Water in Wyoming:
A History of Irrigation from 1868–1979

Jonathon C. Horn & Michael J. Prouty

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Wyoming State Parks & Cultural Resources

Prepared for the Wyoming State Historic Preservation Office
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On the cover: An unnamed canal associated with the Shoshone Project near Ralston, Park County, Wyoming. The image shows the canal, the outlet structure, a vehicle with passengers, and Hart Mountain in the background. Unnamed canal, Kuska Collection, No. P72-79/26, Wyoming State Archives.

ABSTRACT

THE WESTERN UNITED STATES HAS been formed by many events and trends. The development of irrigation was a defining moment for many groups of people. In arid climates in the southwestern United States and other regions (although not evident in Wyoming), Native American groups began utilizing irrigation techniques a millennia ago. With the onset of European and American colonization of the western United States, irrigation practices took root almost immediately. Irrigation not only served to develop agriculture but also influenced economic and social development. Irrigation played a vital role in the development of the State of Wyoming by transforming land that had been perceived as suitable only for grazing into land that was productive for farming when water was applied. The state's water history is defined by initial small irrigation efforts in the Territorial and early statehood periods to increasingly sophisticated and large irrigation projects through the 1970s. Private financing and engineering overseen by the state under the Carey Act and federal funding and design expertise by the federal government under the Newlands Act and later acts are responsible for most of the areas under agricultural irrigation to the present day. These large irrigation projects not only stimulated agricultural development, but also spurred and encouraged colonization of areas throughout the state resulting in an important agricultural economic base for the state. Given the wide use of irrigation within Wyoming, ditches, canals, and other irrigation-resources are frequently encountered during cultural resource and historic preservation work. The following context provides the historical background of irrigation in the state, a description of expected property types, guidance on how to evaluate the significance of those resources, and best practices for their recordation.

ACKNOWLEDGEMENTS

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INTRODUCTION

"MOST ASSUREDLY NO ONE CAN raise a crop or anything like a crop in quantity as quality with out [sic] irrigation" (Pollard 1890:7). This quote by Charles A. Pollard in 1890 encapsulates the importance of what irrigation means to Wyoming.[1] For millennia, Native groups adapted to the harsh conditions of the Northern Plains and Rocky Mountains and thrived in the arid conditions by following the ebbs and flows of various weather patterns that dominate the region. In contrast, early Euroamerican settlers to Wyoming were often more familiar with the humid, fertile farmlands common farther east in the United States than the extreme conditions they found in Wyoming. To survive the harsh, aridness of this new environment and to live a sedentary lifestyle, they needed to adapt. Irrigation was the solution. Once established, irrigation became essential infrastructure to the historical settlement and development of Wyoming.

Irrigation has a long and often complex history in Wyoming. Water is a vital resource, not only as a basic human necessity, but for the development and prosperity of various industries, including agriculture, transportation, electrical generation, and mining, to name a few. Each industry varies in the amount of water it requires, but irrigation for agricultural purposes has, and continues to, dominate the use and control of water throughout the state. The control of water has directly influenced the acquisition and distribution of land in Wyoming and has not been without controversy and legal battles. These legal fights ultimately resulted in various complicated laws and regulations, including various international and interstate compacts and state and local ordinances that govern the distribution and use of water.

Irrigation has also influenced the social development of the state. Primarily, it has affected settlement patterns and economic development. This can be seen in the development of individual and large-scale irrigation systems. Elwood Mead (1889:4), Wyoming's first Territorial and State Engineer, wrote that to "build large ditches…requires either a community of efforts on the part of the farmers owning the land or the introduction of capital to build canals and rent water." As Mead further summarized, to develop successful irrigation systems, the endeavor needed a collaborative effort by the users to

[1] Charles A. Pollard (1848-1895) was an early settler in Converse County who developed his ranch property through irrigation from La Bonte Creek, a tributary of the North Platte River south of Douglas, beginning in 1885 (Bowen 1901:123). He testified before the U.S. Senate in 1890 regarding irrigation.

construct it or, as was more common, the injection of capital provided by a company to construct. Both methods fostered significant development––be it through an individual or small-group effort or the formation of companies and corporations––and impacted the social organization of the communities the systems serviced.

The construction of an irrigation system seems simple but, in actuality, requires complex engineering to effectively convey water across the landscape (**Figure 1**). Systems vary in intricacy from a simple system that provides water to a single user to multifaceted Canal and Ditch Systems that convey water to a larger group of users. Each system is made of various features, including canals and ditches, flumes, pipelines, diversion structures, and headgates, to name a few. Most Canal and Ditch Systems have long histories and have undergone routine maintenance, upgrading, and improvement through time, but nearly all continue to function as they were originally designed. They are common historical resources that are frequently encountered and documented during cultural resource management projects in the state. Given the complexity and significance of irrigation resources, the Wyoming State Historic Preservation Office (SHPO) determined that a historical context was needed to assist cultural resource specialists in documenting and evaluating these resources. Alpine Archaeological Consultants, Inc. (Alpine) of Montrose, Colorado was retained by the Wyoming SHPO to conduct research and compile the context. The context was developed in association with the Wyoming SHPO's Advisory Committee on Historic Context Development, as well as a working group that consisted of representatives associated with the Bureau of Reclamation (BOR), Natural Resources Conservation Service (NRCS), and the United States Fish and Wildlife Service.

This document presents the results of Alpine's research. It begins by summarizing the methods used to conduct research and defines the geographical and chronological extents of the context. Next, the historical background for the development of irrigation in Wyoming is presented. This section spans from the Territorial Period (1868–1890) until the 1970s and summarizes major topical issues and chronological periods that were important in the development of irrigation in the state. The historical background is followed by detailed descriptions of the various property types that are associated with irrigation systems, as well as the features that make up those property types. Next, the significance and methods necessary to evaluate the significance of irrigation-related property types to the National Register of Historic Places (NRHP) is presented. This is followed by an analysis of previously documented properties within the state. Data gaps and future research goals derived from the previous documentation analysis are then discussed. Finally, the context concludes with management recommendations.

Irrigation in the western United States contributed significantly to colonial expansion and substantially impacted the development of social, commercial, and legal norms region wide. These impacts were especially noteworthy in Wyoming. The following context will assist cultural resource specialists with identifying and accurately placing encountered irrigation property types into an appropriate historical context to make meaningful interpretations regarding these resources and their role in Wyoming history.

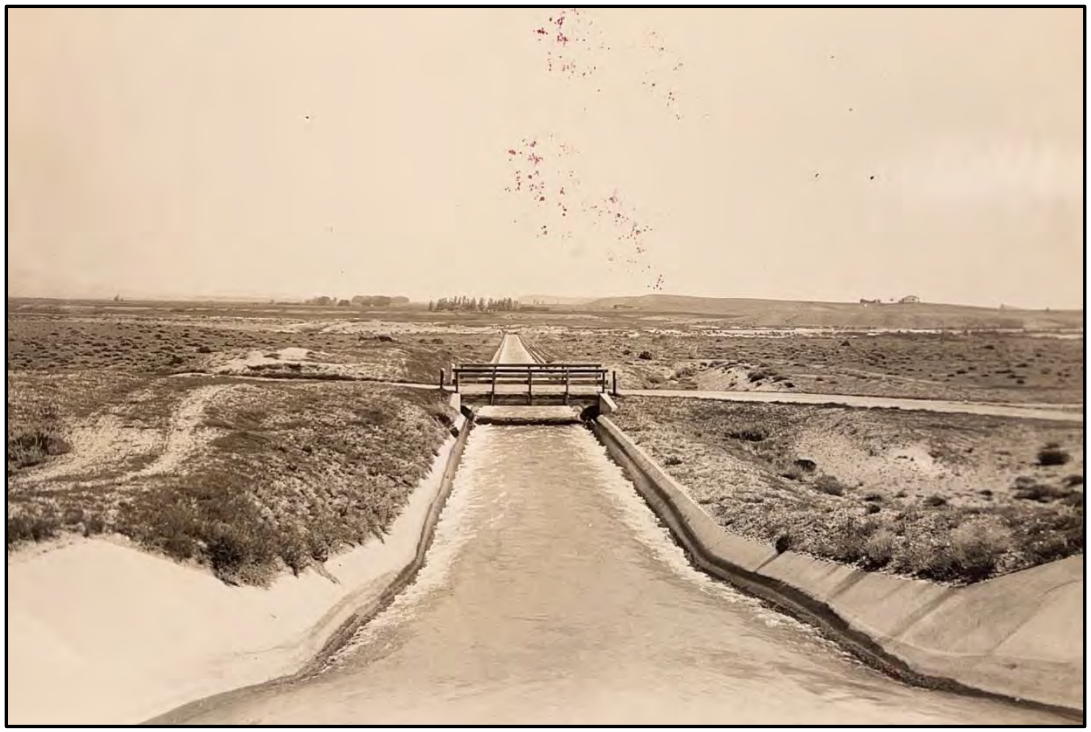


Figure 1. Historical photograph of the Gorland Canal in Wyoming circa 1926. Gorland Canal, Kuzka Collection, P72-P79/49, Wyoming State Archives.

CONTEXT METHODS

THIS CONTEXT FOLLOWS THE STANDARDS set-forth by the Wyoming SHPO's *Guidelines for the Development of Historic Contexts in Wyoming* and uses a variety of data sources. This section describes the research methods and data sources consulted. In addition, chronological and geographic extents are defined and discussed.

Archival Research

Primary document research utilized sources available online and at local archives. Online research occurred from April to December 2021. Consulted documents included BOR reports, Wyoming State Engineer biennial reports, U.S. Department of Agricultural reports, U.S. Geological Survey reports, and historical newspapers through the Wyoming Digital Newspaper Collection database. A variety of other documentary sources were consulted and accessed through online searches and through Alpine's extensive library of historical references. Biennial reports, Carey Act project documents, receipts, engineering drawings and reports, ledgers, photographs (**Figure 2**), brochures, promotional materials, and other such documents relating to irrigation in Wyoming were examined at the Wyoming State Archives on October 29, 2021 and from December 8–10, 2021. Focus was given to five collections in particular: Carey Act Records; State Engineer Publications; Lands Department Publications; Chicago, Burlington & Quincy Railroad Collections; and the Joseph Pykoski Collection. Secondary resources included regional histories, Wyoming Water Development Commission reports, historical contexts, and various cultural resource reports.

Cultural resource geographic information systems (GIS) data was acquired from the Wyoming SHPO in April 2021, and included spatial data and its associated metadata. These data were used to compile information regarding previously documented, irrigation-related resources and property types for the state. Data for irrigation-related properties were also verified and supplemented through the Wyoming SHPO's WyoTrack online database and through the State of Wyoming's e-Permit water rights online database.

Figure 2. Historical photograph, circa 1904–1908, of the Douglas Canal in Converse County, Wyoming. Douglas Canal, J.E. Stimson Collection, STIMSON NEG 2923, Wyoming State Archives.

Chronology and Topical Organization

History is not always a simple, linear event––history can be concurrent and one event can impact other aspects of a historical subject. This is the case for the history of irrigation in Wyoming. As a result, this context is presented both chronologically and topically. The initial section provides an overview of Wyoming's history chronologically that introduces acts, laws, and events that have shaped irrigation practices in the state. The next section discusses the history in terms of periods of significance that discusses the irrigation history more completely and uses key legislative acts as a way of placing major irrigation into defined categories that overlap in time. The initial section presents the history of irrigation during the Territorial and Early Statehood periods (1868–1894). This is followed by a topical, but also similarly chronologically distinct period, related to the implementation of the Carey Act and the associated projects related to that period (1894–1954). Following the Carey Act, although at times contemporaneous with Carey Act projects, is a history of irrigation projects that occurred under the Newlands Reclamation Act (1902–1979) and the Pick-Sloan Missouri River Basin Program (1944–1975). Following the Pick-Sloan Missouri River Basin Program section is a discussion of various irrigation districts and federal works programs (1907–1960s). Finally, the historical context concludes with a summary of major, privately initiated projects that occurred mostly after the Carey Act and Newland Act projects; however, some of the projects occurred concurrently with state or federal projects (1891–1970s).

Geographic Division

Certain topics within the context, such as the discussion of previous resource recordings and data gaps, are best presented geographically. To this end, the context utilizes river basin divisions, as defined by the Wyoming Water Development Office. These divisions separate the state into seven areas that encapsulate 18 distinct watersheds in Wyoming (**Figure 3**). Although many of the river basins cover entire counties, many of the river basins split counties (**Table 1**). A summary history of each basin is discussed below under the Wyoming Water Law section. GIS data were initial sorted by county, then by river basin, by using the intersect tool within ESRI's ArcMap 10.4. The same program was also used to create the maps presented in the context.

Table 1. Wyoming River Basins by Watershed and Associated Counties.

Basin Division	Watersheds	Associated Counties
Wind-Big Horn	Missouri Headwater	Northwestern Teton and western Park.
	Upper Yellowstone	Northeastern Teton and central Park.
	Big Horn	Southeastern Park, Big Horn, northwestern Sheridan, Washakie, Hot Springs, northwestern Natrona, and the northern and central portions of Fremont.
Powder-Tongue	Tongue	Central Sheridan and the northwestern corner of Johnson.
	Powder	Southeastern Sheridan, the northern and western portions of Campbell, Johnson, the southeastern corner of Washakie, the northeastern and central portions of Natrona, and the western edge of Converse.
Northeast	Little Missouri	The eastern edge of Campbell and northwestern Crook.
	Belle Fourche	The south-central portion of Campbell, Crook, and northwestern Weston.
	Cheyenne	Southeastern Campbell, Weston, the northern half of Converse, and the northern and central portions of Niobrara.
	Niobrara	Southeastern Niobrara and the northeastern corner of Goshen.
Platte	North Platte	Southern Fremont, the southern and central portions of Natrona, southern Converse, the southwestern corner of Niobrara, Goshen, Platte, the northern half of Laramie, Albany, Carbon, and the northern edge of Sweetwater.
	South Platte	The southern half of Laramie and the southeastern corner of Albany.
Green	White-Yampa	Southwestern Carbon and the southeastern corner of Sweetwater.
	Great Divide Closed Basin	Northwestern Carbon, northeastern Sweetwater, and the southern edge of Fremont.
	Upper Green	The central and eastern portions of Sweetwater, Sublette, southeastern Lincoln, and the eastern and central portions of Uinta.
Bear	Upper Bear	Western Uinta and southwestern Lincoln.
	Weber	The extreme southwestern corner of Uinta.
Snake-Salt	Snake Headwaters	Northern Lincoln, northwestern Sublette, and the southern and central portions of Teton.
	Upper Snake	Western Teton

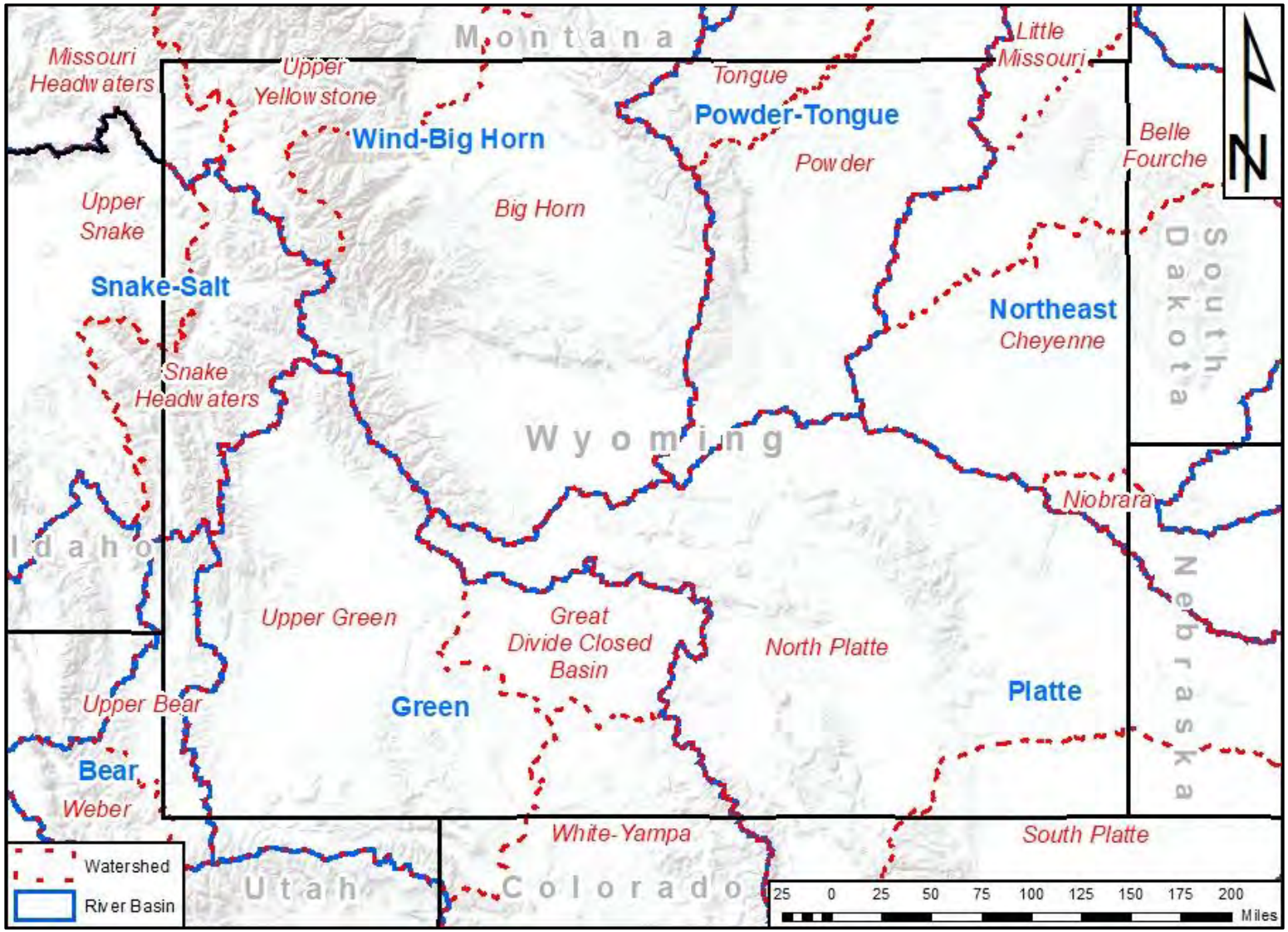


Figure 3. River basin divisions within Wyoming with associated watersheds.

