



Water Rights

and Water Use of Coal Facilities in the Colorado River Basin

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Water Rights and Water Use of Coal Facilities in the Colorado River Basin

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Background

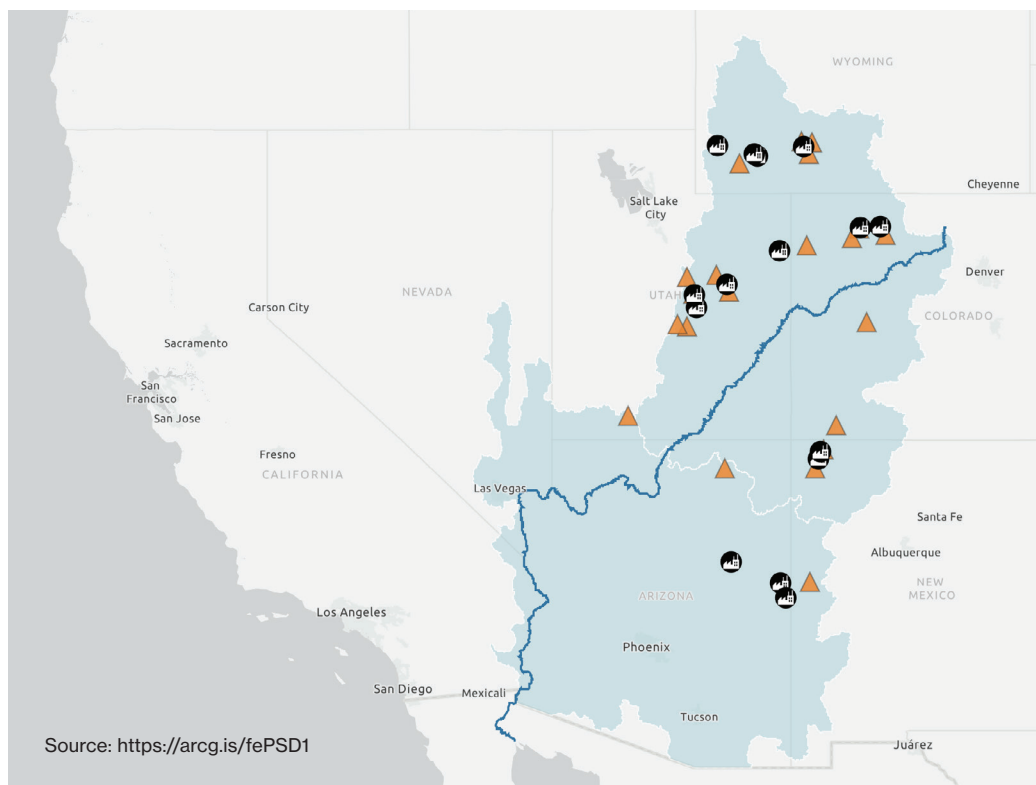
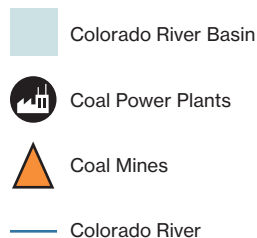
Energy production from coal is on a downward trajectory, and many coal power plants and mines are expected to cease operations in the next two decades.¹ As a result, communities whose economies are centered on coal are vulnerable to disruption. By the same token, the closure of coal mines and coal power plants may free up water supplies and create opportunities for sustainable economic development based on those supplies.

In this report, the Just Energy Transition Center at Arizona State University Lightworks and ASU's Kyl Center for Water Policy at Morrison Institute have inventoried the water used for coal power plants and mines within the Colorado River Basin. **This first-of-its-kind report summarizes findings from extensive research to identify and describe the amount, source, and ownership of water rights used by coal-fired power plants and coal mines throughout the Colorado River Basin.**

This report is intended to help policymakers and community stakeholders impacted by the closure of coal-fired power plants and coal mines in the Colorado River Basin understand the water resources implications and opportunities to inform decision-making about the future use of those resources.

As used in this report, “**impacted communities**” means communities situated near coal-fired power plants and coal mines that are disproportionately impacted by the pollution and environmental impacts created by those facilities and/or that can reasonably demonstrate ways in which changes in the coal industry have caused or will cause serious consequences in local economies.

Coal Power Plants and Mines in the Colorado River Basin



¹ Howard Gruenspecht, Brookings, *The US Coal Sector: Recent and Continuing Challenges* 10-15 (Jan. 2019), <https://www.brookings.edu/research/the-u-s-coal-sector/>.

Summary

There are currently about **37 coal-fired power plants and coal mines in the Colorado River Basin**. These plants and mines are located in five states – Arizona, Colorado, New Mexico, Utah and Wyoming – and together they withdraw an estimated 131,130 acre-feet of water each year.² Coal plants use the vast majority of this water, about 130,000 acre-feet per year, while coal mines collectively use a modest 1,130 acre-feet.*

There are more than 800 industrial water rights associated with the 37 coal facilities, entitling their owners to approximately 1.8 million acre-feet of water annually. Facilities use less than their full entitlement for a variety of reasons: permits may include efficiency requirements or a facility operator may temporarily lease water to another part of the operation (such as waste disposal or remediation). In general, these rights give their owners a claim to use a specific quantity of water for a particular purpose, enforceable against other water users with lower priority rights, also known as junior water rights.³ Many of these rights can be purchased independently under state law, but some (e.g., all the rights associated with Arizona coal facilities) may be bought and sold only as part of the sale of land.

Most of the coal facilities in the Colorado River Basin get their water through water rights owned by the same companies that own and operate the facilities. PacifiCorp, a six-state power company, has water rights associated with coal facilities (“coal water rights”) that entitle it to at least 490,000 acre-feet of water each year in three states (Colorado, Utah, and Wyoming), the highest total quantity controlled by any single owner identified in this report. Salt River Project, an Arizona-based utility, owns coal water rights that entitle it to around 100,000 acre-feet of surface water each year in Arizona and Colorado. A variety of other companies – including Peabody Energy, Public Service Co. of New Mexico, Tucson Electric Power Co., and Tri-State Generation and Transmission Co. – own large coal water rights representing more than 300,000 acre-feet of water each year in total. In most states, the water supplying coal facilities comes primarily from rivers, streams, and reservoirs, while the rest comes from underground wells.

	Arizona	Colorado	New Mexico	Utah ⁴	Wyoming	Total (Basin)
Total Coal Water Rights (acre-feet per year)	141,750	928,638	73,820	481,718	188,685	1,803,752
Percent Groundwater	100	0.5	2.8	5.1	20.7	11.7
Percent Surface Water	0	99.5	97.2	94.9	79.3	88.3

* As used in this report, the term “use” does not necessarily equate with “consumptive use.” This study did not investigate whether any water uses by power plants or mines result in water returned to a surface water or water treatment system.

2 *Thermoelectric Cooling Water Data*, Energy Info. Admin. (Nov. 1, 2021), <https://www.eia.gov/electricity/data/water/>. An acre-foot is 325,851 gallons, or about the amount of water used by three to four Arizona single-family households in a year. *How Many Homes in Arizona, On Average, Share an Acre-Foot of Water Each Year?*, Ariz. Dep’t of Water Res. (Apr. 19, 2021), <https://new.azwater.gov/news/articles/2021-19-04>. Annual water usage information was not available for any of the coal mines in this study except those located in Utah, so figures regarding mine annual water usage are estimates.

