3 Setting

This chapter describes the general physical, socioeconomic, legal and institutional setting for the Wind-Bighorn Basin. Additional information regarding hydrology and socioeconomics is also provided in later chapters of this document.

3.1 Physical Setting

The Wind-Bighorn Basin Plan study area encompasses the five river basins generally located in the northwest corner of Wyoming, including the Madison/Gallatin, Yellowstone Headwaters, Clarks Fork, Wind and Bighorn River Basins. All of these river basins are on the eastern slope of the Continental Divide and are part of the Missouri River Basin. The Wind River and Bighorn River are actually the same river, changing names at the "Wedding of the Waters" located at the mouth of the Wind River Canyon south of Thermopolis. The study area encompasses most or all of five of Wyoming's 23 counties, including Big Horn, Fremont, Hot Springs, Park, and Washakie Counties. The study area also includes a small portion of Natrona County. The total basin area is nearly 22,900 square-miles, or 23 percent of Wyoming's 98,210 square mile area. A map of the study area is presented in Figure 4.

Current Basin population is approximately 89,500, which is approximately 17 percent of the state's total population of 533,000 people. Major population centers include Lander and Riverton in the Wind River Basin and Thermopolis, Worland, Cody and Powell in the Bighorn River Basin, all with populations between 3,000 and 10,000. There is a significant rural population throughout the study area, especially within major agricultural areas in the Wind and Bighorn Basins. There are no population centers in the Madison/Gallatin, Yellowstone or Clarks Fork Basins.

In general, the Basin has abundant water resources, especially on the mainstem of the Wind-Bighorn River. These water resources fuel a vibrant and active agricultural industry in the study area. Several large reservoirs within the study area, including Bull Lake Reservoir, Boysen Reservoir and Buffalo Bill Reservoir, provide supplemental late season water supplies to downstream irrigation districts. Some of the irrigated crops in the Basin are exported as cash crops, such as dry beans and sugar beets. However, a majority of the crops are grown to support the livestock industry within the Basin and throughout the state. The Basin also contains abundant mineral resources, including oil and gas reserves, and has a growing tourism and outdoor recreation industry that includes Yellowstone National Park.

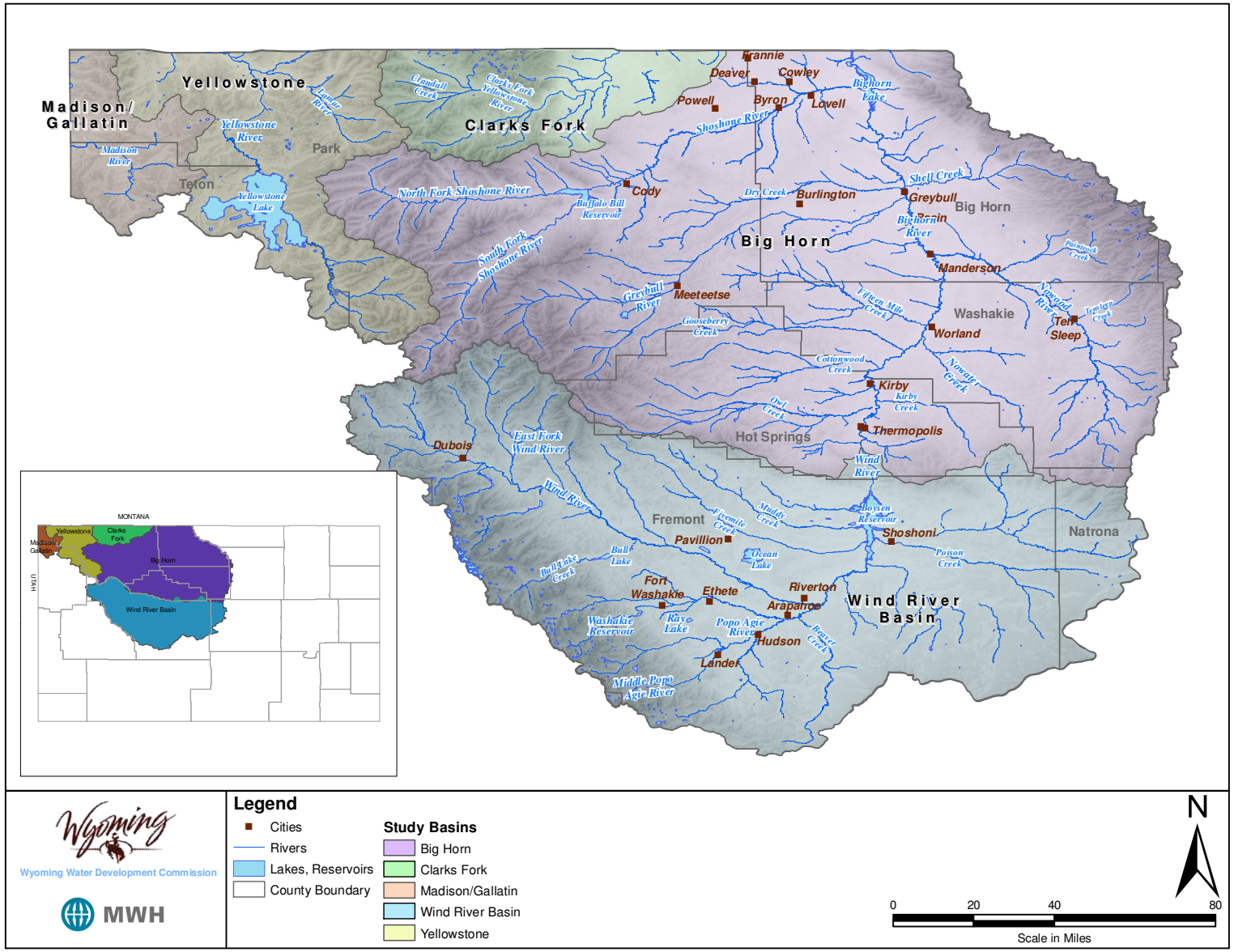

Figure 4. Wind-Bighorn Basin Study Area Map

3.1.1 Land Area and Ownership

The land area within the boundaries of the Wind-Bighorn Basin in Wyoming is approximately 14.6 million acres, or 22,900 square miles. Of this land area, approximately 75 percent is owned by the federal government, 21 percent is privately held (including local and county governmental entities), and 4 percent is owned by the State of Wyoming. The Wind River Indian Reservation, which is settled and managed by the Eastern Shoshone and Northern Arapaho Tribes under the Bureau of Indian Affairs, encompasses approximately 1.5 million acres within the Basin, or slightly more than 11 percent of the total land area. In should be noted that the 1.5 million acres reported for the Wind River Indian Reservation does not include portions of the reservation in the Riverton area that were ceded to the United States in the 1905 Act (or Second McLaughlin Agreement)[2]. The total reservation area including the ceded area is approximately 2.2 million acres (Eastern Shoshone, 2009). Yellowstone National Park also encompasses approximately 11 percent of the total land area in the Basin. A summary of land ownership area is presented in Table 2, while a summary of land ownership percentages is presented in Figure 5.

Table 2. Summary of Land Ownership Area in Wind-Bighorn Basin

Landowner	Acres	Square Miles
United States Government		
National Park Service	1,607,570	2,512
Forest Service	3,045,476	4,759
Bureau of Land Management	4,449,244	6,952
Bureau of Reclamation	212,243	332
Bureau of Indian Affairs (Wind River Indian Reservation)	1,547,180	2,417
Department of Defense	4,876	8
Sub-Total Federal	10,866,589	16,979
State	615,151	961
Private	3,108,597	4,857
Water	51,972	81
Total	14,642,308	22,879

Source: BLM surface and mineral ownership GIS dataset (BLM 2005).

[2] The status of the 1905 Act ceded lands is a complex and controversial issue, and is not discussed further in this document, as it generally does not have bearing on basin planning activities.