WYOMING SETTLEMENT AND PERTINENT WATER LAW

Initial Settlement

NATIVE AMERICANS RESIDED ON THE lands that make up Wyoming for millennia. These were nomadic groups that understood the available natural resources and lived off the land. To date, no use of irrigation is known by prehistoric Native American groups in Wyoming. Soon after the Lewis and Clark Expedition made their way to the Pacific Coast in 1806, some of the expedition members entered Wyoming on their return eastward. Mostly though, early exploration by non-Natives was largely by fur trappers beginning in the 1810s. A few immigrant parties and missionaries passed through Wyoming on their way to California, Oregon, and Washington in the 1830s and early 1840s, as did Mormons (Latter Day Saints) on their way to the Salt Lake Valley in 1846 and 1847. Initial settlement in Wyoming was associated with the establishment of Fort Laramie and Fort Bridger in the 1840s. These small enclaves resulted in limited agriculture, including by a group of Mormons settlers sent to the area by the church in 1853 at what became known as Fort Supply and at Fort Bridger, which was acquired by the Mormon Church in 1855. The primary concern of settlement at these two forts was assisting Mormon immigration to the Salt Lake Valley. Although some crop production was attempted, it was of little consequence. By 1857, Fort Bridger was in the hands of the U.S. Army (Twitchell 1959). In addition to Mormon immigration to the Salt Lake Valley, the discovery of gold in California in 1848 spurred the greatest movement of people along what became known as the Oregon and California trails. These early travelers were destined for points farther west and had no intention of establishing residence in Wyoming, but their consumption of natural resources during their travels depleted resources critical to local Native American groups that lived in the area. As traffic along the trails increased, hostilities with Native American groups intensified. U.S. government interaction with the Native American groups in the region was initially to ensure safe passage of these immigrants by the military, which often provided escorts and began to erect fortifications for the stationing of troops. The 1851 Treaty of Fort Laramie was the first formal negotiation with Native Americans in Wyoming. It was intended to enable safe passage of travelers and formally permit the establishment of military posts at key points along the trails. The treaty resulted in the recognition of regional Native American groups as sovereign nations, established the territories of those groups, and paid them for the use and occupation of the travel routes and military posts on their land. The Shoshone Indian Reservation was established by the Treaty of 1868 that was negotiated on July 3, 1868. Conflicts between Native Americans, travelers, and the U.S. military gradually increased and were particularly pronounced with the construction of the Union Pacific Railroad after the Civil War as part of the Transcontinental Railroad that connected eastern rail lines to California in 1868. These conflicts throughout the Northern Plains resulted in the forced establishment of other reservations for those groups on diminished lands outside of the Wyoming Territory.

Wyoming Territory

Wyoming Territory was created on July 25, 1868, from portions of Dakota (1861), Nebraska (1854), Idaho (1863), and Utah (1850) territories. The Territory was divided into five original counties in 1869. Over time, these have been subdivided into the 23 counties that exist today. At the time Wyoming Territory was established, agricultural settlement existed largely along the Union Pacific Railroad's newly constructed transcontinental railroad (which generally followed the same corridor as the Overland Trail) and near military posts in the region.

Settlement of Land under the Homestead Act and other Acts

The Homestead Act of 1862 distributed large amounts of land in the U.S. public domain in the Midwest and western United States to private ownership through a formal process of filing an application, living on the land, and making a living from it through farming or ranching. It was the means by which settlers in Wyoming were able to formally acquire land from the federal government. The Homestead Act was not the first land acquisition act passed by the Federal Government. The Land Ordinance Act of May 20, 1785 authorized the Treasury Department to survey and sell land within the public domain to generate revenue to pay debts incurred during the Revolutionary War. Prior to being sold, the government required that the land be surveyed. A standard rectilinear prior survey was used to divide land into one-mile-square sections in six-by-six-mile blocks arranged along baselines as Townships and Ranges. This is the same Public Land Survey System still in use today. The General Land Office (GLO) was created on April 25, 1812 to manage the sale of land from the public domain. Cash Entry sales were first instituted under the Land Act of April 24, 1820, that enabled purchase of 80–160 acres of the public domain for a minimum of $1.25 per acre. Later, payment of $1.25 per acre was used by entrants wishing to forego the obligation of having five years' residency under the Homestead Act.

The Homestead Act was the first act that enabled land acquisition from the public domain with no cost except filing fees. The Homestead Act was created to facilitate the growth of an agrarian society by encouraging free farmers, as opposed to slave-based agriculture. Southern secession and the subsequent American Civil War removed the slavery issue from land acquisition. The Homestead Act went into effect on January 1, 1863, the same day President Lincoln signed the Emancipation Proclamation, which freed slaves in Confederate-occupied states.

The Homestead Act enabled anyone of at least twenty-one years of age or the head of a family who had never borne arms against the U.S. government, including single women and previously enslaved people, to acquire up to 160 acres of land from the public domain. An entrant had to file a claim, reside on the land for five years, build a home, make improvements, and farm or ranch the land. He or she also had to be a citizen or acquire citizenship prior to satisfying the entry requirements. After six months, entrants had the option to forego the five-year residency requirement and simply pay $1.25 per acre to acquire title. In return, entrants received a patent transferring the property from the public domain to the private individual. Land acquisition under the Homestead Act ended in the continental United States in 1976 and in Alaska in 1986.

In order to facilitate the settlement of less desirable lands, additional acts were established. These included the Timber

Culture Act, the Desert Land Act, the Forest Homestead Act, the Enlarged Homestead Act, and the Stock Raising Homestead Act. The **Timber Culture Act** of March 3, 1873, made it possible for an individual to acquire an additional 160 acres of land if 40 acres of it were planted in trees. The erroneous premise behind the Timber Culture Act was that the presence of trees increased rainfall on the plains. It was also recognized that trees were an important resource for fuel, building materials, and windbreaks. Compliance with the act was fraught with fraud and other difficulties, resulting in its repeal in 1891. The **Desert Land Act** of March 3, 1877 was an amendment to the Homestead Act intended to promote settlement of arid lands through irrigation in all of the western states and North and South Dakota. Initially, the Desert Land Act authorized the issuance of 640 acres to a single individual, but this was later reduced to 320 acres. Proof of irrigation was required within three years, and improvements worth $1.25 per acre were necessary. The **Forest Homestead** Act of June 11, 1906, was implemented to satisfy opponents of Forest Reserves, who were concerned that land suitable for agriculture was being withheld from private ownership. Homesteads filed upon within Forest Reserves and National Forests were reviewed by the Forest Service for compliance. The act was amended in 1913 so that only three years of residence were required rather than the five years required under the Homestead Act. The **Enlarged Homestead Act** of February 19, 1909 was enacted to facilitate dry-land farming in all western states except California. Lands suitable for settlement under the act were classified as such by the GLO and excluded irrigable lands and land with timber or valuable minerals. Homesteaders could acquire up to 320 acres of land under the act. The **Stock Raising Homestead Act** of December 29, 1916, was implemented to facilitate settlement on lands unsuitable for agriculture other than animal grazing. The Stock Raising Homestead Act authorized issuance of up to 640 acres of land. There were not any land cultivation requirements; however, at the time of final proof, improvements worth $1.25 per acre had to have been made on the land. Entrants received no mineral rights (Horn 2015).

The Union Pacific Railroad Land Grants

The Union Pacific Railroad was built across southern Wyoming and other states in 1868. Construction was incentivized by the granting the odd numbered sections of federal lands for 20 miles on either side of the constructed tracks. The idea was that the railroad company would be able to sell the tracts of land to recoup the cost of construction. In order to facilitate the granting of the land, the corridor along the railroad was among the first surveyed into sections. In Wyoming, little of the route had appealing agricultural value, though irrigation projects on Union Pacific-granted lands were subject to agricultural settlement land sales and irrigation from the North Platte River. Near Saratoga, Wyoming, the intervening federal lands were included in the North Platte Canal project under the Carey Act. The Union Pacific attempted to recoup some of their construction costs by entering the cattle business and was able to sell some of the better grazing lands to large livestock operations, including those of F. E. Warren, Territorial Governor George Baxter, the Wyoming Land and Improvement Company, and the Swan Land and Cattle Company. The failure of the railroad to entice buyers to most of their granted lands and the undesirability of the intervening federal lands resulted in the checkerboard pattern along the strip of the railroad to the present day. The Union Pacific and subsequent railroads that constructed lines in Wyoming were instrumental in promoting agriculture in the state as a way to increase the volume of commercial traffic along their routes.

Wyoming Water Law

The general format and historical foundation of this section is based on *A History of Water Law, Water Rights & Water Development in Wyoming, 1868–2002* (Cooper 2004). Numerous other sources were consulted to expand on the information. The initiation of water law in Wyoming began during the Territorial Period and remains the foundation for irrigation to the present day. The laws first codified by the Territorial Legislature were refined and expanded upon for inclusion in the State Constitution at the time of statehood in 1890. Legal challenges and additional legislation resulted in a complex set of laws that defy easy explanation and are beyond the scope of this section. The general concepts of Wyoming water law are explained below, but water law is so complex that legions of lawyers have made careers in interpreting, refining, and battling over the meaning and application of the laws.

The first law that regulated the use of water in the Wyoming Territory was the Mining Act of July 26, 1866, which recognized the right of citizens to possess water rights by appropriation[2] on federal lands and establish canal and ditch rights-of-way across federal lands. In 1869, the Territorial Legislature recognized the rights of citizens to appropriate and convey water with no restriction on quantity. In addition, no permission was required to construct ditches or canals. At that time, there was no governmental oversight or recordkeeping for the appropriation of water. If a group of three or more people associated themselves in a venture, they were required to file incorporation papers. This was typical governmental regulation of business that happened to include some ventures focused on the acquisition and use of water.

The concept of "first in use, first in right" developed as the recognized system of water rights priority in Wyoming Territory. In other words, later users were restrained from actions that could be considered detrimental to earlier appropriators. Ditches and canals were required to be built and maintained so that the water they carried would not cause injury to another party. Damaging or interfering with the improvements of a ditch company was made illegal. Initially, appropriations consisted of the quantity of water necessary to satisfy the appropriator's needs and included water lost to seepage, evaporation, or other loss along the way.

As the population grew, demand for water also increased. The increased use of water resulted in the 1876 Territorial Legislature passing the first legislation pertaining to water ("Irrigation" 1876 Wyoming Session Laws 377-379). Outlined within the legislation, the Territorial Legislature ensured that:

- Ditches had to be maintained.
- Water for agriculture could be appropriated to the degree that the soil could hold it.
- Water could be conveyed across another person's land to land distant from the source[3].
- In times of reduced water availability, water would be made available to users on a rotating system and not based on appropriation date or quantity of appropriation, ensuring water availability for the good of all. The rotation process was instituted and overseen by designated commissioners when needed.

[2] The appropriation date is when an applicant claims they acquired the right to divert the water and use it for beneficial use.

[3] This has since been removed as a legal right and its removal resulted in considerable conflict.

The continued agricultural settlement of the Wyoming Territory prompted the establishment of irrigation companies to administer and operate various ditches. From 1870–1890, 134 irrigation companies were incorporated (see Appendix A). It should be noted that nine of the 134 companies had multiple incorporation dates and various initial capital stock amounts (Department of the Interior 1885). Nearly two-thirds of the companies were incorporated between 1884 and 1886 (**Figure 4**). The initial capital stock varied from a few hundred dollars to one million dollars for the Wyoming Development Company and the Goshen Hole Irrigation Company, representing various efforts in the development and scale of the projects. Companies with relatively low capital stock likely represent small-scale irrigation projects that serviced a few ranches or farms. Conversely, the higher capitalized companies likely represent large-scale projects that serviced numerous users and acres. The first large water project in the Wyoming Territory was the Pioneer Canal, which was built in 1879 from the Big Laramie River by the Pioneer Canal Company. It included the construction of the first reservoir in the state. In 1883, cattlemen Joseph Carey, Horace Plunket, William Irvine, and Francis E. Warren organized the Wyoming Development Company to construct a water system from the Big Laramie River. This highly capitalized venture resulted in the Wyoming Development Company Canal near Wheatland, which provided water on a large scale. Charles A. Pollard (1890:11) offers insight into his belief that these types of highly capitalized projects were beneficial to the overall development and settlement of the territory:

> As the land is in its natural state, it must lie forever worthless for ages; by a liberal policy & allowing land enough to be entered to make an inducement to capitalists to reclaim it. Poor men will be constantly employed at a good cash price & by their employment will in their turn be enabled to subsist & carry out their own land entries on a smaller scale in accordance with their means.

Pollard believed that the territory's long-term, successful agricultural development—and subsequent settlement—hinged on highly capitalized irrigation projects (**Figure 5**). Pollard stated that, for agriculture to be successful, large tracts of land needed complex irrigation projects to reclaim them (i.e., prepare the land for cultivation) (Pollard 1890:8). He concluded that the average homesteader would only have enough resources to make an adequate irrigation system to prove up on their land entry alone. More intensive agricultural settlement could only be accomplished through large-scale ventures.

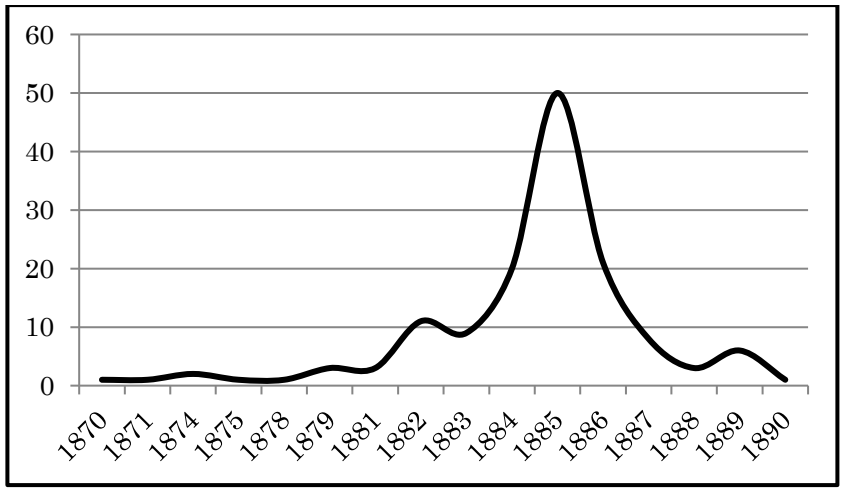


Figure 4. Distribution of Territorial Period irrigation companies by year incorporated, 1870–1890.

Figure 5. An undated historical photograph of an open, earthen ditch used to convey water through pasture and fields near Worland, Wyoming. Irrigation Canal, Worland WY, J.E. Stimson Collection, STIMSON NEG 3146, Wyoming State Archives.

The establishment of the first large irrigation projects and the growth of land acquisitions from the public domain prompted new legislation in 1886 for better water management and regulation (Blake et al. 1887):

- Eight "irrigation districts" (not to be confused with private irrigation districts allowed by statute beginning in 1907 for management of irrigation systems) were formed, each with designated water commissioners.
- Acceptable uses of water were identified, and overuse of water beyond its beneficial purpose was not permitted.
- Dates of priority were considered in the distribution of water, but designated amounts still needed to be codified.
- Water users were required to file a claim statement that gave the date of appropriation based on construction, the ditch capacity, and the quantity of water claimed.
- Someone with intent to appropriate water was also required to make a filing.
- Adjudication[4] of water was done by county courts.
- Streambeds were designated as carriers of water from a reservoir for diversion downstream, with an accounted-for allowance for loss due to seepage and evaporation.
- Dams built across flowing streams had to include fish passages and provisions made for floating logs, lumber, or timber to pass it in a sluiceway.
- Reservoir owners were liable for damages caused to others.
- Water appropriators were required to prevent fish from entering ditches.
- Owners were responsible for road damage due to flooding caused by overflow or failure of their ditches or canals.

The devastating winter of 1886–1887 resulted in tremendous die-offs of cattle on the open range and devastated ranching in Wyoming. Cattlemen whose businesses survived became cognizant that their business model had to change. The most significant change was a recognition that stock raisers needed to produce sufficient feed for their animals to survive the winter rather than rely on the overgrazed public domain for year-round forage, resulting in an increased demand for water to grow forage crops.

[4] Adjudication is the date that the courts decree the existence of a water right.

In 1888, legislation formalized the oversight of water with the establishment of a Territorial Engineer whose duty was to oversee all of the water in the Territory and to supervise County Water Commissioners (1888 Wyoming Session Laws 115-122). Before the creation of the Territorial Engineer, county judges, with little or no knowledge of the actual water quantities available in streams, had been granting more water to appropriators than was available, and in quantities greater than could be beneficially used. The Territorial Engineer was tasked with quantifying water flows in streams so that appropriate adjudication of water could be made and with certifying the carrying capacity of ditches. The official unit of measurement for water was specified as cubic feet per second (cfs). The first Territorial Engineer was Elwood Mead of the Colorado Agricultural College (now Colorado State University) in Fort Collins, Colorado (**Figure 6**).

Water users were required to install a measuring device near their point of diversion so that the proper flow of water into a ditch could be regulated (**Figure 7**). In instances when an appropriator was diverting more water than could be used beneficially, the appropriator was required to make the excess water available to other users at a reasonable cost. This meant that the owner of a ditch could be compensated for the use of his ditch to convey water to another user when excess water was available. In addition, legislation identified domestic water use as being of the highest priority in times of water shortage. Stream diversions were not allowed to prevent fish passage, and wording in the legislation further reinforced the need to prevent fish from entering canals and ditches.

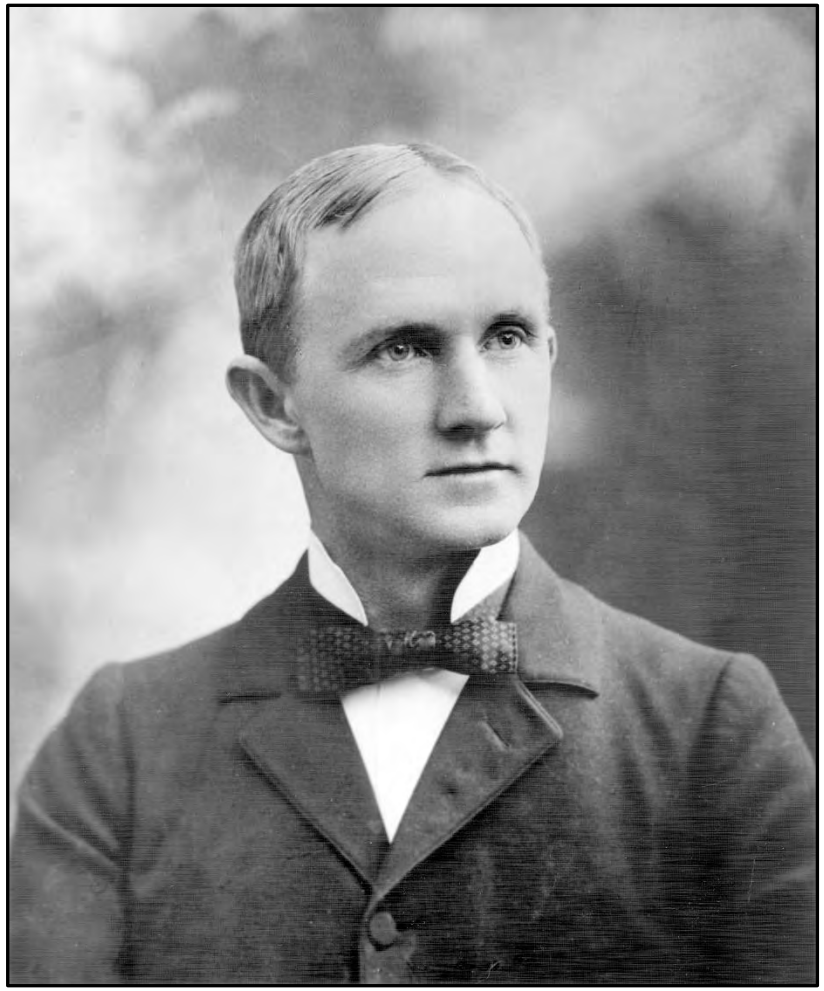


Figure 6. Elwood Mead (1858–1936), circa 1890. Elwood Mead Portrait, Bio File – Mead, Elwood, SUB NEG 2462, Wyoming State Archives.

