



Wyoming Water Bulletin



Wyoming **WATER** Development Office

The State of Wyoming established the Wyoming Water Development Office in 1975 to promote the optimal development of the state's water resources. To help meet our state's needs, the Office's River Basin Planning Program provides essential information concerning the current status and future availability of water resources in Wyoming. To be more responsive in carrying out this mission, we undertook modernization of the planning program in 2017 and summarized data for 2018. This Water Year Bulletin is one product of modernization. Newly developed tools take advantage of current technology to allow rapid evaluation of water use by user type and by year. This new information will inform state water policy and project development, provide a proactive stance in the legal arena, and provide an opportunity for local input on water policy and projects.

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Water and Climate: Influences water use, largely as a factor of temperature and precipitation.

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Water Supply and Availability: Assessed based on streamgages and reservoir capacities.

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Water Use: Includes agriculture, municipal, domestic and industrial.

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Water Development: Administered by the Wyoming Water Development Office and partners to select, plan, finance and construct projects.

From the high peaks of the mountains to the low lying basins and plains, Wyoming's diverse geography greatly influences water availability throughout the state. Winter snowpack in the mountains supplies most of the state's water. As the snow melts, water flows into streams, rivers, and lakes to provide drinking water, irrigate farm and ranch land, power industrial equipment, sustain fisheries, and generally support the natural environments for which Wyoming is famous. Wyoming is unique, in that we are the headwaters for seven river basins that support the majority of the western United States. Knowing where our water comes from and how it is managed helps us be responsible stewards of this irreplaceable and vital resource.

Surface water sustains Wyoming. Snowpack and precipitation were above average in 2018, helping to replenish Wyoming's streams and reservoirs.

This Wyoming Water Bulletin outlines how water is used throughout the state, describing the factors affecting water conditions during 2018, specifically climate, water supply and water use. The bulletin describes the work and specific water projects conducted by the Wyoming Water Development Office.

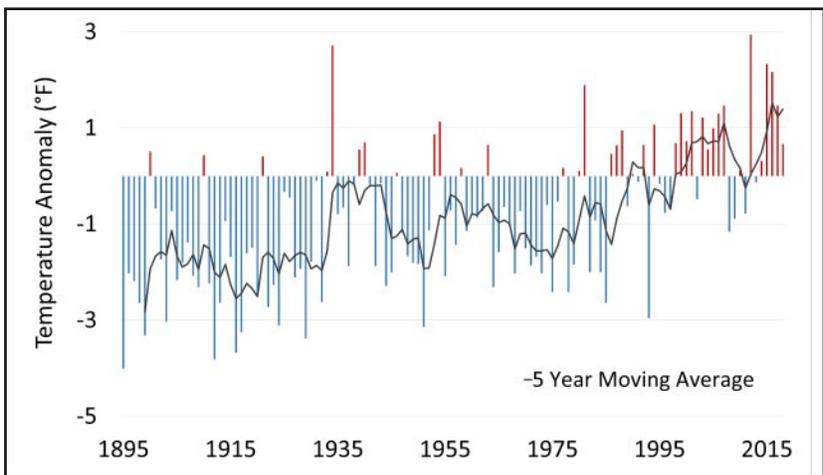
Water is a vital resource in Wyoming and across the arid west. The Wyoming Water Development Office continues to support water development and planning for our communities and industries. In addition, we are excited to develop comprehensive tools to provide snapshots of water use and supply within the boundaries of the state that also have the capability to support regional and interstate analyses.



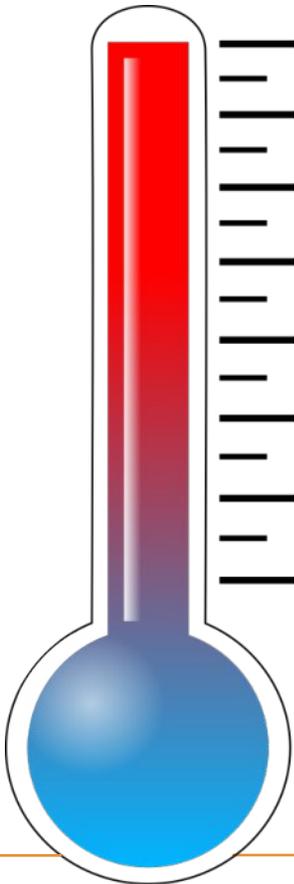


Water and Climate

Because water and climate are intricately related, examining climate trends helps us better understand water use and water availability. The average annual temperature over time supports our understanding of potential water use and management strategies to address climate variability.



Statewide average annual temperature relative to the 30-year average from 1981 - 2010. The 5-year moving average is the average temperature over the previous 5 years. (Courtesy of PRISM Climate Group, Oregon State University)



43.1° 5-year average statewide temperature from 2014 to 2018

42.4° 2018 average statewide temperature

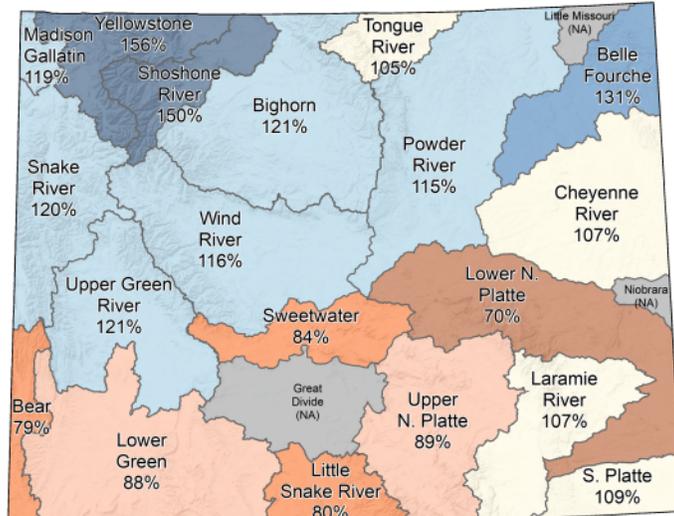
41.7° 30-year average statewide temperature from 1981 to 2010

1.4 °F statewide temperature increase over the past 5 years compared to 30-year average

Wyoming's mountains function as reservoirs, providing runoff in spring and summer for our state as well as for millions of people downstream. Snowpack in Wyoming is melting earlier due to higher temperatures, changes in canopy cover and less spring moisture and can result in late-season water shortages.

