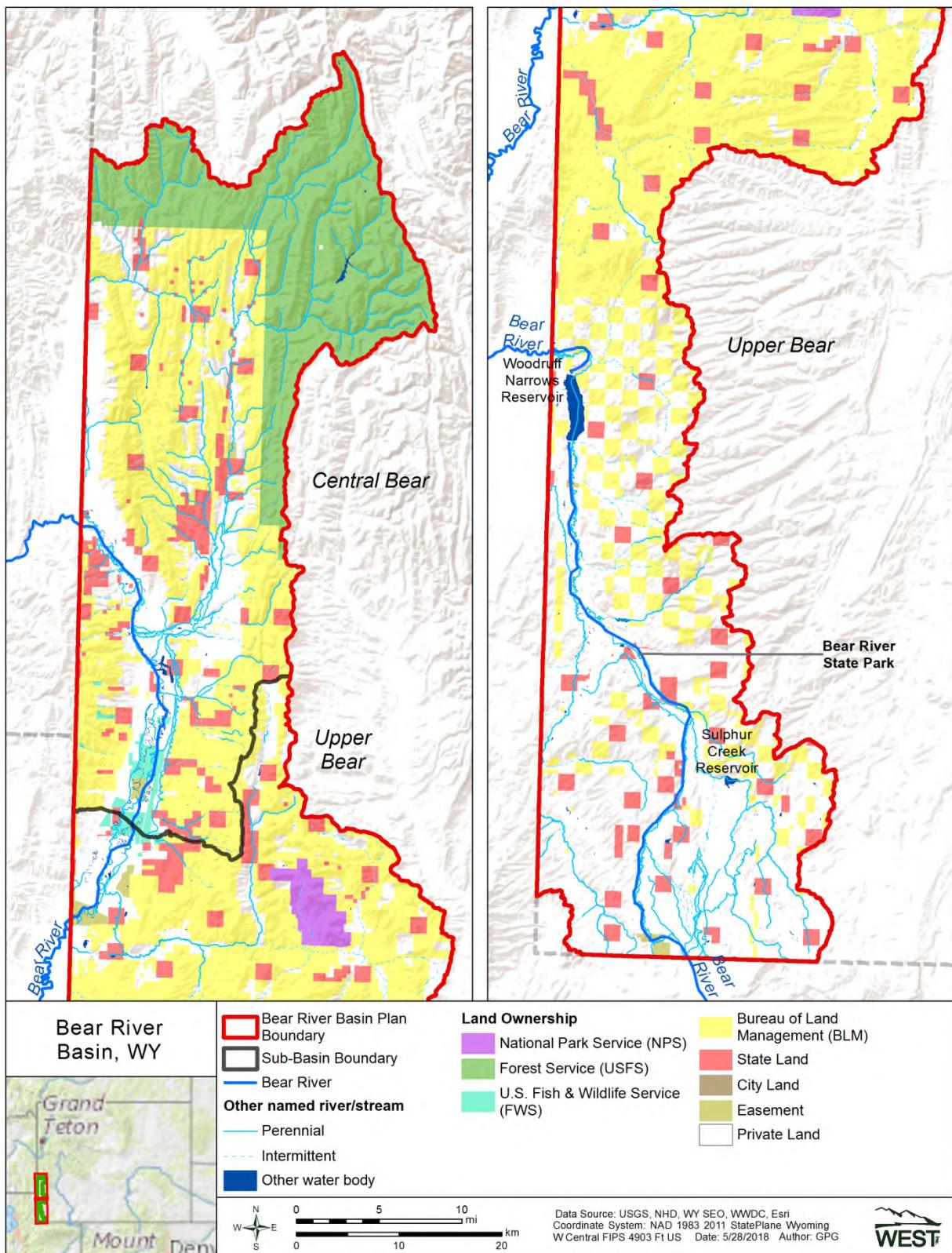


Figure 5-1. Bear River Basin land ownership.

## 6 ENVIRONMENTAL

This section is broken into state and federal environmental uses. Environmental water use in the Basin is demonstrated through permitted and protected resources and areas where environmental resources have been identified as important. These include national wildlife refuges, state designed aquatic priority habitats and stream corridors, USFWS critical habitats, instream flows, and wetland complexes, among others. Further discussion on environmental water use is provided below.

Environmental water use is difficult to quantify as most environmental factors are non-consumptive or consumed at a level that makes quantifying difficult and potentially inaccurate. Where appropriate, the section does quantify water use associated with specific environmental uses. Environmental uses that cannot be specifically quantified are discussed using a qualitative approach relative to how a change in water availability may affect the environmental use. The relative scale or magnitude of environmental water uses across the Basin is discussed in the environmental model sections 8.3.2.

### 6.1 State – Environmental

This section discusses the state-level management of environmental resources in the Basin that are associated with water use. State government bodies include the WWDC, Wyoming SEO, WGFD, and others.

#### 6.1.1 *Instream Flow Filings and Minimum Reservoir Conservation Pools*

Instream flow filings are a legal means to protect and manage fish habitat. The instream flows designate a specific water flow that must be maintained in the permitted stream segment. Detailed information on instream flows was presented in the 2000 Basin Plan and 2011 Update and is available on the WGFD and SEO websites, including magnitudes by month. No new filings have occurred since the most recent plan update (WWDO 2012).

Seventeen instream flow filings exist in the Basin (Table 6-1, Figure 6-1). The majority of the filings occur high in the watershed on tributaries to the Smiths Fork River and on USFS land. The filings range in stream length from 0.4 miles to 5.0 miles. The priority dates for the filings are all set between 1995 – 1997, with actual issued dates ranging from 2001 – 2008.

**Table 6-1. Bear River Basin instream filings detailed breakdown.**

<b>Basin</b>	<b>Name</b>	<b>Priority Date</b>	<b>Issue Date</b>	<b>Length (miles)</b>
Bear River	Coal Creek I.F. Segment No.1	6/27/1996	11/1/2002	4.2
	Coal Creek (a.k.a. Howland Creek) I.F. Segment No.1	6/20/1995	1/10/2002	0.8
	Coantag Creek I.F. Segment No.1	6/27/1996	1/2/2002	4.9
	Giraffe Creek I.F. Segment No.1	6/27/1996	10/9/2002	2.4
	Hobble Creek I.F. Segment No.1	6/20/1995	10/3/2001	2.7
	Huff Creek I.F. Segment No.1	6/20/1995	10/9/2002	3.3
	Lander Creek I.F. Segment No.1	8/25/1997	12/1/2003	0.4
	Little White Creek I.F. Segment No.1	8/25/1997	11/13/2002	2.5
	North Fork Smiths Fork River I.F. Segment No.1	8/25/1997	12/1/2003	2.4
	Packstring Creek I.F. Segment No.1	8/25/1997	11/4/2002	1.3
	Poker Hollow Creek I.F. Segment No.1	8/25/1997	10/9/2002	1.6
	Porcupine Creek I.F. Segment No.1	12/19/1995	12/8/2002	1.3
	Raymond Creek I.F. Segment No.1	12/19/1995	9/15/2002	1.6
	Salt Creek I.F. Segment No.1	6/27/1996	1/18/2002	4.5
	Smiths Fork I.F. Segment No.1	12/19/1995	11/26/2002	5.0
	Trespass Creek I.F. Segment No.1	8/25/1997	1/17/2008	1.0
	Water Canyon Creek I.F. Segment No.1	6/27/1996	10/31/2002	1.2

Two reservoirs in the Basin have storage permitted for a variety of environmental uses. As reported in previous Basin Plans, these water right uses include fish or fish and wildlife. Recreational uses defined on permits can be considered environmental to the extent that water in storage is used for recreational purposes, is not released for other consumptive or non-consumptive uses, and can be environmentally beneficial for fish habitat and wildlife consumption. Reservoirs with permitted capacity for stock water similarly serve a dual environmental function. Reservoirs with fish or fish and wildlife uses or pools listed in their permitting documents include:

- **Sulphur Creek** (4,180 acre-feet with a minimum downstream release of nine cubic feet per second [cfs])
- **Woodruff Narrows** (4,000 acre-feet with a minimum downstream release of 10 cfs)
  - Temporary storage account of 4,000 acre-feet was set up to accommodate an agreement between the Reservoir Company and the Utah Department of Fish and Game to supply the 10 cfs winter minimum release for fishery purposes

#### 6.1.2 Wyoming Game and Fish Department – Environmental

WGFD is a state agency that provides oversight and management for the natural resources in Wyoming, including both environmental and recreation management. The WGFD has prepared a number of documents that identify, categorize, and provide management recommendations for Wyoming environmental and recreation resources. These documents include the *State Wildlife Action Plan* (SWAP; 2010 and 2017) and *Strategic Habitat Plan* (SHP; WGFD 2001, 2009, and 2015). The SWAP identifies wildlife resources throughout the state by terrestrial habitats and aquatic regions (basins). The goal of the plan is to develop management strategies

for wildlife based on current and future risks. The SHP identifies five goals including conservation and management, enhancement, increased recreation, increased public awareness, and promotions of collaborative efforts (WGFD 2015). Only data on aquatic resources were included in this report.

#### 6.1.3 Wyoming Game and Fish Department –Aquatic Priority Habitat Areas

The WGFD developed a SHP in 2001 with the most recent update in 2015. The SHP recognized the important role habitat issues play in the future of Wyoming's wildlife. Several habitats and vegetation communities were identified as important to maintain or enhance. The SHP specifically acknowledged declines in water flows, water quality, loss of water flow to diversions, and loss of native fish to entrainment as risk factors affecting Wyoming resources. Through the SHP, the WGFD identified priority habitats that are “crucial” for wildlife and those habitats that have been degraded and have potential for “enhancement”.

This section identifies the priority habitat areas designated by WGFD as aquatic crucial habitat priority areas, aquatic enhancement habitat priority areas, crucial stream corridors, and key nongame wildlife areas.

##### 6.1.3.1 Crucial Habitat Priority Areas - Aquatic

Crucial Habitat Priority Areas (CHPA) are areas that are considered to be crucial to conserving and maintaining populations of aquatic wildlife for the present and future. These areas are identified as having significant biological or ecological value that needs to be protected or managed to maintain viable healthy populations of aquatic wildlife. These areas address Goal 1 in the SHP and are deemed valuable by WGFD. The WGFD provides examples of core crucial area values including: “*crucial winter range, sage grouse core areas, seasonal habitats, Species of Greatest Conservation Need (SGCN) diversity and uniqueness, quality of watershed hydrologic function, etc.* (WGFD 2015).” Management and habitat protection activities will be targeted in these areas.

Three distinct CHPA occur in the Basin (Figure 6-1). The entire Central Bear sub-basin is designated as the Lower Bear River crucial habitat. This area contains the headwaters for the Smiths Fork, Thomas Fork, and Salt Creek. A number of streams and instream flow filings exist in this region. The Bear River Corridor and Bear River Tributary CHPA exist in the Upper Bear sub-basin along and adjacent to the Bear River. The Bear River Corridor is a large riparian community that provides habitat for native fish species. This area supports BCT, leatherside chubs (*Snyderichthys copei*), and bluehead suckers (*Catostomus discobolus*). Additional SGCN targeted by this CHPA include the boreal toad (*Anaxyrus boreas boreas*) and Great Basin spadefoot (*Spea intermontana*). The Bear River Tributaries CHPA was designated for the conservation of the Yellow Creek, LaChapelle Creek, Mill Creek, and Sulphur Creek tributaries. These creeks provide aquatic habitat for the BCT, leatherside chubs, mountain whitefish (*Prosopium williamsoni*), mountain suckers (*Catostomus platyrhynchus*), and northern leopard frog (*Lithobates pipiens*).

#### **6.1.3.2 Enhancement Habitat Priority Areas - Aquatic**

Enhancement Habitat Priority Areas (EHPA) have been identified by WGFD as areas that have the potential to provide wildlife habitat, but are currently in a state that needs restoration or improvements. The areas may be targeted by WGFD to address Goal 2 in the SHP. If properly managed and addressed, the EHPA may provide a value similar to the CHPA. The WGFD provides examples of issues including: “*loss of aspen communities, habitat fragmentation, development, loss of connectivity, water quality effects, water quantity limitations, lack of fish passage, loss of fish to diversions, degraded habitat, etc.* (WGFD 2015)”

The entire Central Bear sub-basin and northern half of the Upper Bear sub-basin is designated an EHPA. This designation is associated with native trout species and the desire to maintain and reestablish populations through habitat conservation. Because these areas do not currently provide high value habitat, they are not discussed in great detail or included in the environmental model section. These areas are important to note as changes in water regimes may have a greater effect on the recovery and enhancement goals targeted within these areas.