Figure 7. Example of the intake structure, circa 1909, of the West Side Ditch by the North Platte Valley Irrigation Company. Intake West Side Ditch, J.E. Stimson Collection, STIMSON NEG 2934, Wyoming State Archives.

Anticipation of Wyoming statehood resulted in the development of a State Constitution in 1889 and 1890, which included water laws. Of great importance to water development in the state was that the Constitution established that municipal corporations had the same rights as individuals for the appropriation of water for domestic and municipal use. The Constitution established a Board of Control, headed by the State Engineer, to administer the state's water through four Water Divisions. Elwood Mead was appointed the State Engineer, and the four Water Divisions reflected the major river basins.

Division 1: North Platte, Laramie, and Little Snake rivers.

Division 2: Cheyenne, Belle Fourche, Little Missouri, Powder, and Tongue rivers.

Division 3: Wind, Bighorn, and Clark rivers

Division 4: Green, Bear, and Snake rivers

Prior to 1890, the state was divided into nine "irrigation districts," separate from the four Water Divisions. These were designated generally along county lines and corresponded with District Court boundaries. With statehood, adjudication decisions were transferred from the District Courts to the Board of Control. A process was established for the adjudication of water rights claims, resulting in the issuance of Certificates of Appropriation for recording in the respective County Clerk's office. A "Tabulation of Water Rights" that was developed for all existing water rights claims up to that time has been updated regularly to include newly adjudicated water rights as they occur. It is the primary document relied upon to understand adjudicated water rights priorities to the present day. New water rights go through the permitting process and require the preparation of a plat. Permits are for the use of water in a certain designated place only.

In 1891, Wyoming's first stream gaging station was installed on Clear Creek in Johnson County. In 1899, partnership ditches were required to have someone in a position of authority to equitably distribute water to the partners of a system beyond the initial diversion. State water commissioners did not have water-management jurisdiction beyond the initial diversion.

River Basin History

As mentioned above, upon statehood, Wyoming was divided into four water divisions centered on the major watersheds within the state: the Platte, the Powder, the Wind-Big Horn, and the Green. These divisions were administered by a superintendent. The superintendent and a state engineer made up the Board of Control, whose purpose was to resolve disputes among water users and to protect water rights among the state and private citizens (Roberts 2014). Unique to Wyoming was that the state owned all rights to water; however, this did not account for the water rights that were due to the Eastern Shoshone and Northern Arapahoe tribes. In the 1868 treaty that established what would become known as the Wind River Reservation, water was a defined natural resource, which was a right for the tribe. However, it was not until the 1990s, that the Wyoming Supreme Court ruled (and upheld by the U.S. Supreme Court) that the 1868 Treaty established a first in right priority for the tribes to the water supplied by the Wind River and that the state did not own those water rights (Roberts 2014). The administrations of the water rights continue to be managed by river basin, which today is comprised of seven basins, and a summary history is presented below.

Wind-Big Horn River Basin

The Wind-Big Horn River Basin consists of primarily Fremont and Park counties, as well as Big Horn, Washakie, and Hot Springs counties. This area has been the traditional lands for various Native American groups; however, following the 1851 Fort Laramie Treaty (also known as the Horse Creek Treaty), it was primarily occupied by the Crow and the Shoshone. In 1868, the Shoshone Reservation was formed around the Wind River in the northern portion of Sweetwater County. Fremont County was organized in 1884 from this portion of Sweetwater County. Big Horn County was formed from portions of Sheridan, Johnson, and Fremont counties in 1890. Park County was formed from the western portion of Big Horn County in 1909. As the population continued to grow in the region, Washakie and Hot Springs counties were formed in 1911 out of the southern portion of Big Horn County. In terms of agriculture, the basin has primarily focused on raising alfalfa, although spring grains have been grown as well. Other crops include grass, hay, corn, beans, and sugar beets. As of 2010, approximately 566,000 acres of the water basin are irrigated through various ditches and canals (Wyoming Water Development Commission 2010a).

Powder-Tongue River Basin

The Powder-Tongue River Basin is mostly comprised of Johnson and Sheridan counties, although portions of Campbell and Natrona counties are within the basin. Prior to sustained Euroamerican settlement, the region was the traditional lands of primarily the Sioux and Cheyenne. In the first half of the nineteenth century, the area, especially the Powder River Basin, was a frequent fur trapping region. Little settlement occurred in the region until the discovery of gold in adjoining areas (e.g. the Black Hills in South Dakota or in the Rocky Mountains in Montana) in the 1860s and 1870s, which prompted additional migration into the region. As settlement continued, Johnson County was formed out of the northern portions of Carbon County in 1880 (although it was formed from the un-organized Pease County). Sheridan County was formed from the northern portion of Johnson County in 1888. Natrona County was formed in 1890 from the northern portion of Carbon County, and Campbell County was formed in 1911 from the western portions of Crook and Weston counties. The region has been used for agriculture since initial settlement, although ranching has been a major commercial endeavor as well. Farmers and ranchers in the region have traditionally grown alfalfa, although grasses, corn, and various grains have also been cultivated. As of 2002, when a summary of data is last available, approximately 160,000 acres were under active cultivation (Wyoming Water Development Commission 2002a).

Northeast River Basin

The Northeast River Basin consists of Crook, Weston, and Niobrara counties, as well as the southeastern portion of Campbell County and the northeastern portion of Converse County. Similar to the Powder-Tongue River Basin, the area has been the ancestral lands of a number of Plains tribes, but primarily the Sioux and Cheyenne. The 1868 Fort Laramie Treaty established this area as part of the hunting grounds for Native American Plains tribes and expressly outlined that settlers could not pass through the region without the permission of the tribes. However, settlement and trespasses continued, and the discovery of gold in the Black Hills in

the 1870s amplified illegal trespassing. By the mid-1870s, Wyoming territorial government pressured the U.S. Congress to force the Sioux and Cheyenne onto reservations and to open the area to homesteading. This pressure, coupled with the allure of the resource-rich areas of the Black Hills, resulted in U.S. military actions against the Sioux and Cheyenne and their forced removal to dedicated reservations. The area quickly became settled, and ranching, mining, and logging operations took hold as a driving economic force. Some dry-land farming occurred, especially in Niobrara County.

In 1884 Crook County was formed out of the northern portion of Albany and Laramie counties, and, in 1890, Weston County was formed out of the southern portion of Crook County. Converse County was established in 1888 from portions of Albany and Laramie counties. Niobrara County was formed in 1910 in what was the eastern portion of Converse County, and Campbell County was established in 1911 from the western halves of Crook and Weston counties. The region has mostly focused on ranching, although farming does occur. As of 2002, approximately 77,300 acres were under cultivation for a variety of crops. The majority of the irrigated lands in 2002 were for hay grass and alfalfa, with some grains and corn grown (Wyoming Water Development Commission 2002b).

Platte River Basin

The Platte River Basin is comprised of Albany, Laramie, Platte, and Goshen counties, as well as parts of Converse, Natrona, and Carbon counties. The region consists of the state's highest population, with the towns of Cheyenne and Laramie within the basin. The region has been used by numerous Native American groups, including the Sioux, Cheyenne, Arapahoe, and others. The region along the North Platte River was a primary transportation corridor for Native Americans. Fur trappers and traders used the river corridor to access points farther west in the 1820s and 1830s. Settlers traveling to Oregon, the Salt Lake Valley, and California between the 1830s and the 1850s followed the Oregon, Mormon Pioneer, and California trails along the river through the region to reach their destination. This mass migration strained natural resources along the river corridor, especially for Native American groups. As a result, the 1851 Fort Laramie Treaty was signed intending to define traditional territories for Native American groups, as well as determine compensation from the U.S. government. In exchange, the treaty laid out safe passage for settlers along the trails in the region. Additionally, it allowed the U.S. to lay claim to the river corridor through which they sought to build a transcontinental railroad. By the late 1860s, the railroad had been constructed south of the North Platte, with communities such as Cheyenne and Laramie being established along the route. Encouraged by the establishment of the railroad, the areas along the North Platte River and along the railroad were opened to settlement. Ranching quickly took hold in the area, as well as some farming and other industries, including coal mining, became important economic endeavors.

Albany, Laramie, and Carbon counties were formed when the Territory of Wyoming was established in 1868. The counties were initially long strips oriented south to north between the southern and northern borders of the territory. Converse County was established in 1888 from portions of Albany and Laramie counties. Natrona County was established in 1890 from the northern half of Carbon County. Platte and Goshen counties

were formed in 1911 from the northern portions of Laramie County. Livestock has been the primary focus of agriculture in the region. In 2012, approximately 523,600 acres of land were under cultivation. Crops associated with livestock production, including grass hay, and alfalfa hay accounted for nearly 80 percent of irrigated lands. Other crops, however, are grown, including beans, sugar beets, and various grains (Wyoming Water Development Commission 2016)

Green River and Bear River Basins

The Green River and Bear River basins share a similar history so are presented together. The Green River Basin is primarily two counties: Sweetwater and Sublette. The basin covers portions of Carbon, Lincoln, and Uinta counties. The Bear River Basin is the smallest and consists of the far western portions of Uinta and Lincoln counties. Although various Native American groups utilized the region, including the Crow, Sioux, Arapahoe, and Ute, among others, it has been the traditional lands of the Shoshone. The first Euroamericans in the region were fur traders making their way into the Rocky Mountains, particularly along the Green River, where annual rendezvous also occurred. The Oregon, Mormon, Pioneer, and California trails crossed through the southern portion of the region and brought numerous westward-bound settlers into the area. The construction of the Transcontinental Railroad in the late 1860s continued to establish a Euroamerican presence in the region. As with other portions of the state, ranching took root in the region; however, coal mining also became an important industry and contributed to the area's economic development.

Sweetwater (originally Carter County), Carbon, and Uinta counties were established as three of the original counties of the Territory of Wyoming in 1868. All three stretched from Colorado to Montana. Lincoln County was formed in 1911 from portions of Uinta County. Sublette County was organized in 1921 from the western portion of Fremont County and the eastern portion of Lincoln County. Ranching has been, and continues to be, a primary industry in the region, although some farming does occur. As of 2010, approximately 334,500 acres are irrigated within the Green River Basin for agricultural use. Crops related to livestock, such as grass and alfalfa hay, are the primary crops within the area, with limited cultivation of other crops, such as beans or grains (Wyoming Water Development Commission 2010b). Approximately 64,000 acres in 2011 were irrigated in the Bear River Basin, with the majority of that being used for grass and alfalfa hay (Wyoming Water Development Commission 2012).

Snake-Salt Basin

The Snake-Salt Basin consists primarily of Teton County, although the northern portion of Lincoln and a small portion of Sublette counties are also within the basin. The region is characterized by the high-elevation mountains of the Teton Range of the Middle Rocky Mountains. The region is the traditional lands of the Shoshone and the Bannock tribes. Given the high elevation, it is likely that the Native American tribes used the region during the summer months. However, some evidence suggests that groups wintered in the valley around Jackson Hole. In the 1820s and 1830s, the region was a popular fur trapping area. After the collapse of the fur trade, the region continued to be used by Native American tribes; Euroamerican

activity in the area was limited to occasional U.S. military and government expeditions. In 1872, Yellowstone National Park was formed, covering a vast expanse of the region and began conservation efforts within the region. Conservation efforts culminated in the 1950s when Grand Teton National Park was formed. As such, over 95 percent of Teton County is federally owned. Lincoln County was formed in 1911 from portions of Uinta County. Teton County was organized in 1921 from the northern portion of Lincoln County. Sublette County was organized in 1921 from the western portion of Fremont County and the eastern portion of Lincoln County. Because of the short growing season, given the high elevation of the basin, agriculture has primarily focused on various grass and alfalfa hays. However, some grains have been grown in the valleys. As of 2012, a little over 99,000 acres were irrigated in the basin (Wyoming Water Development Commission 2014).

Government Involvement in Facilitating Irrigation Projects

Federal involvement in developing of large-scale irrigation projects to facilitate agricultural settlement was established by the Carey Act of 1894. The Act was devised by U.S. Senators from Wyoming, Francis E. Warren and Joseph M. Carey, for whom the act was named. The Act came about because there was a sense that vast amounts of arable land existed in the western states that only required water to be productive. The U.S. government agreed to withdraw up to 1,000,000 acres of the public domain in each western state for disbursement through State Land Boards to qualified irrigation projects. Carey Act projects were intended to encourage private investment in irrigation projects well beyond what was possible by individuals or private irrigation companies alone. The goal was to have viable irrigation systems to serve previously unserved lands that would entice major settlement by small farmers through the Homestead Act. Wyoming was well suited to Carey Act projects because large swaths of potentially arable lands were in close proximity to rivers and streams. However, the cost of developing irrigation systems to serve the land on a sufficient scale was beyond the reach of private developers. The federal government partnered with states to facilitate projects by guaranteeing that land suitable for irrigation under a project would be withdrawn from the public domain and made available only to settlers within the project areas. It was up to the states to work with private individuals and companies to develop viable projects, identify the lands to be served, and to contract with companies to construct the systems. The backing of the federal and state governments was intended to give assurance that the projects were viable and legitimate so that investors would be willing to put forth the money to finance the construction (**Figure 8**). The increased value of lands and cost of construction was recouped to some degree by the sale of water to the settlers, which was regulated through state oversight. Once projects were completed, the irrigation systems were put in the hands of local irrigation districts under the management of the farmers benefitting from and utilizing the systems. Initial enthusiasm for Carey Act projects was high, and investment and settlement took off. However, many projects had difficulty reaching full completion, often because of unforeseen construction difficulties. Investment tapered off, and many projects dragged on for years before fresh capital enabled completion or projects ceased after being only partly completed.

Figure 8. A 1908 photograph of grading work occurring during construction of the Shell Canal. Grading work on Shell Canal, Canal Folder, C1226-51, Wyoming State Archives.

The shortcomings of Carey Act projects' federal/state partnerships became quickly apparent and resulted in further consideration of how large-scale irrigation projects in the western United States could be facilitated with more comprehensive federal involvement. The National Irrigation Congress, which promoted the idea of large-scale federal irrigation projects, held annual conferences that drew the attendance of national leaders in irrigation. From this, George Maxwell formed the National Reclamation Association in 1899 as an advocacy group to lobby members of Congress on irrigation matters. A federal reclamation program for the western United States quickly gained momentum through the support of Senators Francis G. Newland of Nevada and Francis E. Warren of Wyoming, Frederick Newell of the U.S. Geological Survey, and President Theodore Roosevelt. Newlands and Maxwell drafted the provisions of the Newlands Reclamation Act, which was approved on June 17, 1902 (Dooley 2001; Roberts 2019). Many of the ideas put forward by the Carey Act were continued under the Reclamation Act, including delineating areas to be served by a project and withdrawing unclaimed lands from the public domain for settlement under the project.

Fifteen western states were included in the original Newlands Reclamation Act, and Texas was added in 1906. The philosophy behind the act was a continuation of the ideals of the Homestead Act: putting small farmers on the land. To this end, federal withdrawals of public lands to be served by the reclamation projects were made available to settlers in 40-acre parcels with total acreage per settler not to exceed 160 acres. Land entrants still had to conform to the provisions of the Homestead Act, but had the further obligation to reclaim half of the land that they obtained for agriculture. The sale of lands to settlers was intended to make the Reclamation Act self-funding through the Arid Land Reclamation Fund. The revolving-fund concept separated funding of the projects from the legislative appropriation process, eliminating uncertainty in financing. In addition, the act gave the Secretary of the Interior the ability to authorize projects without concern for state boundaries, to survey public lands for suitability for inclusion in projects, and to have authority on project siting and construction management (Dooley 2001; Roberts 2019).

In order to satisfy the requirements of the Newlands Reclamation Act, the U.S. Reclamation Service, now known as

the Bureau of Reclamation (BOR), was established under the Department of Interior. Water permits still originated from the State Engineer. Two of the first Reclamation Projects in Wyoming originated as projects under the Carey Act, but had not been completed. The Cody and Salisbury Canal Company Project became the Shoshone Project in 1904, and the Whalen Falls Project became part of the North Platte (Pathfinder) Project in 1905, though most of that latter project irrigates land in Nebraska. In the planning process of the Reclamation Projects, private partnerships were made with local water districts or water users' associations who helped facilitate acquisition of existing water rights and worked with farmers on already claimed lands to subscribe for water. At the completion of projects, these water districts or water users' associations were designated to administer the operation of the projects from that time forward under the oversight of the BOR. These organizations were tasked with ensuring that repayment of the costs of the projects was ongoing with a deadline for full repayment. However, because of economic downturns and other financial considerations, repayment schedules were frequently extended and, eventually, indebtedness was forgiven. As continuing managers of the many large reservoirs that were constructed as components of the Reclamation Projects, the BOR found themselves increasingly in the role of providers of hydroelectricity, which has proven to be a lucrative revenue source. In addition, the reservoirs increasingly became recreational destinations (Dooley 2001; Roberts 2019).

The last federal act that resulted in development of water storage for irrigation projects was the Pick-Sloan Missouri Basin Program authorized under the Flood Control Act of 1944. The Act was the result of studies by the Army Corps of Engineers and the BOR of the entire Missouri River corridor and watershed, which incorporated portions of 10 states, including nearly half of Wyoming. In Wyoming, the focus was on reservoir construction or enhancement for storage of supplemental water for irrigation and hydroelectricity. Other important aspects of the program were flood control, navigation, water supply, recreation, fish and wildlife, and water quality (Bureau of Reclamation 2022; Ostott n.d.).

War and Economic Hard Times from the 1910s through 1930s

Work on Carey Act and Reclamation Act projects was curtailed by manpower shortages as a result of World War I. The state and federal governments expected that the end of the war would bring a new wave of settlers to Wyoming because an abundance of good farmland was still available under Carey Act and Reclamation Service projects. The U.S. government successfully promoted the original Homestead Act of 1862 to returning veterans of the Civil War and attempted to do the same with returning WWI soldiers. They planned to give veterans priority for acquiring land under their projects, but only a few advantages were actually afforded them. One benefit offered to give veterans first preference for entry for the first several months after newly opened lands were made available. Six states attempted to establish veteran agricultural communities, nearly all of which failed, because a crash in agricultural prices following the war created an agricultural depression. The Wyoming town of Veteran, in Goshen County, was on land withdrawn in 1920 by the BOR to give land acquisition priority to World War I veterans. Several veterans

took advantage of the opportunity, and the town of Veteran was established in 1921, though it was never incorporated. Those veterans that took up new homesteads after World War I seem to have been encouraged more by the opportunities of the Homestead Act, despite the economic hard times, rather than other incentives that were offered them (Marcell 2018).