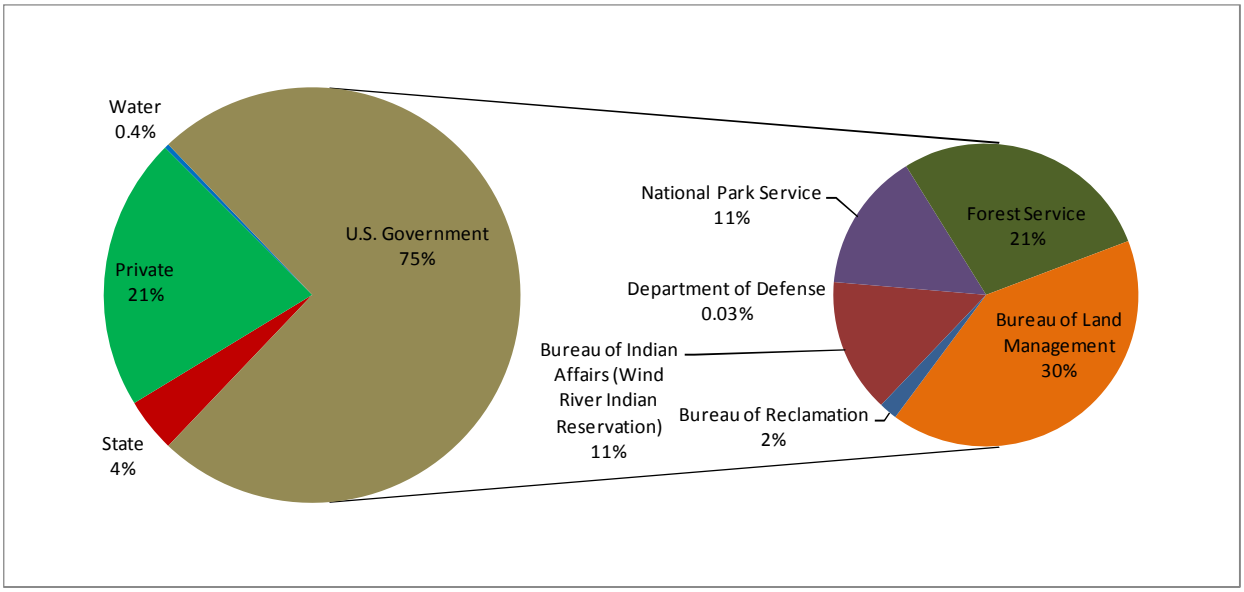

Figure 5. Land Ownership Percentage in Wind-Bighorn Basin

3.1.2 Physiography

The Basin is generally characterized by broad, rolling high plains with limited vegetation surrounded by high mountains. The Wind River Range, Owl Creek Range, Absaroka Range and the Bighorn Basin are within the Middle Rocky Mountain major physiographic province, while the Wind River Basin is generally within the Wyoming major physiographic province as defined by the WSGS. The Wind River Basin and the Bighorn Basin also form their own minor physiographic provinces within the major provinces. Mountain ranges were generally formed by large-scale crustal movements and tectonic activity, with streams and river basins formed by high-gradient water flows cutting through younger sedimentary rocks. The terrain of the Yellowstone Plateau and the Absaroka Range were heavily influenced by deposition and erosion of rock materials derived from volcanic vents in the Yellowstone area. The Yellowstone Plateau remains a thermally and seismically active area (WSGS 2009).

Topography

The Madison/Gallatin and Yellowstone Basins within Wyoming are primarily mountainous areas in Yellowstone National Park. There are high mountain valleys within the park with grass pastures. However, most of this area is forested. Similar to the Yellowstone Basin, the Clarks Fork Basin primarily consists of the mountainous headwaters region of the Clarks Fork River. The Clarks Fork River starts in Montana, flows south and east into Wyoming, then flows north and east back into Montana where it is tributary to the Yellowstone River. The river profile does flatten out into a larger valley as the river turns north into Montana, supporting small irrigation facilities along both the mainstem and tributaries that are outside of the Shoshone National Forest.

The Wind River Basin contains the headwaters of the Wind and Bighorn Rivers. The Wind River Basin is bounded by the Wind River Mountain Range on the west and southwest, the Absaroka Range to the northwest, the Owl Creek Range to the north, and the Gas Hills to the east. The Wind River Range and a portion of the Absaroka Range constitute a portion of the Continental Divide. The Wind River Range and Absaroka Range consist of high mountain forests, while the Owl Creek Range is generally drier and more sparsely vegetated. The central portion of the Basin is dry, sparsely

vegetated sagebrush covered rolling hills, except in the river valleys and the area northwest of Riverton, which are flatter and support large scale irrigation. Irrigation supports hay and grass pasture meadows in tributaries throughout the mountain regions.

The Bighorn Basin begins downstream of the "Wedding of the Waters" just south of Thermopolis. The Bighorn Basin is bounded by the Absaroka Range on the west and southwest, the Owl Creek Range to the south, the Bighorn Range to the east, and the Sawtooth Range to the northwest. As with the Wind River Range, the Absaroka, Sawtooth and Bighorn Ranges are more heavily forested mountainous areas, while the Owl Creek Range is drier and more sparsely vegetated. In addition, the Bighorn Range is characterized by a much more gradual transition from the Absaroka and Owl Creek Ranges to the Bighorn River, resulting in longer, drier tributary drainages. The central portion of the Basin is dry, sparsely vegetated sagebrush covered rolling hills, except in the river valleys and the area northeast of Cody, which are flatter and support large scale irrigation.

Basins and Sub-Basins

Table 3 shows the USGS Hydrologic Unit classifications which are included in the planning area. All of the river basins are tributary to the Yellowstone River in southern Montana, which is subsequently tributary to the Missouri River in northeastern Montana.

Table 3. Hydrologic Units and Associated Models Included in Study Area

Hydrologic Unit Code	Hydrologic Unit Name	Sub-Region Name[1]	Area (sq. mi.) [2]	Study Basin	Study Sub-Basin
10020007	Madison	Missouri Headwaters	2,561	Madison/Gallatin	Madison/Gallatin
10020008	Gallatin	Missouri Headwaters	1,816	Madison/Gallatin	Madison/Gallatin
10070001	Yellowstone Headwaters	Upper Yellowstone	2,585	Yellowstone	Yellowstone
10070002	Upper Yellowstone	Upper Yellowstone	2,966	Yellowstone	Yellowstone
10070006	Clarks Fork Yellowstone	Upper Yellowstone	2,789	Clarks Fork	Clarks Fork
10080001	Upper Wind	Big Horn	2,544	Wind	Upper Wind
10080002	Little Wind	Big Horn	1,107	Wind	Little Wind
10080003	Popo Agie	Big Horn	799	Wind	Popo Agie
10080004	Muskrat	Big Horn	728	Wind	Lower Wind
10080005	Lower Wind	Big Horn	1,694	Wind	Lower Wind
10080006	Badwater	Big Horn	841	Wind	Badwater
10080007	Upper Bighorn	Big Horn	3,464	Big Horn	Upper Big Horn
10080008	Nowood	Big Horn	2,004	Big Horn	Nowood
10080009	Greybull	Big Horn	1,146	Big Horn	Greybull
10080010	Big Horn Lake	Big Horn	1,798	Big Horn	Big Horn Lake
10080011	Dry	Big Horn	440	Big Horn	Big Horn Lake/Greybull
10080012	North Fork Shoshone	Big Horn	852	Big Horn	Shoshone
10080013	South Fork Shoshone	Big Horn	653	Big Horn	Shoshone
10080014	Shoshone	Big Horn	1,492	Big Horn	Shoshone
Total			32,279		

Notes:
[1]All Sub-Regions contained in the Missouri River Region.
[2] Includes basin area outside of Wyoming, and thus is not representative of study area.

The Madison River and Gallatin River are not hydrologically connected. However, they have been grouped together because the models of their systems are very small. Similarly, although the Wind

and Bighorn Rivers are the same rivers, they are separated in this document because of the clear basin distinctions that occur through the Owl Creek Mountains. Except for the Wind-Bighorn River connection itself, there are no other hydrologic connections between the two basins. As shown in Table 3, the major basins are further sub-divided into sub-basins based on the USGS hydrologic unit classifications.

The previous Basin Plan did not include hydrologic analysis or modeling of the Popo Agie River Basin as it was done under separate analysis as part of the Popo Agie River Watershed Study (ACE 2003). As part of the Basin Plan Update, information from the Popo Agie River Watershed Study has been included and updated, including all hydrologic data and the basin planning model.

3.1.3 Climate

The Wind-Bighorn Basin has a spatially variable climate. The Wind River and Absaroka Mountain Ranges block the flow of moisture from the west, while the Bighorn Mountains block the flow of moisture from the east. This causes very dry climates in some portions of the Basin and much wetter climates in other portions. Figure 6 shows precipitation within the state based on PRISM data. PRISM is a "unique knowledge-based system that uses point measurements of precipitation, temperature, and other climatic factors to produce continuous, digital grid estimates of monthly, yearly, and event-based climatic parameters" (PRISM Climate Group 2009). A 1971-2008 PRISM GIS dataset was developed as part of this study by combining the 1971-2000 PRISM data set with individual PRISM datasets for individual years from 2001-2008 and is shown in the map.

Historical average monthly and annual temperature data for four stations within the Wind-Bighorn Basin generally representing the lower elevation agricultural and populous areas are shown in Table 4 (WRCC 2010). Additional information on climate and climate related issues in the Basin is contained in Technical Memorandum 6C.

