Platte River Basin Plan 2016 Update
Volume 3
Basin Surface Water Use Profile




Prepared for:

Wyoming Water Development Commission

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In Association With:
Lidstone & Associates, a Wenck Company
Harvey Economics
HDR Engineering

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VOLUME 3
BASIN SURFACE WATER USE PROFILE

December 2016

Explanation of Cover Photos

Lake Marie in the Snowy Range Mountains. Lake Marie lies south in the shadow of the quartzite massif of 12,847-foot Medicine Bow Peak at an elevation of 11,000-feet. Winter and Spring precipitation in the Snowing Range constitutes an important portion of the water supply in the Platte River Basin.

The bald eagle (*Haliaeetus leucocephalus*, from Greek hali "sea", aiētos "eagle", leuco "white", cephalos "head"). It is a common, frequently observed breeding and winter resident in the North Platte Basin of Wyoming. The bird is strongly associated with large rivers, lakes and reservoirs with an abundant food supply and riparian environments with large trees used for roosting and nesting. The bald eagle is an opportunistic predator which subsists primarily on fish. During the winter, they also feed on dead or injured waterfowl and road or winter killed deer and antelope. The bald eagle is both the national bird and national animal of the United States of America. It is the most familiar success story of the Federal Endangered Species Act. During the latter half of the 20th century it was on the brink of extirpation in the contiguous United States and was one of the first species to receive protections under the precursor to the Endangered Species Act in 1967. Populations have since recovered and the species was removed from the U.S. government's list of endangered species on July 12, 1995 and transferred to the list of threatened species. It was removed from the List of Endangered and Threatened Wildlife in the Lower 48 States on June 28, 2007 but remains protected under the provisions of the Bald and Golden Eagle Protection Act.

Historical photo of flood irrigation. Flood irrigation is an ancient method of irrigating crops and was the first form of irrigation used by humans as they began cultivating crops. In the Platte River Basin, it is still commonly used to irrigate grass hay. In areas of the Platte River Basin where higher value crops are raised such as corn, sugar beets and alfalfa hay, conversion to sprinkler irrigation has the dual benefits of improved crop yields while conserving water.

The Dave Johnston Power Plant is named for W.D. “Dave” Johnston a former PacifiCorp Vice-President. The plant generates power by burning coal that produces steam under high pressure. The steam drives turbines and the turbine blades to engage generator that produce electricity. The plant was commissioned in 1958. There have been four phases of plant expansion to-date and numerous upgrades to comply with changing environmental requirements. The present power generation capacity is 817 megawatts.

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The Platte River Basin Plan 2016 Update is a planning tool developed for the Wyoming Water Development Office. It presents estimated current and estimated future uses of water in Wyoming's Platte River Basin. The Plan is not intended to be used to determine compliance with the administration of state law, federal law, court decrees, interstate compacts, or interstate agreements.

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Industrial Reservoirs Permitted by the Wyoming SEO Since the 2006 Platte River Basin Plan

3.0 Basin Surface Water Use Profile

3.1 SUMMARY

"Our lifestyle, our wildlife, our land and our water remain critical to our definition of Wyoming and to our economic future."

- Dave Freudenthal, Former Governor of Wyoming

The water supplies in the Platte Basin significantly contribute to the economy of the entire State of Wyoming. The Platte region is home to 44% of the State's population and supports a diversified economic base of agricultural, industrial, government, education, and recreation resources. The water uses that were evaluated in this study are the industrial, municipal, agricultural, recreational and environmental sectors.

3.1.1 Industrial Use

Since 2004, the types of industrial water use have not changed appreciably in the Platte River Basin. The principal industrial users continue to include oil and gas, coal and uranium as well as power generation, aggregate mining, cement production, chemical processing and ethanol production. Overall, annual industrial water use is estimated to be approximately 147,950 acre-feet. Increases in industrial water use were limited to a few areas. The Pathfinder to Guernsey Subbasin experienced the most robust increase in industrial water use with additional groundwater production to serve the oil and gas industry near Douglas and uranium mining near Glenrock. Industrial activity increased the subbasin's percentage of total water use in the Platte River Basin from 36.4 to 38.0%. The South Platte Subbasin also witnessed an increase in industrial water use with the addition of a new power plant, dairy, and oil and gas development. This industrial activity raised the subbasin's percentage of total water use from 6.1% to 7.2%

3.1.2 Municipal and Domestic Use

There are 54 community public water systems located within the seven subbasins of the Platte River Basin. Since the completion of the 2006 Basin Plan, additional water usage data have been developed and compiled through master planning projects sponsored by the Wyoming Water Development Commission (WWDC), the Wyoming State Engineer's Office (SEO) annual municipal water use surveys and the WWDC's public water system surveys.

Groundwater remains a significant water supply for municipal and domestic users. Since January 1, 2004, 32 new wells or enlargements have been filed with the SEO for municipal use. Between January 1, 2004 and January 26, 2015, 5,043 domestic well permits were obtained and presumably completed within the subbasins of the Platte River Basin. An assumed per capita usage rate of 150 to 300 gpd was used to calculate rural domestic water usage for each of the subbasins. With a total rural population of approximately 20,000, the South Platte subbasin has the highest estimated usage at approximately 3.0 to 6.0 million gpd. The Pathfinder to Guernsey subbasin had the second highest usage estimated at 1.8 to 3.6 million gpd. With the lowest rural population, the Horse Creek subbasin had the lowest estimated usage at 0.2 to 0.4 million gpd. Municipal use accounts for 6.1% to 7.2% percent of the South Platte subbasin's total groundwater use.

3.1.3 Irrigation Use

Surface water and groundwater are both used for irrigation purposes in the Platte River Basin. Trihydro (2006) and The Wyoming Geological Survey tabulated the quantities of

permitted irrigation groundwater rights. Total annual average groundwater withdrawals f or irrigation were estimated to be 206,745 acre-feet (Taucher and others, 2013). Assuming surface water is applied at a rate of 1 cubic foot per second (cfs) per 70 acres, total surface water use during the irrigation season based on the number of irrigated acres in 2012 would be approximately 2.4 million acre-feet.

3.1.4 Recreation and Environmental Use

There are numerous and excellent water-based recreational opportunities in most of the Platte subbasins, primarily flat water boating, swimming, river rafting and stream fishing. There are also extensive environmental water uses, including wetland areas, crucial habitat areas and in-stream flows. Overall, almost all of the environmental and recreational uses (E&R) uses in the Basin have been determined to be protected or complementary. Of those that are competing, most are likely already unavailable in many years due to over-appropriation of Basin water resources.

3.1.5 Water Use from Storage

The reservoirs above Pathfinder have permitted and actual active storage capacities that exceed 18,000 ace-feet so the potential exists for Wyoming to exceed the cap in any one year. The records reviewed for the largest reservoirs instrumented with new measuring devices confirmed that most reservoirs filled nearly every year except when affected by severe drought conditions or when reservoir or conveyance deficiencies prevented their physical ability to store water.

During drought periods, the reservoir owners are intentionally saving water to conserve water supplies for the following year so the storage space available for accruals the following year is physically limited. Some reservoir owners are also increasing reservoir carry-over amounts to serve other beneficial uses such as fishery or recreational purposes. HDR's structural and non-structural recommendations are based on the water storage analysis performed on the reservoirs storing for irrigation purposes above Pathfinder Reservoir exclusive of Seminoe Reservoir. The implementation of one or more of the stated alternatives could assist Wyoming in maximizing the annual accrual quantities.

Constructing new reservoirs or enlarging existing irrigation reservoirs are challenging projects to implement. The siting of new reservoirs would require the need to evaluate suitable reservoir sites and consider the environmental effects of each site to address the environmental permitting requirements. Water supply alternative analysis evaluations would also be a National Environmental Policy Act (NEPA) requirement for a reservoir enlargement project. The permitting process will require NEPA compliance for the issuance of federal permits or required right-of-way agreements on federal lands. Wyoming's compliance with the Platte River Recovery Implementation Program (PRRIP) and Wyoming's Depletions Plan will need to be considered for either alternative. A new irrigation reservoir would require the need for a local sponsor that could provide a share of the overall capital costs.

A potential non-structural recommendation is to facilitate the coordination of storage accruals amongst the reservoir owners. Coordination with reservoir owners on an annual basis could occur that would allow maximizing storage accruals occurring in Wyoming in any one year. This approach requires cooperation between the SEO and the entities responsible for coordinating the individual reservoir owners. The reservoir owners of the largest reservoirs with measuring device equipment may be the most amenable to this coordination approach based on their previous coordination with the State of Wyoming. The largest reservoirs represent the most efficient entities to accomplish this cooperation alternative due to their size and the practicality of coordinating with fewer reservoir owners.

Another potential non-structural alternative is to consider the reservoir storage water right and its function of serving irrigation purposes. A portion of the active reservoir storage in the larger reservoirs could be better defined and modified within a Wyoming Board of Control change of use petition process to eliminate the requirement and the need to track the storage under the Modified Decree requirements. For example, the portion of storage that is for the purposes of meeting fishery or recreation beneficial uses could be formally designated for that purpose within the reservoir storage water right. The portion of the storage water right for in-place environmental or recreation uses should not be included in the SEO reporting or storage water dedicated to meeting irrigation purposes.

Graphic summaries of water usage in the Platte River Basin are presented in **Figures 3.1.1 – 3.1.8**.

> **"It is life, I think, to watch the water. A man can learn so many things."**
>
> - Nicholas Sparks

Figure 3.1.1 Estimated Annual Yield vs. Estimated Annual Consumptive Use in Platte River Subbasins

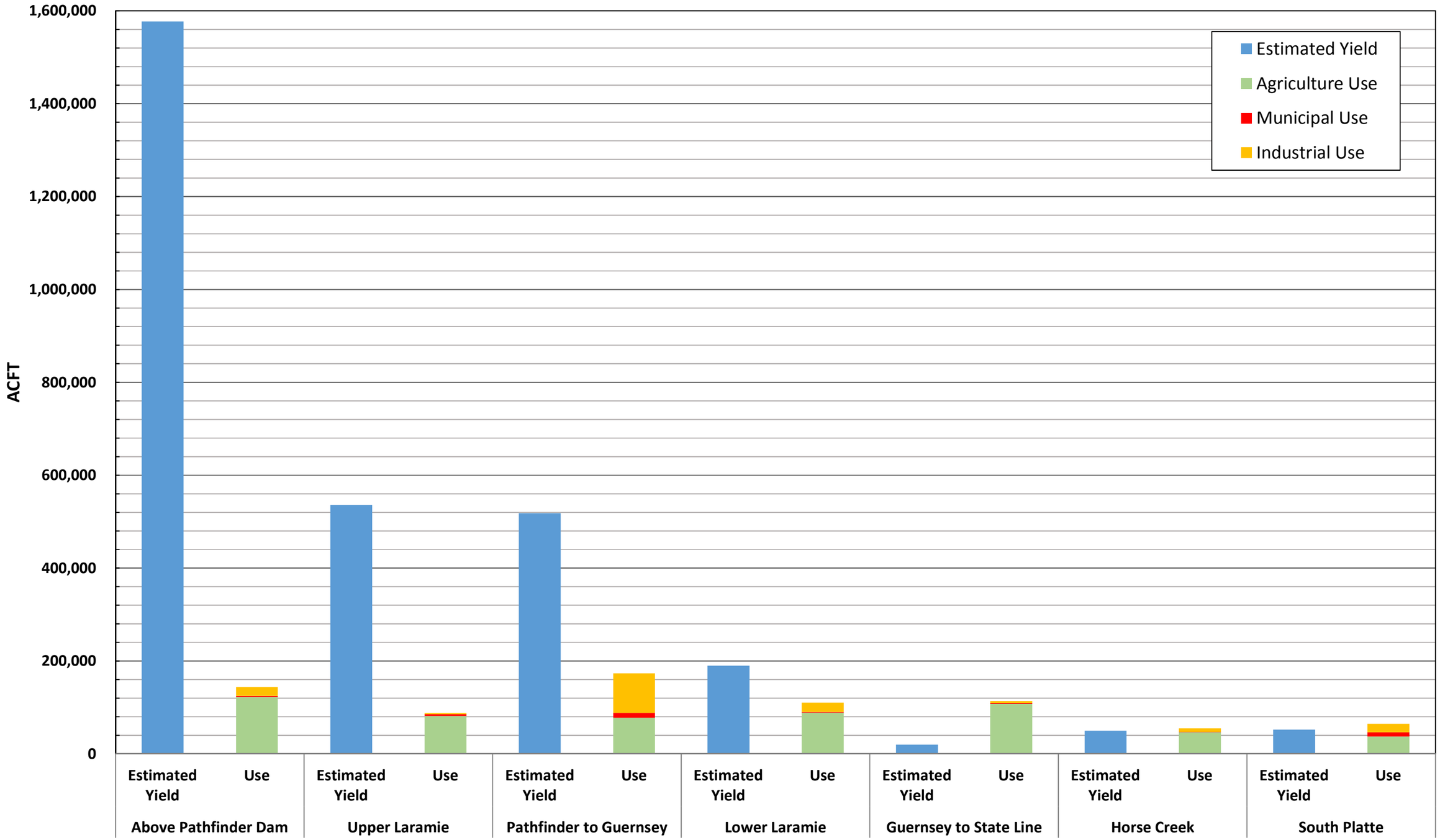

Figure 3.1.2
Overall Water Use Profile within the Above Pathfinder Subbasin

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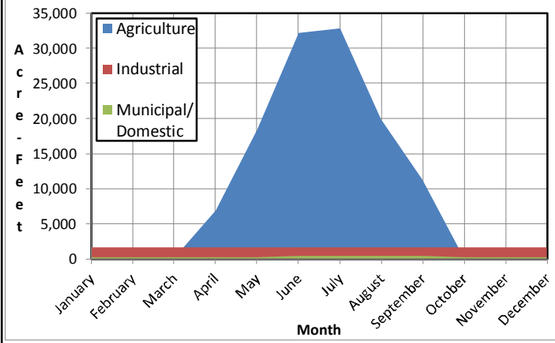
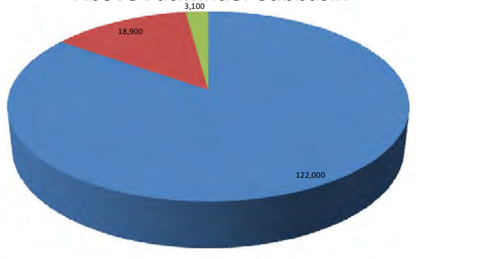
Estimated Monthly Consumptive Use in an Average Year in Acre Feet Above Pathfinder Subbasin

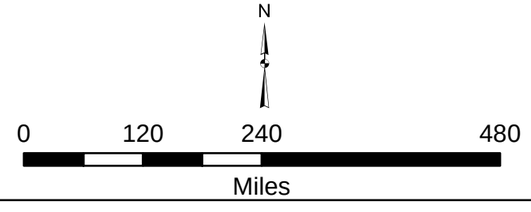


Total Annual Consumptive Use in Acre Feet in an Average Year Above Pathfinder Subbasin



Total of All uses = 144,000 Acre Feet
2012 Irrigated Acreage = 123,651 Acres

Agriculture Industrial Municipal/Domestic



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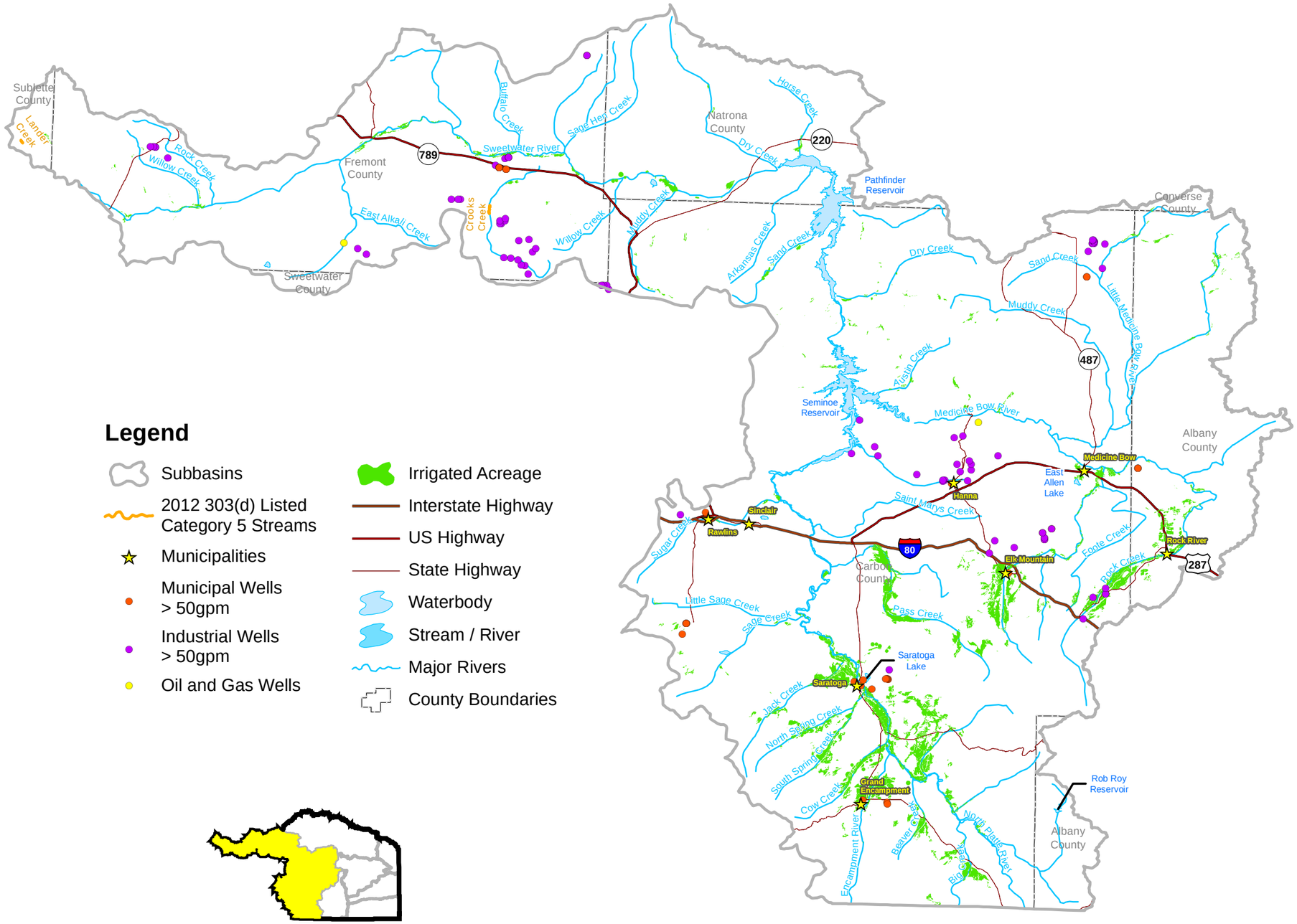

Legend

- Subbasins
- 2012 303(d) Listed Category 5 Streams
- Municipalities
- Municipal Wells > 50gpm
- Industrial Wells > 50gpm
- Oil and Gas Wells
- Irrigated Acreage
- Interstate Highway
- US Highway
- State Highway
- Waterbody
- Stream / River
- Major Rivers
- County Boundaries

Figure 3.1.3
Overall Water Use Profile within the Pathfinder to Guernsey Subbasin

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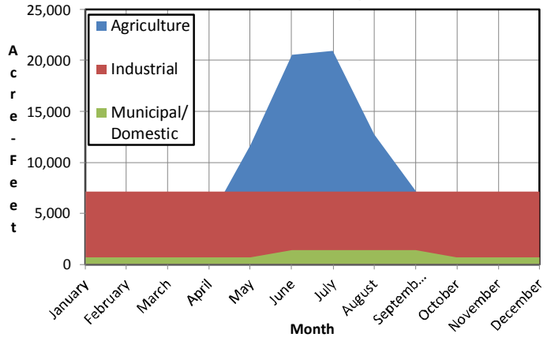
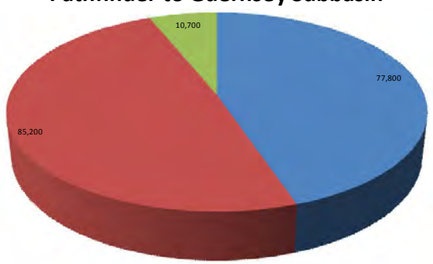
Estimated Monthly Consumptive Use in an Average Year in Acre Feet
Pathfinder to Guernsey Subbasin



Total Annual Consumptive Use in Acre Feet in an Average Year
Pathfinder to Guernsey Subbasin



Total of All uses = 173,700 Acre Feet
2012 Irrigated Acreage = 65,114 Acres

Agriculture Industrial Municipal/Domestic

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Miles

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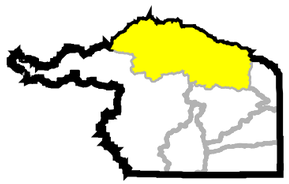

Legend

- Subbasins
- Municipalities
- 2012 303(d) Listed Category 5 Streams
- Municipal Wells > 50gpm
- Industrial Wells > 50gpm
- Oil and Gas Wells
- Aquatic Conservation Areas
- Irrigated Acreage
- Interstate Highway
- US Highway
- State Highway
- Waterbody
- Stream / River
- Major Rivers
- County Boundaries

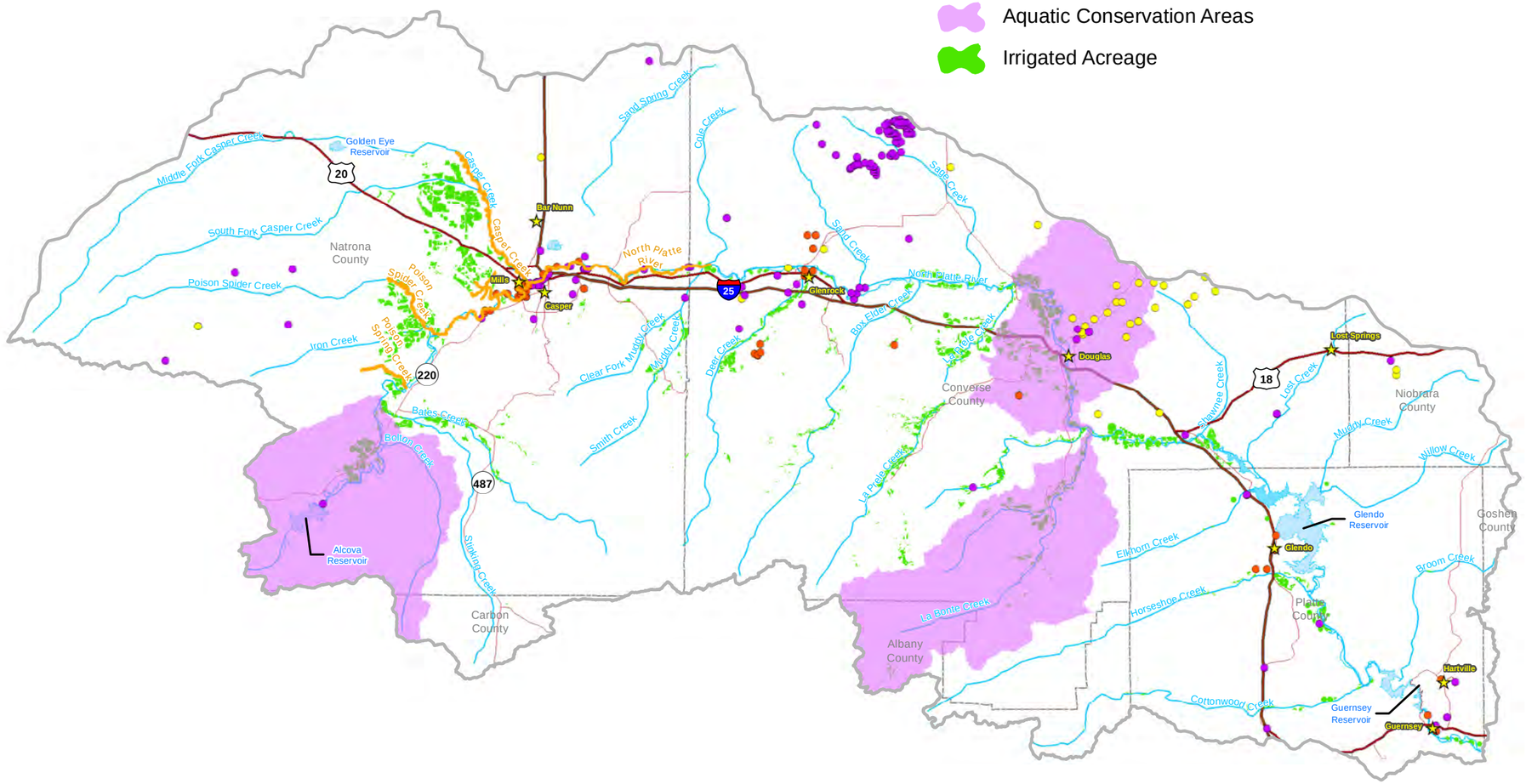

Figure 3.1.4
Overall Water Use Profile in the Guernsey to State Line Subbasin

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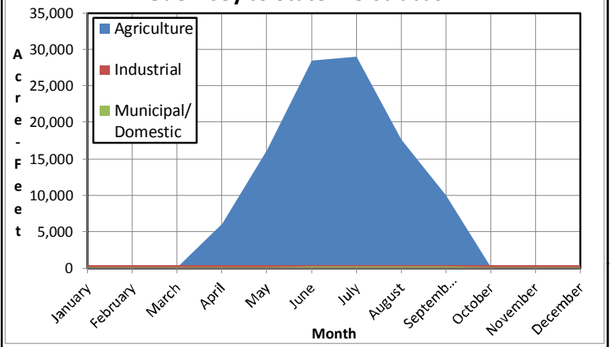
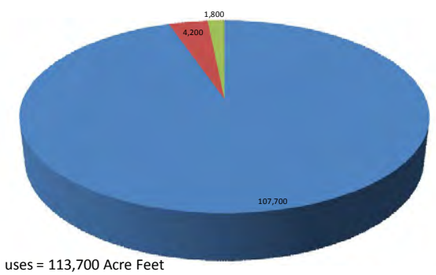
Estimated Monthly Consumptive Use in an Average Year in Acre Feet
Guernsey to Stateline Subbasin

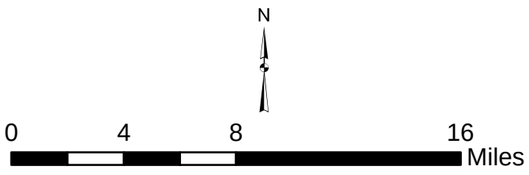


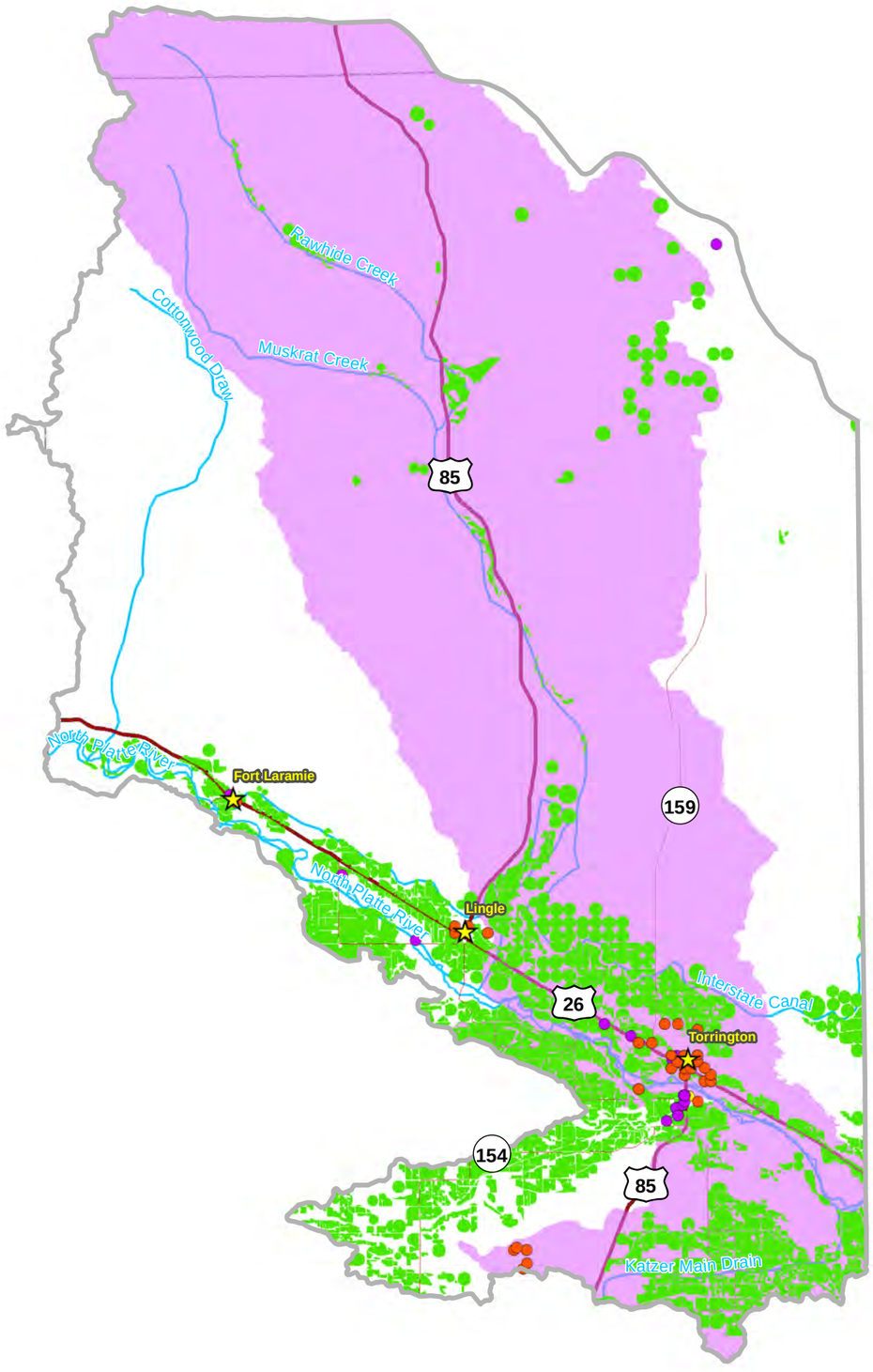
Total Annual Consumptive Use in Acre Feet in an Average Year
Guernsey to State Line Subbasin

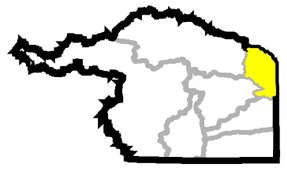


Total of All uses = 113,700 Acre Feet
2012 Irrigated Acreage = 80,585 Acres

Agriculture Industrial Municipal/Domestic







Legend

- Subbasins
- Municipalities
- 2012 303(d) Listed Category 5 Streams
- Municipal Wells > 50gpm
- Industrial Wells > 50gpm
- Oil and Gas Wells
- Irrigated Acreage
- Aquatic Conservation Areas
- Interstate Highway
- US Highway
- State Highway
- Waterbody
- Stream / River
- Major Rivers
- County Boundaries

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Figure 3.1.5
Overall Water Use in the Upper Laramie Subbasin

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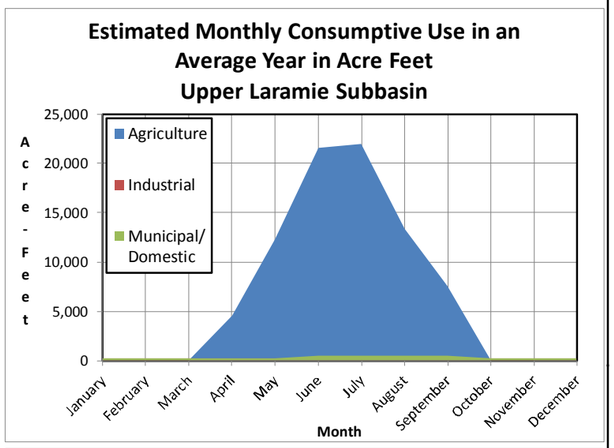

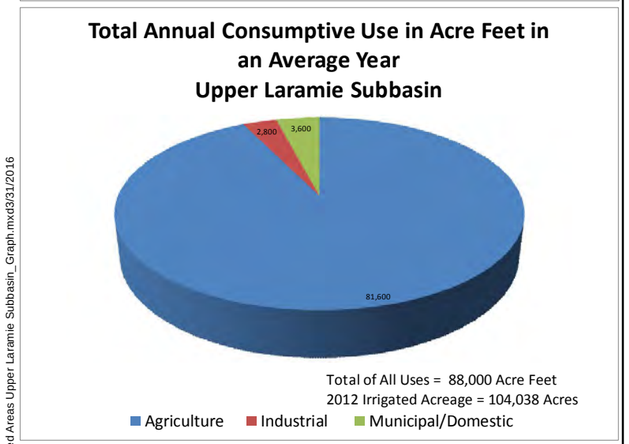

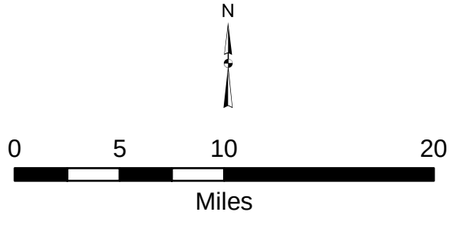

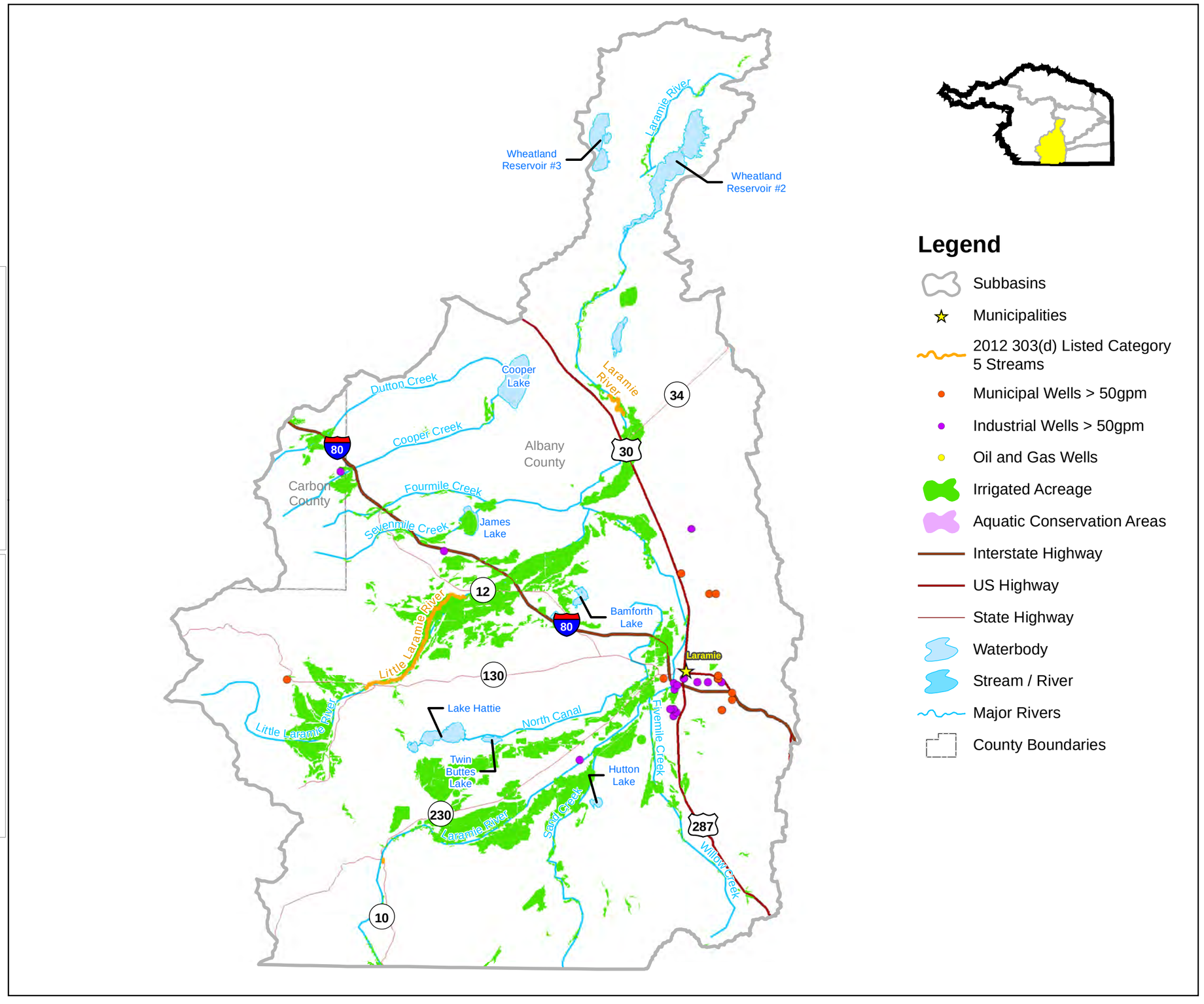

Legend

- Subbasins
- Municipalities
- 2012 303(d) Listed Category 5 Streams
- Municipal Wells > 50gpm
- Industrial Wells > 50gpm
- Oil and Gas Wells
- Irrigated Acreage
- Aquatic Conservation Areas
- Interstate Highway
- US Highway
- State Highway
- Waterbody
- Stream / River
- Major Rivers
- County Boundaries

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Figure 3.1.6
Overall Water Use Profile within the Lower Laramie Subbasin

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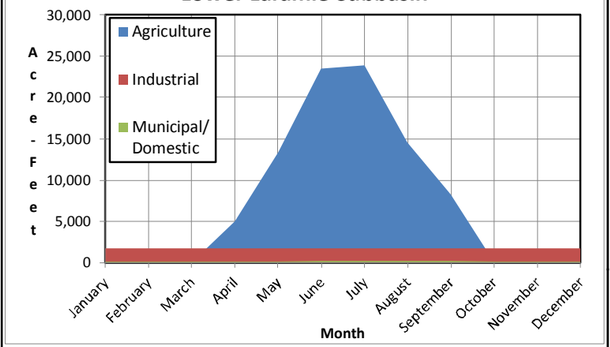
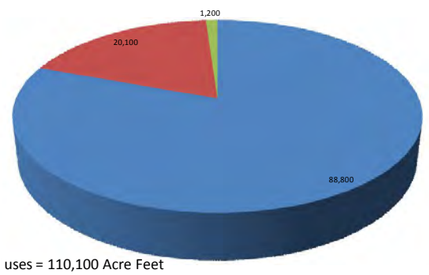
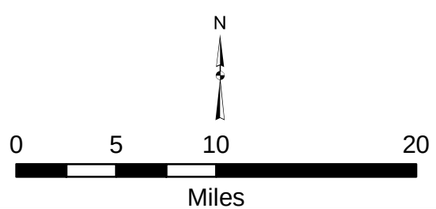
Estimated Monthly Consumptive Use in an Average Year in Acre Feet
Lower Laramie Subbasin

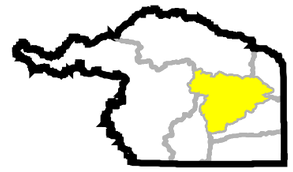


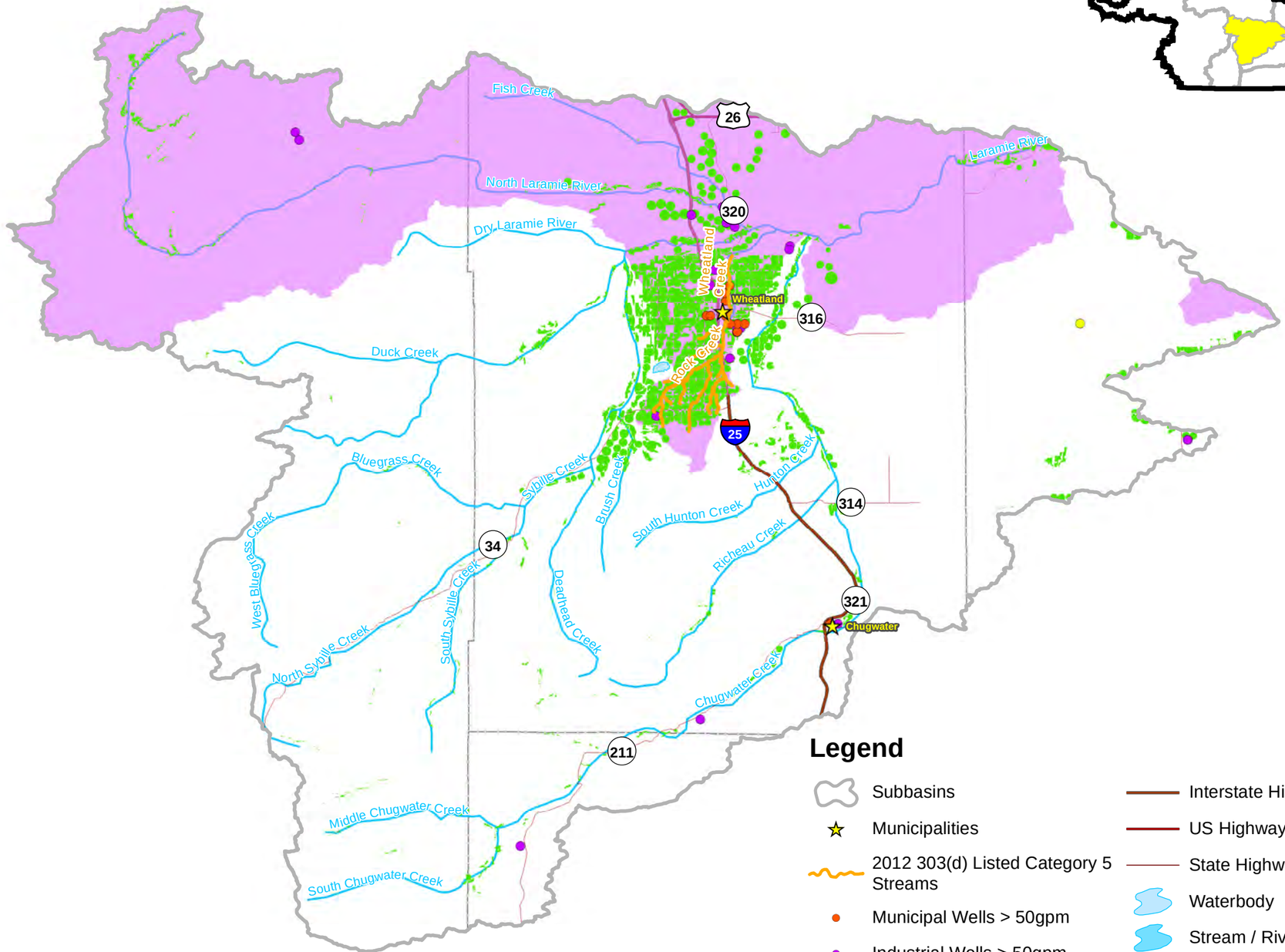
Total Annual Consumptive Use in Acre Feet in an Average Year
Lower Laramie Subbasin



Total of All uses = 110,100 Acre Feet
2012 Irrigated Acreage = 66,437 Acres
Agriculture Industrial Municipal/Domestic







Legend

- Subbasins
- Municipalities
- 2012 303(d) Listed Category 5 Streams
- Municipal Wells > 50gpm
- Industrial Wells > 50gpm
- Oil and Gas Wells
- Irrigated Acreage
- Aquatic Conservation Areas
- Interstate Highway
- US Highway
- State Highway
- Waterbody
- Stream / River
- Major Rivers
- County Boundaries

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Figure 3.1.7
Overall Water Use Profile within the Horse Creek Subbasin

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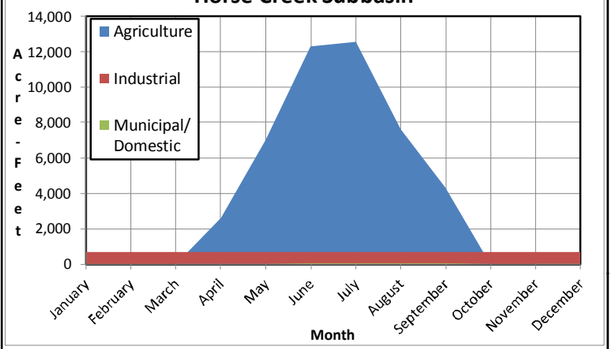
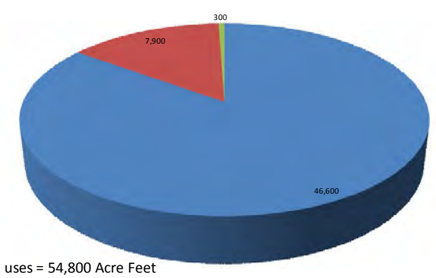
Estimated Monthly Consumptive Use in an Average Year in Acre Feet
Horse Creek Subbasin



Total Annual Consumptive Use in Acre Feet in an Average Year
Horse Creek Subbasin



Total of All uses = 54,800 Acre Feet
2012 Irrigated Acreage = 40,595 Acres
Agriculture Industrial Municipal/Domestic

N

0 5 10 20
Miles

Legend

- Subbasins
- Municipalities
- 2012 303(d) Listed Category 5 Streams
- Municipal Wells > 50gpm
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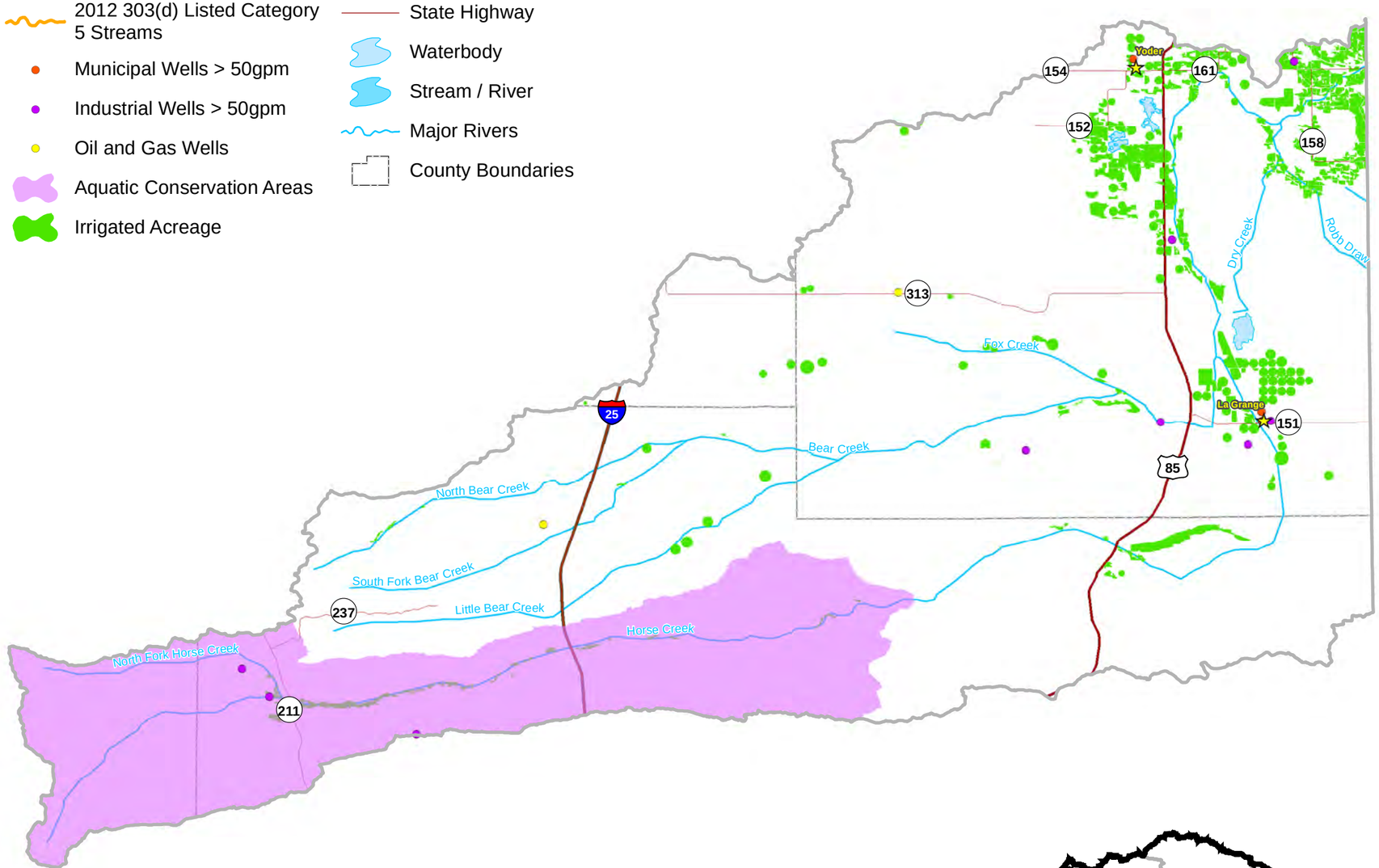

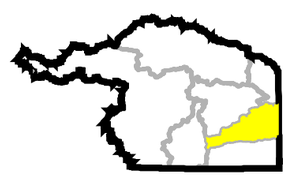

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Figure 3.1.8
Overall Water Use Profile within the South Platte Subbasin

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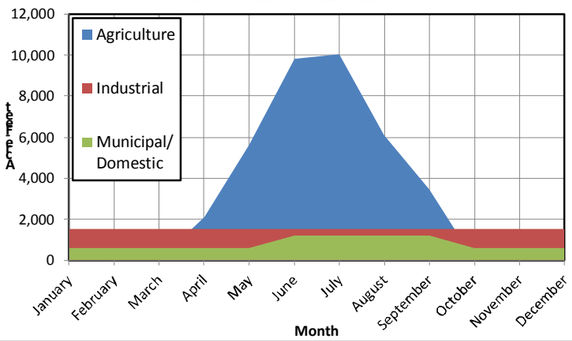
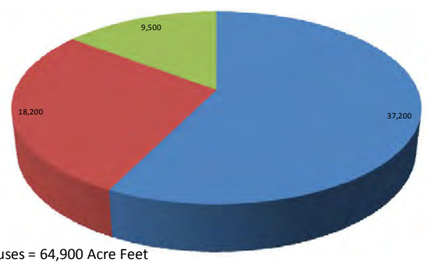
Estimated Monthly Consumptive Use in an Average Year in Acre Feet
South Platte Subbasin



Total Annual Consumptive Use in Acre Feet in an Average Year
South Platte Subbasin



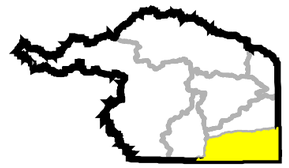
Total of All uses = 64,900 Acre Feet
2012 Irrigated Acreage = 43,223
Agriculture Industrial Municipal/Domestic

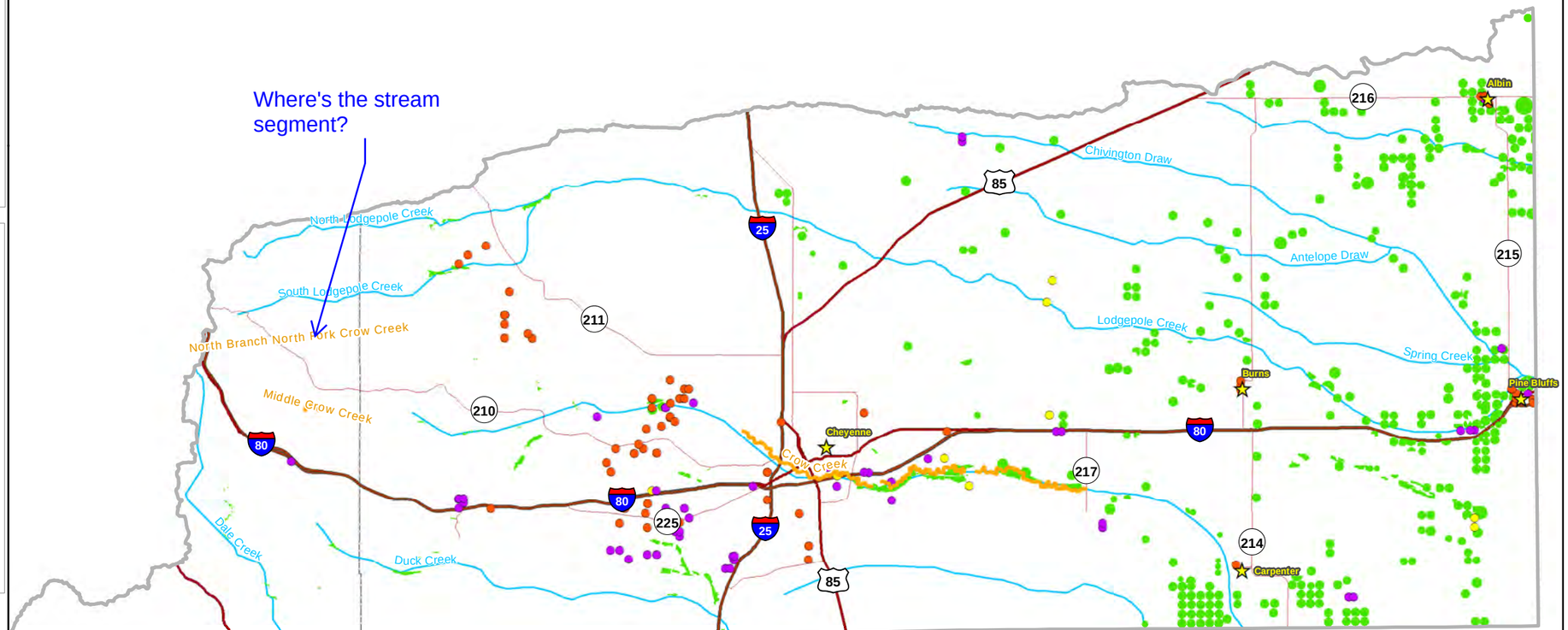
N

0 4.5 9 18
Miles

Legend

- Subbasins
- Municipalities
- 2012 303(d) Listed Category 5 Streams
- Municipal Wells > 50gpm
- Industrial Wells > 50gpm
- Oil and Gas Wells
- Aquatic Conservation Areas
- Irrigated Acreage
- Interstate Highway
- US Highway
- State Highway
- Waterbody
- Stream / River
- Major Rivers
- County Boundaries





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3.2 AGRICULTURE USE

3.2.1 Introduction

Section 3.2 presents an update on the agricultural use within the Platte River Basin of Wyoming. The principal focus of this update to the Platte River Basin Plan (Trihydro, 2006) has been a revision to the irrigated lands mapping and the consumptive use estimates associated with irrigated agriculture in the basin. This update relied heavily on information developed and maintained by the SEO for the Wyoming Depletions Plan.

3.2.2 Irrigation Systems

Trihydro (2006) provided a comprehensive overview of the irrigation systems established within each subbasin of the Platte River Basin in Technical Memorandum 2.1.3. The locations of the irrigation districts within the Platte River Basin are shown on **Figure 3.2.1**. Since the completion of that report, master plan studies have been completed through the WWDC for both the Goshen Irrigation District (Anderson Consulting Engineers, 2008) and Wheatland Irrigation District (Anderson Consulting Engineers, 2011). Briefly, these reports noted that significant infrastructure improvements were needed to various structures and conveyances to improve overall irrigation system efficiency.

In addition to the aforementioned reports, the WWDC's Irrigation System Survey Report (2012) was reviewed for the purpose of identifying irrigation systems in need of repairs. **Appendix 3-A,** Table 1 lists the irrigation systems within each subbasin, and presents a comparison of the issues that were noted during the original basin plan and now.

3.2.3 Platte River Basin Irrigated Acreage Update

Trihydro (2006) completed an irrigated lands map of the Platte River Basin that was based on several data sources spanning 1995-2001. Since 2006, the SEO has been completing annual inventories of the irrigated lands with the portions of the Platte River Basin that are subject to the Modified North Platte Decree of 2001. The SEO has not specifically delineated irrigated acreages with the following areas: South Platte Subbasin, Horse Creek Subbasin, the Casper Alcova Irrigation District, any closed surface water basins not tributary to the North Platte River, and any Glendo contract water (Hoobler, 2014). The irrigated lands within these areas were delineated and added to those identified by the SEO for 2012, the date of the most recent aerial photography dataset that could be used. Irrigated acreages from the previous Basin Plan (TriHydro, 2006) formed the basis of comparison for this study.