3 See page 6 for a summary of western water law.

4 As Utah does not distinguish between surface water and groundwater, these percentages represent the source of the water and not its legal designation.

Considerations for Future Water Uses

As these facilities are retired, the water supplies used to support them will potentially become available for alternative uses. The best future uses for the water currently consumed by coal facilities in the Colorado River Basin will depend on a variety of factors, including the environment, applicable state and federal laws and regulations, and the goals and needs of each impacted community. As communities and stakeholders consider new uses, they will want to bear in mind the following:

- The **laws governing water rights are complex** and may include decades of court decisions and settlement agreements. State laws could complicate or impede a community's plans to buy, lease, transfer or retire water rights.
- **Environmental remediation and land reclamation** will be required for some retiring plants and mines, and these post-operation requirements will have their own water demands.
- **Climate change** is impacting the surface water flows in the Colorado River Basin. As the magnitude and severity of future impacts are uncertain, community planners should use caution in relying on historic hydrologic patterns for estimating future water supplies and **consider recent climate models** for predictions of water availability and plan based on diverse availability scenarios.⁵
- The amount of economic value that water supplies can generate varies: water can be dedicated to agriculture, the environment, commercial and industrial purposes or residential uses. Within agriculture there are higher and lower value crops, just as there are higher and lower earning industries. Communities may want to evaluate the economic benefits of various water uses; for example, **value of product or well-paying jobs produced per acre foot**.
- **Groundwater overdraft is a risk in many parts of the Colorado River Basin.**⁶ In much of the arid and semi-arid West, groundwater is considered a non-renewing resource, because it can be withdrawn much faster than it is replenished. De-watering an aquifer means the resource will not be available for future needs and may lead to subsidence, a condition in which the ground sinks in on itself and is no longer capable of storing water.
- In smaller communities, **comparatively modest supplies** of water can yield **significant** economic, environmental or community **benefits**.

⁵ See Appendix B for suggested research reports on how climate change may impact surface water flows.

⁶ Stephanie L. Castle et al., *Groundwater Depletion During Drought Threatens Future Water Security of the Colorado River Basin*, Geophysical Research Letters (Aug. 29, 2014).

Western Water Law Basics

While the Colorado River Basin states vary in specifics of how they govern water rights, they share some important similarities in their approaches.

Throughout the region, the two main sources of water are **surface water** – that is, water in rivers and streams – and **groundwater** – that is, water lying in rock and soil pore spaces beneath the Earth's surface. Groundwater is generally pumped from wells.

One of the most important concepts in western water law is the **relationship between surface water and groundwater**. In some states, there is effectively no difference – their “**unified**” systems treat all water as one and the same resource. Other states have “**bifurcated**” their water rights systems such that they govern surface water and groundwater differently. In those states, surface water is (usually) legally defined as water that flows in definable channels, such as streams and rivers, which can be both above and below the ground. Groundwater, by contrast, is defined as water that percolates through undefined underground aquifers. In bifurcated water rights states, the legal line between what is groundwater and what is surface water is the foundation for longstanding water rights litigation.

Both unified and bifurcated states use some variation of the **prior appropriation** system to govern their surface water rights. Prior appropriation is a “first in time, first in right” legal regime. In other words, the first person to put water to beneficial use without waste⁷ has superior water rights relative to all those who come later. The relative priority of each water right is delineated by a “priority date,” which is (usually) the date that a person first put water to beneficial use – the earlier the date, the more senior the water right. Prior appropriation rights entitle a person to a specified amount of water, frequently measured as cubic feet per second or acre-feet per year, for a specific set of uses.

A variety of factors may affect water rights and their relative priorities, including non-use resulting in forfeiture of all or part of the right and private agreements and settlements. An array of laws controls the purchase, sale, lease and transfer of these water rights, including requirements of public notice and opportunities for other water rights holders to object to such transfers if the transfer would impact other rights on the river.

In states with unified systems, the rules for groundwater are the same as for surface water. In states with bifurcated systems, the rules for groundwater are different: groundwater pumping must be “reasonable” or else limited to a specific amount of water (sometimes correlating to the size of the parcel of land on which the water is pumped). The exact definition of reasonableness is often determined by courts in water rights litigation according to a variety of complicated factors. Groundwater rights are frequently appurtenant to the land, meaning they cannot be bought or sold separate from the land on which the water is being pumped.

To illustrate a typical bifurcated system, if Person A began diverting 10 acre-feet of water from the Blue River to grow turnips in 1900, they would have a prior appropriation surface water right to 10 acre-feet per year to grow turnips from a particular diversion point on the River. If Person B began diverting 5 acre-feet of water from the Blue River to water cattle in 1910, they would have a right to 5 acre-feet per year to water cattle. Person B's right would be junior to Person A's. This means that if there were 13 acre-feet in the Blue River, Person A would get their full 10-acre-foot allocation and Person B would get only 3 acre-feet. If there were only 9 acre-feet in the river, Person A would get all of it and Person B would get nothing. By contrast, if Person C owned 30 acres of

⁷ These are legal terms with specific definitions unique to each state.

farmland, they could pump a “reasonable” or state-specified amount of groundwater from beneath their land. Person C could not sell these rights to their neighbor, and there may be rules governing whether they could sell the water itself for use off their land.

In “unified” systems, both surface water and groundwater rights operate just like the example of Person A and Person B on the Blue River. If, in addition to Person A’s 10-acre-foot surface water right, they began pumping 5 acre-feet of groundwater from beneath their land in 1960, they would have a 5-acre-foot groundwater right with a priority date of 1960. There would be no “reasonableness” requirement for Person A’s use, and A’s right would be superior to anyone who began pumping after them.

Water Rights and Use of Coal Plants and Mines

ARIZONA

Arizona Water Law. Arizona treats surface water and groundwater as two legally distinct resources subject to different rules. Surface water rights are allocated according to prior appropriation. Groundwater is heavily regulated in five “Active Management Areas” (AMAs) in central and southern Arizona and subject to limited regulation in three “Irrigation Non-expansion Areas” (INAs). In the remainder of the state, groundwater pumping is limited to a “reasonable and beneficial use.” Outside of AMAs, groundwater rights in Arizona are generally tied to ownership of the overlying surface land, meaning they cannot be bought or sold separate from the land.

The fact that water is withdrawn from a well does not necessarily mean the water is legally groundwater. Depending on their location, wells may be deemed to be pumping a river’s subsurface flow that under Arizona law is considered surface water, even though it is underground. This distinction is important because the right to use water from wells pumping subflow may be subject to senior surface water rights.⁸

The state’s primary water regulatory authorities are the Arizona Department of Environmental Quality, the Arizona Corporation Commission and the Arizona Department of Water Resources. Water rights are regulated by the Department of Water Resources.

Arizona Coal Facilities. Arizona has four coal facilities within the Colorado River Basin. All four facilities are in the Little Colorado Watershed in the north and east parts of the state. The Little Colorado Watershed is currently under adjudication, a proceeding in which the rights to use surface water and to pump water from the subflow zone will be definitively determined.

Coronado Generating Station is owned by Salt River Project (“SRP”) and located near St. Johns. Coronado used about 5,200 acre-feet of water in 2020, all of which came from about 30 groundwater wells with a combined pumping capacity of 44,000 acre-feet annually. All of the wells are owned by SRP. The station is not located in an AMA or INA.