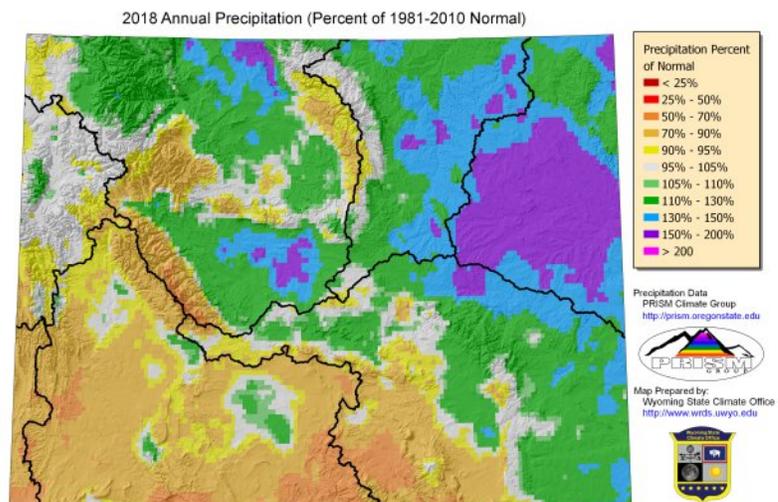
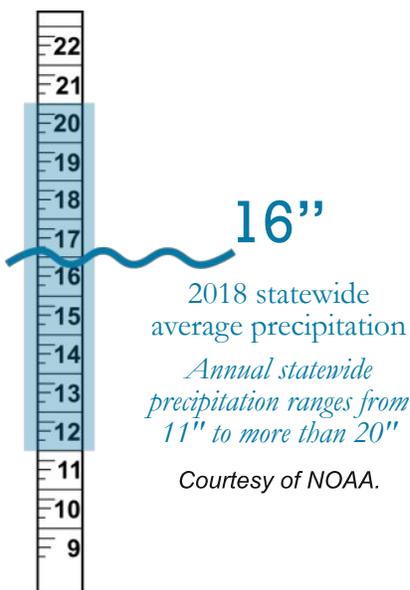
Northern Wyoming above average snowpack. Yellowstone and Shoshone River sub-basins (part of the Wind/Bighorn River Basin) highest levels of snow pack at 150% of median.

Southern Wyoming below historic averages. Lower North Platte lowest amount of snowpack at 70% of median.



Snow water equivalent as percent of median for April 1st (generally recorded as the date of maximum snowpack), 2018. (Courtesy of Natural Resources Conservation Services (NRCS) and WRDS)

Precipitation patterns in 2018 were split along the continental divide, with the northeast portion above normal and the southwest portions below normal. At a basin-scale, the Northeast Basin received significant precipitation with large areas recording 150-200% above normal. Conversely, the Bear River and Green River Basins were 70-90% of normal.



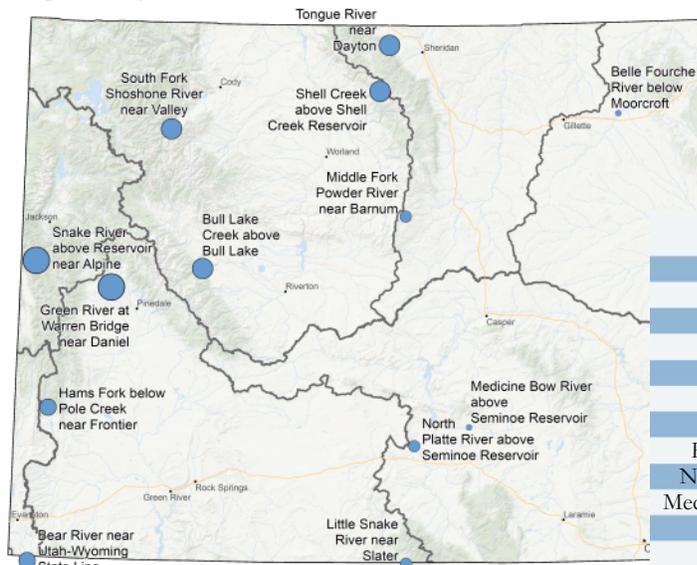
Statewide average annual precipitation for 2018 as the percent of normal. (Courtesy of WRDS and the PRISM Climate Group)



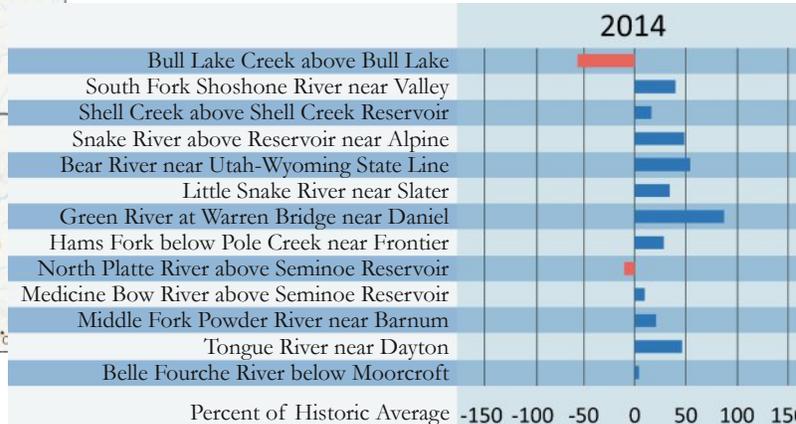
Water Supply and Availability

WYoming's water supply and availability is closely monitored by federal, state and local entities to document current conditions, legal availability, and define management actions.

USGS stream gages provide long-term surface water supply monitoring throughout the state. In 2018, above and below average flows were measured in northern and southern Wyoming, respectively.