The current irrigated lands mapping for 2012 was composited from data acquired from several sources. These data sources included the following:

1. GIS mapped irrigated acreages for decree areas from 2011-2013 from the SEO (Hoobler, 2014).
2. GIS mapped agricultural acreages (irrigated and dryland) for Laramie County supplied by the Laramie County Assessor (Pavlica, 2014).
3. GIS mapped irrigated acreage from the Casper Alcova Irrigation District (Anderson Consulting, 2014).
4. Lidstone & Associates, a Wenck Company (LA), delineated acreages in the Horse Creek, Pathfinder to Guernsey, and South Platte subbasins using ArcGIS and US Department of Agriculture aerial photos (USDA, 2014).

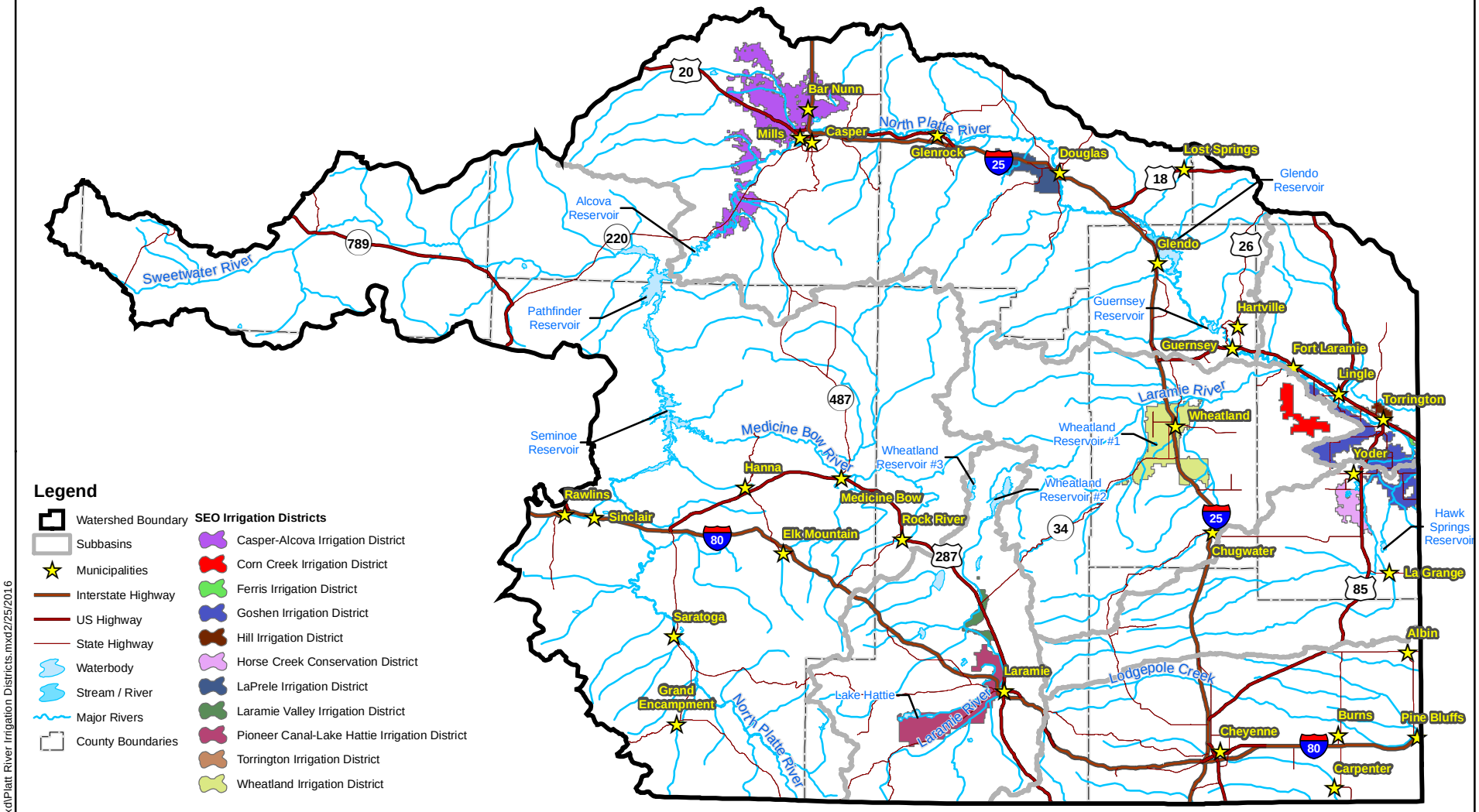

Figure 3.2.1
Irrigation Districts in the Platte Basin

WENCK ASSOCIATES
Responsive partner. Exceptional outcomes.

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3.2.4 GIS Mapped Irrigated Acreages, 2012

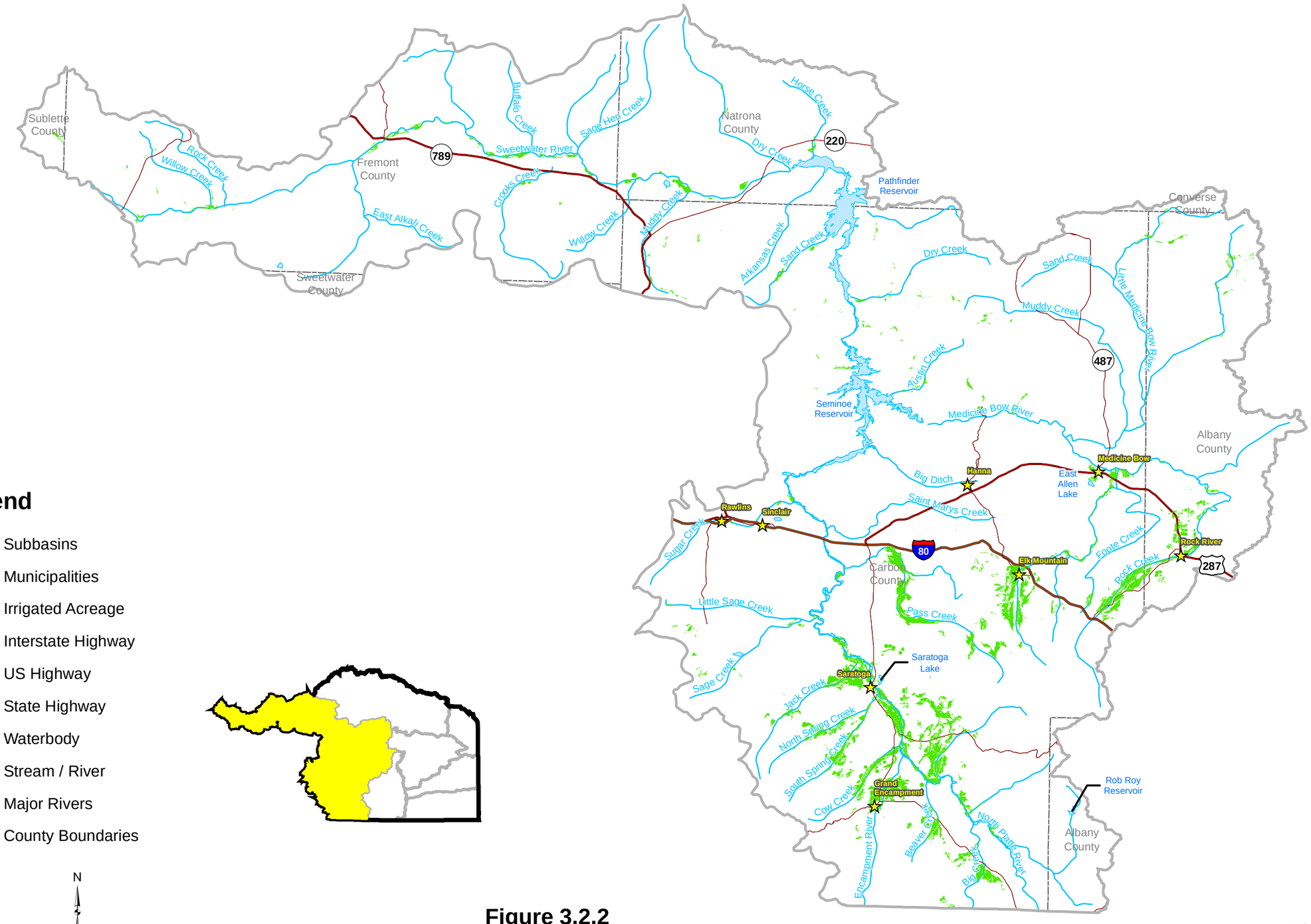
LA delineated irrigated agricultural lands in areas that the SEO had not based on whether they were being actively irrigated in 2012 from aerial imagery (USDA, 2014). The LA specific GIS delineations included the entire South Platte subbasin, the Horse Creek subbasin outside of the Goshen Irrigation District, the Dutton Creek closed basin, and the Casper Alcova Irrigation District in the Pathfinder to Guernsey subbasin. Hoobler (2014) noted that the acreages related to Glendo contract water are small and therefore LA did not delineate those minor areas. Results of the irrigated land delineation are summarized by subbasin and county, and are presented in **Table 3.2.1**. The locations of the irrigated lands identified in 2012 are presented by subbasin on **Figures 3.2.2 through 3.2.8**.

Table 3.2.1: GIS-derived Platte River Basin Irrigated Agricultural Land Organized by Subbasin for 2012

Platte River Subbasin	County	Area (acres)	Percent of Total Per Subbasin
Above Pathfinder	Albany	8,586	6.9
	Carbon	106,692	86.3
	Converse	52	0.0
	Freemont	4,918	4.0
	Natrona	3,102	2.5
	Sublette	303	0.2
	Total	**123,651**	**100**
Pathfinder to Guernsey	Albany	209	0.3
	Converse	32,423	49.8
	Natrona	28,565	43.9
	Platte	3,917	6.0
	Total	**651,14**	**100**
Guernsey to State Line	Goshen	80,585	100
	Total	**80,585**	**100**
Upper Laramie	Albany	101,537	97.6
	Carbon	2,501	2.4
	Total	**104,038**	**100**
Lower Laramie	Albany	2,627	4.0
	Goshen	4,316	6.5
	Laramie	695	1.0
	Platte	58,799	88.5
	Total	**66,437**	**100**
Horse Creek	Goshen	34,505	85
	Laramie	5,420	13.3
	Platte	670	1.7
	Total	**40,595**	**100**
South Platte	Albany	195	0.5
	Laramie	43,028	99.5
	Total	**43,223**	**100**

Note: All data has been projected in the NAD1983 datum.

Figure 3.2.9 presents a direct comparison of the irrigated acreage among the different subbasins of the Platte River Basin. The Above Pathfinder, Upper Laramie, and Guernsey to Stateline subbasins account for 59% of the irrigated acreage in the riverbasin while the remaining 41% is split between the other four subbasins.



Legend

- Subbasins
- Municipalities
- Irrigated Acreage
- Interstate Highway
- US Highway
- State Highway
- Waterbody
- Stream / River
- Major Rivers
- County Boundaries

N

0 10 20 40 Miles

Figure 3.2.2
2012 Irrigated Areas Above Pathfinder Dam Subbasin

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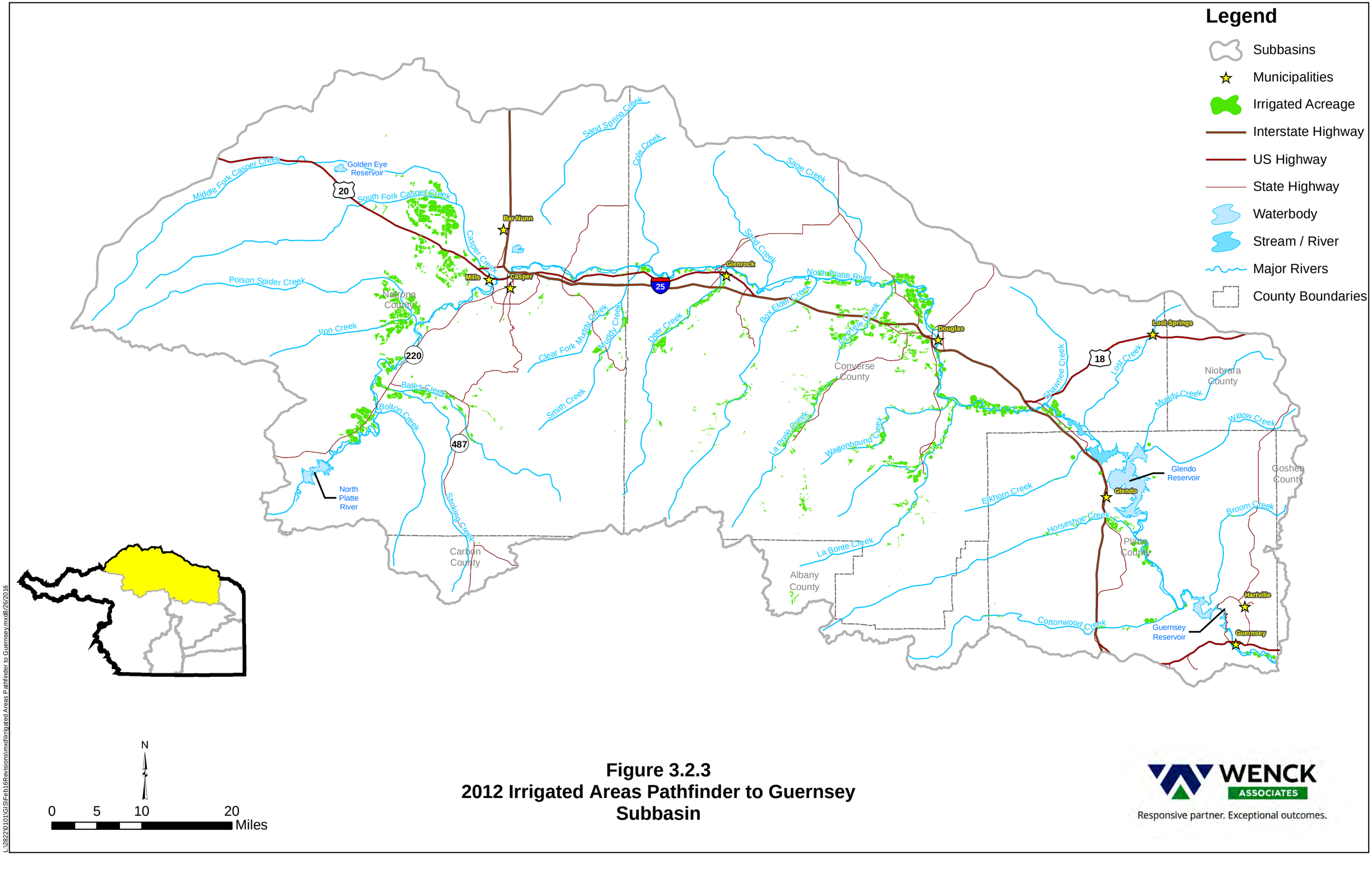

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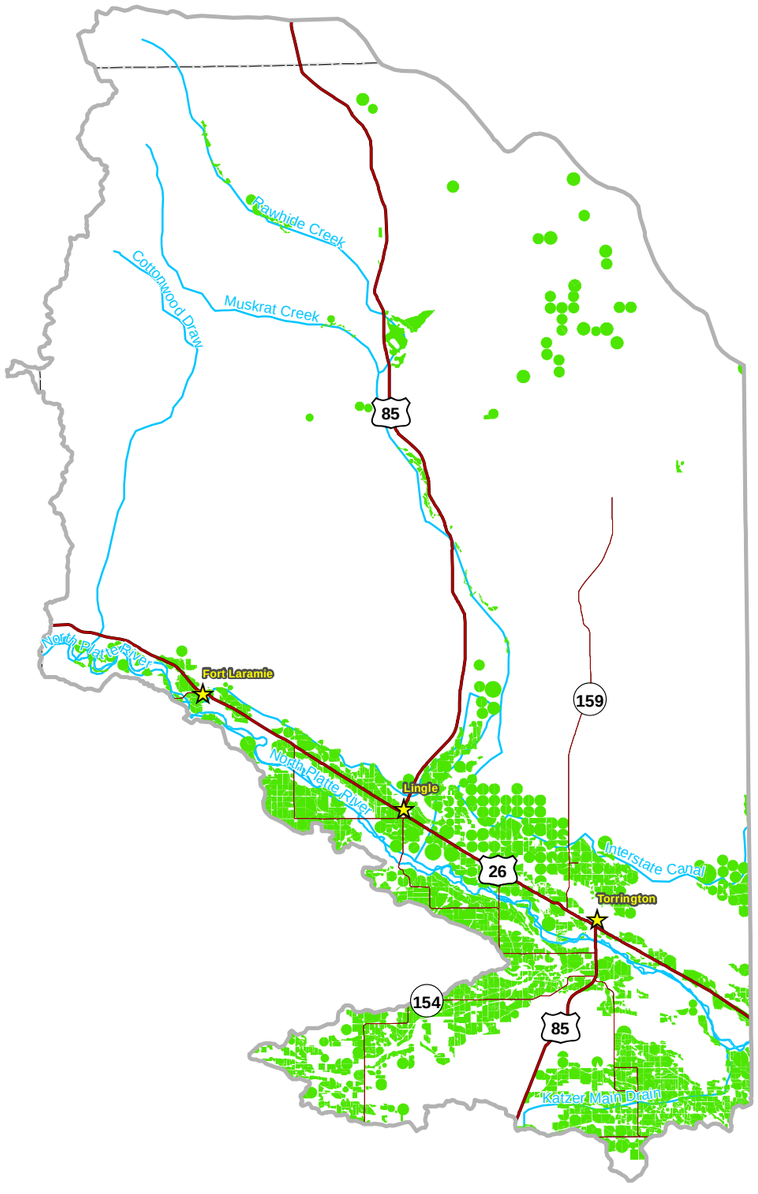
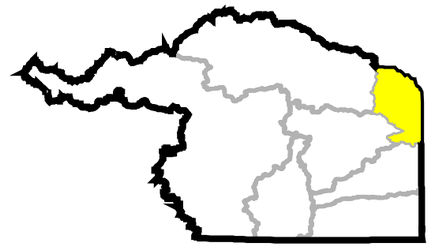
Figure 3.2.3
2012 Irrigated Areas Pathfinder to Guernsey Subbasin

WENCK ASSOCIATES
Responsive partner. Exceptional outcomes.





Legend

- Subbasins
- Municipalities
- Interstate Highway
- US Highway
- State Highway
- Irrigated Acreage
- Waterbody
- Stream / River
- Major Rivers
- County Boundaries

N

0 4.75 9.5 19 Miles

Figure 3.2.4
2012 Irrigated Areas Guernsey to State Line Subbasin

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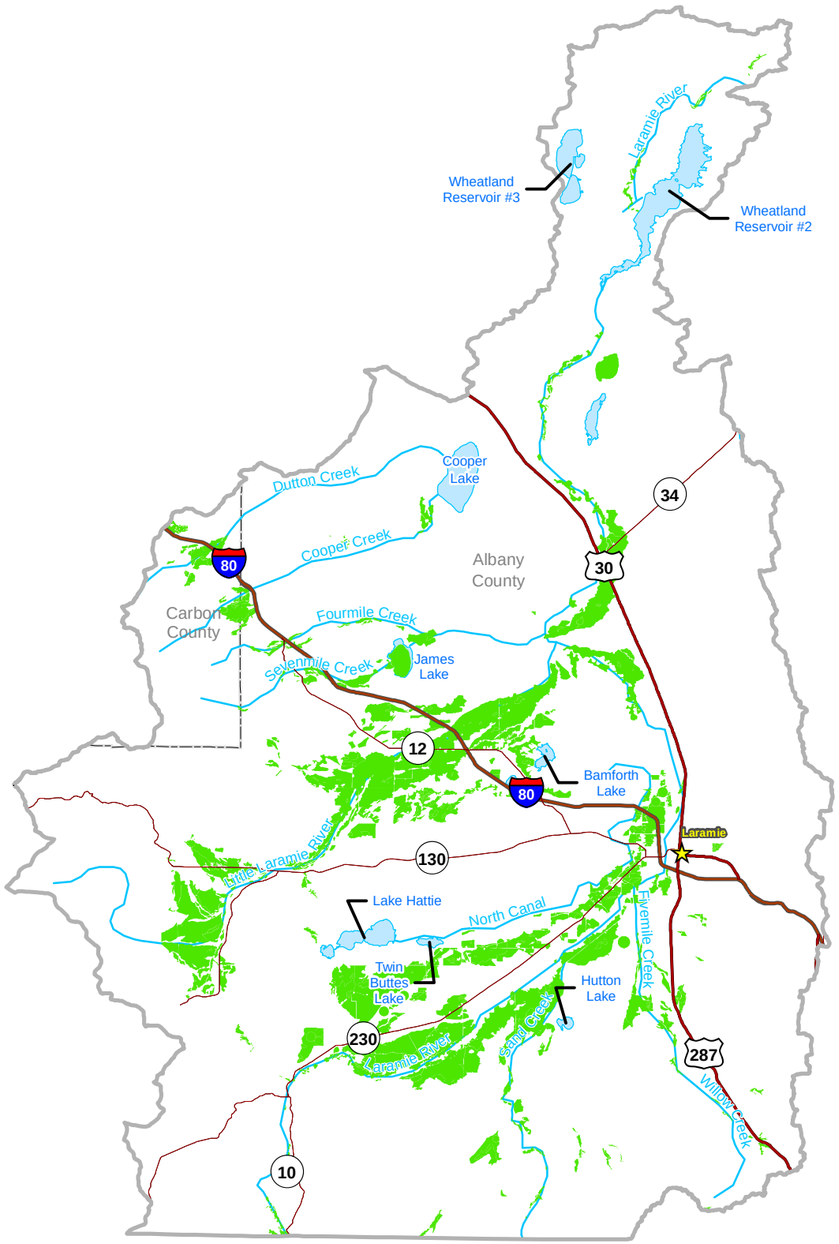

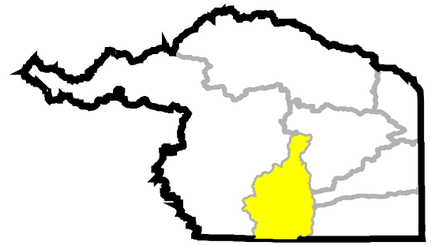

Legend

- Subbasins
- Municipalities
- Interstate Highway
- US Highway
- State Highway
- Irrigated Acreage
- Waterbody
- Stream / River
- Major Rivers
- County Boundaries

N

0 5 10 20 Miles

Figure 3.2.5
2012 Irrigated Areas Upper Laramie Subbasin

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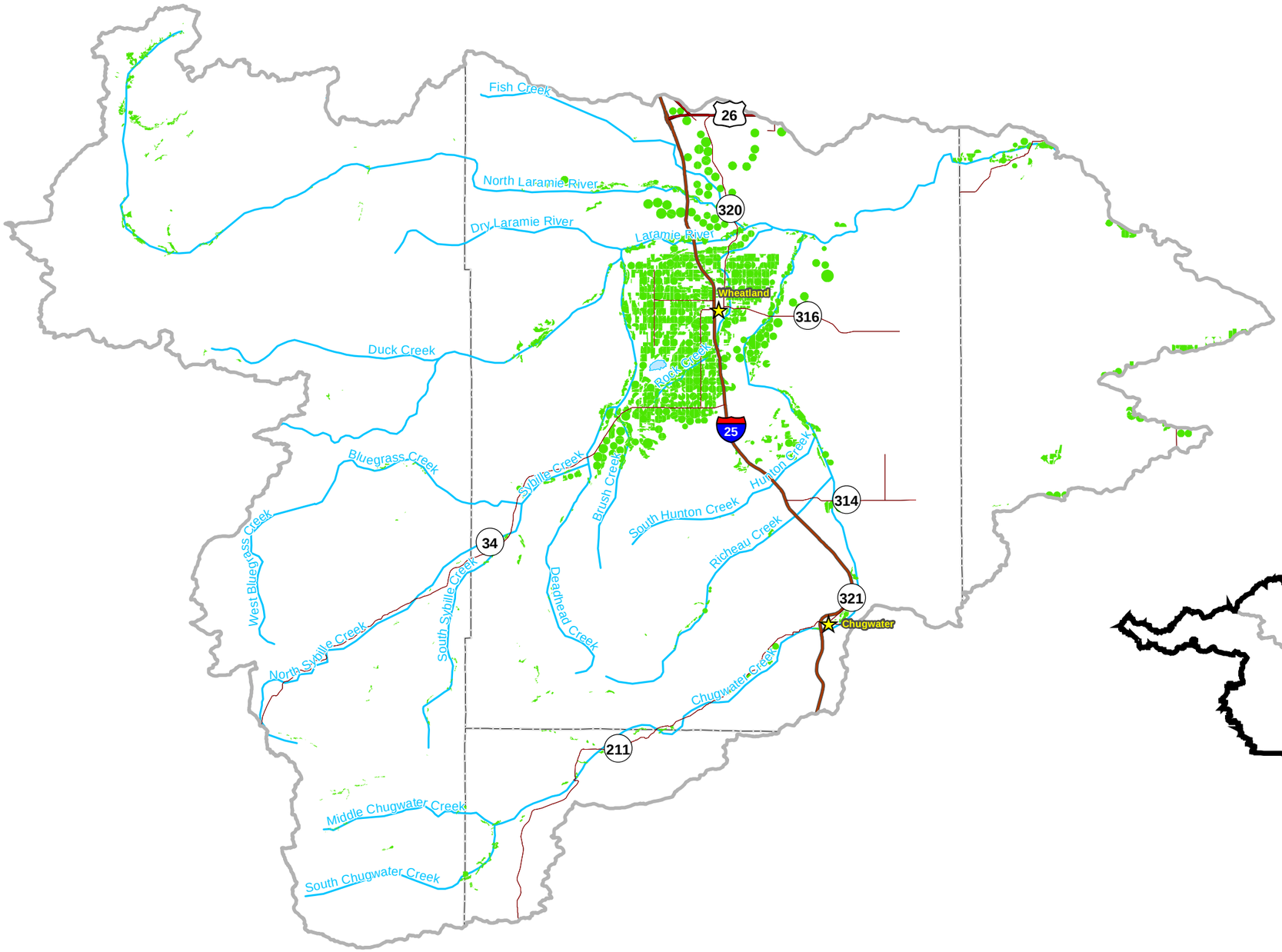

Legend

- Subbasins
- Municipalities
- Interstate Highway
- US Highway
- State Highway
- Irrigated Acreage
- Waterbody
- Stream / River
- Major Rivers
- County Boundaries

N

0 5 10 20 Miles

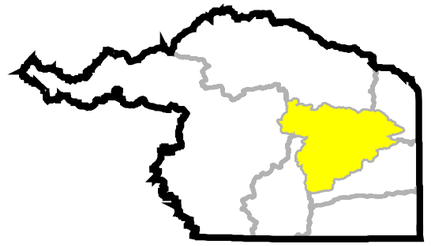

Figure 3.2.6
2012 Irrigated Areas Lower Laramie Subbasin

WENCK ASSOCIATES
Responsive partner. Exceptional outcomes.

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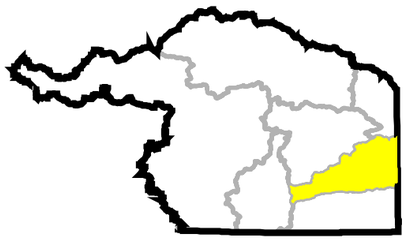
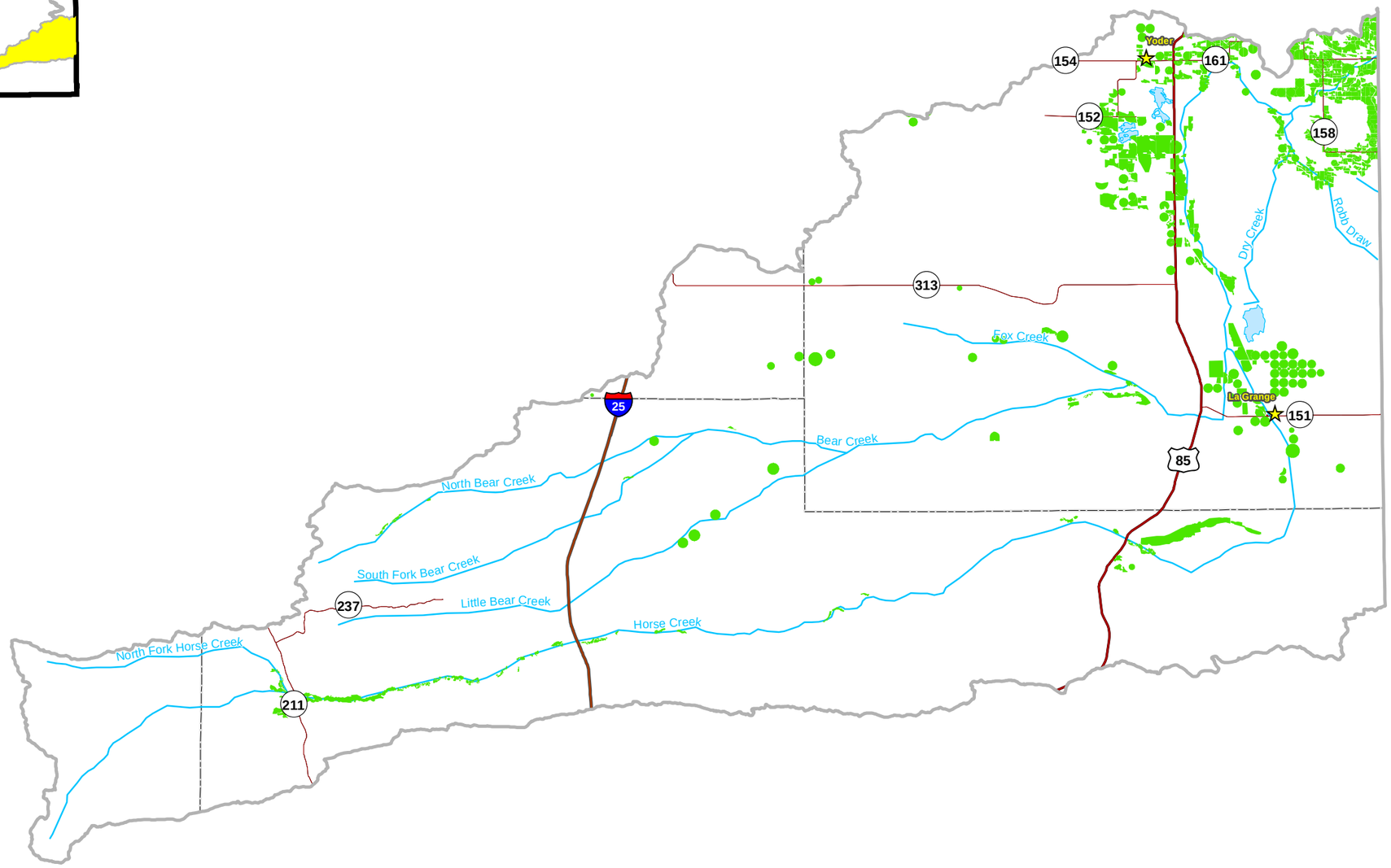


Legend

- Subbasins
- Municipalities
- Irrigated Acreage
- Interstate Highway
- US Highway
- State Highway
- Waterbody
- Stream / River
- Major Rivers
- County Boundaries



N

0 5 10 20

Miles

Figure 3.2.7
2012 Irrigated Areas Horse Creek Subbasin

WENCK ASSOCIATES
Responsive partner. Exceptional outcomes.

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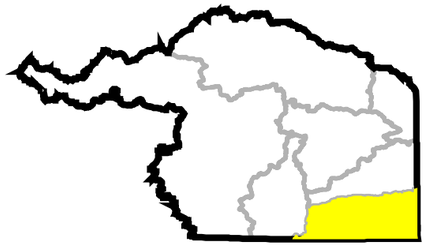
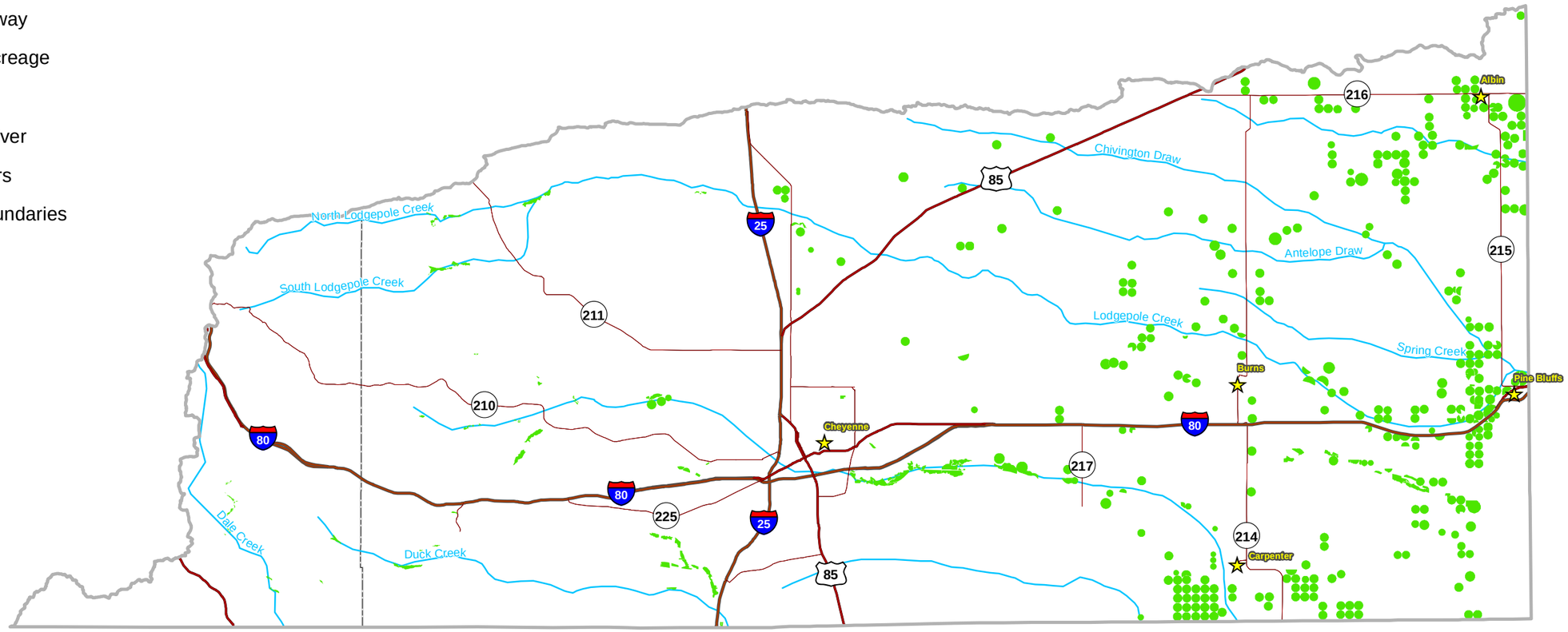
Legend

- Subbasins
- Municipalities
- Interstate Highway
- US Highway
- State Highway
- Irrigated Acreage
- Waterbody
- Stream / River
- Major Rivers
- County Boundaries





N

0 5 10 20 Miles

Figure 3.2.8
2012 Irrigated Areas South Platte Subbasin

WENCK ASSOCIATES
Responsive partner. Exceptional outcomes.

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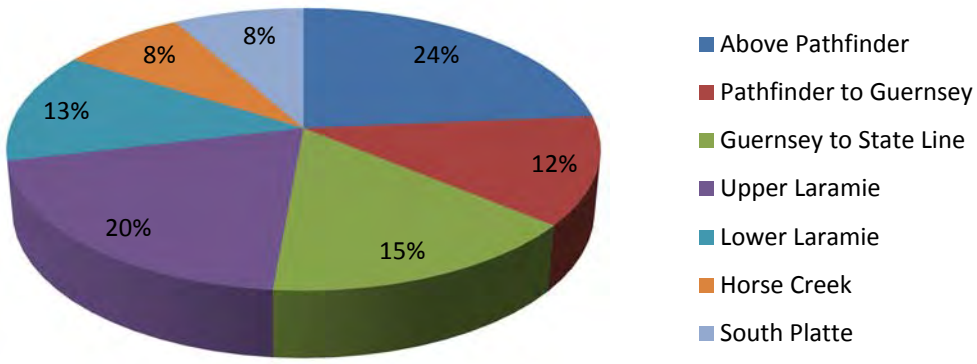
Figure 3.2.9: Percent of Total Irrigated Acres by Subbasin in 2012



3.2.5 Irrigated Acreage Comparison and Variation in Irrigated Acreage

The irrigated acreages that were delineated for 2012 for the entire Platte River Basin were compared to those from the original basin plan report. **Appendix 3-A,** summarizes the GIS delineated acreages and notes the percent differences between the irrigated lands maps. All Platte River subbasins, with the exception of the Upper Laramie, experienced an overall decrease in irrigated acreages between the two mapping periods. The subbbasins that experienced the largest reduction in irrigated acreage were Horse Creek (-32%), Pathfinder to Guernsey (-28%), and the Lower Laramie (-23%). Generally, the substantial reduction in irrigated acreages can be attributed to the below average water year of 2012, when water supplies were stressed. The only subbasin with an observed increase in irrigated acreage was the Upper Laramie (+13%). Overall, 14% fewer irrigated acres were identified through the most recent irrigated lands mapping in the Platte River Basin. Overall, as shown in **Table 3.2.2**, mapped acreage in 2012 was 14% less than reported in the period from 1995 to 2001.

Table 3.2.2: Comparison of Original Basin Plan and 2012 Mapped Irrigated Acreages

Platte River Subbasin	1995-2001 Mapped Acreages[1]	2012 Mapped Acreages	Percent Difference
Above Pathfinder	150,186	123,651	-18
Pathfinder to Guernsey	90,028	65,114	-28
Guernsey to State Line	88,034	80,585	-8
Upper Laramie	92,186	104,038	13
Lower Laramie	86,380	66,437	-23
Horse Creek	59,521	40,595	-32
South Platte	45,454	43,223	-5
Total	**611,789**	**523,644**	**-14**

Note:
1. Irrigated acres from Table 2-3 of the Platte River Basin Plan Final Report (Trihydro,2006).

To further assess the variability in irrigated acreage with water availability, the irrigated acreages identified by the SEO within the decree areas only for 2011, 2012, and 2013 were compared. Hoobler (2014) reported that 2011 was an above average water year, while 2012 was below average and 2013 was an average year. **Table 3.2.3** presents a

comparison of the irrigated acreage the SEO delineated for those years. It is important to note that the discrepancy between mapped acreages shown in **Table 3.2.2** and **Table 3.2.3** is attributable to the fact that the SEO did not delineate all the irrigated acreage in the Platte River Basin in 2012 and this is reflected in **Table 3.2.3** (Hoobler, 2014). Therefore, the methodologies used to calculate irrigated acreage in the Platte River Basin differed between the analysis performed by Wenck and the SEO.

Table 3.2.3: Irrigated Acreage Identified by the SEO within Platte River Basin Decree Areas

Decree Area	2012 Mapped Acreages (below)[1]	2013 Mapped Acreages (average)[2]	2011 Mapped Acreages (above)[3]	Percent Difference (below)	Percent Difference (above)
Above Guernsey[4]	169,059	171,696	203,599	1.5	18.6
Guernsey to State Line	78,533	72,344	78,389	-8.6	8.4
Upper Laramie	77,440	68,018	80,294	-13.9	18.0
Lower Laramie	52,370	54,516	64,095	3.9	17.6

Notes:
1. Acreage from Wyoming Depletions Report – Water Year 2012 (SEO, 2012)
2. Acreage from Wyoming Depletions Report – Water Year 2013 (SEO, 2013)
3. Acreage from Wyoming Depletions Report – Water Year 2011 (SEO, 2011)
4. Acreage above Guernsey excludes Casper Alcova Irrigation District/Kendrick Project

Based on the data presented in **Table 3.2.4**, water usage and irrigated acreages varies considerably between subbasins. The Above Guernsey area experienced an 18.6% increase in irrigated acreage in an above average water year, and decreased only 1.5% in a below average water year. This area appears to be far more dependent upon surface water flow for irrigation supplies. Similarly, water use and associated irrigated land usage in the Upper and Lower Laramie subbasins increased 18% and 17.6%, respectively, in an above average water year. During a below average water year, irrigated lands in Lower Laramie decreased 3.9%, while those in the Upper Laramie increased almost 14%. The reason for this specific increase between these years is unknown, but the limited number of years used for comparison likely has an effect. In contrast, the Guernsey to State Line area exhibited less significant swings in irrigated land of approximately 8% during above and below average years. The stability of this area could be attributed to pumping from triangle groundwater wells and/or regulation in favor of this area.

Table 3.2.4: Estimated Percentage of Acres Irrigated by Center Pivot Irrigation System in 2012

Subbasin	Pivot Acres	Total Irrigated Acres in 2012	Estimated Pivot Irrigation %
Above Pathfinder	3,203	123,651	3
Pathfinder to Guernsey	25,018	64,870	39
Guernsey to State Line	38,093	80,585	47
Upper Laramie	1,662	104,038	2
Lower Laramie	37,682	66,437	57
Horse Creek	17,344	40,597	43
South Platte	38,667	43,221	89
Platte Basin Total	**161,669**	**523,400**	**31**

Notes:
1. Irrigated area was based on 2012 irrigated lands coverages from SEO North Platte modified Decree Area irrigated land inventory.
2. Pivot irrigation was estimated based on 2012 NAIP aerial imagery.

3.2.6 Crop Distribution

Trihydro (2006) previously summarized the distribution of crops grown in the Platte River Basin by county in Table 2-2 and by subbasin in Table 2-4 of their final report. The National Agricultural Statistics Service (NASS) 2012 Census of Agriculture for Wyoming (USDA, 2015) was reviewed to evaluate crop distribution for the irrigated lands for each of the seven Platte River subbasins. Based on that review, there is insufficient data for 2012 to complete a thorough update to the work previously completed. The principal reasons for the incomplete data sets are lack of responses from the agricultural community and privacy concerns. However, Table 4.9 in Volume 4 summarizes crop acreage for the entire Platte River Basin.

3.2.7 Water Use and Consumptive Use

Surface water and groundwater are both used for irrigation purposes in the Platte River Basin. Trihydro (2006) and The Wyoming Geological Survey tabulated the quantities of permitted irrigation groundwater rights. Total annual average groundwater withdrawals for irrigation were estimated to be 206,745 acre-feet (Taucher and others, 2013). Assuming surface water is applied at a rate of 1 cfs per 70 acres, total surface water use during the irrigation season based on the number of irrigated acres in 2012 would be approximately 2.4 million acre-feet.

The annual consumptive use of irrigation water for 2012 was estimated on the basis of the unit consumptive use rates and the irrigated acreages that were delineated. These rates of irrigation water use (CU_w) for irrigated acreage were established in the 2006 Platte River Basin Plan, and were calculated on the basis of calibrated crop coefficients derived from the supreme court (2001) consumptive use data (Trihydro, 2006). Based on the same methodologies used in the original basin plan, AMEC (2014) developed a CU_w of 0.93 for Laramie County that was based on 18 years of data and encompassed a wide range of meteorologic variability. The CU_w value from the AMEC study (2014) was deemed acceptable for the purposes of estimated consumptive use in this analysis, given that 99.5% of the 2012 irrigated acreage in the South Platte subbasin resides within Laramie County.

Table 3.2.5 summarizes the 2012 consumptive use calculations, and is organized on the basis of subbasins. Overall this usage is very similar to that provided by Trihydro (2006) for a low streamflow year. The most significant increase in water use was observed in the Upper Laramie.

Table 3.2.5: Consumptive Use of Irrigation Water by Platte River Subbasin

Platte River Subbasin	Annual Unit Consumptive Use (CU_w) Value (acre-feet/acre)[1]	2012 Consumptive Use (acre-feet)[2]	Average Low Streamflow Consumptive Use (acre-feet)[3]
Above Pathfinder	0.74	91,502	85,920
Pathfinder to Guernsey	1.04	67,719	63,323
Guernsey to State Line	1.32	106,373	112,895
Upper Laramie	0.79	82,190	43,696
Lower Laramie	1.31	87,033	102,937
Horse Creek	1.16	47,090	61,281
South Platte	0.93[1]	40,197	43,314
Total	**----**	**522,103**	**513,366**

Notes:

1. Annual consumptive use unit values taken from Trihydro (2006), with the exception of the South Platte Subbasin that was obtained from AMEC (2014).
2. Consumptive use equal to annual unit consumptive use multiplied by the 2012 irrigated acreage for each respective subbasin from **Table 3.2.2**.
3. Consumptive use during average low streamflow years from Trihydro (2006) in Technical Memorandum 2.1.4.

3.2.8 Livestock Water Use within the Platte River Basin

Trihydro (2006) provided maps showing the locations of stock water wells in the basin plan and provided an overview on livestock population. To supplement this information and provide a current estimate of water use by the various types of livestock in the basin, the 2012 Census of Agriculture prepared by the U.S. Department of Agriculture (USDA, 2012) was reviewed to determine the populations of livestock. The USDA prepared profiles in 2012 for each of the counties located within the Platte River Basin that included inventories for each livestock type, including cattle, sheep, horses, layers (poultry), and buffalo among others. With the exceptions of Sublette and Sweetwater Counties, the county populations for each livestock type were multiplied by the percentage of each county within the Platte Basin to estimate the basin population. The 2012 livestock population estimates are presented in **Table 3.2.6**. In Volume 4, Harvey Economics (HE) used more recent 2015 data rather than the 2012 data used in the Volume 3 analysis. Therefore, the livestock population numbers for cattle and sheep reported in Volume 4, Table 4.9 are greater than those presented in **Table 3.2.6**. It is worth noting that the water directly consumed by livestock is insignificant when compared to the use by irrigated crops.

Annual water use by livestock type for 2012 was estimated from these populations and established livestock watering requirements. Unit water usage data for different types of livestock were obtained from the 2010 Wyoming Livestock Water and Pipeline Handbook (USDA, 2010). These values were multiplied by the total estimated population of the respective livestock type to estimate total water use. As shown in **Table 3.2.6** total livestock water use in 2012 has been estimated to be approximately 8,494 acre-feet. Of that total, approximately 95% is attributed to cattle raised in the basin, while 3% was attributed to horses.

3.2.9 References

AMEC Environment & Infrastructure Inc., 2014, Hydrogeologic Study of the Laramie County Control Area: Consultant's report prepared for Wyoming State Engineer's Office in collaboration with Hinckley Consulting and HDR Engineering.

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Trihydro Corporation, 2006, Platte River Basin Plan Final Report: Consultant's report prepared for the Wyoming Water Development Commission in collaboration with Lidstone and Associates, Inc., Harvey Economics, and Water Rights Services LLC

Table 3.2.6: Estimated Livestock Water Use in the Platte River Basin in 2012

	Livestock Population by County											
Livestock Category	**Albany**	**Laramie**	**Platte**	**Goshen**	**Carbon**	**Natrona**	**Converse**	**Fremont**	**Niobrara**	**Livestock Totals by Type**	**Unit Daily Water Use by Livestock Type (gal/day)**	**Estimated Annual Water Use by Livestock Type (Acre-feet)**
Cattle and Calves	68,725	83,455	78,634	108,355	63,732	29,167	29,529	15,282	3,192	480,072	15	8,066
Sheep and Lambs	2,762	29,749	417	1,273	7,203	12,664	27,234	3,027	190	84,519	1.5	142
Horses and Ponies	2,687	3,358	1,374	2,420	1,884	1,397	882	2,231	84	16,318	15	274
Layers	1,727	-	790	1,571	172	723	549	584	18	6,135	1.5	10
Buffalo	-	NR	-	-	NR	-	-	-	52	52	20	1
Goats	-	-	-	-	-	-	104	-	-	104	1.5	0.2
Hogs and Pigs	NR	NR	NR	-	-	-	-	-	-	NR		NR
County % in Platte River Basin	100%	100%	100%	96%	70%	57%	50%	19%	7%		**Total =**	8,494

Notes:
NR – Present
- Indicates not present in county.
County percentages estimated using GIS and Platte Basin Watershed boundary. Sublette (1.1%) and Sweetwater (0.3%) Counties were not included due to their low county percentage within the Platte River Basin.
Livestock type and number obtained from 2012 USDA Census by county at the following address: http://www.agcensus.usda.gov/Publications/2012/Online_Resources/County_Profiles/Wyoming
Livestock population for each county estimated by multiplying 2012 USDA Census county data for each livestock category by county percentage within the Platte River Basin.
Estimated daily unit livestock water requirements from Wyoming Livestock Water and Pipeline Handbook, 2010.

United States Department of Agriculture, 2014, 2012 Census of Agriculture, Wyoming, Volume 1: National Agricultural Statistics Service Geographic Area Series, Part 50, AC-12-A-50.

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3.3 MUNICIPAL AND DOMESTIC USE

3.3.1 Introduction

This section presents an update on the municipal and domestic use of water within the Platte River Basin of Wyoming. The basin consists of the six subbasins of the North Platte River and the South Platte Subbasin. The principal focus of this update to the Platte River Basin Plan (Trihydro, 2006) has been a revision to the amounts of water used for municipal and domestic purposes on both an annual and a monthly basis, with a review of how that usage changes between above and below average water years. This update relied heavily on information developed and maintained by the SEO and the WWDC.

3.3.2 Municipal Use

Trihydro (2006) presented a comprehensive overview of the 54 community public water systems located within the subbasins of the Platte River Basin in Technical Memorandum 2.2. Since the completion of the 2006 Basin Plan, much new water usage data have been developed through master planning projects sponsored by the WWDC, the SEO's annual municipal water use surveys for subbasins within the North Platte River drainage, and the WWDC's public water system surveys. These data sources are listed in the references section at the end of this section. Water usage data were either compiled on a monthly or an annual basis and provide sufficient information for evaluating water usage changes both seasonally within a given year and annual changes in available water.

Actual water usage data are not typically available for many smaller community public water systems. For these systems, average and peak use were calculated as done in the Basin Plan by taking the average and peak usage values of entities who participated in the WWDC's 2002 survey, 226 and 575 gallons per capita per day (gpcpd), respectively, and multiplying this value by the respective entity's population. The following sections present the current water usage data.

3.3.3 New High Capacity Wells

Since January 1, 2004, 30 new wells or enlargements have been filed with the SEO for municipal use. Typically, these wells produce more than 50 gallons per minute (gpm), although the towns of Yoder and Glendo completed wells with smaller yields during the time period. The location, depth, and appropriation of these wells are listed in **Appendix 3-B,** Table 1. The locations of these wells are shown along with those identified by Trihydro (2006) on **Figure 3.3.1**. This documentation demonstrates that several municipalities have identified and developed new water sources as they have attempted to keep pace with water demand.

The new municipal wells include the following:

- Five North Park Aquifer wells for the Town of Saratoga, which has transitioned from a surface water only system to a groundwater only system;
- Two Lance/Fox Hills Aquifer wells for the Town of Pine Bluffs, which has lost several Brule Aquifer wells due to declining water levels;
- Two High Plains Aquifer wells for the City of Cheyenne, which has been evaluating various groundwater development options at its Belvoir Ranch including the Casper Aquifer;
- Two High Plains Aquifer wells for the Town of Albin; and,
- One Lance/Fox Hills Aquifer well for the Town of Yoder.

Legend

- Municipal Wells > 50GPM (Drilled after 1/1/2004)
- Municipal Wells > 50GPM (Drilled before 1/1/2004)
- Watershed Boundary
- Subbasins
- Municipalities
- Interstate Highway
- US Highway
- State Highway
- Waterbody
- Stream / River
- Major Rivers
- County Boundaries

N

0 10 20 40 Miles

L:\28222\01\GIS\Feb16Revisions\mxd\Municipal Wells.mxd8/26/2016

Figure 3.3.1
Municipal 50+ GPM Wells

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These new wells indicate that groundwater remains a significant source of supply for many municipalities within the Platte River Basin. The fact that these wells have also been drilled to depths ranging up to 2,926 feet, completed in new aquifers, and used to replace surface water indicates the measure of the municipalities resolve to continue providing quality drinking water to Wyoming's residents.

3.3.4 Annual Rural Domestic and Municipal Water Usage and Usage Variations

Water usage data for the community public water systems in each subbasin were compiled from the WWDC's 2013 Public Water System Survey Report and various master plans to compare changes in water usage between 2002 as noted in the original Basin Plan (Trihydro, 2006) and 2013. **Tables 3.3.1 through 3.3.7** present the water source, average day use, and peak daily use in gallons per day (gpd) for each of the respective entities in the various subbasins. Total annual water usage for each community public water system is shown for the recent 2013 dataset. Usage data were estimated for those systems that were not included or did not provide recent information.

Comparison of these data on an individual basis indicates that water usage changes vary, likely for different reasons. With respect to the municipalities serving a population of 500 or more, average daily water usage increased for the following municipalities: Hanna, Evansville, Casper, Douglas, Wheatland, and Cheyenne; while average daily water usage declined for the following municipalities: Saratoga, Rawlins, Guernsey, Glenrock, Mills, Lingle, Torrington, Laramie, and Pine Bluffs. Most of these changes correspond to changes in population. Wheatland's increase is likely due to a reporting error from 2002. The magnitude of the other changes can be obtained from reviewing the respective tables.

For entities within subbasins of the North Platte River, the total annual usage reported by the WWDC in **Tables 3.3.1 through 3.3.7** can be compared with that obtained from the SEO for 2013 in **Table 3.3.8**. This table lists the total annual diversion or usage of each municipality within the North Platte River subbasins as reported to the SEO for water years 2011 through 2013. These data were obtained from the Wyoming Depletions Reports (SEO, 2011-2013) associated with each of these water years.

Table 3.3.8 can also be used to evaluate changes in water usage related to water availability. While 2013 was an average water year, 2011 was an above average water year and 2012 was a below average water year. Based on these data, water usage across the subbasins of the North Platte River generally decreased during an above average water year, and increased during a below average water year. Water use increased 6.5% during a below average water year, and decreased 8.6% during an above average water year. Previously, municipalities had reported changes in usage ranging from 0 to 20% (Trihydro, 2006). Water usage between the various subbasins varied. During a below average water year, water usage increased 9% to 22% in the following subbasins: Pathfinder to Guernsey, Guernsey to State Line, Lower Laramie, and Horse Creek, while those in the other subbasins decreased slightly. During an above average water year, water usage decreased 8.5% to 20% in the following subbasins: Above Pathfinder, Pathfinder to Guernsey, Upper Laramie, and Horse Creek, while water use in the Lower Laramie and Guernsey to State Line subbasins decreased less than 3%.

Appendix 3-B presents detailed information on new water wells and summaries of water usage for community water systems in the Platte River Basin.

Table 3.3.1: Summary of Rural Domestic Water Use in the Above Pathfinder Dam Subbasin, Wyoming

2006 Platte Basin Plan						
County	**Number of Domestic Wells**	**Area (sq mi)**	**Housing Density (people per house)[1]**	**Rural Population**	**Estimated Minimum Water Use (gpd)[2]**	**Estimated Average Water Use (gpd)[3]**
Albany	290	1,027	2,44	708	106,140	212,280
Carbon	1,105	5,425	2.46	2,718	407,745	815,490
Converse	3	20	2.63	8	1,184	2,367
Fremont	247	1,749	2.61	645	96,7-1	193,401
Natrona	35	809	2.52	88	13,230	26,460
Sublette	2	55	2.52	5	756	1,512
Sweetwater	0	35	2.74	0	0	0
Totals	**1,682**			**4,172**	**625,800**	**1,251,600**

Notes:
1. From 2000 U.S. Census county population data.
2. Assumed 150 gpd per capita multiplied by rural population.
3. Assumed 300 gpd per capita multiplied by rural population.
4. Water use values reflect total demand but do not necessarily reflect consumptive use.

Platte Basin Plan Update			
City/Town Service Area	**Population Servied[1]**	**Estimated Minimum Water Use (gpd)[2]**	**Estimated Average Water Use (gpd)[4]**
Total Subbasin Population[1] – 15,220			
Encampment/Riverside	593		
Saratoga	1,761		
Hanna	827		
Rawlins	9,416		
Sinclair	432		
Rock River	249		
Elk Mountain	211		
Medicine Bow	315		
Total Municipal Population	**13,804**	**Total =**	**Total =**
Rural Population[2]	**1,416**	**212,400**	**424,800**

Notes:
1. From Wyoming Department of Administration and Information, and Wyoming SEO (2013).
2. Rural population = total subbasin population – total municipal population.
3. Assumed 150 gpd per capita multiplied by rural population.
4. Assumed 300 gpd per capita multiplied by rural population.