Table 4. Average Monthly Temperature for Selected Long-Term Gages

	Average Temperature / Precipitation												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Cody (1915—2009)													
Max (°F)	35.9	40.2	47.4	56.8	66.3	75.7	84.9	82.7	72.2	60.9	45.9	37.9	58.9
Mean (°F)	24.3	28.2	35.1	44.1	53.2	61.9	69.8	67.6	57.7	47.6	34.6	26.8	45.9
Min (°F)	12.8	16.4	22.7	31.3	40.1	48.0	54.6	52.5	43.3	34.4	23.2	15.7	32.9
Precip. (in)	0.34	0.30	0.53	1.07	1.62	1.64	1.04	0.80	1.05	0.77	0.49	0.31	9.97
Riverton (1907—2009)													
Max (°F)	29.5	37.5	48.1	59.0	69.3	79.5	88.8	86.5	75.2	61.4	42.8	31.3	59.1
Mean (°F)	14.9	22.4	33.3	44.0	53.9	62.9	70.4	67.8	57.3	44.9	28.6	17.2	43.3
Min (°F)	0.3	7.3	18.5	28.9	38.6	46.2	51.9	49.2	39.3	28.5	14.4	3.1	27.2
Precip. (in)	0.21	0.26	0.47	1.13	1.74	1.29	0.78	0.58	0.84	0.90	0.43	0.28	8.89
Worland (1907—2009)													
Max (°F)	29.1	37.2	48.4	60.0	70.3	80.6	89.8	87.5	75.4	62.0	44.6	32.1	59.8
Mean (°F)	15.0	22.8	34.4	45.6	56.0	65.2	72.3	69.6	58.3	46.3	31.2	19.0	44.7
Min (°F)	0.9	8.5	20.4	31.2	41.5	49.6	54.8	51.6	41.2	30.7	17.6	5.7	29.5
Precip. (in)	0.28	0.22	0.38	0.91	1.37	1.24	0.66	0.52	0.85	0.67	0.36	0.23	7.69
Deaver (1916—2009)													
Max (°F)	29.5	37.6	48.2	60.2	70.1	79.2	88.7	86.4	74.5	61.3	44.1	32.7	59.4
Mean (°F)	16.4	24.0	33.8	44.7	55.0	63.6	71.5	68.8	57.8	45.7	30.7	20.1	44.4
Min (°F)	3.6	10.3	19.3	29.3	39.8	48.0	54.3	51.2	41.0	30.0	17.3	7.5	29.3
Precip. (in)	0.15	0.12	0.20	0.43	1.00	1.14	0.62	0.50	0.57	0.37	0.18	0.17	5.46

Source: WRCC 2010

Note: Max and min temperatures are average daily maximum and average daily minimum temperature.

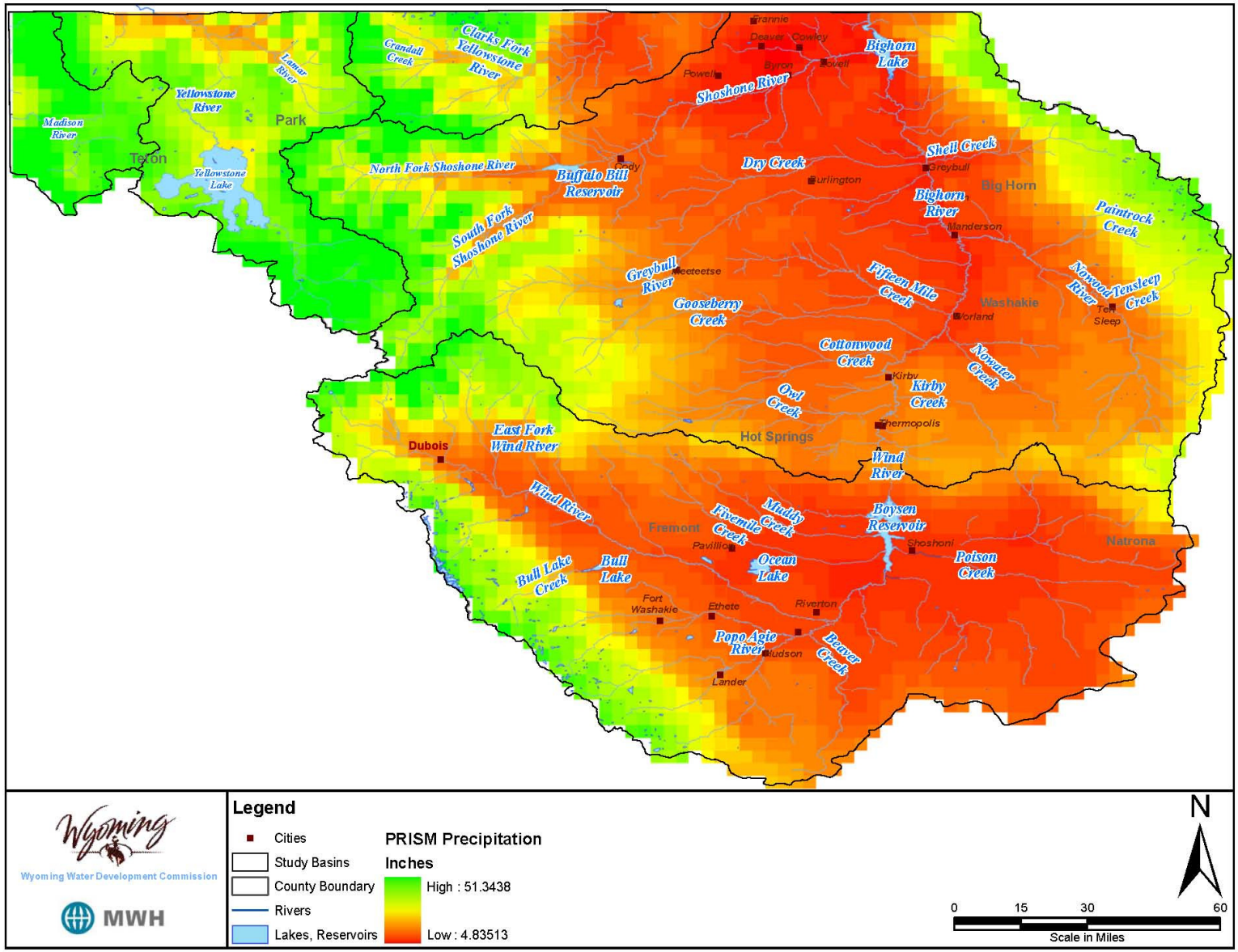

Figure 6. Mean Annual Precipitation in the Wind-Bighorn Basin

3.2 Socioeconomic Setting

This section describes the current socioeconomic situation in the Basin and discusses changes that have occurred since the previous Basin Plan was developed in 2003. Additional information on the socioeconomic setting in the Basin is contained in Technical Memorandum 5A.

3.2.1 Historic Population and Growth

The five counties that comprise the Wind-Bighorn Basin had a population of about 89,500 in 2008. About 43 percent of the population is located in Fremont County while about 31 percent resides in Park County. The city of Riverton, located in Fremont County, is the most populous city in the Basin, with about 10,000 residents in 2008. About 43 percent of Basin residents lived in unincorporated areas in 2008. Wyoming is the second most sparsely populated state, with about 5 people per square mile; the Basin has a lower population density than the overall state, with 2 persons per square mile in Hot Springs County, 3 persons per square mile in Washakie County, and 4 persons per square mile in Big Horn, Fremont and Park Counties. Table 5 provides population figures for Basin counties and selected cities and towns in 2000 and 2008.

Table 5. Basin County, City and Town Populations

County	Place	Census 2000 Population	July 1, 2008 Population	Percent Change April, 2000 to July, 2008
Big Horn		**11,461**	**11,322**	**-1.2**
	Greybull (town)	1,815	1,739	-4.2
	Lovell (town)	2,281	2,276	-3.6
Fremont		**35,804**	**38,113**	**6.4**
	Dubois (town)	962	1,053	9.2
	Lander (city)	6,867	7,264	5.1
	Riverton (city)	9,310	10,032	8.4
Hot Springs		**4,882**	**4,622**	**-5.3**
	Thermopolis (town)	3,172	2,971	-6.3
Park		**25,786**	**27,574**	**6.9**
	Cody (city)	8,835	9,309	4.7
	Powell (city)	5,373	5,524	2.4
Washakie		**8,289**	**7,821**	**-5.6**
	Worland (city)	5,250	4,958	-6.3
Basin Total		**86,222**	**89,452**	**3.7**

Source: (EADIV 2009a)

The average annual population change during the 2000 to 2008 time period was 0.5 percent. Year 2000 was the baseline for population projections in the previous Basin Plan. Although, as shown above, Big Horn, Hot Springs and Washakie Counties lost population, growth in Park and Fremont Counties more than offset these losses, producing modest growth for the Basin since 2000. During the same time period, the Wyoming population increased by more than 7 percent.