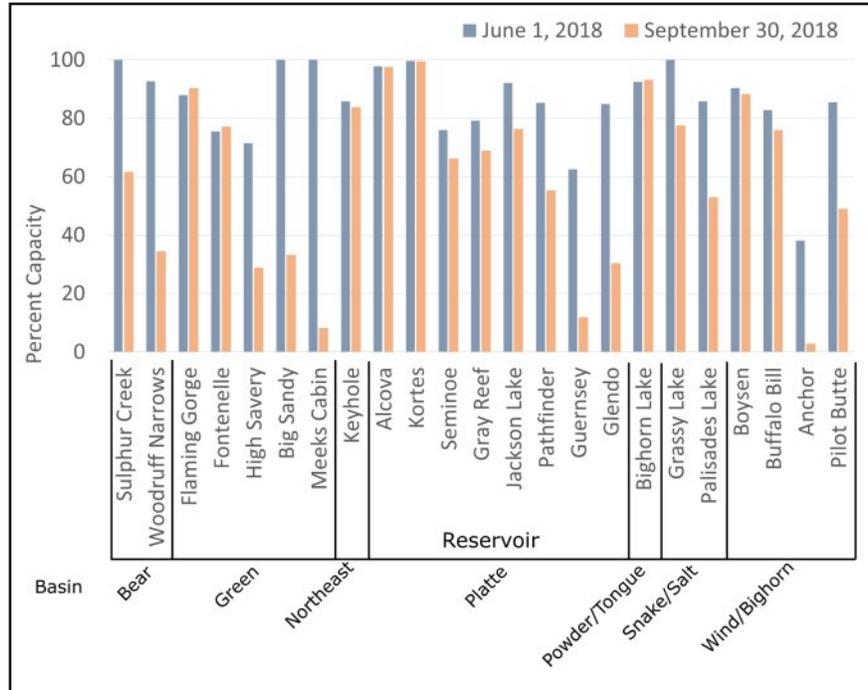


River Gauge 2018 - Percent of Average
 • 37 - 46 • 46.1 - 57 • 57.1 - 76 • 76.1 - 121 • 121.1 - 190



Stream gage locations and measurements as a percent of historic average for 2018 (left) and 2014-2018 (right). Courtesy of USGS.

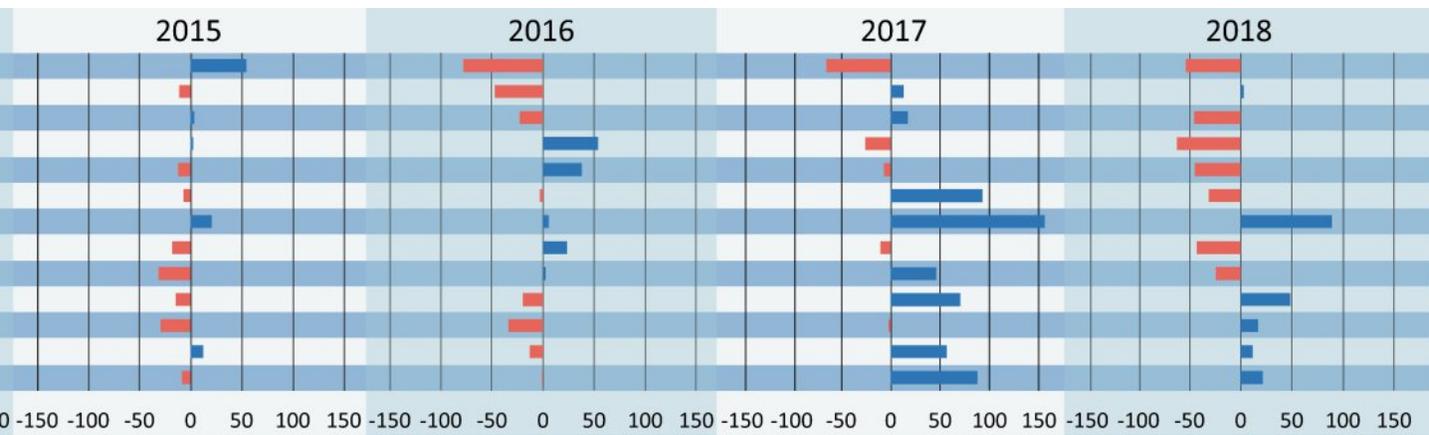
Wyoming's reservoirs are an important source of surface water that provide hydro-power, reduce flooding and play an important role in supplying water for uses including agriculture, municipal, industrial, recreation and fisheries. Reservoirs recharge from snowmelt in the spring and are used throughout the year. It is useful to assess reductions in reservoir capacity over the summer months to better understand year to year water use and availability. The Bear and Green River Basins had particularly large draw-downs, averaging reductions of 49% and 40%, respectively.



Reservoir percent capacity comparison for early summer (June) to late summer (September) for 2018. Courtesy of WRDS. Data provided by USBR, WWDO, WSEO.



Average reservoir capacities remaining at the end of the summer in 2018 were 5% less than 2017. The average reduction across all reservoirs from June 2018 to September 2018 was 26%. The mean (2016 – 2018) capacity in September was 63%.





Water Use

Water use is estimated annually across the state of Wyoming using a water use index. The index breaks down water use in each of the seven river planning basins using easily accessible, consistent datasets that are available historically and can be updated for future estimates. The water use index incorporates data from each of the core water use sectors: agricultural, municipal/domestic, and industrial.

This index allows water users and managers to track trends over time in a rapid and cost effective manner. The index can identify potential changes in water use based on growth or reduction within Wyoming's core sectors (e.g., oil and gas boom) and can be used in conjunction with climate data to identify areas of present-day or future water shortages and excesses.