#### **6.1.3.3 Crucial Stream Corridor**

WGFD developed this dataset to provide the location of critical stream corridors for statewide and regional use. Critical corridors were identified using WGFD professional judgement by considering uniqueness of the river corridor, species present, presence of and/or lack of migration barriers, degree of departure from historic conditions (some are presently functioning near their historic potential) and importance for providing connectivity between source and sink localities.

Over 50 miles of crucial stream corridors have been identified in the Basin, including portions of the Bear River and the entire Smiths Fork (Figure 6-1). The main stem of the Bear River in the southern Basin is not designated as a crucial stream.

#### **6.1.3.4 Key Nongame Wildlife Areas**

Key Nongame Wildlife Areas (KNWA) were identified by the WGFD as habitat that supports birds and mammals that are classified by WGFD as SGCN. These areas contain high densities of wildlife, high species richness, and unique habitat characteristics with low habitat fragmentation. Data provided by the WGFD for each KNWA includes a description of the area relative to uniqueness and a list of birds and mammals that occur in the area that are classified as SGCN.

The only KNWA in the Basin is the Bear River KNWA (Figure 6-1). The Bear River KNWA covers approximately 250,000 acres around the sub-basin divide area. Major stream corridors (Bear River) and the Cokeville Meadows NWR occur in the KNWA. The area also overlaps with aquatic crucial habitat. Twenty-one bird and 13 mammal species listed as SGCN are believed to exist in the Bear River KNWA. This includes significant concentrations of breeding long-billed curlews (*Numenius americanus*) and sandhill cranes. Additionally, the WGFD has classified this area as highly important habitat for trumpeter swans (*Cygnus buccinator*).

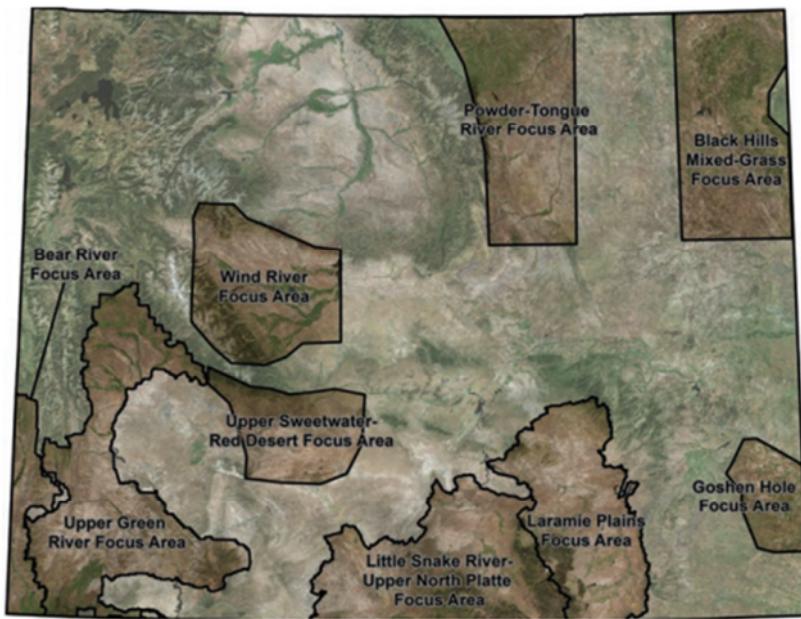
#### 6.1.4 Conservation Programs

A number of conservation programs and groups have been established in the Basin and include programs managed by Trout Unlimited (TU), Ducks Unlimited (DU), Wyoming Wildlife and Natural Resource Trust (WNRT), Partners for Fish and Wildlife (PFW), and the Wyoming Landscape Conservation Initiative (WLCI). These groups often team with one another and other state and local agencies to support research and restoration/enhancement projects, commonly associated with water resources. Projects may include construction of fish passage structures, wetland restoration, riparian habitat enhancements, removal of diversion structures, updating culverts and underpasses, grazing management near water sources, and prescribed burns, among numerous other projects that have occurred over multiple decades. Locations of projects managed by these conservation groups were not plotted on the environmental use maps or included in the model; however, they are presented to recognize the grassroots efforts that are ongoing in the Basin. These groups have been working in the region for decades and will continue to target projects with the goal of restoring, enhancing, and conserving habitat. Additional information on the individual groups and specific projects can be found on the respective websites.

These conservation programs and projects do not require a water demand. The programs' goal is to increase the health of habitats that often are associated with water, providing support for aquatic ecosystems. As such, the location of these projects can be used to identify areas where environmental practices have been implemented to increase the environmental function and values associated with water resources. Table 6-2 demonstrates the PFW accomplishments from 2012 – 2016 and the included photo identifies the focus areas, of which the Bear River Basin is included. Future project development should be cognizant of the efforts made to support environmental resources in the Basin.

**Table 6-2. Wyoming Partners for Fish and Wildlife Program – Bear River Focus Area 2015 Fiscal Year Report.**

Habitat Type	FY 2012-15 Accomplishments	FY 2015 Accomplishments	FY 2012-2016 Goal	% Five-year Goal Completed
Stream Enhancement (feet)	7,498	2,746	10,000	75.0
Riparian Enhancement (miles)	2	0.5	10	17.0
Wetland Restoration (acres)	978	1	500	195.0
Upland Enhancement (acres)	550	0	2,000	28.0
Fish Passage/screens (units)	5	2	8	63.0



Wyoming Partners for Fish and Wildlife Program – Focus Areas (USFWS 2017).

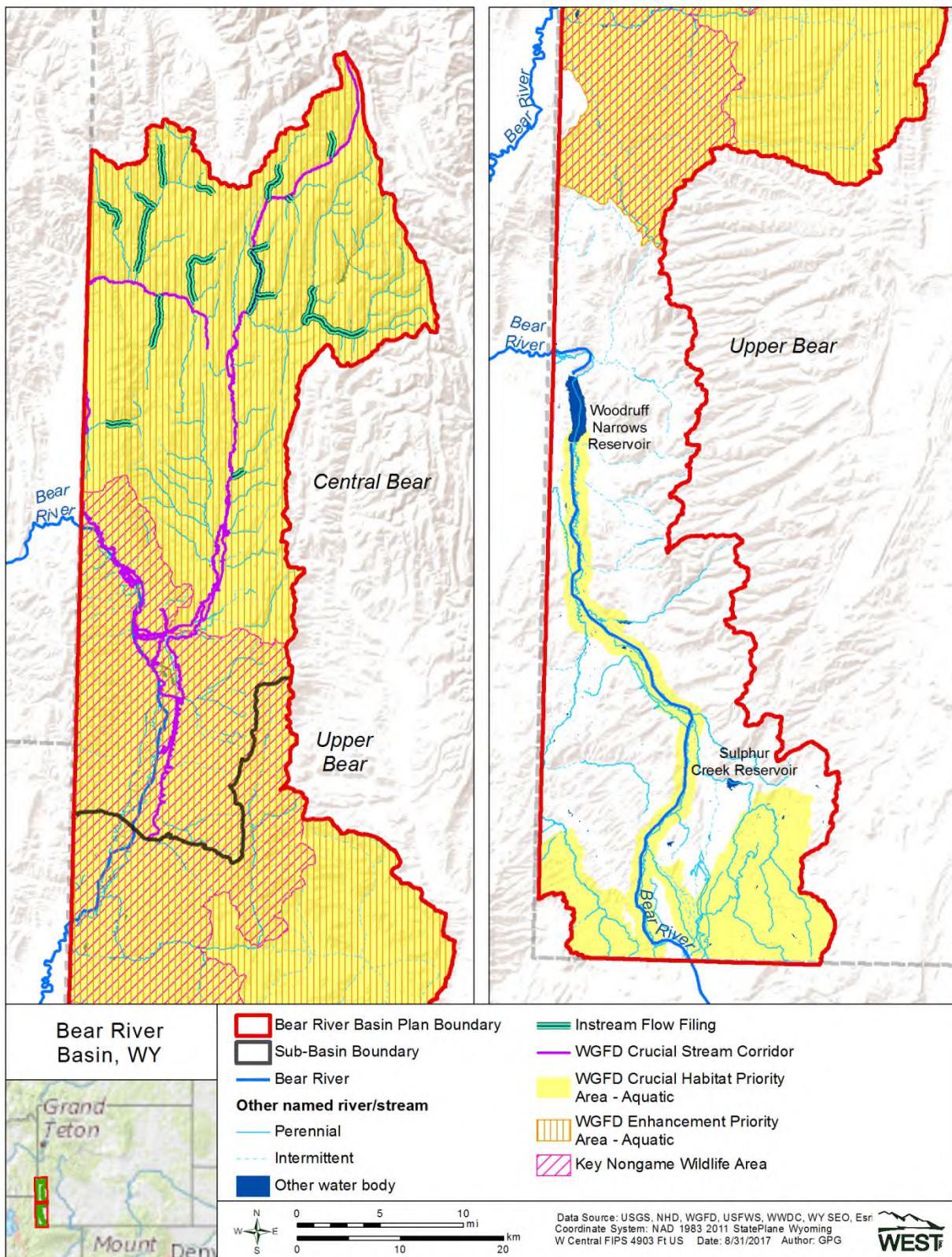


Figure 6-1. Bear River Basin – state environmental water use overview by sub-basin.

## 6.2 Federal - Environmental

This section discusses the environmental uses in the Basin that are provided oversight or are under the authority of the federal government. Federal government agencies include the USFWS, BLM, US Army Corps of Engineers, and USFS.

### 6.2.1 National Wildlife Refuges

The NWR system is “a national network of lands and waters for the conservation, management, and where appropriate restoration of fish, wildlife, and plant resources and their habitats within the United States for the benefit of the present and future generations of Americans” (National Wildlife Refuge System Improvement Act 1997) that is managed by the USFWS. The USFWS publishes Comprehensive Conservation Plans that outline conservation and wildlife management goals for each NWR. NWR are typically managed to protect habitat, water quality, and endangered species, but they are also often open to recreational opportunities such as hunting, camping, and wildlife viewing.

The Cokeville Meadows NWR was established in 1992, and is located on a 20-mile stretch of the Bear River, directly south of Cokeville, Wyoming in Lincoln County (Figure 6-2). While the approved acquisition boundary for the refuge encompasses 26,657 acres, less than 10,000 of those acres have been purchased or are protected through conservation easements as of August 2014; however, land acquisition is ongoing from willing sellers only. The refuge was identified as a top priority for conservation by the Inter-Mountain West Joint Venture because the refuge supports one of the highest densities of nesting waterfowl in Wyoming, the area is ideal for reintroducing trumpeter swans, and it provides habitat for greater sage grouse (*Centrocercus urophasianus*) and big game animals such as mule deer, elk, and pronghorn (*Antilocapra americana*; IWJV 2013).

**Table 6-3. Federally threatened and endangered species with potential to occur in the Bear River Basin.**

Common Name	Scientific Name	USFWS Status	Habitat Requirements	Potential Water Use in River Basin
<b>Birds</b>				
yellow-billed cuckoo	<i>Coccyzus americanus</i>	Threatened <sup>1</sup>	Mature riparian forest with multiple vegetative structures	High - habitat is typically associated with river/stream systems
<b>Mammals</b>				
Canada lynx	<i>Lynx canadensis</i>	Threatened <sup>1</sup>	Mature forest in areas where snow cover is abundant Habitat generalist, but commonly associated with forested area around the greater Yellowstone area	Low – not commonly associated with water; does have critical habitat in river basin
grizzly bear North American wolverine	<i>Ursus arctos horribilis</i>	Threatened <sup>1</sup>		Moderate – may forage in rivers systems
	<i>Gulo gulo luscus</i>	Proposed Threatened <sup>2</sup>	Mature forest	Low – not associated with water

**Table 6-3. Federally threatened and endangered species with potential to occur in the Bear River Basin.**

Common Name	Scientific Name	USFWS Status	Habitat Requirements	Potential Water Use in River Basin
<b>Plants</b>				
whitebark pine	<i>Pinus albicaulis</i>	Candidate	Alpine forests	Low – not associated with water
Ute ladies'-tresses	<i>Spiranthes diluvialis</i>	Threatened <sup>1</sup>	Mesic areas near streams or other water sources; wetlands	Moderate – commonly associated with habitats where water is present

<sup>1</sup>USFWS 2017b<sup>2</sup>USFWS 2017c

## 6.2.2 USFWS Threatened and Endangered Species

The USFWS Information for Planning and Consultation (IPaC) report for the Basin identified one bird, three mammals, and two plants as threatened, endangered, or a candidate/proposed species under the Endangered Species Act (Table 6-3). While all species require some level of water to survive, certain species are more commonly associated with water as part of their suitable habitat or life cycles. These species are identified in Table 6-3 and discussed in more detail below.