Historical population and annual growth rate is presented in Figure 7. Basin population was about 68,500 in 1970, increased to 87,700 by 1980, then fell back to 80,600 in 1990 before slowly climbing back to 86,200 by 2000. These fluctuations are mostly explained by the varying fortunes of the mineral and related sectors.

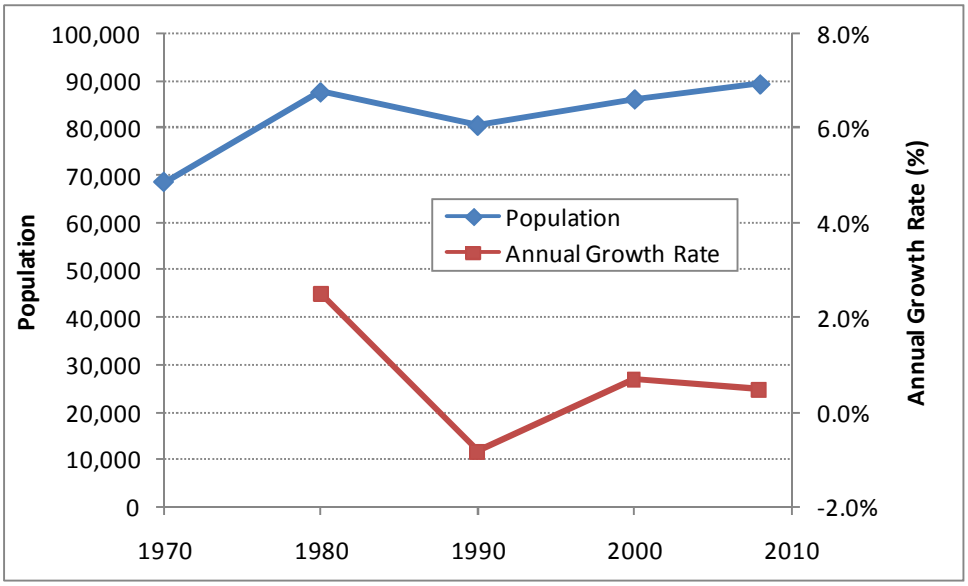

Figure 7. Historical Population and Annual Growth Rate

3.2.2 Aging Populations

Natural population change is driven by births and deaths. When births in a given year exceed deaths, net natural population growth occurs. In-migration and out-migration also contributes to population change. Figure 8 provides total population change and net migration for the Basin from 2000 to 2007. Births and deaths are from State of Wyoming, Department of Health while net migration was derived by the Wyoming Economic Analysis Division based on U.S. Census Bureau's population estimation and vital stats (EADIV 2009a; Census 2009a).

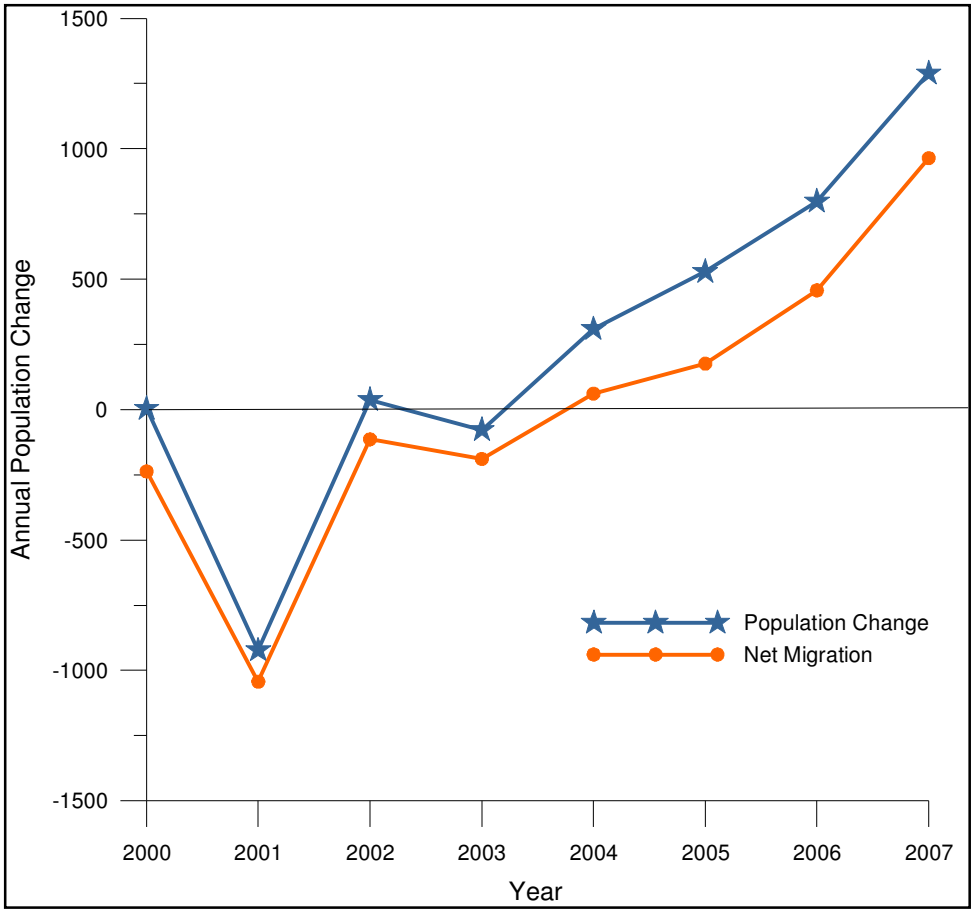

Figure 8. Components of Population Change, 2000 to 2007

The area between the lines on the graph represents the natural population change. Patterns of in- and out-migration are clearly important to population change in the Basin, as show in Figure 8, and have contributed significantly to the Basin's modest population growth in recent years.

The median age of the population of the Basin is older than the median age of the Wyoming population, and the median age is trending upward. The median age for each Basin county in 2000 and 2008 and for Wyoming is shown in Table 6.

Table 6. Median Age of Basin Population by County and Wyoming

County	Median Age 2000	Median Age 2008
Big Horn	38.7	40.8
Fremont	37.7	37.9
Hot Springs	44.2	49.0
Park	39.8	41.7
Washakie	39.4	43.3
Wyoming	36.2	36.8

2008 data are estimates

Source: Population Division, U.S. Census Bureau (Census 2009a)

Fremont County has the lowest median age in the Basin, about one year greater than the Wyoming average. All other counties have a median age significantly higher than the state, notably Hot

Springs County with a median age more than 12 years greater than Wyoming as a whole. This trend suggests that young people are leaving the region. In addition, there is evidence that the Basin is attracting retirees. Park County saw a large influx of retirees from California from 2000 to 2006 (Gillette 2009). The low cost of living and rural atmosphere of the Basin are attractive to some retirees.

3.2.3 Employment and Labor Force

The labor force participation rate is that percent of a population between the ages of 18 and 65 that are employed or actively looking for work. The labor force participation rate in the Basin was 72 percent in 2008, as compared to a national average of 65.7 percent (BLS 2009). In addition, the State of Wyoming has a high labor force participation of 21.9 percent for residents over 65, as compared to the national average of 15.5 percent (Census 2009b).

In recent years, Wyoming has seen a low unemployment rate, due predominately to the boom in the energy industry. However, like the rest of the country, the economic slowdown, which began in 2008, is impacting employment in the state and the Basin. Statewide unemployment rates are typically less than those in the Basin. Unemployment trends for the Wind-Bighorn Basin and Wyoming are provided in Figure 9.