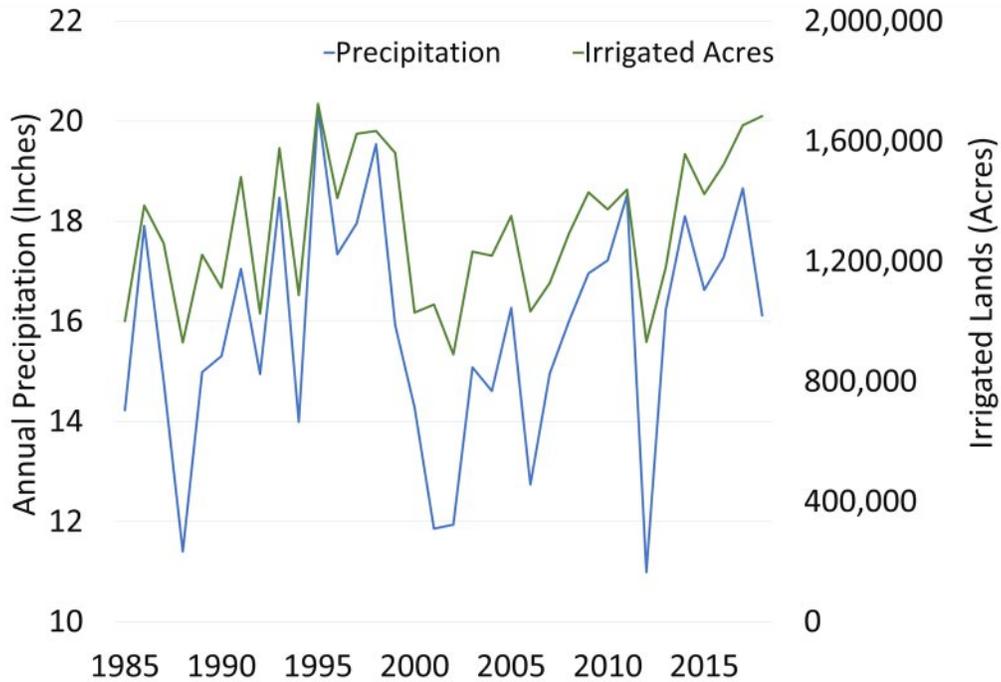
1.7M

acres of irrigated lands in 2018
21% above the thirty year average

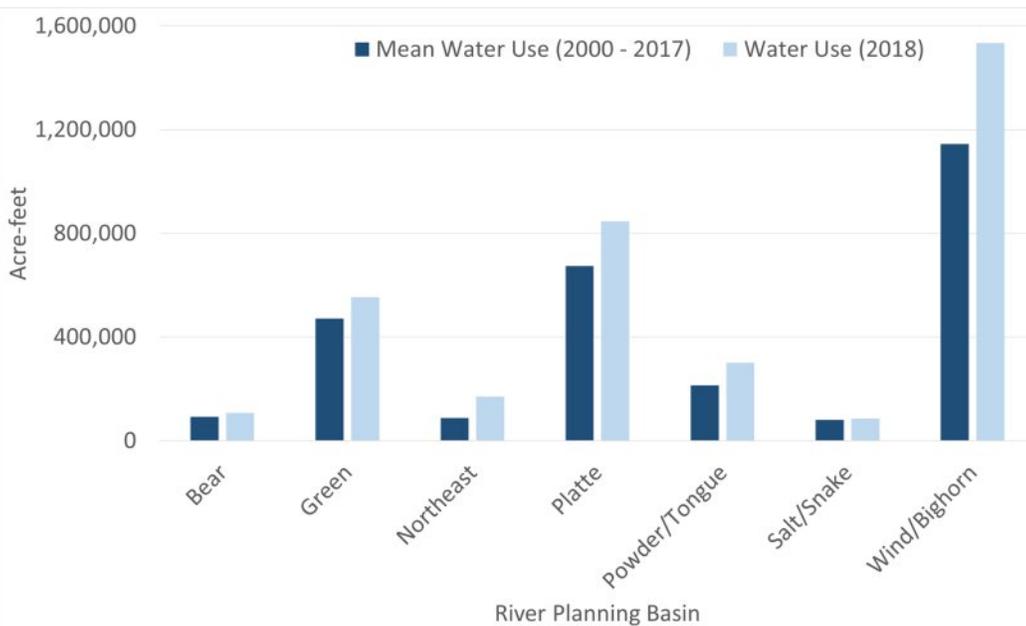


Agricultural Water Use

Irrigation of croplands is by far the largest water use sector in the state, accounting for nearly 90% of water use in Wyoming in 2018. Under Wyoming's system of appropriation, many of these irrigated lands are located immediately adjacent to major waterways. Fields of green emerge in the summer irrigation season, in stark contrast to the surrounding semi-arid landscape.

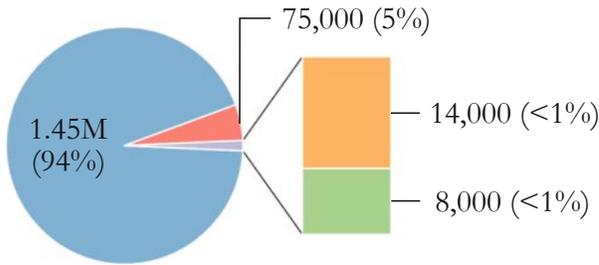


Annual precipitation statewide compared with agricultural water use (courtesy of PRISM Climate Group). The extent of irrigated lands varies annually depending on water availability in the form of snowpack and summer precipitation. High snowpack allows users to irrigate more acreage and irrigate later into the season.

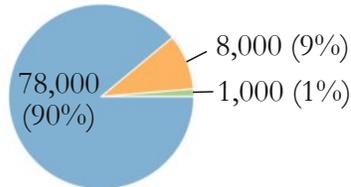


2018 water use by basin compared to basin averages. Overall, water use in 2018 was above average relative to the 2000 – 2017 average. Although many basins had higher water use in 2017, high snowpack and precipitation levels in 2018, particularly in the Powder/Tongue and Northeast River basins, led to more irrigation and more overall water use when compared to previous years. Statewide, 2018 had 21% higher agricultural water use when compared to the 30 year average and slightly more than 2017, making it the second highest year on record since 1985.

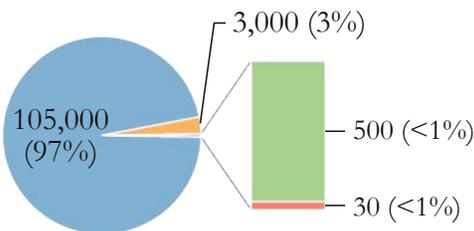
Wyoming Irrigated Lands and Water Use



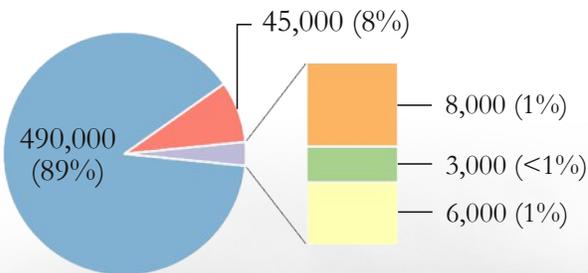
1.45 M ac-ft of water use is for agricultural purposes



Highest municipal water use by percent (9%)