The expected wave of new settlers following World War I did not appear, though a brief uptick in homesteading occurred in about 1920. The World War I war effort stimulated the U.S. economy to provide goods and food for the war effort. However, with the war's end, the government ceased their purchases, and a devastated Europe could not afford American agricultural products. The hardest hit was beef and wheat exports, the mainstay of Wyoming's agricultural economy. A drought began in the summer of 1919, and the harsh winter of 1919-1920 further diminished the productivity of Wyoming farms and ranches. Prices for agricultural products continued to decline in the early 1920s to the point that settlers were unable to make their loan payments. Bank foreclosures further exacerbated the problem. Local banks held properties worth a fraction of what had been loaned on them, making them impossible to sell. The local banks, in turn, were unable to satisfy their financial obligations to the larger banks to which they were indebted. Small banks began to fail, causing ruin even to depositors and loan customers who had been able to weather the financial downturn to that point. Bank failures peaked in 1924. Even though new settlement and irrigation projects resurged briefly in the later 1920s, Wyoming never completely came out of the economic decline, which transitioned quickly into the Great Depression of the 1930s (Rea 1917).

The Depression years of the 1930s drastically reduced the demand for expansion onto new agricultural lands. Farmers had difficulties retaining and working the land that they were already settled upon, and few new settlers had sufficient funds to embark on developing new farming operations. Irrigation districts had difficulty maintaining the irrigation systems that were in place, and considerable degradation took place. In order to put unemployed people to work, the federal government, under the Roosevelt Administration, put programs in place to employ laborers on public works projects of all sorts through the Civilian Conservation Corps (CCC), Works Progress Administration (WPA), and other new governmental institutions. A considerable amount of money and federally subsidized labor was put forward in completing Reclamation Act projects and rehabilitating deteriorating irrigation systems.

The Colorado River Compact and the Law of the River

The Colorado River Compact of 1922 set the groundwork for allocating water to the seven states through which the Colorado River am dots tributaries flow. The seven states had previously been in negotiations about developing and using of the river's water as the League of the Southwest, formed in 1917. The compact divided the seven states into two basins, with the division point being Lee's Ferry, Arizona. It also resulted in extending the Colorado River name above the confluence of the Green River to what had been known as the Grand River in Utah and Colorado. The Upper Basin states are Wyoming, Colorado, Utah, and New Mexico, forming the headwaters of the Colorado River. The Lower Basin states are Arizona, Nevada, and California. Water allocated to each of the basins was determined

to be 7.5-million-acre ft. using a 10-year river-flow average. The compact set the stage for apportioning the river's water to the individual states in the Upper and Lower basins. The Lower Basin states apportioned their water in 1928. The Upper Basin states had to wait until Arizona agreed to the compact in 1944 through the Upper Colorado River Basin Compact of 1948. At that time, Wyoming was allocated 14 percent of the 7.5 million acre ft., or 1.04 million acre ft. of water per year. However, it has become apparent that the calculations on which the allocations were made were from years of unusually high stream flows. Stream flows can vary widely from year to year, and the quantity of water carried by the river, in general, has diminished to the present time, resulting in concern about allocations in recent years. After the Colorado River Compact was negotiated, subsequent agreements refined water use and authorized major reservoir construction, resulting in what is known as the "Law of the River." Included in these agreements were the Boulder Canyon Project Act of 1928, which authorized the construction of Hoover Dam; the Colorado River Storage Project Act of 1956 for the construction of Glen Canyon, Flaming Gorge, Navajo, and Curecanti Project dams; and the Colorado River Basin Project Act of 1968 that authorized the Central Arizona Project. An additional 1.1 million acre ft. of water continuing into Mexico was agreed to in the Mexican Water Treaty of 1944, with additional water possible when it was available (Bureau of Reclamation 2008; Water Education Foundation 2022).

Other Interstate Water Agreements

In addition to the Colorado River Compact of 1922 and the formal division of water between the Upper Basin states under the Upper Colorado River Compact of 1948, three court decrees and five other water compacts relate to irrigation water in Wyoming. The earliest court decree is an agreement with Colorado for water in the Laramie River from 1911 and 1922 that allows Colorado to divert up to 39,750 acre ft. per year. In 1941, Teton Creek and South Leigh Creek were apportioned between Wyoming and Idaho at times of low flow. Water sufficient to irrigate 168,000 acres in Wyoming from the North Platte River was agreed to in 1945 as the result of negotiations with Nebraska, which amounted to one-quarter of the river's flow being allocated to Wyoming as measured at the state line. The Belle Fourche River Compact of 1943 allotted 10 percent of the flow of that river to Wyoming, with the remainder going to South Dakota. The Snake River Compact between Wyoming and Idaho in 1949 apportioned 4 percent of the flow to Wyoming. In 1950, the Yellowstone River Compact allocated the flows of the Powder, Tongue, Bighorn, and Clark's Fork rivers between Wyoming and Montana. The Upper Niobrara River Compact of 1962 restricts reservoir storage on that drainage system in Wyoming. The Bear River Compact of 1978 administers water flowing in the Bear River between Wyoming, Idaho, and Utah (State of Wyoming 2021).

WYOMING IRRIGATION PERIODS OF SIGNIFICANCE

THE IRRIGATION HISTORY OF WYOMING is divided into six periods of significance. Although these have discrete time periods associated with them, they are mostly topical and overlap with each other.

- Early Irrigation during the Territorial Period and Early Statehood, 1868–1894
- The Carey Act and the Initiation of Large-Scale Irrigation Projects, 1894–1954
- Projects Conducted under the Newlands Reclamation Act of 1902, 1902–1979
- Pick-Sloan Missouri Basin Program, 1944–1975
- Management and Maintenance of Irrigation Systems: Irrigation Districts and Federal Works Programs, 1907–1960s
- Irrigation for Wildlife, 1912-1993
- Private Irrigation Projects after Statehood, 1891–1970s

Early Irrigation during the Territorial Period and Early Statehood, 1868–1894

The first irrigation in Wyoming was by Hispanic farmers that planted gardens to supply Fort Laramie using water from the Laramie River (Roberts 2019). This use of water was very specific to the fort itself and does not represent initiation of agricultural irrigation.

Except for possible minor irrigation in the Fort Bridger area in the 1850s, the first mention of ditches being constructed to convey water in Wyoming was for placer mining in the 1860s, and this continued as the prime use of water from streams into the early 1880s. The earliest examples are from mining near South Pass City, in Oregon Gulch by the Summit Ditch Company, and in June Gulch using water from Rock Creek (*The Sweetwater Mines* [South Pass City], June 3, 1868:3; *Cheyenne Leader,* June 1, 1868:1; *Frontier Index* [Laramie], July 3, 1868:6). As soon as the town of Cheyenne was established along the Union Pacific Railroad line in 1867, a reliable water source was sought. Plans to build a ditch from Crow Creek to the new town were formulated with the survey of a ditch route made late that year. The plan was to convey water to the town via the ditch where it was then divided for distribution. In early 1868, a plan by Generals Stephenson and Anger of nearby Fort Russell was to have soldiers build a ditch along the route surveyed by the town to the fort. Once completed to the southern end of the military reservation, the citizens of the town were to finish construction to Cheyenne (*Cheyenne Leader,* November 7, 1867:4; January 11, 1868:1; May 18, 1868:4). The military failed to build their portion of the ditch, and the citizens of Cheyenne began construction on their own in 1870, finishing it by early 1871 (*Cheyenne Leader,* October 28, 1868:1; January 22, 1869:1; *Cheyenne Daily Leader,* August 1, 1870:4; April 26, 1871:4). Although the ditch was built to supply the town with reliable water, it was often referred to as an irrigation ditch, as some of the water was expected to be used to water landscaping in the town and may have provided water for some farming along its route.

Land along the Union Pacific Railroad was withdrawn by the GLO and surveyed with odd numbered sections going to the railroad. Even-numbered sections were restored to the public

domain and made available for settlement beginning May 7, 1868. At that time, it was recognized that agricultural settlement, other than for grazing, would require irrigation (*Cheyenne Leader*, April 10, 1868:1). However, the railroad lands and the intervening sections had few takers, and the land was subject only to livestock grazing. The best land granted to the railroad was sold to the large livestock operations of Francis E. Warren and the Swan Land and Cattle Company and the Wyoming Central Land and Improvement Company in the early 1880s. These large livestock and land companies acquired, or otherwise controlled, the intervening sections. Strategic land acquisitions to control the available water and illegal fencing of the public domain insured large contiguous grazing lands for the livestock companies and an abundance of land for livestock and agricultural development by the land and improvement company.

The first report of a ditch being used for agriculture was when water was diverted from Pole Creek into Crow Valley near Cheyenne (*Cheyenne Daily Leader*, May 6, 1871:3). It is likely that other small diversions were made in the early 1870s to irrigate small tracts used for grazing elsewhere in the Territory, most probably to enhance natural grass growth in adjacent valley bottoms for grazing and, possibly, grass hay harvesting.

The passage of Wyoming Territorial House Bill 24: "Act to Protect and Regulate the Irrigation of Lands of Wyoming" in 1875 gave ranchmen the right to use the water in streams throughout the Territory for irrigation and to build ditches through the land of others (*Laramie Sentinel,* March 19, 1881:2; *Cheyenne Daily Leader*, December 7, 1875:4; *Wyoming Weekly Leader* [Cheyenne], December 18, 1875:1). With legislation in place and the benefits of irrigation demonstrated, irrigation began to take off.

The first organized attempt at constructing an irrigation ditch system to irrigate a large tract of agricultural land was the Pioneer Ditch in 1875, which took water from the western side of the Big Laramie River near the Alsop and Hutton ranches upstream of the town of Laramie. The 6½-mile-long ditch carried water to the federal penitentiary farm at Laramie and was intended to irrigate 4,000 acres of land between the Big and Little Laramie Rivers (*Laramie Daily Sentinel*, June 24, 1875:3). The formative elements of the ditch system may have been constructed to the prison by Warden Nicholas F. Spicer in 1874 (*Laramie Weekly Sentinel,* July 9, 1877:4). How extensive the ditch system was is not known, but in September 1878, the Pioneer Ditch Company was formed to enlarge and extend the ditch to 20 miles in length for the irrigation of 100,000 acres. J. W. Donnelson was the company's chairman, and H. L. Myrick was the secretary. The ditch was planned to be five ft. wide and to carry water 18 in. deep. The contract to construct the ditch was awarded to a Mr. Grant that November (*Laramie Daily Sentinel*, July 9, 1878:4; September 12, 1878:2; *Laramie Weekly Sentinel*, July 13, 1878:2; September 14, 1878:1; October 19, 1878:4; November 16, 1878:2). The original ditch returned water to the Laramie River at the town of Laramie, but when it was extended, it continued through the town until it had a full length of 30 miles by 1880, when water was first turned into the extension. Settlers were encouraged to settle along the route of the ditch using Desert Land Entries to acquire land from the public domain.

Ranchers in the state were initially not very enthusiastic about the project, but the productivity of the land put under irrigation was immediately apparent. Charles Hutton, a rancher on the Big Laramie River, expected to cut 2,000 tons of hay to

ship by railroad to Rawlins, Fort Steele, Fort Saunders, Fort Russel, and Camp Carlin, with some also going to Laramie. Irrigation resulted in 10 times the hay production than without it, which certainly caught the attention of other ranchers, who began to see the benefits that irrigation might bring to them (*Laramie Sentinel,* January 10, 1879:2; July 26, 1879:3; December 6, 1879:2; May 1, 1880:2; May 8, 1880:2; August 7, 1880:3; March 19, 1881:2;). The company planned to extend the canal an additional 15 miles, but interest declined before the full length of the ditch was put into use. But, in 1883, interest was revived, and plans were made to extend the ditch farther (*Weekly Boomerang* (Laramie), May 31, 1883:1; August 30, 1883:5; *Cheyenne Daily Leader*, August 22, 1883:3).

The main drawback to opening large tracts of land to irrigated agriculture was getting land out of the public domain in large enough pieces to attract irrigators. It was possible for individuals to bring water to their land, but the expense was often hard for settlers to afford, and ditches were only as big as an individual and, perhaps, their neighbors could construct using their own labor. Individual settlers or small groups of settlers could not make much of a dent in reclaiming the available land in Wyoming. Many homesteaders found that cultivation took a number of years. Charles A. Pollard (1890:4) described the process as follows:

> ["reclaiming" land for cultivation as taking between] 3 to 6 years, according to the sage brush, alkali, general character of the land as to rock, boulders, gravel, sand, etc. & also the "lay of the land" – if very gravelly or sandy, it requires time for the sediment in the water each spring to flow out upon the sand & gravely land, & "form a soil" – that cannot be excelled by any known process of fertilization...I firmly believe the same land could be "successfully cropped to the same product each and every year forever" as the soil is constantly renewed each year by the "sediment or wash" that comes down the stream with the spring freshet.

Pollard (1890:8) went on to state that the "farmers cannot possibly tell in advance 'what the rainfall of the coming season will be' and when ever [sic] there is sufficient rainfall, or partly sufficient, it only so happens once in 5 years, it is impossible to depend on anything other than 'artificial irrigation.'"

If large-scale agricultural immigration was to take place to Wyoming, large-scale irrigation projects needed to be put into place. Furthermore, the initial projects had to show that valuable crops could be grown if water was applied to the land to entice settlers to move in. The key for speculative land ventures to reclaim arid lands through irrigation was obtaining large tracts of land from the public domain, which was afforded by the Desert Land Act of 1877. The Act enabled an individual to acquire a full 640-acre section of land rather than the 160 acres that could be acquired by an individual under the Homestead Act. Although intended for individual settlers to acquire sufficient land to raise crops or livestock on arid lands, the Act quickly became the means of choice for acquiring large tracts of land for irrigation schemes of all sizes.

By 1883, outside investors had discovered the opportunities that Wyoming Territory had to offer if irrigation could be brought to valley lands with the best agricultural potential. Speculators, many from Colorado who had experience building irrigation systems or were well connected with capitalists looking for a place to invest their money, flocked to Wyoming to find the most suitable places for agricultural

development. Groups of individuals associated with the irrigation speculators filed Desert Land Entries on large tracts of land on their behalf. Once assured of having large blocks of the most easily irrigated lands available, the companies moved forward with their irrigation plans. Once the systems were in place, the companies were able to sell smaller parcels of land to settlers to recoup the investment in the irrigation systems. Although the process of land acquisition through Desert Land Entries was probably fraudulent, it was recognized as the only means to efficiently bring agricultural settlers in large numbers to the arid lands of Wyoming. The Territorial government was greatly interested in enticing new settlers to Wyoming and abetted the method of land acquisition from the public domain by speculators. As an example, Leopold Kabis of the Territorial Commission on Immigration went to Germany in 1884, where he recruited 400 German farmers to settle in Wyoming on land of the Wyoming Ditch Company 60 miles north of Cheyenne on Sybille Creek near the town of Wheatland (*Cheyenne Daily Sentinel,* February 17, 1884:3).

The use of the Desert Land Act to acquire large tracts of land by individuals on behalf of land speculators interested in building large irrigation systems did not go unnoticed by the GLO. In early 1885, Special Agent Sanborn of the GLO was sent from Washington to investigate fraudulent Desert Land Entry claims in Johnson County, particularly those made by the Colorado Ditch Company that filed on 12 sections of land between Little and Big Goose creeks. The claims were temporarily suspended, but no further action seems to have taken place (*Cheyenne Daily Sentinel,* February 15, 1885:1; *Weekly Boomerang* [Laramie], June 14, 1883:9). It does not appear that Desert Land Entry filings were denied by the GLO when they were tied to an irrigation project, and the only cases that seem to have been pursued were when individuals had not attempted irrigation at all.

Irrigation projects instigated by formally organized corporations started in 1883 and peaked in 1885 and 1886. They then tapered off through 1889, probably for a variety of reasons. At the time irrigation schemes began, little water from the streams had been tapped for irrigation. Filings on water from streams were largely unregulated and granted by local governments rather than the Territorial government. As a result, not knowing how much water was actually available from an individual stream, water was over-allocated with more water granted than was available. This soon resulted in conflicts over water rights and irrigation companies going to court to battle each other. Another reason was that, although companies incorporated with large amounts of capital stock available, the ability for them to build their systems required that they had sufficient subscribers to the stock for their projects to move forward. Confidence in the companies had to remain high in order for investors to feel comfortable investing their money, so later corporations may have had difficulty finding the capital necessary to bring their projects to fruition. Delays, difficulties in constructing irrigation systems, and outright failure of companies to complete projects caused investors to think twice about where to put their money. Furthermore, the final necessity was to entice settlers so the companies could sell them the lands now under irrigation and the water that the systems provided. Most of the companies that undertook irrigation projects had full intentions of bringing their projects to a successful conclusion, but a myriad of obstacles made doing so difficult.

Joseph M. Carey was involved in a large irrigation project on Wheatland Flats along the North Platte River that resulted in what was later known as the Wheatland No. 1 Canal. Work on the project began in 1883 by the Wyoming Development Company. As was typical, a large tract of land to utilize the water was obtained from numerous 640-acre Desert Land Entries. Carey's experience with the project made him very cognizant of the difficulties in developing large-scale irrigation projects in Wyoming, and he witnessed firsthand the problems Wyoming was having in properly managing and allocating the water in the state with the growth of irrigation projects in the early and mid-1880s. As a result, Carey, who became a U.S. Senator from Wyoming in 1890, was instrumental in hiring Elwood Meade as the Wyoming Territorial Engineer in 1888.

Born in Indiana, Mead was a graduate of Purdue University in 1882 and worked initially for the Army Corps of Engineers in Indianapolis. He moved to Fort Collins and taught at the Colorado Agricultural College (now Colorado State University) in 1883 and 1884. He then worked for the Colorado State Engineer until appointed as the Wyoming Territorial Engineer in 1888. In Wyoming, Meade had the daunting task before him of better organizing the distribution and allocation of water in the Territory. Of primary concern was understanding the actual availability of water in the streams that were being tapped for irrigation, so that they could be judiciously allocated and fairly distributed. He instituted the installation and monitoring of stream gauges, investigations of existing water systems, and began reviewing and approving plans for irrigation systems and reservoirs to assure that they were properly designed. For irrigation systems, he was particularly concerned that they could actually irrigate the land they were intended for with the water that was available. Such regulation and oversight gave increased confidence in irrigation plans put forth by land developers. As a result of court cases regarding the priority of water rights on streams in the Territory, some of the most used streams at that time had their water rights adjudicated in 1890. Unfortunately, Mead saw problems in the adjudications. Because the actual flows of streams were poorly understood, he knew that the amount of water decreed were excessive and would require adjustment downward when good data was available through stream measurements. He also knew that not all of the irrigators using water from a stream were accounted for and not all streams in an area that contributed water to a drainage system were accounted for, causing conflicts between users and a need for future clarification. In addition, information gathered for the decrees was incomplete and needed to be made complete in order for actual priorities to be assigned and allotments of water quantities to be made accurately (Meade 1890:71-91).