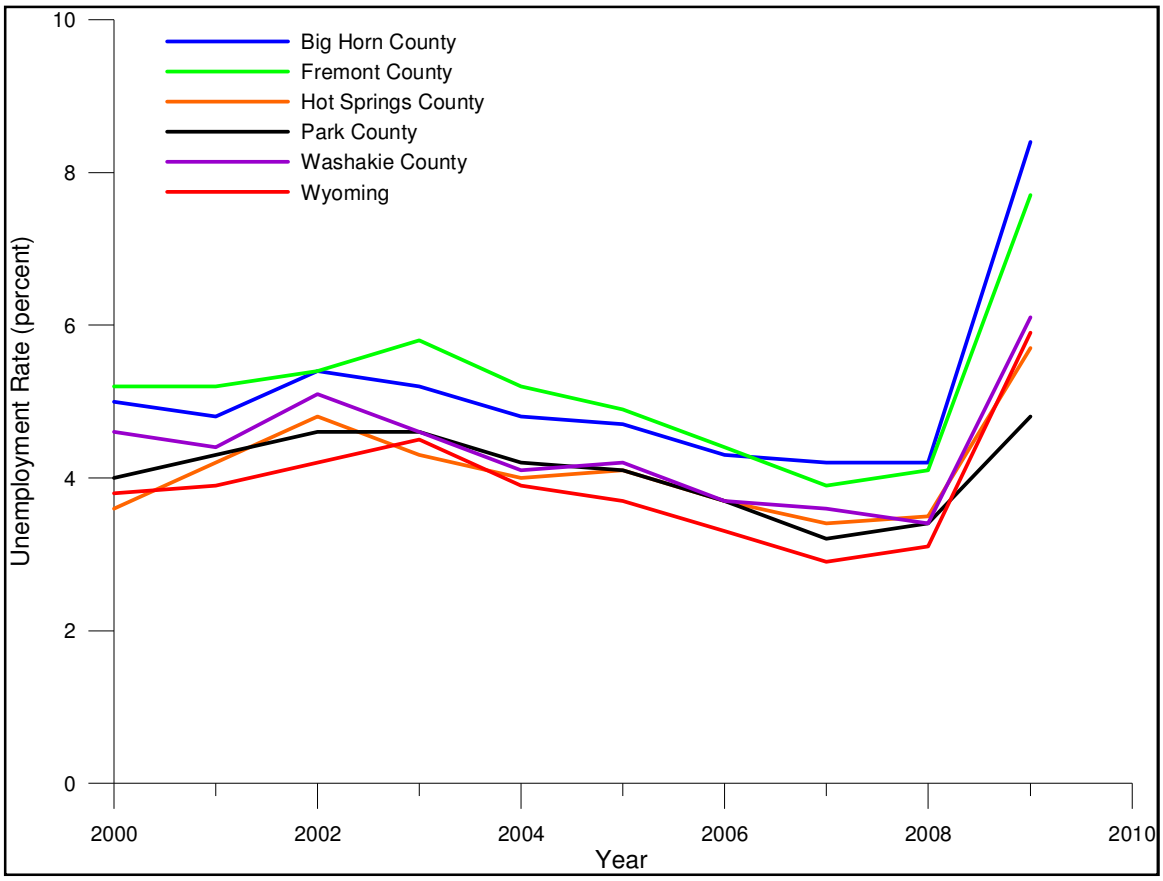

Figure 9. Unemployment Rates, 2000 to 2009

Source: Wyoming Department of Employment Research and Planning. Local Area Unemployment Statistics.

3.2.4 Key Economic and Water Use Sectors

Agriculture, mining and tourism are the most important economic sectors in the Basin. Manufacturing and utilities are also important to consider for this update because they have the potential to use significant amounts of water.

Agriculture

As of 2007, agriculture accounted for about 5 percent of all employment in the Basin. As was true at the time of the previous Basin Plan, agriculture is relatively more important in the Basin than in the state as a whole (BEA 2009). In addition, agriculture is by far the single largest water using sector, making it key to the basin planning process.

In 2007, livestock sales were responsible for 64 percent of the market value of agricultural production in the Basin. Cattle are the predominate livestock in the Basin. A drought in the early years of the decade contributed to a decline in cattle, due to a shortage of grazing opportunities and poor prices. Basin cattle business has since rebounded somewhat since the end of the drought.

BLM and Forest Service lands for grazing are very important in the Basin. Since the previous Basin Plan, the number of animal unit months (AUM) available for grazing on federal lands has declined, due to regulations related to environmental and other management concerns. This likely also contributed to the decline in cattle numbers in the Basin.

From 2000 to 2008, the number of sheep in the Basin decreased by almost 20 percent. However, in Hot Springs County, the sheep population has tripled, from 2,000 head in 2000 to 6,000 head in 2008. The general decline is due to the falling prices of wool and losses from wolves and other predators (Ballard 2009). Other livestock in the Basin include horses, hogs, layers (hens), goats and bees, which pollinate the Basin's alfalfa.

Hay production far exceeds any other crop in both Wyoming and the Basin. Within the Basin, it is predominately used for winter livestock feed, although several Basin counties also export hay. In 2007, sugar beets had the second highest crop value in Wyoming and the three top producing counties, Park, Washakie and Big Horn, are in the Basin. About 87 percent of Wyoming sugar beets were produced in the Basin in 2007, with a total value of about $27 million. About 20 percent of the Basin crop acreage is in barley, corn and dry beans.

Minerals and Mining

Historical information about mining in the Basin was provided in the previous Basin Plan. Mineral production is the most important economic sector in Wyoming and is also a leading sector in the Basin. In 2006, mining provided about 3,000 jobs, 5 percent of all jobs in the Basin, but since these jobs are much higher paid than the average wage, the economic importance to the Basin is magnified. All counties in the Basin produce oil and in 2008 the Basin produced about 30 percent of Wyoming's total oil production. Natural gas production in the Basin has increased since the original Basin Plan through 2007, driven by demand and strong, though fluctuating, prices.

Water used for mining in the Basin is almost all saline groundwater, almost entirely attributable to natural gas and oil extraction byproduct. Water produced from oil and gas production is either injected into the subsurface or disposed of in evaporation ponds (BLM 2009a).

As of 2008, there is no uranium mining in the Basin. Gypsum is mined in Big Horn and Park Counties and is used exclusively in the production of wallboard (WBC 2007). Coal production in the Basin is modest with one active operation and a relatively small reserve base. In 2007, about 2.8 million tons of bentonite was mined in the Basin. Bentonite processing plants are located in Big Horn, Hot Springs and Washakie Counties.

Tourism and Recreation

Tourism and recreation are important water use and economic considerations in the Basin. The tourism outlook has remained relatively constant since the previous Basin Plan. While this sector is important to the entire Basin, Park County has the largest tourism economy due to the location of Yellowstone National Park within its borders. Other important tourism and recreation opportunities in the Basin include hunting and fishing, boating, white water rafting, hiking, camping, snowmobiling, and golfing.

Travel and tourism provided more than 6,000 jobs in the Basin in 2008. Since the previous Basin Plan, the impact from tourism and recreation has increased. Total spending increased about 20 percent, earnings went up by almost 19 percent, employment increased by 9 percent and local tax receipts increased about 25 percent. Although most water use for recreation is non-consumptive, water in reservoirs, lakes, rivers and streams plays an important role in attracting visitors to the region.

Manufacturing and Other Industry

Nationally, about 11 percent of employment is in the manufacturing sector. Wyoming, likely due to a small, dispersed population, employs about 3 percent of its workforce in this sector. As discussed above, manufacturing is a relatively small sector in the Basin. This has remained unchanged since the previous Basin Plan; manufacturing employment has even declined. Industries within the Basin include camping equipment manufacturing, sulphur processing, gravel pits, bottling, aluminum can manufacturing and processing plants for bentonite, sugar beets and beans. No new significant manufacturing water uses have arisen since the previous Basin Plan.

Environmental Water Use

Environmental water use is that water used for the purpose of enhancing environmental conditions, such as improving or maintaining fish habitat and providing water for wildlife. Although environmental water use is not consumptive, it is important to the economy and for the quality of life of Basin residents.

3.3 Legal and Institutional Setting

As with most other western states, the State of Wyoming adopted the prior appropriation doctrine, which establishes a “first-in-time, first-in-right” method for the allocation of surface and groundwater resources in times of limited water supply. Water rights in Wyoming are acquired by securing a permit from the Wyoming State Engineer’s Office (WSEO) and adjudicated through a state process. All unadjudicated permits within the Wind-Bighorn River Basin were inspected in a general stream adjudication process which commenced in 1977 and is known as the Big Horn River Adjudication. The Big Horn River Adjudication included an award of federal reserved water rights to the Eastern Shoshone and Northern Arapaho Tribes. The administration and allocation of water resources in the Wind-Bighorn River Basin is also affected by the Yellowstone River Compact, which allocates water in the Yellowstone River Basin between the states of Wyoming, Montana and North Dakota.

The following provides a summary of key state laws, federal laws, interstate compacts and court decrees that affect the Wind-Bighorn Basin. Additional information on water rights is contained in Technical Memorandum 3H, while additional information on water quality and environmental laws is contained in Technical Memoranda 6A and 6B.

3.3.1 Wyoming Water Rights

Water within the State of Wyoming is administered by the WSEO. To manage this water, the state is divided into four water divisions. All of the Wind-Bighorn River Basin is included in Water Division III. The Division III superintendent administers water within the division with assistance from water commissioners and hydrographers. The WSEO and superintendent administer both surface water and groundwater within each water division. The State Board of Control is made up of the four superintendents and the State Engineer. The Board of Control meets quarterly (February, May, August and November) to consider petitions and discuss matters related to water rights adjudication and administration.

A general overview of Wyoming Water Law is provided in the document "Wyoming Water Law, a Summary" (Jacobs et al. 2003). The following is a summary of this document, specifically as it pertains to the Wind-Bighorn Basin.