⁸ Kathleen Ferris et al., Kyl Ctr. for Water Policy, *The Price of Uncertainty* 5 (Mar. 2018), https://morrisoninstitute.asu.edu/sites/default/files/the_price_of_uncertainty.pdf.

Cholla Power Plant is owned by Arizona Public Service Co. (APS) and located near Joseph City. Cholla used about 9,200 acre-feet of water in 2020. It gets its water from approximately ten groundwater wells, all owned by APS, capable of pumping 9,550 acre-feet annually. The Cholla Plant is located within the Joseph City INA. Accordingly, for parcels of two acres or greater, only land that was irrigated in the five years prior to the INA's creation in 1980 may be irrigated. The right to irrigate is tied to these lands and not transferrable to other lands. Moreover, owners of wells withdrawing over 35 gallons per minute must use a water measuring device and file annual reports with the Department of Water Resources.⁹

Springerville Generating Station is owned by Tucson Electric Power Co. ("TEP"), SRP and Tri-State Generation & Transmission Co. ("Tri-State G&T") and located near the Town of Springerville. The Springerville plant used about 10,400 acre-feet of water in 2020. The plant gets its industrial and power production water from about 32 groundwater wells, owned by SRP, TEP and Tri-State G&T, that can pump a total of 77,000 acre-feet each year.

Kayenta Mine is owned by Peabody Energy and located near Kayenta, AZ, within the boundaries of the Navajo Nation. Kayenta Mine closed in 2019, but most coal mines in the Colorado River Basin for which water usage is known use less than 100 acre-feet each year. The mine gets its water from 7 wells, all owned by Peabody, capable of pumping 11,200 acre-feet each year.

Navajo Generating Station, a coal-fired power plant located in the Navajo Nation, closed in 2019. The largest coal-fired plant in the US West, Navajo Generating Station was statutorily entitled to 34,000 acre-feet of water from Arizona's allocation of Upper Colorado River Basin water. Now that the plant has ceased operations, this water supply could be used in settlement of federal reserved water rights claims of the Navajo Nation and Hopi Tribe, both of whose homelands are located in northeastern Arizona.¹⁰

COLORADO

Colorado Water Law. Similar to Arizona, Colorado water law considers surface water and groundwater to be distinct resources. All water rights require some version of a permit from the state Division of Water Resources or an adjudication by a Colorado Water Court, and changes to or transfers of permits generally require approval from the state.

Surface water in Colorado is allocated according to the law of prior appropriation,¹¹ which provides that an earlier appropriator of water has higher priority to limited water supplies than later appropriators.¹² Colorado law specifies, however, that if there is insufficient water to satisfy all those with rights to it, "those using the water for domestic purposes shall have the preference over those claiming for any other purpose, and those using the water for agricultural purposes shall have preference over those using the same for manufacturing purposes."¹³ Thus, Colorado law waives some of the tenets of prior appropriation in times of water shortage.

In addition, Colorado has a legally-recognized pilot water banking program, but only in the Arkansas River Basin. There are proposals for this program to expand to the Colorado River Basin in the future. Additionally,

9 Ariz. Rev. Stat. tit. 45, art. 3.

10 See Parker Shea, *Navajo Generating Station Closure Leaves Questions of Water Ownership*, Ariz. Mirror, <https://www.azmirror.com/2019/11/08/navajo-generating-station-closure-leaves-questions-of-water-ownership/>; Gregor A. MacGregor, *When the Navajo Generating Station Closes, Where Does the Water Go?*, 31 Colo. Nat. Res., Energy & Env't L. Rev. 290 (2020).

11 Colo. Const. art. XVI, § 5.

12 Colo. Const. art. XVI, § 6.

13 Colo. Rev. Stat. Ann. § 37-92-203.

a partnership between The Nature Conservancy, Colorado's Southwestern Water Conservation District and the Colorado Water Conservation Board facilitates certain incentives for water conservation under a voluntary program within the Gunnison River sub-basin. Colorado has set a goal to conserve 50,000 acre-feet per year under these sorts of temporary voluntary agreements by 2030.

Groundwater rights, on the other hand, are governed by a complex array of different rules depending on the exact nature of the water. "Tributary groundwater," groundwater that is directly connected to surface water supplies, is similar to "subflow" in Arizona – underground water that is allocated according to prior appropriation.¹⁴ "Designated groundwater," by contrast, is groundwater in specially designated basins that do not support surface water supplies and is allocated according to a "reasonableness" rule.¹⁵ "Non-tributary groundwater" is groundwater within deep, confined aquifers with minimal connection to surface water or tributary groundwater outside of designated basins.¹⁶ This groundwater is allocated based on overlying land ownership and according to a rigid 100-year standard that effectively concedes the long-term depletion of groundwater supplies.¹⁷ Under the 100-year standard, the sum of all non-tributary groundwater permit holders may deplete the aquifer by a maximum of 1% each year.¹⁸ Lastly, "not-nontributary groundwater" is groundwater with slightly greater connection to surface systems than non-tributary groundwater, and it is allocated under a 100-year standard, but permit holders must also submit an augmentation plan to the State Engineer's Office.¹⁹

Despite the differential treatment of surface water and groundwater, Colorado's water law regimes are integrated, meaning that surface water and groundwater rights are recorded together. Most sub-basins in Colorado have been fully adjudicated, meaning water rights in the state are substantially more certain and secure than in other Colorado River Basin states.

The primary regulatory authorities in Colorado are the Colorado Department of Natural Resources, Division of Water Resources, the Colorado Public Utilities Commission and the Colorado Department of Public Health and Environment. Water rights are administered and recorded by the Division of Water Resources and the Colorado Water Courts.

Colorado Coal Facilities. Colorado has eight coal facilities in the Colorado River Basin. Even though water rights in Colorado are relatively more certain than in other states, Colorado law does not require the owners of water rights to be recorded, making it difficult to know with certainty who owns any given water right. Owners are frequently recorded on imaged records available from the Colorado Division of Water Resources, but these records may not be up to date.

Nevertheless, it appears that the water rights for the Colorado coal facilities are owned mostly by the owners of each respective facility. Although our research failed to conclusively identify the specific water rights used at each facility, we were able to identify those rights that are likely owned by companies associated with the facilities and that have diversion points near the respective facilities. Each facility seems to get water from a mix of surface water and groundwater sources, but the largest coal water rights are surface water rights.

¹⁴ Colo. Rev. Stat. Ann. §§ 37-92-103(11), 37-90-137.

¹⁵ Colo. Rev. Stat. Ann. § 37-90-103.

¹⁶ Colo. Rev. Stat. Ann. § 37-90-103(10.5); Luke W. Harris & Christopher J. Sanchez, *Considerations for Analyzing Colorado Ground Water: A Technical Perspective*, 15 U. Denv. Water L. Rev. 105, 119 (2011).

¹⁷ Colo. Rev. Stat. Ann. § 37-20-137.

¹⁸ Id.; Colo. Rev. Stat. Ann. § 37-90-137.

¹⁹ Colo. Rev. Stat. Ann. §§ 37-90-103(10.7), 37-90-137.