Mead was a great proponent of agricultural expansion in Wyoming through irrigation. He noted in 1894 that corporate irrigation projects were viewed suspiciously by the state and state residents, and that livestock or mining ventures were viewed more favorably, though they were no less speculative. Meade noted that corporate irrigation ventures were the most effective means of getting small farmers onto the land and that three-quarters of the land reclaimed in Wyoming by 1894 was done by corporations (Mead 1894:25). Meade's observations on the difficulties private entities had in successfully building large irrigation systems necessary to draw settlers to Wyoming set the stage for the major reforms set forth in the Carey Act of 1894.

The Carey Act and the Initiation of Large-Scale Irrigation Projects, 1894–1954

Implementation of the Carey Act of 1894 in Wyoming began in 1895, when the State Board of Land Commissioners was given the authority to select, manage, and dispose of suitable lands under the Act. The first lands selected for a Carey Act project were for the Burlington and Bench Canals in 1896. According to Elwood Mead, the first Wyoming Territorial and State Engineer, the Act made canal construction "a safe and legitimate building enterprise (Mead 1897:20).

Several key elements safeguarded the rights of the project proponents and settlers. No one could file on lands segregated from the public domain by the GLO as specifically designated for irrigation by a project except those settlers participating in the project as water users. This prevented claims from being filed by settlers who were not participants in the project as a whole and who might expect benefits without paying for them. It also insured that money from settlers went towards funding the projects. Settlers were shareholders in a canal, but the construction company controlled the operation of the canal and could charge a reasonable fee until the shares were paid for. The price of shares was fixed by the state, which provided protection for the canal builder and the water user. The cost of land under the projects was not subject to land speculation, but was set at a reasonable price. Water was guaranteed by the state through secure water rights. Once a project was complete, the water users had a share in ownership and management of the water system. As part of a large project, the settlers were secure in the knowledge that surrounding land would be irrigated and farmed, so that they were not left as an irrigated island surrounded by nonagricultural land (Mead 1897).

The increased value of reclaimed lands was substantial. In 1889, Mead (1889) estimated that unirrigated land useful only for grazing had a value of 50 cents per acre. Irrigated farmland, however, had a value of between $5 and $15 per acre. In later years, the state set prices for land under irrigation at between $25 and $35 per acre. The state saw considerable benefit from having irrigated farmland available to settlers because it put land into more productive use, enabled the people of the state to depend on locally produced products, rather than imports, and brought revenue in from outside the region through the export of surplus. It also stimulated the development of transportation systems, such as railroads and highways, and resulted in business opportunities in nearby towns.

The Carey Act process involved project proponents designing irrigation projects that were approved by a State Engineer and identifying the lands they proposed to irrigate. Lands unoccupied by settlers in Wyoming that were expected to become attractive for productive agriculture because of the availability of irrigation water were then "segregated" from the public domain by the GLO and turned over to the Wyoming State Board of Land Commissioners. This was a huge departure from how lands had previously come out of the public domain during the period of private irrigation development of the 1880s and early 1890s when private companies utilized the Desert Land Act as a way of accumulating large tracts of land through entry filings by company representatives, seemingly in violation of the Act. The step of segregating lands for projects returned land acquisitions back to filings under the Homestead Act, which put small farmers onto the land in parcels that ranged from 40 to 160 acres. The state was granted patents to the land from the GLO once a project or portion of a project was completed and considered ready to be

open to settlement. In order for this to happen, the state had to file a map with an application to the Secretary of the Interior by way of the GLO showing the lands to be irrigated (**Figure 9**). Preparation of a map took a considerable amount of work on the part of the project proponents, resulting in an amendment to the Act in 1901, which allowed land to be temporarily withdrawn from settlement for one year to enable full investigations to take place. Additional amendments in 1910 and 1914 specified that land containing minerals retained by the federal government—specifically coal, phosphate, nitrate, potash, oil, gas, and asphaltic minerals—could be included in Carey Act projects where they had previously been excluded. Anticipating the Carey Act and providing the key funding mechanism for it and the subsequent Reclamation Act was the Arid Land Fund under Article 18 of the 1890 Wyoming State Constitution. This Article enabled the state to obtain grants of arid land identified by the Department of the Interior through the GLO, sell them to legitimate settlers, and use the proceeds to fund the reclamation of additional appropriated arid lands, thereby making them suitable for agricultural settlement and sale. All funds collected by the Commissioner of Public Lands from the sale of the selected lands was placed in the Arid Land Fund and administered by the Board of Land Commissioners, which was also mandated by the Constitutional Article. This helped facilitate the Carey Act in Wyoming and provided funding to identify and investigate possible Carey Act water projects throughout the state and to help fund water projects that seemed most important. The fund also provided money to construct smaller projects on land not included under the Carey Act or the later Reclamation Act.

Selection, management, and disposal of lands under the Act were administered by the State Board of Land Commissioners (Board) under the Commissioner of Public Lands. Maps and plans for projects were examined by the State Engineer, from whom approval was necessary before the Board would move forward with a project (**Figure 10**). After 1913, the State Engineer's role was taken by the Chief Engineer in the office of the Commissioner of Public Lands. After this process, the Board applied for segregation of the land from the Secretary of the Interior through the GLO, which often sent their own experts to examine the feasibility of a project, a step that caused frequent delays and conflict with the Board (**Figure 11**). Once segregated, the state contracted with the proposing company for the construction of the irrigation system.

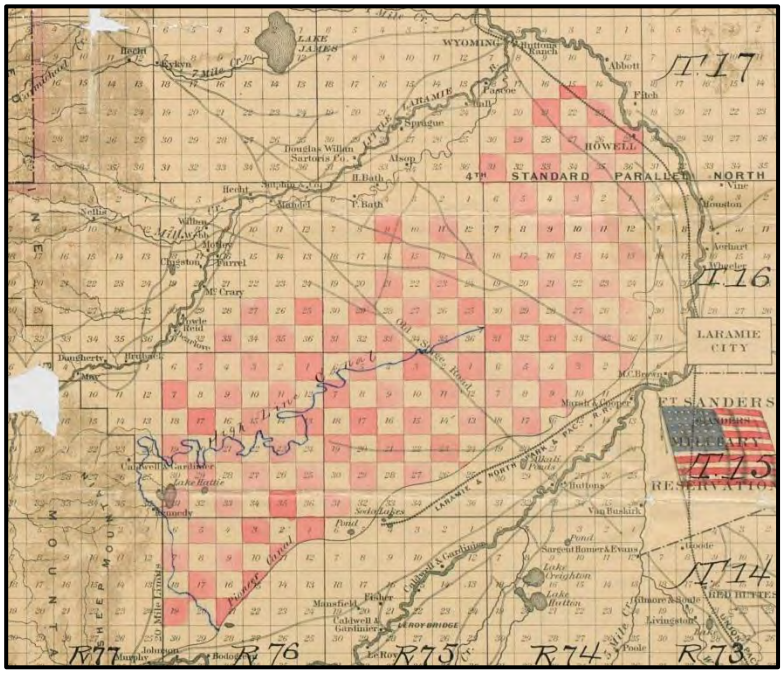


Figure 9. Historical map, circa 1894, of the proposed irrigated lands associated with the Pioneer Canal Company's High Line Canal. Image courtesy of the Wyoming e-Permit system.

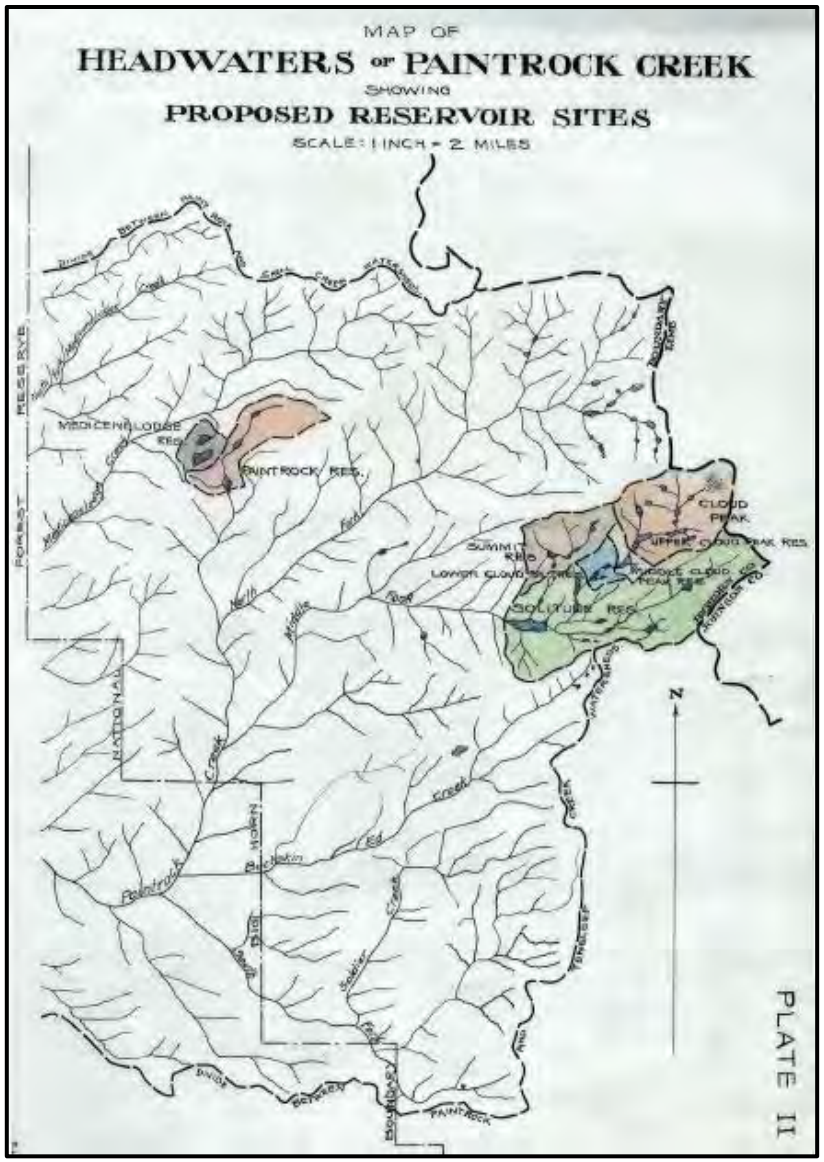
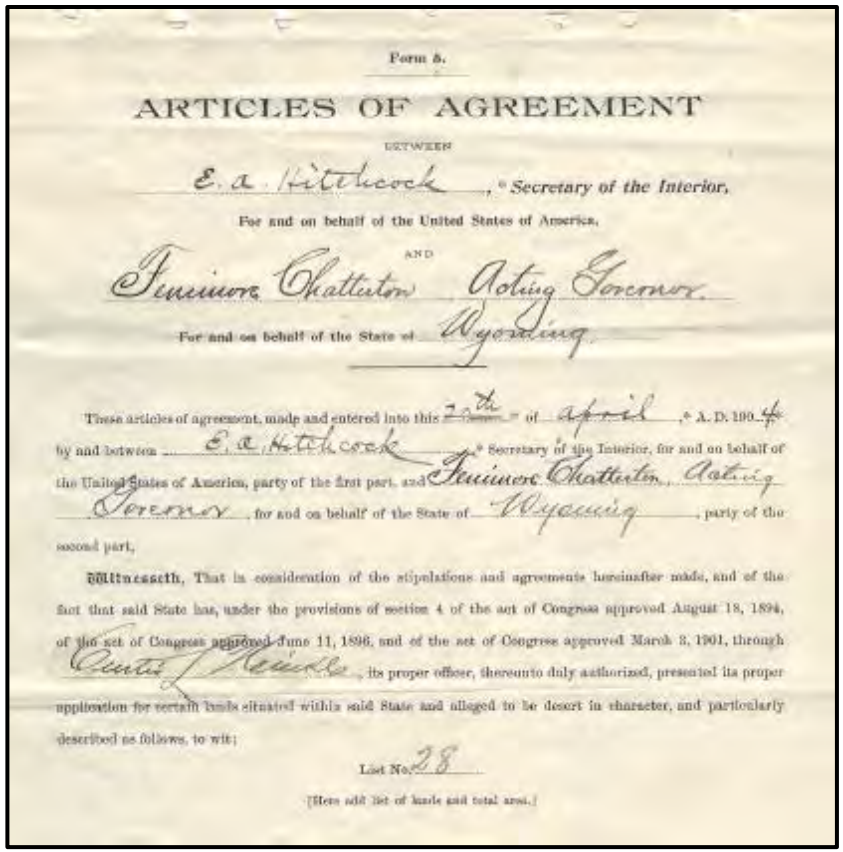


Figure 10. Example of a survey map of the Paint Rock Canal and Reservoir Project (Carey Act, RR488, Carey Act Records, Wyoming State Archives).



Form 5.

ARTICLES OF AGREEMENT

BETWEEN

E. a. Hitchcock, Secretary of the Interior,

For and on behalf of the United States of America,

AND

Fenimore Chatterton Acting Governor.

For and on behalf of the State of Wyoming

These articles of agreement, made and entered into this 7th of April, A. D. 190 4, by and between E. a. Hitchcock, Secretary of the Interior, for and on behalf of the United States of America, party of the first part, and Fenimore Chatterton, Acting Governor, for and on behalf of the State of Wyoming, party of the second part,

Witnesseth, That in consideration of the stipulations and agreements hereinafter made, and of the fact that said State has, under the provisions of section 4 of the act of Congress approved August 18, 1894, of the act of Congress approved June 11, 1896, and of the act of Congress approved March 3, 1901, through Curtis J. Hinkle, its proper officer, thereunto duly authorized, presented its proper application for certain lands situated within said State and alleged to be desert in character, and particularly described as follows, to wit:

List No. 28

[Here add list of lands and total area.]

Figure 11. Article of Agreement between the Secretary of the Interior and the Governor of Wyoming for the segregation of lands under List 28 for the Hanover Canal (Carey Act, RR479, Carey Act Records, Wyoming State Archives).

Once the project proponent had constructed a system that was able to serve all or part of the project area, it was a responsibility of the Board to advertise the lands as open for settlement. Applicants were required to be U.S. citizens or individuals that had declared their intent to be citizens over the age of 21 and could be either male or female. Applicants had to make a first payment of 25 cents per acre for land in 40-acre increments up to 160 acres in size. When an application was approved by the Board, a Certificate of Location was issued. The applicant was then required to begin cultivation within six months, and a final proof was required to be made within three years. For a proof to be valid, the applicant had to have resided on the land for 30 days prior to the proof and to have resided in the vicinity for at least three years. By that time, at least one-quarter of the irrigable land within a claim had to have been irrigated and reclaimed, and that quarter had to comprise at least one-eighth of the entire parcel being acquired. An additional 25 cents per acre was required at the time of the final proof along with a $1 filing fee, and an additional $1 fee was assessed for issuance of a patent. Once the Board approved the final proof, the state conveyed a state patent to the land to the claimant. In cases where the state had not yet received a patent from the U.S. government for the land, the state patent was conveyed as soon as the federal patent was received from the U.S. government.

In addition to working with the state for filing on and obtaining land served by the irrigation project, settlers made arrangements with the development companies to pay for the water to irrigate their land, usually through a payment plan at a reasonable interest rate. Proceeds from qualified settlers were required to go toward payments to private land development and irrigation companies that engaged in the installation of irrigation systems and marketing of the lands they served. Most of these companies financed their projects with the sale of construction-bond securities to investors on the national market. In order to ascertain an equitable cost per acre for water to be charged to the settlers, the state projected the cost of each project and was able to calculate a proposed price per acre. For projects underway in 1906, the proposed price ranged from $15 to $30 per acre, with $25 to $30 per acre being typical. In 1906, the State Land Board began allowing the development companies to sell water rights to settlers before their systems were completed and water was delivered. Money collected in advance by the companies was deposited with the State Land Board, which held the money in escrow until the companies completed their projects. This provided protection to the settlers in the event that the companies failed to complete their projects and deliver the promised water. The first company to take advantage of this mechanism was the La Prele Canal & Reservoir Company in the mid-1910s (**Figure 12**).

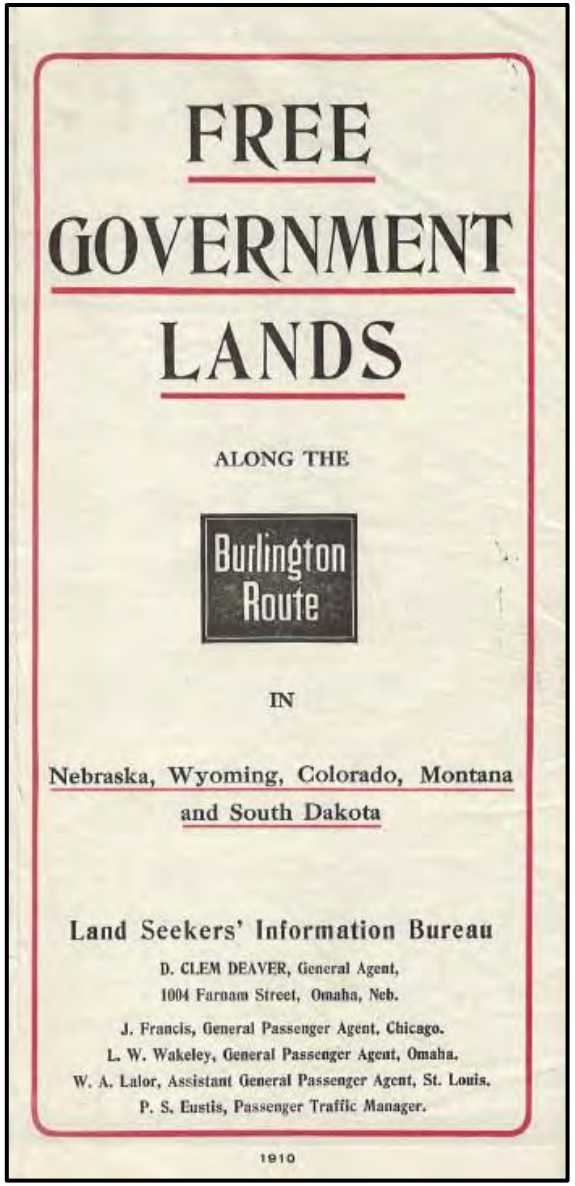
The State Board of Land Commissioners was responsible for facilitating the settlement of state lands within Wyoming, including land set aside under the Carey Act, which was important for the success of those projects. In 1907, the Department of Immigration was established, and it was suggested that the Commissioner of Public Lands be made the ex-officio Commissioner of Immigration to deal directly with prospective settlers on irrigation projects. An outreach program was established with plans to hire a speaker to present talks throughout Indiana, Illinois, Missouri, Iowa, Kansas, and Nebraska about the virtues of settling in Wyoming. It was expected that irrigation companies, counties, cities, and towns would gladly contribute

Figure 12. Historical photograph, circa 1909, of the main headgate on the La Prele Ditch. Headgate on La Prele Ditch, J.E. Stimson Collections, STIMSON NEG 2933, Wyoming State Archives.

toward printed matter and would help in other ways (e.g., monetary compensation) in the promotion campaign. The Department of Immigration prepared a pamphlet about Wyoming; advertised in newspapers in Iowa, Illinois, Kansas, Nebraska, and Missouri; distributed printed materials at national agricultural conventions, irrigation congresses, and elsewhere; and had an exhibit at the National Corn Exposition in Omaha. Additional promotional advertisements were made by the Burlington Northern Railroad and Union Pacific Railroad (**Figure 13** and **Figure 14**). Expansion of railroads throughout Wyoming facilitated growth of agriculture into areas that were previously undeveloped. Railroads made it possible to more easily bring in the large equipment necessary for the construction of major irrigation systems and provided an outlet for the agricultural products that the newly irrigated lands produced. It was in the best interest of the railroads to encourage settlement of land that otherwise would have remained unoccupied.