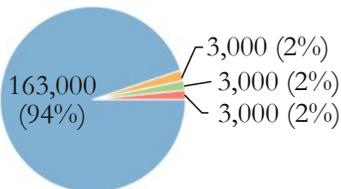
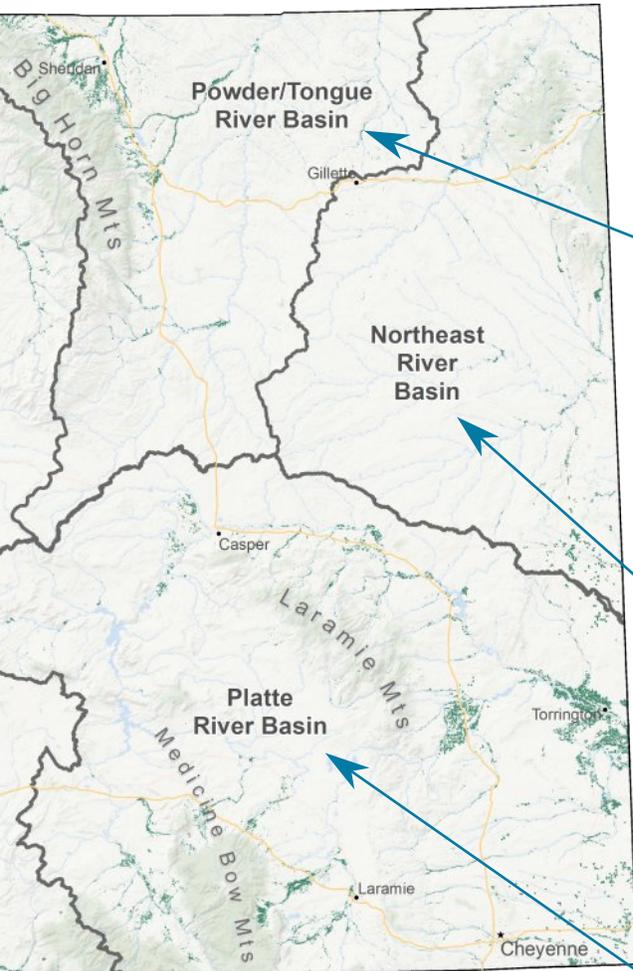
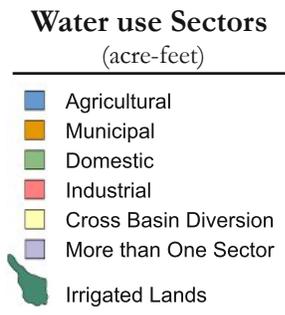
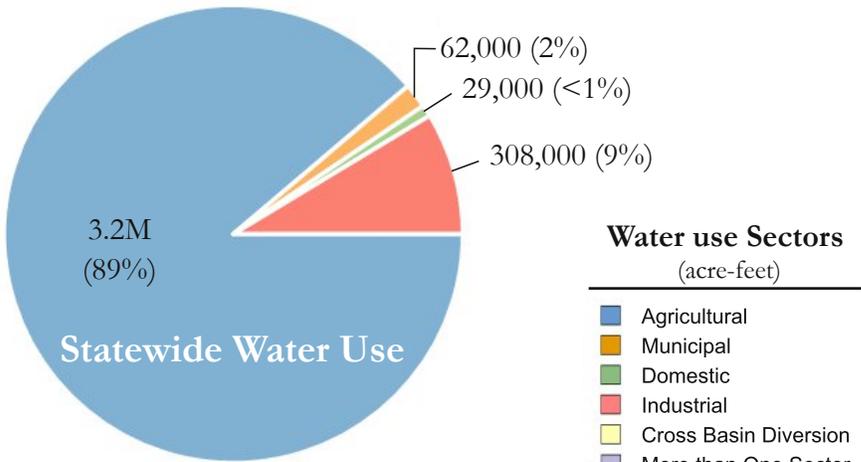
97% of water use is for agricultural purposes



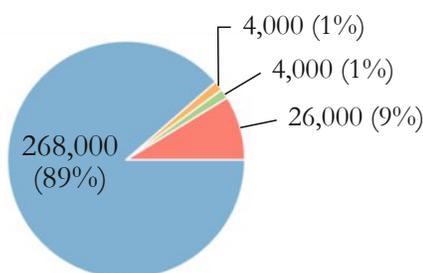
Primary industrial use: thermal electric power generation



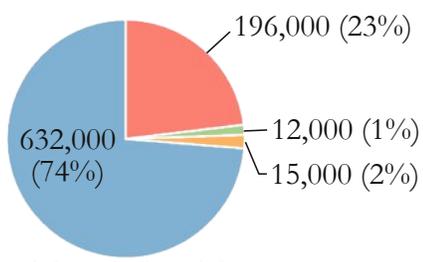
by Sector



Oil and gas account for majority of industrial water use



The Northeast and Platte River Basins use proportionally more groundwater than all other basins



Highest industrial water use (196,000 ac-ft)
Lowest agricultural water use by percent (74%)

Please note these water use values are derived using methods developed using the WWDO Water Use Index which provides for consistency across Wyoming's Basins. Accordingly, these values may vary from water use measured and calculated specifically for compact or decree reporting or other purposes.



Industrial Water Use

Industrial water use is estimated based on the major industries in each river basin. This includes water used by Wyoming's primary industries, such as electrical generation, oil and gas production, mining, natural gas processing and coalbed methane.

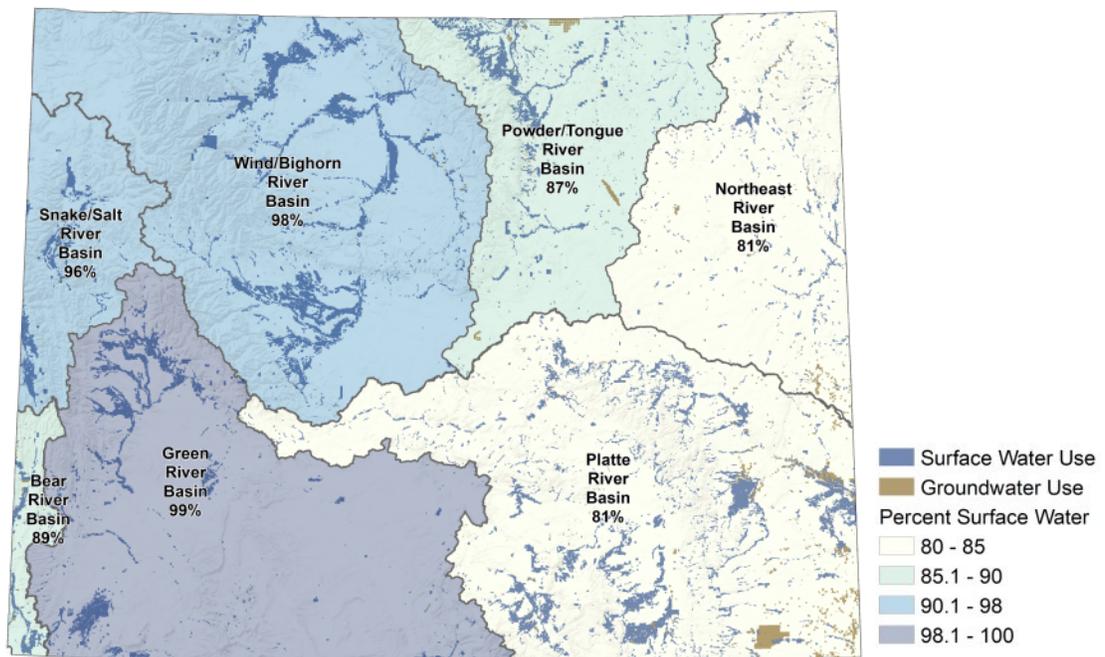
- Industrial is the second largest water use sector in the state (9%)
- Only the Platte River Basin has demonstrated an increase in use over the past decade (over 100% increase); all other basins combined have recorded an approximately 35% decrease in use