Surface Water

Wyoming's earliest water rights date back to its territorial days, prior to its statehood in 1890. During these days, water rights were established through water rights claims with the territorial officials or through court decrees. Since statehood, water rights are only acquired through a permit from the WSEO. Obtaining a surface water permit requires an application, including the preparation of a map and payment of required fees. Once the proposed project is completed and water is put to beneficial use, the water right can be adjudicated.

For irrigation purposes, water rights are adjudicated on the basis of 1 cfs per 70 acres, with an additional 1 cfs per 70 acres when water supplies permit. In addition, water rights are divided into three general categories based on the priority dates of March 1, 1945 and March 1, 1985. The pre-March 1, 1945 category is eligible to divert surplus water (an additional 1 cfs per 70 acres), when available, before the post-March 1, 1945 and pre-March 1, 1985 category is allowed to divert their first 1 cfs per 70 acre amount. The March 1, 1945 through March 1, 1985 category is eligible to divert excess water (an additional 1 cfs per 70 acres) when available before the post-March 1, 1985 is allowed to divert their first 1 cfs per 70 acres. Within each of these groups, the first 1 cfs per 70 acres is allocated on a strict priority basis, while the second 1 cfs per 70 acres is allocated on a pro-rata basis. A strict priority allocation means that a water right can only be allocated water when all water rights with a priority date earlier than the subject water right are satisfied.

For some facilities, a simplified application process is available. This includes small stock reservoirs, fishing ponds and wetlands ponds, flood detention dams, small springs, small domestic uses and cisterns. The simplified procedure does not require maps and plans prepared by a registered engineer or surveyor.

Reservoirs are entitled to fill in priority once per year during the period October 1st through September 30th. Any water left in the reservoir at the end of the year is accounted as part of the following year's fill. In general, once stored, water is not subject to the water rights allocation

scheme described in previous paragraphs. Stored water may be delivered to specific lands or places of use, or may be generally allocated to downstream water users. Specific reservoir operations within the Wind-Bighorn River Basin are described in later chapters of this document and in Technical Memorandum 3F - Reservoir Operations.

In 1986, the Wyoming legislature declared that instream flow for maintenance or improvement of existing stream fisheries is a beneficial use of water that can be provided either by natural streamflow or from storage. Statutes were adopted that allow the WWDC to apply for a permit to appropriate instream flows in streams and at streamflow rates requested by the Wyoming Game and Fish Commission. To establish an instream flow right, the WWDC prepares a feasibility study that contains a hydrologic analysis of the reach. The feasibility study is provided to the WSEO for review. The WSEO then holds public hearings before granting or denying the application. Adjudicated water rights can be changed to instream flow rights by granting of a petition by the Board of Control. If such a petition were granted, the State of Wyoming becomes the owner of the water right. A description of instream flow water rights in the Wind-Bighorn Basin are described in Technical Memorandum 3D/3E – Recreational and Environmental Water Use.

Groundwater

Wyoming's groundwater laws were originally enacted in 1945 and amended in 1947. These laws were replaced by new groundwater laws on March 1, 1958, which were then amended in 1969. Groundwater is administered on a permit basis. The acquisition of groundwater rights generally follows the same permitting procedures as surface water rights, except that a map is not required at the time of permit application. Applications are submitted to and approved by the WSEO prior to drilling a well. With the completion of the well and application of the water to a beneficial use, the appropriation can then be adjudicated. The issuance of well permits carries no guarantee of a continued water level or artesian pressure.

As with surface water rights, groundwater rights are administered on a priority basis. For all wells drilled prior to April 1, 1947, a statement of claim process was followed to determine the priority date of the well. For wells drilled between April 1, 1947 and March 1, 1958, the priority date is the date the well was registered. For wells drilled after March 1, 1958, the priority date is the date the application was received at the WSEO.

Domestic and stock wells are those wells used for non-commercial household use, including lawn and garden watering that does not exceed one acre in aerial extent, and the watering of stock. The yield from these wells cannot exceed 25 gallons per minute (gpm). Prior to the 1969 amendment, domestic and stock wells were exempt from the requirement to obtain a permit and held a preferred right over other wells. The 1969 amendment established priorities for domestic and stock wells similar to those for other wells. The Groundwater Division also issues permits for spring developments where the total yield or flow of the spring is 25 gpm or less and where the proposed use is for stock and/or domestic purposes.

Board of Control

Wyoming water law defines preferred uses for both surface water and groundwater. In general, domestic and livestock water use, municipal use, and industrial use have preferred status over non-preferred uses such as irrigation. For surface water permits, preferred status does not imply that during times of shortage, a preferred use takes priority over a non-preferred use (the water rights priority establishes this allocation). Rather, preferred status relates to how the water right use can be

changed. The only way to obtain a preferred surface water right from a non-preferred right is by purchase or condemnation and petitioning the State Board of Control for the change of use. For groundwater permits, domestic and stock wells yielding less than 25 gpm have preferred rights and priority over wells for all other uses.

The point-of-diversion, location or type of surface water use of an adjudicated water right can only be changed through a petition filed with the Board of Control. Generally, a petitioner for a change in use does not lose priority of the water right as long as no other water rights are injured (including the location and amount of return flows) and the quantity of use remains the same. The Board of Control may consider economic losses to the community and the availability of water from other sources when making its decision.

3.3.2 Interstate Compacts

All river basins within the Wind-Bighorn River Basin Plan are tributary to the Yellowstone River. The two rivers having significant water use within Wyoming, the Bighorn River and the Clarks Fork River, are governed by the Yellowstone River Compact (Compact). The Compact, which was ratified in 1950 by the states of Wyoming, Montana and North Dakota, governs the allocation of the tributaries to the Yellowstone River between the states. In general, existing rights as of January 1, 1950 maintain their status quo at the time of the Compact. Unappropriated or unused total divertible flow of each tributary as of January 1, 1950, after needs for supplemental supply for existing rights are met, is allocated to Wyoming and Montana according to the percentages shown in Table 7.

Table 7. Yellowstone River Compact Allocation Percentages

State	Percent of Unused, Unappropriated Flow Allocated to State	
	Clarks Fork	Bighorn River
Wyoming	60%	80%
Montana	40%	20%

Annual administration of the Compact is carried out by the Yellowstone River Compact Commission (YRCC), which is made up of one commissioner from Wyoming, one commissioner from Montana, and a federal representative who serves as Chairman of the YRCC. Water available to Wyoming under the Compact is quantified in Section 7.1.5.

3.3.3 Bighorn Adjudication

On January 22, 1977, the Wyoming legislature enacted statute §1-37-106, which authorized the state to institute a general adjudication of water rights within the State of Wyoming. The general adjudication would determine the nature, extent, and relative water rights of all persons in any river system and all other sources. On January 24, 1977, the state filed a complaint in the Fifth Judicial District Court against the United States and other parties to adjudicate all water rights in Division III, including reserved water rights claims for the Wind River Indian Reservation. The Eastern Shoshone and Northern Arapaho Tribes intervened and joined the federal government as defendants in the Big Horn General Stream Adjudication.

The rights to water on Indian reservations were confirmed by the United States Supreme Court in the case *Winters v United States* (207 U.S. 564 (1908)). The Court ruled that when Congress set aside land for the Fort Belknap Indian Reservation, Congress also implied reserved water rights consistent

with Western States' prior appropriation doctrine (commonly referred to as the Winters Doctrine; Brooks, 2005). The treaty between the U.S. government and the Bannock and Shoshone Indians established the Wind River Reservation on July 3, 1868. The Bannock later ceded land back to the U.S. and the Arapaho then moved to the reservation.

The Wyoming Supreme Court ruled on the original complaint and six subsequent matters involving water rights on the Wind River Indian Reservation. Throughout the adjudication process, a special master was appointed. The primary ruling in the case was Big Horn I (753 P.2d 76, 1988), in which the court found that Congress intended to reserve water for the Tribes' agricultural use on the reservation. The Tribes were awarded a 499,862 acre-foot reserved water right with a treaty priority date of July 3, 1868, for the 107,976 "practicable irrigable acres" on the reservation. The Court also held that Indian and non-Indian successors of Indian allottees were entitled to treaty based water rights for the practicable irrigable acres they could prove were continuously irrigated since or within a reasonable time after the property passed out of Indian ownership ("Walton Rights"). The Wyoming Court's decision was affirmed by the U.S. Supreme Court in *Wyoming v. United States* (492 U.S. 406 (1989)).

Since that time, several additional rulings were made including upholding treaty priority rights for Walton Rights (Big Horn II), use and administration of rights (Big Horn III), adjudication and appeal of Walton Rights (Big Horn IV), limitations on treaty priority dates for Walton Rights lands that were not derived from Indian allottees (Big Horn V), administration of Walton Rights (Big Horn VI), and a process for dispute resolution (Big Horn VII).