Table 3.3.2: Summary of Rural Domestic Water Use in the Pathfinder Dam to Guernsey Subbasin, Wyoming

2006 Platte Basin Plan						
County	**Number of Domestic Wells**	**Area (sq mi)**	**Housing Density (people per house)[1]**	**Rural Population**	**Estimated Minimum Water Use (gpd)[2]**	**Estimated Average Water Use (gpd)[3]**
Albany	82	146.46	2.44	200	30,012	60,024
Carbon	4	75.11	2.46	10	1,476	2,952
Converse	1,681	2,103.58	2.63	4,421	663,155	1,326,309
Goshen	5	51.24	2.42	12	1,815	3,630
Natrona	2,685	2,285.06	2.52	6,766	1,014,930	2,029,860
Niobrara	47	157.80	2.33	110	16,427	32,853
Platte	388	812.23	2.43	943	141,426	282,852
Totals	**4,892**			**12,462**	**1,869,300**	**4,738,600**

Notes:
1. From 2000 U.S. Census county population data.
2. Assumed 150 gpd per capita multiplied by rural population.
3. Assumed 300 gpd per capita multiplied by rural population.
4. Water use values reflect total demand but do not necessarily reflect consumptive use.

Platte Basin Plan Update			
City/Town Service Area	**Population Servied[1]**	**Estimated Minimum Water Use (gpd)[2]**	**Estimated Average Water Use (gpd)[4]**
Total Subbasin Population[1] – 97,148			
Mills	3,568		
Casper	68,284		
Evansville	3,162		
Glenrock	2,727		
Rolling Hills	450		
Douglas	6,742		
Glendo	204		
Total Municipal Population	**85,137**	**Total =**	**Total =**
Rural Population[2]	**12,011**	**1,801,650**	**3,603,300**

Notes:
1. From Wyoming Department of Administration and Information, and Wyoming SEO (2013).
2. Rural population = total subbasin population – total municipal population.
3. Assumed 150 gpd per capita multiplied by rural population.
4. Assumed 300 gpd per capita multiplied by rural population.

Table 3.3.3: Summary of Rural Domestic Water Use in the State Line Subbasin, Wyoming

2006 Platte Basin Plan						
County	**Number of Domestic Wells**	**Area (sq mi)**	**Housing Density (people per house)[1]**	**Rural Population**	**Estimated Minimum Water Use (gpd)[2]**	**Estimated Average Water Use (gpd)[3]**
Goshen	1,471	1,064,04	2.42	3,560	533,973	1,067,946
Niobrara	4	25.26	2.33	9	1,398	2,796
Platte	0	0.92	2.43	0	0	0
Totals	**1,475**			**3,569**	**535,350**	**1,070,700**

Notes:
1. From 2000 U.S. Census county population data.
2. Assumed 150 gpd per capita multiplied by rural population.
3. Assumed 300 gpd per capita multiplied by rural population.
4. Water use values reflect total demand but do not necessarily reflect consumptive use.

Platte Basin Plan Update			
City/Town Service Area	**Population Servied[1]**	**Estimated Minimum Water Use (gpd)[2]**	**Estimated Average Water Use (gpd)[4]**
Total Subbasin Population[1] – 12,296			
Guernsey	1,184		
Hartville	63		
Fort Laramie	240		
Lingle	503		
Yoder	467		
Torrington	7,331		
Total Municipal Population	**9,788**	**Total =**	**Total =**
Rural Population[2]	**2,508**	**376,200**	**752,400**

Notes:
1. From Wyoming Department of Administration and Information, and Wyoming SEO (2013).
2. Rural population = total subbasin population – total municipal population.
3. Assumed 150 gpd per capita multiplied by rural population.
4. Assumed 300 gpd per capita multiplied by rural population.

Table 3.3.4: Summary of Rural Domestic Water Use in the Upper Laramie Subbasin, Wyoming

2006 Platte Basin Plan						
County	**Number of Domestic Wells**	**Area (sq mi)**	**Housing Density (people per house)[1]**	**Rural Population**	**Estimated Minimum Water Use (gpd)[2]**	**Estimated Average Water Use (gpd)[3]**
Albany	1,980	1,859	2.44	4,831	724,680	1,449,360
Carbon	41	72	2.46	101	15,129	30,258
Totals	**2,021**			**4,932**	**739,800**	**1,479,600**

Notes:
1. From 2000 U.S. Census county population data.
2. Assumed 150 gpd per capita multiplied by rural population.
3. Assumed 300 gpd per capita multiplied by rural population.
4. Water use values reflect total demand but do not necessarily reflect consumptive use.

Platte Basin Plan Update			
City/Town Service Area	**Population Servied[1]**	**Estimated Minimum Water Use (gpd)[2]**	**Estimated Average Water Use (gpd)[4]**
Total Subbasin Population[1] – 36,558			
Laramie	31,874		
Total Municipal Population	**31,874**	**Total =**	**Total =**
Rural Population[2]	**4,684**	**702,600**	**1,405,200**

Notes:
1. From Wyoming Department of Administration and Information, and Wyoming SEO (2013).
2. Rural population = total subbasin population – total municipal population.
3. Assumed 150 gpd per capita multiplied by rural population.
4. Assumed 300 gpd per capita multiplied by rural population.

Table 3.3.5: Summary of Rural Domestic Water Use in the Lower Laramie Subbasin, Wyoming

2006 Platte Basin Plan						
County	**Number of Domestic Wells**	**Area (sq mi)**	**Housing Density (people per house)[1]**	**Rural Population**	**Estimated Minimum Water Use (gpd)[2]**	**Estimated Average Water Use (gpd)[3]**
Albany	193	959	2.44	471	70,638	141,276
Goshen	124	324	2.42	300	40,012	90,024
Laramie	20	125	2.54	51	7,620	15,240
Platte	1,118	1,244	2.43	2,717	407,511	815,022
Totals	**1,455**			**3,539**	**530,850**	**1,061,700**

Notes:
1. From 2000 U.S. Census county population data.
2. Assumed 150 gpd per capita multiplied by rural population.
3. Assumed 300 gpd per capita multiplied by rural population.
4. Water use values reflect total demand but do not necessarily reflect consumptive use.

Platte Basin Plan Update			
City/Town Service Area	**Population Servied[1]**	**Estimated Minimum Water Use (gpd)[2]**	**Estimated Average Water Use (gpd)[4]**
Total Subbasin Population[1] – 6,808			
Wheatland	3,820		
Chugwater	214		
Total Municipal Population	**4,034**	**Total =**	**Total =**
Rural Population[2]	**2,774**	**416,100**	**832,200**

Notes:
1. From Wyoming Department of Administration and Information, and Wyoming SEO (2013).
2. Rural population = total subbasin population – total municipal population.
3. Assumed 150 gpd per capita multiplied by rural population.
4. Assumed 300 gpd per capita multiplied by rural population.

Table 3.3.6: Summary of Rural Domestic Water Use in the Horse Creek Subbasin, Wyoming

2006 Platte Basin Plan						
County	**Number of Domestic Wells**	**Area (sq mi)**	**Housing Density (people per house)[1]**	**Rural Population**	**Estimated Minimum Water Use (gpd)[2]**	**Estimated Average Water Use (gpd)[3]**
Albany	8	86	2.44	20	2,928	5,865
Goshen	520	709	2.42	1,258	188,760	377,520
Laramie	149	740	2.54	378	56,769	113,538
Platte	17	52	2.43	41	6,197	12,393
Totals	**694**			**1,698**	**254,700**	**509,400**

Notes:
1. From 2000 U.S. Census county population data.
2. Assumed 150 gpd per capita multiplied by rural population.
3. Assumed 300 gpd per capita multiplied by rural population.
4. Water use values reflect total demand but do not necessarily reflect consumptive use.

Platte Basin Plan Update			
City/Town Service Area	**Population Servied[1]**	**Estimated Minimum Water Use (gpd)[2]**	**Estimated Average Water Use (gpd)[4]**
Total Subbasin Population[1] – 1,910			
LaGrange	455		
Total Municipal Population	**455**	**Total =**	**Total =**
Rural Population[2]	**2,455**	**218,250**	**436,500**

Notes:
1. From Wyoming Department of Administration and Information, and Wyoming SEO (2013).
2. Rural population = total subbasin population – total municipal population.
3. Assumed 150 gpd per capita multiplied by rural population.
4. Assumed 300 gpd per capita multiplied by rural population.

Table 3.3.7: Summary of Rural Domestic Water Use in the South Platte Subbasin, Wyoming

2006 Platte Basin Plan						
County	**Number of Domestic Wells**	**Area (sq mi)**	**Housing Density (people per house)[1]**	**Rural Population**	**Estimated Minimum Water Use (gpd)[2]**	**Estimated Average Water Use (gpd)[3]**
Albany	163	228	2.44	398	59,658	119,316
Laramie	6,444	1,820	2.54	16,368	2,455,164	4,910,328
Totals	**6,607**			**16,766**	**2,514,900**	**5,029,800**

Notes:
1. From 2000 U.S. Census county population data.
2. Assumed 150 gpd per capita multiplied by rural population.
3. Assumed 300 gpd per capita multiplied by rural population.
4. Water use values reflect total demand but do not necessarily reflect consumptive use.

Platte Basin Plan Update			
City/Town Service Area	**Population Servied[1]**	**Estimated Minimum Water Use (gpd)[2]**	**Estimated Average Water Use (gpd)[4]**
Total Subbasin Population[1] – 95,548			
Albin	196		
Burns	308		
Cheyenne	73,836		
Pine Bluffs	1,153		
Total Municipal Population	**75,493**	**Total =**	**Total =**
Rural Population[2]	**20,091**	**3,013,650**	**6,027,300**

Notes:
1. From Wyoming Department of Administration and Information, and Wyoming SEO (2013).
2. Rural population = total subbasin population – total municipal population.
3. Assumed 150 gpd per capita multiplied by rural population.
4. Assumed 300 gpd per capita multiplied by rural population.

Table 3.3.8: Total Annual Diversions in Million Gallons by Water Year for Municipal Water Systems

	2011 (wet year) Million Gallons	2012 (dry year) Million Gallons	2013 (average year) Million Gallons	Percent difference (between 2012 and 2013 water years)[3]	Percent difference (between 2011 and 2013 water years)[3]
Above Pathfinder Subbasin					
Encampment	27.50	27.50	27.50	0.0%	0.0%
Sierra Madre Joint Powers Board	7.09	8.98	8.74	2.7%	-18.9%
Saratoga	142.16	168.80	180.20	-6.3%	-21.1%
Hanna	92.00	96.00	90.00	6.7%	2.2%
Rawlins	742.35	767.56	832.37	-7.8%	-10.8%
Sinclair	34.85	37.34	31.39	19.0%	11.0%
Rock River	48.55	35.88	21.50	66.9%	125.8%
Elk Mountain	7.52	10.82	11.23	-3.7%	-33.0%
Medicine Bow	38.00	53.00	43.00	23.3%	-11.6%
Total =	**1,140.02**	**1,205.88**	**1,245.93**	**-3.2%**	**-8.5%**
Pathfinder to Guernsey Subbasin					
Mills	231.00	268.00	250.00	7.2%	-7.6%
Central Wyoming Regional Water	4,705.51	5,649.20	5,156.13	9.6%	-8.7%
Evansville	249.97	290.38	261.81	10.9%	-4.5%
Glenrock	159.01	205.84	217.63	-5.4%	-26.9%
Douglas	530.79	620.60	591.10	5.0%	-10.2%
Glendo	16.45	20.06	16.69	20.2%	-1.4%
Total =	**5,892.73**	**7,054.08**	**6,493.36**	8.6%	-9.2%
Guernsey to State Line Subbasin					
Guernsey	123.90	153.60	147.50	4.1%	-16.0%
Hartville[1]	5.83	5.83	5.83	0.0%	0.0%
Fort Laramie[2]	33.26	33.26	18.77	77.2%	77.2%
Lingle	90.40	104.40	83.42	25.1%	8.4%
Torrington	558.14	684.22	583.02	17.4%	-4.3%
Total =	**811.53**	**981.31**	**838.54**	17.0%	-3.2%
Upper Laramie Subbasin					
Laramie	1,891.56	2,051.11	2,098.81	-2.3%	-9.9%
Total =	**1,891.56**	**2,051.11**	**2,098.81**	-2.3%	-9.9%
Lower Laramie Subbasin					
Wheatland	426.40	531.10	433.10	22.6%	-1.5%
Chugwater	19.39	21.72	19.12	13.6%	1.4%
Total =	**445.79**	**552.82**	**452.22**	22.2%	-1.4%

Table 3.3.8: Total Annual Diversions in Million Gallons by Water Year for Municipal Water Systems

	2011 (wet year) Million Gallons	2012 (dry year) Million Gallons	2013 (average year) Million Gallons	Percent difference (between 2012 and 2013 water years)[3]	Percent difference (between 2011 and 2013 water years)[3]
Horse Creek Subbasin					
LaGrange	36.67	54.17	45.90	18.0%	-20.1%
Total =	**36.67**	**54.17**	**45.90**	18.0%	-20.1%
Total =	**10,218.30**	**11,899.37**	**11,174.76**	**6.5%**	**-8.6%**

Notes:

Total annual diversions obtained from the Wyoming Depletions Reports prepared by the Wyoming State Engineer's Office (2011, 2012, 2013).

1. Wyoming State Engineer's Office Estimated the amounts for all three years.
2. Wyoming State Engineer's Office estimated amounts for 2011 and 2012.
3. Positive percentage represents an increase in water use. Negative percentage indicates a decrease in water use.

3.3.5 Monthly Water Usage

Monthly water usage data from 28 of the community public water systems were compiled to evaluate seasonal use during the average water year of 2013, and in some instances, to estimate consumptive use. **Table 3.3.9** presents the monthly water usage data by municipality and subbasin, the total amount of water diverted from surface or groundwater sources, and where available, the amount of water returned to the surface stream monthly for each entity. Water from interbasin transfers is included in these figures. The locations of treated return flows are shown on **Figure 3.3.2** along with surface water intakes for the municipalities. These data were obtained from the Wyoming Depletions Report compiled by the SEO for 2013, and for entities in the South Platte subbasin, from recent master plan reports. The data presented generally do not include that used by independent raw water irrigation systems for those municipalities that utilize them.

For those systems that reported both diversions and return flows, consumptive use estimates range from 27% to 92%, and compare similarly to those reported by Trihydro (2006) that ranged from 26% to 65%. Aside from other groundwater systems, the Sierra Madre Joint Powers Board had the highest consumptive use at 92%. Of the systems for which consumptive use estimates were previously made, Cheyenne had the lowest consumptive use at 27%, compared with 65% previously; Laramie increased from 26% to 46%; Glenrock increased to 70% from 46%; and Torrington increased to 60% from 50%. Casper had an estimated consumptive use of 54%.

3.3.6 Rural Domestic Use

Excluding non-community public water systems, rural domestic water usage was estimated on the basis of the estimated rural population and the same assumed domestic usage values applied by Trihydro (2006). This approach is markedly different from that applied during the original Basin Plan that used housing density and the number of domestic wells completed in each subbasin. The Wyoming Department of Administration and Information (2015) provided estimates of the 2013 population for each subbasin. The estimated rural population was obtained by subtracting the population served by each municipality within its water service area from the total subbasin population. The following sections present the estimated water usage based on this approach.

New Domestic Wells

Between January 1, 2004 and January 26, 2015, 5,043 well permits were obtained and presumably completed within the subbasins of the Platte River Basin. The locations of these wells are shown along with those wells previously identified by Trihydro (2006) on **Figure 3.3.3**. **Figure 3.3.3** illustrates that most of these wells have been drilled in close proximity to existing areas of development, including east of Cheyenne; around Wheatland, Douglas, and Casper; and within the triangle near Torrington. More rural areas did not experience as much development.

Estimated Rural Domestic Water Use

Based on an assumed per capita usage rate of 150 to 300 gpd used in the Basin Plan, rural domestic water usage for each of the subbasins has been estimated. **Appendix 3-B,** Tables 2 through 8 present the minimum to average water usage estimates for the various subbasins. With a total rural population of approximately 20,000, the South Platte subbasin has the highest estimated usage at approximately 3.0 to 6.0 million gpd. The Pathfinder to Guernsey subbasin had the second highest usage estimated at 1.8 to 3.6 million gpd. With the lowest rural population, the Horse Creek subbasin had the lowest estimated usage at 0.2 to 0.4 million gpd.

Table 3.3.9: Monthly Municipal Surface Water and Groundwater Diversions and Return Flow in Million Gallons

	Water Year 2013[1]																	
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Total	Total Groundwater Diversions (MG)	Total Surface Water Diversions (MG)	Total Diversions (MG)	Total Return Flow (MG)	Estimated Consumptive Use %	Remarks
Above Pathfinder Dam Subbasin																			
Encampment																			
Surface water diverted into primary supply / treatment system (MG)	2.20	1.50	2.50	2.50	2.30	1.50	1.50	1.80	2.70	3.60	2.80	2.60	27.50						
														0.00	27.50	27.50	Unknown	Unknown	
Sierra Madre Joint Powers Board																			
Groundwater diverted into primary supply / treatment system (MG)	0.55	0.31	0.31	0.24	0.29	0.23	0.35	0.58	1.67	1.98	1.29	0.95	8.74						
Water returned to river through wastewater system (MG)	0.00	0.00	0.45	0.00	0.00	0.00	0.00	0.00	0.22	0.00	0.00	0.00	0.66						
														8.74	0.00	8.74	0.66	92%	
Saratoga																			
Groundwater diverted into primary supply / treatment system (MG)	9.70	8.70	9.50	11.40	10.60	12.00	11.80	16.70	26.00	25.20	22.80	15.80	180.20						
Water returned to river through wastewater system (MG)	6.30	5.10	6.40	5.70	4.70	6.50	5.80	17.40	13.30	8.60	7.20	9.20	96.20						Excludes independent raw water irrigation.
														180.20	0.00	180.20	96.20	47%	
Hanna																			
Surface water diverted into primary supply / treatment system (MG)	5.00	4.00	5.00	4.00	4.00	5.00	5.00	6.00	9.00	10.00	10.00	7.00	74.00						
Surface water sold to users outside corporate limits (MG)	1.00	1.00	0.00	0.00	0.00	0.00	1.00	2.00	3.00	3.00	3.00	2.00	16.00						
														0.00	90.00	90.00	Unknown	Unknown	
Rawlins																			
Surface water diverted into primary supply / treatment system (MG)	41.82	42.54	36.25	38.59	37.86	43.39	35.17	65.57	106.10	114.94	103.09	59.64	724.96						
Groundwater diverted into primary supply / treatment system (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.20	34.56	31.25	33.48	32.40	138.89						
Water returned to river through wastewater system (MG)	0.00	0.00	0.00	0.00	0.00	0.00	31.97	42.53	44.97	0.00	0.00	0.00	119.47						Excludes golf course raw water irrigation.
Surface water sold to Sinclair (MG)	2.38	1.98	1.59	1.83	1.41	1.82	1.72	3.33	4.75	4.47	4.02	2.18	31.48	138.89	693.48	832.37	119.47	86%	Surface water sold to Sinclair excluded from total diversion.
Sinclair																			
Surface water from Rawlins (MG)	2.38	1.98	1.58	1.73	1.41	1.82	1.72	3.33	4.67	4.47	4.02	2.28	31.39						
														0.00	31.39	31.39	Unknown	Unknown	
Rock River																			
Surface water diverted into primary supply / treatment system (MG)	1.30	0.68	0.64	1.02	0.91	1.23	1.20	2.24	4.40	3.03	3.22	1.64	21.50						
														0.00	21.50	21.50	Unknown	Unknown	
Elk Mountain																			
Groundwater diverted into primary supply / treatment system (MG)	0.81	0.74	0.64	0.58	0.52	0.52	0.47	0.78	1.72	1.87	1.72	0.87	11.23						
														11.23	0	11.23	Unknown	Unknown	

Table 3.3.9: Monthly Municipal Surface Water and Groundwater Diversions and Return Flow in Million Gallons

	Water Year 2013[1]																	
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Total	Total Groundwater Diversions (MG)	Total Surface Water Diversions (MG)	Total Diversions (MG)	Total Return Flow (MG)	Estimated Consumptive Use %	Remarks
Medicine Bow																			
Groundwater diverted into primary supply / treatment system (MG)	3.00	2.00	4.00	3.00	3.00	3.00	3.00	4.00	4.00	5.00	5.00	4.00	43.00						
														43.00	0	43.00	Unknown	Unknown	
Pathfinder Dam to Guernsey Subbasin																			
Mills																			
Surface and groundwater diverted into primary supply / treatment system (MG)	15.00	13.00	14.00	16.00	13.00	15.00	14.00	24.00	35.00	34.00	32.00	25.00	250.00						
														250.00		250.00	Unknown	Unknown	Wastewater treated by City of Casper.
Casper/Central Wyoming Regional Water System																			
Surface water diverted into primary supply / treatment system (MG)	197.35	143.91	116.89	144.99	166.74	218.95	248.88	235.48	515.07	569.64	509.22	320.80	3387.92						
Groundwater diverted into primary supply / treatment system (MG)	116.15	83.16	105.13	87.40	34.84	3.78	40.45	183.69	249.06	296.91	304.30	263.34	1768.20						
Water returned to river through wastewater system (MG)	202.15	193.03	187.50	190.13	169.79	193.94	198.64	207.15	196.86	206.33	208.58	205.17	2359.27						
														1768.20	3387.92	5156.13	2359.27	54%	Excludes independent raw water irrigation. Consumptive use estimate affected by Mills and Evansville return flows.
Evansville																			
Surface water diverted into primary supply / treatment system (MG)	18.47	16.34	15.77	17.58	15.14	17.52	16.98	23.51	33.03	32.40	31.28	23.80	261.81						
														0.00	261.81	261.81	Unknown	Unknown	Wastewater treated by City of Casper.
Glenrock																			
Groundwater diverted into primary supply / treatment system (MG)	9.37	7.59	9.58	11.51	9.88	10.09	9.90	20.04	35.87	40.25	32.06	21.50	217.63						
Water returned to river through wastewater system (MG)	5.14	5.24	5.20	6.32	5.31	5.60	5.65	5.43	4.73	4.98	5.29	5.37	64.27						
														217.63	0.00	217.63	64.27	70%	Excludes independent raw water irrigation.
Douglas																			
Surface water diverted into primary supply / treatment system (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.60	18.50	5.10	39.20						
Groundwater diverted into primary supply / treatment system (MG)	38.00	25.80	28.90	29.20	25.90	29.30	30.20	51.40	78.10	83.20	72.20	59.70	551.90						
Total Return Flows (MG)	19.50	19.00	19.00	18.90	16.90	17.90	18.40	29.20	31.80	27.50	33.10	27.70	278.90						
														551.90	39.20	591.10	278.90	53%	Excludes independent raw water irrigation.
Glendo																			
Groundwater diverted into primary supply / treatment system (MG)	1.22	0.52	0.53	1.25	0.46	0.52	0.72	1.28	2.70	3.56	2.48	1.45	16.69						
														16.69	0	16.69	Unknown	Unknown	
Guernsey																			
Groundwater diverted into primary supply / treatment system (MG)	9.20	5.80	6.10	5.70	5.00	7.10	9.80	14.90	23.70	21.70	23.70	14.80	147.50						
														147.50	0	147.50	Unknown	Unknown	

Table 3.3.9: Monthly Municipal Surface Water and Groundwater Diversions and Return Flow in Million Gallons

	Water Year 2013[1]																	
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Total	Total Groundwater Diversions (MG)	Total Surface Water Diversions (MG)	Total Diversions (MG)	Total Return Flow (MG)	Estimated Consumptive Use %	Remarks
Hartville																			
Groundwater diverted into primary supply / treatment system (MG)	0.23	0.27	0.47	0.18	0.20	0.23	0.34	0.37	0.60	0.92	1.10	0.92	5.83						
Water returned to river through wastewater system (MG)	0.03	0.04	0.06	0.01	0.01	0.01	0.12	0.29	0.58	0.87	0.24	0.14	2.40						
														5.83	0	5.83	2.40	59%	
Guernsey to State Line Subbasin																			
Fort Laramie																			
Groundwater diverted into primary supply / treatment system (MG)	1.05	0.79	0.78	0.68	0.66	0.77	0.81	2.00	3.11	3.51	2.78	1.82	18.77						Excludes independent raw water irrigation.
														18.77	0.00	18.77	Unknown	Unknown	
Lingle																			
Groundwater diverted into primary supply / treatment system (MG)	7.14	2.64	1.81	1.87	2.18	1.95	3.35	6.04	11.15	14.88	16.28	14.13	83.42						
														0.00	83.42	83.42	Unknown	Unknown	
Torrington																			
Groundwater diverted into primary supply / treatment system (MG)	38.15	25.20	26.56	29.10	26.57	31.54	28.72	50.78	81.98	91.56	87.26	65.60	583.02						
Water returned to river through wastewater system (MG)	22.08	16.18	18.36	20.79	18.79	17.16	15.85	21.19	20.48	16.99	20.72	22.60	231.19						Excludes independent raw water irrigation.
														583.02	0	583.02	231.19	60%	
Upper Laramie Subbasin																			
Laramie																			
Surface water diverted into primary supply / treatment system (MG)	58.30	41.30	36.06	37.06	54.47	91.76	71.93	96.57	156.07	140.24	148.46	98.30	1030.52						
Groundwater diverted into primary supply / treatment system (MG)	66.49	65.45	63.15	74.29	72.67	82.31	80.75	98.09	143.45	136.79	109.57	75.28	1068.29						
Estimated return flows to river (MG)	81.11	90.74	84.33	94.65	108.07	147.96	99.24	107.06	98.84	72.03	72.25	78.11	1134.39						
														1068.29	1030.52	2098.81	1134.39	46%	
Lower Laramie Subbasin																			
Wheatland																			
Groundwater diverted into primary supply / treatment system (MG)	21.00	14.50	14.40	13.90	12.00	14.90	17.70	39.70	71.20	77.00	66.50	42.30	405.10						
Groundwater diverted into raw water irrigation system (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	6.00	7.00	8.00	4.00	28.00						
Estimated return flows to river (MG)	4.76	4.76	4.76	4.76	4.76	4.76	4.76	4.76	4.76	4.76	4.76	4.76	57.12						Includes raw water irrigation.
														433.10	0	433.10	57.12	87%	
Chugwater																			
Groundwater diverted into primary supply / treatment system (MG)	1.00	0.68	0.61	0.72	0.94	0.38	0.61	1.04	2.94	4.39	3.71	2.10	19.12						
														19.12	0	19.12	Unknown	Unknown	
Horse Creek Subbasin																			
LaGrange																			
Groundwater diverted into primary supply / treatment system (MG)	2.87	1.86	0.93	1.19	1.02	1.08	0.84	4.58	8.48	9.25	8.66	5.14	45.90						
														45.90	0	45.90	Unknown	Unknown	

Table 3.3.9: Monthly Municipal Surface Water and Groundwater Diversions and Return Flow in Million Gallons

	Water Year 2013[1]																	
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Total	Total Groundwater Diversions (MG)	Total Surface Water Diversions (MG)	Total Diversions (MG)	Total Return Flow (MG)	Estimated Consumptive Use %	Remarks
South Platte Subbasin																			
Cheyenne[2]																			
Groundwater pumped into treatment system (MG)	88.72	63.00	66.65	82.26	51.74	62.03	69.00	108.81	170.28	239.72	223.20	159.39	1384.81						
Surface Water diverted into treatment system (MG)	239.88	189.00	199.95	187.44	163.86	207.67	207.00	309.69	345.72	408.18	396.80	323.61	3178.79						
Water returned to river through wastewater system (MG)	279.00	270.00	269.70	266.60	246.40	275.90	273.00	294.50	294.00	297.60	294.50	267.00	3328.20						
														1384.81	3178.79	4563.60	3328.20	27%	
Pine Bluffs[3]																			
Groundwater delivered to customers (MG)	7.19	3.04	3.17	2.90	2.87	2.94	6.02	11.49	12.03	17.20	16.00	13.47	98.32						
														98.32	0	98.32	Unknown	Unknown	
Burns[4]																			
Groundwater delivered to customers (MG)	2.66	1.75	1.95	1.41	1.28	1.66	2.11	4.13	5.29	6.68	5.79	4.12	38.83						
														38.83	0	38.83	Unknown	Unknown	
Albin[5]																			
Groundwater delivered to customers (MG)	3.00	1.16	0.74	1.38	1.57	1.68	1.29	1.85	2.48	4.09	3.29	4.12	26.65						
														26.65	0	26.65	Unknown	Unknown	

Notes:
(1) Based on 2013 Water Year Depletions Report from the Wyoming State Engineers Office (2013).
(2) Source: HDR, 2013 - Average monthly water demand between 2003 and 2012 (Chart 2-8 of Volume 2 and Figure 3-29 of Volume 3) and average monthly wastewaster discharge between 2005-2012 (Chart 2-23 of Volume 2)
(3) Source: Lidstone, 2015 - 2012-2013 water demand data
(4) Source: Lidstone, 2011 - Average monthly water demand between 2000 and 2009 (Figure 4)
(5) Source: Benchmark, 2005 - 2001 water demand data (Table 3.1)

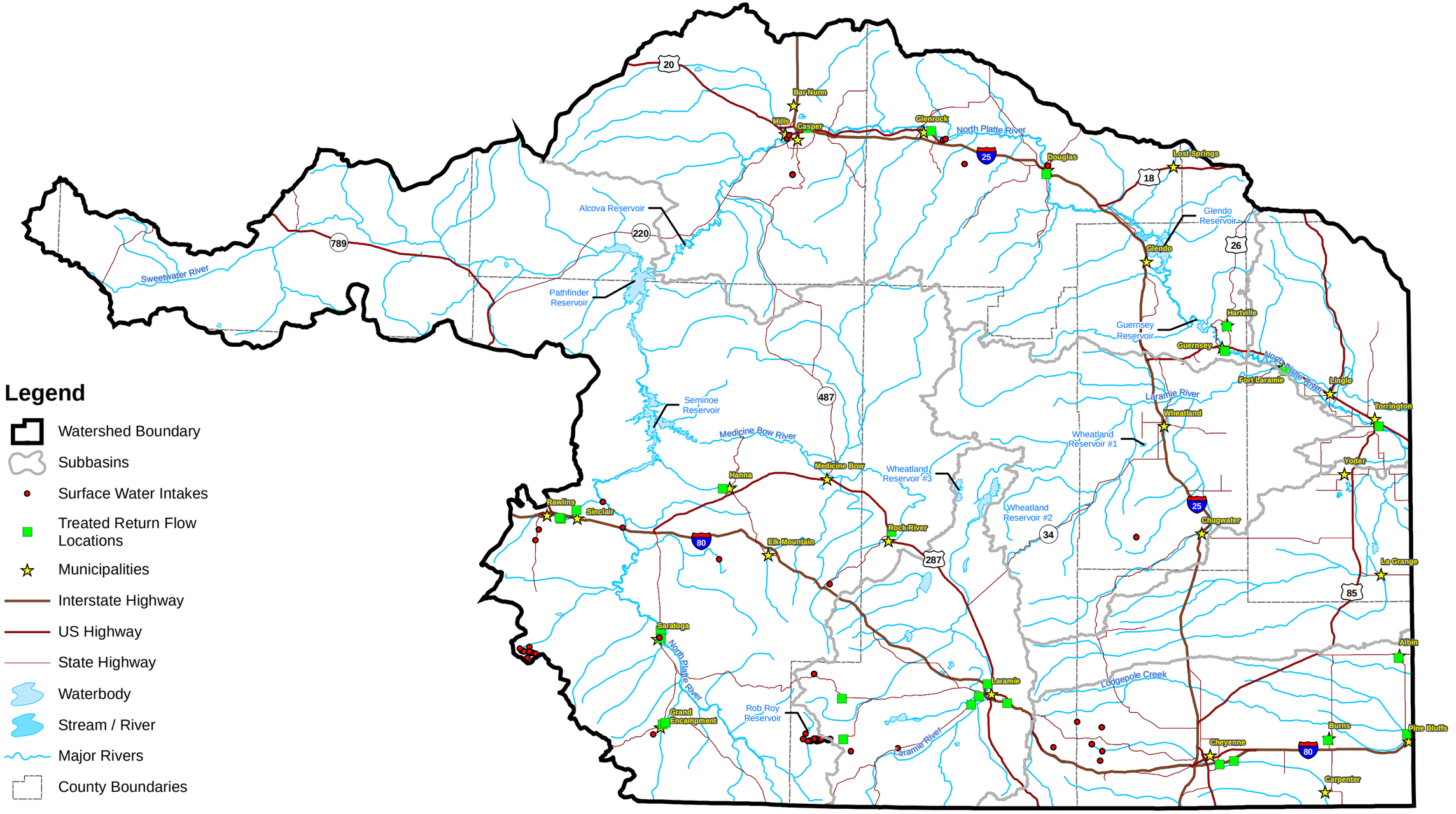

Figure 3.3.2
Surface Water Intakes and Locations of Treated Return Flows

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Source: SEO GIS Database

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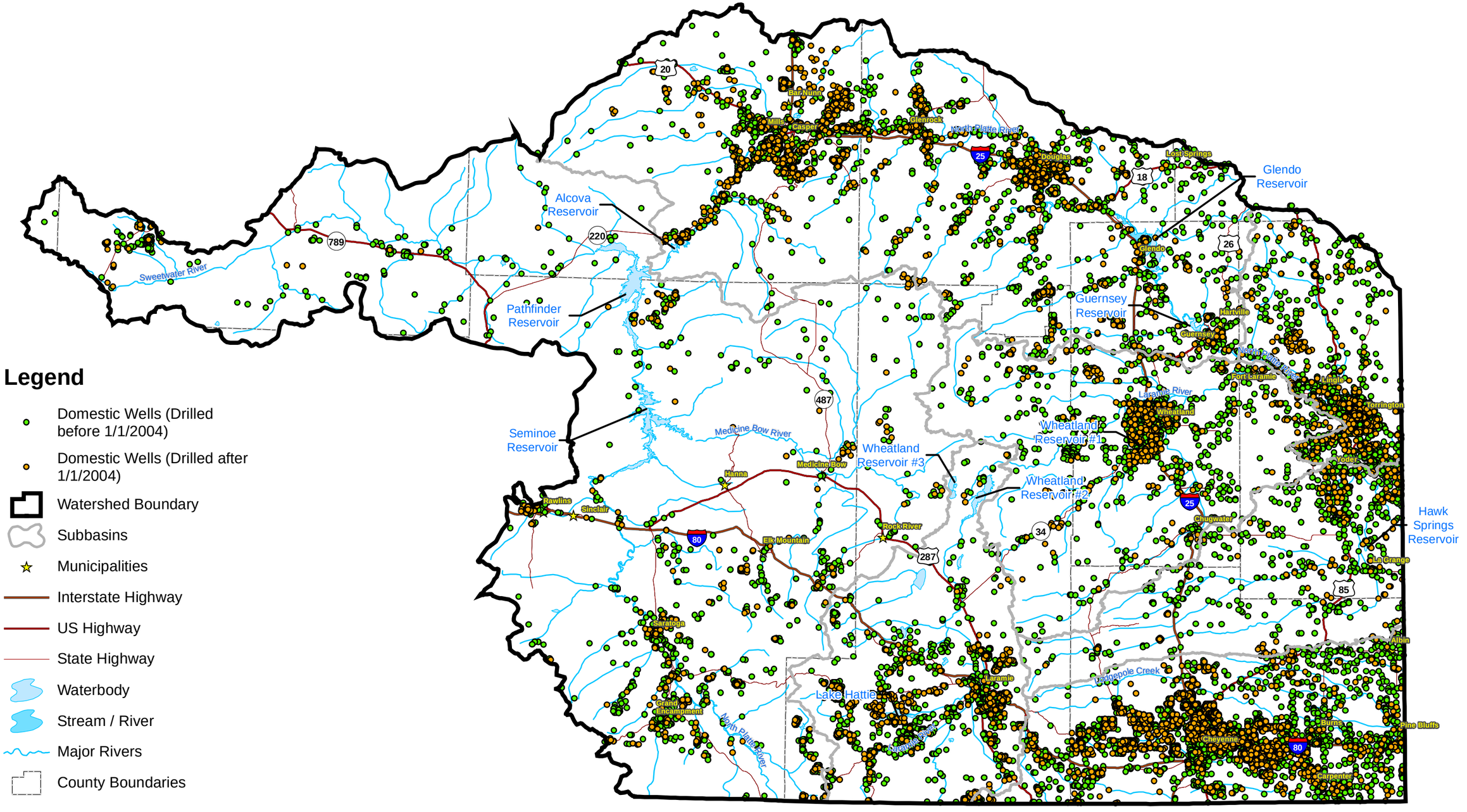

Legend

- Domestic Wells (Drilled before 1/1/2004)
- Domestic Wells (Drilled after 1/1/2004)
- Watershed Boundary
- Subbasins
- Municipalities
- Interstate Highway
- US Highway
- State Highway
- Waterbody
- Stream / River
- Major Rivers
- County Boundaries

N

0 10 20 40 Miles

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Figure 3.3.3
Domestic Wells

Source: SEO GIS Database

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3.3.7 References

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3.4 INDUSTRIAL USE (MODIFIED FROM THE INDUSTRIAL USE TECH MEMO)

3.4.1 Introduction

This section presents an update on the industrial use within the Platte River Basin of Wyoming. The Platte River Basin in Wyoming consists of the six subbasins of the North Platte River and the South Platte Subbasin. The principal focus of this update to the Platte River Basin Plan (Trihydro, 2006) has been to identify new groundwater and surface water industrial users not supplied through municipal systems, and to evaluate usage changes during above and below average water years. This update relied on information developed and maintained by the SEO. Because the original basin plan included data through 2003, this update covers the period between January 1, 2004 and September 30, 2014.

3.4.2 Platte River Basin Industrial Water Use Overview

A thorough inventory of industrial water use within the Platte River Basin for 1981 through 2000 is presented in Technical Memorandum 2.3 of the Platte River Basin Plan (Trihydro, 2006). The industries that have typically used the most water for industrial purposes in the Basin are oil and gas, coal, and uranium. Power generation, aggregate mining, cement production, chemical processing, and ethanol production have also played a role. Taucher and others (2013) provided updated data on industrial groundwater use through 2011. The SEO maintains annual water use records for some of the largest industrial water users in the basin.

Generally, the types of industries that use water in the Platte River Basin have not changed appreciably since the completion of the original plan, but the amount of use in some areas has increased based upon the number of groundwater water rights filed with the SEO since 2004. Over this same timeframe, no surface water diversion permits were issued by the SEO for industrial use. Permits issued for various reservoirs of limited use are included in **Appendix 3-C.**

3.4.3 New High Capacity Wells and Water Wells for Oil and Gas Production

Since January 1, 2004, 167 new wells or enlargements have been filed with the SEO for industrial use. This total includes 95 wells that produce more than 50 gpm for industry, and 72 wells of any permitted rate that are utilized for oil and gas production. The location, owner, and permitted discharge rate for these new wells are listed in **Appendix 3-D**, Table 1 for industry and **Appendix 3-D**, Table 2 for oil and gas production. The locations of the 50+ gpm industrial wells are shown along with those identified by Trihydro (2006) in **Appendix 3-D**, Tables 1 and 2. The locations of the water wells associated with oil and gas production in the basin are shown in **Appendix 3-D**, Table 2.

3.4.4 Annual Usage and Usage Variations

Water usage data for several of the major industrial water users within the Platte River Basin were obtained from the Wyoming Depletion Reports (SEO, 2011-2013). These reports include both annual diversion and depletion information for the following industrial water users: Sinclair Refinery, Sinclair Casper Refinery, Texaco Refinery, BP Products Refinery, Dave Johnston Power Plant, and Western Ethanol. The locations of these users are shown in the basin in **Appendix 3-D**, Table 1. Of these users, the Texaco Refinery and BP Products Refinery shown in **Appendix 3-D**, Table 1 are no longer active, and their usage has not been reported here for that reason. The Texaco Refinery ceased operations in August 1982. The SEO identifies evaporation and irrigation of the Veteran's Cemetery as industrial use because it is conducted with the water rights of the former refinery. BP Products has some shallow wells that pump near the river and divert directly into the river. At the time BP

Products was active, from 1957 to 1990, the SEO was mainly concerned with their diversion of process water into Soda Lake. Shown on **Figure 3.4.1** near Torrington, the Western Ethanol Plant has closed due to a drop in corn and crude prices and expiration of a state tax credit (Casper Star Tribune, 2015).

New industrial reservoirs have been permitted in the Platte River Basin by the SEO since 2006. A total of approximately 53 industrial reservoirs have been permitted basin-wide and are shown in **Appendix 3-D**, Table 3

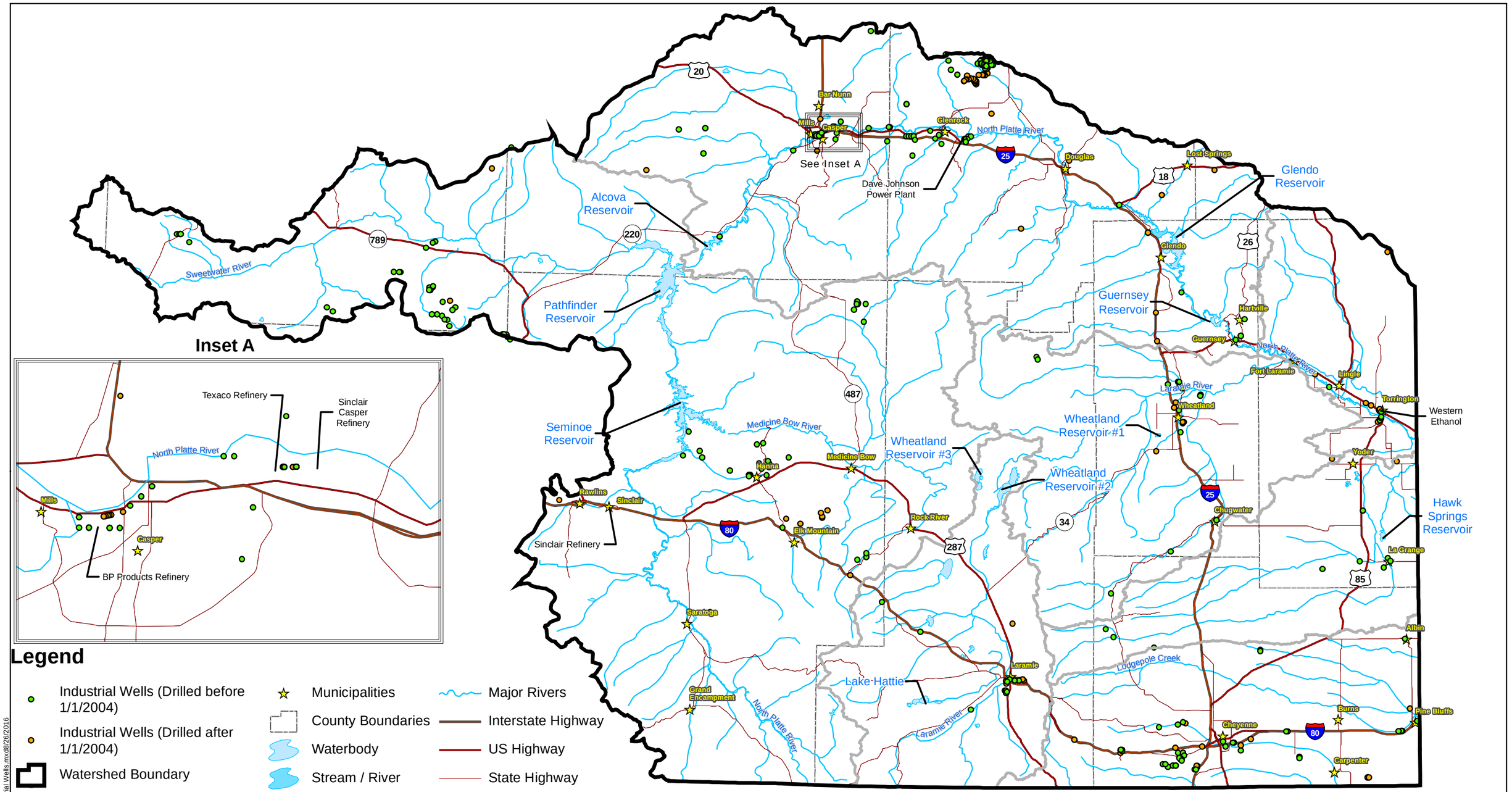
Data from 2011 through 2013 were obtained from the SEO permit records to assess how industrial water usage changed between average, wet, and dry years. The data generally seem to indicate that industrial water use for these established users varies little but mask the variability with lower volume users. While 2013 was an average water year, 2011 was an above average water year and 2012 was a below average water year. The data from these years for the respective industries are summarized in **Table 3.4.1**. The tabulated results in **Table 3.4.1** indicate that overall water use increased only 3.9% from average during the dry year of 2012. Similarly, there was an overall decrease in water use of 2.7% from average during the wet year of 2011. The Dave Johnston Power Plant shown on **Figure 3.4.1** east of Glenrock accounted for the majority of the industrial water usage reported by the SEO, or roughly 60 billion gallons annually. The high volume usage (diversion) of this plant also accounts for the limited variation in the total water use of the four users listed in **Table 3.4.1**. The Power Plant water usage varied within 4% from average between wet and dry years. Industrial water usage among the refineries and ethanol plant generally diminished during the wet water year, and increased during the dry water year. While the refineries usage was up 8.3% to 9.2% during the dry year, Western Ethanol's usage diminished approximately 1.9%. Water usage by the refineries and ethanol plant during the wet year was reduced between 2.5% and 21.5%.

Table 3.4.1: Total Diversions to Million Gallons by Water Year for Industrial Water Users

	2001 (wet year) (million gallons)	2012 (dry year) (million gallons)	2013 (average year) (million gallons)	Percent Difference (between 2012 and 2013 water years[1])	Percent difference (between 2011 and 2013 water years[1])
Above Pathfinder Subbasin					
Sinclair Refinery	905.5	1,014.1	929.0	9.16%	-2.53%
Subtotal	**905.5**	**1,014.1**	**929.0**	**9.16%**	**-2.53%**
Pathfinder to Guernsey Subbasin					
Sinclair Casper Refinery	236.4	271.9	251.0	8.33%	-5.82%
Pacific Corp/Dave Johnston Power Plant	60,359.2	64,315.0	61,932.2	3.85%	-2.54%
Subtotal	**60,595.6**	**64,586.9**	**62,183.2**	**3.87%**	**-2.55%**
Guernsey to State Line Subbasin					
Western Sugar Coop./Western Ethanol	407.3	509.3	519.2	-1.92%	-21.56%
Subtotal	**407.3**	**509.3**	**519.2**	**-1.92%**	**-21.56%**
Total	**61,908.4**	**66,110.3**	**63,631.4**	**3.90%**	**-2.71%**

Notes:
Total Annual diversions obtained from Wyoming Depletion Reports prepared by the Wyoming State Engineer's Office (2011, 2012 and 2013).

1. Positive percentage represents an increase in water use. Negative percentage indicates a decrease in water use.



Legend

- Industrial Wells (Drilled before 1/1/2004)
- Industrial Wells (Drilled after 1/1/2004)
- Watershed Boundary
- Subbasins
- Municipalities
- County Boundaries
- Waterbody
- Stream / River
- Major Rivers
- Interstate Highway
- US Highway
- State Highway

N

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Figure 3.4.1
Platte River Basin Industrial 50+ GPM Wells

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3.4.5 Monthly Water Usage

Monthly water usage data for the four industrial water users were compiled to evaluate seasonal use within the 2011, 2012, and 2013 water years, and in some instances, to estimate consumptive use. **Table 3.4.2** presents the monthly water usage data by user and subbasin, the total amount of water diverted from surface water sources, and where available, the amount of water returned to the surface stream monthly for each entity. These data were obtained from the Wyoming Depletions Report compiled by the SEO for 2011, 2012, and 2013.

Monthly and consumptive use appeared to vary little for the Dave Johnston Power Plant over this time period. Water usage by the refineries and ethanol plant varied seasonally and on an annual basis. Water usage by the refineries tended to increase during the summer months. Western Ethanol used very little water during the late spring through summer months, and used most water between the fall and winter months. Water use for the Dave Johnston Power Plant was fairly uniform throughout the year. Based on the reported return flows, the refineries and ethanol plant consumptively use 100% of the water they divert. The Dave Johnston Power Plant consumptively uses approximately 4% of its diverted flows and returns the rest to the North Platte River.

3.4.6 Recent Industrial Water Use within the Platte River Basin

The following sections describe the various industries and companies that have acquired groundwater permits from the SEO for water supply to begin or supplement their respective industrial practices. The use associated with these permits is presented by subbasin, and only for those particular industrial sectors for which permitting activity had been reported. The industries presented include: Mining and Mine Reclamation; Oil Exploration, Refining and Reclamation; Road and Bridge Construction and Maintenance; Power Generation; Aggregate, Cement, and Concrete Production; and Miscellaneous Industrial Water Use. Unless noted otherwise, details on the permits and associated uses were identified from review of the groundwater permits on file with the SEO (Various). **Table 3.4.3** presents an update of Table 2-6 from the 2006 basin plan.

Above Pathfinder Subbasin Industrial Water Use

Within the Above Pathfinder Subbasin, new groundwater rights were filed for mining and oil development, but have not resulted in much additional water use to date. As shown on **Figures 3.4.1 and 3.4.2**, new permits were filed for wells located near Elk Mountain and south of Jeffery City. Details on the individual permits referenced are included in **Appendix 3-D**, Tables 1 and 2.

Mining and Mine Reclamation. Five new permits were issued for uranium mining and mine dewatering to Energy Fuels, Arch of Wyoming, and Kennecott. Energy Fuels Wyoming, Inc. has permits totaling 2,000 gpm. This water will be obtained from dewatering of the Sheep Mountain underground workings and be used for the heap leaching of uranium at their Sheep Mountain Mine. This project has been in the permitting phase with the Nuclear Regulatory Commission (NRC) and the Wyoming Land Quality Division (LQD) since 2010, and is not currently consuming water. A secondary use of the water for this project is for culinary supply within a shop and warehouse. Energy Fuels anticipates the project will start up sometime between late 2016 and 2017.

Arch of Wyoming (Arch Coal) intends to use their 2,300 gpm of water rights for mine dewatering and dust suppression in mining coal at the Saddleback Hills Mine near Elk Mountain. According to a letter to the SEO dated October 16, 2014, this mine has yet to be developed due to market demand; therefore, there has been no use of the permitted wells to date.

Table 3.4.2: Monthly Industrial Water Diversions and Return Flow in Million Gallons

User		Water Year[1]	Diversion / Return Flow	(Reported Monthly Diversion, MG) Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total	Total Surface Water Diversions (MG)	Total Return Flow (MG)	Estimated Consumptive Use %
Above Pathfinder Subbasin																			
Sinclair Refinery			Surface water diversions	74.5	71.9	64.9	62.8	63.3	80.9	78.0	85.0	81.9	93.4	89.0	59.9	905.5			
		2011	Water returned to river	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	905.5	0.0	100.0
			Surface water diversions	70.9	67.2	64.9	70.3	70.4	81.0	78.3	90.6	117.2	109.5	108.2	85.8	1,014.2			
		2012	Water returned to river	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,014.2	0.0	100.0
			Surface water diversions	77.3	78.4	70.1	76.9	69.1	77.6	73.7	82.6	79.9	74.2	90.2	79.2	929.0			100.0
		2013	Water returned to river	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	929.0	0.0	
Pathfinder to Guernsey Subbasin																			
Sinclair Casper Refinery			Surface water diversions	22.9	20.4	20.5	20.0	10.7	10.2	20.1	20.9	19.8	24.3	24.6	22.0	236.4			
		2011	Water returned to river	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	236.4	0.0	100.0
			Surface water diversions	24.8	21.9	21.3	21.5	20.5	22.3	22.6	22.2	22.9	23.9	24.8	23.2	271.9			
		2012	Water returned to river	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	271.9	0.0	100.0
			Surface water diversions	23.0	20.4	22.0	21.4	18.1	8.9	20.6	22.3	22.6	24.1	24.6	23.0	251.0			
		2013	Water returned to river	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	251.0	0.0	100.0
Pacific Corp / Dave Johnston Power Plant			Surface water diversions	5,158.8	4,992.0	5,170.8	5,164.8	4,661.4	5,152.8	4,779.0	4,588.0	4,725.0	5,152.8	5,170.8	5,643.0	60,359.2			
		2011	Water returned to river	4,965.8	4,833.0	4,995.1	4,987.2	4,507.0	4,981.1	4,608.8	4,384.5	4,496.1	4,914.4	4,911.1	5,407.3	57,991.4	60,359.2	57,991.4	3.9
			Surface water diversions	5,170.8	5,022.0	5,344.4	5,170.8	4,670.4	5,125.8	4,920.0	5,147.2	5,630.3	6,106.5	6,083.7	5,923.1	64,315.0			
		2012	Water returned to river	4,961.9	4,853.4	5,158.1	4,979.1	4,506.0	4,986.0	4,827.6	4,925.0	5,360.9	5,831.8	5,813.2	5,610.2	61,813.2	64,315.0	61,813.2	3.9
			Surface water diversions	5,859.4	5,050.9	5,198.3	5,213.7	4,704.3	5,183.0	5,042.3	5,361.2	5,059.0	4,970.7	5,242.4	5,047.0	61,932.2			4.8
		2013	Water returned to river	5,611.6	4,828.0	4,992.2	4,993.8	4,498.5	4,981.5	4,829.5	5,136.7	4,762.0	4,650.4	4,910.4	4,781.0	58,975.6	61,932.2	58,975.6	
Guernsey to Stateline Subbasin																			
Western Sugar Coop. / Western Ethanol			Surface water diversions	90.3	104.0	74.6	64.9	54.7	8.8	0.9	0.2	0.0	0.8	1.7	6.5	407.3			
		2011	Water returned to river	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	407.3	0.0	100.0
			Surface water diversions	58.7	72.7	96.9	91.1	86.6	44.0	0.7	1.0	1.0	0.9	2.0	53.7	509.3			
		2012	Water returned to river	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	509.3	0.0	100.0
			Surface water diversions	103.3	90.4	83.7	98.6	81.1	35.6	0.6	0.2	0.3	0.6	1.3	23.5	519.2			100.0
		2013	Water returned to river	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	519.2	0.0	

Notes: 1. Based on 2011, 2012, & 2013 Water Year Depletions Report from the Wyoming State Engineers Office

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Table 3.4.3: Summary of Industrial Permitted Water Rights and Actual Water Use within Wyoming's Platte River Basin

Industry – Ranked in Descending Order by Total Industrial Water Use	Gallons per minute (gpm)																	Percent of Total Water Use by Industry
	Subbasin – Ranked in Descending Order by Total Industrial Water Use														Water Use by Industry			
	Pathfinder to Guernsey		Above Pathfinder		Lower Laramie		South Platte		Horse Creek		Upper Laramie		Guernsey to State Line		Subtotal of Water Use by Industry		Total of Water Use by Industry	
	GW	SW	GW	SW	GW	SW	GW	SW	GW	SW	GW	SW	GW	SW	GW	SW	GW & SW	
Oil exploration, refining and reclamation	8,896	1,921	8,640	752	485		1,168		300		50		500		20,039	2,674	22,713	25
Mining and mine reclamation	4,683	449	16,974	2	0										21,657	451	22,108	24
Power generation	5,215				960	10,303	200								6,375	10,303	16,678	18
Miscellaneous	1,830	2,886	275	1,580	100		2,383		4,485	100			1,432		10,505	4,566	15,071	16
Aggregate, cement and concrete production	8,740		50		275		2,585		25		870	583			12,545	583	13,128	14
Road and bridge construction and maintenance[1]		197		592		395	50	197				592			50	1,974	2,024	2
Subtotal, gpm	29,364	5,454	25,939	2,926	1,820	10,698	6,386	197	4,180	100	920	1,176	1932		71,171	20,552	91,723	
Subbation Total, gpm	34,818		28,865		12,518		6,583		4,910		2,096		1,932					
Platte River Basin Total, gpm	91,723																	
Platte River Basin Total, ac-ft/yr	147,950																	
Percent of total water use by subbasin	38.0		31.5		13.6		7.2		5.4		2.3		2.1					
Percent of total water use by subbasin **(Original Basin Plan)**	36.4		35.0		13.4		6.1		5.7		2.3		1.1					

Notes:
Permitted water use data was used where information on actual industrial water use was not available.
GW – Groundwater SW = Surface Water

1. Water is used when construction and/or maintenance activities are in progress.

Oil Exploration, Refining, and Reclamation. Six new groundwater well permits have been issued for oil related industry in the subbasin, but only four of those permits are significant in terms of potential usage. Medicine Bow Fuel and Power, LLC (DKRW Energy) filed for four 1,000 gpm permits to use the water from the Mesaverde Aquifer for converting coal to liquid fuel. Mr. Bill Gathmann (2015) of DKRW Energy indicated that only one well permit was issued, and also explained that the facility has not yet been constructed. Hence, there has been no consumptive use to date. Once the facility is operational, it will consume approximately 300 gpm with zero return on a 24/7 operational basis. Construction of the facility is anticipated to take up to four years to complete once initiated.