Municipal and Domestic Water Use

Municipal and domestic water use includes water used for personal, commercial, and other purposes. While municipal water is supplied directly by a municipality, domestic water is not, with examples including rural residences and highway rest-stops.

- Municipal and domestic use accounted for less than 3% of the total 2018 water use in the state (91,000 ac-ft)
- Use within each basin has remained relatively consistent through time due to minimal changes in population; however, statewide use has decreased over the last decade due to a reduction in population.

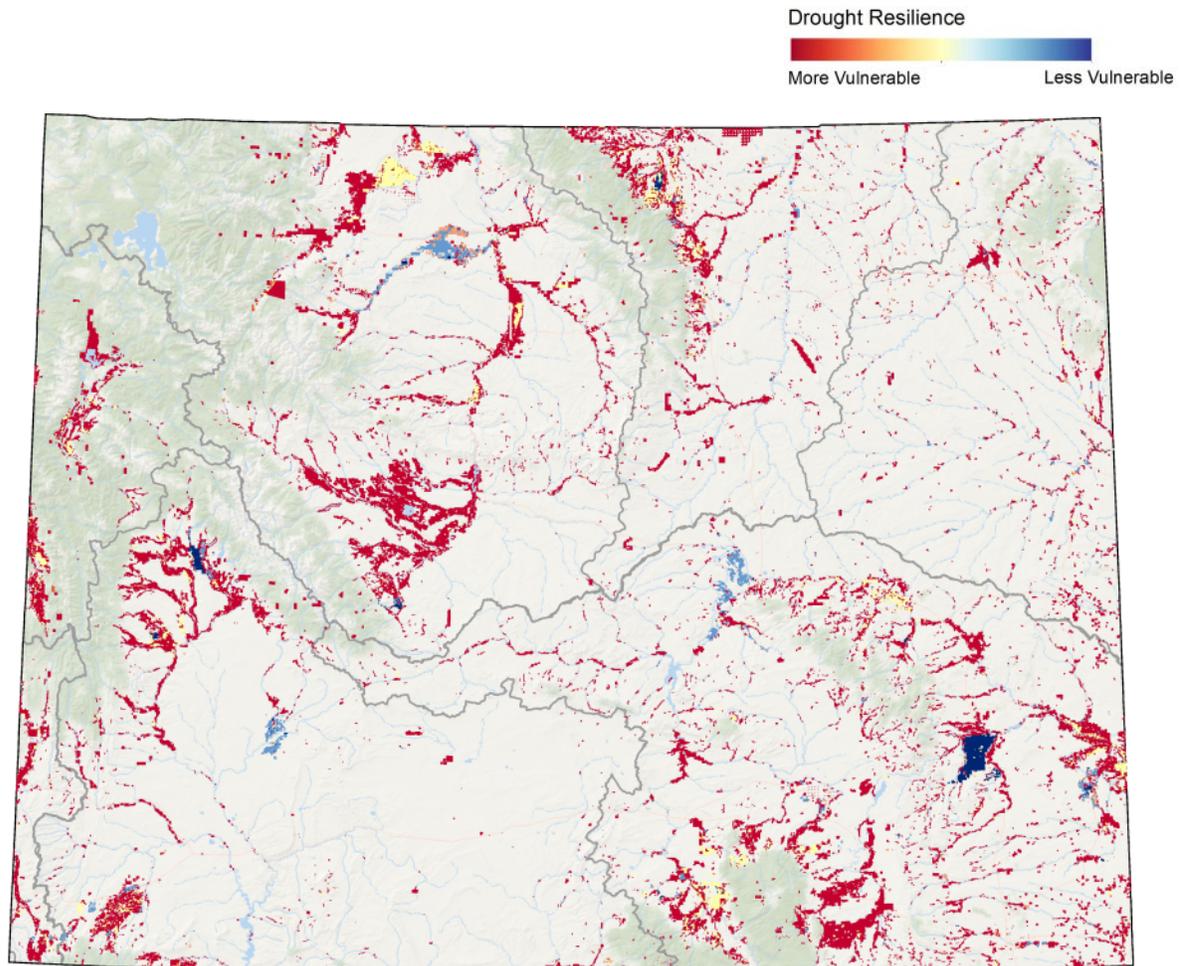


Statewide distribution of surface water/groundwater use and percent surface water by river basin. The majority of remaining water is derived from groundwater.