West Elk Mine is owned by Mountain Coal Co. LLC and located near Paonia. Its precise water usage is unknown, but it produces roughly the same amount of coal as Sufco Mine in Utah, so we estimate that it uses around 50 acre-feet of water each year. This water comes from a mix of groundwater and surface water rights owned in whole or in part by Mountain Coal Co. and from surface water rights owned by irrigation companies, in which Mountain Coal is a shareholder. Together, these rights entitle Mountain Coal to about 13,000 acre-feet of water per year. This water is very likely used at other facilities in addition to West Elk Mine.

Deserado Mine is owned by Blue Mountain Energy, Inc. and located near Rangely. Like West Elk Mine, Deserado Mine's water usage is uncertain. However, it is about half the size of West Elk Mine, so it probably uses about 25 acre-feet of water each year. Blue Mountain Energy owns several groundwater permits entitling it to a total of about 3,300 acre-feet per year, but it is not clear whether or to what extent these rights are used at Deserado Mine. Blue Mountain Energy and Deseret G&T also own several surface water rights, including one with a total capacity of about 130,000 acre-feet per year. This water is very likely used at other locations besides Deserado Mine.

Colowyo Mine is owned by Colowyo Coal Co. and located near Axial. It likely uses around 25 acre-feet of water each year, since it is approximately the same size as Deserado Mine. Colowyo Coal Co. owns 15 groundwater permits entitling it to a total of about 500 acre-feet of water each year, but it is not clear that this water is used at Colowyo Mine. In addition, Colowyo Coal owns at least 25 different surface water rights associated with Colowyo Mine. The largest right entitles Colowyo Coal to nearly 300,000 acre-feet per year. This is the single largest water right identified in this study. It is not clear whether any of this water is used at Colowyo Mine, but its diversion point on the Yampa River is located within a few miles of the mine. In addition, Colowyo Coal owns several other surface water rights totaling nearly 20,000 acre-feet per year. Because Colowyo Mine itself uses only a small fraction of this, the water is likely used in several places.

Foidel Creek Mine is owned by TwentyMile Coal Co. and located near Milner. We estimate that it uses about 30 acre-feet of water each year, as it produces slightly more coal than the Deserado and Colowyo mines. TwentyMile Coal Co. owns a host of groundwater and surface water rights that may be used in part at the mine. The groundwater rights entitle TwentyMile Coal to around 250 acre-feet of water each year, while the surface water rights allow TwentyMile Coal to divert nearly 300,000 acre-feet each year. As with the other Colorado mines, these rights are likely used in many locations for a variety of purposes.

Trapper Mine is owned by Trapper Mining, Inc. and located near Craig. It probably uses around 25 acre-feet of water each year, as it is similar in size to Deserado Mine. This water comes primarily from a single surface water right owned by Trapper Mining and from 4 groundwater permits. The surface water right entitles Trapper Mining to about 18,700 acre-feet each year, while the groundwater permits total 800 acre-feet per year.

King II Mine is owned by GCC Energy LLC and located near Hesperus, in southern Colorado. It is the smallest coal mine in Colorado within the Colorado River Basin. The mine likely uses less than 10 acre-feet of water each year, which probably comes from a single groundwater permit owned by GCC Energy that allows it to pump 48 acre-feet per year. GCC Energy also owns several surface water rights, including one entitling it to about 7,600 acre-feet per year.

Craig Generating Station is owned by Tri-State G&T, PacifiCorp, Platte River Power Authority ("PRP"), SRP and the Public Service Company of Colorado ("PSCC") and is located near Craig, Colorado. It used about 13,300 acre-feet of water for cooling purposes in 2020. According to the EIA, all this water was surface water from the Yampa River. This accords with our research, which revealed that the primary water right associated with the power plant is a surface water right owned jointly by PacifiCorp, PSCC, PRP, SRP and Tri-State G&T. This right

entitles its owners to about 43,440 acre-feet of water per year, but 25% of this is “conditional,” meaning it could potentially be taken away in the event of a conflict with higher priority water rights. Such conflict is unlikely at this point because of the advanced stage of most Colorado water rights adjudications. The same handful of companies own several additional (smaller) surface water rights that may be used at Craig Generating Station, but it is unclear whether or to what extent these rights overlap with the primary right.

Lastly, **Hayden Station** is owned by PSCC, PacifiCorp and SRP and is located near Hayden, Colorado. It used approximately 4,300 acre-feet of water for cooling purposes in 2020. Consistent with the EIA's data indicating that all of this was surface water from the Yampa River, there are three primary surface water rights associated with Hayden Station. Two of these are owned jointly by PacifiCorp, PSCC and Tri-State G&T, and one is owned wholly by PSCC. Together, these rights entitle their owners to about 91,000 acre-feet of water each year. Since the power plant uses only a small fraction of this, it is very likely that the rights are used at many different locations. There are several other smaller surface water rights owned by the companies that own Hayden Station, but it is not clear whether these rights are used at the power plant.

NEW MEXICO

New Mexico Water Law. Like Arizona and Colorado, New Mexico law treats surface water and groundwater as two distinct resources, but, unlike Arizona and Colorado, the legal rules governing the allocation of these resources in New Mexico are mostly the same. Surface water is allocated according to the law of prior appropriation and may be severed and sold separately from the land.²⁰ Groundwater, while once largely unregulated and governed by the “reasonableness” standard, is now subject to the same prior appropriation system as surface water. Comprehensive groundwater regulation in the state began in 1931, when the legislature declared all water to be a public resource subject to appropriation.²¹ These statutory changes authorize the State Engineer to “declare” groundwater basins, triggering heightened groundwater regulation.²² As of 2006, every basin in New Mexico has been “declared.”²³

New appropriations of both surface water and groundwater require a permit from the state, as do transfers of water rights. Under New Mexico law, conserved water can be shielded from forfeiture and banked under certain conditions. This option is available only to approved acequias and ditch companies and would thus require communities to comply with regulatory prerequisites before relying on banking as an option.

The primary regulatory authorities in New Mexico with jurisdiction over water are the New Mexico Office of the State Engineer, which administers and records water rights in the state, the New Mexico Environmental Department and the New Mexico Public Regulation Commission.

New Mexico Coal Facilities. There are five New Mexico coal facilities within the Colorado River Basin. Four of them – all but the El Segundo Mine – are located in the San Juan River sub-basin, which is currently undergoing a general stream adjudication that could impact the ownership and amount of existing water rights, as well as the availability of new rights. El Segundo is within the Little Colorado Watershed, along with the Arizona coal facilities.

²⁰ N.M. Const. art. II, § 2.

²¹ N.M. Rev. Stat. Ann. § 72-12-1.

²² N.M. Rev. Stat. Ann. § 72-12-25.

²³ *Declared Groundwater Basins*, N.M. Office of the State Engineer, <https://www.ose.state.nm.us/WR/groundWater.php> (last visited July 15, 2022).

Four Corners Power Plant is owned by APS, Pinnacle West, SRP, TEP and the Public Service Company of New Mexico (PNM) and is located near Fruitland, on land leased from the Navajo Nation. According to EIA data, the power plant used about 17,000 acre-feet of water for power generation and cooling in 2020, all from the San Juan River.

San Juan Generating Station is owned primarily by PNM and TEP and is located near Waterflow. EIA data show that in 2020, the generating station used approximately 6,200 acre-feet of water from the San Juan River.

Navajo Mine is owned by Navajo Transitional Energy Co. and Navajo Coal Co. and is located near Fruitland. We were unable to find information about the Navajo Mine's annual water usage. However, this mine produces about the same amount of coal as the Skyline Mine in Utah, so we estimate that it uses around 50 acre-feet of water each year.