Road and Bridge Construction and Maintenance. One new permit was issued to McMurry Ready Mix to use water for dust control and compaction operations for a Wyoming Department of Transportation (WYDOT) project on U.S. Highway 287. The estimated project duration was two years based on the SEO permit.

Aggregate, Cement, and Concrete Production. One new 50 gpm permit was issued to WYDOT for dust control and for crushing operations for the reconstruction of a 10.34 mile section of U.S. Highway 287 between Rawlins and Muddy Gap in Carbon County (State project SCP-SL13-N211056). The water source is groundwater from the Brokaw Pit. The permit has a 15-year limit for operations.

Miscellaneous Industrial Use. Two new permits were issued to Arch of Wyoming, LLC and Wyoming State Game & Fish Department with a primary use for stock watering. Arch of Wyoming's secondary use is dust abatement and reclamation. Both permits total 275 gpm.

Pathfinder to Guernsey Subbasin Industrial Water Use

Within the Pathfinder to Guernsey Subbasin, new groundwater rights were principally filed for uranium mining and oil development. The expansion of these industries involved significant additional water use in the subbasin. As shown on **Figures 3.4.1 and 3.4.2**, new permits were filed for wells located principally north of Glenrock and northeast of Douglas. Details on the individual permits referenced are included in **Appendix 3-D**, Tables 1 and 2.

Mining and Mine Reclamation. Of the 57 new 50+ gpm groundwater permits issued, 47 were issued for uranium recovery and processing operations in the southern Powder River Basin. Cameco Resources dba Power Resources owns 43 of the permits with a total permitted yield of 34,900 gpm. The remaining four mining related permits accounted for a total of 670 gpm. Cameco has been in operation since 1987 at their Smith Ranch/Highland Mine which has four operating plants and mines uranium via the in situ recovery process. Each of the four plants can use up to 4,200 gpm of water, but consumptively uses only 1% of the volume that is pumped as 99% is reinjected and further utilized for mining uranium. While the actual groundwater production volume varies, it can range up 16,800 gpm with a consumptive use of only 168 gpm.

Oil Exploration, Refining, and Reclamation. An additional 47 permits for industrial water supply wells were issued for oil related operations, seven of which were for enlargements on existing wells. Most of the permits, 34, were issued for oil exploration and refining while the remaining 13 permits were issued for reclamation purposes. Chesapeake Operating Inc. obtained permits for 15 water wells for a total appropriation of 2,740 gpm. The wells are all located near Douglas. The water is used for the construction and preparation of drill sites, and hydraulic fracturing of oil wells. Another 3,016 gpm is permitted for oil and gas exploration by several other companies.

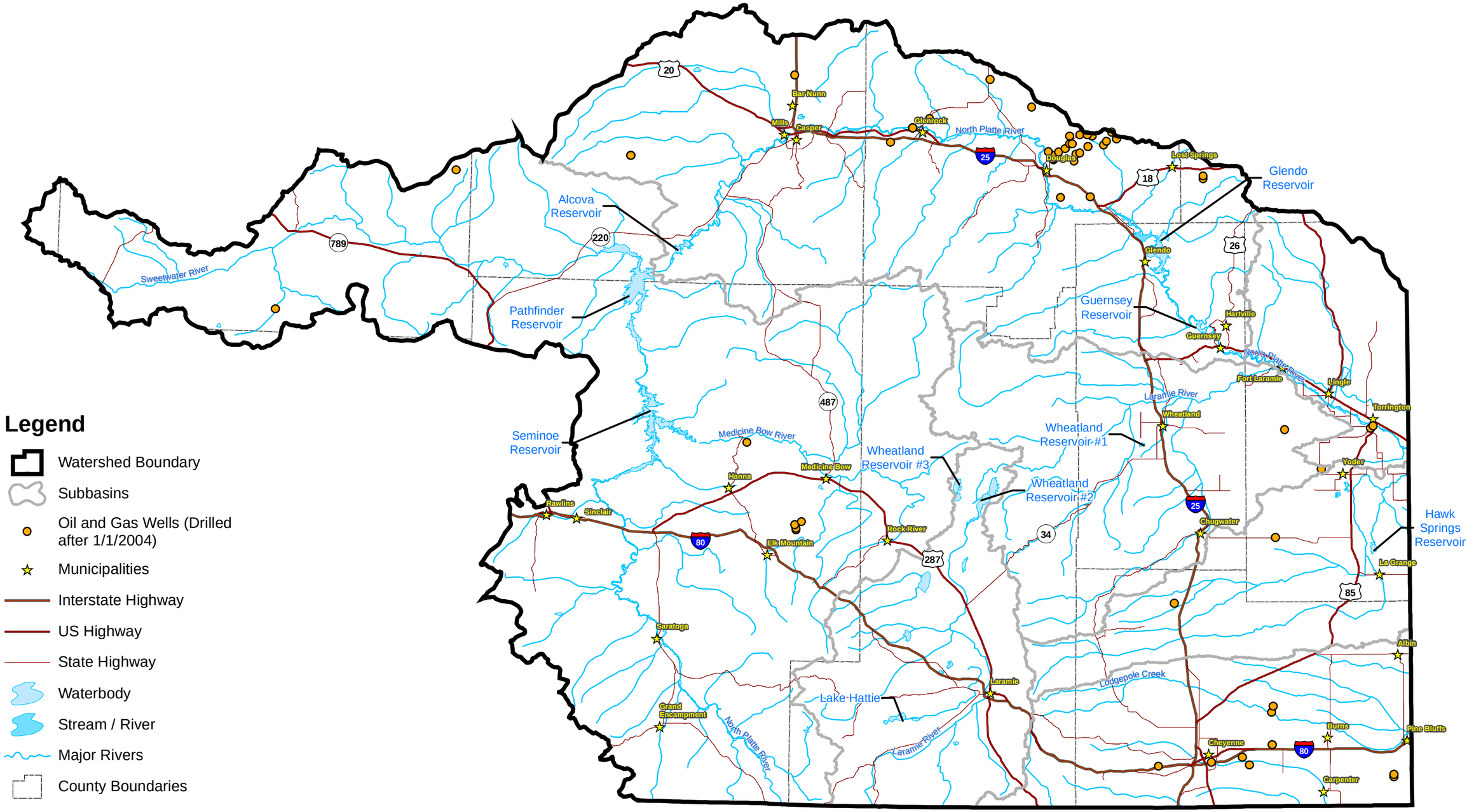

Figure 3.4.2
Platte River Basin Oil and Gas Production Wells

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Mr. Kyle Bradley (2015), a Regulatory Analyst for Chesapeake Energy Corp., provided water usage data for several recent years and indicated that active drilling did not commence until 2009. Chesapeake Energy Corp. has surface water contracts to purchase water from the U.S. Bureau of Reclamation (USBR) for hauling water during years of excess water on the North Platte River, and also purchases water from irrigators via Temporary Water Use Agreements. Mr. Bradley (2015) provided groundwater usage data for 2013, 2014, and 2015. In addition to their own permits, Chesapeake Energy Corp. has agreed to handle reporting to SEO for some well permits that are privately held. In some instances, the well owner has sold water to other oil and gas operators or other parties needing fresh water. Due to this fact, the total water use reported may not always reflect what Chesapeake Operating, LLC has actually put to beneficial use in their operations. According to Mr. Bradley, a total of 166.85 MG, 95.80 MG, and 99.57 MG were used in 2013, 2014, and 2015, respectively.

Two companies, Texaco Downstream Properties, Inc. and BP Products North America use water for hydrocarbon recovery and reclamation at former refinery sites in Casper. Combined they have 13 permits that have total permitted water rights of 1,150 gpm.

Road and Bridge Construction and Maintenance. WYDOT was issued three permits totaling 350 gpm for construction purposes related to the reconstruction of a 3.32 mile section of Interstate 25 north of Wheatland and 3.57 miles of Wyoming 319, for a combined length of 6.89 miles.

Aggregate, Cement, and Concrete Production. GGH Aggregate LLC was issued a permit at a production rate of 1,000 gpm. The water is to be used for dust suppression, construction, and sanitary uses. Croell Redi-Mix Inc. has two permits on one well that provides 500 gpm to the Elkhorn Sand & Gravel Pit. The water is used to wash sand from the aggregate resource and for dust abatement related to mining operations.

Miscellaneous Industrial Water Use. Two miscellaneous permits for a total of 125 gpm were issued. The main use of the water is for washing down of equipment, while secondary uses include irrigation, dust suppression, and restrooms.

Guernsey to State Line Subbasin Industrial Water Use

Within the Guernsey to Stateline Subbasin, new groundwater rights were filed for oil development and miscellaneous industrial purposes. As shown on **Figures 3.4.1 and 3.4.2**, these permits were filed for wells located primarily near Torrington. Details on the individual permits referenced are included in **Appendix 3-D**, Tables 1 and 2.

Oil Exploration, Refining, and Reclamation. One permit was issued to John's Pump Service for 500 gpm for oil exploration. This well provides water to a loading facility where water is hauled to the well sites.

Miscellaneous Industrial Water Use. The SEO issued five permits totaling 560 gpm of water rights. The water is mainly for agricultural purposes such as mixing of liquid fertilizer and pesticides, washing equipment, and some irrigation. Wyoming Ethanol LLC has three permits totaling 765 gpm. The water is used for boiler feed and process water at an ethanol production facility. This facility recently closed.

Industrial Water Use in the Upper Laramie Subbasin

Within the Upper Laramie Subbasin, a new groundwater right was filed for aggregate industrial purposes. As shown on **Figure 3.4.1**, this permit was filed for a well located north of Laramie. Details on the individual permit referenced are included in **Appendix 3-D**, Table 1.

Aggregate, Cement, and Concrete Production. One new permit was issued to Pete Lien & Sons, Inc. at a production rate of 500 gpm. The well is used at a batch plant for aggregate crushing, concrete and asphalt production, dust abatement, and domestic purposes.

Lower Laramie Subbasin Industrial Water Use

Within the Lower Laramie Subbasin, new groundwater rights were filed for oil development, power generation, and miscellaneous industrial purposes. As shown on **Figures 3.4.1 and 3.4.2**, these permits were filed for wells located in and around Wheatland. Details on the individual permits referenced are included in **Appendix 3-D**, Tables 1 and 2.

Oil Exploration, Refining, and Reclamation. The SEO issued three new permits for wells for oil and gas industrial development, which included a total of 485 gpm. The main use of the water is for the construction of drill sites, dust abatement, and oil and gas exploration. Secondary uses include stock watering and domestic use.

Power Generation. Basin Electric Power Cooperative added one well with a permitted water right of 950 gpm for use at the Laramie River Station, a steam power electric generation plant. The water is used for cooling water, process water, and fire protection.

Aggregate, Cement, and Concrete Production. One well permit with a production rate of 50 gpm was issued for use at a concrete batch plant.

Miscellaneous Industrial Use. Flying H Land and Cattle was issued one well permit for 100 gpm for a 6,000 head feed lot. Another permit was issued for 100 gpm for stock and irrigation purposes.

Horse Creek Subbasin Industrial Water Use

Within the Horse Creek Subbasin, a few new groundwater rights were filed for oil development and miscellaneous industrial purposes. As shown on **Figures 3.4.1 and 3.4.2**, these permits were filed for wells located primarily near Yoder. Details on the individual permits referenced are included in **Appendix 3-D**, Tables 1 and 2.

Oil Exploration, Refining, and Reclamation. The SEO issued two new well permits with a total permitted yield of 200 gpm for oil exploration. Both wells are for loading facilities where water is hauled to the well sites.

Miscellaneous Industrial Use. One permit was issued for a commercial feedlot. The well is permitted for 85 gpm.

Industrial Water Use in the South Platte Subbasin

Within the South Platte Subbasin, new groundwater rights were filed for oil development, power generation, and miscellaneous industrial purposes. As shown on **Figures 3.4.1 and 3.4.2**, these permits were filed for wells located primarily near Cheyenne. Details on the individual permits referenced are included in **Appendix 3-D**, Tables 1 and 2.

Oil Exploration, Refining, and Reclamation. Ten new permits for water wells were issued for oil and gas exploration. One of the wells was an enlargement where the water was used for hydrostatic testing of a 16-inch diameter crude oil pipeline. The largest permit was issued to Texas American Resources Co. at a production rate of 2,500 gpm. A total 5,215 gpm was permitted for oil exploration operations.

Road and Bridge Construction and Maintenance. Two permits were issued for WYDOT highway construction projects. Both wells were permitted for 50 gpm.

Power Generation. Generation Development Company, LLC was issued a permit for a production rate of 400 gpm for use at the Cheyenne Prairie Generating Station. The water is used as an alternate supply for make-up water for the cooling tower which cools water from the circulating water system. Coolant water is primarily obtained from the nearby Dry Creek Wastewater Reclamation Facility.

Aggregate, Cement, and Concrete Production. Three permits were issued for dust control and for crushing and screening operations. Two of the sources are wells while the other source is an open pit. Two 200 gpm permits were issued to Jebco Inc. for domestic, sanitary facilities, washing, landscaping, and steam production to feed boilers at an asphalt plant. New permits for aggregate and batch plants totaled 650 gpm.

Miscellaneous Industrial Water Use. One new permit was issued to Cheyenne-Laramie County Corp for Economic Development at the Swan Ranch facility south of Cheyenne. The water is used for landscaping, potable, sanitary and construction purposes.

Burnett Land & Livestock LTD LLLP was issued three well permits each at 60 gpm for a total 180 gpm. These wells are used to provide stock water for a dairy operation near Carpenter.

3.4.7 Industrial Water Use Summary in the Platte River Basin

Since 2004, the types of industrial water use have not changed appreciably in the Platte River Basin. The principal industrial users continue to include oil and gas, coal and uranium as well as power generation, aggregate mining, cement production, chemical processing and ethanol production. Overall, annual industrial water use is estimated to be approximately 147,950 acre-feet in the Platte River Basin as indicated in **Table 3.4.3**. Increases in industrial water use were limited to a few areas. As summarized in **Table 3.4.3**, the Pathfinder to Guernsey Subbasin experienced the most robust increase in industrial water use with additional groundwater production to serve the oil and gas industry near Douglas and uranium mining near Glenrock. This activity increased the subbasin's percentage of total water use in the Platte River Basin from 36.4% to 38.0%. The South Platte Subbasin also witnessed an increase in industrial water use with the addition of a new power plant, dairy, and oil and gas development. This industrial activity raised the subbasin's percentage of total water use from 6.1% to 7.2%.

3.4.8 References

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3.5 RECREATIONAL AND ENVIRONMENTAL USE

3.5.1 Introduction

This section provides detailed information and mapping related to the E&R water uses in the Platte Basin of Wyoming. Although this work is part of a larger effort to update the original Platte River Basin Plan that was completed in 2006, the methodology used for this particular task is considerably different from the original plan memorandum and resultant demand estimates. Further, this section presents specifics as to how the new methodology was utilized in developing current water use patterns for E&R water use and the relationship between current use and traditional, permitted uses. It also provides a detailed analysis of the current uses and how they interact with those permitted uses in each of the subbasins. Within this framework, the appropriate E&R uses will be included in the current and future demand projections, while other uses will be discussed but not included in projections. The methodology for developing these data is discussed below.

3.5.2 Development of the New Methodology

After completing River Basin Plans for the seven Basins in Wyoming, the WWDC desired a more uniform methodology for non-consumptive E&R water uses. HE and Hinckley Consulting were engaged to develop a new methodology that would more accurately explain how the water for these non-consumptive uses related to traditional, permitted uses. The resulting work began with an overview of approaches from the existing Basin plans and identification of the inconsistencies and perceived shortcomings of those plans as related to non-consumptive water use. The HE team, in coordination with WWDC, developed a new methodology and a Handbook for implementing that methodology, the basics of which are described below. The complete study can be found at: http://library.wrds.uwyo.edu/wwdcrept/Wyoming/Wyoming-Environmental_and_Recreational_Water_Use_Study-Final_Report-2012.html.

The initial steps of the process outlined in the Handbook and utilized for this update are:

- Identification and mapping of E&R water uses
- Locating traditional, divertible uses
- Categorization of recreational and environmental uses (described below)
- Assimilation of recreational and environmental uses

The categorization of the E&R water uses places them in context relative to traditional uses. This allows planners to more fully understand the role of these non-consumptive uses under existing conditions and their relative vulnerability in the future. The following categories were developed for the Handbook and have been applied to existing E&R uses in the Platte Basin in this report:

1) ***Protected water uses*** – These are water uses which 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.

2) ***Complementary water uses*** – These E&R water uses exist without explicit protection, but exist and will continue to exist typically by virtue of 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.

3) ***Competing uses*** – Competing uses are those environmental or recreational water uses which are in a location where other traditional water use diverters 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.

Readers should note that this methodology does not include divertible E&R water demands, as recommended in the Handbook. Where diversions exist for a golf course, ski area, hot springs, wetlands or other permitted E&R diversion, those uses have been identified in specific terms and are aggregated as sub-elements of other uses. For example, golf course diversions may be classified as agricultural, municipal or recreational water by the SEO, and are included in the divertible demands for the appropriate category.

3.5.3 GIS Sources

Mapping for this work was provided by Wenck Associates. Geographic Information Systems (GIS) layers were combined to reveal the relationship between E&R water uses and traditional diversions. All diversions of 10 or more cfs which are extremely senior water rights were noted by Wenck if available. **Table 3.5.1** provides a list of sources used. Layers were acquired in late 2014 and early 2015.

Unique Characteristics of the Platte Basin

The Platte Basin is the most populous of all the Wyoming basins and has fully appropriated water rights. Further, water leaving the Basin is governed by the North Platte Decree and 2001 Modified Decree, which govern the amount of water from the Platte Basin that can be diverted for agriculture. The details of these Decrees as they apply to the Platte Basin, its water uses and diversions are discussed in other parts of the updated Basin Plan. The Compact and fully appropriated water rights within the Basin tend to limit or to some extent, impact, future water development prospects for the Basin. Current water uses can be changed with the appropriate approvals and as a result the situation is not static. However, changes are complicated by the various decrees and rules that govern the Basin

and required mitigation, making such changes expensive, time consuming and thus relatively uncommon.

The Platte River Basin encompasses 22,000 square miles, or about a quarter of the state, and covers a wide variety of landscapes (Wyoming Historical Society). The eastern part of the Basin is relatively flat, sparsely populated and well-suited to agriculture. To the west,

the Laramie Mountains provide many recreational opportunities and environmental habitat. The North Platte River traverses the northern part of the Basin and provides a rich environment for fishing and other recreational activities. The close proximity of this Basin to Northern Colorado and its large population base, make it an attractive destination and likely puts additional pressure on recreational and environmental water uses.

The Platte River Basin encompasses many vital aspects of the Wyoming economy and culture. However, it is also the location of many important E&R uses, most notably along the North Platte River and its reservoirs, which provides a wealth of recreational opportunities and wildlife habitat, while providing irrigation waters to Basin farmers. This report will put these varied uses in the context of E&R water use to provide greater understanding for future planning efforts.

Table 3.5. 1: GIS Data Sources for Environmental and Recreational Mapping in the Platte River Basin

Name	Source
Aquatic Habitat Priority Areas	Wyoming Game and Fish
Critical Streams Corridors	Wyoming Game and Fish
Elk Feed Grounds	Wyoming Game and Fish
Fishing Spots	WyGISC
Game and Fish Stream Classifications	Wyoming Game and Fish
Golf Courses	WyGISC
Instream Flows	WWDO, SEO, Wyoming Game and Fish
Lakes	WSGS
Landownership	BLM
Model Demand Nodes	WWDO
National Wetlands Inventory	Fish and Wildlife Service
Nature Conservancy Easements	The Nature Conservancy
Non-Nature Conservancy Easements	The Nature Conservancy
Scenic Highways and Byways	WyGISC and ESRI
Ski Areas	WyGISC
Streams	WSGS
Trout Unlimited Projects	Trout Unlimited
Wild and Scenic Rivers	WyGISC and SEO
Wilderness Areas	WyGISC

3.5.4 Section Organization and Maps

This report first considers E&R water uses that fit within the Handbook framework and that will be included in the current water demand profile and demand projections for the Basin update. Specific E&R uses are mapped and discussed on a subbasin level.

Each subbasin is discussed individually in the following order:

- Above Pathfinder Dam
- Pathfinder to Guernsey
- Guernsey to State Line
- Upper Laramie
- Lower Laramie
- Horse Creek
- South Platte

For each subbasin, two maps were prepared for the analysis and categorization of water uses. That first map includes existing E&R water uses, along with traditional diversion locations, which are identified by their permitted cfs allocation. The second map includes dry

land information, such as land ownership, campgrounds, electric generating facilities, etc. This land-use map provides context to the water-use map, separated to facilitate interpretation. Electronic versions of these maps will be available that will allow users to select map layers to view any combination of these elements as desired. As the Above Pathfinder Dam Subbasin is quite large and has many relevant uses to map, that subbasin was divided into two maps to improve readability, east and west, and thus there are four maps for this subbasin. The categorization of the E&R water uses is also analyzed separately for the east and west sections.

Wetlands are discussed for each subbasin, but not included on the maps to improve the readability of the maps. A more general discussion of wetlands and a Basin-wide map are provided after the subbasin analyses in a later section of this report. A map of all irrigated lands is also provided following the wetlands map.

There are some topics that are related, but less directly, to E&R use that do not lend themselves to the Handbook methodology because of their broad geographic reach and non-specific water use characteristics. These topics include threatened and endangered species and hunting, which are discussed generally; Basin-wide maps have been provided, following the subbasin analyses.

Water Use Maps

Water use maps are provided for each subbasin. Traditional, permitted water uses are included on these maps, and the marker for each indicates the size of the allocation. As discussed above, the relationship between these water uses and E&R is the basis for this analysis. These maps also include existing E&R water uses, which were located using the GIS data layers discussed above. An effort was also made to acquire any unique Platte Basin uses. Legends for each subbasin map only include those items that are relevant to that subbasin. Recreational topics include:

- Fishing access points
- Whitewater rafting
- Trout streams - mapped by their classification, which is determined by the estimated total pounds of trout per mile (WGF, 2006): [1]
    - Blue Ribbon Streams – National importance, > 600 pounds per mile
    - Red Ribbon Streams – Statewide importance, 300 to 600 pounds per mile
    - Yellow Ribbon Streams – Regional importance, 50-300 pounds per mile

Mapped environmental elements include:

- Instream Flow Segments
- Crucial Stream Corridors
- Trout Unlimited Projects
- Aquatic Enhancement Priority Areas
- Designated or Protected Wetlands

Land Use Maps

For each subbasin, a land use map follows the water use map. Mapped recreational elements include:

- Campgrounds

[1] Green Ribbon streams are of local importance <50 pounds per mile and include 63% of all stream miles in the state and are not included because of the large number and relative lack of importance.

- Natural Landmarks
- Scenic Highways and Byways
- National Historic and Scenic Trails

Mapped environmental elements include:

- Wilderness and Roadless Areas
- U.S. Forest Service Lands
- Other Land Ownership

NOTE: The GIS databases used in this mapping and analysis include:

1) WyGISC
2) SEO Water Rights Database
3) USFS Natural Resource Database
4) 2006 Platte River Basin Plan Database
5) American Whitewater Association Database

3.5.5 Subbasins

The seven subbasins of the Platte Basin are shown in **Figure 3.5.1** which also includes the approximate elevations.

Above Pathfinder Dam Subbasin

This is the largest of the Platte Basin subbasins with many recreational opportunities and varied landscapes. The entire subbasin is first described as a whole, but for the mapping analysis, this subbasin will be discussed in two sections. First is Above Pathfinder Dam Subbasin (East). Second is the area below Pathfinder Reservoir and Above Pathfinder Dam Subbasin (West), the area including and to the west of Pathfinder Reservoir. The East portion of the subbasin encompasses much of Carbon County, about 20% of Albany County and a very small portion of southern Converse County. The West portion includes the northwest area of Carbon County, southwest corner of Niobrara County, across the southern part of Freemont County and small portion of eastern Sublette County.

This mostly rural subbasin offers many opportunities for recreation including a long stretch of the North Platte River, the Sweetwater River and two major reservoirs. It is also home to much of the Medicine Bow National Forest and extensive environmentally sensitive areas.

The subbasin includes the highest elevations in the Basin, ranging from about 6,400 to more than 13,000 feet. About 23% of the Basin's irrigated lands are in this subbasin, mainly in the East Pathfinder Subbasin. However, since 2006, irrigated acreage has declined 18% with about 123,500 irrigated acres remaining as of 2012.

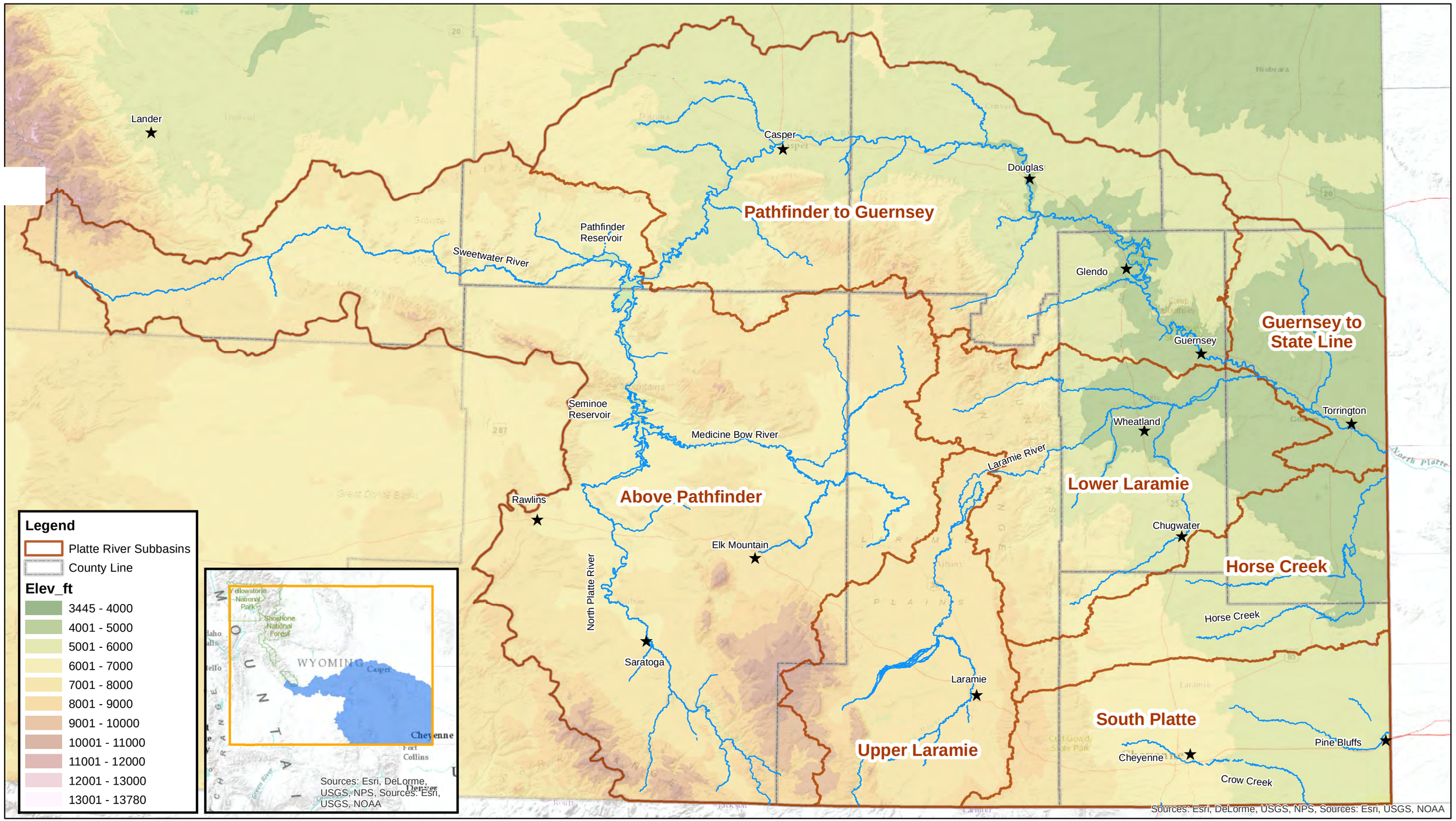

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Figure 3.5.1 Approximate Elevation

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Major Recreational Opportunities in the Above Pathfinder Dam Subbasin

Seminoe Reservoir and State Park. Seminoe State Park was established in 1965, and construction of Seminoe Dam was completed in 1939. Seminoe Dam is located on the North Platte River approximately 72 miles southwest of Casper and 34 miles north of Sinclair in Carbon County. The reservoir has an adjudicated capacity of 1,026,360 acre-feet. The Wyoming Department of State Parks and Cultural Resources manages the recreational facilities at Seminoe Dam for the USBR. Campgrounds and boat-launching facilities are provided to the public on a fee basis. The Morgan Creek drainage is located near the north end of the reservoir. This approximately 4,700-acre area has been designated by the Wyoming Game and Fish Department (WGFD) as winter range for elk and bighorn sheep.

Kortes Reservoir / Miracle Mile Area. This area is located in a narrow North Platte River canyon downstream of Seminoe Dam in Carbon County. The USBR manages Kortes Reservoir and the North Platte River reach below the dam known as the "Miracle Mile." No fish are stocked in Kortes, but rainbow trout are stocked annually in the Miracle Mile (USBR – Kortes, 2015). The dam was completed in 1951 primarily as a hydroelectric power generation project. The reservoir has an adjudicated capacity of 4,640 acre-feet. Due to frequent surges of water from Seminoe Dam, there are no boat facilities providing access to Kortes Reservoir. The Miracle Mile area extends approximately 5.5 miles downstream from the Kortes Dam to the southern management unit of the Pathfinder National Wildlife Refuge. Primitive camping areas are located in the Miracle Mile area. No fees are collected for recreational utilization of this area.

Pathfinder Reservoir. Pathfinder Reservoir is located on the North Platte River 47 miles southwest of Casper in Carbon and Natrona Counties. The reservoir was completed in 1909 and the adjudicated amount of water allotted to the reservoir is 1,070,000 acre-feet. The U.S. Bureau of Land Management (BLM) and the Natrona County Roads, Bridges and Parks Department manage the recreational facilities at Pathfinder Reservoir for the USBR. Camping and boat launching facilities are present at the site as well as an interpretive center and trail. The facilities are free to the public with the exception of a fee to utilize the campgrounds. Portions of the reservoir are included in the Pathfinder National Wildlife Refuge, which consists of 16,807 acres and 117 miles of shoreline. At low reservoir levels much of the refuge is a bare mud flat with some marsh adjacent to tributary stream inlets.

State Park visitor data for Seminoe State Park are shown in **Table 3.5.2**.

Table 3.5.2: State Park Visitor Days, Five Year Average and 2014

State Park	Five Year Average (2009-2013)	2014
Seminoe	22,329	24,466
Total		**24,466**

Source: Wyoming Division of State Parks, Historic Sites and Trails, Department of State Parks & Cultural Resources, *Visitor Use Program, 2014*.

Fishing. Almost 170,000 angler days are estimated for this subbasin each year. Many trout species, including rainbow, brown and cutthroat, along with walleye can be found in the reservoirs and other locations. **Table 3.5.3** provides angler days for various locations throughout the subbasin.

Table 3.5.3: Angler Days for the Above Pathfinder Dam Subbasin

Above Pathfinder Subbasin	Angler Days/Year
Kortes Reservoir, Miracle Mile, Pathfinder Reservoir	46,827
Seminoe Reservoir and Big Ditch Drainage	33,200
Platte River, North Seminoe to CO	18,547
Encampment River Drainage	16,258
Lake, Cedar, Elk Hollow Drainages	14,191
Upper Medicine Bow River Drainage	10,465
Seminoe and Ferris Mountains	9,180
Lower Medicine Bow River Drainage	5,879
Sweetwater River Drainage	NA
Jack and Spring Creeks	3,975
Beaver Creek and Big Creek Drainages	3,292
Pass Creek Drainage	3,062
Shirley Mountains	1,157
Total	**166,033**

Note: Some of these data have not been updated in several years, but these are the latest available figures.
Source: Al Conder, Casper Regional Fisheries Supervisor, WGFD, December 2014 and Mike Snigg, Laramie Regional Fisheries Supervisor, WGFD, January 2015.

Notable Environmental Factors in the Above Pathfinder Dam Subbasin

Critical Habitat Areas. The main stem of the North Platte River, and its tributaries, from the Colorado border to Sage Creek has been designated a Crucial Aquatic Habitat Area. The value of this habitat includes supporting wild trout fisheries and providing wetland habitat for amphibians. Residential and energy development are potential threats due to fragmentation of habitat. The boreal toad, beaver, brown trout, rainbow trout and brook trout are the focus of restorative action. Proposed solutions include conservation easements, creation of wetland habitats, fish passage and screening at irrigation diversions, and promotion of livestock grazing management practices to restore riparian habitat (WGF – Upper North Platte, 2014).

The North Platte River from Seminoe Reservoir to Pathfinder Reservoir, including the Miracle Mile blue ribbon fishery, has also been classified as a Crucial Habitat Area. This designated area continues to Alcova Dam in the Pathfinder to Guernsey Subbasin. This area received this designation due to its superior sport fisheries and wetlands. Brown trout, rainbow trout and walleye are species of concern. Proposed actions include enhancement of spawning habitat, working with USBR on minimum pool requirements and control of invasive species (WGF – Upper North Platte Reservoirs, 2014).

Sweetwater Aquatic Enhancement Area. This area has riparian habitat, aspen, true mountain mahogany and big sagebrush plant communities that have been degraded due to overgrazing, lack of beaver, trampled stream banks, stream bank erosion, channel degradations, sedimentation, reduced floodplain connectivity, low riparian woody plant regeneration, and conifer encroachment and lacks diversity. Remediation efforts are focused on rainbow trout, brown trout, cutthroat trout, brook trout, native non-game fish species and the Great Basin Spadefoot (toad). Proposed actions to improve this habitat include fencing, restoration of the beaver population, upgrades to road and culvert crossings that are detrimental to fish habitat and promotion of best management practices (WGF – Sweetwater, 2014).

Trout Unlimited Project. Encampment River Watershed Restoration Plan seeks to restore a segment of the Encampment River, which has degraded due to channelization, mine dredging and diversions, leaving the river banks highly unstable. It is also wide

and shallow which warms the water causing stress to fish. The project is a partnership between WGF and the Wyoming Wildlife and Natural Resource Trust Fund, and the land owner. Many other groups have contributed funding. The project will narrow the channel to increase sediment flow, keep the water cool and reduce algae. A wetland area has also been created which will benefit the fishery by providing off-channel rearing habitat for young fish. (TU, 2015)

Pathfinder National Wildlife Refuge. This wildlife refuge was established in 1909, although its boundaries have been changed several times. It is generally located on the lands around Pathfinder Reservoir and is jointly managed by U.S. Fish and Wildlife Service (USFWS), the USBR, the WGFD, the BLM, and Natrona County Parks. Pathfinder Reservoir is attractive to water birds and the refuge provides open water wetlands, shrub and grasslands and alkali flats that support a diversity of wildlife. (USFWS, 2014)

Minimum Release Reservoirs. The only minimum release flow reservoir in this subbasin is located at the Kortes Dam. Authorized by Congress, a minimum flow of 500 cfs is maintained in the North Platte between Kortes and the normal headwater of Pathfinder Reservoir permits maintenance of the fishery in the Miracle Mile, discussed above. Details are provided in **Table 3.5.4.**

Table 3.5.4: Minimum Release Reservoir in the Above Pathfinder Dam Subbasin

Structure	Owner	Minimum Release	Regulation
Kortes Dam	USBR	500 cfs	U.S. Public Law 92-146 (85 Statute 414), Missouri Basin project
Source: USBR Annual Operating Plan, North Platte River Area, 2013-2014.			

Classification of Recreational and Environmental Water Uses in the Above Pathfinder Dam (East) Subbasin

As described in Section 3.5.1, an analysis of recreational and environmental water uses was performed utilizing GIS data and maps in order to categorize those uses. **Table 3.5.5** provides a listing or recreational and environmental sites within the subbasin.

Table 3.5.5: Recreational and Environmental Water Uses within the Above Pathfinder Dam Subbasin

Recreation Sites	
Fishing Access	20
Whitewater Rafting	8
Trout Streams	
Blue	4
Red	6
Yellow	Numerous
Campgrounds	22
Natural Landmarks	1
Scenic Highways and Byways	2
National Historic and Scenic Trails	0
Environmental Uses	
Wilderness/Roadless Areas	Yes
US Forest Service Lands	Yes
Instream Flow Segments	6
Crucial Stream Corridors	1
Aquatic Crucial Priority Areas	4
Wetland Area	Yes
Source: GIS sources are provided in the Introduction.	

Maps of these data are provided following the analysis.

Categorization of Recreational and Environmental Water Uses in the Above Pathfinder Dam (East) Subbasin

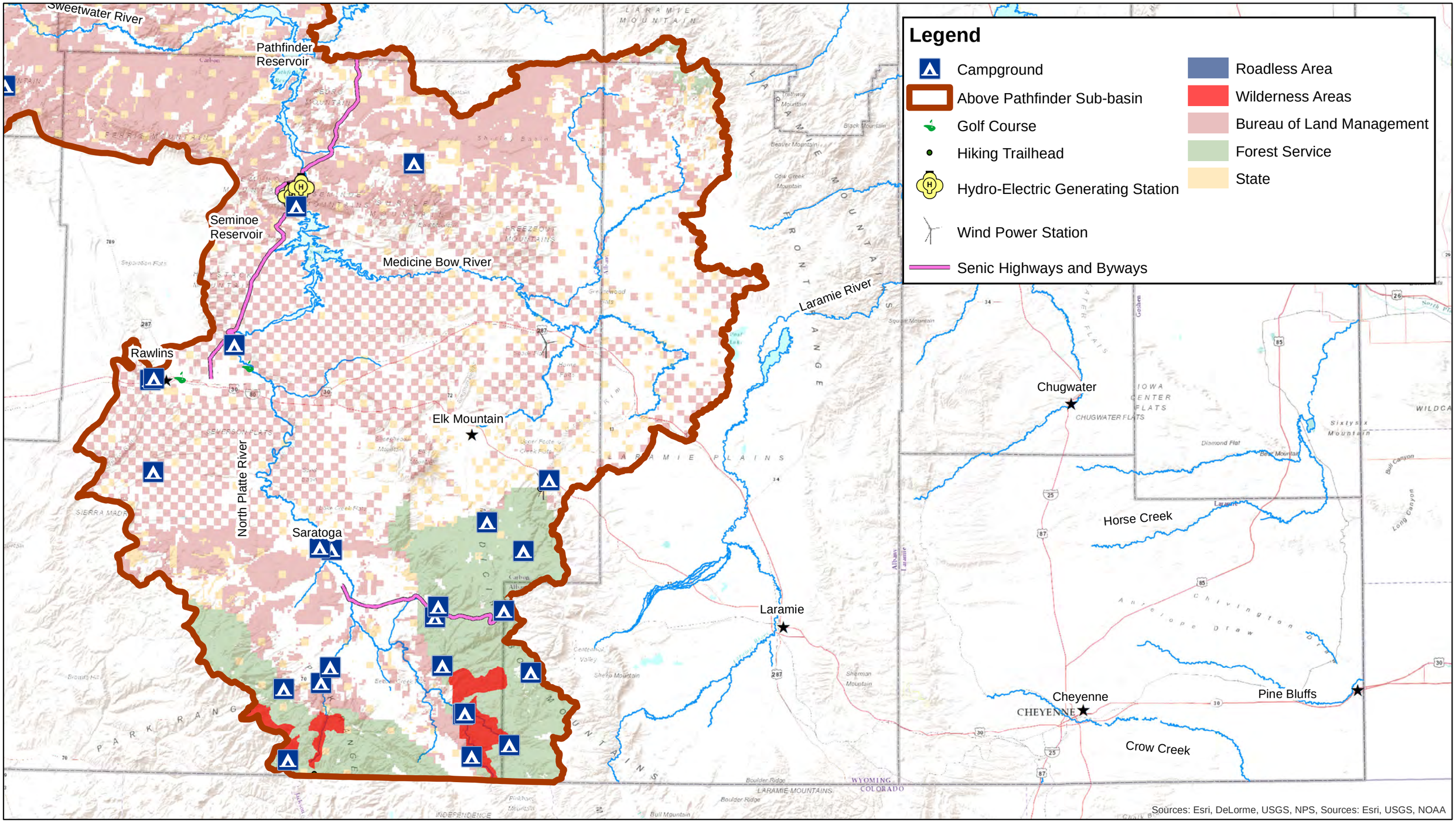
As shown on **Figure 3.5.2**, the fishing and whitewater activity south of Saratoga in the southwest corner of the subbasin are located within U.S. Forest Service (USFS) lands. As a result, these uses are considered protected. They are also within the Encampment River Watershed aquatic enhancement area, although this designation does not provide explicit protection. The southeastern portion of the subbasin is also within USFS lands and thus the fishing and whitewater rafting there are also protected. The Encampment River Watershed and Douglas Creek aquatic enhancement areas in the subbasin are within USFS lands which affords these areas protected status and facilitate proposed improvement activities. The Trout Unlimited Project is located along an instream flow segment which affords this environmental project protection.

Between these two tracts of USFS lands, there is one red ribbon trout stream. The upper portion of this stream is complementary to existing diversions. Downstream of the diversion and continuing as the red ribbon designation becomes yellow, there are numerous small diversions which provide a complementary status to this stream segment.

The North Platte River crosses the border from Colorado into this subbasin within USFS wilderness land. After it leaves that protected area, the area around the River is within the North Platte Crucial Stream Corridor. There is a long section of the River that has been designated Blue Ribbon Trout Stream that is complementary to downstream diversions south of Saratoga. After those diversion, where the Encampment River flows into the North Platte, the river flows to Seminoe Reservoir and there are no sizable diversions that would complement the bluE&Red ribbon stream segments. However, due to minimum release flows at Kortes Dam, the Cooperative Agreement and reservoir operating plans, it is unlikely that any new diversions could disrupt the recreational activities on the this stretch of the North Platte. Therefore, these uses should be considered complementary. As described above, minimum flow requirements between Kortes Dam and Pathfinder Reservoir provide explicit protection to the blue ribbon stream segment known as the Miracle Mile.

In the Elk Mountain area, an instream flow segment provides protected status to a whitewater rafting area and yellow ribbon stream. Elsewhere in the area surrounding Elk Mountain, fishing and whitewater rafting can be classified as complementary due to various irrigation diversions. To the east of the North Platte, several yellow ribbon streams are complemented by numerous small diversions and several large diversions. The Pathfinder National Wildlife Refuge is protected by its wildlife refuge status.

The determination for the Above Pathfinder Dam (East) subbasin is that all E&R uses are either protected or complementary and that there are no competing uses that should be eliminated from the water demand calculations. **Table 3.5.6** provides a summary of the classified uses in Above Pathfinder Dam (East) subbasin.



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Wyoming Water Development Commission

Figure 3.5.2 Land Use - Above Pathfinder East

Wyoming Water Development Office

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Table 3.5.6: Categorization of E&R Uses in the Above Pathfinder Dam (East) Subbasin

Status	Location and Uses
Protected	All activities on U.S. Forest Service lands, ISF segments, Miracle Mile blue ribbon stream, whitewater rafting and yellow ribbon segment upstream of an ISF near Elk Mountain, Pathfinder National Wildlife Refuge, aquatic enhancement areas
Complementary	Red and yellow segments between U.S. Forest Service lands, blue ribbon segment to Kortes Dam, whitewater rafting east of Elk Mountain, yellow ribbon segments in the northeast area of the subbasin
Competing	NA

Maps of these resources are provided in **Figure 3.5.2 and Figure 3.5.3**.

Categorization of Recreational and Environmental Water Uses in the Above Pathfinder Dam (West) Subbasin

Most of the area in the west portion of this subbasin is BLM land, with some state and USFS lands. Privately owned land is very limited. Much of the Sweetwater River and its tributaries are designated as yellow ribbon streams as they flow out of the Wind River Range. Fishing and whitewater rafting are protected by an ISF along one segment of the River. Segments at the higher elevations are protected by geography and complementary to downstream diversions. A designated fishing access point to the northeast at Carmody Lake is unprotected and subject to drought conditions. A second, small rafting location in the Granite Mountains is protected by its mountainous location and complemented by downstream diversions. Yellow ribbon streams that feed into the Sweetwater from the Granite Mountains are complemented by several large downstream diversions and the operating requirements of Pathfinder Reservoir, where the Sweetwater joins the North Platte. A third fishing access point in the Ferris Mountains is protected by that mountainous location.

The determination for the Above Pathfinder Dam (West) subbasin is that all E&R uses are either protected or complementary, with the exception of fishing access at Carmody Lake. **Table 3.5.7** provides a summary of the classified uses in the Above Pathfinder Dam (West) subbasin.

Table 3.5.7: Categorization of E&R Uses in the Above Pathfinder Dam (West) Subbasin

Status	Location and Uses
Protected	Fishing and whitewater rafting upstream and contiguous with an ISF, yellow ribbon segments at high elevations, fishing access point in the Ferris Mountains, fishing at Pathfinder Reservoir
Complementary	Whitewater rafting in the Granite Mountains, yellow ribbon segments that feed into the Sweetwater River
Competing	Fishing access point at Carmody Lake

Maps of these resources are provided in **Figures 3.5.4 and 3.5.5**.

Pathfinder Reservoir
Sweetwater River
Seminoe Reservoir
Medicine Bow River
Laramie River
Rawlins
Elk Mountain
North Platte River
Saratoga
Glendo
Guernsey
Wheatland
Torrington
Chugwater
Pine Bluffs

Legend

- Fishing Access
- Trout Unlimted Projects

Surface Water Diversion

- 0 - 10 cfs
- 10 - 50 cfs
- 50 - 100 cfs
- 100-300 cfs
- 300 - 15,000 cfs
- USGS Stream Gages

- Blue Ribbon Trout Stream
- Red Ribbon Trout Stream
- Yellow Ribbon Trout Stream
- ISF Segments
- Whitewater
- Crucial Stream Corridor
- Streams
- Aquatic Habitat Enhancement Priority Area

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Wyoming Water Development Commission

Figure 3.5.3 Surface Water Uses - Above Pathfinder (East)

Wyoming Water Development Office

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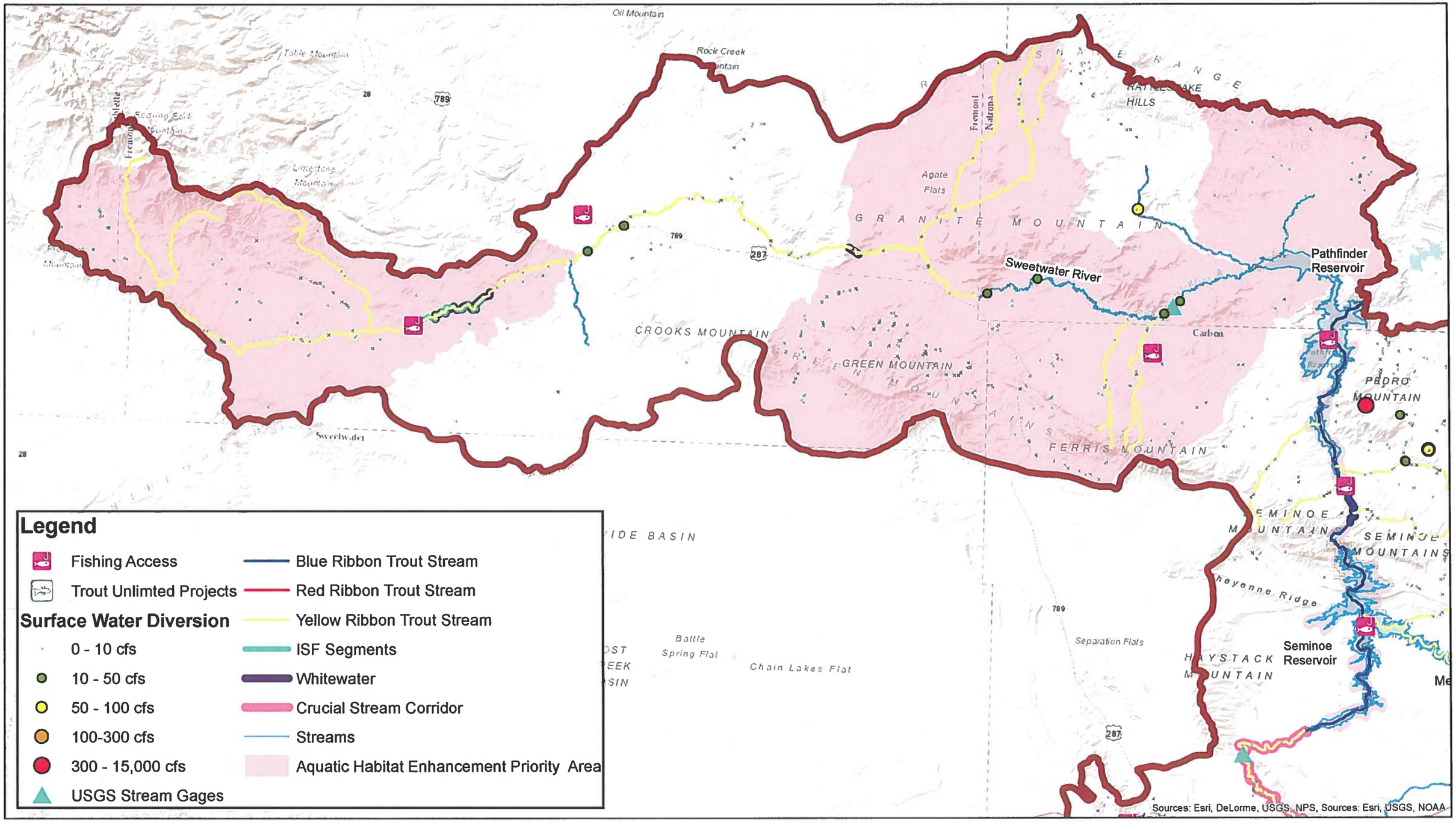

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Wyoming Water Development Commission

Figure 3.5.4 Surface Water Uses - Above Pathfinder (West)

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Oil Mountain
Table Mountain
Rock Creek
Mountain
Roaring Fork
Mountain
Limestone
Mountain
Fremont
Natrona
RATTLESNAKE HILLS
Agate
Flats
GRANITE MOUNTAIN
Sweetwater River
CROOKS MOUNTAIN
GREEN MOUNTAIN
Carbon
Pathfinder
Reservoir
PEDRO
MOUNTAIN
FERRIS MOUNTAIN
Sweetwater
DIVIDE BASIN
LOST
CREEK
BASIN
Battle
Spring Flat
Chain Lakes Flat
SEMINOE MOUNTAINS
Seminoe
Reservoir
Separation Flats
HAYSTACK MOUNTAIN
Rawlins
28
789
287

Legend

- Campground
- Above Pathfinder Sub-basin
- Golf Course
- Hiking Trailhead
- Hydro-Electric Generating Station
- Wind Power Station
- Senic Highways and Byways
- Roadless Area
- Wilderness Areas
- Bureau of Land Management
- Forest Service
- State

Sources: Esri, DeLorme, USGS, NPS, Sources: Esri, USGS, NOAA

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Wyoming Water Development Commission

Figure 3.5.5 Land Use - Above Pathfinder (West)

Wyoming Water Development Office

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Pathfinder to Guernsey Subbasin

This subbasin is rich in recreational opportunities with its long reach of the North Platte River and three reservoirs, two of which are associated with state parks, and offers a wide variety of recreational opportunities. The Laramie and Granite Mountains provide numerous E&R benefits. Casper, the second largest city in the state, is also located here. As of 2012, there were about 65,000 irrigated acres in the subbasin, down almost 30% since 2006. About 12% of the total Basin irrigated acreage is located in this subbasin.

The elevation of this subbasin ranges from about 4,000 to 8,400 feet providing a variety of landscapes well suited to agriculture, recreational pursuits and environmental habitat.

Major Recreational Opportunities in the Pathfinder to Guernsey Subbasin

Alcova Reservoir. Alcova Reservoir is located on the North Platte River approximately 30 miles southwest of Casper, in Natrona County. The dam was completed in 1938 and has an adjudicated capacity of 184,295 acre-feet of water. The Natrona County Roads, Bridges and Parks Department manages recreational facilities at Alcova Reservoir for the USBR. Alcova Reservoir is unique in that it serves many facets of water use. The dam serves as a diversion dam for the Casper Irrigation Canal and as a forebay for the Alcova Power Plant. These uses, in addition to recreational use, make this reservoir an important basin feature. Campgrounds, boat ramps, an interpretive trail, and a marina concession are available at the site. A dinosaur interpretive trail is located near Cottonwood Creek Beach. In 2010, there were more than 100,000 visitor days at the lake; visitor days are projected to grow to more than 130,000 by 2030 (USBR, 2013).

Edness K. Wilkins State Park. This state park is located 6 miles east of Casper near Interstate 25 in Natrona County. The site covers 315 acres of what was once a rock quarry. As a result of a master reclamation plan to construct an attractive and functional park for all visitors, the site was transformed into a handicapped accessible facility with picnic tables, playgrounds, and a launching ramp for canoes and rafts. Lake water at the park is groundwater that has percolated from the subsurface. The property was purchased by the State of Wyoming in 1981 and is managed by the Wyoming Department of State Parks and Cultural Resources.

Glendo Reservoir and State Park. Glendo Reservoir is located on the North Platte River 6 miles southeast of the town of Glendo in Platte County. Construction on the dam was started in 1954 and completed in 1957. The power plant was completed in 1958. The adjudicated water right of Glendo Reservoir is 800,000 acre-feet. The Wyoming Department of State Parks and Cultural Resources manages recreational facilities at Glendo Reservoir for the USBR. Glendo State Park provides

campgrounds, boat ramps, and a marina concession. Three interpretive trails, including the Glendo Dam Wetlands Trail, Muddy Bay Wetlands Interpretive Trail, and the Glendo Dam Overlook Trail, provide recreational opportunities for those who desire to learn about the area. An entrance fee and a campground fee are assessed to users of Glendo State Park.

Guernsey Reservoir and State Park. Guernsey Reservoir is located on the North Platte River 2 miles west of the town of Guernsey in Platte County. A dam was built between 1925 and 1927 by the USBR to create Lake Guernsey. Guernsey Reservoir has an adjudicated water right for 71,040 acre-feet. The Civilian Conservation Corps completed approximately 85% of the construction of Guernsey State Park between 1933 and 1936. The Wyoming Department of State Parks and Cultural Resources manages the recreational facilities at Guernsey Reservoir for the USBR. Guernsey State Park provides

campgrounds and boat ramps for public use. Fees are collected from the public to utilize campgrounds and to enter Guernsey State Park.

The Guernsey Reservoir water level is typically lowered twice each year for a relatively brief period in order to provide annual "silt runs." The "silt runs" are USBR operations which provides silt-laden irrigation water to the Goshen, Gering-Fort Laramie, and Pathfinder Irrigation Districts by decreasing Glendo Reservoir outflow, thereby reducing the Guernsey Reservoir water level; then increasing Glendo Reservoir discharge into and through Guernsey Reservoir, thereby flushing silt from Guernsey Reservoir and re-filling Guernsey Reservoir. This practice is thought to affect the Guernsey Reservoir fishery and the ways in which the public utilizes the park and reservoir for recreational purposes during periods of low water.

Trappers Route Special Recreation Management Area. This is a newer recreational area, managed by BLM, developed since the original Basin Plan. The area is operated under an adaptive management approach, which is more flexible than traditional resource management but requires monitoring of management actions to measure site-specific actions for potential extrapolation to a larger area. The recreation area consists of several recreation sites along the North Platte River between Alcova Lake and Casper. The various sites provide four-day use areas, camping, fishing, picnicking and floating opportunities. Future improvements and additional amenities are planned (BLM, 2014).

State Park visitor data for the parks discussed above are shown in **Table 3.5.8**.

Table 3.5.8: State Park Visitor Days, Five Year Average and 2014

State Park	Five Year Average (2009-2013)	2014
Edness K. Wilkins	60,983	85,593
Glendo	219,845	300,801
Guernsey	64,323	77,613
Total		**462,007**

Source: Wyoming Division of State Parks, Historic Sites and Trails, Department of State Parks & Cultural Resources, *Visitor Use Program, 2014*.

Fishing. Fishing opportunities are abundant in the subbasin and are evident at all the state parks and recreational locations discussed above. Many trout species, including rainbow, brown and cutthroat, along with walleye and channel catfish can be found in the North Platte. **Table 3.5.9** provides angler days for various locations throughout the subbasin.