The USFWS has designated critical habitat for the Canada lynx (*Lynx canadensis*) in the Basin. The critical habitat boundary follows the USFS boundary. The Canada lynx is generally found in dense boreal forests, especially where snowshoe hare densities are high, but it may also venture into open forests and rocky areas. A number of water resources are present in the critical habitat area including crucial stream corridors, instream flow filings, wetlands, and various streams and lakes. However, the Canada lynx does not rely on water sources for life stages beyond hydration. Any proposed water projects or changes in use in designated critical habitat areas should evaluate how they may reduce the availability of water for the Canada lynx or alter the forest cover.

Two species are commonly associated with riparian or other water-dependent habitats that may be affected by a change in water regimes. The Ute ladies'-tresses (*Spiranthes diluvialis*) is the only listed plant species associated with riparian and wetland habitat. This species is believed to have the potential to occur in floodplains at lower elevations in the Basin (USFWS 2016; USFWS 2017), but has never been detected during surveys in the Basin in Wyoming (Fertig et al. 2005, Heidel 2007). The yellow-billed cuckoo (*Coccyzus americanus*) is known to inhabit mature riparian communities where large deciduous forests with shrub understories exist (USFWS 2014). These areas provide suitable habitat for the species and should therefore be identified and evaluated whenever a water project or change in water regime is proposed that may affect potentially suitable habitat. The potential effect on yellow-billed cuckoos of changes to water regimes should be considered during planning stages.

All other species should be evaluated during planning for future projects; however, changes in water resources are less likely to directly affect these species and these species would be uncommon in areas supported by the Basin's water resources. The USFWS has developed

potential habitat layers for each individual species. These layers were not included on the environmental use maps, but were used to inform the environmental model and are provided in the supporting GIS files.

### *6.2.3 National Wetlands Inventory*

Wetlands and riparian areas are important ecologically in that they can improve water quality, store sediment, provide habitat, and maintain stream flows. Wetlands are significant environmental features, specifically related to the state's water management planning. Addressing impacts to water's regulated by the US Army Corps of Engineers (USACE) under the Clean Water Act (CWA) are commonly associated with water management planning across the state and in the Basin. Additionally, wetlands may provide a variety of recreation opportunities including hunting, fishing, and general passive and active recreation activities.

The USFWS National Wetlands Inventory (NWI) is publically available dataset that maps all potential wetland and waters resources. The dataset was updated in 2016 (USFWS 2016). The NWI categorizes wetlands by type following the Cowardin et al. 1979 classification system. Table 6-4 lists all wetland types and acres by sub-basin in the Basin. Wetland type is important as higher functional value is commonly associated with woody wetlands (e.g., palustrine shrub-scrub or palustrine forested) and projects that impact these wetland types may require a greater level of mitigation.

Over 50,000 acres of NWI are mapped in the Basin, of which over 32,000 acres occur in the Upper Bear sub-basin and just under 20,000 acres occur in the Central Bear sub-basin. Palustrine emergent wetlands are the most common wetland category with nearly 40,000 acres mapped in the Basin. Wetlands in the Basin occur primarily along waterways such as rivers/streams and open waterbodies. This is fairly typical of the Western Mountain, Valleys, and Coast region (US Army Corps of Engineers 2010). The two largest wetland complexes in the Basin occur along the Bear River. One wetland complex is located in the middle of the Basin in the Cokeville Meadows NWR. This area is a large river riparian corridor with meandering and braided channels. Agricultural activities are relatively common throughout the complex with pivot systems located along the wetland complex edge and other hay production occurs within the braided channel system. The second large wetland complex is located near the southern extent of the Basin. The Bear River and Sulphur Creek Reservoir occur within the complex.

### *6.2.4 BLM Areas of Critical Environmental Concern and NCLS Wilderness Study Area*

The BLM has identified sections of land in Wyoming as Areas of Critical Environmental Concern (ACEC). The ACEC are areas within the public land where special management attention is required to protect and prevent irreparable damage to important historical, cultural, or scenic values, fish and wildlife resources, or other natural systems or processes, or to protect human life and safety from natural hazards.

Only one ACEC exists in the Basin and covers approximately 12,650 acres (Figure 6-2). The Raymond Mountain ACEC is located in the northern Basin just east of the Wyoming – Idaho border. This site was designated to protect and preserve big game winter ranges and other

potentially sensitive wildlife habitats. Huff Creek (a tributary to Coal Creek and Salt Creek) traverses through the ACEC. The area supports cutthroat trout and has two waterways that have been recommended for inclusion in the National Wild and Scenic Rivers System: Huff Creek and Raymond Creek.

**Table 6-4. National Wetland Inventory acreage in the Bear River Basin by sub-basin.**

Sub-basin	Palustrine Emergent	Palustrine Shrub	Palustrine Forested	Pond	Lake	Riverine	Other	Total
Central Bear – Sub-basin	13,321	3,299	3	353	240	747	34	17,997
Upper Bear – Sub-basin	25,658	1,910	636	698	2,689	949	263	32,804
<b>Total</b>	<b>38,979</b>	<b>5,209</b>	<b>639</b>	<b>1,051</b>	<b>2,928</b>	<b>1,697</b>	<b>298</b>	<b>50,800</b>

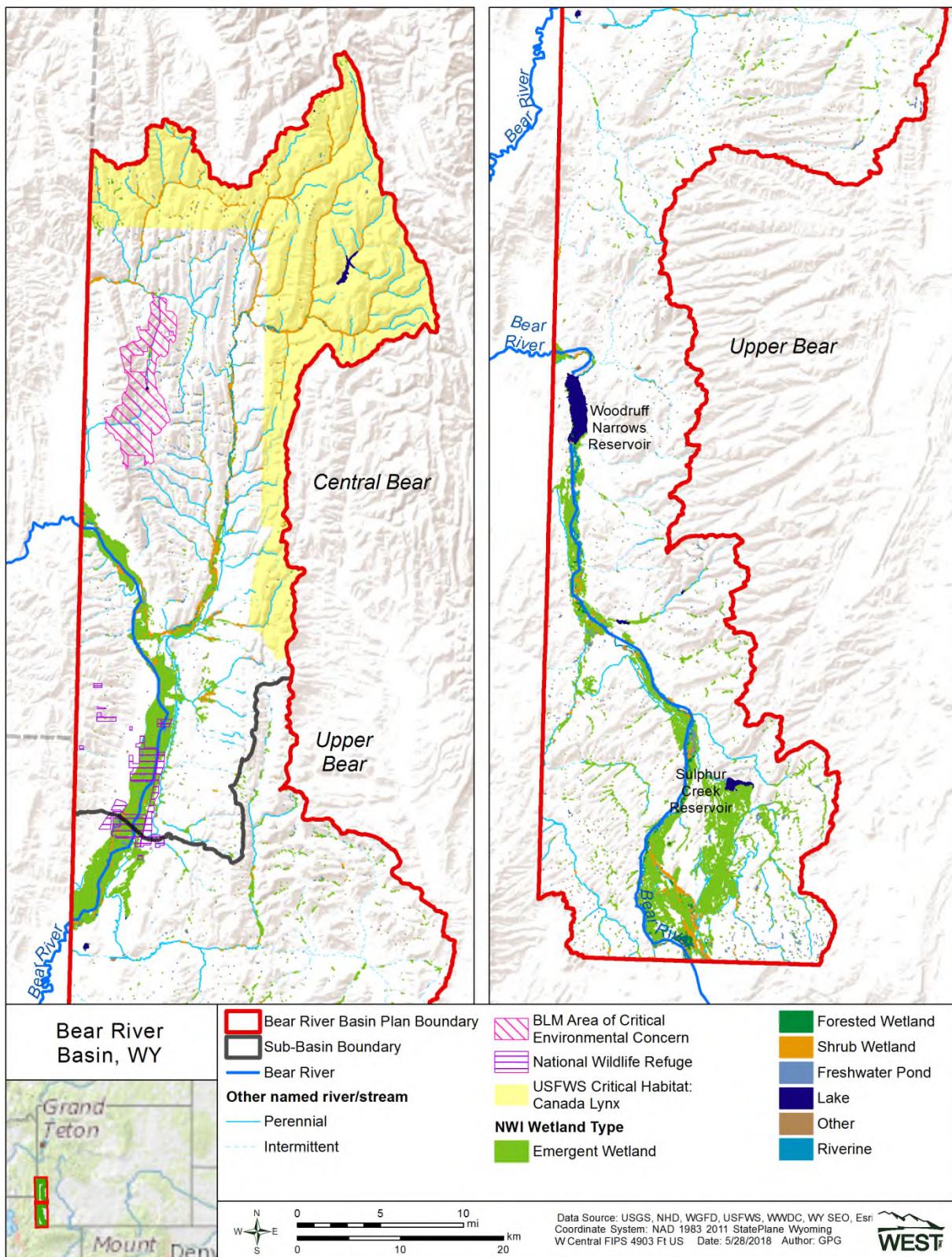


Figure 6-2. Bear River Basin – federal environmental water use overview by sub-basin.

## 7 RECREATION

There are many water-based recreation destinations throughout the Basin that are located on public land, including almost 120,000 acres of national forests, over 380,000 acres of BLM land, and over 8,000 acres of land that are managed by the NPS (Table 5-1). The State Land Board owns almost 70,000 acres (one section in each township) of land in the Basin that is held for the school trust fund, but these lands are not typically used for water-based recreation.

Many of the environmental uses discussed above also provide recreation uses. For example, crucial stream corridors and instream flow filing areas provide opportunities for fishing and whitewater rafting, while Cokeville Meadows NWR is managed for both recreation and environmental uses.

### 7.1 US National Forest

The Bridger-Teton National Forest covers most of the headwaters for Smiths Fork and Thomas Fork, the two largest tributaries to the Bear River that occur in the Wyoming Range in the northeastern part of the Central Bear sub-basin. These two tributaries and the segment of the Bear River that connects them provide some of the last known connected large river habitat for the BCT, which is a popular fish with anglers. Lake Alice is a large natural lake that occurs high up in the northeastern part of the Central Bear sub-basin within the boundary of the Bridger-Teton National Forest. Lake Alice is only available for day use and fishing, but the lake is home to the only known pure lake strain of naturally reproducing BCT, making it a high-value fishing destination.

### 7.2 Reservoirs, Lakes, and Parks

Two recreation reservoirs exist in the Basin - Sulphur Creek and Woodruff Narrows. These reservoirs provide the public with water-based recreation opportunities in the form of boating, fishing, swimming, rafting, jet skiing, wake boarding/waterskiing/tubing, camping, and other passive and active recreation opportunities. Each reservoir is discussed in more detail below.

#### 7.2.1 Sulphur Creek Reservoir

Sulphur Creek Reservoir is located approximately 10.3 miles from Evanston, Wyoming (Figure 7-1). This is a relatively small reservoir, but does provide basic facilities for day use and a boat ramp to access the reservoir. Sulphur Creek Reservoir has a variety of fish including smallmouth bass (*Micropterus dolomieu*) and other species.

#### 7.2.2 Woodruff Narrows

Woodruff Narrows Reservoir is located approximately 16.5 miles from Evanston, Wyoming (Figure 7-1). The reservoir is located along the main stem of the Bear River in the Upper Bear sub-basin. The reservoir provides recreation opportunities, specifically fishing with amenities to support visitors. Woodruff Narrows Reservoir has several species of fish including cutthroat trout and suckers. The reservoir is stocked by the WGFD.