Because of the complexity of this case, the Special Master divided the adjudication into three phases: Phase I addressed the quantification of the Reserved Water Rights for the Wind River Indian Reservation; Phase II addressed non-Indian Federal Reserved Rights; and Phase III is the determination of the status of all unadjudicated and partially adjudicated surface and groundwater permits in the Basin.

The federal reserved water rights awarded in Phase I of the Big Horn Adjudication are for agricultural purposes only. The rights have a priority date of July 3, 1868, which is the treaty date of the reservation. The reserved rights have varying water duties across the Basin and were awarded based on an annual volume (acre-feet), which is different than the 1 cfs per 70 acre duty applied to state water rights (see previous sub-section). Except for Walton Rights, the Tribes administer the Tribal reserved water rights. The Tribes established the Water Resources Control Board and the Tribal Water Engineer's (TWE) Office to oversee and perform these administrative duties. The State of Wyoming monitors the use of the Tribal water rights, with any disagreement handled through the federal court system. A summary of the tribal federal reserved water rights awarded by the court is summarized in Table 8.

Table 8. Summary of Phase I Tribal Water Rights Award

Type	Irrigated Area (acres)	Water Right (ac-ft)
Federal Reserved Rights		
Historic	54,216	290,490
Futures	53,760	209,372
Sub-Total	107,976	499,862
Walton Rights		
Walton Award	14,194	79,796
Total	122,170	579,658

Walton Rights are a special type of water right that were adjudicated along with the Tribal Reserved Water Rights in Phase I. Walton Rights are rights for historical use of water on Indian "fee" lands (Indian or non-Indian privately held lands that were originally allotted to individual Indians). The term Walton Rights comes from the case *Colville Confederated Tribes v Walton* (647 F.2d 42, 51 (9th Cir. 1981)), in which the Ninth Circuit court ruled that an allottee's share of a tribes' reserved right is equal to the percentage of the entire reservation's irrigable acreage that is located on the allottee's land (Brooks 2005). Thus, Walton Rights have the same priority date as Tribal reserved rights, and are appurtenant to the land that is irrigated. Because the lands are not part of the Reservation, they are administered by the WSEO. Any state water rights that overlap Tribal reserved or Walton rights were cancelled through Phase III of the General Adjudication process.

In the Big Horn Adjudication, the Wyoming Supreme Court ruled that the Winters Doctrine does not include groundwater. Therefore, there are no federal reserved groundwater rights on the reservation. However, groundwater on the reservation is administered by the Tribes, with groundwater permits issued by the Water Resources Control Board and TWE. There are approximately 685 adjudicated groundwater wells on the reservation which were confirmed by the Court during the case.

Phase II of the Big Horn Adjudication quantified non-Indian federal reserved water rights within the Basin. This included cooperation with federal agencies such as the Bureau of Land Management, Forest Service and the National Park Service. Surface water rights were adjudicated for reservoirs, stock reservoirs, and instream flows, while groundwater rights were adjudicated for springs and wells. Uses include stock, domestic, firefighting, and public water reserves.

Phase III quantified the remaining non-federal water rights, including all typical surface water and groundwater rights within the Basin. Approximately 4,000 permits have been adjudicated; all permits have now been inspected and reported to the court for final disposition. There remains a possibility of re-inspection of several large irrigation districts within the Basin. Phase III also included the adjudication of groundwater wells. Over 7,000 stock and domestic wells were adjudicated, as well as an additional 1,000 wells for other uses.

The Wyoming Judicial Branch website (http://bhrac.courts.state.wy.us/) contains electronic copies of important documents in the Big Horn Adjudication, including a history of the adjudication, reports of the Special Master, court rulings, stipulations and decrees, and water rights tabulations.

3.3.4 Contracts and Agreements

In a 1985 agreement with the United States of America, covering the Buffalo Bill Dam Modifications which raised the dam 25 feet and increased storage capacity, Wyoming acquired approximately 190,000 acre-feet of space from the 644,540 acre-feet total upsized capacity of Buffalo Bill Reservoir. Wyoming and the USBR provide winter releases, beginning in October and ending with the onset of the irrigation season, that range from a minimum of 100 cfs to a maximum of 350 cfs. During normal and wet cycles the majority of the winter releases come from the Wyoming account. A maximum winter release of 50 cfs accrues to the original reservoir before undertaking the Buffalo Bill Modifications project. The actual release is dependent upon reservoir inflows and the amount of carry-over storage remaining in Wyoming's 190,000 acre-feet storage account. During periods of drought, the winter 100 cfs releases equally debit the Wyoming account and the USBR's original storage space, which was available before the Buffalo Bill Modifications project (WWC 2007).

After winter releases are considered, Wyoming's Buffalo Bill Reservoir account yields 20,000 acre-feet on a firm annual basis. Further, during normal and wet cycles, up to an additional 10,000 acre-feet of water, whenever available, may be marketed for irrigation, municipal, or industrial purposes. Before a water sale contract can be executed, the required NEPA review must be completed, and the potential sale must first be approved by the WWDC and the Governor. As of the date of printing this report, the State has not marketed any of its Buffalo Bill storage water (Ogle 2010).

Currently, there are no defined winter release schedules for Boysen Reservoir. The U.S. Bureau of Reclamation (USBR) Wyoming Area Office "prepares an annual operating plan that identifies the projected winter released from Boysen Reservoir in early October. While the winter releases identified in the operating plan may vary slightly, they are generally adhered to for the winter months. Further, the operating plan is updated monthly throughout the year to reflect current conditions. The annual operating plan including monthly updates are provided to the State Engineer's Office Division III Superintendent as well as made available to the public online at http://www.usbr.gov/gp/lakes_reservoirs/wareprts/expectedboy.pdf" (Lawson 2010). However, the Basin Advisory Group and the Division III superintendent have expressed interest in a more defined and predictable winter release schedule for Boysen Reservoir.

3.3.5 Water Quality Laws

This section provides a general overview of state and federal water quality laws and regulations. A more detailed discussion of surface water quality in the Basin is presented in Section 4.1.2. The Environmental Quality Act was passed by the Wyoming legislature in 1973.[3] The purpose of the law was to address the concern that pollution "will imperil public health and welfare, create public and private nuisances, be harmful to wildlife, fish and aquatic life, and impair domestic, agricultural, industrial, recreational and other beneficial uses." The act authorized the state "to prevent, reduce and eliminate pollution; to preserve, and enhance the water and reclaim the land of Wyoming; to plan development, use, reclamation, preservation and enhancement of the air, land, and water resources of the state; to preserve and exercise the primary responsibilities and rights of the state of Wyoming; to secure cooperation between agencies of the state, agencies of other states, interstate agencies, and the federal government in carrying out these objectives" (WDEQ 1973).

[3] This section adapted from Framework Plan.

The State of Wyoming has designated the Water Quality Division (WQD) of the Wyoming Department of Environmental Quality (WDEQ) to oversee water quality and enforce the Environmental Quality Act. This is being done through a number of programs that have been set up to control various forms of potential pollution. Pollution can come from point and nonpoint sources and can affect surface water and groundwater.

The WQD developed water quality standards which are documented in Chapter 1, Wyoming Water Quality Rules and Regulations, and are available on the WQD website at http://deq.state.wy.us/wqd/WQDrules/Chapter_01.pdf. The surface water quality standards are divided based on four surface water classifications (WDEQ 2007):

Class 1, Outstanding Waters. Class 1 waters are those surface waters in which no further water quality degradation by point source discharges other than from dams will be allowed. Nonpoint sources of pollution shall be controlled through implementation of appropriate best management practices. Pursuant to Section 7 of these regulations, the water quality and physical and biological integrity which existed in the water at the time of designation will be maintained and protected. In designating Class 1 waters, the Environmental Quality Council shall consider water quality, aesthetic, scenic, recreational, ecological, agricultural, botanical, zoological, municipal, industrial, historical, geological, cultural, archaeological, fish and wildlife, the presence of significant quantities of developable water and other values of present and future benefit to the people.

Class 2, Fisheries and Drinking Water. Class 2 waters are waters, other than those designated as Class 1, that are known to support fish or drinking water supplies or where those uses are attainable. Class 2 waters may be perennial, intermittent or ephemeral and are protected for the uses indicated in each sub category. There are five subcategories of Class 2 waters (2AB, 2A, 2B, 2C and 2D).