The Wyoming State Board of Land Commissioners forwarded lists of settlers who had been granted state patents and lists of the lands settled upon to the GLO (later the Bureau of Land Management [BLM]), so that it was clear what lands had been acquired. Lands that were found to have insufficient arable land or went unirrigated and unsettled were returned to the federal government for potential settlement by others. Once an irrigation project had been built by the developer to the satisfaction of the state and the irrigable lands had been settled upon to the point that most or all of the water rights had been sold by a company to its settlers, the irrigation system was turned over to a local irrigation district for future management and maintenance. Irrigation districts as legal entities to manage completed projects were defined by the Wyoming legislature in 1907. To form a district, a petition was made to the relevant county commissioners. Irrigation districts were governed by a board of directors elected by the owners of land irrigated by a particular ditch, canal, or reservoir representing all of the farmers served by an irrigation system. An irrigation district board of directors had the power to acquire rights of ways, sell bonds, levy assessments, incur debts, and operate the district to the benefit of its constituents (Cooper 2004:36). The Irrigation District Concept was introduced in Utah in 1865 and adopted in California in 1887 under the Wright Act. After constitutional

Figure 13. A Burlington Northern Railroad brochure used to promote the railroad and available lands in Wyoming, circa 1910 (Burlington Railroad Brochures, H57-10, CB&Q Collection, Wyoming State Archives).



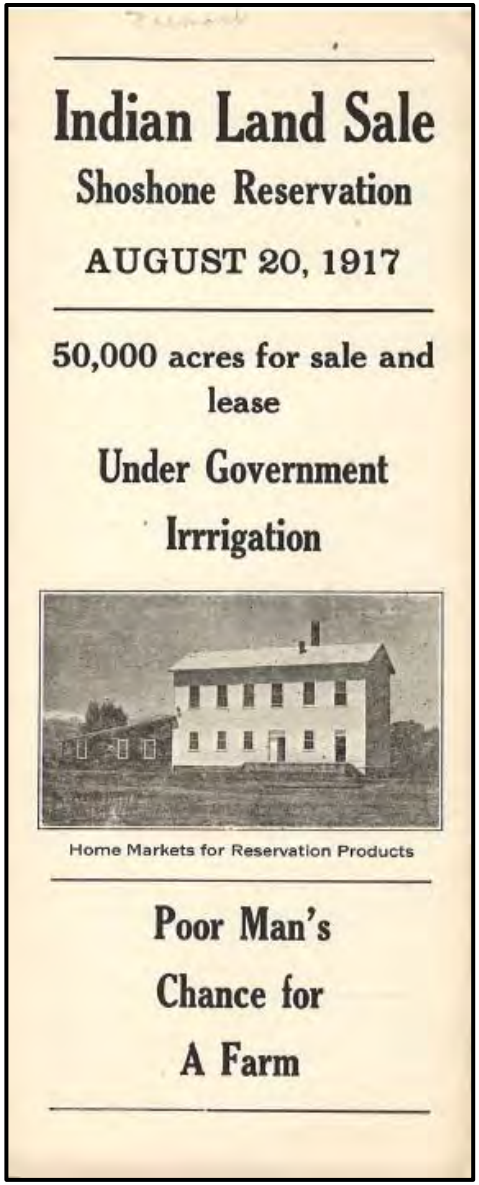
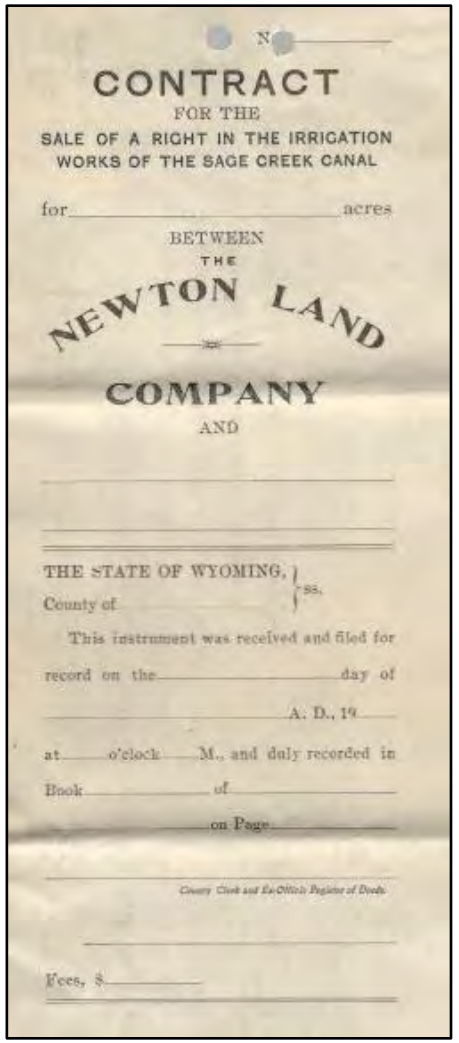


Figure 14. Burlington Northern Railroad brochure promoting the sale of lands on the Shoshone Reservation in 1917 (Burlington Railroad Brochures, H57-10, CB&Q Collection, Wyoming State Archives).

challenges had been cleared, it was revised in 1897, and numerous western states adopted the practice (State of Wyoming 1910:49). Contracts between construction companies and the settlers for the transition of the irrigation system to the settlers represented by an irrigation district required approval by the state (**Figure 15**).

The Uintah County Irrigation Company's North Piney Canal project was a typical Carey Act Project. Settlers purchased 80- or 160-acre parcels of land for $25 or $35 per acre in return for perpetual water rights and a proportional share of the irrigation system under the management of a ditch company or irrigation district made up of private irrigators. Very small projects were overseen by the landowners without a formal entity. Settlers also paid $3 per acre for $25 land or $5 per acre for $35 land, which was usually financed with 10 annual payments at 6-percent interest (Sommers 2003).

Many large projects were started under the Carey Act soon after it was implemented, resulting in most of the 1,000,000 acres earmarked for projects in Wyoming being segregated by the early 1900s. In order to continue to have land available for more projects, an additional 1,000,000 acres were made available for future projects in Wyoming under a 1908 amendment to the Carey Act. Carey Act projects were numerous until about 1912, when irrigation construction-bond securities offered by project developers fell out of favor and became difficult to sell because the most lucrative investment projects were already underway or completed, and the difficulties of completing most projects became clear. This greatly diminished the ability of developers to finance their water projects. Projects ceased entirely during World War I, and it took several years after the war for money to again be



N

CONTRACT

FOR THE

SALE OF A RIGHT IN THE IRRIGATION WORKS OF THE SAGE CREEK CANAL

for _____ acres

BETWEEN

THE

NEWTON LAND

&

COMPANY

AND

_____

_____

THE STATE OF WYOMING, }
County of _____ } ss.

This instrument was received and filed for record on the _____ day of _____ A. D., 19__ at _____ o'clock _____ M., and duly recorded in Book _____ of _____ on Page _____

_____
County Clerk and Ex-Officio Register of Deeds

_____

Fees, $_____

Figure 15. An example of a contract between a settler and the Newton Land Company for rights and acres associated with the Sage Creek Canal (Segregation List No. 17) (Carey Act, RR497, Carey Act Records, Wyoming State Archives).

invested in irrigation projects. Among the problems encountered during World War I were labor shortages and the scarcity and high cost of materials (Lee 1918).

Irrigation companies ceased seeking new settlers for their projects during the Depression years of the 1930s because settlers did not have the capital to finance their land acquisitions or undertake new farming operations (Cox and Kienzle 1932). By 1940, 118 applications for segregation of land for 77 Carey Act projects had been acted on. Fifty-three projects were approved, but 21 were canceled, leaving 32 that moved forward. Of those, 28 were completed and four were still in the process of being completed by 1940 (McWhinnie and Gill 1936; Griffith and Kienzle 1940). From the mid-1930s into the early 1950s, actions were taken to return lands to the public domain that had been withdrawn for projects under the Carey and Reclamation Acts but that had not been claimed by settlers. These were lands that had not been put into agricultural production under a water project. Most of those lands were thereafter administered by the BLM. On August 19, 1954, Public Law 582 was passed by the U.S. Congress, quit-claiming all lands that had been conveyed to the states as segregations under the Carey Act that had not yet been patented to settlers. This put an end to Carey Act responsibilities between the state and the federal government and put 25,000 acres of unclaimed lands into the hands of the State of Wyoming for it to lease or sell (Reidel 1954).

Carey Act projects in Wyoming are summarized below by river basin and then in order of their Segregation List Numbers. The numbers following the List Numbers are the number of acres segregated for the project. Projects completed under the Carey Act have a "Patented" mention following that is the number of acres patented by settlers under the project. Information about these projects is from Apperson 1904; Baker et al. 1920, 1922; Bond 1901; Burritt 1936:S-4; Cossman 1956, 1958; Cox and Kienzle 1930, 1932; Follansbee 1919; Fuller 1906, 1908, 1911; Griffith and Kienzle 1940; Griffith 1942; HDR, Inc. 1988; Heinke 1900; Hopkins 1912; Hopkins and Stuart 1914, 1916; Johnston 1909, 1910; Kellogg 1948; Lee 1918; McWhinnie et al. 1924, 1926; McWhinnie and Gill 1936, 1938; Mead 1897, 1898; Natwick 1944, 1946; Parshall 1897, 1913, 1914; Reidel 1952, 1954; and Tynan 1901, 1903. It should be noted that many of these projects were not completed under the Carey Act, but had construction done that may have resulted in irrigation systems being completed to some degree. Some small projects were conducted under the Carey Act in early years, but similar small projects were rejected for consideration under the Carey Act in later years because they were considered to be too small.

A total of 103 projects is listed below. Carey Act projects occurred in each river basin, except for the Bear River Basin (**Table 2**). The majority of the projects were completed in either the Platte or Wind-Big Horn River Basins, followed by the Green River Basin (**Figure 16**). The brief descriptions of all of the Carey Act projects in Wyoming are intended to introduce the projects to researchers and are not intended to be exhaustive. Data about these projects is quite variable in the official state agency reports and in the reviewed records held by the State of Wyoming. The earliest projects have virtually no official annual or biennial reporting. Some later projects have little official reporting because they had difficulties in getting underway, failed to come to completion, or were small in size. Considerable raw data exists in the Wyoming State Archives for most of the projects that can be used by interested researchers to develop comprehensive histories of the projects.

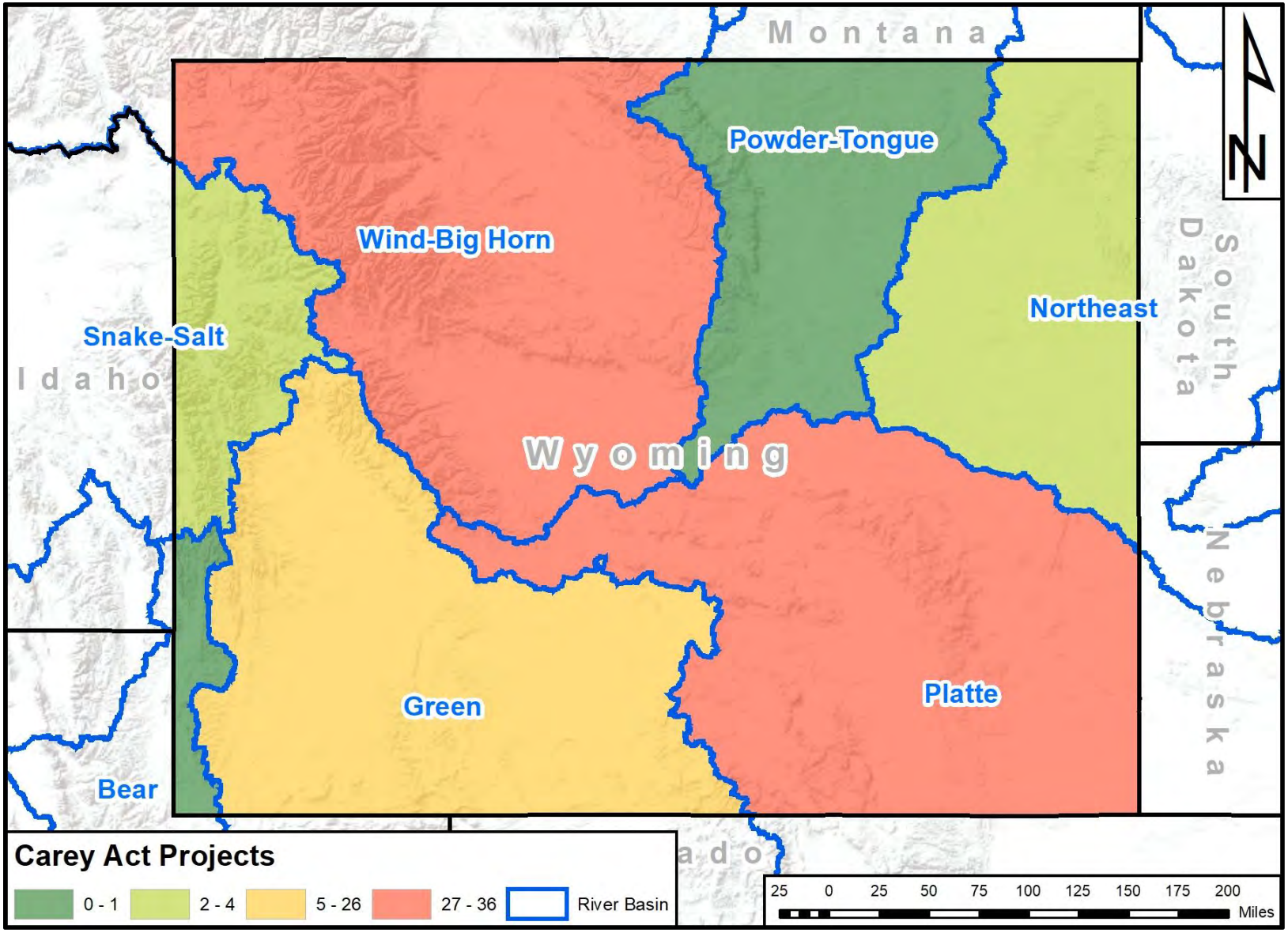


Figure 16. Frequency of Carey Act projects within Wyoming by river basin.

Table 2. Summary of Cary Act Project by River Basin.

River Basin	Total Number of Carey Act Projects
Wind-Big Horn	32
Powder-Tongue	1
Northeast	4
Platte	36
Green	26
Bear	0
Snake-Salt	2

Wind-Big Horn River Basin

A total of 32 projects occurred within the Wind-Big Horn River Basin. These projects occurred between 1895 and 1923. This basin, along with the Platte River Basin, account for the majority of the Carey Act Projects within Wyoming.

Burlington and Bench Canals
(Segregation List Nos. 1: 28,069 acres, 3: 14,713 acres, and 14: 3,459 acres; Total Patented: 14,337 acres)

The Bench Canal takes water from the Greybull River near Germania and Cody, Wyoming, in Big Horn and Park counties. The Big Horn Basin Development Company requested segregation of land on List 1 in June 1895, which was approved on January 28, 1896, with the land to be irrigated through the proposed Burlington Canal. Soon after initial plans for the canal were made, the existing Bench Canal was incorporated into the system, which was enlarged as the initial part of the project under List 3. By the end of 1900, the Bench Canal was sufficiently enlarged and extended for the state to begin applying for patents for more than 12,000 acres of land; there were an initial 25 applications for settlement. In 1904, land on List 14 was added to the project. The initial contractor, the Big Horn Basin Development Company, went bankrupt and was unable to complete the Carey Act work, and the Burlington Canal was never constructed. The Bench Canal was enlarged and extended as the main canal of the project and had a concrete diversion installed by 1916. With the elimination of construction of the Burlington Canal, 16,401 acres were returned to the federal government. As portions of the project were considered completed, beginning in 1908, they were turned over to the settlers. Final transfer of management to the Bench Canal Company of Emblem, Wyoming, happened soon after 1916. Elements of the project not administered by the Bench Canal Company were conveyed to the Shoshone River Canal Company of Basin, Wyoming. The Bench Canal itself is 8 miles long, but the entire system has over 54 miles of canals and laterals, including the South Lateral, North Lateral, Dry Creek Lateral, and 42 Lateral. The South Lateral feeds the Highline Lateral. Water is stored in Lower and Upper Sunshine reservoirs (Nelson Engineering, Inc. 1991).

Globe Canal
(Segregation List Nos. 2 and 4: 6,508 acres; Not Completed)

The initial construction of the Globe Canal was by the Globe Canal Company in 1894; they had acquired a permit to divert water from the Shoshone River on June 14, 1894, and obtained a permit for water to enlarge the canal on December 29, 1894. Permits transferred to the Yellowstone Park Land and Irrigation Company on March 4, 1895, which requested segregation of land on Lists 2 and 4. The initial request for about 14,000 acres was reduced by the GLO to 6,508 acres, which was approved on July 8, 1896. The project was canceled in 1897 when

it was discovered that the segregated land was actually timbered and not arid land, as required under the Carey Act. The canal was constructed by other means and extended in 1909 by the Farmer's Protective Association (Lindsay 1932:211).

Cody Canal
(Segregation List Nos. 6: 24,563 acres and 9: 1,867 acres; Total Patented –18,749 acres)

The Cody Canal takes its water from the South Fork of the Shoshone River two miles above Buffalo Bill Dam near Marquette and Cody, Wyoming, in Park County to irrigate land south of the Shoshone River. The 32-mile-long canal was constructed by the Shoshone Land and Irrigation Company beginning with lands on Lists 6 and 9 requested for segregation in 1895 and approved on March 28, 1896. The project was completed August 18, 1904; water rights date to 1895 (**Figure 17**). About 10,000 acres were patented to the state in 1898, making the Cody Canal the first Carey Act project to reclaim land in the country. Although the project had only received 14 applications from prospective settlers at the time, a rush of settlers was expected with the anticipated construction of the Burlington Northern Railroad to Cody. At the end of 1900, it was reported that the first 18 miles of the canal had been completed at a cost of $200,000 and that the project was able to begin irrigating about 12,000 acres of land. By the end of 1906, about 90 percent of the land that could be irrigated by the project had been sold, and the state recommended that the project be turned over to the settlers. The project was turned over to the Cody Canal Association in 1907. The Cody Canal Irrigation District based in Cody, Wyoming, was formed to manage the canal in 1911. The canal irrigates 11,543 acres south of Cody using 14 lateral canals in three divisions: Upper Division, Town Section, and Sage Creek Division (Aqua Engineering, Inc. 2005).

Figure 17. Historical photograph, circa 1904, of the Cody Canal (Johnston 1905:40).