### 7.2.3 Bear River State Park

Bear River State Park is a 300-acre park located on the eastern edge of Evanston that has opportunities for fishing, hiking, wildlife viewing, bicycling, skiing, and many other activities. The park is home to a small herd of captive bison (*Bison bison*) and elk kept for public viewing. There are three miles of foot trails within park limits that double as cross-country ski trails in the winter. The park is for day-use only, with no overnight camping allowed. Visitation at the Park has increased, with 2014 and 2015 visitation numbers greater than the reported five-year average (Table 7-1).

**Table 7-1. Bear River State Park visitation rates.**

Park	Five-year Average	2014 Visitation	2015 Visitation
Bear River State Park	224,948	261,540	266,646
Bear River Travel Center	150,916	190,611	199,123

Source: Wyoming State Parks, Historic Sites & Trails 2015 Visitor Use Program

### 7.3 Fishing

The WGFD has developed a stream classification system to rank Wyoming streams based on the pounds of sportfish per stream mile (Table 7-2). Blue ribbon streams are the highest stream rank, followed by red, yellow, green, orange, and clear. Detailed information on the stream classification system can be found in the previous basin plans or on the WGFD website.

**Table 7-2. WGFD Stream Fisheries Classifications**

Category	Percent of Stream Miles	Pounds of Sport Fish Per Mile
Blue Ribbon	3	≥600
Red Ribbon	6	≥300 and <600
Yellow Ribbon	28	≥50 and <300
Green Ribbon	63	≥1 and <50
Orange Ribbon	Unknown	Any cool/warm water game fish present

No blue ribbon fisheries are located in the Basin. One red ribbon fishery is located on Pine Creek and various yellow and green ribbon fisheries occur throughout the Basin (Figure 7-1). A large number of green and yellow fisheries are located in the Central Bear sub-basin, high in the watershed. These areas are located primarily on USFS or BLM managed lands. The two main river channels in the Basin are the Smiths Fork and Bear River. The Smiths Fork is a yellow ribbon fishery and the Bear River is a green ribbon fishery. The WGFD produced a fishing location guide file that identified five fishing opportunities. The WGFD also identified one walk-in fishing area along Sulphur Creek. The WGFD also notes that in most cases, anglers can access any public land for fishing including BLM, USFS, State Lands, among other public areas. Detailed information can be found on the WGFD website (<https://wgfd.wyo.gov/Fishing-and-Boating/Places-to-Fish-in-Wyoming>).

Updated angler data from the past 10 years was not available to support this report. A 2011 *National Survey of Fishing, Hunting, and Wildlife-Associated Recreation* report was reviewed; however, based on the limited sample size and presented standard error, this report was not deemed appropriate for the use in this report. Additional efforts were also made to obtain fishing

licenses purchase information and associate these data with fishing practices. These data were ultimately determined to be incomplete and potentially biased. Please reference the 2001 and 2010 plans for the most recent available data.

#### **7.4 Waterfowl Hunting**

The Basin occurs in the Pacific Flyway on the western side of the Continental Divide, and provides several areas for hunting ducks and geese. Between 2011 and 2015, waterfowl hunting in the Basin accounted for 3.8% of the total statewide duck harvest and 1.4% of the total statewide goose harvest (WGFD 2017; Tables 7-3 and 7-4). Cokeville Meadows NWR provides the largest contiguous hunting area in the Basin, but there are other hunting areas located along rivers and wetlands. Maintenance and improvement of existing wetlands and riparian areas, and establishment of new areas will help maintain and improve habitat for waterfowl. By 2030, waterfowl hunting in Wyoming is projected to grow as follows:

##### **2030 Low Scenario**

- Duck hunting approximately 18,050 hunting-days
- Goose hunting approximately 10,420 hunting-days

##### **2030 Moderate Scenario**

- Duck hunting approximately 39,010 hunting-days
- Goose hunting approximately 22,510 hunting-days

##### **2030 High Scenario**

- Duck hunting approximately 50,090 hunting-days
- Goose hunting approximately 28,910 hunting-days

The WGFD has divided the Basin into two waterfowl management areas: the Upper Bear River and the Lower Bear River. Both management areas attract similar numbers of hunters on average each year. In the Lower Bear River management area, between 2011 and 2015, there were an average of 92 duck hunters harvesting 3,593 ducks over 437 hunting days each year (Table 7-3), and an average of 94 goose hunters harvesting 1,199 geese over 315 hunting days each year (Table 7-4). In the Upper Bear River management area, between 2011 and 2015, there were an average of 130 duck hunters harvesting 4,996 ducks over 452 hunting days each year (Table 7-3), and an average of 84 goose hunters harvesting 618 geese over 288 hunting days each year (Table 7-4).

#### **7.5 Whitewater Rafting**

Whitewater rafting is not a major recreation activity in the Basin; however, there are two established river rafting stream segments between designated “put-in” and “take-out” locations (Figure 7-1) that cover over 20 miles along the Bear River in the Basin. One whitewater rafting segment occurs on the Bear River in the Central Bear River sub-basin, and the other occurs on the Bear River in the Upper Bear River sub-basin in Bear River State Park (Figure 7-1).

Whitewater rapids in the Basin range from beginner (Class I) to expert (Class V+) based on the International Scale of River Difficulty (American Whitewater 2009). Rapid classifications and recommended flows for whitewater segments located in the Basin vary considerably.

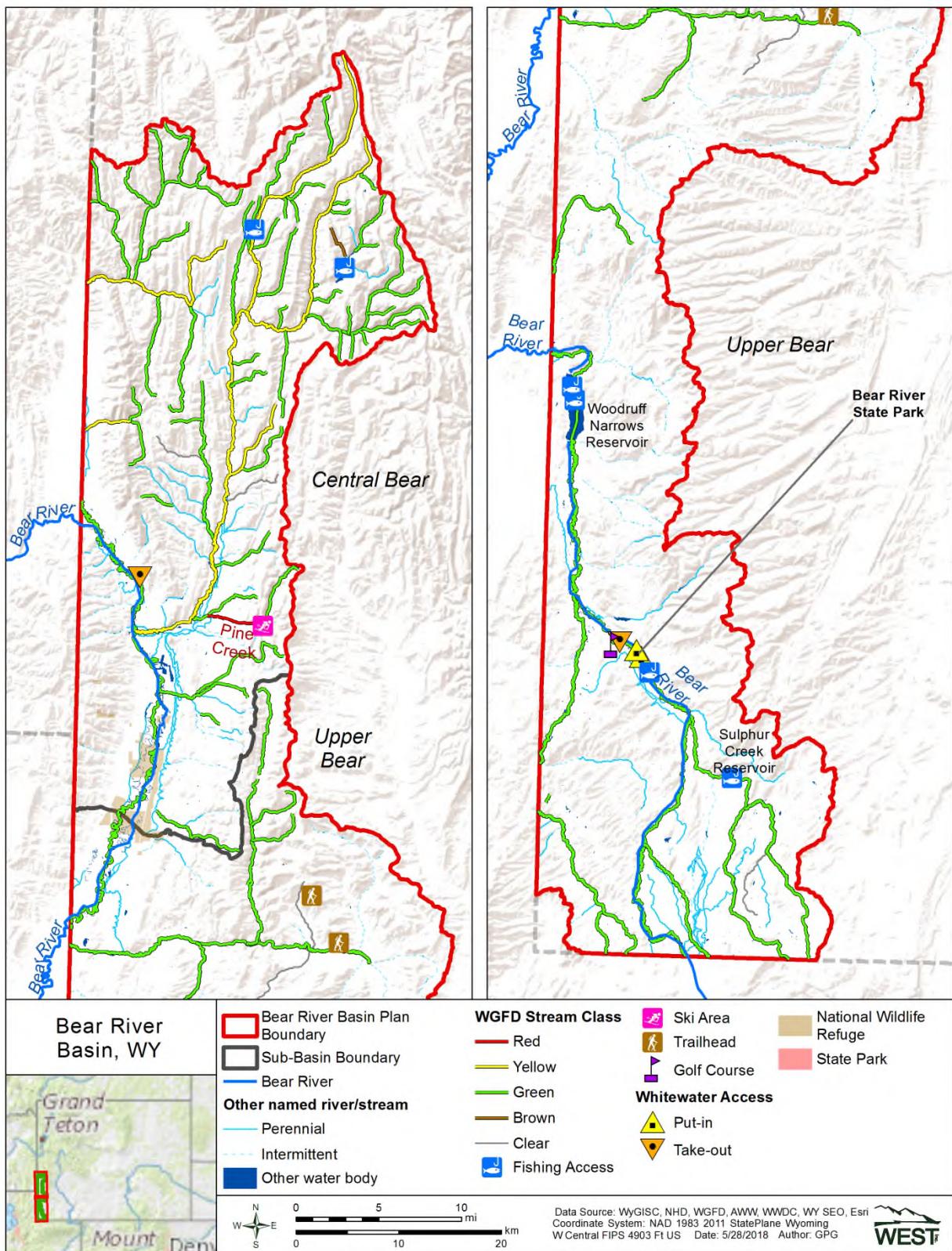


Figure 7-1. Bear River Basin – recreation water use overview by sub-basin.

**Table 7-3. Duck hunter and harvest data for the Bear River Basin from 2011-2015.**

<u>Management Area</u>	<u>Statistic</u>	<u>5-year Average (2011-15)</u>	<u>2011</u>	<u>2012</u>	<u>2013</u>	<u>2014</u>	<u>2015</u>	<u>WGDF Objective*</u>
Lower Bear River	# of Hunters	92	116	65	148	80	50	92
	# of Recreation Days							
	Harvest	437	533	323	718	473	140	437
	# of Hunters	3,593	1,031	529	1,085	628	320	3,593
Upper Bear River	# of Hunters	130	184	112	109	121	123	130
	# of Recreation Days							
	Harvest	452	697	365	335	530	334	452
	# of Hunters	4,996	1,451	1,182	717	828	818	4,996
<b>Total</b>		<b>2011-15</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	
Total Basin Harvest		8,589	2,482	1,711	1,802	1,456	1,138	
Total Statewide Harvest		228,116	47,387	50,233	53,296	30,456	46,744	
% of Statewide Harvest in Basin		3.8%	5.2%	3.4%	3.4%	4.8%	2.4%	

Source: WGFD 2017

Objectives source: Huck 2015

**Table 7-4. Goose hunter and harvest data for the Bear River Basin from 2011-2015.**

<u>Management Area</u>	<u>Statistic</u>	<u>5-year Average (2011-15)</u>	<u>2011</u>	<u>2012</u>	<u>2013</u>	<u>2014</u>	<u>2015</u>	<u>WGDF Objective*</u>
Lower Bear River	# of Hunters	94	129	72	152	81	37	94
	# of Recreation Days							
	Harvest	315	400	289	529	265	93	315
	# of Hunters	1,199	161	156	423	345	114	1,199
Upper Bear River	# of Hunters	84	98	67	83	132	40	84
	# of Recreation Days							
	Harvest	288	354	235	188	485	178	288
	# of Hunters	618	101	45	114	172	186	618
<b>Total</b>		<b>2011-15</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	
Total Basin Harvest		1,817	262	201	537	517	300	
Total Statewide Harvest		134,555	21,732	31,993	30,861	29,147	20,822	
% of Statewide Harvest in Basin		1.4%	1.2%	0.6%	1.7%	1.8%	1.4%	

Source: WGFD 2017

Objectives source: Huck 2015

## 7.6 Golf Courses

The Purple Sage Golf Course in Evanston is the only golf course in the Basin. The golf course uses municipal water for course irrigation, so its water use has already been accounted for in municipal water use estimates.

## 7.7 Ski Resorts

The Pine Creek Ski Resort located approximately seven miles northeast of Cokeville, Wyoming is the only ski hill in the Basin. The resort was unable to be contacted. A search on the Wyoming SEO ePermit website (<http://seoweb.wyo.gov/e-Permit/Common/Home.aspx>) was unable to identify any water rights for the facility; therefore, it is unclear what water use requirements the facility has and/or how water is allocated to the facility.

## 8 CATEGORIZATION OF USES

All of the potential E&R uses identified above were evaluated and categorized as protected, complementary, or competing. These uses were categorized based on the definition provided in the Handbook and additional discussion with the WWDC and Wyoming SEO. A number of factors were considered to categorize the E&R uses including location in the Basin, land use and ownership, and existing permits, among other factors. The location and magnitude of diversions were specifically evaluated to determine the use categories. Categorization of uses included specific individual E&R activities and categorizations were assigned to larger geographic areas where multiple uses may occur.