Table 3.5.9: Angler Days for the Pathfinder to Guernsey Subbasin

Pathfinder to Guernsey Subbasin	Angler Days/Year
Dave Johnson Power Plant to Glendo Dam	60,815
Pathfinder Dam to Alcova	94,670
Alcova Dam to Dave Johnson Power Plant	29,293
North Slope Laramie Range	7,500
Sage Creek Drainage	3,091
Bates Hole	2,365
Glendo Dam to Guernsey Dam	1,713
Total	**199,447**

Note: Some of these data have not been updated in several years, but these are the latest available figures.
Source: Al Conder, Casper Regional Fisheries Supervisor, WGFD, December 2014.

Notable Environmental Factors in the Pathfinder to Guernsey Subbasin

Critical Habitat Areas. The North Platte River from Seminoe Reservoir to Alcova Dam has been classified as a Crucial Habitat Area. The area above Alcova Dam is in the Above Pathfinder Dam Subbasin. This area received this designation due to its superior sport fisheries and wetlands. Brown trout, rainbow trout and walleye are species of concern. Proposed actions include enhancement of spawning habitat, working with USBR on minimum pool requirements and control of invasive species (WGF – Upper North Platte Reservoirs, 2014).

The area along the North Platte River from Seminoe Reservoir to Glendo Reservoir is also designated as an Aquatic Crucial Habitat Area. It is divided into two sections, North Platte Corridor and Middle with somewhat differing values and species of interest. The habitat values for the North Platte Corridor include sport fishery, cottonwood gallery forest, and riparian wetlands. The habitat narrative calls for efforts to maintain or enhance this economically significant fishery. Primary species in the area include brown and rainbow trout, walleye, bald eagles, white-faced ibis and many more. Water temperature and USBR water management are critical elements in this area (WGF North Platte, 2014).

The Middle North Platte – Glendo Reservoir habitat values include sport fishery, existing and potential native sport fish habitat, riparian cottonwood habitat and wetlands that should be maintained or enhanced. Primary species include black crappie, brown trout, channel catfish, rainbow trout and more. Issues in the area include USBR water management, barriers to fish migration and degraded riparian habitat (WGF Glendo, 2014).

These areas do not receive specific protection due to this designation, but management efforts in these areas are designed to improve conditions.

Minimum Release Reservoirs. There are three minimum release flow reservoirs in this subbasin, each owned and operated by the USBR. Only releases at Gray Reef, a regulating reservoir downstream of Alcova Dam, are mandated by law. USBR voluntarily maintains releases at Pathfinder and Glendo Dams to improve fisheries, wetlands and wildlife habitat. Details on the minimum release flows are provided in **Table 3.5.10**.

Table 3.5.10: Minimum Release Reservoirs in the Pathfinder to Guernsey Subbasin

Structure	Owner	Minimum Release	Regulation
Pathfinder Dam	USBR	75 cfs	Voluntary low flow release for trout fisheries
Gray Reef Dam	USBR	300 cfs	U.S. Public Law 85,695, Missouri Basin Project
Glendo Dam	USBR	25 cfs	Voluntary release for wetlands and associated fish and wildlife benefits
Source: USBR Annual Operating Plan, North Platte River Area, 2013-2014.			

Classification of Recreational and Environmental Water Uses in the Pathfinder to Guernsey Subbasin

An analysis of recreational and environmental water uses was performed utilizing GIS data and maps in order to categorize those uses. **Table 3.5.11** provides a listing or recreational and environmental sites within the subbasin.

Table 3.5.11: Recreational and Environmental Water Uses within the Pathfinder to Guernsey Subbasin

Recreation Sites	
Fishing Access	5
Whitewater Rafting	3
Trout Streams	
Blue	2
Red	6
Yellow	Numerous
Campgrounds	14
Natural Landmarks	1
Scenic Highways and Byways	2
National Historic and Scenic Trails	1
Environmental Uses	
Wilderness/Roadless Areas	Yes
US Forest Service Lands	Yes
Instream Flow Segments	1
Crucial Stream Corridors	1
Aquatic Crucial Priority Areas	2
Wetland Area	Yes
Source:GIS sources are provided in the Introduction.	

Categorization of E&R Water Uses in the Pathfinder to Guernsey Subbasin

Many of the E&R water uses in this subbasin appear to be protected or complementary to the traditional diversions. The North Platte is somewhat different than other rivers because of the 1945 North Platte Decree and 2001 Modified Decree, which limits diversion for agriculture in this subbasin. In addition, the economic importance and quality of life value of the recreation associated with the North Platte make it highly unlikely that flows would be reduced to a level that would impair these uses. An additional level of protection exists because the reservoirs along the Platte, discussed above, ensure that water is released to the river. All uses directly associated with existing reservoirs are categorized as protected for this analysis.

The North Platte River is a prime recreational resource in the subbasin. In addition to the designated fishing access points, there are many fishing spots all along the Platte that offer opportunities to catch rainbow, brown and cutthroat trout, channel catfish and walleye (BLM, 2015). Much of the North Platte in this subbasin has been designated as a blue ribbon trout stream by WGFD. Most of the land area along the banks of the Platte in this subbasin has been designated as an Aquatic Enhancement Priority Area by WGFD, because of its high value as a fishery. However, there are no specific protections associated with this designation (WGF, 2009).

As the Platte leaves the Pathfinder Reservoir, there are several recreational water uses, including a whitewater rafting segment, a yellow ribbon trout stream and a fishing access point. Just downstream of these activity areas are two surface water diversion points, including a large diversion for power generation at Alcova Reservoir, a USBR project. The locations of these diversions complement the recreational uses and as long as those diversions are in place, the recreational uses upstream of them will be protected. It is likely that the power generation at Alcova will remain in place for the long term and thus these upstream uses should be considered protected.

North of Casper is a short rafting segment that is complemented by several large downstream diversions. West of Natrona County in Converse County, there is an important stream segment with a whitewater segment, red ribbon trout stream, and an instream flow

segment. As the instream flow segment is protected by a water right, the trout stream and whitewater segment above it are thus protected. However, the whitewater segment below it and the yellow ribbon trout stream should be considered competing. Although there are numerous small diversions downstream, any changes to those diversions could allow for additional upstream diversions. Just to the east is another whitewater stream segment and yellow ribbon trout stream. These uses are complementary to several, large downstream diversions.

There are numerous yellow ribbon and a few red ribbon stream segments originating in the Laramie Mountains. Some of these are within the bounds of the Medicine Bow National Forest and are at high elevations. As a result, these uses can be considered protected, even though the segments outside of the national forest would not have explicit protection. Their location within the landscape provides the required protection. The red ribbon stream west of Douglas lacks sufficient complementary uses and should be considered competing.

There is a fishing access point in the northwest portion of the subbasin that should be considered competing as there is no evidence of protection from other uses. This is also true of the fishing access point that is south of Douglas. No apparent protection exists and it should be considered competing.

Table 3.5.12 provides a summary of the classified uses in the subbasin.

Table 3.5.12: Categorization of E&R Uses in the Pathfinder to Guernsey Subbasin

Status	Location and Uses
Protected	Uses at reservoirs, North Platte activities between Pathfinder and Alcova Reservoir, remaining stretch of the North Platte to Glendo, instream flow segments and associated upstream uses, uses originating in the upper reaches of the Laramie Mountains
Complementary	Whitewater rafting north of Casper, and rafting and yellow ribbon segment west of Douglas
Competing	Fishing access points in the northwest area of the subbasin and south of Douglas, whitewater and yellow stream segment below the ISF in Converse County, red ribbon stream west of Douglas

Maps of these resources are provided in **Figures 5.3.6 and 5.3.7**.

Guernsey to State Line Subbasin

This subbasin is home to the Goshen County seat of Torrington, which has a population of about 6,800. The remainder of the subbasin is sparsely populated. The area of the subbasin is predominately in Goshen County with a small area in Niobrara County and a very small area of Platte County. There is little recreational or environmental activity in the subbasin. As of 2012, there were about 81,700 irrigated acres in the subbasin, down from 90,980 in 2006, for a reduction in irrigated acres of about 10%. More than 15% of the Basin's total irrigated acreage is located here, much of it in the vicinity of Torrington.

The land here is relatively flat and well suited for agriculture. The elevation of this subbasin ranges from about 4,000 to 5,500 feet.

Major Recreational Opportunities

Recreational opportunities in this subbasin are limited. There are no designated fishing access points or other recreational locations in the subbasin. The water used for the Torrington golf course will be included in the municipal demands.

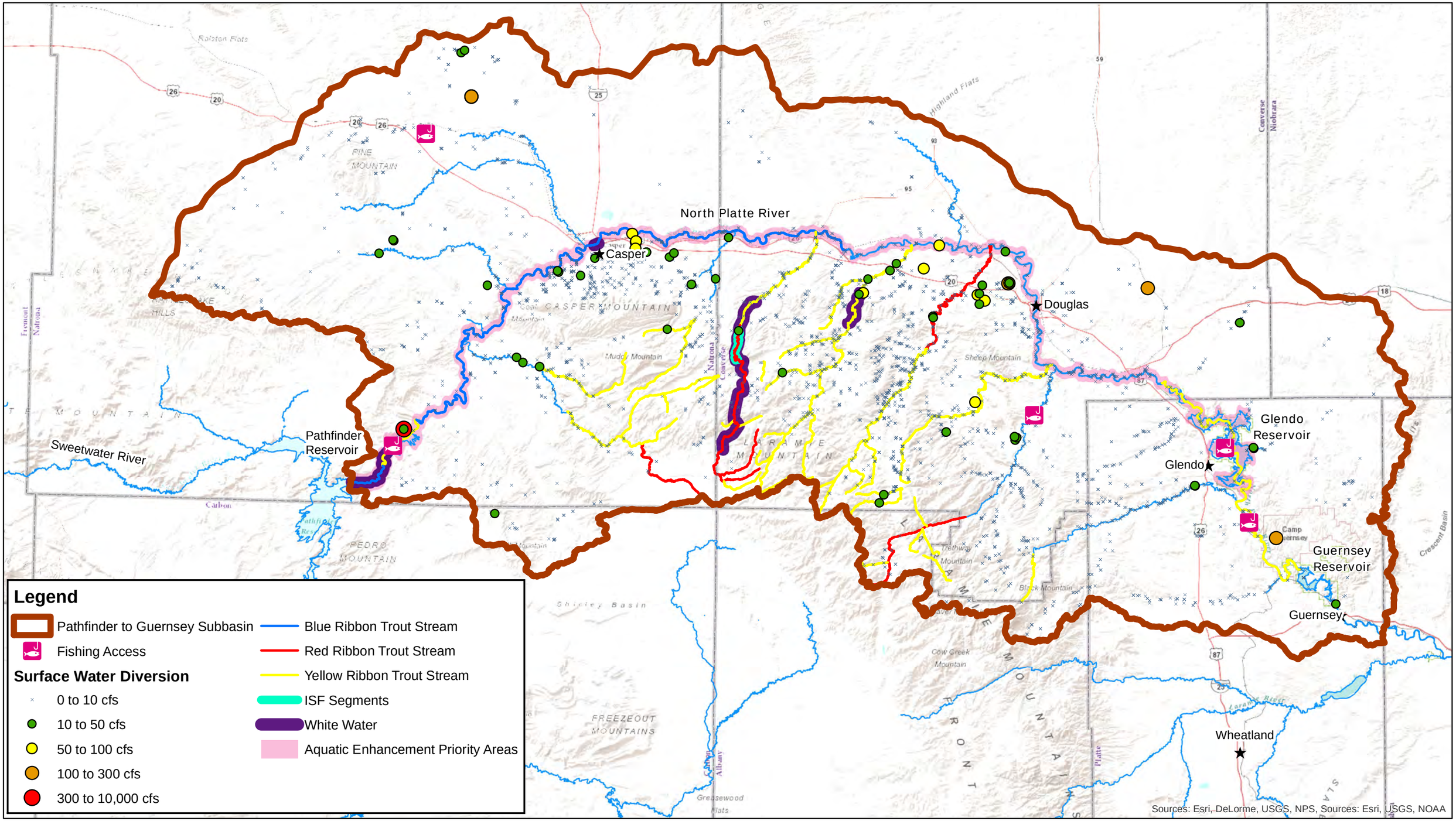

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Figure 3.5.6 Surface Water Uses - Pathfinder to Guernsey

Wyoming Water Development Office

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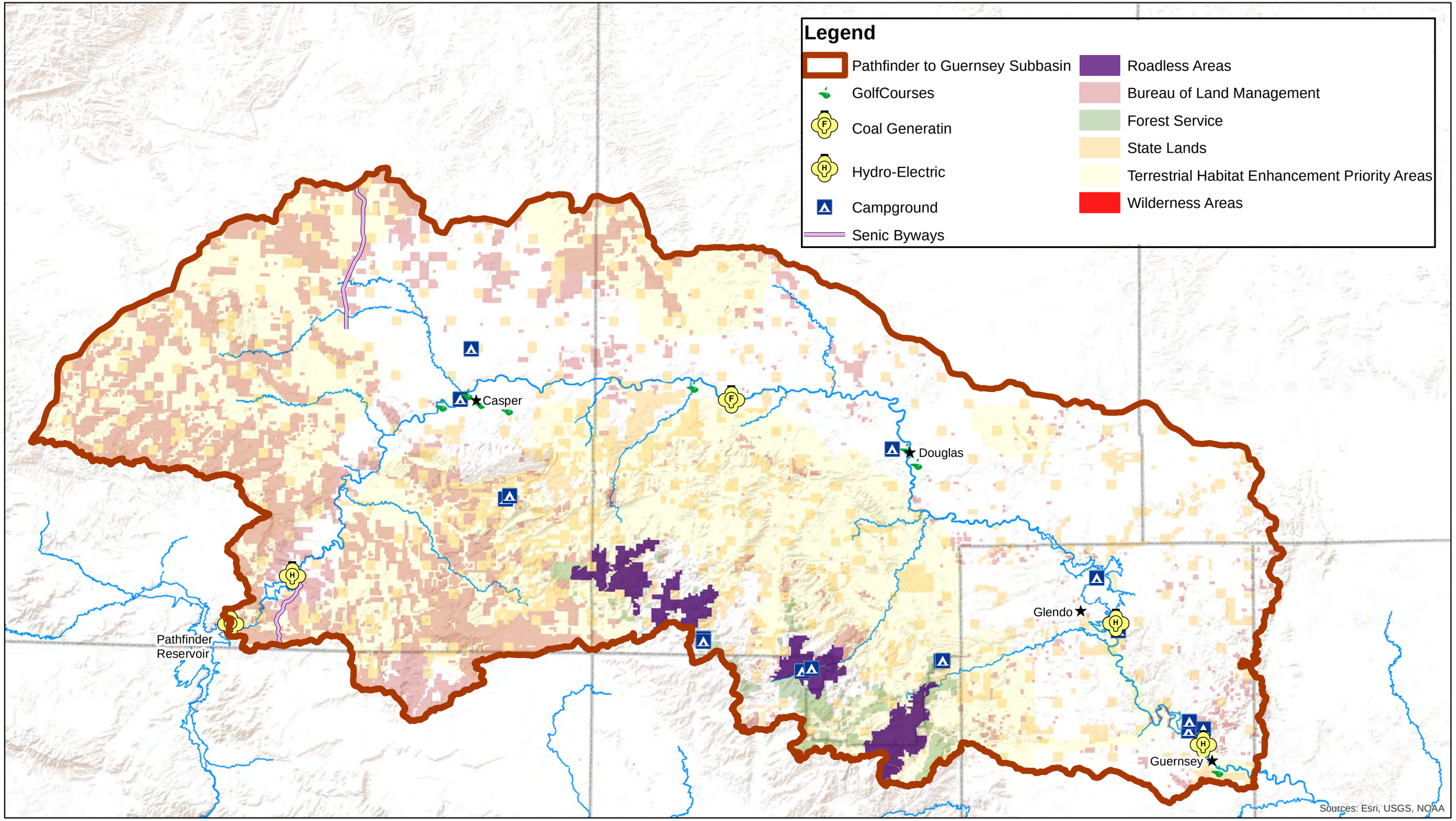

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Wyoming Water Development Commission

Figure 3.5.7 Land Use - Pathfinder to Guernsey

Wyoming Water Development Office

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Notable Environmental Factors in the Guernsey to State Line Subbasin

Wetlands. The Goshen Hole Complex, located in Southern Goshen County, is one of nine high priority wetland areas, as designated by the Wyoming Joint Ventures Steering Committee. Much of this wetland area has been created by and is sustained by irrigation activities. These wetlands are an important migration corridor for and provides habitat for waterfowl and attracts diverse species. This wetlands complex is the most important waterfowl hunting area in the state. A large number of acres of both wetlands and upland buffers are in private ownership and are enrolled in management agreements. This wetlands complex occupies about 491 square miles and includes about 7,000 acres of wetlands (Wyoming Joint Ventures Steering Committee, 2010).

Critical Habitat Areas. The Niobrara Critical Aquatic Area is mostly located north, and outside of Platte Basin. However, small sections of it cross over into the Guernsey to State Line Subbasin. WGF has identified the important habitat value here to be for native fish assemblage. The primary species of importance are the finescale dace, northern pearl dace and plains topminnow. Impacts from cultivated land, including nutrient and sediment inputs, and barriers to migration are issues here. Landowner awareness, conservation easements and stream surveys are some of the proposed actions for this area (WGF – Niobrara, 2014).

Minimum Release Reservoirs. There are no minimum release reservoirs in the subbasin.

Classification of Recreational and Environmental Water Uses in the Guernsey to Stateline Subbasin

An analysis of recreational and environmental water uses was performed utilizing GIS data and maps in order to categorize those uses. **Table 3.5.13** provides a listing or recreational and environmental sites within the subbasin.

Table 3.5.13: Recreational and Environmental Water Uses within the Guernsey to State Line Subbasin

Recreation Sites	
Fishing Access	0
Whitewater Rafting	0
Trout Streams	
Blue	0
Red	0
Yellow	0
Campgrounds	0
Natural Landmarks	0
Scenic Highways and Byways	0
National Historic and Scenic Trails	0
Environmental Uses	
Wilderness/Roadless Areas	0
US Forest Service Lands	0
Instream Flow Segments	0
Crucial Stream Corridors	0
Aquatic Crucial Priority Areas	1
Wetland Area	Yes
Source: GIS sources are provided in the Introduction.	

Categorization of Recreational and Environmental Water Uses

The only water use that meets the mapping standards for this analysis are those for irrigated agriculture and the small area of the Niobrara Critical Aquatic Area. However, as

the large majority of the area is outside the subbasin, it is assumed that any impactful activities will take place there. In addition, there are no explicit protections associated with this classification.

Land and water use maps for the subbasin are presented in **Figures 3.5.8 and 3.5.9**.

Upper Laramie Subbasin

This subbasin is home to Laramie. It is mostly within Albany County, but does extend into a small area of Carbon County. The Laramie River, several small lakes and reservoirs and the Medicine Bow National Forest provide ample opportunity for recreation. This subbasin is the only one in the Platte Basin that has seen an increase in irrigated acres since 2006. As of 2012, there were about 104,400 irrigated acres, up 13% from 92,250. This represents more than 18% of irrigated acres within the Basin. The elevation of this subbasin ranges from about 7,000 to 11,000 feet.

Major Recreational Opportunities in the Upper Laramie Subbasin

Lake Hattie Reservoir. Lake Hattie is located 15 miles west of Laramie near the foothills of the Medicine Bow Mountains in Albany County. The dam was originally constructed in 1912 and modified in 1990. The reservoir has an adjudicated water right to store 65,260 acre-feet of water. Lake Hattie contains 2,239 acres of land. The Lake Hattie Irrigation District owns the lake, and the WGFD manages the recreational facilities. Camping and picnic facilities are undeveloped, potable water is not available, and there are no fees to use the park. A boat launch is available.

Rob Roy Reservoir. Rob Roy Reservoir and campground is located in the Medicine Bow National Forest approximately 40 miles southwest of Laramie in Albany County. The reservoir has an adjudicated water right and a storage capacity of 35,434 acre-feet.

Construction of the dam and reservoir was completed in 1963 and modified in 1985. Rob Roy Reservoir is the largest and deepest of a series of five reservoirs in the Cheyenne public water supply system, including Hog Park Reservoir in the Sierra Madre Mountains; Rob Roy Reservoir and Lake Owen (Berg Reservoir) in the Medicine Bow Range; and Crystal Lake and Granite Springs Reservoir in the Laramie Range. Rob Roy contains 79% of Cheyenne's surface water storage capacity. Rob Roy is the only lake in the series that stores only runoff from its watershed and receives no inflow from other reservoirs. The reservoir campground is developed and includes picnic tables and potable water. The reservoir is managed by Cheyenne, and the nearby recreational facilities are administered by the USFS.

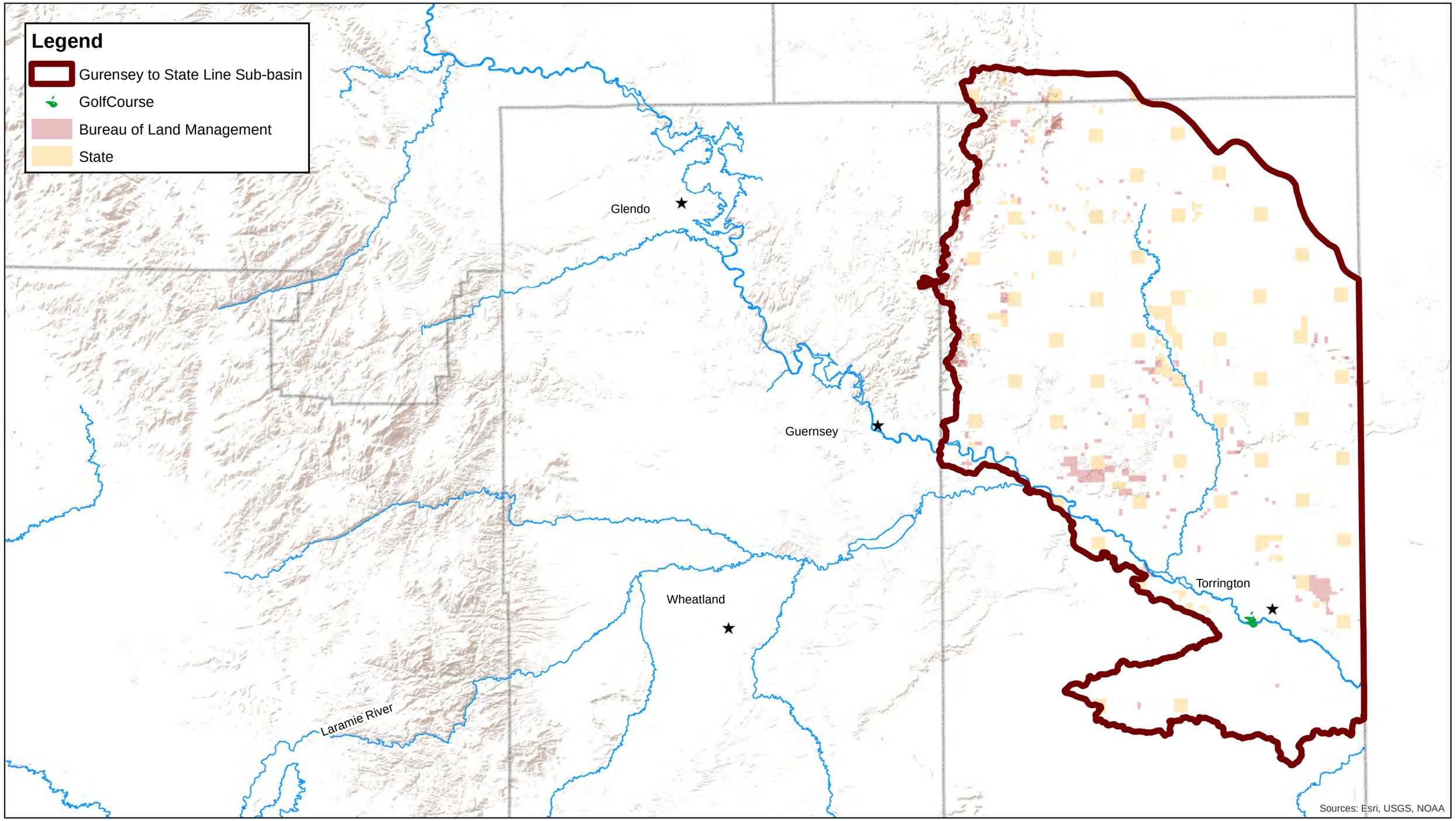
Fishing. Fishing opportunities are good in the subbasin, which has several red ribbon trout streams and numerous yellow ribbon streams. Rainbow, brown, brook, and cutthroat trout can be found in the streams and lakes. Angler days for the subbasin are provided in **Table 3.5.14**.

Table 3.5.14: Angler Days for the Upper Laramie Subbasin

Upper Laramie Subbasin	Angler Days/Year
Upper Big Laramie	24,975
Little Laramie River and Drainages	12,513
Total	**37,488**

Note: Some of these data have not been updated in several years, but these are the latest available figures.
Source: Mike Snigg, Laramie Regional Fisheries Supervisor, WGFD, January 2015.

There are no state parks in the subbasin.



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Miles

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Figure 3.5.8 Land Use - Guernsey to State Line

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Legend

Surface Water Diversions

- 0 - 10 cfs
- 10 - 50 cfs
- 50 - 100 cfs
- 100 - 300 cfs
- 300 - 10,000 cfs
- USGS Stream Gages
- Streams
- Aquatic Habitat Enhancement Priority Areas

Glendo Reservoir

Glendo

Guernsey

North Platte River

Greyrocks Reservoir

Torrington

Wheatland

Laramie River

Sources: Esri, DeLorme, USGS, NPS, Sources: Esri, USGS, NOAA

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Miles

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Figure 3.5.9 Surface Water Uses - Guernsey to State Line

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Notable Environmental Factors in the Upper Laramie Subbasin

Aquatic Habitat Enhancement Priority Area. The Laramie River/Spring Creek aquatic enhancement area was adopted to improve brown and rainbow trout habitat that has been degraded due to stream channelization, streambank erosion, urbanization and willow removal. The creation of this cooperative project should improve habitat and improve upstream fishing opportunities.

Trout Unlimited Project. Trout Unlimited contributed funding to this National Resources Conservation Service project for channel restoration on Holland Ranch/ Laramie River. This project was completed in 2015.

Permitted Instream Flow. This 3.94 mile segment on the Laramie River was issued in 2012, with a priority date of December 15, 1989. The permitted cfs is a minimum of 50 and maximum of 100.

Laramie Plains Wetlands Complex. This large wetlands encompasses about 1,480 square miles in Albany and Carbon Counties. The dominant land use within the area is agriculture, including both irrigated and non-irrigated crops and native rangeland. Flood irrigation has contributed to the wetlands and snowmelt from the surrounding mountains reaches the wetlands through irrigation ditches and irrigation. Recreational activities in the Complex are not currently an issue, but that could change as population increases in the southeastern part of the state (WGF - Regional Wetland Conservation Plan, 2014).

Classification of Recreational and Environmental Water Uses in the Upper Laramie Subbasin

As described in Section 3.5.3, an analysis of recreational and environmental water uses was performed utilizing GIS data and maps in order to categorize those uses. **Table 3.5.15** provides a listing or recreational and environmental sites within the subbasin.

Table 3.5.15: Recreational and Environmental Water Uses within the Upper Laramie Subbasin

Recreation Sites	
Fishing Access	7
Whitewater Rafting	4
Trout Streams	
Blue	0
Red	3
Yellow	Numerous
Campgrounds	6
Natural Landmarks	0
Scenic Highways and Byways	1
National Historic and Scenic Trails	0
Environmental Uses	
Wilderness/Roadless Areas	Yes
US Forest Service Lands	Yes
Instream Flow Segments	1
Crucial Stream Corridors	0
Aquatic Crucial Priority Areas	2
Wetland Area	Yes
Source: GIS sources are provided in the Introduction.	

Categorization of Recreational and Environmental Water Uses in the Upper Laramie Subbasin

There are seven public access fishing locations on the map, the first being on the Laramie River just north of Colorado and upstream of the Trout Unlimited Project and the only permitted instream flow in this subbasin. It is recognized as protected due to its proximity to an instream flow segment as well as numerous senior downstream diverters. Just to the east of the Medicine Bow Range are four fishing locations at small lakes and reservoirs which are protected due to their location. This is also true of the fishing access point located at Wheatland Reservoir 3 on the northwest side of the subbasin. The final public fishing access point on the Laramie River has a single, close downstream diverter but is protected by the downstream irrigation rights of the Wheatland Irrigation District.

There are three red ribbon trout streams in this subbasin. The first is on the Laramie River beginning at the Colorado border. Much of this stretch is upstream of a permitted in-stream flow, and all of it is upstream to numerous senior diverters, providing it a protected status. Coming out of the Medicine Bow National Forest is a second lengthy red ribbon segment. Its location upstream of numerous senior downstream diverters affords this stretch of fishing a complementary use status. The final red ribbon stream is a short stretch high in the Medicine Bow Mountains which is protected by its location but is also complementary to numerous senior downstream diverters.

There are five whitewater rafting locations in the subbasin. The first is just north of Laramie on the Laramie River. This stretch of the river is also a yellow-ribbon trout stream, and is within the aquatic enhancement area discussed above. There are several senior traditional diversions downstream of this location associated with the Wheatland Irrigation District. Although its location in a priority area does not afford official protection, this river reach is considered complementary because the Laramie River has many downstream diverters which necessitate bypassing water through this segment. The WGF's goal is to improve the segments habitat and it is unlikely that flow would be curtailed. In the northern area of the subbasin, is another whitewater stretch, also a yellow-ribbon trout stream, which is complementary to one large senior downstream and several smaller diversions in the Lower Laramie Subbasin.

There are two whitewater stream segments coming out of the higher reaches of the Medicine Bow Mountains. Their location on USFS lands provides a protected status to these recreation areas. Just north of the Colorado border is a fifth whitewater rafting area on the Laramie River. This relatively short stretch is just upstream of an instream flow segment, which provides a protected status to this stream segment. **Table 3.5.16** provides a summary of the classified uses in the subbasin.

Table 3.5.16: Categorization of E&R Uses in the Upper Laramie Subbasin

Status	Location and Uses
Protected	Fishing access locations, whitewater segments and a red ribbon stream in the Medicine Bow National forest, the ISF segment and whitewater rafting and red ribbon stream segment upstream of it
Complementary	Whitewater rafting and yellow ribbon stream segment north of Laramie, long red ribbon segment after it leaves the Medicine Bow Forest
Competing	NA

Maps of these data are provided in **Figures 3.5.10 and 3.5.11**.

Legend

Surface Water Diversion

- 0 to 10 cfs
- 10 to 50 cfs
- 50 to 100 cfs
- 100 to 300 cfs
- 300 - 10,000 cfs
- Fishing Access
- USGS Stream Gage
- Trout Unlimted Project
- Red Ribbon Trout Stream
- Yellow Ribbon Trout Stream
- Whitewater
- ISF Segments
- Streams
- Aquatic Habitat Enhancement Priority Area

Elk Mountain
Saratoga
Laramie
Laramie River
Spade Flats
Home Flats
Greasewood Flats
Upper Foote Creek Flats
Foote Creek Rim
Simpson Ridge
Sheephead Mountain
Elk Mountain
Sand Basin
Lake Creek Flats
Squaw Mountain
Sherman Mountain
Sheep Mountain
Boulder Ridge
Brown's Hill
Beaver Creek Hills
Medicine Bow Mountains
Laramie Mountains
Park Range
Carbon
Albany
Sources: Esri, DeLorme, USGS, NPS, Sources: Esri, USGS, NOAA

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Figure 3.5.10 Surface Water Uses - Upper Laramie

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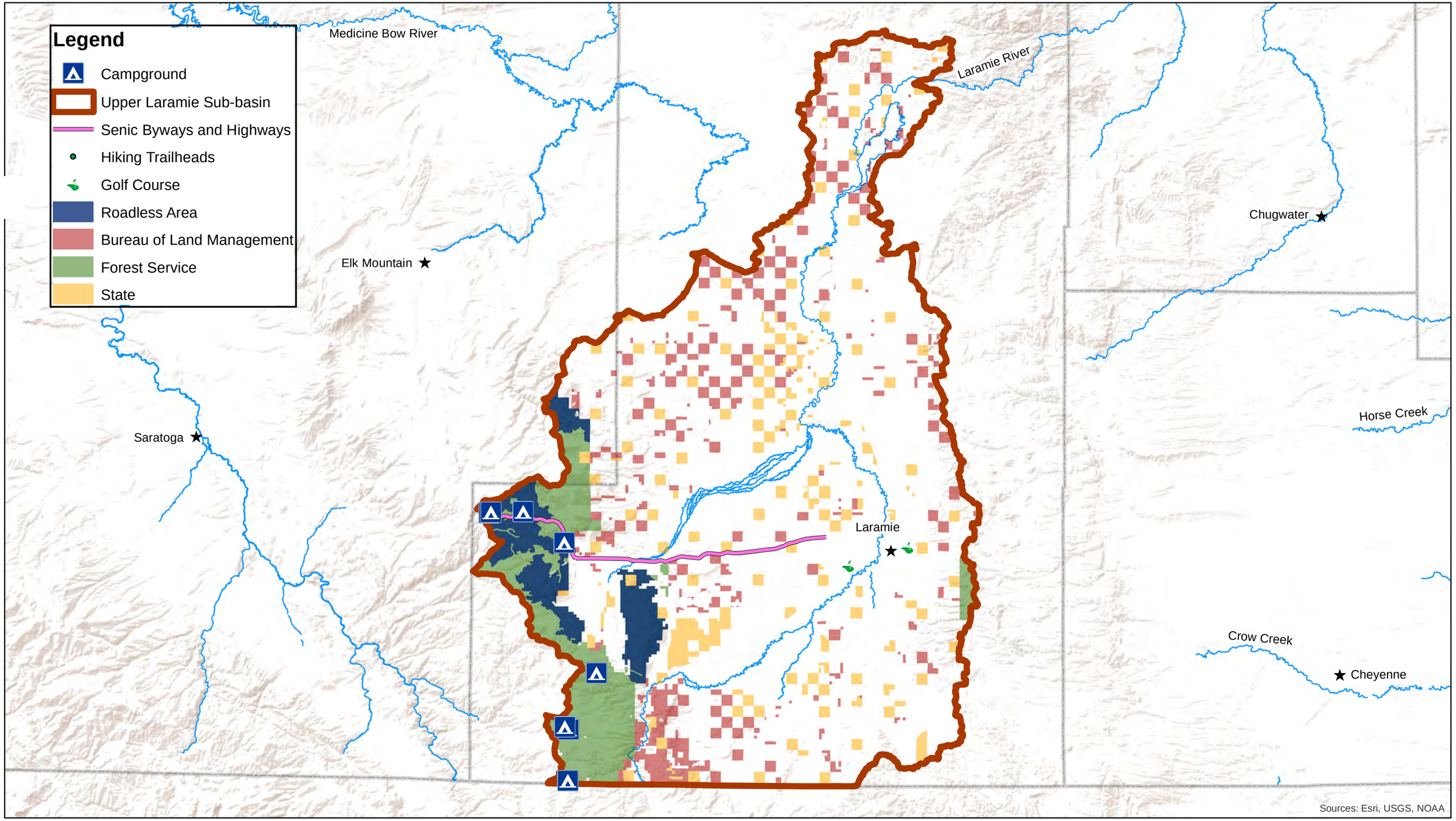

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Wyoming Water Development Commission

Figure 3.5.11 Land Use - Upper Laramie

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Lower Laramie Subbasin

This subbasin is home to Wheatland and encompasses parts of four counties, Albany, Platte, Laramie and Goshen. The Laramie River continues its course through the subbasin flowing out of the Upper Laramie Subbasin and providing many recreational opportunities. In addition, the Laramie Mountains provide excellent fishing and rafting locations. The area around Wheatland includes a heavy presence of irrigated agriculture, which has diminished about 27% since 2007. As of 2012, there were about 66,600 irrigated acres, including the Wheatland Irrigation District. The elevation of this subbasin ranges from about 4,000 to 8,000 feet, much of it at the lower elevations that are suitable for agriculture.

Major Recreational Opportunities

Grayrocks Reservoir. Grayrocks Reservoir is located on the Laramie River about 11 miles east of the Laramie River electrical power generating station. The reservoir lies at an elevation of approximately 4,000 feet in Platte County. The reservoir is about 8 miles long, has an adjudicated storage capacity of 104,109.60 acre-feet, and includes recreational facilities. The reservoir, which is owned by the Basin Electric Power Cooperative, is the primary source of steam production and cooling water for the power station. In addition, the reservoir and surrounding areas are managed by the WGF as a wildlife habitat management area. WGF stocks the reservoir with several species of game fish, and the reservoir contains largemouth bass, smallmouth bass, walleye, tiger muskie, channel catfish, crappie, pumpkinseed, and bluegill.

Fishing. There is one blue, several red, and numerous yellow ribbon streams in the subbasin. In addition to Grayrocks Reservoir, stream fishing opportunities exist for walleye, channel catfish, yellow perch, largemouth bass, black bullhead, and rainbow trout. Angler days are provided in **Table 3.5.17**.

Table 3.5.17: Angler Days for the Lower Laramie Subbasin

Lower Laramie Subbasin	Angler Days/Year
North Laramie River and Drainages and Grayrocks Reservoir	5,813
Chugwater and Wheatland Creeks	3,432
Grayrocks Reservoir	17,000
Total	**26,245**

Note: Some of these data have not been updated in several years, but these are the latest available figures.
Source: Mike Snigg, Laramie Regional Fisheries Supervisor, WGFD, January 2015.

There are no state parks in the subbasin.

Notable Environmental Factors in the Lower Laramie subbasin

Aquatic Enhancement Priority Areas. A segment of the Laramie River as it exits the canyon in the Laramie Range to Grayrocks Reservoir has been designated an Aquatic Habitat Enhancement area. Irrigation diversions, livestock grazing and invasive plant species have caused degradation of the stream segment. Many fish species may benefit from an improved habitat and include bigmouth shiner, common shiner, hornyhead chub, Iowa darter, plains topminnow and many more. Potential actions include fish passage/screening projects, cottonwood regeneration, removal of invasive plants and conservation easements (WGF – Laramie River, Wheatland, 2008).

Minimum Reservoir Releases. There is one minimum release flow reservoir at the Grayrocks Dam, which is owned by the Basin Electric Power Cooperative. The minimums released are governed by the Modified North Platte Decree and are dependent on flows

measured at the Grayrocks Reservoir and at the Fort Laramie Gauge. Details are provided in **Table 3.5.18** and in the italicized text below the table.

Table 3.5.18: Minimum Release Reservoir in the Lower Laramie Subbasin

Structure	Owner	Minimum Release	Regulation
Grayrocks Dam	Basin Electric Power Cooperative	See notes below	1978 Agreement of Settlement and Compromise and the Modified North Platte Decree
Source: 1978 Agreement of Settlement and Compromise and the Modified North Platte Decree.			

The operation of the Grayrocks is complicated. Natural flow is measured at the gage above the Reservoir. Senior rights downstream of the Reservoir total 24.69 cfs. Minimum release flows are dependent on storage at the Reservoir and time of year and are measured at the gage below Grayrocks (Below GR) and at the Ft. Laramie Gauge (FLG)

When storage is at least 50,000 AF:

October 1 to March 31 – 40 cfs at both GR and FLG
April 1 to April 30 – 50 cfs at both GR and FLG
May 1 – September 30 – minimum flow of whichever is greater: 40 cfs or 75% of natural flow at the gage above Grayrocks Reservoir, after all rights have been filled except the Grayrocks Reservoir storage right and the direct flow right for the Laramie River Station power plant; release rates are not to exceed 200 cubic feet per second – at both GR and FLG

When storage is at below 50,000 AF:

No minimum releases at GR
October 1 to March 31 – 20 cfs at FLG
April 1 to April 30 – 40 cfs at FLG

Classification of Recreational and Environmental Water Uses in the Lower Laramie Subbasin

As described in Section 3.5.3, an analysis of recreational and environmental water uses was performed utilizing GIS data and maps in order to categorize those uses. **Table 3.5.19** provides a listing or recreational and environmental sites within the subbasin.

Categorization of Recreational and Environmental Water Uses in the Lower Laramie Subbasin

Fishing in the subbasin is excellent as evidenced by the number of red and yellow ribbon streams and one blue ribbon stream. The lone blue-ribbon stream is at the end of a long stretch of red ribbon through the Laramie Mountains. Although there are no traditional diversions downstream that would seem to protect these uses, their high mountain location makes it unlikely that they will be disturbed and are therefore recognized as protected. Just to the east is another red ribbon segment that is complementary to large, senior diversions at its end point. The red ribbon segments in the northern area of the subbasin appear to exist by virtue of their location and should be considered protected. This is also true of the yellow ribbon streams in the Laramie Mountains. The yellow ribbon streams in the eastern part of the subbasin however, lack the same level of protection. There are several yellow ribbon streams in the Chugwater area that are likely subject to frequent low flows under existing conditions. These streams should be considered competing.

Table 3.5.19: Recreational and Environmental Water Uses within the Lower Laramie Subbasin

Recreation Sites	
Fishing Access	3
Whitewater Rafting	2
Trout Streams	
Blue	1
Red	6
Yellow	Numerous
Campgrounds	6
Natural Landmarks	0
Scenic Highways and Byways	0
National Historic and Scenic Trails	0
Environmental Uses	
Wilderness/Roadless Areas	Yes
US Forest Service Lands	Yes
Instream Flow Segments	0
Crucial Stream Corridors	0
Aquatic Crucial Priority Areas	1
Wetland Area	Yes
Source: GIS sources are provided in 3.5.3.	

The fishing location at Grayrocks Reservoir is protected due to its location. A second fishing access point west of Grayrocks on the Laramie River is complementary to two large downstream diversions and minimum flow requirements at Grayrocks. A third fishing access location is at the Wheatland Reservoir #1, which has storage rights and should be considered protected.

There are two whitewater rafting segments within the subbasin. The first begins at the western border on the Laramie River, high in the Laramie Mountain Range. A very large, senior diversion complements the early reach of this rafting segment. As the river crosses into Platte County, it is part of the aquatic enhancement area discussed above. In addition to large, senior downstream diversions, the mountainous location of this stretch provides protection for this stretch of the river. Directly south of this segment is the second whitewater area. This stretch comes out of the mountains, which is the source of this segment's protection as there are no large diverters downstream. These rafting segments are all classified as protected due to location, but in some cases, are further enhanced by complementary, large downstream diversions.

The aquatic enhancement area along the Laramie River does not receive explicit protection due to this status. However, it is likely that projects will be undertaken to maintain or improve this stretch of the River. Its proximity to Grayrocks Reservoir also provides some level of protection due to the required minimum release flows.

Table 3.5.20 provides a summary of the classified uses in the subbasin.

Table 3.5.20: Categorization of E&R Uses in the Lower Laramie Subbasin

Status	**Location and Uses**
Protected	All red, yellow and the single ribbon segments high in the Laramie Mountains, whitewater rafting segments, fishing access points at Grayrocks Reservoir and Wheatland Reservoir #1
Complementary	Fishing access point west of Grayrocks on the Laramie River
Competing	Yellow ribbon streams in the Chugwater area

Maps of these resources are provided in **Figure 3.5.12 and 3.5.13**.

Horse Creek Subbasin

This subbasin is sparsely populated with two small incorporated towns, Yoder and LaGrange. The area of the subbasin is predominately in Goshen and Laramie Counties, with small areas in Platte and Albany Counties. Fishing is the primary recreational activity here. There are several creeks that offer fishing opportunities and a variety of recreational activities are available at Hawk Springs Reservoir and State Park. There are no significant environmental water uses in this subbasin. As of 2012, there were about 41,700 irrigated acres in the subbasin, down from 61,500 in 2006, for a reduction in irrigated acres of 32%. The elevation of this subbasin ranges from about 4,000 to 8,000, much of it the lower range.

Major Recreational Opportunities in the Horse Creek Subbasin

Hawk Springs Reservoir and State Park. Hawk Springs Reservoir is located approximately 20 miles south of Torrington in Goshen County. The site was named a state recreation area in 1987. The dam was originally constructed in 1925 and modified in 1985. The adjudicated storage capacity of the reservoir is 16,735 acre-feet of water (WWDC - Hawk Springs, 2013). The Horse Creek Conservation District owns the reservoir and surrounding area. The Wyoming Department of State Parks and Cultural Resources manages and maintains the recreational area around the reservoir while the WGF regulates recreational use of the water and stocks the reservoir with fish. Walleye, largemouth bass, brown trout, yellow perch, largemouth and smallmouth bass, and channel catfish are found in the reservoir. Hawk Springs State Park includes a blue heron rookery, home to blue-winged and green-winged teal, gadwall, pintail wood duck and great horned owls. Amenities at the park include a beach, boat ramp, playground, picnic area and campsites.

State Park visitor data are shown in **Table 3.5.21**.

Table 3.5.21: State Park Visitor Days, Five Year Average and 2014

State Park	Five Year Average (2009-2013)	2014
Hawk Springs	17,704	20,692
Total		**20,692**

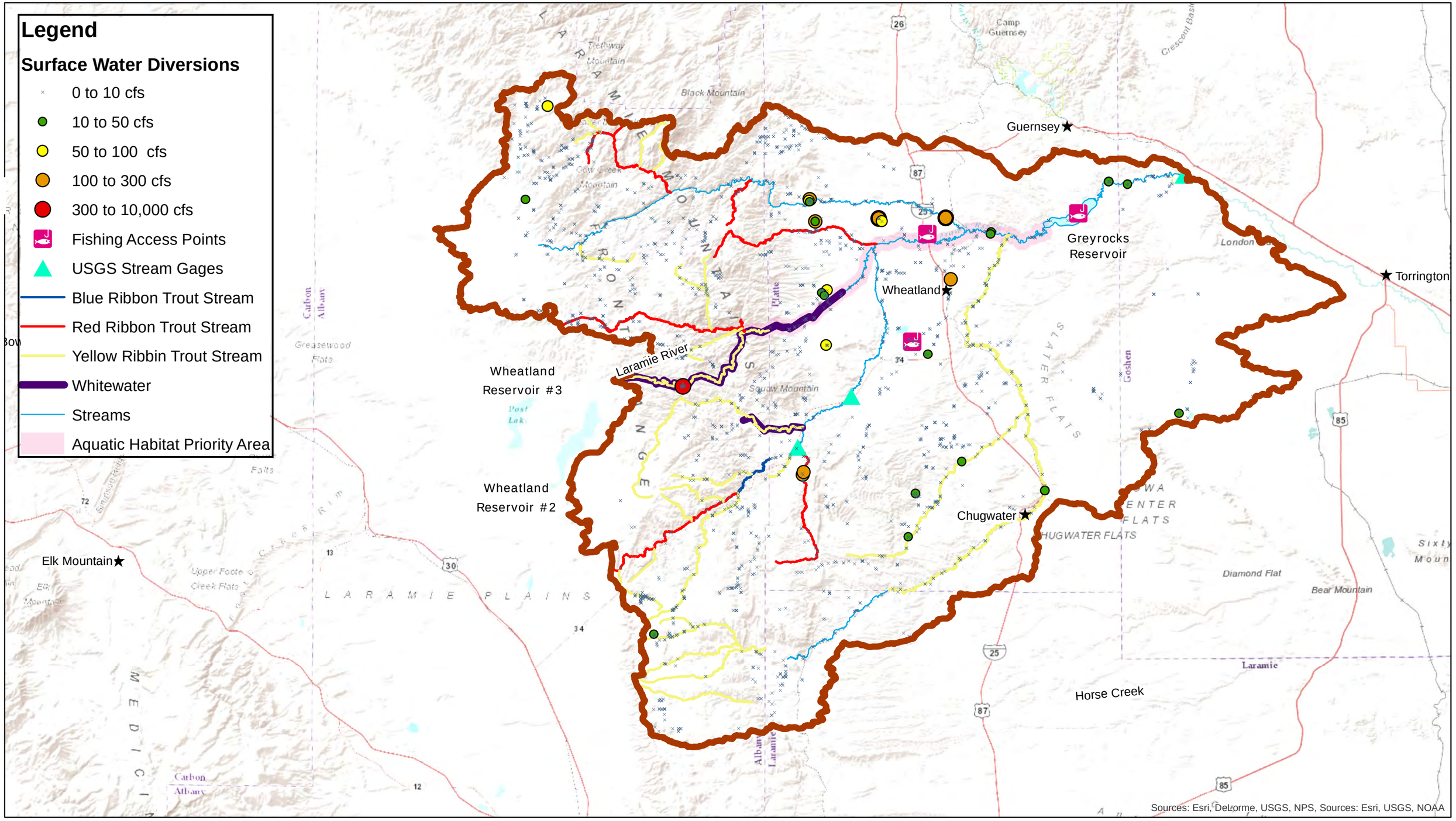
Source: Wyoming Division of State Parks, Historic Sites and Trails, Department of State Parks & Cultural Resources, *Visitor Use Program, 2014*.

Fishing. Opportunities for fishing are limited in this subbasin, but there are some creek locations that provide prospects for fishermen. Angler days for the subbasin are shown in **Table 3.5.22**.

Table 3.5.22: Angler Days for the Horse Creek Subbasin

Horse Creek Subbasin	Angler Days/Year
Horse, Bear, Cherry and Deer Creeks	3,663
Hawk Springs Reservoir	1,536
Total	**5,199**

Note: Some of these data have not been updated in several years, but these are the latest available figures.
Source: Mike Snigg, Laramie Regional Fisheries Supervisor, WGFD, January 2015.



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Miles

Wyoming Water Development Commission

Figure 3.5.12 Surface Water Uses - Lower Laramie

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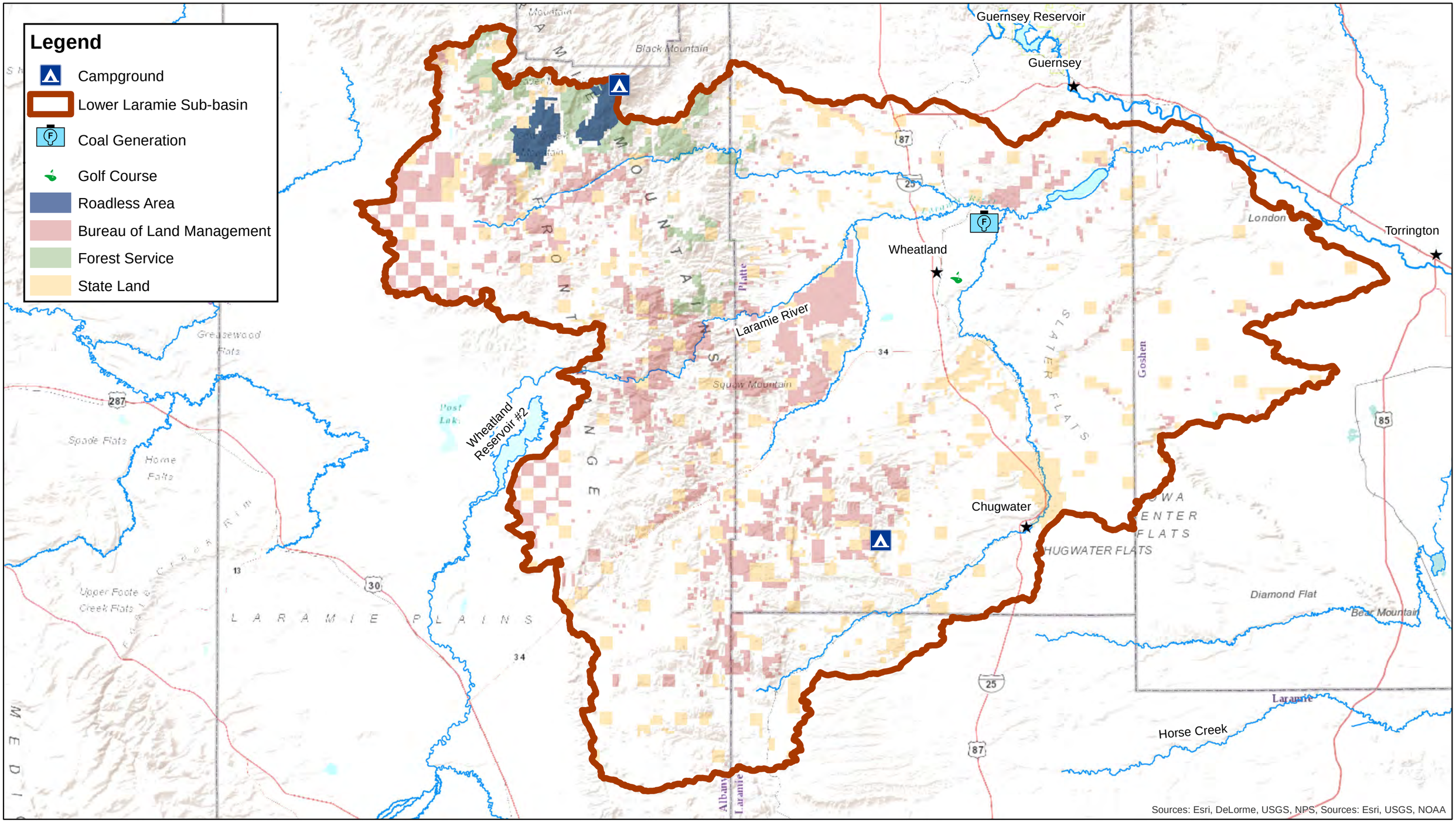

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Figure 3.5.13 Land Use - Lower Laramie

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Notable Environmental Factors

There are no notable environmental areas within this subbasin.

Classification of Recreational and Environmental Water Uses in the Horse Creek Subbasin

As described in Section 3.5.3, an analysis of recreational and environmental water uses was performed utilizing GIS data and maps in order to categorize those uses. **Table 3.5.23** provides a listing or recreational and environmental sites within the subbasin.

Categorization of Recreational and Environmental Water Uses in Horse Creek Subbasin

Recreational and environmental water uses within this subbasin are minimal. The fishing location at Hawk Springs Reservoir is considered protected. The yellow ribbon stream segment in the western part of the subbasin is at a high elevation and likely protected by its location. The other two yellow ribbon segments north and south of Horse Creek eventually come together and flow into Hawk Springs Reservoir, which has storage rights. However, those rights are junior to other upstream diverters and these stream segments are over-appropriated. Thus, these segments are classified as competing. The fishing location at Packer Lake near the state line is classified as competing. This lake is rarely accruing water due to low flows and upstream diversions. **Table 3.5.24** provides a summary of the classified uses in the subbasin.

Table 3.5.23: Recreational and Environmental Water Uses within the Horse Creek Subbasin

Recreation Sites	
Fishing Access	2
Whitewater Rafting	1
Trout Streams	
Blue	0
Red	0
Yellow	3
Campgrounds	1
Scenic Highways and Byways	0
National Historic and Scenic Trails	0
Environmental Uses	
Wilderness/Roadless Areas	0
US Forest Service Lands	0
Instream Flow Segments	0
Crucial Stream Corridors	0
Aquatic Crucial Priority Areas	0
Wetland Area	Yes
Source: GIS sources are provided in 3.5.3.	