San Juan Mine is owned by BHP Billiton and located near Farmington. The water usage of this mine is unknown, but it is about half the size of Navajo Mine, so we estimate that it uses about 25 acre-feet each year.

There are several large water rights associated with the four facilities above, but because the facilities are located near each other and are owned by the same group of companies, it is difficult to know which water rights are used at a particular location. It is most likely that the rights are shared between all four facilities. The first large water right is owned by Navajo Coal Co. and entitles the company to 51,600 acre-feet of surface water each year. The second right, owned by PNM and TEP, entitles these companies to 20,200 acre-feet of surface water annually. The third right is a 370-acre-foot groundwater right also owned by PNM and TEP. There is also a major water agreement between BHP Billiton, APS, PNM and the Jicarilla Apache Tribe which is meant to ensure a diverse water supply but does not allow for additional consumptive use.

Lastly, **El Segundo Mine** is owned by Peabody Energy and is located near Grants. This mine produces a little more coal than Sufco Mine in Utah, so we estimate that it uses about 60 acre-feet of water each year. The mine gets its water from two groundwater rights owned by Peabody, supplying a total of 1,650 acre-feet per year.

UTAH

Utah Water Law. Unlike most other states in the Colorado River Basin, Utah law treats surface water and groundwater as the same resource – both are governed by prior appropriation and all the rights are recorded together.²⁴ This legal structure is known as “unified.” This means that, in contrast to New Mexico, groundwater rights in Utah may be severed and sold separately from the land, as can surface water rights. All new appropriations of water, whether surface water or groundwater, require a permit from the Utah Division of Water Rights.²⁵ “Perfected” water rights (i.e., rights that are finalized, certificated, decreed or proven by certain types of claims) are transferrable by deed, while unperfected rights are transferrable only via application to the Division of Water Rights.²⁶

The primary regulatory authorities in Utah are the Utah Division of Water Resources, the Utah Division of Water Rights, the Utah Public Service Commission and the Utah Department of Environmental Quality. Water rights are administered and recorded by the Division of Water Rights.

24 Utah. Const. art. XVII, § 1; *Wrathall v. Johnson*, 40 P.2d 755 (Utah 1935).

25 Utah Code Ann. § 73-2-1.

26 Utah Code Ann. §§ 73-1-10, 73-3-18.

Utah Coal Facilities. Utah has eleven coal facilities within the Colorado River Basin, and an additional facility near the Basin's boundary. Most river basins in the state are undergoing general water rights adjudications, except for the Weber River, Sevier River and Green River basins. In these latter basins, water rights are relatively settled, although some litigation is still ongoing. Most of the Utah coal facilities receive their water from rights owned by operators and other parties, including nearby municipalities. These water rights use a mix of groundwater and surface water sources.

Coal Hollow Mine is owned by Alton Coal Development and located near Alton. Its exact water usage is unknown, but we estimate that it uses about 50 acre-feet of water each year. All of this water comes from a single water right owned by the nearby town of Alton, which entitles the town to a total of 138.9 acre-feet of water each year. Exactly 50 acre-feet of this is reserved for Coal Hollow Mine and purchased by Alton Coal from the town.

Sufco Mine is owned by Wolverine Fuels LLC and located near Salina. It used about 53.5 acre-feet of water in 2021. The mine gets its water primarily from three water rights, all owned by Canyon Fuel Company LLC (Wolverine Fuels' predecessor in interest at the mine), with a total capacity of 2,250 acre-feet per year. Canyon Fuel and Wolverine Fuels own several other smaller water rights near the mine that entitle them to a total of 175 acre-feet per year.

Emery Mine is owned by Bronco Utah Operations LLC and located near Huntington. It used only about 3.26 acre-feet of water in 2021. Bronco Utah Operations owns the primary water right associated with the mine, with a total capacity of approximately 2,345 acre-feet per year. This right is likely also used at other places besides the mine. Bronco Utah Operations and the Town of Emery also own several other water rights in the area that might be used in part at Emery Mine. These rights have a total capacity of about 3,800 acre-feet per year for mining and industrial uses.

Lila Canyon Mine is owned by Murray Energy and located near Sunnyside. Its exact water usage is not known, but it is approximately half the size of Sufco Mine, so we estimate that it uses around 25 acre-feet of water each year. The source of this water is unclear, but Emery County Coal Resources owns several water rights in the area, amounting to 480 acre-feet per year, that may be used at the mine. One other water right, owned by the Emery Water Conservation District, with a capacity of 3,200 acre-feet per year, may also be used at the mine.

Dugout Canyon Mine is owned by Wolverine Fuels LLC and located near Price. It has been closed since 2019, but that year the mine used 93.80 acre-feet of water. This water came from one primary water right owned by Canyon Fuels, entitling Canyon Fuels to 245 acre-feet of water from an underground spring. Canyon Fuels owns one other water right in the area with a capacity of 181 acre-feet per year for industrial uses, though it is unclear whether this water right is used at Dugout Canyon Mine.

Castle Valley Mine is owned by Castle Valley Mining LLC and located near Huntington. Its annual water use is not known, but the mine is a quarter of the size of Emery Mine, which used less than 4 acre-feet of water in 2021. Castle Valley Mining shares one water right with the Huntington-Cleveland Irrigation Company, entitling Castle Valley to 16.67 acre-feet of water each year.

Skyline Mine, a coal mine, is owned by Wolverine Fuels LLC and located near Helper. Its water usage in 2021 was 46.37 acre-feet. The primary water right associated with the mine is owned by Canyon Fuel Company LLC, supplying 427 acre-feet of water each year. Canyon Fuel owns three other water rights in the area surrounding the mine with a total capacity of 266 acre-feet per year, but it is not clear whether these rights are used at Skyline Mine.

Hunter Power Plant is owned by Utah Associations Power Systems, Deseret Power Electric Co-op, Provo City and PacifiCorp and located near Castle Dale. The plant used about 16,400 acre-feet of water in 2021. It gets its

water from three primary sources: (1) water rights owned by the Cottonwood Creek Irrigation Company, in which PacifiCorp is a shareholder, supplying 4,845 acre-feet each year; (2) water rights owned by the Ferron Canal & Reservoir Co., in which PacifiCorp is a shareholder, and a corresponding water lease between Ferron and PacifiCorp, together supplying 5,913 acre-feet per year; and (3) a water supply contract between PacifiCorp and the Emery Water Conservancy District, supplying 5,683 acre-feet per year. This tracks with the EIA's records, which report that Hunter Power Plant obtained all its cooling water from Cottonwood Creek in Utah.

Sunnyside Cogeneration Facility is owned by ACI Energy and Colmac Utah Inc. and located near Sunnyside, Utah. The facility used 954 acre-feet of water in 2021. East Carbon City has one water right for 723 acre-feet that cited Sunnyside as one of the various uses. The rest of the water came from water rights owned by Sunnyside Cogeneration Associates, which total about 14,100 acre-feet of groundwater and surface water, though these water rights also supplied other facilities.

Huntington Power Plant is owned by PacifiCorp and located near Huntington, Utah. It used about 12,000 acre-feet of water in 2021. This water came primarily from several water rights owned by the Huntington-Cleveland Irrigation Co., in which PacifiCorp is a shareholder, and two rights owned directly by PacifiCorp. Together, these rights have a capacity of nearly 400,000 acre-feet per year, so they are very likely used in other places besides Huntington Power Plant. According to the EIA, Huntington Power Plant gets its cooling water entirely from Huntington Creek, but our research indicates that the sources are more varied.