Additional information is presented in the Model Development – Protection section (8.3.1) that can be used to support discussions on these categories. The protection model demonstrates a relative scale of protection based on a number of identified factors.

### 8.1 Diversions in the Basin

Prior to evaluating and categorizing E&R uses, water diversions within in the Basin were identified and plotted to support categorization discussions. Diversion data included the priority date, location, and magnitude. Figure 8-1 depicts the numerous permitted diversions located throughout the Basin. These were consolidated based on the previous Basin plan efforts to facilitate a consistent and more focused approach. The over 200 diversions that occur in the Basin were consolidated to 36 locations (Figure 8-1). The *Bear River Basin Plan Update* (2012) and *Technical Memorandum – Diversion Summary Tab II* (2011) contain detailed information on the water use and diversions in the Basin and should be referenced as appropriate to inform this discussion.

Most water in the Basin is regulated by the Bear River Compact and many of the diversion points occur along the Bear River. Based on the information presented in the *Technical Memorandum – Diversion Summary Tab II* (2011), major aggregate water diversion points occur where the Bear River enters Wyoming from Utah and Idaho and where the Bear River exits Wyoming to Utah and Idaho, though actual water diversions occur throughout the basin along the Bear River and associated tributaries. The Bear Canal Diversion (near the southern Wyoming – northern Utah border) alone provides senior water rights for nearly 1,500 cfs (individual diversion range from 2 – 74 cfs) when combining the existing diversion permits.

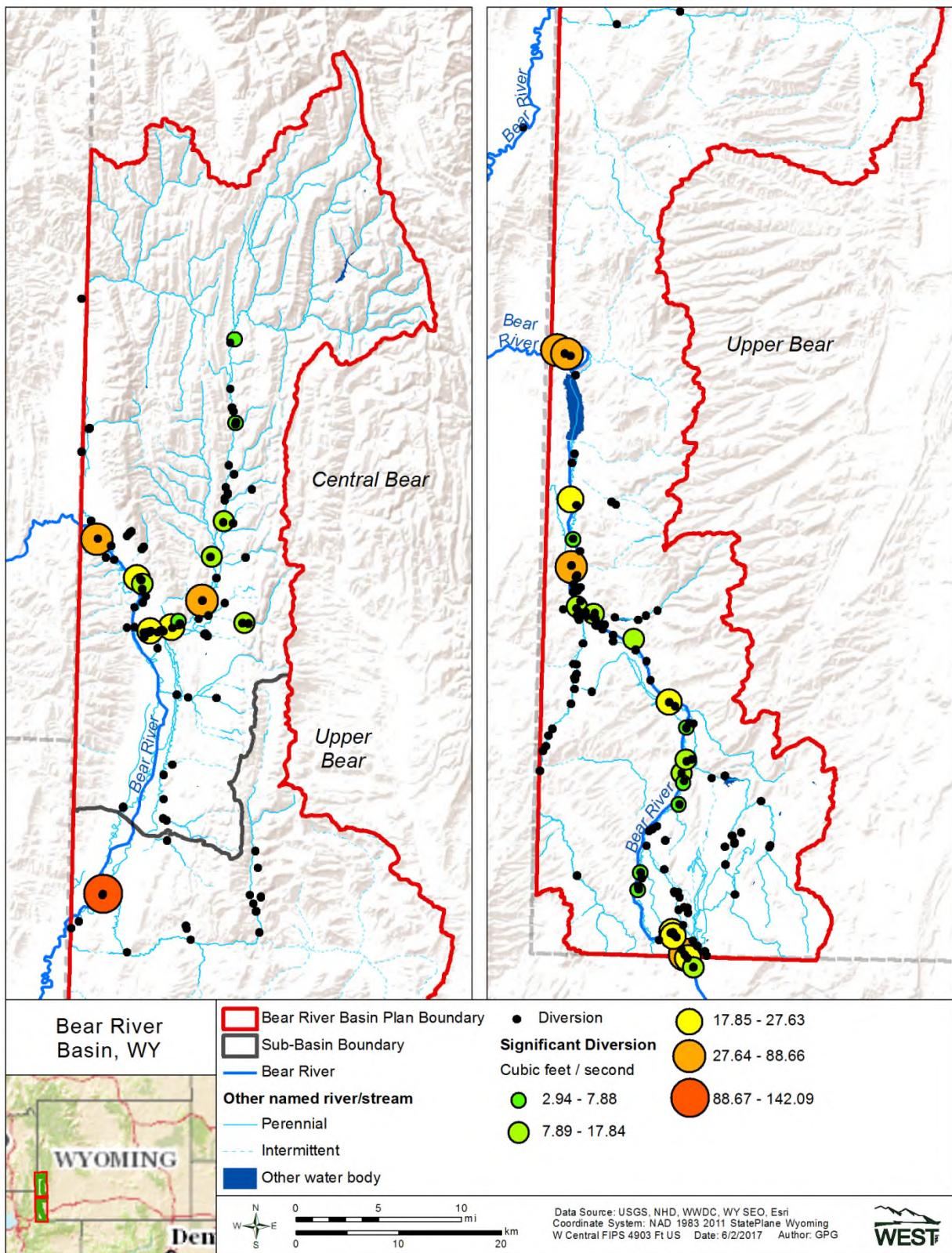


Figure 8-1. Bear River Basin – diversion locations and magnitude.

## 8.2 Categorization of Environmental and Recreational Uses

In most cases, E&R uses were assigned a complementary use, unless specific protection or competing factor was evident. The assumption that all water uses could be altered in the future based on new water management and development projects was applied to these categories. There were only a handful of situations where protection was clear, typically where an existing permit or specialty land use (e.g., wilderness area) exists.

Protected E&R water uses in the Basin exist along the permitted instream flow sections (see Table 6-1). These areas are primarily located on USFS managed land, which provides an additional layer of protection. E&R uses in the Cokeville Meadows NWR should also be considered protected as this is an area owned by the USFWS and designated specifically for E&R uses. Additionally, the Cokeville Meadows NWR water uses are supported by water rights and are therefore protected. This is a unique situation where divertible agricultural irrigation water rights support the E&R uses in the Cokeville Meadows NWR. Other current E&R uses may be considered complementary due to their location in the Basin; however, they are currently protected. All E&R uses along Salt Creek from the Idaho – Wyoming border upstream to the headwaters, all uses upstream from the confluence of the Smiths Fork and Dry Smiths Fork, and all uses above the Muddy Creek and Smiths Fork confluence are currently protected due to the location high in the watershed and lack of existing diversions; however, all are assigned a complementary status based on the defined criteria. If new diversions or water storage were proposed in the future, these areas may no longer be protected.

All other E&R water uses across the Basin are assumed to be complementary. This is based on the assumption that current water conditions will continue in a similar regime to historic water use. A number of large permitted diversions with senior water rights exist throughout the Basin (Figure 8-1). These diversions have the ability to affect E&R use if modification were to occur. The goal of this document is not to speculate; therefore, no competing categorizations were assigned. If major changes were to occur, these could become competing with E&R uses. The B-Q Dam diversions near Pixley Dam are an example of potential changes in water management techniques that may influence E&R uses and highlight the difficulty in assigning a single category to E&R uses. The *Technical Memorandum – Diversion Summary Tab II* specifically states that “irrigators typically pull the dam about July 10<sup>th</sup> to dry up meadows” (Tavelli 2011). A change in these types of water management activities could affect E&R uses across the Basin.

The Purple Sage Golf Course in Evanston is the only golf course in the Basin. The golf course uses municipal water for course irrigation (i.e., divertible), so its water use is protected.

## 8.3 Model Development

The development of protection and use models was first investigated by the WWDC and implemented on the Snake and Salt River Basin Plan Update (Pavlica 2013). The model development was prompted as a way to reevaluate the methods presented in the Handbook (Harvey Economics 2012). The Handbook outlined a consistent method to identify E&R uses, as

detailed in the methods section. However, implementation of the methods on full basins has identified two key factors that require further and potentially new evaluation methods: 1) the large volume of data demonstrating E&R uses across the individual basins can be overwhelming to the evaluators and readers, and 2) the categorization of uses can be complicated by potential future changes in water regimes, as well as separating out the current relationships among E&R uses, land ownership requirements, divertible and non-divertible uses, climate effects, and water demands/diversions. These factors are often so intermingled a person may make a reasonable argument to categorize a use under more than one category; this can become a slippery slope that does not answer the key questions or meet the goals and objectives of basin planning.

To that end, the model approach has been developed and implemented to address the key questions and goals as listed below:

- 1) Where do the E&R uses exist and at what magnitude are they present across the Basin?
- 2) What protection is in place for the E&R uses and at what scale are the protections present across the Basin?
- 3) What E&R uses and locations may be most affected by changes in future water management and planning?

Ultimately, these models can be used in conjunction with the E&R use information presented above and water uses detailed in the individual Basin Plans. These models demonstrate the relative scales, but it is still important to recognize the individual E&R uses and how they may affect or be affected by a change in water management.

#### *8.3.1 Protection Model*

The protection model was developed to demonstrate the institutional protection provided to stream segments in the Basin and subsequent support of E&R uses. This model may be used to identify the level of effort required to obtain a permit or make changes to the surrounding landscape.

Two primary factors were considered to inform the protection model: 1) Land ownership, and 2) Individual factors. Land ownership is often a driving component related to the inherent protection of waters (Table 8-1). Scores for land ownership protection were informed based on the answers to five questions listed below and a general understanding as to the process each landowner/manager undergoes to evaluate projects and manage resources (Table 8-1).

- Is water development allowed?
- Do proposed actions trigger National Environmental Protection Act compliance?
- Is water development a land manager objective?
- Are lands managed for environmental uses?
- Are lands managed for recreational uses?

**Table 8-1. Land ownership – management scores and justification used to inform the protection model.**

Land Ownership	Score	Justification
State Park	4	Protected: State application process.
National Forest Service	5	Protected: Each national forest has its own land and resource management plan with defined goals and objectives; NEPA required.
National Park Service	5	Protected: All parks "tier" to the system plan; however, there are individual Park Management Plans that have specific goals and objectives for each park; NEPA required.
Bureau of Land Management	4	Each field office has its own Resource Management Plan that identifies goals and objectives for a specific management unit; NEPA required.
Bureau of Indian Affairs	3	Bureau of Indian Affairs has its own environmental management system and review process (Environmental Management Assessment and Performance Program), but they also must comply with the National Environmental Policy Act by showing alternatives and impacts were considered in water development projects.
Bureau of Reclamation	3	Bureau of Reclamation either develops a Resource Management Plan for a specific management unit or they partner and relinquish management to state land management agencies. Water management clear BOR goal.
US Fish and Wildlife Service	5	Protected land; National Wildlife Refuges are required to have a Comprehensive Conservation Plan that outlines management objectives to protect the environmental and recreational integrity of the National Wildlife Refuge. Development not typically allowed.
Wyoming Game and Fish	5	Protected land; Wildlife Habitat Management Areas are managed for wildlife and hunting/fishing. Development not typically allowed.
The Nature Conservancy	5	Protected land; The Nature Conservancy drafts different management plans tailored to specific environmental/land use objectives. Development not typically allowed.
Department of Defense	5	If a federal action, requires NEPA compliance. Specific management goals/objectives.
Other	2	Level of protection based on specific owner.
State Department of Natural Resources	5	Assigned consistent with the Wyoming Game and Fish.
County	2	Varies, most have conditional use permit requirement; no NEPA.
State land	2	No NEPA evaluation is required. Limited management planning.
Private	0	No evaluation required.

Other factors used to inform the protection model were the presence of wilderness areas, instream flows, critical habitat, Wild and Scenic Rivers, and NWI wetlands. These factors were selected for inclusion in the model due to the existing permits that regulate a change in water use (e.g., instream flows) or because they are protected by laws or acts and/or require additional analysis or permitting to allow a change in water use (e.g., jurisdictional wetlands are protected and require permits to impact under the CWA). In most cases, these factors were scored as present or absent, either receiving the full score or no score at all. Wild and Scenic Rivers and NWI wetlands were treated slightly different, as a different value is associated with the sub-categories of these datasets. The presence of Wild and Scenic Rivers was provided as an example of a protected area in the Snake and Salt River Plan. Presence of NWI wetlands is

also an example as wetlands are categorized by habitat value and general rarity, which results in a different evaluation when considering impacts and required mitigation. Palustrine forested wetlands are less common and provide structural diversity that benefits wildlife. Conversely, palustrine emergent wetlands are more common and provide less functional value. Mitigation required to offset palustrine forested wetland impacts may range from 3:1 to 5:1, while impacts to palustrine emergent wetlands typically require mitigation ratios of 1:1 to 1.5:1. As such, NWI wetland categories were scored relative to their assumed functional value. The full list of factors, scores, and justification are provided in Table 8-2.