Table 3.5.24: Categorization of E&R Uses in the Horse Creek Subbasin

Status	Location and Uses
Protected	Fishing access point at Hawk Springs Reservoir, yellow ribbon segment at high elevations
Complementary	NA
Competing	Yellow ribbon segments flowing to Hawk Springs Reservoir, fishing access point at Packer Lake

Maps of these resources are provided in **Figures 3.5.14 and 3.5.15.**

Legend

- Horse Creek Sub-basin
- Horse Creek Fishing Access
- Yellow Ribbon Stream

Surface Water Diversion

- 0 - 10 cfs
- 10 - 50 cfs
- 50 - 100 cfs
- 100 -300 cfs
- 300 - 10,000 cfs
- Horse Creek Aquatic Habitat Enhancement Priorities

Chugwater

Laramie

Horse Creek

GOSHEN HOLE RIM

IOWA CENTER FLATS

CHUGWATER FLATS

DIAMOND FLAT

SIXTYSIX MOUNTAIN

BEAR MOUNTAIN

Table Mountain

Hawk Springs

Eristol Ridge

Sources: Esri, DeLorme, USGS, NPS, Sources: Esri, USGS, NOAA

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Wyoming Water Development Commission

Figure 3.5.14 Surface Water Uses - Horse Creek

Wyoming Water Development Office

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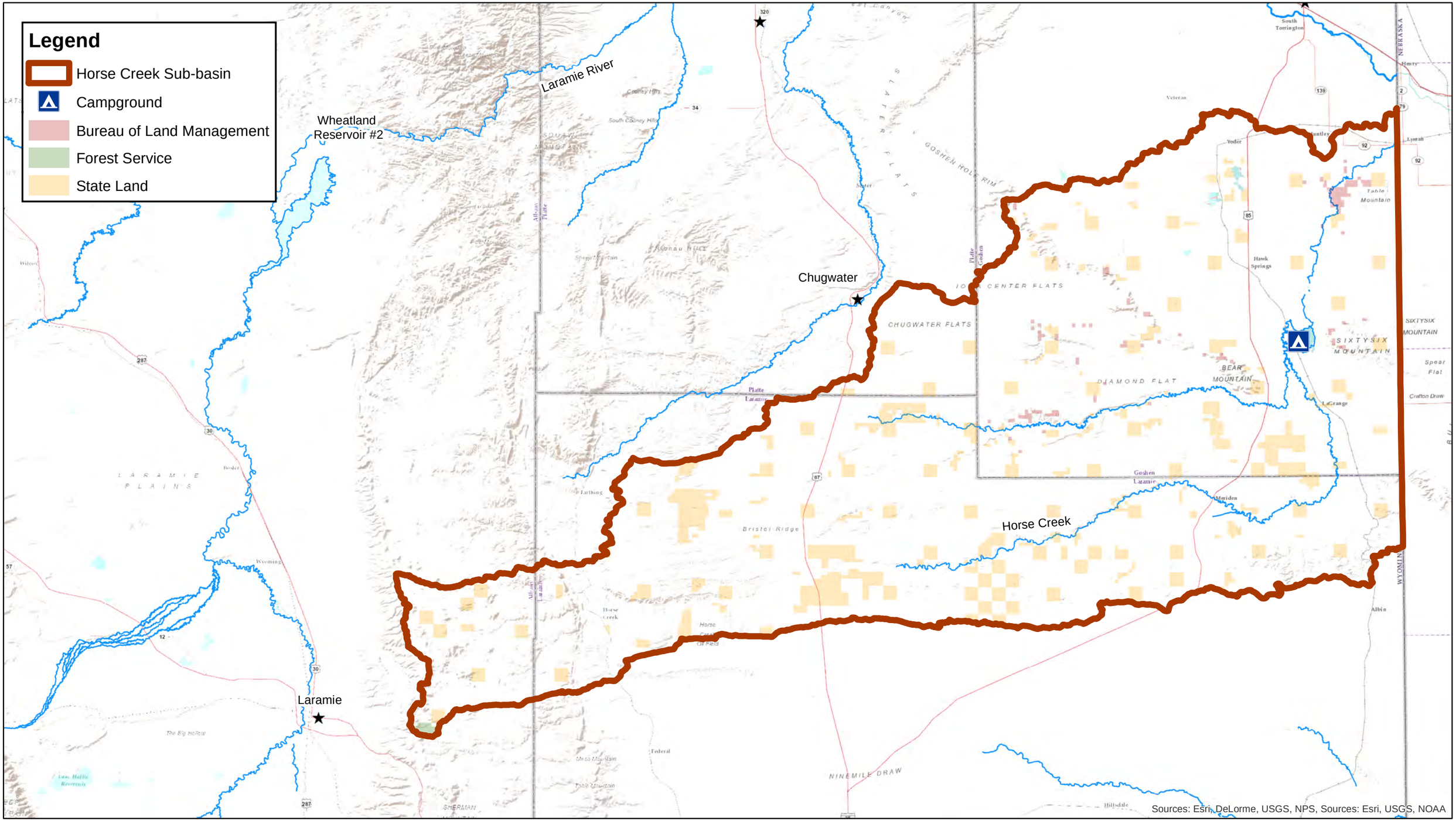

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Wyoming Water Development Commission

Figure 3.5.15 Land Use - Horse Creek

Wyoming Water Development Office

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South Platte Subbasin

This subbasin is home to Cheyenne, the state capital and most populous city in Wyoming. The western area of the subbasin provides the most recreational opportunities, with its many streams flowing out of the Medicine Bow National Forest. In general, irrigated agriculture is located in the plains of the eastern part of the subbasin. As of 2012, there were about 43,300 irrigated acres in the subbasin, down over 5% since 2006. The elevation of this subbasin ranges from about 4,500 to 8,000 feet.

Major Recreational Opportunities in the South Platte Subbasin

Curt Gowdy State Park. Curt Gowdy State Park is located 24 miles west of Cheyenne, 23 miles east of Laramie, and 12 miles north of the Colorado border. The park was established in 1971 through a lease with the City of Cheyenne and the Cheyenne Boy Scouts. The Wyoming State Parks and Cultural Resources Department administers the park. Crystal and Granite Reservoirs are located within the park. Crystal Lake Dam was constructed in 1922 and modified in 1987. The adjudicated water right for Crystal Reservoir is for 4,513 acre-feet. Granite Reservoir was constructed in 1904, and the dam was modified in 1987. The adjudicated water right of Granite Reservoir is 7,367 acre-feet. Motorized boating is allowed on Crystal Reservoir but not on Granite Reservoir. Other water activities are allowed at both reservoirs. The park has over 100 developed campsites available. Hynds Lodge was built in 1922-23 and has since received a listing on the National Register for historical sites. Hynds Lodge is managed by the Wyoming Department of State Parks. State Park visitor data are shown in **Table 3.5.25**.

Table 3.5.25: State Park Visitor Days, Five Year Average and 2014

State Park	Five Year Average (2009-2013)	2014
Curt Gowdy	116,931	149,756
Total		**149,756**

Source: Wyoming Division of State Parks, Historic Sites and Trails, Department of State Parks & Cultural Resources, *Visitor Use Program, 2014*.

Fishing. Although there are only three fishing access points in the subbasin, there are a relatively large number of angler days. This is likely due to the proximity of locations to Cheyenne and larger population centers in Colorado. Angler days for the subbasin are shown in **Table 3.5.26**.

Table 3.5.26: Angler Days for the South Platte Subbasin

South Platte Subbasin	Angler Days/Year
Crow Creek, North Crow Creek, Granite and Crystal Reservoirs	34,954
Total	**34,954**

Source: Mike Snigg, Laramie Regional Fisheries Supervisor, WGFD, January 2015.

Notable Environmental Factors

Aquatic Crucial Areas. There are two crucial aquatic areas in the subbasin. Although there are no explicit legal protections associated with this designation, these areas have been identified as important to habitat. The Pole Mountain Watersheds in the western part of the subbasin are located on Medicine Bow National Forest lands. They received this designation due to the importance of the headwater streams that feed the streams in the Eastern Plains of Wyoming. The primary species within the area are the northern leopard frog, boreal chorus frog, beaver and brook trout. Potential remedial actions include grazing management, aspen restoration, management of beaver population and control of invasive plants (WGF – Pole Mountain, 2014).

In the central and eastern area of the subbasin, the Lower Lodgepole and Muddy Creeks received this designation due to high density of native fishes including, bigmouth shiner, common shiner, Iowa darter, orangethroat darter, plains topminnow and central stoneroller and others. The goal is to seek opportunities for conservation easements and to reduce impediments to habitat (WGF – Lower Lodgepole and Muddy Creeks, 2014).

Classification of Recreational and Environmental Water Uses in the South Platte Subbasin

As described in Section 3.5.3, an analysis of recreational and environmental water uses was performed utilizing GIS data and maps in order to categorize those uses. **Table 3.5.27** provides a listing or recreational and environmental sites within the subbasin.

Categorization of Recreational and Environmental Water Uses in the South Platte Subbasin

The major recreational activity in this subbasin is fishing. Two of the three fishing access areas are at the Crystal and Granite Reservoirs and as such have adjudicated water rights associated with them and are protected uses. The third location is within the Medicine Bow National Forest which provides a protected status to this location.

Table 3.5.27: Recreational and Environmental Water Uses within the South Platte Subbasin

Recreation Sites	
Fishing Access	3
Whitewater Rafting	1
Trout Streams	
Blue	0
Red	2
Yellow	Numerous
Campgrounds	10
Natural Landmarks	1
Scenic Highways and Byways	0
National Historic and Scenic Trails	0
Environmental Uses	
Wilderness/Roadless Areas	0
US Forest Service Lands	Yes
Instream Flow Segments	0
Crucial Stream Corridors	0
Aquatic Crucial Priority Areas	3
Wetland Area	Yes
Source: GIS sources are provided in 3.5.3.	

There are two red ribbon streams in the subbasin, the first is Middle Crow Creek flowing through Curt Gowdy State Park, through the two reservoirs. The 1-mile segment of this stream that is between the two reservoirs should be considered protected due to the water rights associated with Crystal, the downstream reservoir. Downstream of Crystal, this segment becomes a complementary use to the numerous small traditional diversions. Before reaching Cheyenne, the stream becomes a yellow-ribbon stream. This segment is complementary to several large and numerous small downstream diversions. A second red ribbon stream, in the southern part of the subbasin, is complementary to many small diversions and one very large downstream diversion and is categorized as complementary.

There are numerous yellow ribbon streams in the Medicine Bow National Forest whose location, both in the national forest and at high elevations, makes future disturbance of these uses unlikely and they should be considered protected. All other yellow ribbon

segments in the subbasin lack sufficient protection from traditional uses and should be considered competing.

There is one whitewater rafting segment on Middle Crow Creek, the red ribbon stream between Granite and Crystal Reservoirs. This 1 mile stretch is complementary to the two reservoirs which store water for Cheyenne, and thus provide protection to the stream.

Table 3.5.28 provides a summary of the classified uses in the subbasin.

Table 3.5.28: Categorization of E&R Uses in the South Platte Subbasin

Status	Location and Uses
Protected	Fishing access points, red ribbon and whitewater segment upstream of Crystal Reservoir, yellow ribbon streams in Medicine Bow National Forest
Complementary	Red and yellow ribbon segment downstream of Crystal Reservoir, red ribbon segment southwest of Cheyenne
Competing	Yellow ribbon segments southeast of Cheyenne

Maps of these resources are provided **Figure 3.5.16 and Figure 3.5.17**.

Other Topics Related to E&R Water Use

Endangered Species. The presence of endangered species in the Basin is related to environmental water usE&Recreational activity, but it cannot be analyzed in the same fashion as utilized in subbasin analyses above. In addition, the data are only available at the county level. Therefore, **Table 3.5.29** provides threatened and endangered species by county, but the data are not included in the maps.

Table 3.5.29: Endangered, Threatened, CandidatE&Recovering Species in the Platte Basin, by County

Species	County								
	Albany	Carbon	Converse	Fremont	Goshen	Laramie	Natrona	Niobrara	Platte
Endangered									
Wyoming toad	√								
Blowout penstemon		√			√				
Black-footed ferret	√	√		√			√		
Threatened									
Yellow-billed cuckoo		√		√					
Colorado butterfly plant					√	√			√
Desert yellowhead				√					
Ute ladies'-treses	√	√	√	√	√	√	√	√	√
Grizzly bear				√					
Canada lynx	√	√		√					
Preble's meadow jumping mouse	√		√		√	√			√
Candidate									
Greater sage-grouse	√	√	√	√		√	√	√	√
Whitebark pine				√					
Fremont County rockcress				√					
Recovery									
Bald eagle	√	√	√	√	√	√	√	√	√
Gray wolf	√	√	√	√	√	√	√	√	√
Source: USFS, http://www.ws.gov/endangered/									

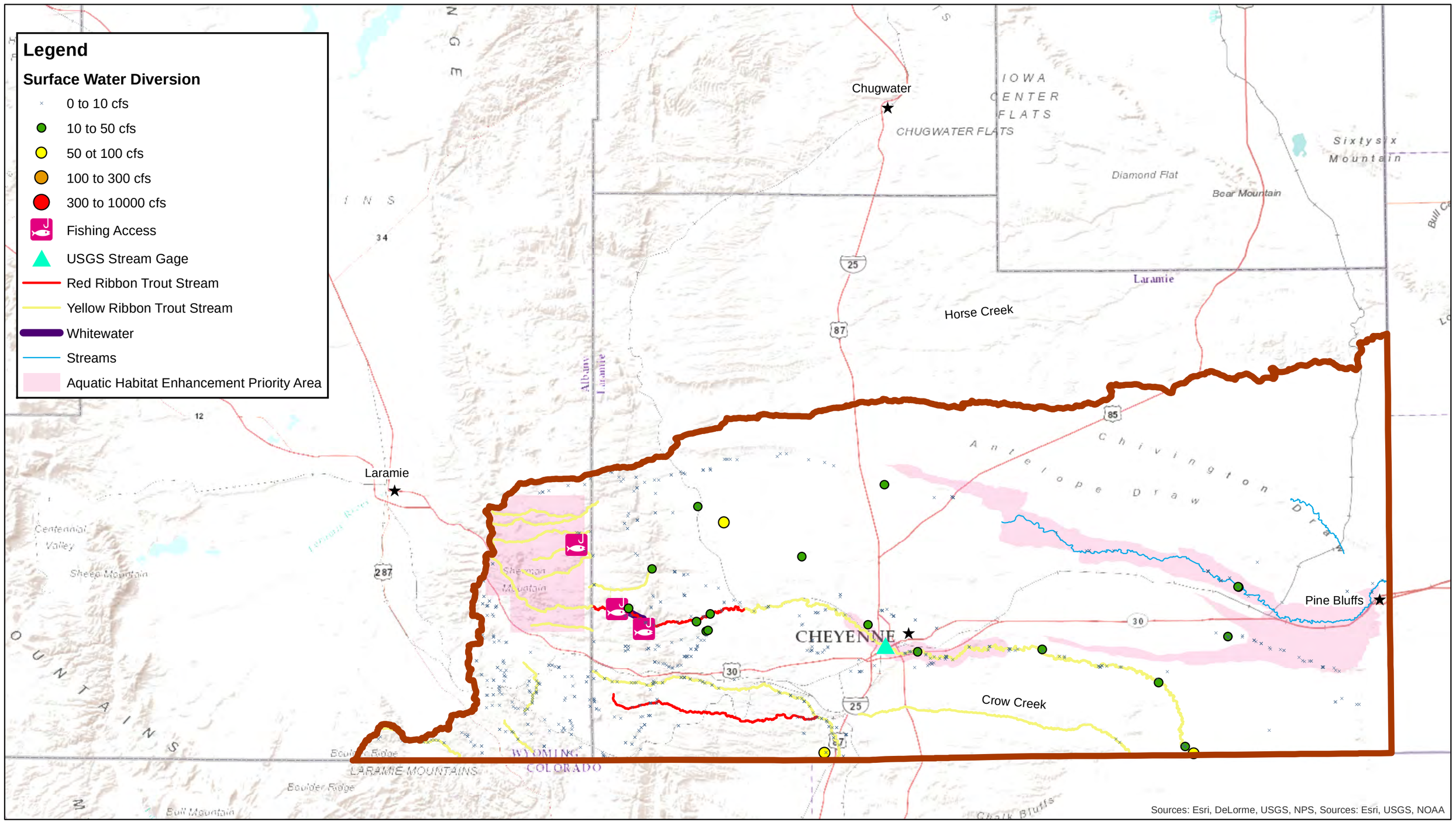

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Figure 3.5.16 Surface Water Uses - South Platte

Wyoming Water Development Office

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Legend

- Campground
- South Platte Sub-basin
- HikingTrail
- GolfCourse

SURFACE

- Bureau of Land Management
- Forest Service
- State

Hawk Springs Reservoir

Horse Creek

Crow Creek

Laramie

Cheyenne

Pine Bluffs

Albin

Sources: Esri, DeLorme, USGS, NPS, Sources: Esri, USGS, NOAA

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Wyoming Water Development Commission

Figure 3.5.17 Land Use - South Platte

Wyoming Water Development Office

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Instream Flows. Instream flows represent a permitted and thus protected water environmental water use. There are 13 instream flow segments in the Basin that have been permitted by the Wyoming State Engineer's Office totaling almost 90 miles. All have been permitted since 2007 and there are no current applications for new permits. Each of the permitted stream segments has been displayed on the appropriate subbasin water use map. SEO instream flow permits are shown in **Table 3.5.30**.

Table 3.5.30: SEO Permitted Instream Flows within the Platte Basin

Permit No.	Stream Segment	Priority Date	Stream Length (mi)	CFS (min-max)	Water Division / District
88 IF	S Fork Grand Encampment River	10/08/93	13.60	54	1/7
P29608D	Carlin Springs	03/11/91	0.25	1.31	1/9
84 IF	Wagonhound Creek	03/11/91	8.50	1.2-545	1/9
103 IF	Rock Creek IF	03/11/91	3.9	13-60	1/9
87 IF	Sweetwater River	06/21/91	10.20	16-80	1/12
86 IF	Deer Creek	06/21/91	5.00	10-30	1/15-5
66 IF	North Platte River	06/21/91	16.00	163*	1/17
67 IF	Lake Creek	06/21/91	5.80	0.5	1/17
61 IF	Horse Creek	06/21/91	0.10	0.2	1/17
62 IF	Nugget Gulch Branch	06/21/91	0.10	0.2*	1/17
63 IF	Beaver Creek	12/31/91	1.90	0.35*	1/17
64 IF	Camp Creek	01/05/93	1.20	0.2*	1/17
65 IF	Douglas Creek	01/21/93	22.30	5.5	1/17
Source: Wyoming State Engineer's Office, 2015					

USFS Lands also have stream segments for which minimum and peak flows have been established. Many of these are important to both recreational and environmental activities. Additional information regarding Priority Watersheds and Streams in the Medicine Bow National Forest can be found in Appendix One of the Revised Land and Resource Management Plan. **Table 3.5.31** provides flow data for the USFS bypass flow points in the Basin.

Table 3.5.31: USFS Permitted Bypass Flow Points in the Platte Basin

Stream	Minimum Flow (cfs)	Peak Flows (cfs)	Bypass Point
Above Pathfinder Subbasin			
Nugget Gulch Creek	020	3-5 days natural peak discharge	T14N R79W Sec 14
Little Beaver Creek	0.35	7	T14N R79W Sec 14
Camp Creek	0.20	2	T14N R79W Sec 13
Horse Creek	0.20	NA	T14N R79W Sec 16
Douglas Creek	5.50	130	T14N R79W Sec 9
Hog Park Creek	15.00	5 days natural peak discharge	T12N R84W Sec 5
Deep Creek, below Sand Lake	0.80	NA	T17N R79W Sec 9
South Platte Subbasin			
Bamford Creek/South Fork of Middle Crow Creek	NA	1.5 (maximum release permitted)	T14N R71W Sec 27
Source: Mr. David Gloss, Hydrologist, Medicine Bow/Routt National Forests, Saratoga, WY, October 2015.			

Waterfowl Hunting. Waterfowl hunting is an important recreational activity in the Platte Basin that is dependent on available water supplies. Wetland areas, lakes,

streams and other water bodies provide the necessary habitat to support waterfowl, but the benefits of water to hunting are ancillary and cannot be accounted in this analysis. Despite this, it is important to recognize that changes to water availability would have an impact on hunting, which is an important economic contributor, especially on the eastern plains. Waterfowl management areas 1C, 2A, 2B, 3A and 4D are within the Platte Basin. **Table 3.5.32** provides data on hunters, harvest and hunter days for waterfowl hunting.

Table 3.5.32: 2013 Duck and Geese Harvest Estimates for the Platte Basin

Management Area	Hunters		Harvest		Days	
	Ducks	Geese	Ducks	Geese	Ducks	Geese
1C Central North Platte River	939	566	8,765	2,071	4,742	2,747
2A Lower Platte River	1,222	1,947	6,438	15,862	4,768	9,860
2B South Platte River	78	47	348	168	180	101
3A Upper North Platte River	401	154	2,536	377	1,901	945
4D Sweetwater River	7	2	17	11	9	4
Total Platte Basin	**2,647**	**2,716**	**18,104**	**18,489**	**11,600**	**13,657**
Total Wyoming	**6,483**	**5,744**	**53,296**	**30,861**	**30,386**	**26,125**
Percent in Basin	41	47	34	60	38	52

Source: WGFD. Annual Report of Small Game, Upland Game, Waterfowl, Furbearer, Wild Turkey & Falconry Harvey, 2013, July 2014.

As **Table 3.5.32** demonstrates, a large percentage of all Wyoming waterfowl hunting occurs in the Platte Basin, especially in the Lower Platte River Management Area, which encompasses Platte and Goshen Counties and small parts of the surrounding counties.

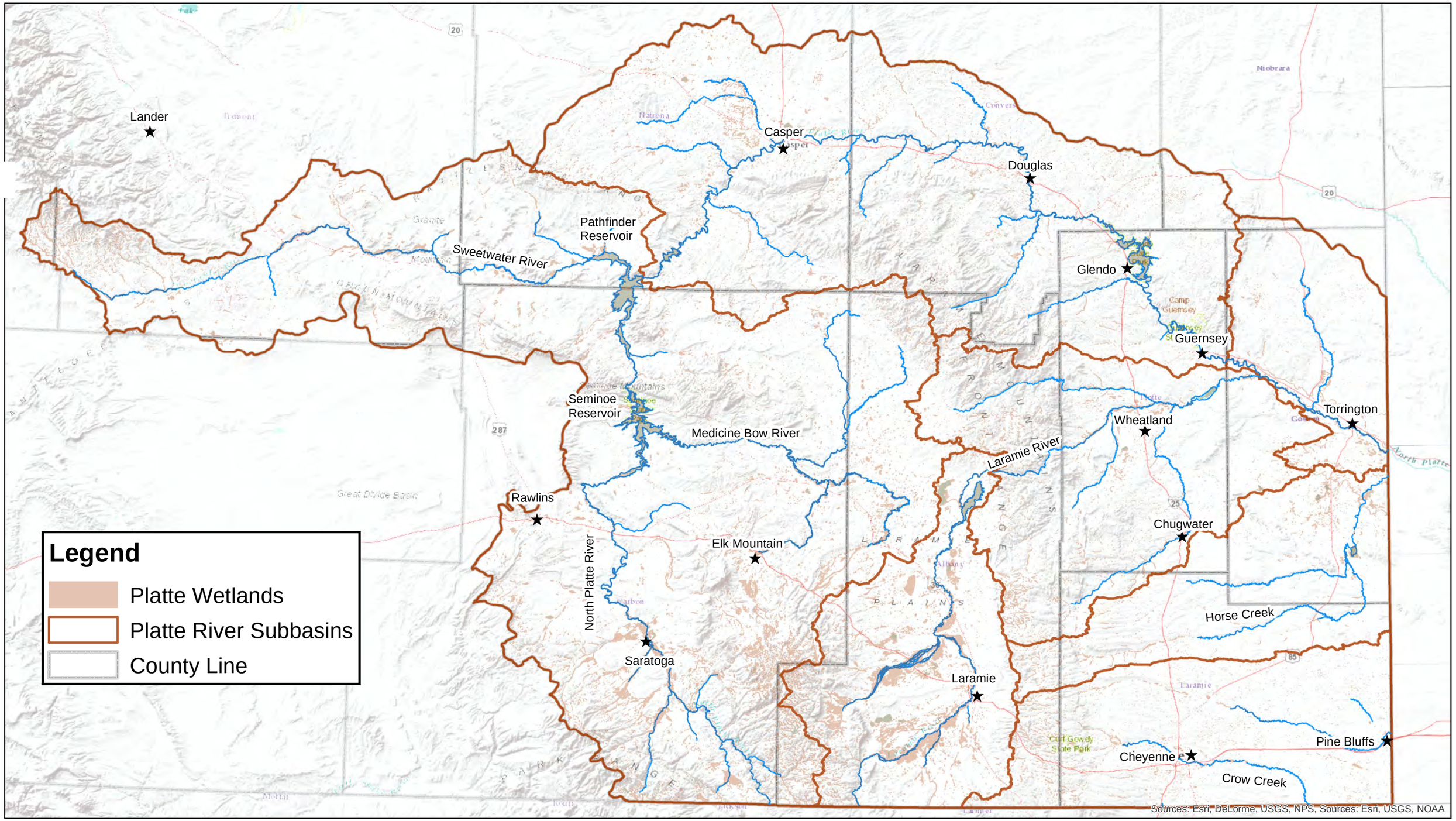
Wetlands. The State of Wyoming has identified 49 major wetland complexes in the Wyoming Wetlands Conservation Strategy (WGF, 2010). For this work, the definition adopted by the USFWS was utilized:

> *"Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this classification wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is non-soil and is saturated with water or covered by shallow water at some time during the growing season each year"* (Cowardin, 1979).

Wetlands provide wildlife habitat and the associated riparian areas provide other benefits such as flood attenuation, aquifer recharge and discharge, sediment filtering, contaminant removal, erosion control, and biomass export. Grazing, stream regulation and other human actions can cause harm to wetlands and riparian areas. As shown in **Figure 3.5.17**, there are many wetland areas in the Basin. Some of these may be temporary in nature, as a result of flood irrigation or other seasonal influences. Major wetland complexes within the Platte Basin are discussed in the appropriate subbasin sections. A map of wetlands within the Basin is presented in **Figure 3.5.17**. A map of irrigated acres within the Basin is provided in **Figure 3.5.18**.

3.5.6 Summary and Conclusions

This examination of E&R uses in the Platte Basin has resulted in the identification of each E&R use by respective subbasin, along with the categorization of those uses into protected, complementary, and competing categories. There are numerous and excellent water-based recreational opportunities in most subbasins, primarily flat water or stream fishing. There



Wyoming Water Development Commission

Figure 3.5.18 Wetland Areas

Wyoming Water Development Office

WENCK ASSOCIATES
Responsive partner. Exceptional outcomes.

are also extensive environmental water uses, including wetland areas, crucial habitat areas and in-stream flows. Overall, almost all of the E&R uses in the Basin have been determined to be protected or complementary. Of those that are competing, most are likely already unavailable in many years due to over-appropriation of Basin water resources.

The maps and analysis provided in this section demonstrate the relative importance of E&R water use in each of the subbasins. There is a large variation in activity levels, which is generally determined by the natural landscape. Land use, especially Federal ownership, is a dominant factor in a number of subbasins. Topography related to high elevation also provides protection to some E & R uses. The interdependence between traditional consumptive water uses, such as irrigated agriculture, and E&R uses has also been demonstrated.

Unfortunately, we were unable to quantify the water amount which would fall into the three categories because of a lack of stream gauge or similar data on the tributaries in the subbasins. We do not know the water volumes associated with traditional uses or how they have changed since the original Platte Basin Plan. Ideally, in this part of the analysis, the mapping of E&R water use would be translated into a number, expressed in acre-feet, which would demonstrate how much of the Basin's water resources contribute to these important sectors. After that determination, the acre-feet that were attributed to competing uses would be subtracted from the total to establish current E&R water demand as prescribed in the Handbook methodology. Unfortunately, flow data for the Basin is very incomplete and thus such a calculation has not been possible.

The WWDC might consider future funding to gather these data. More geographically comprehensive flow data and changes in that data over time could represent a material improvement to water planning in Wyoming.

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3.6 WATER USE FROM STORAGE

3.6.1 Introduction

The objective of this section is to evaluate potential storage possibilities in irrigation reservoirs located in the Basin above Pathfinder Reservoir exclusive of Kendrick Project and Seminoe Reservoir. The previous Platte River Basin Plan (2006) identified and presented water right permit, physical and operational data on non-stock reservoirs greater than 50 acre-feet located within the entire basin. This plan presents any updated information on these reservoirs and includes information on any new reservoirs permitted or constructed since the original plan.

This planning effort reviews both non-structural and structural alternatives for optimizing the use of water supplies within the State of Wyoming. A non-structural alternative approach may be a more achievable undertaking because it involves optimizing the operation of the existing reservoirs and no new construction. Because private parties or irrigation districts own the irrigation reservoirs, any of the non-structural alternatives would require future coordination and monitoring efforts with the respective reservoir owners. A state agency or other state designated entity would need to be responsible for implementing one or more of the non-structural alternatives. A structural alternative to modify an existing reservoir or to build a new reservoir would be faced with environmental permitting and sponsorship funding requirements.

3.6.2 Overview

In accordance with an interstate decree settled in 1945, Wyoming is only able to accrue up to 18,000 acre-feet of water from the North Platte River and its tributaries above the Pathfinder Reservoir for irrigation purposes during any one year. Since the settlement of the decree, Wyoming has been required to track and report the storage accrual amounts on an annual basis. For this study, Wyoming's reported carryover, maximum storage, and accrual data from 1951 to the present was analyzed. An analysis of the maximum storage and accrual data collected since 2003 for the 11 largest irrigation reservoirs was conducted.

Based on recent Wyoming reports there are approximately 55 smaller active irrigation reservoirs with 8 in the Sweetwater drainage, 16 in the Medicine Bow drainage, and 31 within tributaries of the North Platte River in the Saratoga area. The largest reservoirs had water measurement devices installed in the last 10 years. Therefore, accurate continuous records are being collected. The combined total storage capacity of the largest reservoirs is equal to 15,930 acre-feet which represents over 55% of the estimated storage capacity of all the private irrigation reservoirs located above Pathfinder Reservoir. Since 1951 the average annual accrual amount for all these reservoirs is 12,038 acre-feet and the average carryover is 5,380 acre-feet. The average accrual amount for the 11 largest reservoirs since 2003 is 8,015 acre-feet and the average carryover is 4,167. A number of irrigation reservoirs located above Pathfinder Reservoir are inactive.

Any trends in storage accruals and carryover were evaluated. The analysis revealed reservoir owners' operational decisions to conserve water during a drought period or to maintain a minimum pool serving recreational or fishery needs are factors affecting carryover quantities.

The structural and non-structural recommendations presented in this document are based on the water storage analysis performed on the reservoirs. One non-structural recommendation is to facilitate the coordination of storage accruals amongst the reservoir owners. Coordination with reservoir owners on an annual basis would allow Wyoming to maximize storage accruals occurring in Wyoming in any one year. Another non-structural

recommendation is to re-describe the reservoir water rights for the actual water right purpose that is occurring on-the-ground. The beneficial use of meeting fishery or recreational needs could be formally designated for that purpose within the reservoir storage water right. A structural alternative is to construct a new reservoir or the enlargement of an existing irrigation reservoir in the Basin Above Pathfinder Reservoir.

The implementation of one or more of the non-structural alternatives and the structural alternative provides feasible opportunities for Wyoming to maximize its annual accrual quantities for irrigation purposes on an annual basis.

3.6.3 Background

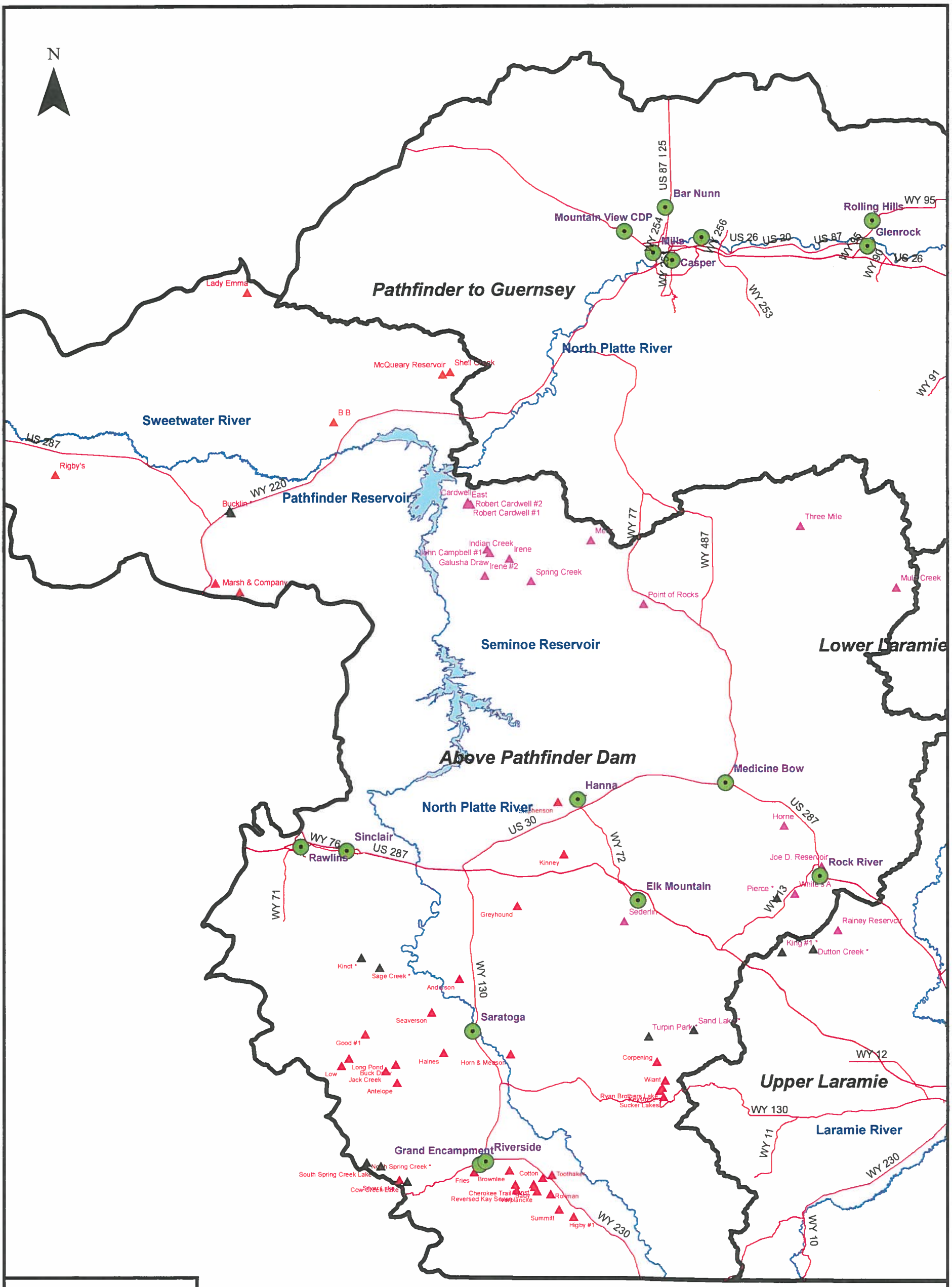
The focus of this section is irrigation reservoirs that fall under compliance activities of the Modified North Platte Decree. The U.S. Supreme Court handed down a 1945 Decree to Wyoming and Nebraska that contained the provision that the State of Wyoming was enjoined from storing[2] more than 18,000 acre-feet of water from the North Platte River and its tributaries above the Pathfinder Reservoir for irrigation purposes during any one year. In 1986 Nebraska filed a lawsuit in U.S. Supreme Court alleging that Wyoming had violated certain aspects of the 1945 decree. One of Nebraska's claims questioned the accuracy of the procedures Wyoming followed to collect and report water stored above Pathfinder for irrigation purposes. The U.S. Supreme Court approved the Final Settlement Stipulation and entered the Modified Decree on November 13, 2001. The storage accrual cap of 18,000 acre-feet in any one year remained unchanged in the Modified Decree.

The headwaters of the North Platte River above Pathfinder Reservoir are in north-central Colorado and south-central Wyoming and the headwaters of the Sweetwater River are in the southern tip of the Wind River Mountains. Various tributaries flow into the North Platte River fed by snowmelt and springs flowing from the two primary mountain ranges. The Snowy Range and Sierra Madre Mountains are the two ranges which receive the most snow in the watershed. The Encampment River, Medicine Bow River, and Sweetwater River are the largest tributary water sources.

The overall climate varies significantly within this region of Wyoming varying from arid to semi-arid primarily affected by changes in elevation. All of the reservoirs affected by the Decree requirement are depicted in **Figure 3.6.1.** The reported annual precipitation at Saratoga which lies within the Decree compliance area is 9.8 inches. Precipitation mainly occurs in the form of snow and rain. On average the wettest months are April and May. The majority of the precipitation occurs between April and October.

The annual precipitation in the form of rain and snow in each subbasin affects carryover and accrual within the reservoirs. The irrigated lands and reservoirs in the above Pathfinder Reservoir basin vary in elevation from about 5,800 to 8,500 feet msl. The primary crop is native hay and most ranchers only perform one harvest cutting per year. Portions of the irrigated lands are not cultivated and only serve as pasture for livestock. Most ranchers rely on flood irrigation practices although some center pivots and siderolls are present within the Saratoga area. The overall runoff and active irrigation can be relatively short for the tributary areas due to the short period of high runoff which primarily occurs in the spring and early summer months. The storage water held in the reservoirs provides for mid to late season irrigation supplies; thereby, extending the irrigation seasons for irrigated lands.

[2] The 1945 Decree reference to "storing" is actually referring to the amount of accrual in storage that is allowed in the above Pathfinder Reservoir basin each Water Year.



Legend

- Municipality

Reservoirs

- Largest 11 Reservoirs
- Basin Boundaries
- WyDOT_Highways

0 5 10 20 30 40 Miles

Figure 3.6.1 Irrigation Reservoirs above Pathfinder Reservoir

Platte River Basin Plan Update Level 1 Study
Irrigation Reservoirs above Pathfinder Reservoir
Feb. 2016

HDR Engineering
1720 Carey Avenue Suite 612
Cheyenne, Wyoming
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Surface water supplies in the North Platte River basin are considered to be fully appropriated. Any new water supplies for a new large water need are typically only available through the transfer of existing water rights, transbasin diversion, or the development of non-hydrologically connected groundwater.

The primary purpose of four federal reservoirs in the Basin is to provide agricultural water supplies to various Federal projects. Pathfinder and Guernsey Reservoirs serve the North Platte Project which was authorized by Congress in 1903. Seminoe and Alcoa Reservoirs which were completed in 1939 serve the Kendrick Project. The Glendo Unit, which includes Glendo Reservoir, is considered a multiple-purpose natural resource development that provides for up to 40,000 acre-feet of irrigation water annually to irrigation lands in Wyoming and Nebraska. The federal reservoir system is allowed flexible operations in accordance with the Modified Decree and Wyoming Water Laws. The filling and re-regulation operations allow for exchanges of ownership between the various federal reservoirs to provide for maximum capacity and to enhance operations.

The overall population is small and most of the human activities are related to hay production, ranching and livestock grazing as well as recreation. A significant amount of public lands is present in the drainage with the majority of federal lands owned by either the BLM or the USFS. The remaining lands are private and State owned lands. The private ranchers hold allotments on BLM lands and leases on State Lands for livestock grazing purposes. The BLM and others have sought to improve the management of livestock and address various environmental issues such as riparian conditions, erosion problems, wildlife/fisheries habitat, and noxious weeds. The management practices include changes to the season, duration or type of livestock use as well as herding, fencing, water development, and vegetation treatments (BLM 2005).

3.6.4 Irrigation Water Storage above Pathfinder Reservoir

For the overall compliance activities, Wyoming, through the SEO, is tracking and reporting storage accruals on an annual basis for 69 active reservoirs listed in **Appendix 3-C,** Table 1 and illustrated in **Figure 3.6.2**. The tracking and reporting of storage is contained within three different subbasins. Within the SEO reporting, the subbasins are referred to as Saratoga, Medicine Bow River, and Sweetwater River and illustrated within each respective subbasin in **Figures 3.6.2, 3.6.3, and 3.6.4**. The total storage accrual data is available from 1951 to the present and is contained within **Appendix 3-C,** Table 3.

In accordance with the Modified Decree requirements, Wyoming has installed measuring devices at 11 of the largest irrigation reservoirs to improve the accuracy of measuring the annual accruals in each reservoir. The Wenck Team reviewed Wyoming's water storage reporting for Decree compliance with particular emphasis on reporting since 2003 for the largest reservoirs that had new measuring equipment installed. The largest storage facilities represent the primary opportunities for maximizing the annual storage quantities.

Wyoming's Field Checking and Reporting

SEO field staff typically visit each reservoir two times each year. The reservoirs are field checked in late spring or early summer when storage levels are the highest and during the fall following the irrigation season when water levels are at the lowest. The fall visit occurs as close to the first of October as possible. The fall water level measurement is considered the carry-over quantity in the reservoir at the beginning of the water year. Many of the irrigation reservoirs were permitted and built within the Decree compliance area prior to the mid 1950's. The field staff refers to various maps and capacity tables to convert the water level measurements to a reservoir capacity. For the many small reservoirs, SEO field staff refers to maps and capacity tables prepared in the 1950's by J.A. Cole, Special Assistant

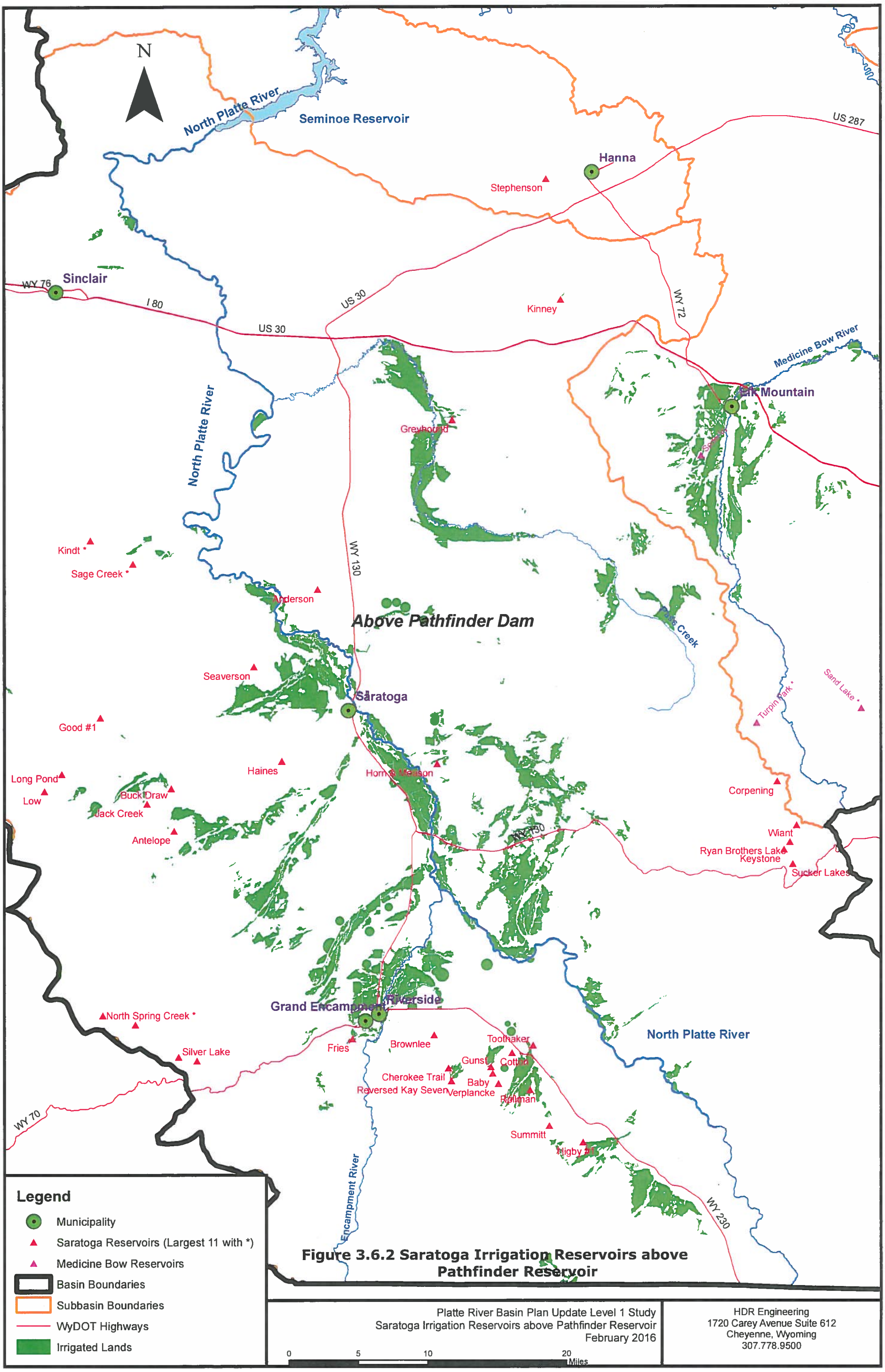

Figure 3.6.2 Saratoga Irrigation Reservoirs above Pathfinder Reservoir

Platte River Basin Plan Update Level 1 Study
Saratoga Irrigation Reservoirs above Pathfinder Reservoir
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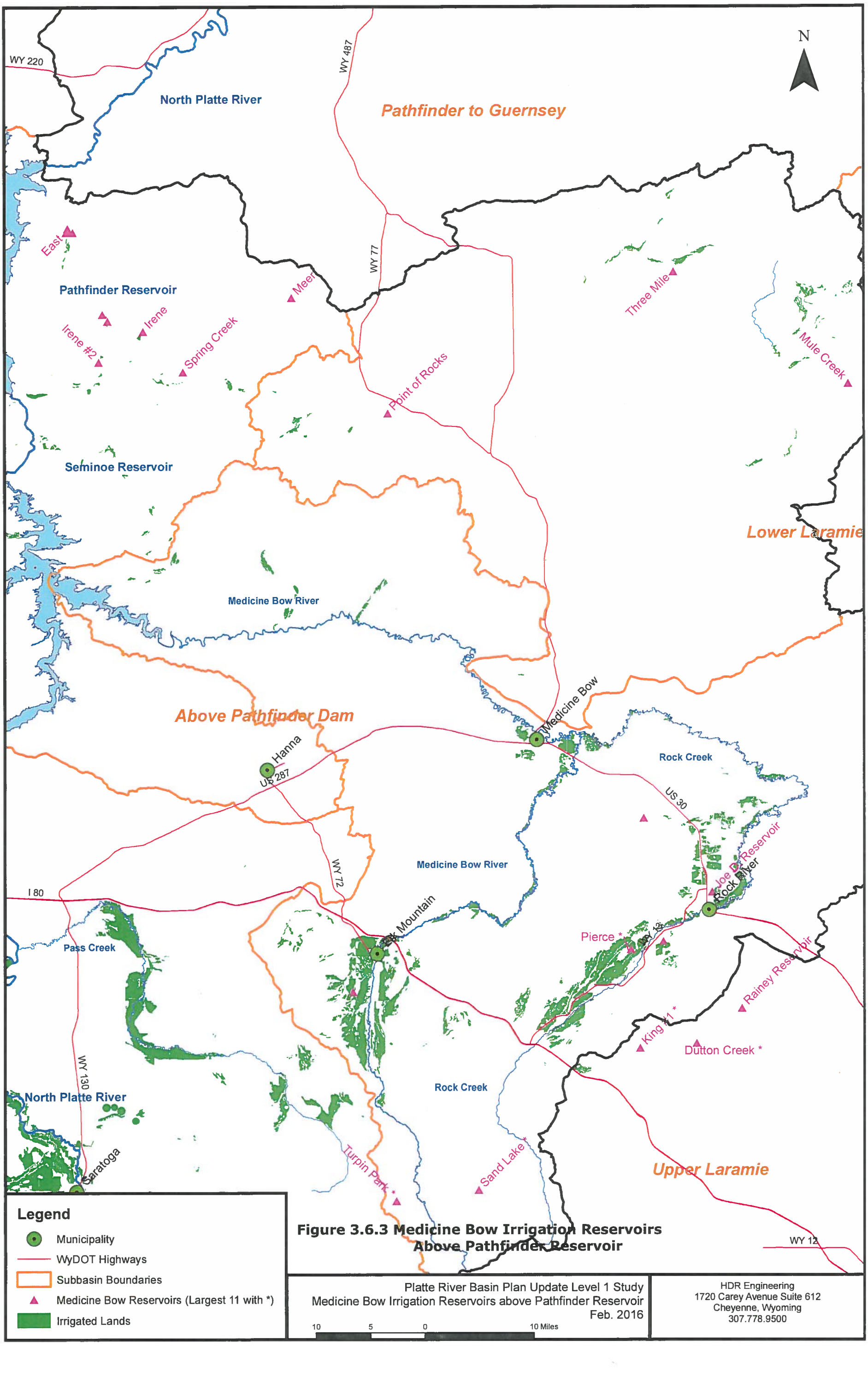

Figure 3.6.3 Medicine Bow Irrigation Reservoirs Above Pathfinder Reservoir

N

Pathfinder to Guernsey

Lady Emma

McQueary Reservoir

Shell Creek

B B

North Platte River

WY 789

Rigby's

Sweetwater River

WY 220

Bucklin #2*

Bucklin

Pathfinder Reservoir

East

Above Pathfinder Dam

Indian Creek

Irene #2

Hanna Mahoney #2

Marsh & Company

North Platte River

Seminoe Reservoir

North Platte River

I 80 Bus.

I 80

US 30

Legend

- Municipality
- Sweetwater Reservoirs (Largest 11 with *)
- Medicine Bow Reservoirs
- Basin Boundaries
- WyDOT Highways
- Irrigated Lands

Figure 3.6.4 Sweetwater Irrigation Reservoirs Above Pathfinder Reservoir

Platte River Basin Plan Update Level 1 Study
Sweetwater Irrigation Reservoirs above Pathfinder Reservoir
February 2015

0 5 10 20 Miles

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State Engineer. Over 90% of the existing reservoirs were physically surveyed at that time. Following the issuance of the Modified Decree in 2001, the 11 largest reservoirs were re-surveyed and new capacities tables were developed.

State West Water Resources, subsequently acquired by Wenck Associates, Inc., oversaw and completed the survey and capacity table calculations as well as completing the design and contractor administration for the installation of measuring devices. The State of Wyoming through the SEO financed the project and completed the coordination between the reservoir owners, engineering firm, and contractor. SEO field personnel rely on the new capacity tables for the largest reservoirs and the measuring devices collect and record data on a frequent basis, typically every 15 minutes. The reservoir water level elevations are measured continuously on a year-round basis. The reservoir water level data for the largest reservoirs is telemetered via the GOES system and served to the public on nearly a real-time basis with the AQUARIUS WebPortal hosted on SEO's website.

Overall Reporting Versus Compliance

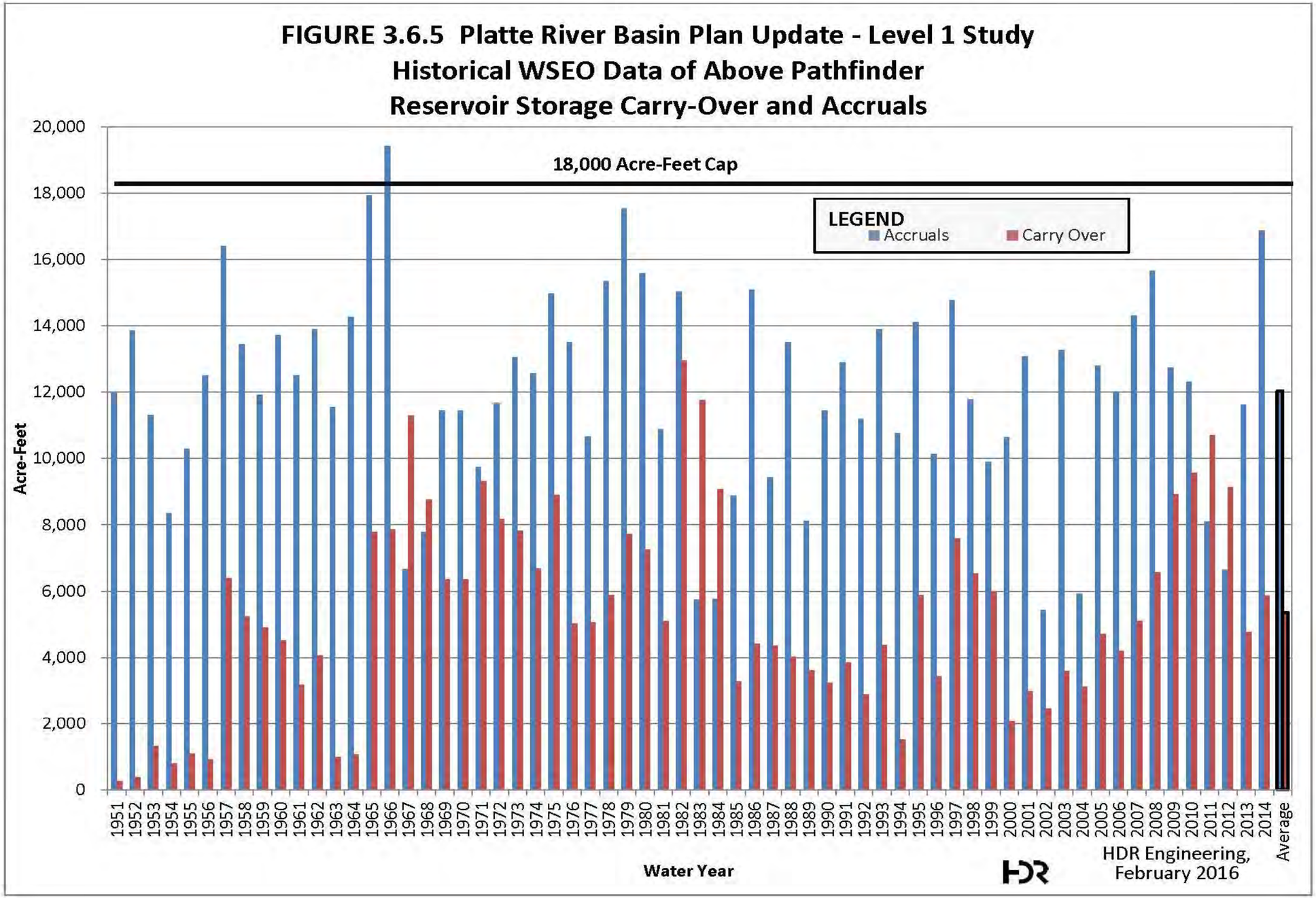
The SEO prepares a report at the end of each water year that contains the water storage accrual amounts. Presently the reports are submitted by the Wyoming State Engineer to the North Platte Decree Committee (NPDC) prior to the end of February each year. The NPDC was established by the States of Nebraska, Wyoming, and Colorado, and the United States of America through the USBR to assist in monitoring, administering, and implementing the Modified North Platte Decree and the Final Settlement Stipulation dated March 31, 2001.

The annual carryover quantities and accrual amounts for each water year are provided in **Appendix 3-C,** Table 3 and are illustrated in **Figure 3.6.5** beginning with 1951. These amounts are the sums from the individual irrigation reservoirs that are tracked and reported by SEO field personnel. Based on all available data, Wyoming has never accrued more than 18,000 acre-feet. The State Engineer's reports in 1965, 1966, and 1967 mistakenly included the storage of Seminoe Reservoir within the total reported accrual quantity. The actual quantity reported in water year 1966 should have been 10,136 acre-feet, not the 19,435 acre-feet that was reported, so the accrual total was less than the compliance cap. The actual maximum accrual quantity as reported by the SEO is 17,552 acre-feet which occurred in 1979. Recently in water year 2014, the total combined accrual quantity reported was 16,875 acre-feet.

The average annual accrual amount since 1951 is 12,038 acre-feet. To maximize water storage for irrigation purposes for above Pathfinder Reservoir in Wyoming, the estimated additional storage accrual amount available on an average annual basis is approximately 6,000 acre-feet. All the years of reporting since 1951 were reviewed and no accrual years were removed as outliers or as being non-representative. Further analysis could be completed to eliminate specific water years from the statistical analysis, but it is unlikely the overall analysis and recommendations would be significantly affected. From the 63 years of SEO reporting, the estimated maximum quantity stored in all the reservoirs combined in any one year is 23,433 acre-feet. This storage quantity occurred in 1979, the same year as the maximum accrual quantity. Water Year 2014 represented a larger than average water storage year with 22,744 acre-feet total storage.

The estimated overall storage capacity of all the reservoirs (active and inactive reservoirs combined) is 27,525 acre-feet. The overall storage capacity was calculated based on adding the actual active capacities from the surveys of the largest 11 reservoirs to the capacities of the smaller reservoirs. Most of the small reservoirs have low-level outlets so the reservoirs are nearly completely drained at the end of the irrigation season and have very small amounts of inactive storage. Based on this estimated total physical capacity, when the

FIGURE 3.6.5 Platte River Basin Plan Update - Level 1 Study
Historical WSEO Data of Above Pathfinder
Reservoir Storage Carry-Over and Accruals



combined carryover quantities are larger than an estimated 9,525 acre-feet for all the reservoirs at the beginning of the water year, there would not be enough available capacity in the reservoirs to exceed the 18,000 acre-feet compliance cap. This is a rare occurrence because the 9,525 carryover amount was exceeded only 5 years in the 64 years of Wyoming's compliance reporting. The reservoirs above Pathfinder subject to Decree compliance are listed in **Appendix 3-C,** Table 1.

Review of the Largest Reservoirs and Carry-Over and Accruals

Largest Eleven Reservoirs. Reporting documents for the largest 11 reservoirs with storage accruals utilizing the new measuring device equipment since about 2003 were reviewed. **Appendix 3-C**, Table 2 contains the annual carryover quantities and accrual amounts for each water year beginning in 2003 for the largest 11 reservoirs. The combined total storage capacity of the largest reservoirs is equal to 15,930 acre-feet which represents over 55% of the estimated storage capacity of all the irrigation reservoirs.