Bonanza Plant is owned by Utah Municipal Power Agency and Deseret Generation & Transmission Co. ("Deseret G&T") and is located near Vernal. The plant used 5,442 acre-feet of water in 2021. As the EIA correctly reports, Bonanza Plant gets all this water from the Green River, under a water right jointly owned by Deseret G&T and the Utah Municipal Power Agency with a capacity of 10,859.5 acre-feet per year. Deseret G&T also owns another water right in the area entitling it to an additional 10,859.5 acre-feet of water per year, but it is not clear whether this right is used at Bonanza Plant. Because the plant's main water rights are on the Green River, they are relatively more secure compared to rights in other basins still undergoing general adjudications.

Finally, **Intermountain Power Plant** is owned by Intermountain Power Agency and is located near Delta. It used about 7,233 acre-feet of water in 2020. The mine gets its water rights from over a dozen water rights, all owned in whole or in part by Intermountain Power Agency, with a total capacity of 15,300 acre-feet per year. Intermountain Power Plant is not within the Colorado River Basin, but it is near the Basin's boundary, such that its water use could impact Basin water resources.

WYOMING

Wyoming Water Law. Wyoming law treats surface water and groundwater as two distinct resources. Surface water is allocated according to a relatively simple version of prior appropriation. Wyoming's constitution simply states: "Priority of appropriation for beneficial uses shall give the better right [to appropriable water]." ²⁷ Like Colorado, Wyoming designates certain priorities of use, favoring domestic and municipal uses over agricultural and industrial uses. ²⁸ Since statehood, the only way to obtain a surface water right in Wyoming is to apply for a permit from the State Engineer. ²⁹ The state must also approve any changes or transfers of surface water rights. ³⁰ Surface rights are severable from land and can be freely bought or sold, subject to the state's approval.

²⁷ Wyo. Const. art. 8, § 3.

²⁸ Wyo. Stat. § 41-3-102.

²⁹ Wyo. Const. art. 8, § 5.

³⁰ Wyo. Stat. § 4-3-104.

Groundwater rights, on the other hand, are tied to land ownership and generally divided according to the “reasonableness” standard.³¹ All wells constructed after 1947 must have a permit from the State Engineer.³² The State Engineer usually grants permit applications, unless the well is within a designated groundwater control area, where groundwater resources are particularly strained or conflicts between users are ongoing or likely to occur.³³

The primary water regulatory authorities in Wyoming are the State Engineer’s Office, which administers and records all water rights in the state, the Wyoming Public Service Commission and the Wyoming Department of Environmental Quality.

Wyoming Coal Facilities. Wyoming has eight coal facilities in the Colorado River Basin. All the facilities are located in the Green River sub-basin, which Wyoming shares with Utah and Colorado. For the most part, rights in the Green River basin have been fully adjudicated, although some litigation is still ongoing. On balance, the water rights within the Green River sub-basin are relatively more certain than other rights elsewhere in the Colorado River Basin.

Most of the water rights used by the Wyoming coal plants and mines are owned by the same companies that own and operate the facilities themselves. The Wyoming coal facilities generally utilize a mix of surface water and groundwater. For the facilities that rely mostly on groundwater (e.g., the Black Butte Leucite Hills Mine), there could be a similar subflow delineation problem as described for the Arizona coal facilities. However, water demand in Wyoming is currently lower than in other states, and its water resources are comparatively less strained. As a result, it is unlikely that, in the near future, groundwater rights associated with the coal facilities will be invalidated under the priority system for pumping subflow.

Naughton Power Plant is owned by PacifiCorp and located near Kemmerer. It used approximately 7,500 acre-feet of water in 2020, supplied entirely by surface water rights owned directly by PacifiCorp with a total capacity of 14,480 acre-feet per year. This tracks with the EIA’s data, which indicates that all of Naughton Power Plant’s cooling water was surface water from the Ham’s Fork River.

General Chemical Green River Power Plant is owned by General Chemical and Tata Chemicals North America and is located near Green River. The power plant supplies electricity to an adjoining soda ash refining facility. Its water usage is not entirely clear, but we estimate that, judging by how much water larger power plants throughout the Colorado River Basin use, it utilizes less than 500 acre-feet per year (not including water used for other purposes at the refining facility). The plant gets its water exclusively from surface water rights owned by Tata Chemicals, totaling approximately 8,400 acre-feet of water each year.

Genesis Alkali Plant is owned by Genesis Alkali LLC and located near Green River. Like the General Chemical plant, Genesis Alkali Plant supplies electricity to an adjoining soda ash refining facility. Because it has a generating capacity similar to the General Chemical plant, we estimate that the Genesis Alkali Plant uses less than 500 acre-feet of water each year (not including water used for other purposes at the refining facility). The plant gets its water from surface water and groundwater rights owned by Genesis Alkali LLC amounting to 28,200 acre-feet per year.

31 Wyo. Stat. §§ 41-3-930, 41-3-930.

32 Wyo. Stat. § 41-3-905.

33 Wyo. Stat. §§ 41-3-930, 41-3-910, 41-3-912.

Kemmerer Mine is owned by Westmoreland Coal Co. and located near Kemmerer, Wyoming. The mine's exact water usage is unknown, but it produces approximately the same amount of coal as Skyline Mine in Utah, so we estimate that it uses less than 50 acre-feet of water each year. The mine gets all of its water from surface water and groundwater rights owned by Kemmerer Operations, totaling 3,185 acre-feet per year.

Black Butte Leucite Hills Mine is owned by Black Butte Coal Co. and located near Point of Rocks. Like the other mines in Wyoming, its exact water usage is not certain. However, it is about the same size as Kemmerer Mine, so we estimate that it uses less than 50 acre-feet of water each year. The mine appears to get its water exclusively from groundwater rights owned by Black Butte Coal Co. These rights entitle Black Butte Coal to 4,420 acre-feet of water each year.

Finally, **Jim Bridger Steam Plant** is owned by PacifiCorp and Idaho Power Corp. and **Jim Bridger Mine** and **Bridger Underground Coal Mine** are owned by Bridger Coal Co. All three facilities are located near Point of Rocks, within a few miles of each other. Together, the three facilities used about 22,000 acre-feet of water in 2020. The power plant used 21,800 acre-feet, while the mines used an estimated 200 acre-feet. We are reporting these three facilities together because they use water rights owned by the same company (i.e., PacifiCorp), making it difficult to parse out which specific rights are used at which facility. In total, PacifiCorp owns a mix of surface water and groundwater rights associated with the Bridger facilities entitling it to about 130,000 acre-feet each year. This accords with the EIA's records, which indicate that Jim Bridger Steam Plant gets all its water from the Green River, which has been largely adjudicated.

Appendix A: Water Rights and Usage of Coal Facilities in the Colorado River Basin

The following abbreviations are used throughout this table: SW (surface water), GW (groundwater), AF/YR (acre-feet per year), PC (parent company), MW (megawatts), and est. (estimated). Additional abbreviations are defined as they are used.

The state regulatory bodies listed in this table generally oversee and regulate various water resources and/or electric utilities. Each body does not necessarily have authority over each company listed as a facility owner or an owner of coal water rights. For instance, Salt River Project is not subject to the authority of the Arizona Corporation Commission (“ACC”). However, the ACC generally regulates most electric utilities in Arizona and, therefore, may play an important role in the transition away from coal power.