Wyoming Surface Water

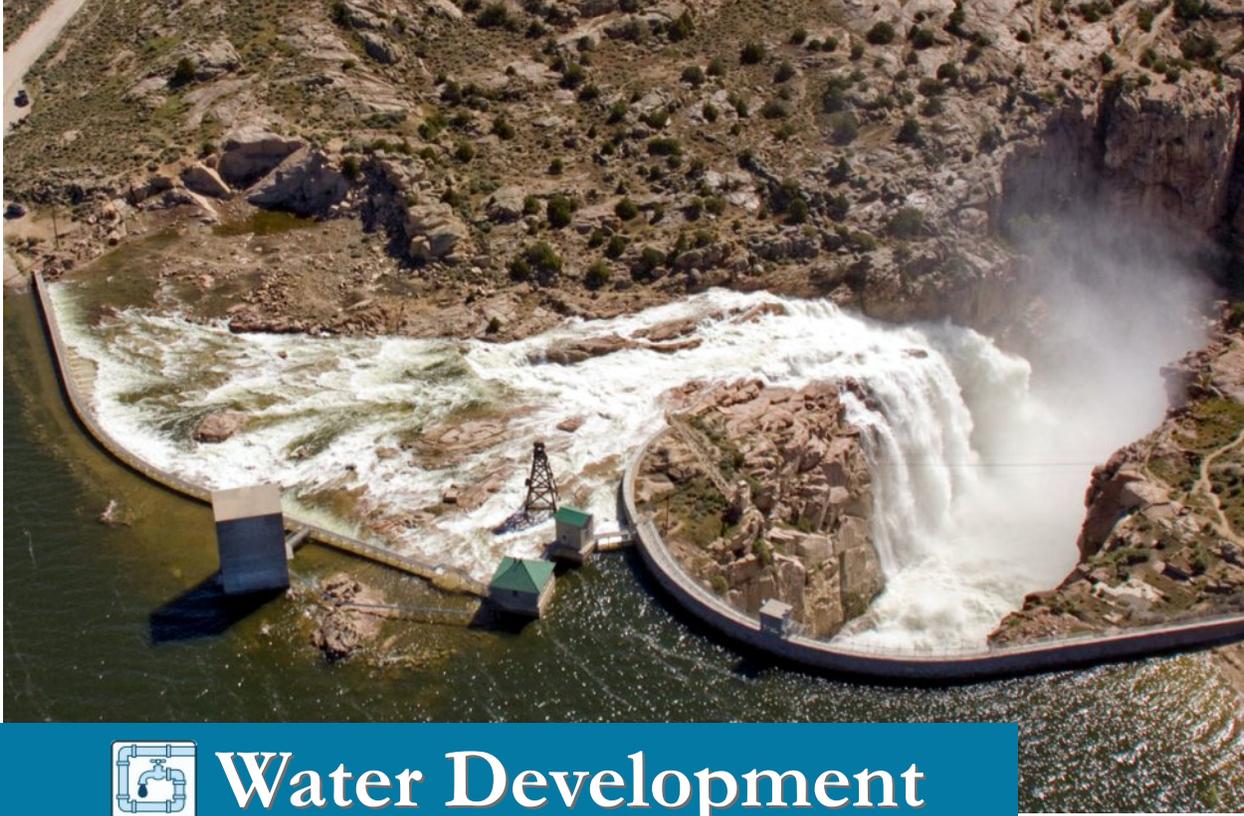
The majority of Wyoming's water use comes from surface water. By basin, the amount of surface water used relative to groundwater ranges from 80 to 99%, with the eastern portion of the state more dependent on groundwater. Because both snowpack and precipitation in the form of rain replenish surface water supplies, the state is dependent on both to supply water for its users.

Even though surface water sustains Wyoming, access to multiple sources of water increases drought resilience during low water years. Having access to groundwater when surface water sources are diminished can be critical during periods of drought.



Statewide drought resiliency (determined by supply type). Drought resiliency is determined by the number of supplies available to the user, where those with access to multiple supplies are more resilient than those with only surface water access.

Other potential drought resiliency factors include water use relative to water in the basin, access to groundwater, annual climate and river flows (specifically related to appropriations), and availability of stored water. Increased water use across the state continues to be driven by more irrigated lands in the Wind/Bighorn and Northeast River Basins and industrial use in the Platte River Basin. Increased water use in these regions may affect resiliency to drought conditions. While climate conditions were relatively positive in 2018 (specifically for northern Wyoming), stream gauges showed variability across the state. Lower than average flows were reported in the Platte, Northeast, Bear, and parts of the Green, and Powder River Basins, making these regions more susceptible to drought conditions and more reliant on groundwater. Reservoirs play an important role supplementing water availability in many of these regions.

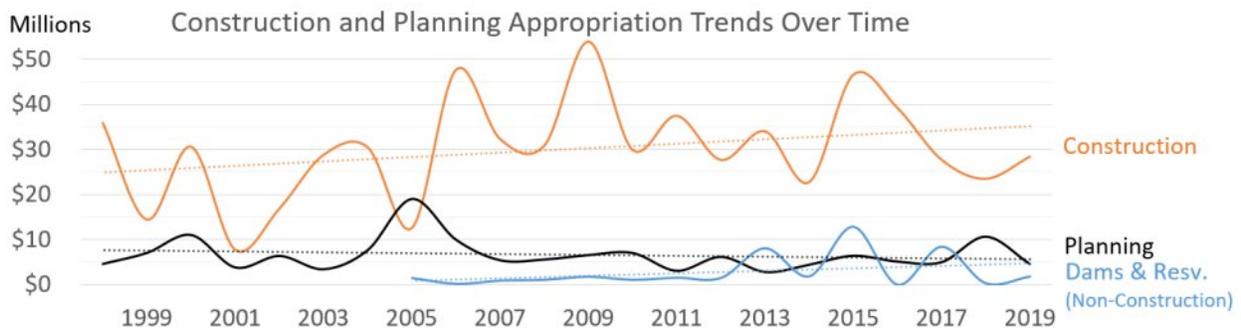


Water Development

The Wyoming Water Development Office serves as a key partner with local, state and federal entities to secure the state's water future. WWDO was founded based on a commitment to utilize financial resources from the use of non-renewable resources to develop a renewable resource, water. Since its founding in 1975, the office has invested over \$1.2 billion to meet water supply needs or alleviate water supply problems for all water use sectors through development, rehabilitation, construction and planning.