The reservoir filling operations typically occur prior to the irrigation season so senior direct flow water rights are not actively calling for and diverting water. With the exception of Kindt Reservoir, the reservoirs filled to capacity or near capacity every year. The minor occurrences of filling exceptions were North Spring Creek Reservoir in water years 2009 and 2013 and Pierce Reservoir in water year 2013. Kindt Reservoir storage and accruals are highly variable with no storage accruing in most normal or dry years. During the 12-year period since 2003, Kindt stored water in only two years, water years 2010 and 2011. Kindt can store up to an estimated capacity of 2,422 acre-feet when adequate supplies are available.

Many of the largest reservoirs filled in water year 2012 which was a record dry year in the Basin, indicating that most of the larger reservoirs under the Decree compliance cap are not limited by available water supplies or water right priority administration activities. Although, water year 2012 followed a wetter year so carryover quantities were larger in many reservoirs going into water year 2012. In addition, the reservoirs owned and operated by Wheatland Irrigation District; Sand Lake, King #1, and Dutton Creek Reservoirs appeared to fill every year if the facilities and conveyance systems were in good working order.

Carry-Over and Accrual Quantities of all Reservoirs. In the overall reporting of all the reservoirs since 2000, **Figure 3.6.5** illustrates increasing carry-over quantities from a low of 2,059 acre-feet in 2001 to a maximum of 10,713 acre-feet in 2011. Both water years 2002 and 2004 stand out in **Figure 3.6.5** as record dry years; with very small accruals of 5,429 and 5,922 acre-feet, respectively.

Reservoir owners of the largest reservoirs following the drought of 2002-2004 purposely conserved storage water in meeting irrigation needs and intentionally increasing carry-over quantities because of uncertainties about future water availability.

Communications with SEO staff and reservoir owners has confirmed this analysis. Another consideration is that most of the reservoir owners have irrigated lands that are served by both direct flow and storage water. The owners will rely on direct flow when it is available and will conserve storage water for the future. The owners' objective to save water and provide carry-over for water needs in future years is evident. Following 2011, the carry-over quantities have steadily decreased to a quantity similar to the long-term carry-over average of 5,380 acre-feet.

For the largest reservoirs that fill almost every year, the carry-over quantities directly affect the storage space available for accruals. The storage space limitation also affects the

smaller reservoirs that make up a large percentage of the overall storage and accrual reporting.

Direct communication with SEO staff has confirmed that some of the reservoir owners operate their reservoirs to meet water needs and objectives other than the permitted irrigation uses. In addition to drought concerns, some reservoir owners are increasing carry-over amounts to serve other beneficial uses and purposes; such as the needs of the existing reservoir fisheries as well as serving recreation uses within the reservoirs.

3.6.5 Water Use from Storage Updates

New Reservoir Permits

All new reservoirs or enlargements in the Wyoming's Platte River Basin that have been permitted by the SEO since the last plan update have been identified in **Appendix 3-C**, Tables 3 through 9. In accordance with the provisions of the Scope of Service, reservoirs less than 50 acre-feet capacity were excluded. The permits in **Appendix 3-C**, Table 3 are listed together within each respective subbasin with the permitted beneficial use identified. Tables 4 through 9 are updated reservoir listings from the previous Platte River Basin Plan (2006) that identified non-federal reservoirs greater than 1,000 acre-feet in storage capacity. At the bottom of each table is a listing of any new reservoirs greater than 50 acre-feet permitted or constructed since the original plan. The reservoirs were also contained in Table 3.

Many of the newly permitted reservoirs were existing facilities. The owners merely obtained a formal water right permit by the Wyoming State Engineer's Office to make the facility a "matter of record." Two reservoirs serving irrigation purposes were constructed in the Pathfinder to Guernsey Subbasin. One of the reservoirs was supplied with a non-hydrologically connected groundwater source (Eastgate Reservoir) and the other reservoir (McMurry no. 4 Reservoir) acquired water supplies through a water right transfer process. The other reservoirs permitted throughout the Basin appear to have been built for a variety of different reasons serving various beneficial uses which included industrial treatment, recreation, wildlife, fish propagation, and flood control.

3.6.6 Summary

Wyoming's reported carryover, maximum storage, and accrual data from 1951 to the present was reviewed. A more detailed analysis of the maximum storage and accrual data collected from the 11 largest reservoirs since 2003 was conducted. Per the Modified 2001 North Platte Decree requirements, the largest reservoirs had measurement devices installed to improve the accuracy of reporting annual accruals. Due to their size and locations, the largest reservoirs represent the best opportunities for maximizing annual storage quantities.

The statistical results of the 63 years of reporting are summarized in **Table 3.6.1**.

Table 3.6.1: 64-Year Statistics of Water Stored for Irrigation Purposes Above Pathfinder Reservoir in Wyoming

Storage Quantities	Carry-Over (acre-feet)	Max Water Stored (acre-feet)	Reported Accrual (acre-feet)
Averages	5,380	17,272	11,908
Minimums	255	8,412	5,429
Maximums	12,956	23,433	17,552

The average annual accrual quantity is 11,908 acre-feet so the estimated additional storage potential on an average annual basis is approximately 6,000 acre-feet to maximize Wyoming's available allocation of 18,000 acre-feet. Various carryover factors and the actual storage quantity physically available in any one year affect the feasibility of Wyoming accruing up to 18,000 acre-feet as often as possible. Reservoir owners' operational decisions to conserve water during a drought period or to maintain a minimum pool are factors affecting carryover quantities.

3.6.7 Conclusions and Recommendations

The reservoirs above Pathfinder have permitted and actual active storage capacities that exceed 18,000 acre-feet so the potential exists for Wyoming to exceed the cap in any one year. The records reviewed for the largest reservoirs instrumented with new measuring devices confirmed that most reservoirs filled nearly every year except when affected by severe drought conditions or when reservoir or conveyance deficiencies prevented their physical ability to store water.

During drought periods, the reservoir owners are intentionally saving water to conserve water supplies for the following year so the storage space available for accruals the following year is physically limited. Some reservoir owners are also increasing reservoir carry-over amounts to serve other beneficial uses such as fishery or recreational purposes. HDR's structural and non-structural recommendations are based on the water storage analysis performed on the reservoirs storing for irrigation purposes above Pathfinder Reservoir exclusive of Seminoe Reservoir. The implementation of one or more of the stated alternatives could assist Wyoming in maximizing the annual accrual quantities.

Reservoir Owner Operating Strategies

A potential non-structural recommendation is to facilitate the coordination of storage accruals among the reservoir owners. Coordination with reservoir owners on an annual basis could occur that would allow maximizing storage accruals occurring in Wyoming in any one year. This approach requires cooperation between the SEO and the entities responsible for coordinating the individual reservoir owners. The reservoir owners of the largest reservoirs with measuring device equipment may be the most amenable to this coordination approach based on their previous coordination with the State of Wyoming. The largest reservoirs represent the most efficient entities to accomplish this cooperation alternative due to their size and the practicality of coordinating with fewer reservoir owners.

In cooperation with reservoir owners, reservoir operational plans could be developed for the largest reservoirs. The operation plans would specify a procedure and method to coordinate communications with the reservoirs owners so they are aware of the carry-over amounts and the targeted accrual quantity. The procedure would require monitoring of individual reservoir carry-over quantities each water year and estimating target accrual amounts. The target accrual amounts would be added together in the respective larger reservoirs so that operational plans can be modified to maximize Wyoming's storage quantities up to the Decree allowance of near 18,000 acre-feet in every water year.

In addition, reservoir owners with excess storage may be in a position to contract with other downstream irrigators that are deficient in direct flow water rights when natural flows decrease in the mid-summer months. This contracting process would allow the reservoir owners to enhance the use of their storage water. In addition, the improved analysis and monitoring of snow pack and estimated runoff quantities would help reservoir

owners optimize their reservoirs in meeting irrigation beneficial uses as well as conserving water for future drought conditions.

The new measuring device equipment will allow for near real-time monitoring of accruals and maximum storage amounts at the largest eleven reservoirs. The reservoir owners would be capable of adjusting reservoir outlets or the bypassing of inflows so Wyoming does not exceed the 18,000 acre-feet accrual cap.

Reservoir Water Right Re-descriptions

Another potential non-structural alternative is to consider the reservoir storage water right and its function for serving irrigation purposes. A portion of the active reservoir storage in the larger reservoirs could be better defined and modified within a Wyoming Board of Control change of use petition process to eliminate the requirement and the need to track the storage under the Modified Decree requirements. For example, the portion of storage that is for the purposes of meeting fishery or recreation beneficial uses could be formally designated for that purpose within the reservoir storage water right. The portion of the storage water right for in-place environmental or recreation uses should not be included in the SEO reporting of storage water dedicated to meeting irrigation purposes.

This re-description of a portion of the water storage rights would allow for more certainty for Wyoming to only account for the storage water actually used to meet irrigation demands. The process of optimizing the tracking and reporting would allow for Wyoming to maximize storage accruals that need to be specifically tracked and reported under the Modified Decree. Following the petition process, the SEO field personal would be required to monitor and track the storage and accruals in accordance with the modified water right for the reservoir. A potential negative impact of this alternative is that the reservoir owner must agree to a permanent change in their reservoir water rights, which eliminates the flexibility in their reservoir operations that has occurred in the past.

Constructing New Reservoirs or Enlargement of Existing Reservoirs

Constructing new reservoirs or enlarging existing irrigation reservoirs are challenging projects to implement. The siting of new reservoirs would require the need to evaluate suitable reservoir sites and consider the environmental effects of each site to address the environmental permitting requirements. Water supply alternative analysis evaluations would also be a NEPA requirement for a reservoir enlargement project. The permitting process will require NEPA compliance for the issuance of federal permits or required right-of-way agreements on federal lands. Wyoming's compliance with the PRRIP and Wyoming's Depletions Plan will need to be considered for either alternative. A new irrigation reservoir would require the need for a local sponsor that could provide for a share of the overall capital costs.

To be eligible for WWDC Account III funds, new reservoirs would have to be 2,000 acre-feet or greater and reservoir enlargements would have to be 1,000 acre-feet or greater. The proposed or existing irrigation reservoirs above Pathfinder must provide irrigation to service areas greater than 2,000 acres which is an additional WWDC funding requirement. New reservoirs and enlargements to reservoirs smaller than these storage quantities could be funded through WWDC Account I funds with WWDC grant funding up to 67% of the total project costs.

Following its construction or after the enlargement of an existing reservoir, the designated sponsor would need to collaborate with State officials to implement an operational strategy to maximize storage accruals to allow Wyoming to accrue near the 18,000 acre-foot quantity on an annual basis. This alternative could be implemented in concert with the nonstructural options. A potential disadvantage of this approach is that new storage

under current-day priority water rights may not accrue enough storage to fill the reservoir every year.

Personal contacts were made with SEO staff regarding the water supplies, water rights, and irrigation needs served by Pierce Reservoir, which is the largest irrigation reservoir with an existing capacity of 3,895 acre-feet. SEO indicated that irrigation shortages exist downstream along Rock River because of declining natural flows during the mid to late irrigation season months that could be addressed through an enlarged storage supply. This would require contractual arrangements between the direct flow only appropriators and the current reservoir owners or an enlargement of the current service area of the Rock Creek Ditch Company. Irrigation supply shortages may exist on other irrigated lands located downstream of small irrigation reservoirs located above Pathfinder Reservoir. Further analysis would be needed to evaluate the irrigation shortages and to evaluate the potential firm water supply yields available for a new or enlarged reservoir.

3.6.8 References

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Wyoming State Engineer's Office, 2000 - Water Year - North Platte River Decree Area Irrigated Acres and Reservoir Storage Report, Jeffrey J. Hansen, Field Investigator, Division No. I, February 2002.

Wyoming Water Development Commission, 2006, Platte River Basin Plan Technical Memorandum 2.15 – 5.3, Volume II, Trihydro Corporation, May 2006.

APPENDIX 3-A

Irrigation System Issues within Subbasins of the Platte River Basin

Table 1. Irrigation System Issues within Subbasins of the Platte River Basin

Name	2003 Problems[1]	2012 Problems[2]
Above Pathfinder		
None		
Pathfinder To Guernsey		
LaPrele Irrigation District	Ditch improvements, dam maintenance, vandalism	Repairs to Dams and Canals needed; Backhoe, shop, pipe
Bates Creek Reservoir Company	Lack of water	Dry Fork of Bates Creek accurately named; Ongoing maintenance of dam & supply ditch.
Casper Alcova Irrigation District	Leaky ditches	High conveyance losses – 20%
Douglas Water Users	No response to survey	No response to survey.
Wagonhound Land and Livestock	No response to survey	No response to survey.
Guernsey To State Line		
Angel Draw Irrigation District	No response to survey	No response to survey.
Burbank Ditch	State and Federal requirements	Inadequate water sources; dependable supply.
Corn Creek Irrigation District	Not listed in survey	Not listed in survey
Goshen Hole Water Users Association	Lake needs to be dredged, headgates and water measuring devices need to be improved	No improvements made for 40+ years, entire system needs an upgrade; Interested in help, but debt is not an option
Goshen Mutual Reservoir and Ditch Company	No response to survey	drought, excessive water loss, state and federal requirements
Hill Irrigation District	None	None
Lingle Water Users Association	Drought, short water	No response to survey.
Lucerne Canal and Power Company	No response to survey	Not listed in survey.
New Grattan Ditch	No response to survey	No response to survey.
New North Platte Irrigation & Ditch Company	Diversion from river during flows less than 500 cfs	Needed improvements, Maintenance requirements; diversion dam on river
Pratte-Ferris Irrigation District	No response to survey	Improvements for conveyance loss
Rock Ranch Ditch Company	The diversion in the North Platte	The diversion in the North Platte
Torrington Irrigation District	Needed improvements, maintenance through subdivisions	No response to survey.
Wright & Murphy Ditch Company	No response to survey	No response to survey.
Upper Laramie		
Laramie Valley Municipal Irrigation District	Flumes, need headgates, riprap, concrete, repairs	Unpredictability of water availability to lower priority water rights holders (specifically, those of lower priority than Wheatland Irrigation District, approximately 1890); Increasing costs of ditch maintenance (measuring

		flumes, culverts, headgates; equipment costs of equipment hired for ditch cleaning services).
Medicine Bow Conservation District	No response to survey	No response to survey.
Pioneer Canal-Lake Hattie Irrigation District	Limited storage imposed by U.S. Fish and Wildlife Service	Improvements at Lake Hattie outlet structure; Major erosion control on supply canal from Big Laramie River; Minimize ditch loss on the entire system.
Rock Creek Ditch Company	Lack of water during drought	Not listed in survey.
Rock Creek Water Users Association	No response to survey	High flows trying to reroute flows away from diversion structures.
Toltec Watershed Improvement District	No response to survey	None
Lower Laramie		
Gunbarrel Lateral Ditch Company	2002 – only 0.2 ft/acre; 2003 – 0.4 ft/acre	Dirt & rubbish blows into open ditch
Wheatland Irrigation District	Lack of storage	Old system started in 1883; unwritten easements; subdivided lands, delivery to subdivided lands.
Horse Creek		
Goshen Irrigation District	State and federal requirements, subdivided land, seepage, lack of adequate water measurement, system age	Canal was established in 1920's and is in need of several improvements. Seepage problems, Federal EDSA, subdivisions, deliveries to and transfers to other lands in our district; Assessments are higher due to increasing costs of materials and rising fuel prices.
Horse Creek Conservation District	Drought, inadequate water supply, easements access issues at Hawk Springs Reervoir with state parks and G & F	Financial burdens; Ditch repairs
South Platte		
None		

Notes: [1]Problems noted in Wyoming Water Development Commission 2003 Irrigation System Survey Report
[2] Problems noted in Wyoming Water Development Commission 2012 Irrigation System Survey Report

APPENDIX 3-B

New Municipal Wells or Enlargements Filed on Existing Municipal Wells Since January 1, 2004

Summary of Water Usage for Community Water Systems for the Subbasins of the Platte River Basin

Table 1. New Municipal Wells or Enlargements Filed on Existing Municipal Wells Since January 1, 2004

Entity/Municipality	Well/Facility Name	Uses	Appropriation (GPM)	Total Depth (Ft)	Depth to Water (Ft)
ALBIN	ALBIN 04-01 NOELLE	MUN_GW	50	361	224.1
ALBIN	ALBIN 04-02 MARY	MUN_GW	110	430	217.1
TOWN OF YODER	STATE NO. 04 WELL	MUN_GW	45	160	74.5
TOWN OF PINE BLUFFS	PINE BLUFFS LANCE/FOX HILLS #1	MUN_GW	250	1,008	240
CITY OF CHEYENNE	ENL. CHEYENNE NO. 51 (FINNERTY NO. 2)	MUN_GW	175	210	45.48
CITY OF CHEYENNE	ENL. BELL NO. 10	IRR_GW; MUN_GW	0	250	40
TOWN OF GLENDO	ROBBENS WELL	MUN_GW	30	650	160
WYOMING WATER DEVELOPMENT COMMISSION	BELVOIR NO. 5	MUN_GW	700	272	82
TOWN OF MILLS	ENL. MILLS NO. 9	MUN_GW	115	35	8
TOWN OF SARATOGA	SARATOGA WELL #1	MUN_GW	230	305	62
TOWN OF SARATOGA	SARATOGA WELL #2	MUN_GW	230	352	78
TOWN OF SARATOGA	SARATOGA WELL #3	MUN_GW	230	390	98
TOWN OF SARATOGA	SARATOGA WELL #4	MUN_GW	230	412	100
TOWN OF SARATOGA	SARATOGA WELL #5	MUN_GW	230	430	100
WYOMING WATER DEVELOPMENT COMMISSION	LONE TREE #2	MUN_GW	500	-	-
WYOMING WATER DEVELOPMENT COMMISSION	BELVOIR NO. 6	MUN_GW	300	406	122
TOWN OF GLENROCK	GLENROCK WELL NO. 7	MUN_GW	1500	1,233	173
CITY OF CHEYENNE, BOARD OF PUBLIC UTILITIES	2ND ENL. BELL # 10	IRR_GW; MUN_GW; MIS	75	250	40
TOWN OF GLENDO	ENL ROBBENS WELL	MUN_GW	45	650	160
TOWN OF ELK MOUNTAIN	ELK MOUNTAIN WELL #4	MUN_GW	200	2,926	0
SIERRA MADRE WATER AND SEWER JOINT POWERS BOARD	RIVERSIDE NO. 7 WELL	MIS; MUN_GW	150	631	38
TOWN OF PINE BLUFFS	PINE BLUFFS #9	MUN_GW	300	702	271.4
TOWN OF YODER	ENL. PRODUCTION WELL NO. 2	MUN_GW	12	195	70
TOWN OF YODER	ENL PRODUCTION WELL NO. 3	MUN_GW	10	193	85
TOWN OF YODER	ENL STATE NO. 04	MUN_GW	7	160	75
CITY OF DOUGLAS	LITTLE BOX ELDER WELL NO. 1	MUN_GW	600	1,170	0
WYOMING WATER DEVELOPMENT COMMISSION	THOMAS MEMORIAL NO. 1	MUN_GW	200	537	33.5
TOWN OF YODER	YODER PRODUCTION WELL #5	MUN_GW	65	1,110	65.4
TOWN OF GLENROCK	ENL. GLENROCK WELL NO. 7	MUN_GW	185	1,233	173
CITY OF CHEYENNE/BOARD OF PUBLIC UTILITIES	ENLARGEMENT BAILEY NO. 5	MUN_GW	160	317	84

Table 2. Summary of Water Usage for Community Public Water Systems in the Above Pathfinder Dam Subbasin, Wyoming

				2002 WWDC Report[2]				2013 WWDC Report[3]					
Use	**County**	**Public water system identification number[1]**	**Name**	**Population served**	**Water Source**	**Average daily use (gallons per day)**	**Peak daily use (gallons per day)**	**Population served**	**Water Source**	**Total Annual Water Use (gallons)**	**Average daily use (gallons per day)[4]**	**Peak daily use (gallons per day)[5]**	**Source/Remarks**
Groundwater Use	Albany	WY5600034	Town of Medicine Bow	282	3 Casper Aquifer wells	91,600	129,500	300	4 Casper Aquifer wells	44,324,926	121,438	172,500	WWDC, 2013; Peak estimated.
	Fremont	WY5600106	Jeffrey City Water & Sewer District	50	2 Arikaree Aquifer wells	11,300	28,750	50	1 Split Rock Aquifer well	23,266,150	63,743	120,000	609 Consulting, 2013
	Carbon	WY5600065	Town of Elk Mountain	207	2 Clovery Aquifer wells	24,000	80,000	200	2 Cloverly Aquifer wells	9,000,000	24,658	60,000	PMPC and Hinckley, 2011; WWDC, 2013
	Carbon	WY5600225	Deer Haven Mobile Home Park	50	2 Quaternary Aquifer wells	11,300	28,750	35	1 Quaternary Aquifer wells	2,887,150	7,910	20,125	Usage estimated.
	Carbon	WY5601332	Sierra Madre JPB	195	2 North Park Aquifer wells	29,254	99,000	180	3 North Park Aquifer wells	8,899,640	24,383	47,000	PMPC and Hinckley, 2011; WWDC, 2013
	Carbon	WY5600061	Town of Saratoga	NA	NA	NA	NA	1,800	5 North Park Aquifer wells	175,000,000	479,452	1,200,000	Switched to groundwater system in 2007; Hinckley, 2007; WWDC, 2013
			Totals	**784**		**167,454**	**366,000**	**2,565**		**263,377,866**	**721,583**	**1,619,625**	
Surface Water Use	Carbon	WY5600025	Town of Hanna	1,200	Rattlesnake Creek	60,000	900,000	841	Rattlesnake Creek	84,036,000	230,236	515,000	WWDC, 2013
	Carbon	WY5600048	Town of Rock River	200	Rock River	18,000	22,000	245	Rock River	35,800,000	98,082	120,000	WWDC, 2013
	Carbon	WY5600060	Town of Encampment	443	North Fork Encampment River	141,279	332,220	450	North Fork Encampment River	22,403,000	61,378	258,750	WWDC, 2013; Peak estimated.
	Carbon	WY5600061	Town of Saratoga	1,850	North Platte River	500,000	1,200,000	NA	NA	NA	NA	NA	Switched to groundwater system in 2007
			Totals	**3,693**		**719,279**	**2,454,220**	**1,536**		**142,239,000**	**389,696**	**893,750**	
Conjunctive Water Use	Carbon	WY5600045	City of Rawlins Water System	9,730	27 Springs, Rawlins Reservoir, North Platte River, 3 Nugget Aquifer wells	2,251,000	5,243,000	9,006	3 Nugget Aquifer wells, 14 Sage Creek Basin springs, North Platte River, Atlantic Rim Reservoir, Peaking Reservoir, Rawlins Reservoir	684,979,000	1,876,655	4,421,000	Sells water to Sinclair; Wester-Wetstein, 2010; WWDC, 2013
	3Carbon	WY5600054	Town of Sinclair	500	City of Rawlins	50,000	100,000	433	City of Rawlins	45,300,000	124,110	400,000	WWDC, 2013
			Totals	**10,230**		**2,301,000**	**5,343,000**	**9,439**		**730,279,000**	**2,000,764**	**4,821,000**	

Notes: (1) Public Water System identification according to USEPA

(2) Data from 2002 WWDC water system survey report or sources included in original Basin Plan technical memorandum

(3) All data from 2013 Wyoming Water Development Commission Public Water System Survey Report unless noted otherwise under remarks.

Table 3. Summary of Water Usage for Community Public Water Systems in the Pathfinder Dam to Guernsey Subbasin, Wyoming

				2002 WWDC Report[2]				2013 WWDC Report[3]					
Use	**County**	**Public water system identification number[1]**	**Name**	**Population served**	**Water Source**	**Average daily use (gallons per day)**	**Peak daily use (gallons per day)**	**Population served**	**Water Source**	**Total Annual Water Use by system (gal)**	**Average daily use (gallons per day)[4]**	**Peak daily use (gallons per day)[5]**	**Source/Remarks**
Groundwater Use	Platte	WY5600023	Town of Guernsey	1,200	3 wells	484,800	866,870	1,147	3 Alluvial Aquifer wells	144,722,000	396,499	771,065	AVI, 2013; WWDC, 2013
	Natrona	WY5600072	Riverside Trailer Court	155	2 wells	35,030	89,125	137	2 Alluvial Aquifer wells	11,301,130	30,962	78,775	Usage estimated
	Natrona	WY5600074	Broken Wrench LLC	50	2 springs	11,300	28,750	30	2 springs	2,474,700	6,780	17,250	Usage estimated
	Platte	WY5600186	Town of Hartville	94	4 wells	23,500	51,000	62	2 Alluvial Aquifer wells	6,000,000	16,438	35,650	WWDC, 2013; peak estimated
	Converse	WY5600199	Town of Glenrock	2,500	3 wells	600,000	1,400,000	2,550	4 Casper Aquifer wells	218,000,000	597,260	1,700,000	Weston, 2007; WWDC, 2013
	Platte	WY5600231	Town of Glendo	250	1 well	95,587	178,685	205	2 Hartville Aquifer wells	20,000,000	54,795	150,000	Wyoming Groundwater, 2009; WWDC, 2013
	Natrona	WY5600756	Countryside Court	125	1 well	28,250	71,875	125	1 Alluvial Aquifer well	10,311,250	28,250	71,875	Usage estimated
	Converse	WY5600782	Town of Rolling Hills	475	4 wells	70,349	387,168	450	5 Lance/Fox Hills Aquifer wells	24,329,142	66,655	174,000	CEPI, 2012; WWDC, 2013
	Converse	WY5600918	Fairway Estates	100	5 wells	22,600	57,500	100	5 High Plains Aquifer wells	8,249,000	22,600	57,500	Usage estimated
	Natrona	WY5600959	Ingram Water Company/Teton Homes	300	1 well	67,800	172,500	NA	NA	NA	NA	NA	Inactive?
			Totals	**5,249**		**1,439,216**	**3,303,473**	**4,806**		**445,387,222**	**1,220,239**	**3,056,115**	
Surface Water Use	Natrona	WY5600018	Town of Evansville	2,800	North Platte River	350,000	1,000,000	2,500	North Platte River	160,235,000	445,000	820,220	C.H. Guernsey, 2009; WWDC, 2013
			Totals	**2,800**		**350,000**	**1,000,000**	**2,500**		**160,235,000**	**445,000**	**820,220**	
Conjunctive Water Use	Natrona	WY5600009	Central Wyoming Regional Water System (Casper)	53,412	20 Quaternary Aquifer wells, North Platte River	10,300,000	28,000,000	62,000	29 Alluvial Aquifer wells, North Platte River	4,100,000,000	11,232,877	29,200,000	CEPI, 2006; WWDC, 2013
	Natrona	WY5600036	Town of Mills	5,745	7 Quaternary Aquifer wells, North Platte River	861,750	2,500,000	3,300	7 Alluvial Aquifer wells, North Platte River	237,107,500	649,610	1,550,000	WWDC, 2013
	Converse	WY5600137	Town of Douglas	5,800	1 spring, 1 well, North Platte River	1,489,085	3,866,500	6,120	1 Casper Aquifer spring, 1 Casper Aquifer well, North Platte River	630,739,154	1,728,052	3,643,853	Dowl HKM, 2010; WWDC, 2013
			Totals	**64,957**		**12,650,835**	**34,366,500**	**71,420**		**4,967,846,654**	**13,610,539**	**34,393,853**	

Notes: (1) Public Water System identification according to USEPA

(2) Data from 2002 WWDC water system survey report or sources included in original Basin Plan technical memorandum

(3) All data from 2013 Wyoming Water Development Commission Public Water System Survey Report unless noted otherwise under remarks.

(4) Where estimated, based on 226 gallons per person per day.

(5) Where estimated, based on 575 gallons per person per day.

Table 4. Summary of Water Usage for Community Public Water Systems in the Guernsey to State Line Subbasin, Wyoming

				2002 WWDC Report[2]				2013 WWDC Report[3]					
Use	**County**	**Public water system identification number[1]**	**Name**	**Population served**	**Water Source**	**Average daily use (gallons per day)**	**Peak daily use (gallons per day)**	**Population served**	**Water Source**	**Total Annual Water Use (gal)**	**Average daily use (gallons per day)[4]**	**Peak daily use (gallons per day)[5]**	**Source/Remarks**
Groundwater Use	Goshen	WY5600030	Town of Lingle	510	3 Quaternary Aquifer wells	295,800	928,200	510	3 Alluvial Aquifer wells	45,000,000	123,288	600,000	WWDC, 2013
	Goshen	WY5600164	Torrington Municipal Water System	6,500	6 Quaternary Aquifer wells	2,360,000	4,700,000	5,800	5 Alluvial Aquifer wells	644,000,000	1,764,384	4,500,000	Sells to South Torrington; WWDC, 2013
	Goshen	WY5600168	South Torrington Water & Sewer	650	Torrington	250,250	300,000	450	Torrington	24,300,000	66,575	100,000	WWDC, 2013
	Goshen	WY5600171	Potlach Trailer Court	75	1 well	16,950	43,125	70	1 Alluvial Aquifer well	5,774,300	15,820	40,250	Usage estimated
	Goshen	WY5600185	Town of Fort Laramie	248	2 Quaternary Aquifer wells	141,360	233,120	200	2 Alluvial Aquifer wells	20,160,900	55,235	176,500	WWDC, 2013
	Goshen	WY5601233	Cottonwood Acres	100	4 wells	22,600	57,500	100	4 Alluvial Aquifer wells	8,249,000	22,600	57,500	Usage estimated
	Goshen	WY5601248	Dillman Estates	46	1 well	10,396	26,450	65	1 Alluvial Aquifer well	7,500,000	20,548	37,375	WWDC, 2013; peak usage estimated
			Totals	**7,479**		**3,097,356**	**6,288,395**	**6,745**		**754,984,200**	**2,068,450**	**5,511,625**	

Notes: (1) Public Water System identification according to EPA
(2) Data from 2002 WWDC water system survey report or sources included in original Basin Plan technical memorandum
(3) All data from 2013 Wyoming Water Development Commission Public Water System Survey Report unless noted otherwise under remarks.
(4) Where estimated, based on 226 gallons per person per day.
(5) Where estimated, based on 575 gallons per person per day.

Table 5. Summary of Water Usage for Community Water Systems in the Upper Laramie Subbasin, Wyoming

				2002 WWDC Report[2]				2013 WWDC Report[3]					
Use	**County**	**Public water system identification number[1]**	**Name**	**Population served**	**Water Source**	**Average daily use (gallons per day)**	**Peak daily use (gallons per day)**	**Population served**	**Water Source**	**Total Annual Water Use (gal)**	**Average daily use (gallons per day)[4]**	**Peak daily use (gallons per day)[5]**	**Source/Remarks**
Groundwater Use	Albany	WY5600162	Country Meadow Estates	375	2 wells	84,750	215,625	375	3 Casper Aquifer wells	12,154,500	33,300	215,625	WWDC, 2013; peak usage estimated
	Albany	WY5600208	Wyoming Technical Institute	560	2 wells	126,560	322,000	560	2 Casper Aquifer wells	46,194,400	126,560	322,000	Usage estimated
	Albany	WY5601232	Centennial Water & Sewer	100	2 wells	17,000	57,500	100	2 Casper Aquifer wells	9,000,000	24,658	45,000	WWDC, 2013
	Albany	WY5601457	Antelope Ridge H.O.A.	50	2 wells	11,300	28,750	70	2 Casper Aquifer wells	5,774,300	15,820	40,250	Usage estimated
			Totals	**1,085**		**239,610**	**623,875**	**1,105**		**73,123,200**	**200,338**	**622,875**	
Conjunctive Water Use	Albany	WY5600029	City of Laramie	27,000	Big Laramie River; 9 Casper Aquifer wells	6,000,000	15,750,000	30,816	9 Casper Aquifer wells, 3 Casper Aquifer springs, Laramie River	1,963,550,000	5,379,589	12,670,000	WWC, 2006; WWDC, 2013
			Totals	**27,000**		**6,000,000**	**15,750,000**	**30,816**		**1,963,550,000**	**5,379,589**	**12,670,000**	

Notes: (1) Public Water System identification according to EPA
(2) Data from 2002 WWDC water system survey report or sources included in original Basin Plan technical memorandum
(3) All data from 2013 Wyoming Water Development Commission Public Water System Survey Report unless noted otherwise under remarks.
(4) Where estimated, based on 226 gallons per person per day.
(5) Where estimated, based on 575 gallons per person per day.

Table 6. Summary of Water Usage for Community Public Water Systems in the Lower Laramie Subbasin, Wyoming

				2002 WWDC Report[2]				2013 WWDC Report[3]					
Use	**County**	**Public water system identification number[1]**	**Name**	**Population served**	**Water Source**	**Average daily use (gallons per day)**	**Peak daily use (gallons per day)**	**Population served**	**Water Source**	**Total Annual Water Use (gal)**	**Average daily use (gallons per day)[4]**	**Peak daily use (gallons per day)[5]**	**Source/Remarks**
Groundwater Use	Albany	WY5600162	Country Meadow Estates	375	2 wells	84,750	215,625	375	3 Casper Aquifer wells	12,154,500	33,300	215,625	WWDC, 2013; peak usage estimated
	Albany	WY5600208	Wyoming Technical Institute	560	2 wells	126,560	322,000	560	2 Casper Aquifer wells	46,194,400	126,560	322,000	Usage estimated
	Albany	WY5601232	Centennial Water & Sewer	100	2 wells	17,000	57,500	100	2 Casper Aquifer wells	9,000,000	24,658	45,000	WWDC, 2013
	Albany	WY5601457	Antelope Ridge H.O.A.	50	2 wells	11,300	28,750	70	2 Casper Aquifer wells	5,774,300	15,820	40,250	Usage estimated
			Totals	**1,085**		**239,610**	**623,875**	**1,105**		**73,123,200**	**200,338**	**622,875**	
Conjunctive Water Use	Albany	WY5600029	City of Laramie	27,000	Big Laramie River; 9 Casper Aquifer wells	6,000,000	15,750,000	30,816	9 Casper Aquifer wells, 3 Casper Aquifer springs, Laramie River	1,963,550,000	5,379,589	12,670,000	WWC, 2006; WWDC, 2013
			Totals	**27,000**		**6,000,000**	**15,750,000**	**30,816**		**1,963,550,000**	**5,379,589**	**12,670,000**	

Notes: (1) Public Water System identification according to EPA
(2) Data from 2002 WWDC water system survey report or sources included in original Basin Plan technical memorandum
(3) All data from 2013 Wyoming Water Development Commission Public Water System Survey Report unless noted otherwise under remarks.
(4) Where estimated, based on 226 gallons per person per day.
(5) Where estimated, based on 575 gallons per person per day.

Table 7. Summary of Water Usage for Community Public Water Systems in the Horse Creek Subbasin, Wyoming

				2002 WWDC Report[2]				2013 WWDC Report[3]					
Use	**County**	**Public water system identification number[1]**	**Name**	**Population served**	**Water Source**	**Average daily use (gallons per day)**	**Peak daily use (gallons per day)**	**Population served**	**Water Source**	**Total Annual Water Use (gal)**	**Average daily use (gallons per day)[4]**	**Peak daily use (gallons per day)[5]**	**Source/Remarks**
Groundwater Use	Goshen	WY5600169	Town of Yoder Water System	300	3 wells	55,000	150,000	151	3 Chadron Aquifer wells, 1 Lance/Fox Hills Aquifer well	11,627,100	31,855	125,000	Wyoming Groundwater, 2011; WWDC, 2013
	Goshen	WY5600788	La Grange	350	2 wells	25,000	37,000	350	2 High Plains Aquifer wells	28,871,500	79,100	201,250	WWDC, 2013; Usage estimated
			Totals	**650**		**80,000**	**187,000**	**501**		**40,498,600**	**110,955**	**326,250**	

Notes: (1) Public Water System identification according to USEPA

(2) Data from 2002 WWDC water system survey report or sources included in original Basin Plan technical memorandum

(3) All data from 2013 Wyoming Water Development Commission Public Water System Survey Report unless noted otherwise under remarks.

(4) Where estimated, based on 226 gallons per person per day.

(5) Where estimated, based on 575 gallons per person per day.

Table 8. Summary of Water Usage for Community Public Water Systems in the South Platte Subbasin, Wyoming

				2002 WWDC Report[2]				2013 WWDC Report[3]					
Use	**County**	**Public water system identification number[1]**	**Name**	**Population served**	**Water Source**	**Average daily use (gallons per day)**	**Peak daily use (gallons per day)**	**Population served**	**Water Source**	**Total Annual Use (gal)**	**Average daily use (gallons per day)[4]**	**Peak daily use (gallons per day)[5]**	**Source/Remarks**
Groundwater Use	Laramie	WY5600012	Orchard Valley Water Company	300	2 wells	34,500	172,500*	400	2 High Plains Aquifer wells	9,000,000	24,658	35,000	WWDC, 2013
	Laramie	WY5600021	Evergreen Park LLC	50	1 well	11,300	28,750	50	1 High Plains Aquifer well	4,124,500	11,300	28,750	Usage estimated
	Laramie	WY5600040	Town of Pine Bluffs	1,153	5 Brule Aquifer wells	288,250	662,975	1,137	2 Lance/Fox Hills Aquifer wells, 2 Brule Aquifer wells, 1 Terrace Aquifer well	95,444,024	261,490	735,000	Lidstone, 2015; WWDC, 2013
	Laramie	WY5600051	Miller Lower Mobile Home Park	70	1 well	15,820	40,250	40	2 High Plains Aquifer wells	3,299,600	9,040	23,000	Usage estimated
	Laramie	WY5600188	Town of Burns	315	4 wells	42,000	75,000	301	4 High Plains Aquifer wells	38,880,000	106,521	405,000	Lidstone, 2011; WWDC, 2013
	Laramie	WY5600189	Town of Albin	120	3 wells	15,000	40,000	120	5 High Plains Aquifer wells	26,664,146	73,052	200,000	Benchmark, 2005; WWDC, 2013
	Laramie	WY5600260	High Plains Ranch	60	1 well	13,560	34,500	50	1 High Plains Aquifer well	4,124,500	11,300	28,750	Usage estimated
	Laramie	WY5600263	Hide-a-Way Mobile Home Park	69	2 wells	15,594	39,675	130	2 High Plains Aquifer wells	10,723,700	29,380	74,750	Usage estimated
	Laramie	WY5600266	Avalon Mobile Manor	120	1 well	27,120	69,000	120	1 High Plains Aquifer well	9,898,800	27,120	69,000	Usage estimated; WWDC, 2013
	Laramie	WY5600779	Winchester Hills	600	2 wells	135,600	345,000	937	3 High Plains Aquifer wells	77,293,130	211,762	538,775	Usage estimated
	Laramie	WY5601265	AAA Mobile Home Park	200	2 wells	45,200	115,000	NA	NA	NA	NA	NA	System Inactive
	Laramie	WY5601464	Carpenter Water & Sewer District	90	2 Chadron Aquifer wells	20,340	51,750	100	2 Chadron Aquifer wells	8,249,000	22,600	57,500	Usage estimated
			Totals	**3,147**		**664,284**	**1,501,900**	**3,385**		**287,701,400**	**788,223**	**2,195,525**	
Conjunctive Water Use	Laramie	WY5600011	Cheyenne Board of Public Utilities	65,000	39 wells, Several surface water sources	13,100,000	36,800,000	73,836	33 High Plains Aquifer wells, numerous surface water sources including N Fork, Little Snake R, Middle Fork, Crow Creek and Douglas Creek	4,942,100,000	13,540,000	31,000,000	HDR, 2013; WWDC, 2013
			Totals	**65,000**		**13,100,000**	**36,800,000**	**73,836**		**4,942,100,000**	**13,540,000**	**31,000,000**	

Notes: (1) Public Water System identification according to EPA

(2) Data from 2002 WWDC water system survey report or sources included in original Basin Plan technical memorandum

(3) All data from 2013 Wyoming Water Development Commission Public Water System Survey Report unless noted otherwise under remarks.

(4) Where estimated, based on 226 gallons per person per day.

(5) Where estimated, based on 575 gallons per person per day.

APPENDIX 3-C

Reservoirs Above Pathfinder Subject to Decree Compliance

Water Stored for Irrigation Purposes in Eleven Largest Reservoirs

Table 1. Reservoirs above Pathfinder Subject to Decree Compliance

Reservoir	Permit Number[2]	Capacity (acre-feet)	Township	Range	Section	Subbasin	Source
Anderson	4121R 4449R	369	15	84	21	Saratoga	Teddy Creek, Otto Creek
Antelope	5242R	147	16	85	18	Saratoga	North Spring Creek
B B	2688R	117	30	86	28	Sweetwater	Dry Creek
Baby	1551R	28	14	82	19	Saratoga	Beaver Creek
Brownlee	1R	98	14	83	9	Saratoga	Cotton Creek
Buck Draw	5530R 6079R	315	16	85	6	Saratoga	Jack Creek
Bucklin[1]	1026R 1976R	736	28	88	18	Sweetwater	Whiskey Creek
Bucklin #2[1]	4108R	519	28	88	18	Sweetwater	Whiskey Creek
Cardwell	692R	56	28	84	13	Medicine Bow	Hill Creek
Cherokee Trail	1767R	95	14	83	22	Saratoga	Indian Creek
Corpening	4726R	116	17	80	34	Saratoga	Little Canyon Creek
Cotton	3804R	12	14	83	15	Saratoga	Indian Creek
Cow Creek Lake[1]	1726R 3960R 5486R	601	14	85	15	Saratoga	Cow Creek
Dutton Creek[1]	528R 1215R 2375R	1489	19	77	24	Medicine Bow	Dutton Creek
East	3843R	13	28	84	13	Medicine Bow	Hill Creek
Fries	459R	6	14	84	11	Saratoga	North Fork
Galusha Draw	6003R	28	27	83	16	Medicine Bow	Indian Creek
Good #1	5824R	191	17	86	15	Saratoga	Beaver Creek
Greyhound	1120R	108	20	83	26	Saratoga	Rattlesnake Creek

Table 1. Reservoirs above Pathfinder Subject to Decree Compliance (cont.)

Reservoir	Permit Number[2]	Capacity (acre-feet)	Township	Range	Section	Subbasin	Source
Gunst	240R 1552R 3260R	269	14	83	24	Saratoga	Dufunny Creek
Gunst	240R 1552R 3260R	269	14	83	24	Saratoga	Dufunny Creek
Hanna Mahoney #2	824R 3433R	84	26	89	2	Sweetwater	Muddy Creek
Higby #1	5545R	8	13	82	11	Saratoga	Bear Creek
Horn & Meason	1052R 2414R	430	17	83	27	Saratoga	Cedar Creek
Horne	461R 6130R	230	21	77	4	Medicine Bow	Foote Creek
Indian Creek	6002R	65	27	83	16	Medicine Bow	Indian Creek
Irene	5816R	251	27	83	13	Medicine Bow	Dry Creek
Irene #2	5904R	87	27	83	33	Medicine Bow	Indian Creek
Jack Creek	783R 2595R	182	16	86	12	Saratoga	Jack Creek
Joe D. Reservoir	703R	21	21	76	32	Medicine Bow	Fieland Creek
John Campbell #1	2034R	56	27	83	9	Medicine Bow	Indian Creek
Keystone	3519R	172	16	80	23	Saratoga	South Twin Lakes Creek
Kindt[1]	729R	2422	19	86	33	Saratoga	Little Sage Creek
Kinney	474R	311	21	82	24	Saratoga	Dana Springs
King #1[1]	3617R	2900	19	77	29	Medicine Bow	Canon
Lady Emma	1641R	29	32	88	3	Sweetwater	Dry Creek
Long Pond	5481R	55	17	86	32	Saratoga	Beaver Creek
Low	5475R	184	16	87	1	Saratoga	Willow Creek
Marsh & Company	825R 823R	152	26	88	8	Sweetwater	Muddy Creek

Table 1. Reservoirs above Pathfinder Subject to Decree Compliance (cont.)

Reservoir	Permit Number[2]	Capacity (acre-feet)	Township	Range	Section	Subbasin	Source
North Spring Creek[1]	539R 6065R	1623	14	86	4	Saratoga	North Spring Creek
Pierce[1]	634R 2407R	3895	20	77	20	Medicine Bow	Rock Creek
Point of Rocks	990R	149	26	80	15	Medicine Bow	Cottonwood Creek
Rainey Reservoir	3547R	1113	19	76	9	Medicine Bow	Coalbank Creek
Reversed Kay Seven	1766R	10	14	83	22	Saratoga	Indian Creek
Robert Cardwell #1	959R	6	28	83	18	Medicine Bow	Dry Gulch
Robert Cardwell #2	960R	335	28	83	18	Medicine Bow	Dry Gulch
Rigby's	P82R P403R	336	29	92	27	Sweetwater	Crook's Creek
Rollman	281R	17	14	82	29	Saratoga	Beaver Creek
Ryan Brothers Lake	2134R	207	16	80	23	Saratoga	North Twin Lake
Sage Creek[1]	2040R	635	18	86	2	Saratoga	Sage Creek
Sand Lake[1]	6136R	1300	17	79	9	Medicine Bow	Rock Creek
Seaverson	4612R 5531R	50	18	85	36	Saratoga	McPhail Creek
Sederlin	1162R	78	19	81	1	Medicine Bow	Fish Creek
Shell Creek	P5508R	130	31	84	26	Sweetwater	Shell Creek
Silver Lake	3763R	322	14	85	18	Saratoga	Silver Lake Brook
South Spring Creek Lake[1]	2508R	857	14	86	2	Saratoga	South Spring Creek
Spring Creek	3460R	240	27	82	32	Medicine Bow	Spring Creek
Stephenson	730R	75	22	82	23	Saratoga	Big Ditch Creek
Sucker Lakes	3990R	49	16	80	26	Saratoga	Snow

Table 1. Reservoirs above Pathfinder Subject to Decree Compliance (cont.)

Reservoir	Permit Number[2]	Capacity (acre-feet)	Township	Range	Section	Subbasin	Source
Summitt	804R 6076R	128	13	82	3	Saratoga	Beaver Creek
McQueary Reservoir	2160R	81	31	84	27	Sweetwater	Fish Creek
Meer	5952R	122	27	81	3	Medicine Bow	Dry Creek
Mule Creek	991R	96	26	7	1	Medicine Bow	Mule Creek
Three Mile	239R	132	28	77	36	Medicine Bow	Three Mile Creek
Toothaker	5816R	215	14	82	16	Saratoga	Beaver Creek
Turpin Park[1]	6155R	1503	17	80	16	Medicine Bow	Turpin Creek
Verplancke	518R 6085R	224	14	82	30	Saratoga	Billy Creek
White's A	3217R	32	20	77	22	Medicine Bow	Coalbank Creek
Wiant	2202R 3859R	296	16	80	11	Saratoga	South Bush Creek

Notes: 1) Largest reservoirs with new measuring devices installed per requirement of Modified Decree. Wenck Associates completed surveying and new reservoir capacity tables in 2005. Total capacity volumes in the third column were updated based on new survey data.

2) WSEO original reservoir permits and enlargement permits.

Table 2. Water Stored for Irrigation Purposes in Eleven Largest Reservoirs

Water Year	Carry-Over acre-feet	Estim. Max Water Stored acre-feet	Reported Accrual acre-feet
2003	1,485	11,999	10,514
2004	1,618	5,519	3,901
2005	1,483	10,877	9,394
2006	2,183	11,745	9,562
2007	3,116	13,721	10,605
2008	4,591	15,235	10,644
2009	5,997	14,608	8,611
2010	6,869	14,644	7,775
2011	7,595	11,699	4,104
2012	6,015	9,600	3,815
2013	3,861	11,532	7,685
2014	5,185	14,756	9,571
Averages	4,167	12,161	8,015
Minimums	1,483	5,519	3,815
Maximums	7,595	15,235	10,644

Table 2. Water Stored for Irrigation Purposes in Reservoirs above Pathfinder in Wyoming

Water Year	Carry-Over acre-feet	Estim. Max Water Stored[3] acre-feet	Reported Accrual[2] acre-feet
1951			11,986
1952	255	14,108	13,853
1953	371	11,691	11,320
1954	1,323	9,669	8,346
1955	787	11,080	10,293
1956	1,085	13,602	12,517
1957	910	17,319	16,409
1958	6,387	19,832	13,445
1959	5,232	17,152	11,920
1960	4,910	18,643	13,733
1961	4,515	17,029	12,514
1962	3,177	17,078	13,901
1963	4,068	15,611	11,543
1964	992	15,266	14,274
1965[1]	1,066	19,014	17,948
1966[1]	7,789	27,223	19,434
1967[1]	7,872	14,533	6,661
1968	11,301	19,098	7,797
1969	8,772	20,223	11,451
1970	6,349	17,800	11,451
1971	6,349	16,087	9,738
1972	9,315	21,010	11,695
1973	8,183	21,236	13,053
1974	7,836	20,399	12,563
1975	6,697	21,675	14,978
1976	8,904	22,404	13,500
1977	5,018	15,679	10,661
1978	5,055	20,411	15,356
1979	5,881	23,433	17,552
1980	7,730	23,324	15,594
1981	7,262	18,142	10,880
1982	5,103	20,143	15,039
1983	12,956	18,710	5,754
1984	11,773	17,544	5,771
1985	9,079	17,973	8,894
1986	3,273	18,361	15,088
1987	4,410	13,850	9,440
1988	4,354	17,871	13,517
1989	4,023	12,139	8,116
1990	3,607	15,067	11,459
1991	3,246	16,146	12,900
1992	3,846	15,052	11,206

Table 2. Water Stored for Irrigation Purposes Reservoir above Pathfinder in Wyoming (cont.)

Water Year	Carry Over	Estim. Max Water Stored[3]	Reported Accrual[2]
	acre-feet	acre-feet	acre-feet
1993	2,889	16,784	13,895
1994	4,378	15,153	10,775
1995	1,521	15,629	14,108
1996	5,878	16,009	10,131
1997	3,444	18,223	14,779
1998	7,595	19,374	11,779
1999	6,540	16,448	9,908
2000	5,978	16,633	10,655
2001	2,059	15,142	13,083
2002	2,464	8,412	5,429
2003	3,598	15,737	13,273
2004	3,133	9,520	5,922
2005	3222	16,033	12,811
2006	4707	16,731	12,024
2007	5,111	19,427	14,316
2008	6,571	22,238	15,667
2009	8,921	21,646	12,736
2010	9,561	21,874	12,313
2011	10,713	18,815	8,107
2012	9,136	15,506	6,642
2013	4,772	16,373	11,626
2014	5,869	22,744	16,875

Notes: 1) The Wyoming State Engineer's reports for 1965, 1966, and 1967 mistakenly reported storage that included Seminoe Reservoir storage. Some of the WSEO records were destroyed in a fire in the Torrington field office on February 22, 1969 (WSEO July 1998). The reported values for these three years were not included in the statistics for accruals and estimated maximum storage in Table 5 below.

2) The above accrual reporting was often discussed at the annual Natural Flow and Ownership (NFO) meetings held between 1946 and 2001. Following the issuance of the Final Settlement Stipulation and the Modified Decree, the North Platte Decree Committee meetings are held twice a year in the spring and fall with annual accruals reported annually during the spring meeting.

3) The WSEO reservoir records of the maximum water stored were not available for 1956 through 2002. For the table above, the maximum storage is estimated by adding the carryover from the previous water year to the total accrual amount in the current water year. The maximum storage in the table for 2003 through 2014 is the actual WSEO storage quantities measured in the spring of each year.

Table 3. New and Enlarged Reservoir Permits

Platte Subbasin	SEO Permit No.	Reservoir Name	Priority Date	Overall Capacity	Permitted Uses
Above Path	P13044R	RED DESERT RECLAMATION 1-2-3 RESERVOIR	12/7/2007	54.72	IND_SW
Above Path	P13579R	CHAPMAN	1/11/2008	68.16	FIS; REC; STO; WL
Above Path	P13681R	ENL. TURPIN PARK RESERVOIR	8/10/2010	186.56	IRR_SW
Above Path	P13895R	ENL. SULLIVAN PIT RESERVOIR	4/26/2011	73,762	IND_SW
Upper Laramie	P14093R	SPIEGELBERG SPRINGS	4/22/2013	131.4	CMU; STO; WL
Lower Laramie	P14249R	WHEATLAND WASTEWATER LAGOON SYS	5/23/2013	418.8	IND_SW; IRR_SW
Path to Guern	P12606R	REESE RESERVOIR	2/22/2006	53	CMU; FIS; WL
Path to Guern	P13125R	EASTDALE CREEK DETENTION RESERVOIR NO. 2	9/17/2007	57.15	FLO
Path to Guern	P13232R	CCI	11/1/2006	240.4	CMU; STO; WL
Path to Guern	P13409R	EASTGATE RESERVOIR	2/10/2009	575.32	DOM_SW; IRR_SW; REC; STO; WL
Path to Guern	P13729R	MCMURRY NO. 2 RESERVOIR	2/3/2011	92.35	FIS; REC; STO
Path to Guern	P14106R	MCMURRY NO. 4 RESERVOIR	3/19/2013	367.16	CMU; FIS; IND_SW; IRR_SW; REC; STO
Path to Guern	P14174R	HENRIE NO. 2	10/14/2013	51.95	STO; FIS, WL
Guern to S.L.	P12936R	FRONTIER RESERVOIR	10/13/2006	331.8	REC
South Platte	P12527R	WARREN AIR FORCE BASE BNSF POND RESERVOIR	3/20/2006	130.5	FLO
South Platte	P12970R	BURNETT DAIRY NO. 1 RESERVOIR	6/27/2007	93.18	IND_SW; IRR_SW
South Platte	P13794R	SOUTH LAKE PEARSON RESERVOIR	8/18/2011	84.5	DSP; FIS; IND_SW; REC
South Platte	P13795R	NORTH LAKE PEARSON RESERVOIR	8/18/2011	125.88	DSP; FIS; IND_SW; REC

Notes: 1. Permitted Uses: CMU - Combined uses, DSP - domestic supply, FIS - fish propagation, IND_SW - Industrial, REC - recreation, IRR_SW - Irrigation, WL - wildlife.
2. No Appropriation was granted for P13895R since the appropriation was originally permitted under P12415R.

Table 4. Reservoirs in the Pathfinder to Guernsey Subbasin

Permit number	Reservoir name	Priority date	Active capacity acre-feet	Inactive capacity acre-feet	Enlargement capacity acre-feet	Total capacity acre-feet
P728R	LaPrele Reservoir	9/21/1905				15,106.0
P1581R	LaPrele Reservoir, Enl.	7/7/1909			4,894.0	20,000.0
P1708R	Johnson No. 1 Reservoir	10/11/1909				11,865.0
P6279R	Soda Lake Reservoir	1/20/1956				8,815.0
P549R	Bates Creek Reservoir	2/16/1904				3,112.0
P5144R	Bates Creek Reservoir, Enl.	9/29/1939			1,605.0	4,717.0
P5199R	J. and J. Reservoir	10/19/1939				1,423.1
P1067R	Reynolds No. 2 Reservoir	6/27/1907				1,008.0
P13409R	Eastgate Reservoir	2/10/2009				575.3
P14106R	McMurry No. 4 Reservoir	3/19/2013				367.2
P13232R	CCI	11/1/2006				240.4
P13729R	McMurry No. 2 Reservoir	2/3/2011				92.4
P13125R	Eastdale Creek Detention Reservoir no. 2	9/17/2007				57.2
P12606R	Reese Reservoir	2/22/2006				53.0
P14174R	Henrie No. 2	10/14/2013				51.1

Source: Wyoming State Engineer's Office.

Table 5. Reservoirs in the Guernsey to State Line Subbasin

Permit number	Reservoir name	Priority date	Active capacity acre-feet	Inactive capacity acre-feet	Enlargement capacity acre-feet	Total capacity acre-feet
P6423R	Detention Reservoir Pine Ridge - 1	4/24/1958				2,207.72
P6422R	Detention Reservoir Case Bier - 1	4/24/1958				1,458.88
P1310R	Harris Reservoir	6/17/1908				292.81
P2110R	Harris Reservoir, Enl.	4/8/1911			1,013.04	1,305.85
P4594R	Arnold Reservoir	8/7/1934				770.00
P6879R	Arnold Reservoir, Enl.	7/1/1963			364.45	1,134.45
P12936R	Frontier Reservoir	10/13/2006				331.80

Source: Wyoming State Engineer's Office.