**Table 8-2. Factors used to inform the protection model.**

Factors	Presence/Category	Score	Justification for Inclusion
Wilderness Areas	Yes No	5 0	No construction allowed.
Instream Flow	Yes No	5 0	Flow protected by permit
Critical Habitat	Yes No	3 0	Protected under the Endangered Species Act
Wild and Scenic Recreation	Wild Scenic Recreation	5 4 3	Protection under the Wild and Scenic Rivers Act
National Wetlands Inventory	Forested Shrub Emergent Waters of US	3 2 1 1	Protected under the Clean Water Act

### 8.3.1.1 Central Bear – Protection

In general, the Central Bear sub-basin has a higher level of protection present along waters in the Basin (Figure 8-2). This is evident in upper reaches of the watersheds along the Smiths Fork, Mill Creek, and associated tributaries. The Bear River shows a moderate level of protection in areas located in the Cokeville Meadows. Less protection was defined along the tributaries to the Bear River near the Central – Upper sub-basin border. Based on the protection model output, land ownership and instream flow filings in the Central Bear sub-basin appear to be the driving factor affecting the range of protections.

### 8.3.1.2 Upper Bear – Protection

Nearly all of the waters in the Upper Bear sub-basin have a low level of protection (Figure 8-2). Small sections along Twin Creek and the Bear River north of Woodruff Narrows were defined as having moderate levels of protection. The low levels of protection evident in the sub-basin were driven by the lack of institutional protections and a high percentage of private land ownership.

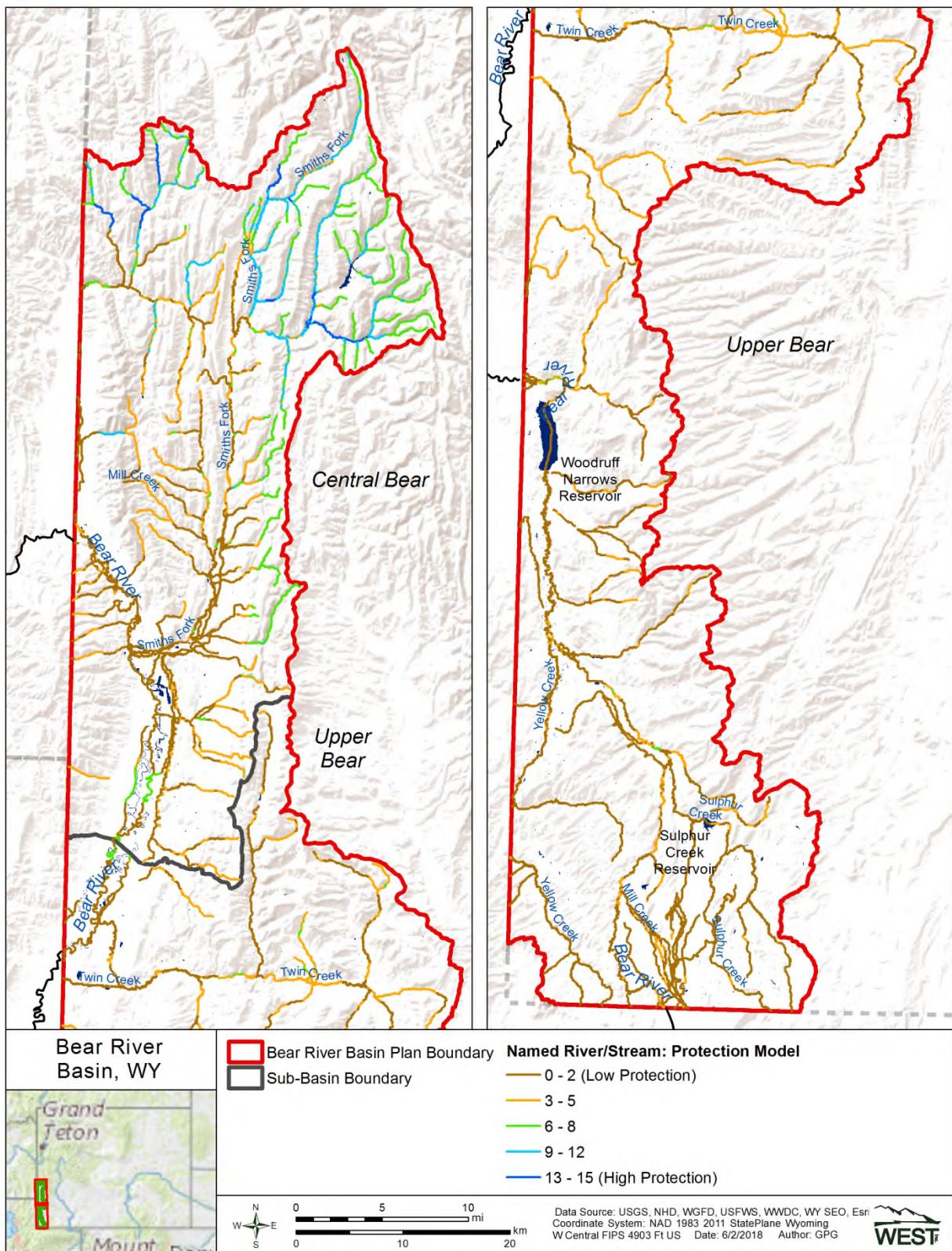


Figure 8-2. Bear River Basin – protection model results.

### *8.3.2 Environmental Model*

The goal of the environmental model is to identify the range of environmental uses present for specific water resources in the Basin. This model can be used in conjunction with the protection model to identify areas where high levels of environmental resources exist and associated levels of protection are provided. This can be used to focus on areas where a change in water management may have a greater effect on the environmental resources present.

Three categories were considered to inform the environmental model: 1) Land ownership; 2) state resources; and 3) federal resources (Table 8-3 and 8-4). These factors are consistent with the E&R use data presented in the results section. Land ownership is often a driving component related to the inherent environmental value present near Basin waters. Land ownership may affect environmental components in a number of ways. Many of the major land owners have formalized resource management plans to specifically address and manage environmental resources. For example, the USFS and BLM have formalized plans identifying natural resource locations and a plan to manage these resources in line with other agency objectives. Other state agencies have developed strategic action plans to support management of environmental resources. The WGFD is an example where the state agency does not own the land, but has identified areas to focus and strategize management activities. Scoring for land ownership was assigned in this manner. Scores for land ownership environmental resources were informed based on the answers to three questions listed below and a general understanding as to the process each landowner/manager undergoes to evaluate projects and manage environmental resources (Table 8-3). These scores may be different from the protection model land ownership scores due to the methods used to evaluate the landowner relative to environmental resources.

- Does the landowner have a formalized resource management plan (RMP)?
- If yes, where do environmental resources fit in the overall objectives of the RMP?
- Is NEPA compliance (or another evaluation that includes environmental resources) required to authorize projects that may impact environmental resources?

**Table 8-3. Land ownership – management scores and justification used to inform the environmental model.**

Landowner-Manager	Scores	Justification for Score
State Park	3	Has a comprehensive recreation plan that includes environmental resources, but more focus on recreation resources.
National Forest	5	Detailed Resource Management Plan (RMP) with Environmental Impact Statement (EIS) requirements for changes; heavy focus on environmental resources.
National Park	5	Detailed RMP with EIS requirements for changes; heavy focus on environmental resources.
Bureau of Land Management	4	Detailed RMP with EIS requirements for changes; primary objectives focused on promoting mixed land use of which environment is considered.
Bureau of Indian Affairs	3	Has an Irrigation RMP which includes small environmental sections.
State land	3	No clear environmental RMP. Focus on agriculture and commercial uses.
Private	0	Highly dependent on individual owner, no requirements.
Bureau of Reclamation	2	Follows standard laws/acts/regulations but does not have a clear RMP; either develops a RMP for a specific management unit or they partner and relinquish management to state land management agencies.
State Fish and Wildlife	5	Has clear SHP/SWAP, but in many cases does not own the land it is targeting (in this case it does own the land).
US Fish and Wildlife Service	5	Primary objective is to conserve, enhance, restore environment.
The Nature Conservancy	5	Primary objective is to conserve, enhance, restore environment.
Department of Defense	3	Has a natural resource program, but primary goal is to support military actions (natural habitat for training).
Other	0	Unknown; therefore no score provided.
State Department of Natural Resources	5	Assume these fall under Wyoming Game and Fish Department action plans.
County	2	Varies by county; most have a conditional use permit (or similar). Environment not a major focus.

State and federal environmental resources were also included to inform the environmental model. These include a variety of designated areas such as WGFD priority habitats, USFWS NWR, USFWS threatened and endangered species habitat, and NWI wetlands, among others. This report relies on the state and federal agencies and other publically available data to identify the environmental uses. It is assumed that the state and federal agencies are familiar with the important environmental resources and have targeted areas in the Basin that should be recognized. Similar to the protection model scheme, most of these uses were scored as present or absent, either receiving the full score or no score at all. Exceptions were made to resources that included multiple categories (e.g., NWI wetlands and WGFD priority habitats). The full list of factors, scores, and justification are provided in Table 8-4.

**Table 8-4. State and federal resources used to inform the environmental model.**

Resource	Presence/ Category	Score	Justification for Score
<b>State</b>			
Wyoming Game and Fish Department (WGFD) Priority Areas	Crucial Stream	2	WGFD identifies these as specific environmental features, but they are not formally recognized in the State Wildlife Action Plan or Strategic Habitat Plan or tied to clear management objectives. Additionally, WGFD does not own the land where these features exist.
	Crucial Aquatic	4	WGFD identified features with specific management strategies as Goal 1; however, WGFD does not own the land where these features exist.
	Crucial Combined	4	WGFD identified features with specific management strategies; however, WGFD does not own the land where these features exist.
	Nongame	3	WGFD identified features with specific management strategies, does not necessarily target water resources; WGFD does not own the land where these features exist.
Instream Flow Filing	Yes	5	State permitted features with the goal of maintaining/conserving environmental factors (i.e., fisheries).
<b>Federal</b>			
National Wildlife Refuge	Yes	5	US Fish and Wildlife Service (USFWS) owned and managed lands specifically for the environment.
	No	0	
Wild and Scenic	Wild	5	Rare features identified specifically for the environmental properties; highest level of Wild and Scenic.
	Scenic	4	Rare features identified specifically for the environmental properties; second tier Wild and Scenic.
Wilderness Areas	Yes	5	Areas provided the highest level of conservation protection.
USFWS Threatened and Endangered	Species habitat (individual)	1	Areas identified by the USFWS as having the potential for individual listed species.
	No species habitat	0	
Critical habitat	Yes	5	USFWS designated areas that are essential to the conservation of individual species.
National Wetlands Inventory	Forested Shrub Emergent Waters of the US	5	Features identified specially for the regular presence of hydrology. These features provide demonstrable value to the environment. Forest wetlands are the least common and often require a greater level of mitigation due to the values they provide.
		3	Same wetland definition...second tier value associated (relative to other wetland types).
		1	Same wetland definition...third tier value associated (relative to other wetland types), most common wetland type.
		2	Regulated under the Clean Water Act due to value provided to the environment.
Bureau of Land Management Critical Environmental Concern	Yes	2	Areas identified as needing additional management actions...not all are environmental related (e.g.; historic sites).
	No	0	

#### **8.3.2.1 Central Bear – Environmental**

In general, the Central Bear sub-basin demonstrated a higher level of environmental use when compared to the Upper Bear sub-basin (Figure 8-3). This is evident in upper reaches of the watersheds along the Smiths Fork, Bear River, and associated tributaries. Only small segments of Coal Creek, Muddy Creek, and the associated tributary system were scored as having moderate-low environmental use. High environmental use scores were driven by the critical habitat in the northeast sections of the sub-basin and Cokeville Meadows NWR along the Bear River.