\$38M

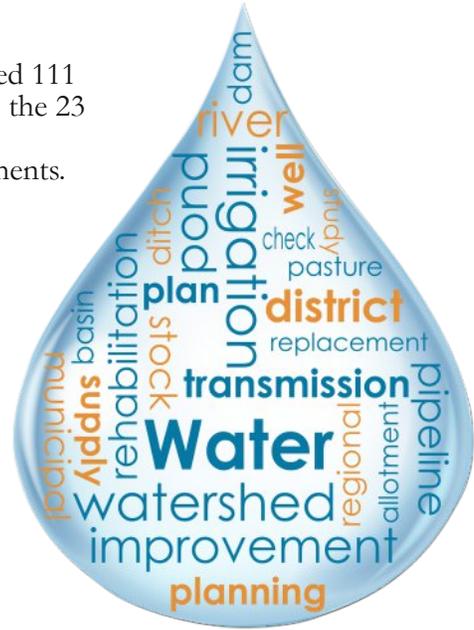
Average Annual Appropriation



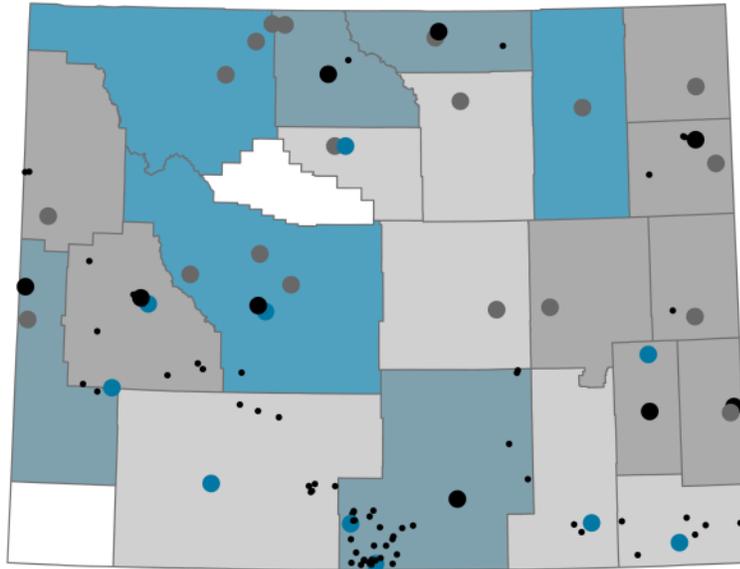
Dam and reservoir Account III established in 2005.

Project priorities are informed by studies conducted by the WWDO in collaboration with local sponsors and their partners. Irrigation and municipal water managers cite challenges due to aging/inadequate infrastructure, operating on shoestring budgets which results in deferred maintenance, storage issues and missed opportunities for water conservation. Local entities including municipalities, irrigation districts, joint powers boards and others can request financial and technical assistance from WWDO.

In 2018, the Wyoming Water Development Commission funded 111 projects across Wyoming. Of these projects, 106 benefit 21 of the 23 Wyoming counties and include water transmission pipelines, irrigation upgrades for special districts and reservoir improvements. Five projects have statewide or broad regional scope. This includes development of resources for River Basin Planning, extension of the Platte River Recovery and Implementation Plan (PRRIP) and assets associated with Lake Desmet.



2018 Appropriations by Project and County



- By Project Type**
- Level III - Construction
 - Level II - Feasibility Planning
 - Level I - Reconnaissance Planning
 - Small Water Projects
- By County**
- ≤ \$5,000,000
 - ≤ \$2,500,000
 - ≤ \$1,250,000
 - ≤ \$500,000
 - No Appropriations



The State of Wyoming has acquired several water storage assets around the state for future use. The purchase of over 62,000 acre-feet of storage space in Lake DeSmet plus the Clear Creek Diversion, pump station, supply pipeline and Healy Reservoir are a beneficial addition to the State's water asset portfolio.

River Basin Planning

Updated River Basin Plans for all seven basins within the state will be complete in 2020. The state has invested significant funds in critical planning data and it is essential to maintain and update it regularly for decision makers and the public. Going forward, planning efforts will focus on creating a comprehensive, current and publicly shared water data repository online.

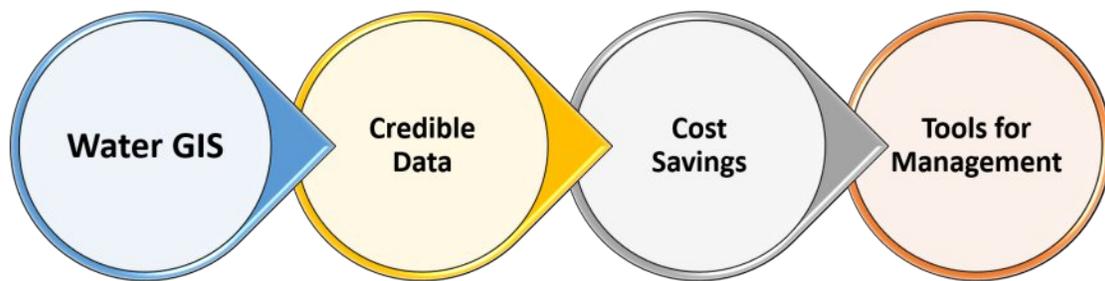
2018 Appropriations by Project Type



Project Focus

Middle Piney Dam was completed in 1940 to raise natural lake levels for storage and irrigation. Due to its hazard classification and poor condition, the USFS has not stored water behind the dam for 20 years. The reconstruction of Middle Piney Dam began in July of 2018 with a groundbreaking ceremony attended by Governor Mead, Regional Forester Nora Rasure and others representing the Middle Piney Watershed Improvement District, Bridger-Teton National Forest, WWDC, local agencies and the general public. WWDC funded analysis, permitting, design and construction for the project. Substantial completion is anticipated in the next several years. The protracted completion schedule is dictated by the abbreviated construction seasons on site, as Middle Piney Reservoir is located at 8,800 feet above sea level and receives runoff from the east slope of Wyoming Peak. The WWDO holds a 30-year special use permit with the Bridger-Teton National Forest for construction and subsequent management of the reservoir once complete. The WWDO plans to enter into an agreement with the Middle Piney Watershed Improvement District to operate, maintain and deliver water to its members into the future.





Water GIS (Geographic Information System) is being developed as a statewide data storage and retrieval system leveraging new tools, technologies and standards for rapid data capture, improved access and comparable analysis. The comprehensive datasets include critical core data for site specific planning efforts and statewide snapshots of water supply and use. The Water Development Office anticipates long term project cost savings and increased efficiency. These data allow decision makers easier access to data and improve interagency coordination. This bulletin marks the beginning of sharing the results from this modernization effort and the beginning of River Basin Planning’s commitment to develop better tools and in-house data infrastructure expertise to support Wyoming’s water management.



Surface water will continue to be Wyoming’s primary supply of water. Fortunately, 2018 saw good snowpack and precipitation throughout most of the state, which led to higher water supply to irrigate a higher percentage of water-righted lands for longer periods. These high levels of irrigation and a notable increase in industrial use in the Platte River Basin meant 2018 had the highest water use rate recorded since 2000. With most of Wyoming dependent upon one source of water, this creates low overall drought resiliency. Therefore protecting, enhancing and developing water resources is vital to help Wyoming’s water users meet demands.



As a headwaters state, Wyoming’s use of our valuable water resources impacts water use within our boundaries as well as in downstream states and countries. Evolving our understanding and planning is essential to maximize water benefits and use. The modernized, Wyoming Water Bulletin is one example of the evolution of information needed to inform future decisions.

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Wyoming

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<http://wwdc.state.wy.us/>

Acknowledgements



Water Resources
Data System

Responsive partner.
Exceptional outcomes.



UNIVERSITY
of WYOMING