Table 6. Reservoirs in the Upper Laramie Subbasin

Permit number	Reservoir name	Priority date	Active capacity acre-feet	Inactive capacity acre-feet	Enlargement capacity acre-feet	Total capacity acre-feet
P1724D	Wyoming Development Company No. 2 Reservoir (Wheatland No. 2)	1/29/1898				98,934.00
P4978R	Wheatland Irrigation District No. 3 Reservoir	5/31/1929	47,429.80	23,889.00		71,318.80
P1372R	Lake Hattie Reservoir	5/11/1908				28,426.00
P9250R	Lake Hattie Reservoir, Enl.	5/1/1986			36,834.00	65,260.00
P1279R	James Lake Reservoir	3/27/1908				8,990.00
P7435R	Twin Buttes Reservoir	2/3/1972	936.90	2,975.40		3,912.30
P4156R	Twelve Mile Reservoir	1/31/1929				3,420.50
P528R	Dutton Creek Reservoir	7/1/1904				
P1215R	Dutton Creek Reservoir, Enl.	2/17/1908				
P2375R	Dutton Creek Reservoir, 2nd Enl.	8/2/1912				
P3617R	King No. 1 Reservoir	2/7/1920				
P5641R	Sportsman Lake Reservoir	10/12/1948				1,459.00
P761R	Willow Creek Reservoir (as changed to Willow Creek No. 2 Reservoir)	10/17/1905				284.27
P5620R	Willow Creek Reservoir, 1st Enl. (as changed to Willow Creek No. 2 Reservoir)	9/15/1947			472.36	756.63
P8026R	Willow Creek No. 2 Reservoir	8/2/1978				473.71
P6537R	Berg (Lake Owen) Reservoir	5/8/1956				750.68
P14093R	Spiegelberg Springs	4/22/2013				131.40

Source: Wyoming State Engineer's Office.

Table 7. Reservoirs in the Lower Laramie Subbasin

Permit number	Reservoir name	Priority date	Active capacity acre-feet	Inactive capacity acre-feet	Enlargement capacity acre-feet	Total capacity acre-feet
P7649R	Grayrocks Reservoir	4/24/1973	101,551.50	2,558.10		104,109.60
P79R	Wyoming Development Company No. 1 Reservoir	3/00/1897				5,360.00
P5387R	Wyoming Development Company No. 1 Reservoir, Enlargement	8/18/1938			1,795.75	7,155.75
P6470R	Wyoming Development Company No. 1 Reservoir, 2nd Enl.	7/10/1958			2,214.00	9,369.75
P1515R	North Laramie Land Co. No. 1 Reservoir	5/1/1909				1,909.60
P1517R	North Laramie Land Co. No. 3 Reservoir	5/1/1909				3,064.89
P7252R	Toltec Reservoir	3/27/1967				2,945.00
P7810R	MBPP Ash Pond Reservoir	11/16/1976				2,111.10
P1989R	Glomill Reservoir	11/17/1910	810.00			810.00
P7670R	Glomill Reservoir, Enlargement of the	3/11/1975			486.40	1,296.40
P14249R	Wheatland Wastewater Lagoon Sys.	5/23/2013				418.80

Source: Wyoming State Engineer's Office.

Table 8. Reservoirs in the Horse Creek Subbasin

Permit number	Reservoir name	Priority date	Active capacity acre-feet	Inactive capacity acre-feet	Enlargement capacity acre-feet	Total capacity acre-feet
P1307R	Hawk Springs Reservoir	5/25/1908				15,718.00
P2568R	Hawk Springs Reservoir, Enlargement	10/13/1913			1,017.00	16,735.00
P349R	Goshen Hole Reservoir	11/5/1902				3,327.24
P4425R	Goshen Hole Reservoir, Enlargement	6/7/1930			1,633.95	4,961.19
P941R	J.H.D. No. 1 Reservoir	10/19/1906				2,040.85
P2140R	Goshen Reservoir	5/22/1911				765.60
P3517R	Goshen Nos. 1 and 2 Reservoir, Enlargement	1/8/1919			287.40	1,929.00
P2716R	Goshen No. 2 Reservoir	7/16/1914				876.00
P3605R	Sinnard Reservoir	2/11/1920				1,358.31

Source: Wyoming State Engineer's Office.

Table 9. Reservoirs in the South Platte Subbasin

Permit number	Reservoir name	Priority date	Active capacity acre-feet	Inactive capacity acre-feet	Enlargement capacity acre-feet	Total capacity acre-feet
P261R	Cheyenne No. 2 Reservoir (Granite Springs Reservoir)	11/9/1901				7,367.00
P1317R	Crystal Lake Reservoir	10/10/1906				3,618.00
P3684R	Crystal Lake Reservoir, Enl.	1/31/1921			894.70	4,512.70
P928R	One Mile Reservoir	10/5/1906				127.16
P1060R	One Mile Reservoir,Enl.	6/8/1907			2,120.00	2,247.16
P4152R	Upper Van Tassell Reservoir	10/24/1912				1,867.90
P3984R	W.H.R. Reservoir	9/25/1924				674.29
P4402R	W.H.R. Reservoir, Enl.	10/8/1929			203.75	878.04
P4032R	W.H.R. No. 2 Reservoir	12/11/1925				794.65
P4640R	W.H.R. No. 2 Reservoir, 1st Enl.	2/10/1936			82.70	877.35
P994R	Polaris Reservoir	12/22/1906				440.00
P1476R	Polaris Reservoir	3/30/1909			607.62	1,047.62
P12527R	Warren Air Force Base BNSF Pond Reservoir	3/20/2006				130.50
P13795R	North Lake Pearson Reservoir	8/18/2011				125.88
P12970R	Burnett Diary No. 1 Reservoir	6/27/2007				93.18
P13794R	South Lake Pearson Reservoir	8/18/2011				84.50

Source: Wyoming State Engineer's Office.

APPENDIX 3-D

Industrial Water Wells Yielding 50+ GPM Completed After January 1, 2005 with Priority Dates Since 2006

Oil and Gas Water Wells and CBM Wells with Priority Dates after 2006 Completed After January 1, 2014

Industrial Reservoirs Permitted by the Wyoming SEO Since the 2006 Platte River Basin Plan

Table 1: Industrial Water Wells Yielding 50+ GPM Completed After January 1, 2004 with Priority Dates Since 2006

	Above Pathfinder Dam Subbasin											
	Permit No	**Priority Date**	**Company/Name**	**Facility Name**	**Latitude**	**Longitude**	**Twn**	**Rng**	**Sec**	**Qtr Qtr**	**Total Flow**	**Subcategory**
1	P189879.0W	2/23/2009	WYDOT	BROKAW PIT	41.595167	-106.1995	019N	078W	30	NW1/4NE1/4	50	Agg
2	P201721.0W	12/19/2013	ENERGY FUELS WYOMING INC.	SHEEP II SHAFT	42.3758	-107.82111	028N	092W	28	NW1/4NE1/4	1,000	Mine
3	P201720.0W	12/19/2013	ENERGY FUELS WYOMING INC.	SHEEP I SHAFT	42.38293	-107.8113	028N	092W	22	NW1/4SW1/4	1,000	Mine
4	P200271.0W	2/21/2013	ARCH OF WYOMING, LLC	SBH-SOUTH PORTAL #1	41.738964	-106.390869	020N	080W	4	SW1/4NE1/4	1,000	Mine
5	P200270.0W	2/21/2013	ARCH OF WYOMING, LLC	SBH-EAST PORTAL #1	41.752336	-106.444008	021N	080W	31	NE1/4NE1/4	1,300	Mine
6	P181753.0W	6/5/2007	KENNECUTT URANIUM COMPANY	BE-001	42.34625	-107.74412	027N	091W	6	NW1/4NE1/4	150	Mine
7	P191170.0W	7/1/2009	MCMURRY READY MIX	PIT SEC. 14	41.791469	-107.3052	021N	088W	14	NE1/4SW1/4	100	Road
8	P200679.0W	5/1/2013	ARCH OF WYOMING, LLC	ROSEBUDPIT #1	41.874631	-106.584519	022N	082W	13	NW1/4SE1/4	200	Stk
9	P173173.0W	1/9/2006	Wyo State Game & Fish Dept.	PENNOCK SECTION 34	41.48356	-106.72524	018N	083W	34	SW1/4SW1/4	75	Stk
	Pathfinder to Guernsey Subbasin											
	Permit_No	**Priority_Date**	**Company/Name**	**Facility_Name**	**Latitude**	**Longitude**	**Twn**	**Rng**	**Sec**	**Qtr_Qtr**	**Total_Flow**	**Subcategory**
1	P203146.0W	10/17/2014	GGH AGGREGATE LLC	JOE BRIGHT G.A. #1	42.67944	-105.02162	031N	068W	9	NE1/4NW1/4	1,000	Agg
2	P194726.0W	1/4/2011	CROELL REDI-MIX INC	ELKHORN SAND & GRAVEL PIT #1	42.573275	-105.075272	030N	069W	13	SW1/4NE1/4	200	Agg
3	P198424.0W	6/26/2012	CROELL REDI MIX, INC.	ENL. ELKHORN SAND & GRAVEL PIT #1	42.57285	-105.075039	030N	069W	13	SW1/4NE1/4	300	Agg
4	P203080.0W	10/27/2014	CAMECO RESOURCES	SWNE 21-35-74 (UP TO 56 WELLS) MINE UNIT 10 EXT	42.99193	-105.73938	035N	074W	21	SW1/4NE1/4	1,400	Mine
5	P203079.0W	10/27/2014	CAMECO RESOURCES	NWNE 21-35-74 (UP TO 87 WELLS) MINE UNIT 10 EXT	42.99578	-105.73939	035N	074W	21	NW1/4NE1/4	2,175	Mine
6	P203078.0W	10/27/2014	CAMECO RESOURCES	NENW 21-35-74 (UP TO 70 WELLS) MINE UNIT 10 EXT	42.99575	-105.74432	035N	074W	21	NE1/4NW1/4	1,750	Mine
7	P203077.0W	10/27/2014	CAMECO RESOURCES	SWSE 16-35-74 (UP TO 52 WELLS) MINE UNIT 10 EXT	42.99927	-105.73953	035N	074W	16	SW1/4SE1/4	1,300	Mine
8	P203076.0W	10/27/2014	CAMECO RESOURCES	SESW 16-35-74 (UP TO 81 WELLS) MINE UNIT 10 EXT	42.99927	-105.74418	035N	074W	16	SE1/4SW1/4	2,025	Mine
9	P203075.0W	10/27/2014	CAMECO RESOURCES	NESW 16-35-74 (UP TO 117 WELLS) MINE UNIT 10 EXT	43.00293	-105.74427	035N	074W	16	NE1/4SW1/4	2,925	Mine
10	P203074.0W	10/27/2014	CAMECO RESOURCES	NWSW 16-35-74 (UP TO 11 WELLS) MINE UNIT 10 EXT	43.00296	-105.75153	035N	074W	16	NW1/4SW1/4	275	Mine
11	P201526.0W	1/29/2014	CAMECO RESOURCES	SE/SE 7-35-74 (UP TO 15 WELLS)-MINE UNIT 9 (I & P)	43.01339	-105.7741	035N	074W	7	SE1/4SE1/4	375	Mine
12	P199096.0W	8/30/2012	CAMECO RESOURCES	3674-36-CPPWW-1	43.05326	-105.68603	036N	074W	36	NE1/4NW1/4	50	Mine
13	P198125.0W	5/4/2012	CAMECO RESOURCES	SE/NW 26-36-74(UP TO 15 WELLS) - MINE UNIT 3 (I&P)	43.06415	-105.69914	036N	074W	26	SW1/4NE1/4	375	Mine
14	P198124.0W	5/4/2012	CAMECO RESOURCES	SE/NW 26-36-74(UP TO 20 WELLS) - MINE UNIT 3 (I&P)	43.06402	-105.70565	036N	074W	26	SE1/4NW1/4	500	Mine
15	P197323.0W	1/9/2012	CAMECO RESOURCES	SW/SE 27-36-74 (UP TO 66 WELLS)-MINE UNIT 7(I&P)	43.056881	-105.720261	036N	074W	27	SW1/4SE1/4	1,650	Mine
16	P197317.0W	1/9/2012	CAMECO RESOURCES	NW/SE 27-36-74 (UP TO 25 WELLS)-MINE UNIT 7(I&P)	43.060467	-105.720328	036N	074W	27	NW1/4SE1/4	625	Mine
17	P196924.0W	10/5/2011	CAMECO RESOURCES	SE/NE 11-35-74(16 WELLS)-MINE UNIT 15A (I&P WELLS)	43.021953	-105.695233	035N	074W	11	SE1/4NE1/4	160	Mine
18	P195811.0W	5/2/2011	CAMECO RESOURCES	SE/NE 26-36-74 (75 WELLS)-MINE UNIT 3 (I&P WELLS)	43.06467	-105.69738	036N	074W	26	SE1/4NE1/4	1,125	Mine
19	P195810.0W	5/2/2011	CAMECO RESOURCES	SW/NE 26-36-74 (4 WELLS) - MINE UNIT 3 (I&P WELLS)	43.06425	-105.69925	036N	074W	26	SW1/4NE1/4	60	Mine
20	P191231.0W	6/22/2009	CAMECO RESOURCES	ENL. NE/SW 11-35-74 - MINE UNIT 15A	43.016856	-105.705169	035N	074W	11	NE1/4SW1/4	1,155	Mine
21	P189700.0W	1/7/2009	CAMECO RESOURCES	WELLFIELD 3 SW/NW/26	43.062778	-105.708656	036N	074W	26	SW1/4NW1/4	120	Mine
22	P189699.0W	1/7/2009	CAMECO RESOURCES	WELLFIELD 3 SE/NW/26	43.062903	-105.707369	036N	074W	26	SE1/4NW1/4	210	Mine
23	P189698.0W	1/7/2009	CAMECO RESOURCES	WELLFIELD 3 NW/SW/26	43.062069	-105.709608	036N	074W	26	NW1/4SW1/4	930	Mine
24	P189697.0W	1/7/2009	CAMECO RESOURCES	WELLFIELD 3 NE/SW/26	43.061153	-105.705483	036N	074W	26	NE1/4SW1/4	1,695	Mine
25	P189696.0W	1/7/2009	CAMECO RESOURCES	WELLFIELD 3 SW/NE/26	43.062806	-105.70325	036N	074W	26	SW1/4NE1/4	75	Mine
	Pathfinder to Guernsey Subbasin (cont'd)											

Table 1: Industrial Water Wells Yielding 50+ GPM Completed After January 1, 2004 with Priority Dates Since 2006

	Permit No	Priority Date	Company/Name	Facility Name	Latitude	Longitude	Twn	Rng	Sec	Qtr Qtr	Total Flow	Subcategory
26	P189695.0W	1/7/2009	CAMECO RESOURCES	WELLFIELD 3 SW/SE/26	43.058975	-105.701725	036N	074W	26	SW1/4SE1/4	285	Mine
27	P189694.0W	1/7/2009	CAMECO RESOURCES	WELLFIELD 3 NW/SE/26	43.060889	-105.702114	036N	074W	26	NW1/4SE1/4	1,680	Mine
28	P185943.0W	2/26/2008	CAMECO RESOURCES	ENL. NW/SW 11-35-74 (60 WELLS) - MINE UNIT 15A	43.016772	-105.712517	035N	074W	11	NW1/4SW1/4	900	Mine
29	P185942.0W	2/26/2008	CAMECO RESOURCES	ENL. SW/NW 11-35-74 (90 WELLS) - MINE UNIT 15A	43.020428	-105.710061	035N	074W	11	SW1/4NW1/4	1,350	Mine
30	P194965.0W	1/20/2011	POWER RESOURCES DBA CAMECO RESOURCES	WELLFIELD 1 NE/NW/36	43.05238	-105.68368	036N	074W	36	NE1/4NW1/4	225	Mine
31	P194964.0W	1/20/2011	POWER RESOURCES DBA CAMECO RESOURCES	WELLFIELD 1 SW/NE/36	43.05021	-105.68066	036N	074W	36	SW1/4NE1/4	1,200	Mine
32	P194963.0W	1/20/2011	POWER RESOURCES DBA CAMECO RESOURCES	WELL FIELD 1 SE/NW/36	43.05114	-105.68562	036N	074W	36	SE1/4NW1/4	1,450	Mine
33	P193386.0W	7/12/2010	POWER RESOURCES INC	NE/SW 16-35-74 (35 WELLS) - MU 10 (I&P WELLS)	43.0025	-105.7443	035N	074W	16	NE1/4SW1/4	195	Mine
34	P193384.0W	7/12/2010	POWER RESOURCES INC	SW/NW 16-35-74-(94 WELLS) - MU 10 (I&P WELLS)	43.00675	-105.75001	035N	074W	16	SW1/4NW1/4	525	Mine
35	P193382.0W	7/12/2010	POWER RESOURCES INC	SW/NE 17-35-74 (51 WELLS) - MU 10 (I&P WELLS)	43.00717	-105.75961	035N	074W	17	SW1/4NE1/4	270	Mine
36	P193380.0W	7/12/2010	POWER RESOURCES INC	SW/NW 17-35-74 (55 WELLS) - MU 10 (I&P WELLS)	43.00529	-105.76889	035N	074W	17	SW1/4NW1/4	300	Mine
37	P182216.0W	6/20/2007	POWER RESOURCES, INC	SE/SE 7-35-74 (11 WELLS) - MINE UNIT 9 (I&P WELLS)	43.01524	-105.77416	035N	074W	7	SE1/4SE1/4	165	Mine
38	P182210.0W	6/20/2007	POWER RESOURCES, INC	SW/NE 18-35-74 (11 WELLS) - MINE UNIT 9 (I&P WELLS)	43.004747	-105.777047	035N	074W	18	SW1/4NE1/4	110	Mine
39	P182207.0W	6/20/2007	POWER RESOURCES, INC	NE/SW 18-35-74 (51 WELLS) - MINE UNIT 9 (I&P WELLS)	43.001433	-105.783731	035N	074W	18	NE1/4SW1/4	510	Mine
40	P182206.0W	6/20/2007	POWER RESOURCES, INC	NW/SE 18-35-74 (45 WELLS) - MINE UNIT 9 (I&P WELLS)	43.003681	-105.779225	035N	074W	18	NW1/4SE1/4	450	Mine
41	P182205.0W	6/20/2007	POWER RESOURCES, INC	SW/SW 18-35-74 (53 WELLS) - MINE UNIT 9 (I&P WELLS)	42.999508	-105.786686	035N	074W	18	SW1/4SW1/4	795	Mine
42	P182204.0W	6/20/2007	POWER RESOURCES, INC	SE/SW 18-35-74 (12 WELLS) - MINE UNIT 9 (I&P WELLS)	43.000367	-105.785714	035N	074W	18	SE1/4SW1/4	120	Mine
	Pathfinder to Guernsey Subbasin											
	Permit No	**Priority Date**	**Company/Name**	**Facility Name**	**Latitude**	**Longitude**	**Twn**	**Rng**	**Sec**	**Qtr Qtr**	**Total Flow**	**Subcategory**
43	P172673.0W	9/21/2005	POWER RESOURCES, INC	SW/NW 11-35-74 (7 WELLS)-MINE UNIT 15 (I&P WELLS)	43.0203	-105.7125	035N	074W	11	SW1/4NW1/4	105	Mine
44	P172669.0W	9/21/2005	POWER RESOURCES, INC	NE/SE 10-35-74 (114 WELLS)-MINE UNIT 15 (I&P WELLS)	43.017342	-105.715028	035N	074W	10	NE1/4SE1/4	1,710	Mine
45	P172666.0W	9/21/2005	POWER RESOURCES, INC	NW/SW 10-35-74 (50 WELLS)-MINE UNIT 15 (I&P WELLS)	43.01736	-105.72979	035N	074W	10	NW1/4SW1/4	750	Mine
46	P197081.0W	11/7/2011	POWER RESOURCES, INC.	SE/NE 18-35-74 (85 WELLS)- MINE UNIT 9 (I&P WELLS)	43.006386	-105.773892	035N	074W	18	SE1/4NE1/4	850	Mine
47	P195273.0W	2/2/2011	CHESAPEAKE OPERATING	SOUTH HYLTON RANCH 34-74 24-1H WW	42.908353	-105.680028	034N	074W	24	NW1/4NE1/4	150	Mine
48	P198801.0W	8/9/2012	DENBURY ONSHORE, LLC	MORTON 1-22-1	42.7325	-107.0056	032N	085W	22	SE1/4NW1/4	150	Mine
49	P198881.0W	9/11/2012	PINNACLE MATERIALS, LLC	SHAWNEE QUARRY NO. 1 WELL	42.678886	-105.021567	031N	068W	9	NE1/4NW1/4	250	Mine
50	P202033.0W	11/27/2013	TEXACO DOWNSTREAM PROPERTIES INC	EW-3B	42.86263	-106.26101	033N	079W	1	NE1/4NE1/4	120	Mine
51	P199729.0W	1/31/2013	FULLSPEED SERVICE, LLC	CAND1	42.88685	-106.339247	034N	079W	29	SE1/4NE1/4	50	Misc
52	P197879.0W	3/23/2012	ACME HOLDINGS LLC	BUCKSHOT 1	42.77715	-105.37908	032N	071W	4	SE1/4NW1/4	75	Misc
53	P202124.0W	5/29/2014	WYDOT	ENL. BIG HOLE #1 WELL	42.74961	-104.81842	032N	066W	18	SE1/4NE1/4	50	Road
54	P199867.0W	1/10/2013	WYDOT	EL RANCHO WELL #1	42.26499	-105.03857	027N	068W	32	SE1/4SW1/4	150	Road
55	P199866.0W	1/9/2013	WYDOT	CASSA NORTH WELL #1	42.34533	-105.04371	027N	068W	5	SW1/4NW1/4	150	Road
56	P176949.0W	5/15/2006	TRUE DRILLING LLC	SUSIE NO. 5 WELL	42.79678	-106.34921	033N	079W	29	NE1/4SW1/4	50	Stk
57	P155944.0W	12/15/2003	WAGONHOUND LAND AND LIVESTOCK CO LLC	ENL MAIN HOUSE WELL	42.58188	-105.56247	030N	073W	11	NE1/4SE1/4	100	Stk
	Guernsey to State Line Subbasin											
	Permit No	**Priority Date**	**Company/Name**	**Facility Name**	**Latitude**	**Longitude**	**Twn**	**Rng**	**Sec**	**Qtr Qtr**	**Total Flow**	**Subcategory**
1	P185107.0W	1/28/2008	SIMPLOT GROWER SOLUTIONS	SIMPLOT GROWER SOLUTIONS #1	42.042222	-104.187222	024N	061W	22	NW1/4NW1/4	50	Misc
2	P201378.0W	11/19/2013	PANHANDLE COOP	PANHANDLE COOP#1	42.06678	-104.19452	024N	061W	9	NW1/4SE1/4	100	Misc

Table 1: Industrial Water Wells Yielding 50+ GPM Completed After January 1, 2004 with Priority Dates Since 2006

3	P200320.0W	5/20/2013	HERITAGE MATERIALS & SUPPLY, LLC	STOCK #1	42.033667	-104.198972	024N	061W	21	SE1/4SW1/4	200	Misc
4	P195704.0W	10/15/2010	DENNIS R AND CYNTHIA L HUCKFELDT	HUCKFELDT WEST PIT NO. 2 WELL	42.06519	-104.19251	024N	061W	9	NE1/4SE1/4	80	Misc
5	P195703.0W	10/15/2010	DENNIS R AND CYNTHIA L HUCKFELDT	HUCKFELDT EAST PIT NO. 1 WELL	42.06523	-104.19227	024N	061W	9	NE1/4SE1/4	80	Misc
6	P165511.0W	1/19/2005		GOSHEN COUNTY WEED AND PEST DISTRICT WELL NO. 1	42.080236	-104.224683	024N	061W	5	NW1/4SW1/4	50	Misc
7	P169879.0W	6/10/2005	LEROY & SALLY LAMB	LAMB NO. 1	42.08709	-104.2442	024N	061W	6	NW1/4NW1/4	100	Stk
8	P169598.0W	7/29/2004	BLAIR J MERRIAM	BIG PRAIRIE #2	42.51511	-104.15589	029N	061W	2	NE1/4SW1/4	400	Stk
9	P160985.0W	7/23/2004	WYOMING STOCKYARDS, INC	WYOMING STOCKYARD INC. #2	42.0694	-104.19088	024N	061W	9	SE1/4NE1/4	60	Stk
10	P154977.0W	10/6/2003	MAKE BEBO	BEBO #5	42.16995	-104.43728	025N	063W	4	SW1/4NW1/4	200	Stk
	Upper Laramie Subbasin											
	Permit No	**Priority Date**	**Company/Name**	**Facility Name**	**Latitude**	**Longitude**	**Twn**	**Rng**	**Sec**	**Qtr Qtr**	**Total Flow**	**Subcategory**
1	P200785.0W	5/20/2013	PETE LIEN & SONS, INC.	JONATHON WELL NO. 1	41.462783	-105.584086	017N	073W	9	SW1/4NE1/4	500	Agg
	Lower Laramie Subbasin											
	Permit No	**Priority Date**	**Company/Name**	**Facility Name**	**Latitude**	**Longitude**	**Twn**	**Rng**	**Sec**	**Qtr Qtr**	**Total Flow**	**Subcategory**
1	P198469.0W	12/12/2011	CHRISTOPHER WRIGHT	WRIGHT NO. 1	42.09063	-104.96948	025N	068W	35	SE1/4SE1/4	50	Agg
2	P171681.0W	6/27/2005	BASIN ELECTRIC POWER COOPERATIVE	FORELL BAUMGARDNER NO.2 WELL	42.113319	-104.874346	025N	067W	27	SW1/4NE1/4	950	Power
3	P198529.0W	4/6/2012	FLYING H LAND AND CATTLE	FLYING H NO. 2	41.953253	-105.043025	023N	068W	19	SE1/4NE1/4	100	Stk
4	P169878.0W	4/27/2005		MURIEL #1	42.0762	-104.97535	024N	068W	2	SE1/4SW1/4	100	Stk
	Horse Creek Subbasin											
	Permit No	**Priority Date**	**Company/Name**	**Facility Name**	**Latitude**	**Longitude**	**Twn**	**Rng**	**Sec**	**Qtr Qtr**	**Total Flow**	**Subcategory**
1	P202295.0W	4/12/2014		FEEDYARD WELL #3	41.92061	-104.129	023N	060W	31	NW1/4SW1/4	85	Stk
	South Platte Subbasin											
	Permit No	**Priority Date**	**Company/Name**	**Facility Name**	**Latitude**	**Longitude**	**Twn**	**Rng**	**Sec**	**Qtr Qtr**	**Total Flow**	**Subcategory**
1	P200088.0W	3/1/2013	GRANITE CANYON QUARRY, MARTIN MARIETTA MATERIALS	SECONDARY #2	41.104664	-105.175922	013N	070W	12	SE1/4SE1/4	50	Agg
2	P189917.0W	1/21/2009	POLO RANCH COMPANY	ENL POLO 18-3	41.180717	-104.931347	014N	067W	18	NW1/4SE1/4	75	Agg
3	P200770.0W	7/16/2013	WILLITS COMPANY INC	HARRIMAN #1	41.097483	-105.175789	013N	070W	13	SE1/4NE1/4	125	Agg
4	P194604.0W	11/12/2010	JEBRO INC	JEBRO SITE NO. 2	41.06042	-104.88864	013N	067W	28	SE1/4SE1/4	200	Agg
5	P194603.0W	11/12/2010	JEBRO INC	JEBRO SITE NO. 1	41.06009	-104.89066	013N	067W	28	SE1/4SE1/4	200	Agg
6	P195611.0W	2/18/2011	CHEYENNE-LARAMIE COUNTY CORP FOR ECONOMIC DEVELOPM	CHEYENNE LEADS SWAN RANCH WELL # 1	41.056847	-104.889144	013N	067W	33	NE1/4NE1/4	50	Misc
7	P202799.0W	8/26/2013	GENERATION DEVELOPMENT COMPANY, LLC	CPGS 1	41.11826	-104.72539	013N	066W	1	SE1/4SW1/4	400	Power
8	P167488.0W	4/25/2005		HEREFORD PIT #1	41.13608	-104.68709	014N	065W	32	NE1/4SW1/4	50	Road
9	P164656.0W	1/3/2005	Wyo State Dept. of Transportation	LONE TREE #1	41.13406	-105.35019	014N	071W	33	SE1/4SE1/4	50	Road
10	P194170.0W	4/16/2010	DAVID DUELLO	DUELLO 2010	41.22005	-104.08855	015N	060W	33	NW1/4SE1/4	50	Stk
11	P168103.0W	12/30/2004	BURNETT LAND & LIVESTOCK LTD LLLP	BURNETT DAIRY #4 (SW)	41.025422	-104.2503	012N	061W	7	SE1/4NW1/4	60	Stk
12	P168102.0W	12/30/2004	BURNETT LAND & LIVESTOCK LTD LLLP	BURNETT DAIRY #3 (SE)	41.0254	-104.250258	012N	061W	7	SE1/4NW1/4	60	Stk
13	P168101.0W	12/30/2004	BURNETT LAND & LIVESTOCK LTD LLLP	BURNETT DAIRY #2 (NE)	41.025406	-104.245531	012N	061W	7	SW1/4NE1/4	60	Stk

Table 2: Oil and Gas Water Wells and CBM Wells with Priority Dates After 2006 Completed After January 1, 2014

	Above Pathfinder Dam Subbasin										
	Permit No	**Priority Date**	**Company**	**Facility Name**	**Latitude**	**Longitude**	**Twn**	**Rng**	**Sec**	**Qtr Qtr**	**Total Flow**
1	P186571.0W	7/25/2006	MEDICINE BOW FUEL AND POWER, LLC	MBFP #29-4	41.756283	-106.308503	021N	079W	29	SE1/4SE1/4	1000
2	P186570.0W	7/25/2006	MEDICINE BOW FUEL AND POWER, LLC	MBFP #29-1	41.759897	-106.308544	021N	079W	29	NE1/4SE1/4	1000
3	P186568.0W	7/25/2006	MEDICINE BOW FUEL AND POWER, LLC	MBFP #20-2	41.77075	-106.313414	021N	079W	20	SW1/4SE1/4	1000
4	P186569.0W	7/25/2006	MEDICINE BOW FUEL AND POWER, LLC	MBFP #21-1	41.778114	-106.289372	021N	079W	21	SE1/4NE1/4	1000
5	P201252.0W	8/16/2013	ELLEN FOX	ELLEN FOX NO. 1	42.32635	-108.25353	027N	096W	11	NE1/4SW1/4	80
6	P198802.0W	8/13/2012	STRATHMORE RESOURCES	STM-WS-1	42.725617	-107.599669	032N	090W	22	SW1/4SW1/4	150
	Pathfinder to Guernsey Subbasin										
	Permit No	**Priority Date**	**Company**	**Facility Name**	**Latitude**	**Longitude**	**Twn**	**Rng**	**Sec**	**Qtr Qtr**	**Total Flow**
1	P199106.0W	8/20/2010	CHESAPEAKE OPERATING INC	SMITH CREEK UNIT 32-70 6WW	42.77985	-105.29056	032N	070W	6	NE1/4NE1/4	150
2	P196624.0W	8/20/2010	CHESAPEAKE OPERATING INC	COMBS RANCH UNIT 33-70 29-1HWW	42.7979	-105.28341	033N	070W	29	SW1/4SE1/4	150
3	P201432.0W	12/18/2013	CHESAPEAKE OPERATING INC	CZAR BENNETT WSW	42.80489	-105.38647	033N	071W	28	SE1/4NW1/4	500
4	P199881.0W	3/8/2013	CHESAPEAKE OPERATING INC	COMBS RANCH 24-33-71 WW	42.81285	-105.32435	033N	071W	24	SW1/4SE1/4	180
5	P199095.0W	6/7/2012	CHESAPEAKE OPERATING INC	COMBS 22-33-70 A 1H WW	42.81914	-105.23873	033N	070W	22	SE1/4NE1/4	150
6	P199134.0W	9/28/2012	CHESAPEAKE OPERATING INC	YORK RANCH 19-33-69 WW	42.82375	-105.18067	033N	069W	19	NE1/4NE1/4	180
7	P201596.0W	2/19/2014	CHESAPEAKE OPERATING INC	COMBS RANCH 10-33-70 WSW	42.85172	-105.24133	033N	070W	10	NW1/4NE1/4	150
8	P198889.0W	9/14/2012	CHESAPEAKE OPERATING, INC.	MVL 34-33-71 WW	42.79468	-105.36422	033N	071W	34	NW1/4NE1/4	130
9	P200976.0W	5/24/2013	CHESAPEAKE OPERATING, INC.	COMBS RANCH 28-33-70 WW	42.801297	-105.268528	033N	070W	28	NE1/4SW1/4	180
10	P200202.0W	3/8/2013	CHESAPEAKE OPERATING, INC.	YORK RANCH 17-33-69 WW	42.833839	-105.169219	033N	069W	17	SE1/4NW1/4	180
11	P198835.0W	8/29/2012	CHESAPEAKE OPERATING, INC.	KRAUSE 10-33-69 WW	42.84094	-105.13159	033N	069W	10	SE1/4SW1/4	80
12	P198775.0W	7/31/2012	CHESAPEAKE OPERATING, INC.	COMBS RANCH 7-33-70 WW	42.84759	-105.308	033N	070W	7	SE1/4NW1/4	150
13	P200201.0W	2/21/2013	CHESAPEAKE OPERATING, INC.	COMBS RANCH 11-33-70 WW	42.847806	-105.223658	033N	070W	11	SW1/4NE1/4	200
14	P200199.0W	1/22/2013	CHESAPEAKE OPERATING, INC.	YORK RANCH 4-33-69 WW	42.859369	-105.149647	033N	069W	4	NE1/4SW1/4	180
15	P200448.0W	6/3/2013	CHESAPEAKE OPERATING, INC.	SUNDQUIST FLATS 12-34-72 WW	42.927886	-105.449464	034N	072W	12	SE1/4SW1/4	180
16	P202711.0W	8/6/2014	CONTANGO ROCKY MOUNTAIN INC	CONTANGO-FORGEY #1	43.00928	-106.34048	035N	079W	8	SE1/4SE1/4	120
17	P177515.0W	8/11/2006	FIDELITY EXPLORATION & PRODUCTIN COMPANY	OXBOW WSW #1	42.778417	-106.94815	032N	084W	6	NE1/4NW1/4	50
18	P201652.0W	3/12/2014	HOUT FENCING OF WYOMING INC.	HOUT # 1	42.68082	-105.2304	031N	070W	3	SE1/4SE1/4	100
19	P197201.0W	11/10/2011	JIM'S WATER SERVICE	JIM'S WATER SERVICE NO. 1	42.785833	-105.370278	033N	071W	34	NE1/4SW1/4	56
20	P199963.0W	3/14/2013	LEBAR RANCH LLC	DW BILL HALL #2	42.826139	-105.298031	033N	070W	18	SE1/4SE1/4	250
21	P199964.0W	3/14/2013	LEBAR RANCH LLC	DW FLAT TOP #3	42.851194	-105.268603	033N	070W	9	NE1/4NW1/4	250
22	P198905.0W	8/29/2012	OXBOW PROPERTIES, INC.	OXBOW WSW #1	42.778417	-106.94815	032N	084W	6	NE1/4NW1/4	50
23	P200087.0W	6/1/2011	PARKERTON RANCH, INC.	ENL. #22 SOUTH BIG MUDDY MADISON WATER WELL	42.827253	-105.978247	033N	076W	16	NE1/4SW1/4	160
24	P193308.0W	2/5/2010	RKI EXPLORATION & PRODUCTION LLC	SPILLMAN DRAW UNIT 35-73 15 - 1H WATER WELL	43.00263	-105.60671	035N	073W	15	NE1/4SW1/4	150
25	P198907.0W	9/6/2012	THE SOD FARM LLC	ENL. HOME RANCH NO. 3 WELL	42.867811	-105.895439	034N	075W	31	SW1/4SE1/4	110
26	P198909.0W	9/6/2012	THE SOD FARM LLC	2ND. ENL. HOME RANCH #1	42.867833	-105.895542	034N	075W	31	SW1/4SE1/4	100
27	P198908.0W	9/6/2012	THE SOD FARM LLC	ENL. HOME RANCH NO. 2 WELL	42.867856	-105.895458	034N	075W	31	SW1/4SE1/4	120
	Pathfinder to Guernsey Subbasin										
	Permit No	**Priority Date**	**Company**	**Facility Name**	**Latitude**	**Longitude**	**Twn**	**Rng**	**Sec**	**Qtr Qtr**	**Total Flow**
28	P199368.0W	12/4/2012	WESTERN CABLE, LLC	WESTERN SKY 1	42.804328	-105.3478	033N	071W	26	SE1/4NW1/4	300

Table 2: Oil and Gas Water Wells and CBM Wells with Priority Dates After 2006 Completed After January 1, 2014

29	P202882.0W	9/8/2014		ENSERCO DEPOT #2	42.67884	-105.34076	031N	071W	2	NW1/4SW1/4	200
30	P197086.0W	11/28/2011	BRAD REESE	ENL HIGH HOPES #2	42.73087	-104.80799	032N	066W	20	NE1/4SW1/4	250
31	P197087.0W	11/28/2011	BRAD REESE	ENL HIGH HOPES #3	42.73803	-104.80813	032N	066W	20	NE1/4NW1/4	250
32	P202008.0W	4/10/2014	BRIAN MENSING	K & M #1	42.78321	-105.36786	033N	071W	34	SE1/4SW1/4	200
33	P199728.0W	1/28/2013	JAY BAUMANN	BAUMANN #1	42.82606	-105.30799	033N	070W	18	SE1/4SW1/4	250
34	P202250.0W	5/29/2014	MARTY TILLARD	ENL. TILLARD 15	42.89389	-105.83227	034N	075W	27	NE1/4NE1/4	50
35	P202032.0W	11/27/2013	TEXACO DOWNSTREAM PROPERTIES INC	EW-4B	42.86265	-106.26099	033N	079W	1	NE1/4NE1/4	120
36	P202031.0W	11/27/2013	TEXACO DOWNSTREAM PROPERTIES INC	EW-2B	42.86265	-106.25622	033N	078W	6	NW1/4NW1/4	70
37	P202030.0W	11/27/2013	TEXACO DOWNSTREAM PROPERTIES INC	EW-1B	42.86272	-106.26099	033N	079W	1	NE1/4NE1/4	80
38	P202029.0W	11/27/2013	TEXACO DOWNSTREAM PROPERTIES INC	EW-4A	42.86259	-106.2609	033N	079W	1	NE1/4NE1/4	120
39	P202028.0W	11/27/2013	TEXACO DOWNSTREAM PROPERTIES INC	EW-3A	42.86263	-106.26097	033N	079W	1	NE1/4NE1/4	120
40	P202027.0W	11/27/2013	TEXACO DOWNSTREAM PROPERTIES INC	EW-2A	42.86273	-106.25618	033N	078W	6	NW1/4NW1/4	70
41	P202026.0W	11/27/2013	TEXACO DOWNSTREAM PROPERTIES INC	EW-1A	42.86265	-106.26095	033N	079W	1	NE1/4NE1/4	120
42	P200447.0W	5/15/2013	BP PRODUCTS NORTH AMERICA INC	R-132	42.84596	-106.33726	033N	079W	8	SE1/4NE1/4	75
43	P200446.0W	5/15/2013	BP PRODUCTS NORTH AMERICA INC	R-131	42.8449	-106.34279	033N	079W	8	SW1/4NE1/4	75
44	P200445.0W	5/15/2013	BP PRODUCTS NORTH AMERICA, INC.	R-130	42.84477	-106.34381	033N	079W	8	SW1/4NE1/4	75
45	P200444.0W	5/15/2013	BP PRODUCTS NORTH AMERICA INC	R-129	42.84467	-106.34458	033N	079W	8	SW1/4NE1/4	75
46	P200443.0W	5/15/2013	BP PRODUCTS NORTH AMERICA INC	R-128	42.84445	-106.34559	033N	079W	8	SW1/4NE1/4	75
47	P200442.0W	5/15/2013	BP PRODUCTS NORTH AMERICA INC	R-127	42.84428	-106.3464	033N	079W	8	SW1/4NE1/4	75
	Guernsey to State Line Subbasin										
	Permit No	**Priority Date**	**Company**	**Facility Name**	**Latitude**	**Longitude**	**Twn**	**Rng**	**Sec**	**Qtr Qtr**	**Total Flow**
1	P191906.0W	8/21/2009	WYOMING ETHANOL LLC	ENL BRIMM NO. 2 WELL	42.03991	-104.19125	024N	061W	21	SE1/4NE1/4	65
2	P191907.0W	8/21/2009	WYOMING ETHANOL LLC	WYOMING ETHANOL #1 MISC.	42.04075	-104.19189	024N	061W	21	SE1/4NE1/4	100
3	P199077.0W	8/16/2011	WYOMING ETHANOL LLC	ENL BRIMM #6	42.03981	-104.19114	024N	061W	21	SE1/4NE1/4	600
4	P200364.0W	5/17/2013		JOHNS PUMP SERVICE #1	42.046978	-104.182692	024N	061W	15	SE1/4SW1/4	500
	Upper Laramie Subbasin										
	Permit No	**Priority Date**	**Company**	**Facility Name**	**Latitude**	**Longitude**	**Twn**	**Rng**	**Sec**	**Qtr Qtr**	**Total Flow**
1	P194147.0W	10/4/2010	CHESAPEAKE OPERATING INC	ENTERPRISE-US 27 STATE 1-36H-WW	41.929056	-104.374056	023N	063W	36	NE1/4NE1/4	150
2	P199862.0W	3/7/2013	H & T RANCH COMPANY	H & T WATER WELL #1	42.038817	-104.50875	024N	064W	23	SE1/4NW1/4	85
3	P195844.0W	2/28/2011	Y-O INVESTMENTS INC	Y-O TRACTS #1 WELL PERMIT NO UW 44727	42.03187	-104.94147	024N	067W	19	SW1/4SW1/4	250
	Horse Creek Subbasin										
	Permit No	**Priority Date**	**Company**	**Facility Name**	**Latitude**	**Longitude**	**Twn**	**Rng**	**Sec**	**Qtr Qtr**	**Total Flow**
1	P197157.0W	11/3/2011	JACOBSON RANCH INC.	DUVALL IRRIGATION NO. 11	41.560983	-104.917417	018N	067W	5	SE1/4NW1/4	50
2	P194099.0W	10/14/2010	HEART BENT ARROW, LLC	HEART BENT ARROW, LLC #3	41.7418	-104.5455	021N	064W	33	SW1/4SE1/4	150
	South Platte Subbasin										
	Permit No	**Priority Date**	**Company**	**Facility Name**	**Latitude**	**Longitude**	**Twn**	**Rng**	**Sec**	**Qtr Qtr**	**Total Flow**
1	P203370.0W	4/22/2014	EOG RESOURCES, INC.	BIG SANDY 132-33 WSW	41.13636	-104.67014	014N	065W	33	NE1/4SW1/4	300
2	P166808.0W	4/11/2005	PALADIN ENERGY PARTNERS	WALLEYE #1	41.27625	-104.55683	015N	064W	9	SW1/4SW1/4	200
3	P196444.0W	11/18/2010	SM ENERGY	HERRINGTON SEC.20 WSW	41.170244	-104.560622	014N	064W	20	NE1/4NE1/4	200
4	P191850.0W	10/19/2009	ST. MARY LAND & EXPLORATION COMPANY	SUNLIGHT 41-20 WSW - OVER-FILING	41.259142	-104.562683	015N	064W	20	NE1/4NE1/4	80
5	P192629.0W	2/16/2010	SUNCOR ENERGY (U.S.A.) PIPELINE CO.	ENL OF WATER WELL#1	41.123233	-104.781783	013N	066W	4	NE1/4SW1/4	485
6	P175177.0W	4/19/2006	TEXAS AMERICAN RESOURCES	WATER SUPPLY WELL #2	41.11181	-104.97003	013N	068W	11	SW1/4NE1/4	50

Table 2: Oil and Gas Water Wells and CBM Wells with Priority Dates After 2006 Completed After January 1, 2014

7	P177384.0W	9/1/2006	TEXAS AMERICAN RESOURCES CO.	SQUIRE 22-11-WATER SUPPLY WELL #2	41.11178	-104.97482	013N	068W	11	SE1/4NW1/4	2500
8	P197393.0W	9/28/2011	UNITED SURFACE AND MINERALS, LLC	DIAMOND K LANCE-FOX HILLS #2	41.079333	-104.118769	013N	060W	20	SW1/4NW1/4	400
9	P197392.0W	9/28/2011	UNITED SURFACE AND MINERALS, LLC	DIAMOND K LANCE - FOX HILLS #1	41.086642	-104.118761	013N	060W	17	SW1/4SW1/4	400
10	P202090.0W	12/10/2013	JANET SHATTO	SHATTO 1-10 WSW	41.11483	-104.64456	013N	065W	10	NW1/4NE1/4	600

Table 3: Industrial Reservoirs Permitted by the Wyoming SEO Since the 2006 Platte River Basin Plan

WR Number	Priority Date	Summary / WR Status	Company	Facility Name	Uses	Twn	Rng	Sec	Qtr-Qtr	Longitude	Latitude
P12497.0R	03/15/2006	Complete	WILLITS COMPANY INC	POLO RANCH RESERVOIR	IND_SW	014N	067W	18	SE1/4NW1/4	-104.936	41.18423
P12963.0R	07/02/2007	Complete	CITY OF DOUGLAS	DOUGLAS WATER TREATMENT PLANT RESERVOIR	IND_SW	032N	071W	08	NW1/4NE1/4	-105.393	42.7657
P12970.0R	06/27/2007	Complete	BURNETT LAND & LIVESTOCK, LTD, LLLP	BURNETT DAIRY NO. 1 RESERVOIR	IND_SW; IRR_SW	012N	061W	07	NE1/4NE1/4	-104.239	41.03122
P13008.0R	09/10/2007	Complete	AQUA TERRA CONSULTANTS	SEDIMENTATION POND SP1	IND_SW	027N	066W	33	SE1/4NW1/4	-104.783	42.2713
P13346.0R	09/12/2008	Complete	WILLITS COMPANY INC	HARRIMAN QUARRY RESERVOIR	IND_SW	013N	070W	13	SE1/4NE1/4	-105.178	41.09888
P13479.0R	07/06/2009	Complete	WWC ENGINEERING	SEDIMENT POND NO. 2	IND_SW	021N	088W	14	NW1/4SE1/4	-107.302	41.7905
P13603.0R	03/31/2010	Complete	NEW FASHION PORK LLP	NEW FASHION PORK NO. 2	IND_SW	017N	062W	26	NE1/4SW1/4	-104.277	41.40799
P13612.0R	11/10/2009	Complete	WWC ENGINEERING	MONOLITH SHALE QUARRY SEDIMENT POND	IND_SW; WET	014N	075W	12	NW1/4NE1/4	-105.76	41.20147
P13615.0R	05/14/2010	Complete	TRIHYDRO CORPORATION	SURFACE IMPOUNDMENT NO. 1	IND_SW	013N	066W	04	SW1/4NW1/4	-104.789	41.12547
P13616.0R	05/14/2010	Complete	TRIHYDRO CORPORATION	SURFACE IMPOUNDMENT NO. 3/4	IND_SW	013N	066W	04	SW1/4NW1/4	-104.787	41.12624
P13617.0R	05/14/2010	Complete	TRIHYDRO CORPORATION	SURFACE IMPOUNDMENT NO. 5	IND_SW	013N	066W	04	SW1/4NW1/4	-104.786	41.12637
P13703.0R	11/09/2010	Complete	COFFEY ENGINEERING AND SURVEYING	POLAR BEAR WATER RESERVOIR	IND_SW	021N	090W	29	SE1/4SE1/4	-107.587	41.75658
P13750.0R	03/24/2011	Complete	DYNO NOBEL INC	CELL 7 RESERVOIR	IND_SW	013N	067W	16	SW1/4NW1/4	-104.905	41.09636
P13762.0R	01/28/2011	Complete	UINTA ENGINEERING AND SURVEYING	RED DESERT RECLAMATION 1-2-3 RESERVOIR	IND_SW	021N	090W	11	SE1/4SW1/4	-107.535	41.80064
P13764.0R	06/16/2011	Complete	R360 NIOBRARA INC	R360 SILO FIELD FACILITY RESERVOIR	IND_SW	015N	065W	12	SW1/4NE1/4	-104.605	41.28522
P13771.0R	10/26/2010	Complete	ARCH OF WYOMING LLC	ENL OF 29-23-1 RESERVOIR	IND_SW; STO	024N	083W	29	NW1/4NW1/4	-106.789	42.02759
P13772.0R	10/26/2010	Complete	ARCH OF WYOMING LLC	ENL OF 29-35-4 RESERVOIR	IND_SW; STO	024N	083W	29	SE1/4SE1/4	-106.774	42.01619
P13794.0R	08/18/2011	Complete	90 CES CEAN	SOUTH LAKE PEARSON RESERVOIR	DSP; FIS; IND_SW; REC	014N	067W	23	SW1/4SE1/4	-104.856	41.16289
P13795.0R	08/18/2011	Complete	90 CES CEAN	NORTH LAKE PEARSON RESERVOIR	DSP; FIS; IND_SW; REC	014N	067W	23	NW1/4SE1/4	-104.857	41.16483
P13839.0R	09/02/2011	Complete	LARAMIE COUNTY	ARCHER COMPLEX RESERVOIR	DSP; IND_SW	014N	065W	28	NE1/4SW1/4	-104.666	41.14944
P13895.0R	04/26/2011	Complete	HAGEMAN & BRIGHTON PC	ENLARGEMENT OF THE SULLIVAN PIT	IND_SW	027N	078W	14	SW1/4NW1/4	-106.159	42.31395
P14052.0R	02/27/2013	Complete	R & R SERVICES, INC	BAUMANN POND	IND_SW	033N	070W	18	SE1/4SW1/4	-105.31	42.8257
P14106.0R	03/19/2013	Complete	JLM ENGINEERING, INC	MCMURRY NO. 4	CMU; FIS; IND_SW; IRR_SW; REC; STO	033N	079W	24	SE1/4SW1/4	-106.272	42.80736
P14164.0R	09/11/2013	Complete	CHESAPEAKE OPERATING INC	COMBS RANCH 29 FRAC POND	IND_SW	033N	070W	29	SE1/4SW1/4	-105.286	42.7971
P14177.0R	10/04/2013	Complete	CHESAPEAKE OPERATING, INC.	MOUNTAIN VALLEY WTR IMP	IND_SW	033N	071W	34	NW1/4NE1/4	-105.365	42.7945
P14222.0R	11/18/2013	Complete	CHESAPEAKE OPERATING INC	NORTHWEST FETTER WTR IMP	IND_SW	033N	072W	01	SW1/4NW1/4	-105.454	42.8634
P14241.0R	03/20/2014	Complete	COFFEY ENGINEERING & SURVEYING	ENLARGEMENT OF THE POLAR BEAR WATER RESERVOIR	IND_SW	021N	090W	29	SE1/4SE1/4	-107.587	41.75658
P14249.0R	05/23/2013	Complete	K2 ENGINEERING	STORAGE ENL OF THE WHEATLAND WASTEWATER LAGOON SYS	IND_SW; IRR_SW	024N	067W	06	SE1/4NE1/4	-104.929	42.08148
P14260.0R	06/30/2014	Complete	SUNRISE ENGINEERING	RESERVOIR NUMBER 6	FLO; IND_SW	013N	066W	04	NE1/4NW1/4	-104.781	41.1278
CR CR19/214	07/06/2009	Fully Adjudicated	MCMURRY READY MIX	SEDIMENT POND NO. 2	IND_SW	021N	088W	14	NW1/4SE1/4	-107.301	41.79055
CR CR20/054	07/02/2007	Fully Adjudicated	CITY OF DOUGLAS	DOUGLAS WATER TREATMENT PLANT RESERVOIR	IND_SW	032N	071W	08	NW1/4NE1/4	-105.393	42.7657
CR CR20/165	05/14/2010	Fully Adjudicated	FRONTIER REFINING INC	SURFACE IMPOUNDMENT NO. 1 RESERVOIR	IND_SW	013N	066W	04	SW1/4NW1/4	-104.789	41.12547

Table 3: Industrial Reservoirs Permitted by the Wyoming SEO Since the 2006 Platte River Basin Plan

WR Number	Priority Date	Summary / WR Status	Company	Facility Name	Uses	Twn	Rng	Sec	Qtr-Qtr	Longitude	Latitude
CR CR20/166	05/14/2010	Fully Adjudicated	FRONTIER REFINING INC	SURFACE IMPOUNDMENT NO. 3/4 RESERVOIR	IND_SW	013N	066W	04	SW1/4NW1/4	-104.787	41.12624
CR CR20/167	05/14/2010	Fully Adjudicated	FRONTIER REFINING INC	SURFACE IMPOUNDMENT NO. 5 RESERVOIR	IND_SW	013N	066W	04	SW1/4NW1/4	-104.786	41.12637
CR CR21/241	08/18/2011	Fully Adjudicated	USAF FE WARREN AIR FORCE BASE	SOUTH LAKE PEARSON RESERVOIR	DSP; FIS; IND_SW; REC	014N	067W	23	SW1/4SE1/4	-104.856	41.16289
CR CR21/242	08/18/2011	Fully Adjudicated	USAF FE WARREN AIR FORCE BASE	NORTH LAKE PEARSON RESERVOIR	DSP; FIS; IND_SW; REC	014N	067W	23	NW1/4SE1/4	-104.856	41.166
CR CR23/179	05/23/2013	Fully Adjudicated		ENL. WHEATLAND WASTEWATER LAGOON SYSTEM	IND_SW; IRR_SW	025N	067W	06	NE1/4SW1/4	-104.938	42.16831
CR CR23/219	03/19/2013	Fully Adjudicated	EAST ELKHORN RANCH LLC	MCMURRY NO. 4 RESERVOIR	CMU; FIS; IND_SW; IRR_SW; REC; STO	033N	079W	24	SE1/4SW1/4	-106.272	42.80731
CR CR23/229	04/26/2011	Fully Adjudicated	HAGEMAN & BRIGHTON PC	ENL. SULLIVAN PIT RESERVOIR	IND_SW	027N	078W	14	SW1/4NW1/4	-106.159	42.314
P12391.0R	01/04/2006	Incomplete	ARCH OF WYOMING LLC	S2-1 RESERVOIR	IND_SW	021N	080W	34	NE1/4SE1/4	-106.386	41.74463
P13247.0R	02/29/2008	Incomplete	ARCH OF WYOMING LLC	SC3-1 RESERVOIR	IND_SW	021N	079W	32	NE1/4NW1/4	-106.32	41.75158
P13248.0R	02/29/2008	Incomplete	ARCH OF WYOMING LLC	SC3-2 RESERVOIR	IND_SW	021N	079W	32	NE1/4NW1/4	-106.317	41.75331
P13249.0R	02/29/2008	Incomplete	ARCH OF WYOMING LLC	SC3-3 RESERVOIR	IND_SW	021N	079W	32	NW1/4NW1/4	-106.323	41.75247
P13602.0R	03/31/2010	Incomplete	NEW FASHION PORK LLP	NEW FASHION PORK WETLANDS NO. 1	IND_SW; WET	017N	062W	26	NE1/4SW1/4	-104.28	41.40881
P13759.0R	04/26/2011	Incomplete	UNITED SURFACE & MINERALS	EAST RESERVOIR	IND_SW; STO	021N	064W	02	NW1/4NW1/4	-104.516	41.82675
P13760.0R	04/26/2011	Incomplete	UNITED SURFACE & MINERALS	CANYON VIEW RESERVOIR	IND_SW; STO	022N	064W	34	SE1/4NE1/4	-104.522	41.83681
P13761.0R	04/26/2011	Incomplete	UNITED SURFACE & MINERALS	WEST RESERVOIR	IND_SW; STO	021N	064W	03	NW1/4NE1/4	-104.526	41.82697
P14389.0R	09/25/2014	Incomplete	EARTH WORK SOLUTIONS	PRBIC	IND_SW	031N	071W	000		-105.338	42.6797
P14461.0R	05/16/2014	Incomplete	TRIHYDRO CORP	NORTH PROPERTY EVAPORATION AND INLET RESERVOIR	IND_SW	034N	078W	29	SW1/4SW1/4	-106.239	42.88238
P14481.0R	02/05/2016	Incomplete	R360 ENVIRONMENTAL SOLUTIONS LLC	ENLARGED R360 SILO FIELD FACILITY	IND_SW	015N	065W	12	SW1/4NE1/4	-104.605	41.28522
P14501.0R	05/13/2016	Incomplete	TRIHYDRO CORPORATION	FINCH RESERVOIR	IND_SW; STO	021N	080W	32	NE1/4NE1/4	-106.425	41.7543
P14526.0R	08/08/2016	Incomplete	BP AMERICA PRODUCTION COMPANY	SECTION 5 FRESHWATER PITS	IND_SW	017N	093W	05	NW1/4NE1/4	-107.898	41.48392
P7834.0E	07/07/2016	Incomplete		SECOND ENLARGEMENT OF COXBILL PORTABLE IRR SYSTEM ACIPT COXBILL PUMP&PL	IND_SW	023N	061W	34	SW1/4SW1/4	-104.183	41.9175