Sidon Canal
(Segregation List Nos. 11, 12, 18, and 19: 20,560 acres; Total Patented: 18,657 acres)

The Sidon Canal takes water from the Shoshone River in Big Horn County. The project began as the Cincinnati Canal, which obtained 17,755 acres of land through segregation of land on Lists 11 and 12 that was applied for in 1896 and approved January 1897 (**Figure 18**). The Cincinnati Canal Company was unable to complete the project, and it was considered abandoned in 1898. Completion under the Carey Act took place from 1900–1902 at a cost of $40,000 by the Big Horn Basin Colonization Company of Cowley, Wyoming, owned and operated by Mormon settlers that had come to the area from Utah and Idaho. They applied for an

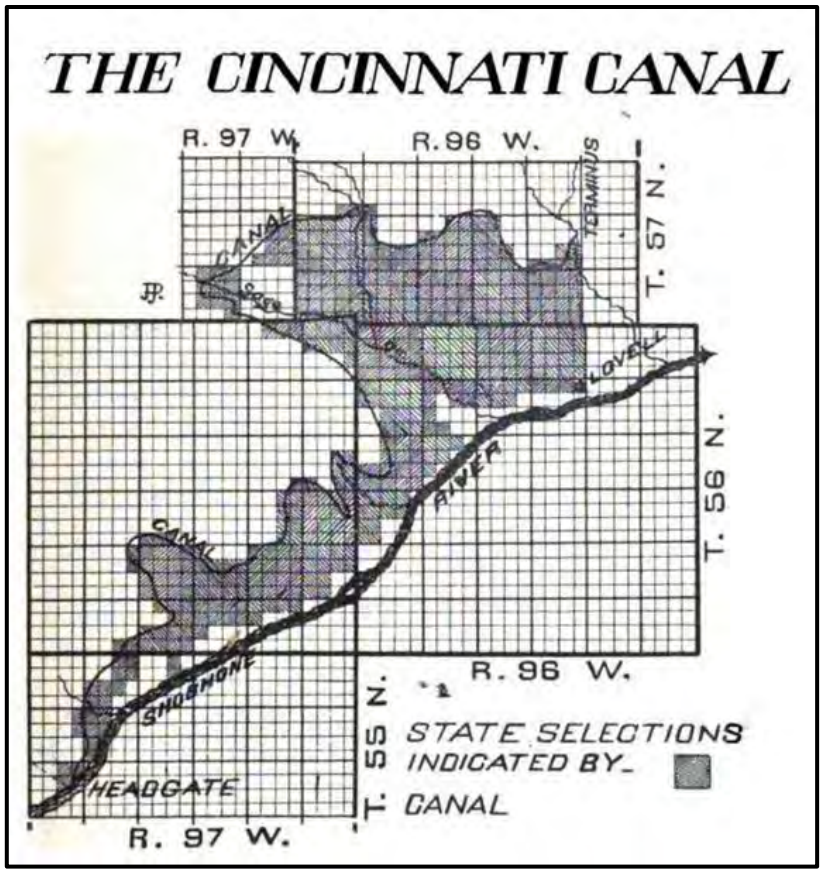


Figure 18. Survey plat of The Cincinnati Canal, circa 1896 (Parshall 1897).

additional 3,000 acres to be segregated for the project in late 1899 under Lists 18 and 19. By the end of 1900, 15 miles of canal had been completed of the 25 miles that were planned. An additional 2,805 acres of land under List 18 were added in 1904. The project resulted in the establishment of the towns of Byron, Lovell, and Cowley. The Sidon Canal Company was formed by 1908 to operate the canal system, and the canal was extended by 1910. The Sidon Irrigation District, based in Lovell, Wyoming, was formed in 1930 to manage the canal. It irrigates 12,024 acres with supplemental water from Bitter Creek for irrigation of 11,964 acres (Inberg-Miller Engineers 1994).

Cody and Salisbury Canal and Elk Canal
(Segregation List Nos. 15: 77,149 acres and 46: 249 acres; Total Patented: 2,321 acres)

The Elk Canal, originally known as the Fort Laramie Canal, takes its water from the southern side of the Shoshone River, and the Cody and Salisbury Canal takes its water from the northern side of the river. Both are near Powell and Penrose in Big Horn and Park counties. The project was proposed by William F. Cody and Nate Salisbury to irrigate 78,748 acres. The project was approved by the State Engineer on March 7, 1900, and an application for segregation of the land on List 15 was filed with the GLO on May 1, 1900; the land was segregated in 1901. The canal was designed to measure 45 feet (ft.) across the top, 25 ft. wide at the bottom, and 10 ft. deep with a grade of 2 ft. per mile. Cody and Salisbury failed to complete Cody and Salisbury Canal and relinquished all rights to the U.S. Reclamation Service for the Shoshone Project. The state also relinquished all of the land that they had reserved on the northern side of the Shoshone River to the Reclamation Service with the understanding that it would also be irrigated through the Shoshone Project. They retained the land on the southern side, served by the Elk Canal. A colony of settlers had built the initial Elk Canal as an enlargement of the Roane Ditch, taking water from the southern side of the Shoshone River. Additional land on List 46 was added to the project in 1910, and a concrete headgate was built on the river for the Elk Canal by the local community that year. The canal is an element of the Lovell

Canal, which was an earlier Carey Act project. Project lands were relinquished to the U.S. government for the Shoshone Project under the Reclamation Service. Water in the Elk Canal retained priority from the Cody and Salisbury Canal. That water is managed by the Elk Canal Company of Penrose, Wyoming.

Sage Creek Canal
(Segregation List No. 17: 784 acres; Patented: 784 acres)

The Sage Creek Canal takes its water from Sage Creek near Wiley, Wyoming, in Big Horn County. Land on List 17 was applied for in 1901 and segregated in 1903. In addition to Sage Creek, the project reportedly obtained some of its water from seepage from the Burlington and Bench Canals. Initially, the Newton Land & Canal Company of Omaha, Nebraska, was to construct the project to irrigate 1,724 acres of land, but failed to enter into a contract with the state by the end of 1904. The project was ultimately constructed by the Oregon Basin Canal Company, beginning about 1905; it was completed by the end of 1906. Immediately, the canal began to be enlarged as part of the Supply Canal of the Oregon Basin project system. Water delivery to project lands was through the Newton Land Company.

Big Horn County Canal
(Segregation List Nos. 21: 16,295 acres, 31: 4,624 acres, and 45: 506 acres; Total Patented: 19,468 acres)

The Big Horn County Canal takes its water from the Big Horn River in Big Horn County for irrigation around Basin and Worland, Wyoming. Construction was initiated by the Big Horn County Canal Company from 1902–1904. The company enticed settlers to buy water from them at a low price before the project was completed. Unfortunately, the company then ran out of water. It was reorganized as the Big Horn County Irrigating Company by 1906 and work resumed. An initial request for segregation of 16,295 acres of land was made in October 1904. Some of the land was opened for settlement in 1907. Additional lands were segregated under List 31. The canal was completed under the Carey Act in 1908 and enlarged in 1909 with the addition of segregated land on List 45. The Big Horn Canal Association of Basin, Wyoming, was formed in 1911 to manage the project.

Oregon Basin Project – Shoshone River Canal
(Segregation List Nos. 22: 59,237 acres and 25: 145,384 acres; Not Completed)

Water for the Oregon Basin Project came from the Shoshone River through the Shoshone Canal and Oregon Basin Reservoir, which was filled by a canal from the river. The Big Horn Basin Development Company proposed building the project to irrigate land between the Shoshone River and Greybull River west of the Big Horn River in Big Horn and Park Counties. Land on Lists 22 and 25 were applied for in 1903 and were segregated on June 9 and 10, 1904. Work evidently began that year with a contract entered into with the state on September 24, 1904. About 30 miles of the Shoshone River Canal was built by 1908. A number of settlers filed for land under the project with the stipulation that money be held in escrow by the state until water could be furnished to their land. By 1912, the company was in receivership, and it was thought likely that the project would be downsized. With the company undergoing reorganization, the 10-year-period allotted for construction expired in 1914 and was extended an additional five years. The company failed, and the receiver sold all interest in the company to its bond holders. A

new contract was made with the Independence Irrigation Company later in 1914. Still, the new company failed to begin work, the five-year extension of time expired in 1919, and it was expected that when a new contractor could be found, land for the project would be re-segregated. A new contractor was not found, and all interests in the project not returned to the state were held by the Shoshone River Canal Company in Basin, Wyoming. The project was considered no longer viable after 1924, and the remaining land was returned to the U.S. government.

Lovell Canal
(Segregation List No. 26: 11,321 acres; Patented: 10,636 acres)

Water for Lovell Canal comes from the Shoshone River in Big Horn and Park counties. The canal was constructed as an enlargement of the earlier Elk Ditch and Roane Canal by the Lovell Irrigation Company beginning in 1900; it was enlarged several times from 1903–1914. Land on List 26 was applied for in 1903 and segregated in April 1904. On November 15, 1904, the state contracted with the Lovell Irrigation Company, organized by local settlers, for its construction. The canal was completed in 1907, but not accepted as completed by the state until 1909. The system includes the Roane, Elk, and Lovell canals. The project was turned over to the settlers by 1912 as the Lovell Irrigation Company of Lovell, Wyoming. Known also as the Elk-Lovell Canal, the upper 12 miles of the canal is shared with the Elk Water Users Association for irrigation of 3,800 acres. The next 26 miles incorporates two laterals with a total length of 7.5 miles and irrigates 11,200 acres, also administered by the Lovell Irrigation District based in Lovell, Wyoming (Sage Civil Engineering 2017).

Hanover Canal
(Segregation List No. 28: 10,683 acres; Patented: 8,644 acres)

Water for the Hanover Canal comes from the Big Horn River near Worland, Wyoming, in Washakie County. It was constructed by the Hanover Canal Company from 1904–1908 (**Figure 19** and **Figure 20**). Under the Carey Act, 10,683 acres were applied for in 1903 and segregated in April 1904; a construction contract with the Hanover Canal Company was made with the state on August 15, 1904. The lay of the land resulted in the concurrent construction of a lateral known as the Lower Hanover or Low Line Canal. The system was completed in 1909, but the settlers disputed that the canals had been finished. Management was turned over to two companies with additional money to complete the canals: the Upper Hanover Water Users Association for the High Line Canal from 1910–1924, which was

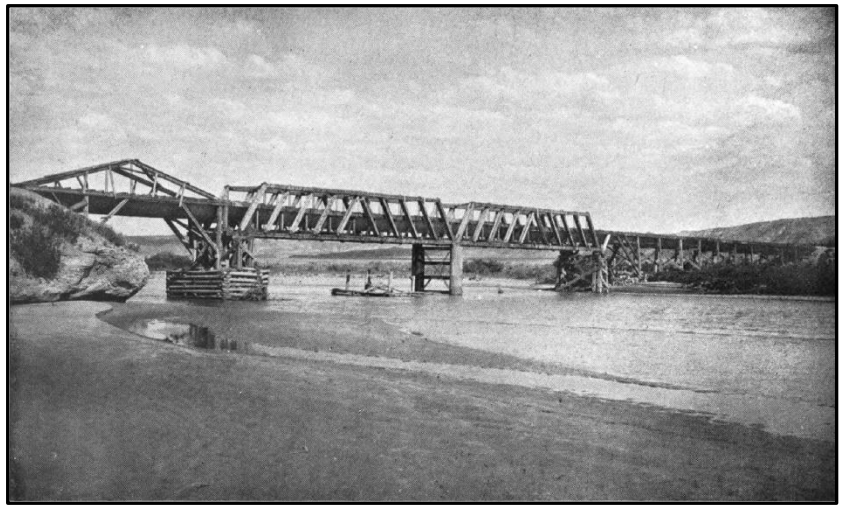


Figure 19. Historical photograph, circa 1908, of the flume on the Hanover Canal crossing the Big Horn River (Johnston 1908:38).

Figure 20. Historical photograph, circa 1910, of the Hanover Canal. Hanover Canal, J.E. Stimson Collection, STIMSON NEG 142, Wyoming State Archives.

replaced by the Hanover Irrigation District in 1925; and the Lower Hanover Canal Association for the Low Line Canal, both in Worland, Wyoming. The Upper Hanover Canal is now operated by the Upper Hanover Canal Company. The 35-mile-long canal carries water for the Bluff, Upper Bluff, and Highland Irrigation districts. These districts operate the Bluff, Upper Bluff, and Highland Hanover canals, respectfully. Around 1956, 13.5 miles of the Upper Hanover Canal was reconstructed. The Upper Hanover Canal provides irrigation water to 13,135 acres; the Bluff Canal serves 3,490 acres, the Upper Bluff Canal serves 1,430 acres, and the Highland Hanover Canal serves 6,545 acres (Nelson Engineering, 1990).

Medicine Wheel
(Segregation List No. 36: 22,386 acres; Not Completed)

Water for the Medicine Wheel Project was to come from Porcupine Creek by way of Trout Creek, from which canal diversions were planned to irrigate land on the eastern side of the Big Horn River in Big Horn County. An application for land on List 36 was made in 1906, and the land was segregated in 1907. Construction was underway by 1909 by the Medicine Wheel Canal Company. They failed to complete construction by 1910 and turned the project over to the Kansas City Big Horn Irrigation Company of Kansas City, Missouri, which contracted with the state for construction in 1911. That year, they build a diversion dam on the Big Horn River so that water could enter the system during periods of low flow. They found that easements for canal construction across the public domain had not been granted by the U.S. government, so they obtained an extension until May 1913 to continue construction in order to resolve the right-of-way problem. The state canceled the project in 1914.

Hubbard Canal/Clarks Fork Canal
(Segregation List No. 39: 38,605 acres; Not Completed)

Water for the Hubbard Canal was to come from the Clarks Fork River north of Cody, Wyoming, in Park County for irrigation of land on the eastern side of the Clarks Fork River. The project was initiated by the Hubbard Canal Company in 1906, when they applied for land on List 39, which was segregated in 1908. Construction was started by the Clarks Fork Irrigation Company. Their plan was to drop water from the main canal to a pumping plan that would lift water to an upper bench. The company completed some construction after 1909, but was unable to

complete the project, and all rights were assigned to the State Board of Land Commissioners by 1912.

Paint Rock Canal
(Segregation List No. 40: 42,600 acres; Not Completed)

Water for the Paint Rock Canal Project came from Paint Rock Creek, a tributary of the Nowood River in Big Horn County. Land on List 40 was applied for and segregated in 1907. The Wyoming Land and Irrigation Company of Chicago, Illinois, had a contract for the Paint Rock Canal to irrigate land on Lists 40 and 44. They found the soil to contain a large amount of gypsum; the gypsum impregnated soils could not be avoided, so they removed List 44 lands from the project. They planned to proceed with construction in 1913 on the new alignment. Rights to the project were transferred to F. C. Emmerson for irrigation of land on List 40. Although negotiations took place beginning in 1918, the 15-year period for completion of the project—initial 10-year period and a 5-year extension—expired and the state applied for re-segregation of 26,595 acres for the project in about 1922. The request does not seem to have been approved, and the project was abandoned.

Lake View Project – Hammitt Canal
(Segregation List Nos. 43: 5,785 acres and 107: 4,323 acres; Total Patented: 8,975 acres)

Water for the Lake View Project came from the South Fork of the Shoshone River through the Hammitt Canal near Cody, Wyoming, in Park County. Land on List 43 was applied for in 1907 and segregated in 1908. Construction was started on the Lake View Canal by the Lake View Irrigation Company, but it went bankrupt about 1909. The receiver sold the rights to the Lake View Canal Company, which completed the project in 1910 and planned the first water delivery in 1911 (**Figure 21**). The canal washed out in 1911, and the canal was realigned. Repair of the canal put the company into bankruptcy. The Lake View Canal Company took over the project and built a flume over the damaged section. The original project was for 5,825 acres, but the new company requested and received segregation of additional land on List 107 in 1920 to be irrigated through an enlarged and extended Hammitt Canal. The improvement and extension of the Hammitt Canal was completed by the end of 1922. The project was turned over to the Fertile Valley Canal Company of Cody, Wyoming, which still manages it.

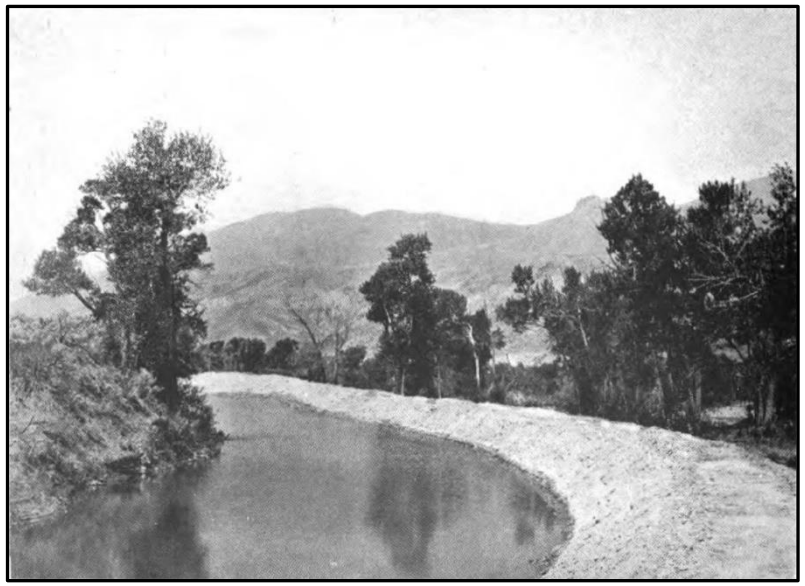


Figure 21. The Hammitt Canal, circa 1910, in Big Horn County, Wyoming (Johnston 1910:58).

Shell Canal
(Segregation List Nos. 44: 10,562 acres and 61: 4,526 acres; Total Patented: 4,934 acres)

Water for the Shell Canal comes from Shell Creek in Big Horn County. The Shell Canal was initially planned to be a lateral from the Paint Rock Canal, but when the contemplated alignment of that canal was found to not be feasible, the Shell Canal was relocated and used the route of the McDonald Ditch, originally built in 1886. Land on List 44 was transferred from the Paint Rock Project, and segregation of land on List 61 was requested for the Shell Canal project. Enlargement under the Carey Act was started by the Wyoming Land and Irrigation Company of Chicago, Illinois, which had completed about 30 miles of the canal by the end of 1908. They transferred their rights to the Wyoming Irrigation Company of Chicago, which completed the project in 1910 (**Figure 22**). Before the irrigation system could be approved, the company was required to provide additional water storage. They began construction of Lake Adelaide in 1912 to store 3,500 acre-ft. of supplemental water. The project is managed by the Shell Canal Company of Greybull, Wyoming.