Colorado River Basin Coal Facilities: Water Rights and Usage

Facility	State	City	Production	Closure Date	Facility Owners	Regulators	Water Use	Water Rights Amount, Type	Water Rights Owners
Coronado Generating Station	AZ	St. Johns	762 MW	Units 1 and 2: 2032	Salt River Project (SRP) (100%)	Arizona Department of Environmental Quality	5,200 AF/YR	44,000 AF/YR, GW only	SRP
Springerville Generating Station	AZ	Springerville	1,625 MW	Unit 1: 2027 Unit 2: 2032 Units 3 and 4: TBD	Tucson Electric (TEP) (50%, PC: UNS Energy) Tri-State (25%) SRP (25%)	Arizona Corporation Commission	10,400 AF/YR	77,000 AF/YR, GW only	SRP, TEP, Tri-State G&T
Cholla Power Plant	AZ	Joseph City	767 MW	Units 1 and 2: 2025 Unit 3: 2020	Arizona Public Service Company (APS) (100%, PC: Pinnacle West)	Arizona Department of Water Resources	9,200 AF/YR	9,550 AF/YR, GW only	APS
Kayenta Mine	AZ	Kayenta	6.5 million short tons	Unknown	Peabody Energy (100%)		Unknown (est. less than 100 AF/YR)	11,200 AF/YR, GW only	Peabody

Colorado River Basin Coal Facilities: Water Rights and Usage

Facility	State	City	Production	Closure Date	Facility Owners	Regulators	Water Use	Water Rights Amount, Type	Water Rights Owners
West Elk Mine	CO	Paonia	4.7 million short tons	Unknown	Mountain Coal Company (100%, PC: Arch Resources)	Colorado Department of Natural Resources, Division of Water Resources	Unknown (est. 50 AF/YR)	13,000 AF/YR, SW & GW	Mountain Coal Company
Deserado Mine	CO	Rangely	2.07 million short tons	Unknown	Blue Mountain Energy (100%, PC: Deseret G&T)		Unknown (est. 25 AF/YR)	Approx. 133,300 AF/YR, SW & GW	Blue Mountain Energy, Deseret G&T
Colowyo Mine	CO	Axial	1.47 million short tons	2030	Colowyo Coal (100%, PC: Tri-State G&T)		Unknown (est. 25 AF/YR)	Approx. 320,500 AF/YR, SW & GW	Colowyo Coal
Foidel Creek Mine	CO	Milner	3.05 million short tons	Unknown	TwentyMile Coal (100%, PC: Peabody Energy)	Colorado Department of Public Health and Environment	Unknown (est. 30 AF/YR)	Approx. 300,250 AF/YR, SW & GW	TwentyMile Coal, Peabody Energy
Trapper Mine	CO	Craig	2.14 million short tons	2026-30	Trapper Mining (100%)		Unknown (est. 25 AF/YR)	19,500 AF/YR, SW & GW	Trapper Mining
King II Mine	CO	Hesperus	0.62 million short tons	2043	GCC Energy (100%)		Unknown (est. 10 AF/YR)	7,648 AF/YR, SW & GW	GCC Energy, Hay Gulch Ditch Inc.
Craig Generating Station	CO	Craig	1,285 MW	Unit 1: 2025 Units 2 and 3: 2028	Tri-State G&T (100% of Unit 3, 24% of Units 1 and 2) PacifiCorp (19% of Units 1 and 2, PC: MidAmerican Energy (PC: Berkshire Hathaway)) Platte River Power Authority (18% of Units 1 and 2) SRP (29% of Units 1 and 2) Public Service Company of Colorado (PSCC) (10% of Units 1 and 2, PC: Xcel Energy)		13,300 AF/YR	Approx. 43,440 AF/YR, SW & GW	Tri-State G&T, PacifiCorp, PSCC, Platte River Power Authority
Hayden Station	CO	Hayden	465 MW	Unit 1: 2027 Unit 2: 2028	PSCC (75.5% of Unit 1, 37.4% of Unit 2, PC: Xcel Energy) PacifiCorp (24.5% of Unit 1, 12.6% of Unit 2, PC: MidAmerican Energy (PC: Berkshire Hathaway)) SRP (50% of Unit 2)		4,300 AF/YR	Approx. 91,000 AF/YR, SW only	PacifiCorp, PSCC, Tri-State G&T, TwentyMile Coal, SRP, Platte River Power Authority

Colorado River Basin Coal Facilities: Water Rights and Usage

Facility	State	City	Production	Closure Date	Facility Owners	Regulators	Water Use	Water Rights Amount, Type	Water Rights Owners
Four Corners Power Plant	NM	Fruitland	1,636.2 MW	Units 1–3: 2013 Units 4 and 5: 2031	APS (63%, PC: Pinnacle West) Pinnacle West (7%) SRP (10%) TEP (7%, PC: UNS Energy) Public Service Company of New Mexico (PNM) (13%)	New Mexico Office of the State Engineer New Mexico Environment Department New Mexico Public Regulation Commission	17,000 AF/YR	72,170 AF/YR, SW & GW	Navajo Coal, PNM, TEP, APS
San Juan Generating Station	NM	Waterflow	924 MW	Units 2 and 3: 2017 Units 1 and 4: 2022	PNM (50% of Unit 1, 77.3% of Unit 4) TEP (50% of Unit 1) Various others (22% of Unit 4)		6,200 AF/YR		
Navajo Mine	NM	Fruitland	3.4 million short tons	Unknown	Navajo Transitional Energy Co. Navajo Coal (PC: New Mexico Coal (PC: BHP Billiton))		Unknown (est. 50 AF/YR)		
San Juan Mine	NM	Farmington	1.85 million short tons	Unknown	San Juan Coal Co. (100% PC: New Mexico Coal (PC: BHP))		Unknown (est. 25 AF/YR)		
El Segundo Mine	NM	Grants	5.55 million short tons	Unknown	Peabody Natural Resources (100%, PC: Peabody Energy)		Unknown (est. 60 AF/YR)	1,650 AF/YR, GW only	Peabody Energy
Coal Hollow Mine	UT	Alton	0.5 million short tons	Unknown	Alton Coal (100%)	Utah Division of Water Resources	Approx. 50 AF/YR	50 AF/YR, N/A	Alton UT
Sufco Mine	UT	Salina	4.9 million short tons	Unknown	Wolverine Fuels (100%)	Utah Division of Water Rights	Approx. 53 AF/YR	2,425 AF/YR, n/a	Canyon Fuels, Wolverine Fuels
Emery Mine	UT	Huntington	0.44 million short tons	Unknown	Bronco Utah Operations (100%)	Utah Public Service Commission	Approx. 3 AF/YR	6,145 AF/YR, n/a	Bronco Utah Operations, Emery UT
Lila Canyon Mine	UT	Sunnyside	2.63 million short tons	Unknown	Emery County Coal (100%, PC: Utah American Energy (PC: Murray Energy))	Utah Department of Environmental Quality	Unknown (est. 25 AF/YR)	Approx. 3,680 AF/YR, n/a	Emery County Coal, Emery Water Conservancy District
Dugout Canyon Mine	UT	Price	0.55 million short tons	2019	Canyon Fuels (100%, PC: Wolverine Fuels)		Approx. 94 AF/YR	426 AF/YR, n/a	Canyon Fuels