#### **8.3.2.2 Upper Bear – Environmental**

Nearly all of the waters in the Upper Bear sub-basin demonstrate a moderate-low level of environmental uses (Figure 8-3). Sections along Twin Creek and the Bridger and Spring Creeks region were scored as having moderate levels of environmental use. The low level of environmental uses evident in the sub-basin is not surprising given the lack of environmental features identified. Land ownership and NWI wetlands were the only factors scored in this sub-basin; however, many of the mapped wetlands occur beyond the evaluation area (i.e., 0.25 miles stream buffer).

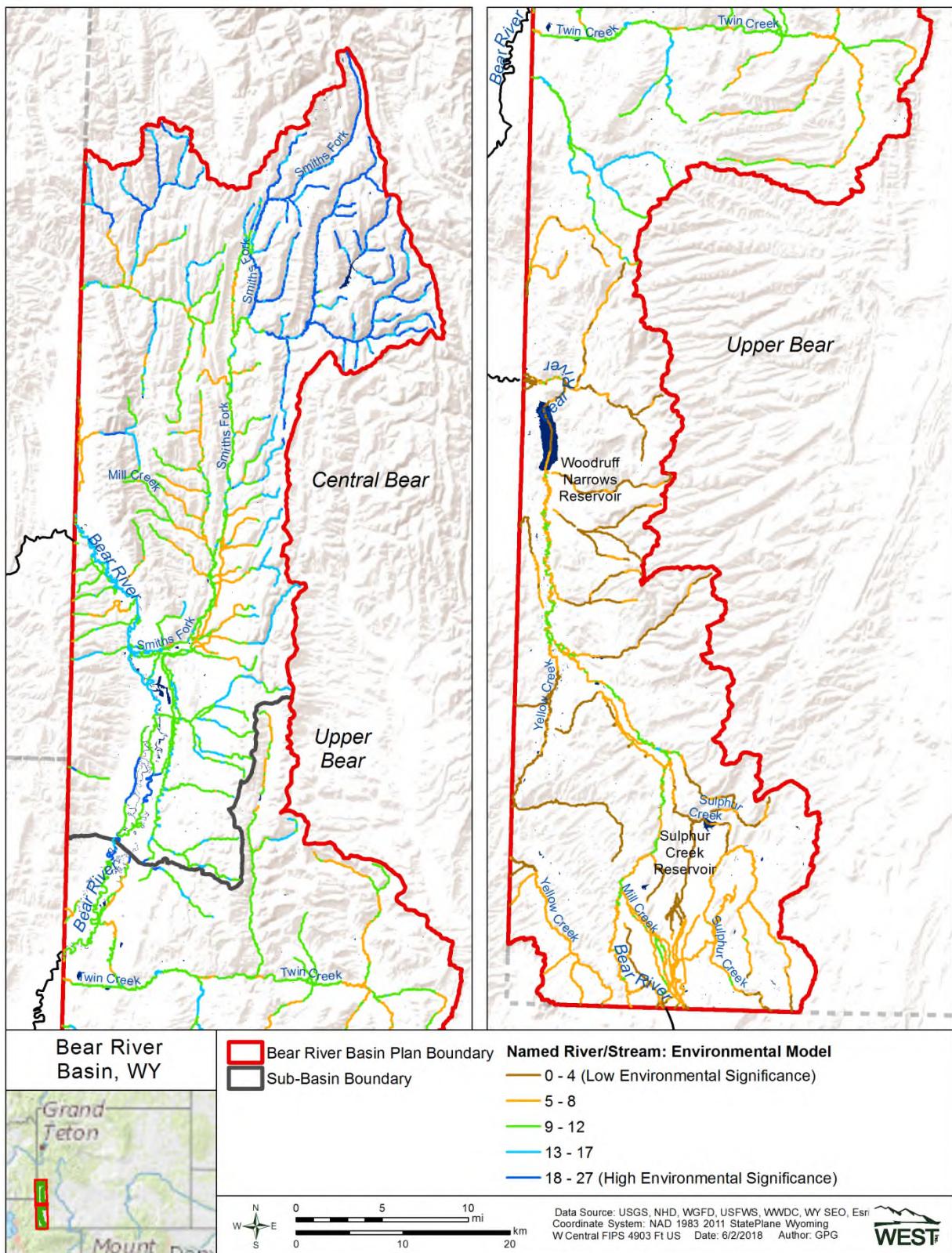


Figure 8-3. Bear River Basin – environmental model results.

### 8.3.3 Recreation Model

The goal of the recreational model is to identify the range of recreational uses present for specific water resources in the Basin. This model can be used in conjunction with the protection model to identify areas where high levels of recreational resources exist and associated levels of protection are provided. Future project planning can be focused to avoid areas where a change in water management may have a greater effect on the recreational resources present.

Two categories were considered to inform the recreation model: 1) Land ownership; and 2) Other factors. These categories are consistent the E&R use data presented in the results sections. Land ownership is often a driving component related to the inherent recreational value present near Basin waters. Land ownership may affect recreational opportunities in a number of ways. Many of the major land owners have formalized RMPs to specifically address, manage, and promote recreational opportunities. An example would be the State Parks Department and NPS. These entities have formalized plans identifying recreational resource locations and a plan to manage these resources in line with other agency objectives. Scores for land ownership recreational resources were informed based on the answers to the questions listed below and a general understanding as to the process each landowner/manager undergoes to evaluate projects and manage recreation resources. These scores may be different from the protection model land ownership scores due to the methods used to evaluate the landowner relative to recreation resources (Table 8-5).

- Is public access provided to the land and recreational resource?
- Is access to the land and recreational resource fee or permit based?
- Does the landowner have a formalized RMP?
- If yes, where do recreational resources fit in the overall objectives of the RMP?
- Is NEPA compliance (or another evaluation that includes recreation resources) required to authorize projects that may impact recreation resources?

**Table 8-5. Land ownership – management scores used to inform the recreation model.**

Landowner-Manager	Scores	Justification for Score
State Park	5	Has a comprehensive recreation plan that includes environmental resources, but more focus on recreation resources. Provides both open access and fee-based.
National Forest	5	Detailed Resource Management Plan (RMP) with Environmental Impact Statement (EIS) requirements for changes; heavy focus on E&R resources; may be open access or fee-based.
National Park	5	Detailed RMP with EIS requirements for changes; heavy focus on E&R resources; typically fee-based access.
Bureau of Land Management	4	Detailed RMP with EIS requirements for changes; primary objectives focused on promoting mixed land use of which recreation is considered, but typically not the focus. Open access to public.
Bureau of Indian Affairs	2	Has an Irrigation RMP, but limited recreation based requirements. Does provide fee-based access to recreation uses.
State land	2	No clear environmental RMP. Focus on agriculture and commercial uses. Access varies based on location.
Private	0	Highly dependent on individual owner, no requirements.

**Table 8-5. Land ownership – management scores used to inform the recreation model.**

<b>Landowner-Manager</b>	<b>Scores</b>	<b>Justification for Score</b>
Bureau of Reclamation	2	Follows standard laws/acts/regulations but does not have a clear RMP; either develops a RMP for specific management units or they partner and relinquish management to state land management agencies. Application process for recreation activities.
State Fish and Wildlife	4	Has clear Strategic Habitat Plan/State Wildlife Action Plan, but in many cases does not own the land it is targeting (in this case it does own the land). Access varies based on location.
US Fish and Wildlife Service	4	Primary objective is to conserve, enhance, restore environment; recreation may not be primary object for land.
The Nature Conservancy	2	Primary objective is to conserve, enhance, restore environment. Public access for recreation is often not provided.
Department of Defense	1	Has a natural resource program, but primary goal is to support military actions (natural habitat for training); limited to no public access.
Other	2	Unknown; dependent on specific owner.
State Department of Natural Resources	4	Assume these fall under Wyoming Game and Fish Department action plans
County	2	Varies by county; most have a conditional use permit (or similar).

Other factors used to inform the recreation model were stream classification, whitewater rafting, and WGFD wildlife habitat management areas (Table 8-6). Stream classifications were scored on a sliding scale based on the value provided by the individual stream categories. This is consistent with the other models where factors included multiple categories.

**Table 8-6. Factors used to inform the recreational model.**

<b>Resources</b>	<b>Presence/Category</b>	<b>Score</b>	<b>Justification for Score</b>
Stream Classification	Blue	5	Wyoming Game and Fish Department (WGFD) Fisheries scoring specifically for sport fishing; highest level
	Red	4	Second level
	Yellow	3	Third level
	Green	2	Fourth level
	Orange	1	Fifth level
Whitewater Rafting Segment	Clear	0	No fisheries identified
	Yes	5	Provides opportunity for recreation activity
WGFD	No	0	
	Wildlife Habitat Management Area	5	Managed to provide recreational opportunities

Many other factors were presented in the results section of this report and may affect recreational value, but were not included in the model. This is primarily based on the type of data available. For example, waterfowl hunting is a major water-associated recreational activity across the Basin; however, a dataset was not readily available to support this evaluation.

Similarly, many of the recreation resources in the Basin are associated with land ownership. Cokeville Meadows NWR provides the public with a wide array of recreational opportunities, including fishing, hiking, boating, among numerous others. These individual factors were not investigated, but their presence and value were included in the model through the land ownership scoring.

#### **8.3.3.1 Central Bear – Recreation**

Recreation scores ranged from low to high across the Central Bear sub-basin (Figure 8-4). High recreation scores exist along a section of the Bear River (associated with Cokeville Meadows NWR). Moderate – high scores exist along segments of the Smiths Fork within the USFS property and the main stem connecting to the Bear River. Moderate recreation scores exist along the remainder of the upper watershed reaches, while low – moderate scores are associated with streams in the lower watershed, specifically the main stem of the Smith's Fork.

#### **8.3.3.2 Upper Bear – Recreation**

Recreation scores ranged from low to moderate in the Upper Bear sub-basin (Figure 8-4). Water resources in the southern sub-basin are primarily low and low-moderate due to a dominance of private ownership and lack of recreation opportunities. The Bear River below Woodruff Narrows Reservoir scored moderate due to rafting and fishing opportunities, while sections of Twin Creek scored moderate due to open public access associated with BLM ownership. In general, less recreation opportunities are apparent in the Upper Bear sub-basin based on the recreation model results.

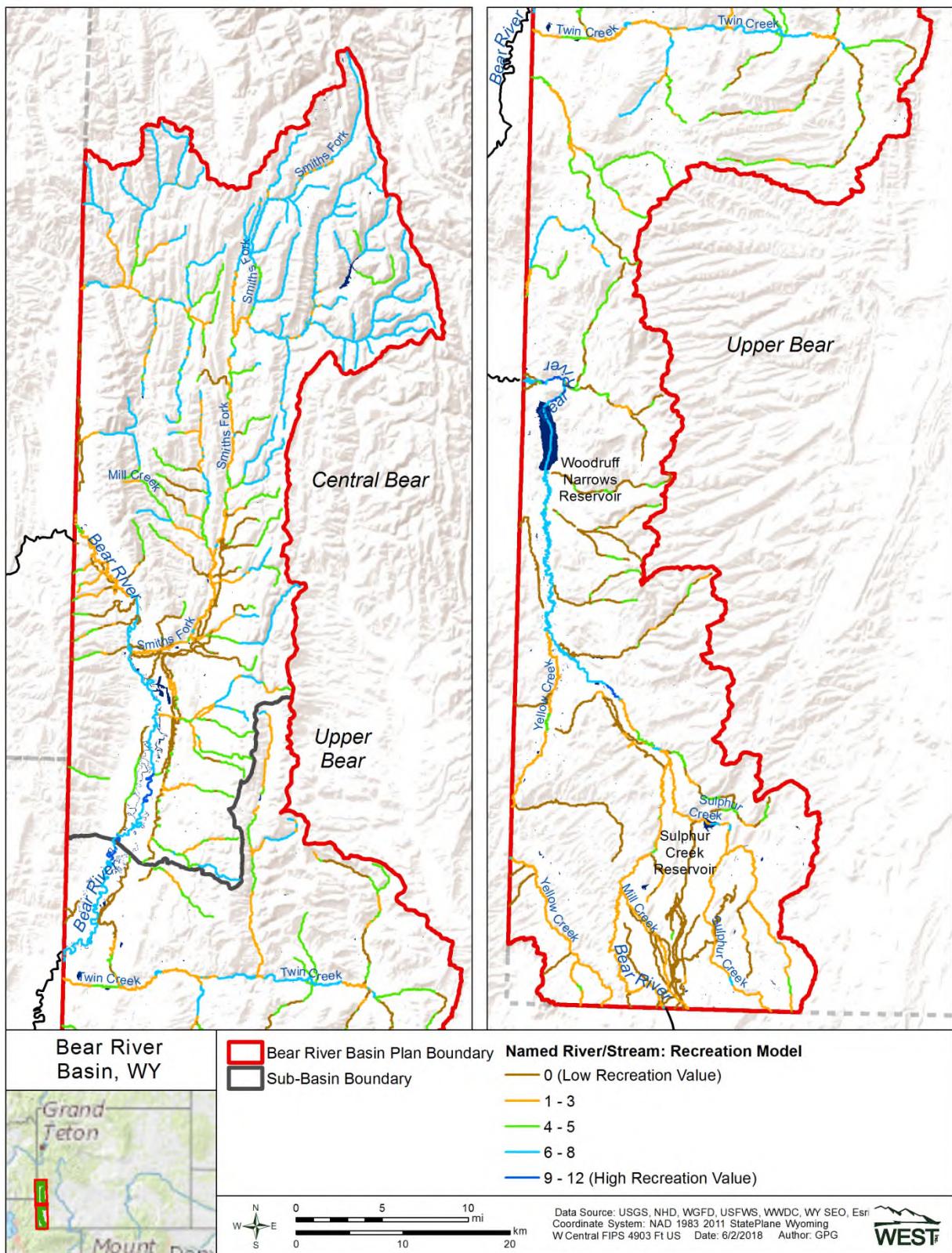


Figure 8-4. Bear River Basin – recreation model results.