Class 3, Aquatic Life Other than Fish. Class 3 waters are waters, other than those designated as Class 1, that are intermittent, ephemeral or isolated waters and because of natural habitat conditions, do not support nor have the potential to support fish populations or spawning, or certain perennial waters which lack the natural water quality to support fish (e.g., geothermal areas). Class 3 waters provide support for invertebrates, amphibians, or other flora and fauna which inhabit waters of the state at some stage of their life cycles. Uses designated on Class 3 waters include aquatic life other than fish, recreation, wildlife, industry, agriculture and scenic value. Generally, waters suitable for this classification have wetland characteristics, and such characteristics will be a primary indicator used in identifying Class 3 waters. There are four subcategories of Class 3 waters (3A, 3B, 3C and 3D).

Class 4, Agriculture, Industry, Recreation and Wildlife. Class 4 waters are waters, other than those designated as Class 1, where it has been determined that aquatic life uses are not attainable pursuant to the provisions of Section 33 of [the] regulations. Uses designated on Class 4 waters include recreation, wildlife, industry, agriculture and scenic value.

Groundwater Quality

The State of Wyoming has identified the following standards for different classes of groundwater as described below (WDEQ 2005). Full rules for groundwater quality are on the WQD website at http://deq.state.wy.us/wqd/WQDrules/Chapter_08.pdf.

- Class I groundwater is defined as groundwater suitable for domestic use.
- Class II groundwater is defined as groundwater suitable for agricultural use where soil conditions and other factors are adequate.
- Class III groundwater is defined as groundwater suitable for stock use.
- Class Special (A) groundwater is defined as groundwater suitable for fish and aquatic life.
- Class IV groundwater is defined as groundwater suitable for industry.
- Class V groundwater is defined as groundwater found closely associated with commercial deposits of hydrocarbons, or groundwater which is considered a geothermal resource.
- Class VI groundwater is defined as groundwater that may be unusable or unsuitable for use.

Table 9 includes additional information regarding the standards for Classes I, II, and III.

Table 9. WDEQ Groundwater Quality Standards

Constituent	Class I (domestic)	Class II (agricultural)	Class III (livestock)
Chloride (mg/L)	250	100	2,000
Iron (mg/L)	0.3	5	
Sulfate (mg/L)	250	200	3,000
TDS (mg/L)	500	2,000	5,000
SAR[1] (mg/L)		8	

Notes:

[1] Sodium Adsorption Ratio (SAR) has been found to be important with respect to use of Coal Bed Natural Gas (CBNG) waters for irrigation.

The U.S. Environmental Protection Agency (USEPA) regulates public drinking water supplies in Wyoming since the state has not assumed primacy for this Clean Water Act program. This program provides comprehensive regulation of both surface and groundwater supplies, including enforceable standards for organic and inorganic constituents, complex filtration and disinfection requirements for surface water or groundwater determined to be under the influence of surface water, and monitoring and reporting requirements to ensure compliance. Although these rules and regulations continue to evolve, groundwater is widely considered to be a more desirable source of drinking water if it is available, due to substantially less expensive compliance requirements. Table 10 provides a partial listing of the inorganic constituents for which the USEPA has promulgated Maximum Contaminant Levels (MCL). “Primary” standards are based on human health effects and are required to be met. “Secondary” standards are based on the aesthetics of drinking water and are advisory.

Table 10. Drinking Water Standards

Constituent (unit)	USEPA Maximum Contaminant Level Primary	Secondary
MAJOR IONS (mg/L)		
Chloride		250
Fluoride	4	2
Nitrogen, Nitrate+Nitrite as N	10	
Nitrogen, Nitrite as N	1	
Sulfate	250	
NON-METALS (mg/L)		
Cyanide	0.2	
PHYSICAL PROPERTIES		
Color (color units)		15
Corrosivity (unitless)		non-corrosive
Odor (threshold odor number)		3
pH (standard units)		6.5 - 8.5
Total Dissolved Solids (mg/L)		500
Surfactants (methylene blue active substances)		0.5
METALS - TOTAL (mg/L)		
Aluminum		0.05 - 0.2
Antimony	0.006	
Arsenic	0.01	
Barium	2	
Beryllium	0.004	
Cadmium	0.005	
Chromium	0.1	
Copper	1.3	1
Iron	0.3	0.3
Lead	0.015	
Manganese		0.05
Mercury	0.002	
Nickel	0.1	
Selenium	0.05	
Silver		0.1
Thallium	0.002	
Uranium	0.03	
Zinc		5
RADIONUCLIDES - TOTAL (pico Curies per liter)		
Gross Alpha	15	
Gross Beta	50	
Radium 226 + Radium 228	5	

Chapter 8 of the Wyoming Water Quality Rules and Regulations addresses groundwater quality standards and protection. These rules are enforced by the WDEQ (WDEQ 2004). Chapter 8 describes various classifications that have been created for groundwater and outlines the rules for discharges to these waters, and are available at http://deq.state.wy.us/wqd/WQDrules/Chapter_08.pdf. Additional information regarding groundwater quality can be found in the groundwater characterization portion of Chapter 4 of the Framework Water Plan.

Surface Water Quality

The Clean Water Act requires that a 305(b) report be created which covers statewide water quality, along with a 303(d) list, of impaired streams in the state. Impaired streams require the establishment of total maximum daily loads (TMDLs) for problem pollutants. A TMDL is the amount of

a specific pollutant that a water body can receive and assimilate in a given time period and still meet water quality standards.

The classification of a stream indicates what use is being or can be supported by that stream. In general, the water quality in Wyoming is good based upon the number of water bodies supporting their designated uses. Wyoming's 305(b) State Water Quality Assessment Report produced by WDEQ includes 303(d) listings. The 2008 303(d) listing includes 27 reaches of impaired stream and one impaired lake (Ocean Lake) within the Basin (WDEQ 2008). With one exception, all impairment listings are due to bacteria that affects water bodies with recreation beneficial uses. Ocean Lake is impaired for aquatic life due to sediment. More information on these reaches is presented in Section 4.1.2.

3.3.6 Environmental Laws

Numerous federal legislative efforts have authorized the remediation and protection of water quality and the environment[4]. These include the Clean Water Act, Pollution Prevention Act, Safe Drinking Water Act, Clean Air Act, NEPA, Solid Waste Disposal Act, Toxic Substance Control Act, and Federal Insecticide, Fungicide and Rodenticide Act. Most of the federal programs involved with water quality allow individual states to obtain primacy to administer the federal programs. The USEPA can step in if a state is not conducting the program to their satisfaction, even if the state has primacy.

The following is a list of water development and management actions that can initiate or trigger federal environmental laws. A discussion of applicable federal legislation is presented following the list.

- Issuance and renewal of special use and right-of-way permits on federal lands.
- Contracting for storage water from federal reservoirs.
- Discharge of dredged and/or fill material into waters of the United States, including rivers, streams, and wetlands.
- Procurement and renewal of licenses from the Federal Energy Regulatory Commission (FERC) to produce hydropower.
- Use of federal loan or grant funds to construct a new water project or rehabilitate an existing water project.

Key applicable federal legislation includes the following acts:

<u>Endangered Species Act</u>

The Endangered Species Act of 1973 (ESA) requires the Secretary of Interior, through the U.S. Fish and Wildlife Service (USFWS), to determine whether wildlife and plant species are endangered or threatened based on the best available scientific information. The ESA constrains all federal agencies from taking any action that may jeopardize the continued existence of an endangered or threatened species. If a federal agency is considering an action that may jeopardize an endangered species, Section 7 of the ESA requires that the agency must consult with the USFWS.

[4] This section adapted from Framework Plan.

National Environmental Policy Act

The National Environmental Policy Act of 1969 (NEPA) requires that federal agencies consider all reasonable foreseeable environmental consequences of their proposed actions. A review of an action under NEPA can be in the form of a simple finding of no significant impact (FONSI), environmental assessment (EA), or an EIS and record of decision. Further, NEPA requires federal decision-makers to "study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources" (42 USC 4321 et seq., Sec. 102(2)E). NEPA provides federal agencies the opportunity to determine which alternative, including no action, they feel best serves the applicant's purpose and need. The alternative selected by the federal agency may differ from the one preferred by the applicant.

Clean Water Act

Section 404 of the Clean Water Act of 1972 prohibits discharging dredged or fill materials into waters of the United States without a permit from the USCOE. The waters of the United States include rivers and streams and, as of 1993, wetlands. USCOE policy requires applicants for 404 permits to avoid impacts to waters of the U.S. to the extent practicable, then minimize the remaining impacts, and finally take measures to mitigate unavoidable impacts. In addition to the alternative review required by NEPA, Section 404(b)(1) guidelines require an alternative review to define the least environmentally damaging practicable alternative.

Section 401 of the Clean Water act provides that the State of Wyoming certify any federally licensed or permitted facility which may result in a discharge into the waters of the state. The 401 certification provides a mechanism for Wyoming to amend, or perhaps veto, an action that the federal agency might otherwise permit. While the 401 certifications are required for several federal actions, most 401 certifications relate to Section 404 Dredge and Fill Permits required from the USCOE.