Colorado River Basin Coal Facilities: Water Rights and Usage

Facility	State	City	Production	Closure Date	Facility Owners	Regulators	Water Use	Water Rights Amount, Type	Water Rights Owners
Castle Valley Mine	UT	Huntington	0.1 million short tons	Unknown	Castle Valley Mining (100%)	Utah Division of Water Resources Utah Division of Water Rights	Unknown (est. 5 AF/YR)	16.67 AF/YR, n/a	Castle Valley Mining, Huntington-Cleveland Irrigation Company
Skyline Mine	UT	Helper	3.6 million short tons	Unknown	Canyon Fuels (100%, PC: Wolverine Fuels)	Utah Public Service Commission	Approx. 46 AF/YR	693 AF/YR, n/a	Canyon Fuels, Price River Water Users Association
Hunter Power Plant	UT	Castle Dale	1,361 MW	2042	Utah Associated Municipal Power Systems (14.58% of Unit 2) Deseret G&T (25.11% of Unit 2) Provo City (6.25% of Unit 1) PacifiCorp (93.7% of Unit 1, 60.31% of Unit 2, 100% of Unit 3, PC: MidAmerican Energy (PC: Berkshire Hathaway))	Utah Department of Environmental Quality	15,100 AF/YR	16,441 AF/YR, n/a	Cottonwood Creek Consolidated Irrigation Company, Ferron Canal & Reservoir Company, PacifiCorp, Emery Water Conservancy District
Sunnyside Cogeneration Facility	UT	Sunnyside	51 MW	Unknown	Sunnyside Cogeneration Associates (100%, PC: ACI Energy and Colmac Utah Inc.)		Approx. 954 AF/YR	14,823 AF/YR, n/a	Sunnyside Cogeneration Associates
Huntington Power Plant	UT	Huntington	909 MW	2036	PacifiCorp (100%, PC: MidAmerican Energy (PC: Berkshire Hathaway))		7,000 AF/YR	Approx. 400,000 AF/YR, n/a	PacifiCorp, Huntington-Cleveland Irrigation Company
Bonanza Plant	UT	Vernal	458 MW	Unknown	Utah Municipal Power Agency (3.75%) Deseret G&T (96.25%)		4,000 AF/YR	21,720 AF/YR, n/a	Deseret G&T, Utah Municipal Power Agency
Intermountain Power Plant	UT	Delta	1,900 MW	2025	Intermountain Power Agency		7,200 AF/YR	Approx. 15,300 AF/YR, n/a	Intermountain Power Agency, City of Delta

Colorado River Basin Coal Facilities: Water Rights and Usage

Facility	State	City	Production	Closure Date	Facility Owners	Regulators	Water Use	Water Rights Amount, Type	Water Rights Owners
Jim Bridger Mine	WY	Point of Rocks	1.99 million short tons	Unknown	Bridger Coal Co. (100%, PC: MidAmerican Energy (PC: Berkshire Hathaway))	Wyoming State Engineer's Office	Unknown (est. 100 AF/YR)	Approx. 130,000 AF/YR, SW & GW	PacifiCorp
Bridger Underground Coal Mine	WY	Point of Rocks	2.21 million short tons	2021	Bridger Coal Co. (100%, PC: MidAmerican Energy (PC: Berkshire Hathaway))	Wyoming Public Service Commission	Unknown (est. 100 AF/YR)		
Jim Bridger Steam Plant	WY	Point of Rocks	2,119 MW	Unit 1: 2023 Unit 2: 2028 Units 3 and 4: 2037	PacifiCorp (67%, PC: MidAmerican Energy (PC: Berkshire Hathaway)), Idaho Power Corp. (33%)	Wyoming Department of Environmental Quality	21,800 AF/YR		
Black Butte and Leucite Hills Mine	WY	Point of Rocks	2.5 million short tons	Unknown	Black Butte Coal Co. (100%)		Unknown (est. 50 AF/YR)	4,420 AF/YR, GW only	Black Butte Coal Co.
Kemmerer Mine	WY	Kemmerer	4.02 million short tons	Unknown	Westmoreland Coal Co. (100%)		Unknown (est. 50 AF/YR)	3,185 AF/YR, SW & GW	Kemmerer Operations
Naughton Power Plant	WY	Kemmerer	832 MW	Unit 3: 2019 Units 1 and 2: 2025	PacifiCorp (100%, PC: MidAmerican Energy (PC: Berkshire Hathaway))		7,500 AF/YR	14,480 AF/YR, SW only	PacifiCorp
Genesis Alkali Plant	WY	Green River	41 MW	Unknown	Genesis Alkali LLC (100%, PC: Genesis Energy LP)		Unknown (est. 500 AF/YR)	Approx. 28,200 AF/YR, SW & GW	Genesis Alkali
General Chemical Green River Power Plant	WY	Green River	30 MW	Unknown	General Chemical (100%)		Unknown (est. 500 AF/YR)	8,400 AF/YR, SW only	Tata Chemicals

Appendix B: State Water Law Summaries for Laypersons

Arizona: Kathleen Ferris et al., Ariz. Town Hall, *Keeping Arizona's Water Glass Full* 30-52 (Nov. 2015), <https://aztownhall.org/resources/Documents/107%20Background%20Report%20web.pdf>.

Colorado: Gregory J. Hobbs, Jr., Water Education Colorado, *Citizen's Guide to Colorado Water Law* (2021), https://issuu.com/cfwe/docs/weco_cgwlaw_5thed_final.

New Mexico: Adrian Oglesby, ed., Univ. of New Mexico School of Law, *Water Matters*, ch.1 (Basic Water Law Concepts) (2015), <https://uttncenter.unm.edu/resources/research-resources/basic-water-law-concepts.pdf>.

Utah: J. Craig Smith & Jeffry R. Gittins, Smith Hartvigsen PLLC, *Water Law for the Layman*, <https://smithhartvigsen.com/water-law-for-the-layman/> (last visited July 15, 2022).

Wyoming: Pat Tyrrell, States West Water Resources Corp., *Bear River Basin Planning: Wyoming Water Law Summary* (2001), <https://waterplan.state.wy.us/plan/bear/2001/techmemos/waterlaw.pdf>.

Appendix C: Scholarly Articles on Climate Change Impacts on Surface Water Flows in the Colorado River Basin

Katrina E. Bennett et al., *Characterizing Drought Behavior in the Colorado River Basin Using Unsupervised Machine Learning*, *Earth & Space Sci.* (2022).

Katrina E. Bennett et al., *Climate-Driven Disturbances in the San Juan River Sub-Basin of the Colorado River*, 22 *Hydrology & Earth Sys. Scis.* 709 (2018).

P.C.D. Milly & K.A. Dunne, *Colorado River Flow Dwindles as Warming-Driven Loss of Reflective Snow Energizes Evaporation*, 367 *Science* 1252 (2020).

Homa Salehabadi et al., *White Paper No. 4: The Future Hydrology of the Colorado River Basin*, Ctr. for Colorado River Studies, Quinney College of Nat. Res., Utah State University (Aug. 31, 2020).

Connie A. Woodhouse & Brad Udall, *Upper Gila, Salt, and Verde Rivers: Arid Land Rivers in a Changing Climate*, 26 *Earth Interactions* 1 (2022).