## **9 MODEL SUMMARY**

The model results demonstrate a clear difference in protection, environmental uses, and recreation uses between the Central Bear and Upper Bear sub-basins. High scores were calculated in the Central Bear sub-basin for all three models. Land ownership and location in the watershed appear to be the driving factor for protection scores with more public land and federal agency oversight in the Central Bear sub-basin and more private land in the Upper Bear sub-basin. Additionally, environmental use scores were lower in the Upper Bear sub-basin due to a lack of WGFD designated priority areas. Recreation scores were higher in the upper watershed on USFS land and along the Bear River. The Bear River is a focal point for recreation within the Basin due to the size of the features and the location of Bear River State Park and Cokeville Meadows NWR.

## **10 DISCUSSION**

The WWDC developed a river basin planning framework as a consistent method to evaluate existing water resources and support existing and future water use planning. Environmental and recreation water uses were included in the initial basin planning framework, but were not fully addressed due to the non-consumptive nature of the uses. To that end, The Handbook (Harvey Economics 2012) was developed and laid out a process to identify, map, categorize, and assimilate E&R use data. WEST followed the Handbook guidance and developed new methods to further evaluate the E&R use data for the Basin.

The Bear River Basin is located in southwest Wyoming and includes two sub-basins. The waters of the Bear River are divided among users according to the framework established by the Bear River Compact (1958) and the Amended Bear River Compact (1980). Agriculture is by far the highest consumptive water source in the Basin. The 2010 Plan projects limited increase in consumptive water use demands into the future. Additionally, the plan demonstrates that water may be available during non-irrigation months (October – April). This is supported by an evaluation that shows the water leaving the state is greater than what is required under the Compact (WWDO 2010). The availability of water in the Basin suggests that the E&R uses are currently supported and should remain intact. However, the potential lack of water during what is typically the growing season (WWDO 2010) should be considered during new project planning, as it may affect both E&R uses.

To assist planning future projects, WEST gathered E&R use data and prepared models to highlight E&R use across the Basin. Two distinct areas demonstrated higher E&R uses when compared with the remainder of the Basin. The northern Basin (Central Bear sub-basin) demonstrated the most E&R uses. This area supports a variety of environmental uses including instream flow filings, wetlands, USFWS T&E habitat, and number of WGFD designated priority habitats. This area is the headwaters for the Smiths Fork. The second distinct area with high E&R uses is the stretch of Bear River between the entry and exit from Idaho. This area is the Cokeville Meadows NWR which provides high E&R uses.

In addition to the E&R use models, WEST prepared a protection model to identify areas where E&R uses may be more at risk to impacts from future project planning. The protection scores were fairly consistent with the E&R use scores, with waters high in the watershed and within the NWR having greater assumed protection. Based on the protection scores and evaluation against the E&R uses scores, no area was specifically identified to focus on in future project planning. It is clear from all models, that the Upper Bear sub-basin does not currently support high levels of E&R use. This may be partially a result of the limited protection provided to this region. Future projects should continue to evaluate the affect a change in water regime may have to this area. The WGFD has designated priority habitat in this area in an effort to manage the environmental resources that remain.

Water use and availability in the Basin appears highly dependent on season (WWDO 2010). The potential shortages from May – August could have a long-term effect on the E&R uses if future project planning and water management further reduced water availability. This is especially important when considering future recreation uses. The Wyoming Office of Tourism 2016 Visitor Profile reported an increase in visitation to Southwest Wyoming from 2014 (19%) to 2016 (24%). This is supported by the increased visitation reported at the Bear River State Park (Table 7-1). While significant increases to environmental uses and recreation uses are not assumed, water planning should continue to ensure adequate water is available to support the current environmental and recreation uses, specifically uses associated with tourism.

While not specifically discussed in the report, economics is a factor that can be used to further evaluate environmental and recreational water uses in Wyoming and the Bear River Basin. A brief literature review was conducted on economics and is presented below. This information was limited to Wyoming, with basin specific information presented as available. The information can be used to highlight benefits a community may receive from environmental and recreational water use opportunities.

Based on the most recent USFWS survey data for Wyoming (USFWS 2011), 775,000 people fished, hunted or watched wildlife in Wyoming. This includes 303,000 people who fished, 140,000 who hunted, and 518,000 who watched wildlife. In 2011, \$1.1 billion was spent on wildlife recreation in Wyoming, including \$874 million on trip-related expenditures and \$181 million on equipment expenditures. An additional \$82 million was spent on licenses, contributions, land ownership and leasing and other items.

Another more recent analysis from the University of Wyoming showed that hunting, fishing and wildlife viewing activities had a significant impact on the state's economy in 2016. This analysis estimated that hunters, anglers and wildlife watchers spent an estimated \$788 million in Wyoming, with the total economic importance up to \$1 billion in business activity. The 2016 data showed that wildlife-related activities accounted for an estimated 9,600 jobs in Wyoming, with a total labor income of \$262 million. This included jobs directly connected to wildlife as well as those in the service and hospitality industries. Based on the analysis it was estimated that hunters spent \$206 million, anglers spent \$186 million, and wildlife watchers spent \$365 million in Wyoming, for a total of \$788 million in wildlife related spending in 2016 (WGFD 2018).

In another recent survey, the Outdoor Industry Association (OIA 2016) estimated that 73% of Wyoming residents participated in some form of outdoor recreation, although this includes other outdoor activities in addition to hunting, fishing or wildlife-watching. The OIA estimated that outdoor recreation in Wyoming creates more jobs (50,000) than oil and gas and mining combined (27,000). It was further estimated that outdoor recreation in Wyoming generates \$5.6 billion in consumer spending, \$1.6 billion in wages and salaries, and \$514 million in state and local tax revenue.

According to the USFWS (2013a), the 518,000 people who watched wildlife in Wyoming in 2011 spent over \$350 million dollars in their pursuits, creating 8,232 jobs, nearly \$200 million in salaries and wages, \$47 million in state and local tax revenues, and \$43 million in federal tax revenues. Of all 50 states, Wyoming had the fifth highest percentage of people who birdwatched in 2011 (USFWS 2013b). It was estimated that 417,000 people watched birds in Wyoming in 2011, of which 31% were residents and 69% were non-residents. Of specific relevance to river basin planning program is that 75% of people reported observing waterfowl, making this group the most watched type of bird.

In Wyoming, the 281,000 people that fished for trout in 2011 spent a total of 2,439,000 angler days fishing for trout in the state. Each angler fished an average of 8.7 days. When combined with people who fished for species other than trout, there were 303,000 anglers in Wyoming in 2011, who each fished an average of 10 days per year. Each angler spent \$1,530 in 2011, or \$126 per day. Anglers in Wyoming had \$394 million in trip-related expenses and nearly \$70 million in equipment-related expenses, for a total of nearly \$464 million (USFWS 2013c).

The number of people who fish in the Bear River Basin cannot accurately be determined. However, the WGFD does keep records on the number of fishing licenses sold by location. The only location within the Bear River Basin that sells fishing licenses is Evanston, where 7,002 fishing licenses were sold in 2016. However, an additional 4,265 fishing licenses were sold in communities around the Bear River Basin including Mountain View, Thayne, Big Piney and LaBarge. Many of these people likely fished within the Bear River Basin. The WGFD sponsors a fishing program referred to as the Cutt Slam to increase knowledge of and appreciation for the four native Wyoming trout. The program rewards people who catch all four subspecies of cutthroat trout in the state. To date, over 1,000 people have been awarded Cutt Slam certificates. One of the cutthroat subspecies, the Bonneville cutthroat, only occurs in the Bear River Basin, so the Cutt Slam contributes economically to the region.

All hunting expenditures in Wyoming totaled \$289 million in 2011. Trip related expenses such as food, lodging and transportation totaled \$159 million. Equipment expenditures totaled another \$81 million. The average expenditure per hunter was \$1,136 (USFWS 2011). Of particular relevance to river basin planning is the economic impact of waterfowl hunting; however, information on waterfowl hunting and expenditures in Wyoming were not provided. In the U.S., waterfowl hunters comprised 11% of all hunters, 6% of all hunting trip-related expenditures, and

7% of all hunting equipment expenditures in 2011 (USFWS 2013d). It is assumed that waterfowl hunting in Wyoming makes up a similar percentage of the hunting population.

Within the Bear River Basin, the economic impact of visitors to Seedskadee and Cokeville Meadows National Wildlife Refuges has been analyzed by the USFWS (Carver and Caudill 2013). Both refuges are managed out of the same office and unfortunately visitor and economic impact data are combined for the two refuges. Most of the visitation and economic impact is likely associated with Seedskadee, as most of the Cokeville Meadows NWR is closed to the public except for a wildlife viewing station along Hwy 30 approximately 10 miles north of Cokeville, although recently hunting has been allowed on much of the refuge. However, as more land is acquired in the refuge, additional opportunities for visitors will occur in the future. The two refuges combined had 13,410 visits in 2011, the latest data available. Approximately 29% of the visits were by Wyoming residents and the remaining 71% was by non-residents. The economic area for the refuges included Lincoln, Sweetwater and Uinta Counties. It was estimated that total expenditures of refuge visitors in this area was \$498,100, and that the refuges accounted for employment of 6 jobs, \$177,900 in employment income, and \$81,800 in total tax revenue (Carver and Caudill 2013).

Another major wildlife recreational attraction in the Bear River Basin is the Bear River State Park. Average visitation at this park over the last 5 years was 224,948. Another 150,916 people per year visited the Bear River Travel Center (Wyoming State Parks & Historic Sites 2015). In 2009, it was estimated that visitors to Bear River State Park spent \$4.6 million in Wyoming, of which \$2.75 million was spent in the local area (Stynes and Stynes 2010). Bear River State Park generated the third highest amount of spending of all state parks, behind only Hot Springs and Glendo State Parks. Bear River State Park was the main destination of 41% of all people who visited the park. It was further estimated that Bear River State Park payroll and operations added \$249,000 to the local area. When all factors are considered, Bear River State Park added \$1.9 million to the state and \$1.3 million to the local economy.

The value and economic benefits received from environmental and recreational uses in Wyoming and the Bear River Basin is clear. Jobs, revenue, and indirect expenses support the local communities as a result of these opportunities. As travel and recreation associated with outdoor activities grows, the need to manage water to support environmental and recreation uses may need to become a bigger focus at the state and basin level.

This report and supporting data can be used to evaluate potential impact to E&R uses. The resources provided in this report include direct E&R uses across the Basin; general categorization of E&R uses; and the environmental, recreation, and protection models. Each of the resources should be evaluated, as no one dataset is all encompassing.

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