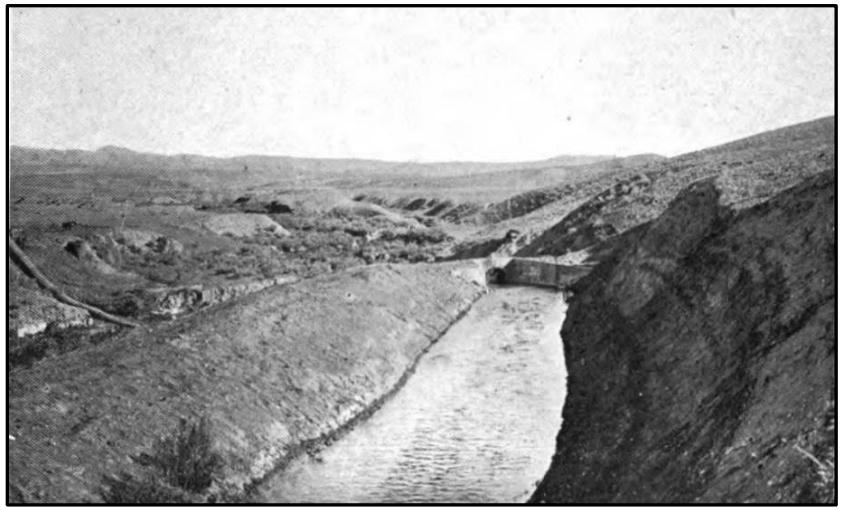


Figure 22. Historical photograph, circa 1910, of the Shell Canal in Big Horn County, Wyoming (Johnston 1910:62).

Tensleep and Bonanza Project
(Segregation List No. 51: 16,486 acres; Not Completed)

Water for the Tensleep and Bonanza project was to come from Tensleep Creek, a tributary of the Nowood River, near Hyattville in Big Horn County. Land for the project planned by the Tensleep and Bonanza Canal Company seems to have been segregated in 1909, and a contract for construction was made in 1909 with Johnson Brothers of Big Horn County. The company failed to pay their contractors, liens were filed, and a receiver was requested. As a result, the project was sold to the contractors, in conflict with state statutes, which tied up the project in District Court. With one-third of the project completed by 1911, no further work was noted through 1916, though the company was granted more time in 1916. Surveys for the project were underway by the Tensleep and Bonanza Canal Company in 1920 with plans to complete the canal in 1922. Instead, the company was financially unable to proceed, and the project was turned over to the state in 1922.

Buffalo Basin Canal and Reservoir
(Segregation List No. 73: 49,910 acres; Not Completed)

W. L. Rohrer of Chicago, Illinois, asked for a temporary withdrawal of 100,000 acres of land under a 1910 Act that allowed temporary withdrawals to enable speculators time to explore an area for development without being hindered by entries on the land by others. After investigation, the project was expected to irrigate

up to 50,000 acres of land using water from Wood River and Gooseberry Creek near Meeteetse in Park County by the Wyoming Land and Irrigation Company of Chicago. The Wyoming Land and Irrigation Company of Chicago planned to store water in Buffalo Basin Reservoir on Buffalo and Gooseberry creeks for distribution in the Gooseberry Canal. By 1914, the project was reported to be that of the Buffalo Basin Land and Water Company of Chicago. It still was considered a live project in 1916, but the proponent requested termination in 1920.

Wyoming Central Project
(Segregation List No. 74: 335,905 acres; Transferred to the Reclamation Service)

Water for the Wyoming Central Project was to come from the Wind River through the Wyoming Canal and Fremont Canal to irrigate land ceded from the Wind River Reservation. A temporary withdrawal of 330,000 acres of project lands was applied for by the Talmadge and Buntin Company of Chicago, Illinois, under a 1910 Act that allowed temporary withdrawals to enable speculators time to explore an area for development without being hindered by entries on the land by others. Land for the project was segregated in September 1912. The Wyoming Irrigation Company failed to sign a contract with the state, and Talmadge and Buntin negotiated to finish the project in 1914. After two years of negotiations, the water permits, rights-of-way, and easements were assigned to the State Board of Land Commissioners, which transferred them to the U.S. government for construction of the project under the Reclamation Service for irrigation of 125,000 acres. The state still held the water permits for the Fremont Canal in 1923. The project was not mentioned in the 1926 Biennial Report of the Commission of Public Lands (McWhinnie et al. 1926).

Thermopolis Investment and Irrigation Company – Kirby Canal
(Segregation List No. 75: 3,384 acres; Not Completed)

Water for the Kirby Canal was to come from Kirby Creek to a storage reservoir in Hot Springs County with distribution by the Kirby Canal. The Thermopolis Investment and Irrigation Company initially applied for segregation of 3,384 acres of land in 1910; their reservoir was not of sufficient capacity, so the acreage was reduced to 2,384. Their application was under review in 1910, and was rejected by 1914 because of an insufficient water supply.

Tremont Canal
(Segregation List No. 81: 8,990 acres; Not Completed)

Water for the Tremont Canal was to be pumped from the Big Horn River to irrigate land in Fremont County using power from the Boysen Power Plant. Land for the project on List 81 was applied for and segregated at the request of the Riverside Irrigation Company in 1910, but the company was in immediate financial trouble and was unable to enter into a construction contract with the state. The project was taken over by the Fremont Lake Irrigation Company of Rock Springs, but the project was delayed as the state awaited information from the proponent that had been requested by the state. The project was canceled after 1916 with lands relinquished about 1921.

Riverside Ditch
(Segregation List No. 82: 6,394 acres; Not Completed)

Asmus Boysen, president of the Riverside Irrigation Company of Shoshone, Wyoming, applied for a temporary withdrawal of over 15,000 acres of land under a 1910 Act that allowed speculators time to explore an area for development

without being hindered by entries on the land by others. The Shoshoni Power and Irrigation Company then made an application for segregation of land on List 82 in 1915. They planned to use electricity from Boysen Dam to operate pumps to lift water from the Big Horn River 10 miles west of Shoshone into the Riverside Ditch and Shoshone Canal to irrigate the segregated land and an additional 23,000 acres of private land on the eastern side of the Big Horn River in Fremont County. The project evidently did not move beyond the planning stage.

Louis Lake
(Segregation List No. 85: 36,099 acres; Not Completed)

Water for the Louis Lake project was to come from the Popo Agie River in Fremont County. The temporary withdrawal of land was made by the Louis Lake Conservation Company in 1911. The List 85 land application was made in 1912 and was segregated in 1913. The company failed to acquire water rights for the project, and the segregation was canceled by the U.S. government by the end of 1914.

Sweetclover Ditch and Reservoir
(Segregation List No. 89: 440 acres; Not Completed)

Water for the Sweetclover Ditch and Reservoir project was to come from Conant Creek in Fremont County. An application for segregation of land from J. A. Defelder was rejected by the GLO in 1912 because of the small acreage and because the Carey Act did not allow for the aggregation of small tracts.

Riverside Canal
(Segregation List No. 94: 6,395 acres; Not Completed)

A temporary withdrawal of land in Fremont County for irrigation from the Wind River in Fremont County was initiated about 1912. Requests from the GLO had not been fulfilled by the Shoshone Power and Irrigation Company by 1916, so the project was rejected.

Agrarian Project
(Segregation List No. 109: 897 acres; Patented: 897 acres)

Water for the Agrarian Project comes from Dry Creek in Big Horn County. Land on List 109 was applied for in 1918 and segregated in 1924. Construction was started by the Agrarian Irrigation Corporation after 1924 and had not been completed by 1930. It was managed by the Agrarian Irrigation Corporation of Basin, Wyoming.

Paint Rock Project
(Segregation List No. 111: 26,607 acres; Not Completed)

Water for the Paint Rock Project comes from Paint Rock, Medicine Lodge, and Tensleep creeks, all tributaries of the Nowood River, and from Medicine Lodge Lake and Solitude Reservoir through the Paint Rock and Bonanza canals in Big Horn County, near Manderson, Wyoming. Segregation of land on List 111 was approved in 1923, and a construction contract seems to have been made soon after 1924. No work on the project had been completed by the end of 1928, and it was considered to be a failed project by 1930. The project was managed by Frank C. Emerson of Cheyenne, Wyoming.

Powder-Tongue River Basin

A single project, the Sahara Ditch, was completed under the Carey Act within the Powder-Tongue River Basin. This project occurred in 1906.

Sahara Ditch
(Segregation List No. 33: 7,920 acres; Patented: 3,729 acres)

Water for the Sahara Ditch Project comes from the Powder River through the Sahara [Sussex] Ditch No. 1 near Kaycee, Wyoming, in Johnson County to irrigate land on the northern side of the river. It was constructed by the Sahara Ditch Company beginning in about 1901, but was not made a Carey Act project until 1906. The ditch originally diverted water through a tunnel that collapsed. Although completed by the end of 1908, it was soon damaged by floodwater. Insufficient water was available for construction of the planned Sussex Ditch No. 2, which was abandoned by 1914. The project was initially turned over to the Sahara Ditch Company of Buffalo, Wyoming, and subsequently to the Sussex Irrigation Company of Sussex, Wyoming, by 1919. The Sahara Ditch is currently 17.7 miles long and irrigates 5,116 acres. It includes the 1.7-mile-long Supply Ditch and the East Lateral (HKM Associates 1992).

Northeast River Basin

Four projects were completed as part of the Carey Act within the Northeast River Basin. These projects were competed between 1895 and 1922.

John Scott Ditch
(Segregation List No. 5: 240 acres; Patented: 160 acres)

The small John Scott Ditch project was constructed by John Scott using water from Indian Creek, a tributary of the Cheyenne River, in Converse County. Land on List 5 was requested to be segregated in 1895; it was approved in 1897. The project was completed by 1904.

Fitzsimmons Ditch
(Segregation List No. 13: 160 acres; Patented: 160 acres)

Land for the Fitzsimmons Ditch was on List 13—applied for in 1898 and segregated in 1899—for irrigation of land from Indian Creek, a tributary of the Cheyenne River, in Converse County. It was completed by 1904 and turned over to James L. Fitzsimmons, the claimant of the ditch.

Little Powder Canals and Reservoirs (Barney Ditch and Reservoir)
(Segregation List No. 83: 36,899 acres; Not Completed)

A temporary withdrawal of 100,000 acres of land for study of the Little Powder Canals and Reservoirs project in Crook County using water from the Powder River was made by C. W. Barney of Moorcroft, Wyoming, in 1912. The subsequent request for segregation of 36,899 acres for the project was delayed by requests for information from the GLO. When the proponent could not comply with the requests, the GLO rejected the project by 1916.

Beaver Valley Ditch
(Segregation List No. 100: 1,220 acres; Not Completed)

Water for the Beaver Valley Ditch was to come from floodwater impounded by a reservoir in Weston County. The project was proposed by J. J. Klodt and Rosco Michaels of Newcastle, Wyoming. Land segregation was pending from 1918 to 1922 and may have been approved in 1923. No contract for construction was ever made, so the project did not proceed.

Platte River Basin

A total of 36 projects was completed in the Platte River Basin under the Carey Act. These projects occurred between 1893 and 1924. Along with the Wind-Big Horn River Basin, the Platte River Basin accounts for the river basin where the majority of Carey Act Projects occurred in the state.

Whalen Falls Canal
(Segregation List No. 20: 14,425 acres; Patented: 13,065 acres)

The Whalen Falls Canal, also known as the Lingle Ditch, takes its water from the North Platte River in Goshen County near Torrington, Wyoming. Construction began in about 1893, but main construction under the Carey Act was by the North Platte Canal and Colonization Company, under contract with the state on May 4, 1903, with land for the project being segregated in December 1903. By the end of 1904, the company had completed 20 miles of the canal; it was considered complete on October 2, 1906. By that time, the route of the canal was found to be the most suitable for the Interstate Canal of the North Platte (Pathfinder) Project, and the canal was integrated into that project by the end of 1908. The Reclamation Service received approval to build the Interstate Canal on the route, providing that water of the Whalen Canal was also carried in it. In 1912, the Reclamation Service determined that Carey Act lands served by water from the North Platte River needed supplemental water and would receive such water as needed from the North Platte (Pathfinder) Project. To accommodate the increase in water, the Whalen Falls Canal was enlarged by 1912, but it had not yet been turned over to the settlers by that date. It was managed by the Goshen Land Company of Torrington, Wyoming.

Ft. Laramie Canal and Reservoir
(Segregation List No. 27: 26,936 acres; Not Completed)

An application for segregation of land was made for land near Torrington, Wyoming, in what is now Laramie County that was to use water from the North Platte River through the Ft. Laramie Canal and Reservoir. Land on List 27 was applied for and segregated in 1903. The project, proposed by the Ft. Laramie Canal and Reservoir Company was rejected by the Department of Interior in 1908 because it was in conflict with a Reclamation Service project.

French Creek Canal
(Segregation List Nos. 29: 18,869 acres and 77: 3,696 acres; Not Completed)

Water for the French Creek Canal was originally planned to come from the North Platte River to irrigate land north of Encampment Creek in Carbon County. The project also conveyed water through the Casteel Canal. The project was started by the North Platte and Encampment Canal Company, but construction was prevented by miners in the Encampment copper mining district, and rights to the project were returned to the state. The

18,869 acres of land on List 29 were applied for and segregated in 1904, but the North Platte Canal, Reservoir and Colonization Company failed to enter into a contract with the state by the end of 1904. The French Creek Irrigation Development Company of Aurora, Illinois, thought that they could irrigate the land on Lists 29 and 38 by siphoning water across the North Platte River from French Creek (see the North Platte and Encampment Canal, below). They entered into a construction contract with the state in 1910 and applied for List 77 land that same year. The land was segregated in 1911, and the company planned to irrigate it using water diverted from Mullen Creek to French Creek. After spending $70,000, the company suspended work in 1912 with hopes of resuming in 1913; however, they failed to complete the project.

North Platte Canal
(Saratoga Canal; Platte Valley Canal)
(Segregation List No. 30: 18,171 acres; Not Completed)

The Western Land and Irrigation Company planned to irrigate 18,171 acres of unclaimed land and a comparable amount of land owned by the Union Pacific Railway on the eastern side of the North Platte River near Saratoga, Wyoming, in Carbon County, from French Creek, Barrett Creek, and North and South Brush creeks. Land on List 30 was applied for and segregated in 1904, but the company failed to enter into a construction contract with the state by the end the year. Surveys were made, but the company was unable to make the project work using water from the North Platte River. In 1910, relinquishment of the segregated lands was recommended, and the land was turned back to the State Board of Land Commissioners. The Western Land and Irrigation Company had a contract pending in 1912. The 10-year period required for construction expired on October 24, 1914, and the segregated land was relinquished back to the federal government by 1916.

Wheatland Industrial Company's Project (Wheatland No. 1 Canal)
(Segregation List Nos. 32: 8,087 acres, 42: 21,952 acres, and 52: 3,076 acres; Total Patented: 3,718 acres)

Water for the Wheatland Industrial Company's project came from the Laramie River and its tributaries through Reservoir No. 2 on the Laramie River, with a capacity of 118,800 acre-ft., and the Wheatland No. 2 Canal system, which was an enlargement of the Wyoming Development Company's irrigation system near Wheatland and Bordeaux, Wyoming, in Platte County. Development under the Carey Act was only part of a large project that included 60,000 acres of adjacent land already owned by the company in Carbon, Albany, and Platte counties. Surveys for the earlier project took place in 1881, and the Wyoming Development Company was incorporated in 1883; it was the first irrigation company incorporated in Wyoming. Joseph M. Carey was a main actor in the initial project, and the Wyoming Development Company was instrumental in having Elwood Mead appointed as the first Territorial Engineer in 1888. Carey was elected a U.S. Senator from Wyoming in 1890 and served until 1895. His experience with the Wheatland project resulted in his being an advocate for federal assistance for major irrigation projects in the west and his involvement in the passing of the Carey Act. Having enough land settled upon for the amount of water diverted by the project was a major difficulty. The most efficient means for acquiring land from the public domain was through 640-acre claims permitted under the Desert Land Act (Oliver 2022). The Bluegrass Tunnel and an irrigation system on Wheatland Flats were completed in 1886. Wheatland Reservoir No. 1 and its Supply Canal were completed in 1896 (**Figure 23**), with Wheatland Reservoir No. 2 constructed in 1901. Development under the Carey Act was carried out using water stored in Wheatland Reservoir No. 2.

Figure 23. The Wheatland Canal No. 1, circa 1910. Wheatland Canal, J.E. Stimson Collection, STIMSON NEG 398, Wyoming State Archives.

Suitability was enhanced because the Colorado and Southern Railroad passed through the project lands. The project was constructed by the Wheatland Industrial Company beginning in 1907 with the initial segregation of land having taken place in 1906. The Wheatland Industrial Canal No. 1 was completed by the end of 1908. By 1911, the company had completed the lateral canals to serve the land near Bordeaux (**Figure 24**). The 10-year period for construction to serve land on List 52 expired on March 30, 1919, and the project was extended for 5 years. By 1923, most of the project had been completed, but time ran out for land included on List 42, which had been segregated around 1908. Once completed, the project was managed by the Wheatland Industrial Company of Wheatland, Wyoming.

Later development included the first trans-basin diversion of water in Wyoming, with water from Sand Lake transported in Deep Creek, and Rock Creek diverted into the Canon Canal into Dutton Creek and then diverted into the Dutton Canal into Wheatland Reservoirs Nos. 2 and 3. Wheatland Reservoir No. 3 was completed in 1943. Water in those reservoirs was released into the Laramie River for diversion through the Bluegrass Tunnel into Bluegrass and Sybille creeks into the main canal system. The 120-mile-long canal system comprised five main canals and laterals that irrigate 54,100 acres: Canal Nos. 1, 2, and 3; Lateral No. 1; and the Bordeaux Lateral. The system is managed by the Wheatland Irrigation District, based in Wheatland, Wyoming, which was formed in 1947 (Anderson Consulting Engineers, Inc. 2011).

Figure 24. Historical photograph, circa 1908, of the Wheatland Industrial Company's Lateral No. 1 (right) diversion from Canal No. 1 (left) (Johnston 1908:42).

La Prele Ditch
(Segregation List Nos. 34: 13,614 acres, 41: 4,785 acres, and 48: 160 acres; Total Patented: 7,421 acres)

Water for the La Prele Ditch Project comes from La Prele Creek, a tributary of the North Platte River, through the La Prele Ditch and Reservoir near Douglas, Wyoming, in Converse County. The La Prele Reservoir and Ditch Company applied for land on List 34 in 1905, land on List 41 in 1907, and land on List 48 in 1908; all were segregated in 1908. By then, the company had already constructed 16 miles of canal. A concrete dam on La Prele Creek for a storage reservoir was under construction by the end of 1906 and completed in 1909 by the Amburson Hydraulic Company (**Figure 25** and **Figure 26**); the reservoir had 15,100 acre-ft. of capacity for late-season irrigation. The project was constructed by the La Prele Ditch and Reservoir Company, but before 1910 and before completing the project, they went into bankruptcy and their rights were transferred to the North Platte Valley Irrigation Company, which also went bankrupt by 1914. The company holdings were sold by its receiver to the Douglas Reservoir Company about 1918, which completed the project and managed the system. The Douglas Reservoir Water Users Association acquired the system in 1923; it is now organized as the La Prele Irrigation District, based in Douglas, Wyoming. The BOR conducted investigations for rehabilitating the system in the 1950s, but could not justify a new dam at the time. Poor dam integrity resulted in reduced capacity by 1971, but repairs were made in 1983. The system currently irrigates 11,462 acres through the Main Canal and its 10 or 11 laterals and through the West Side Canal and its West Side Lateral (RESPEC 2018).

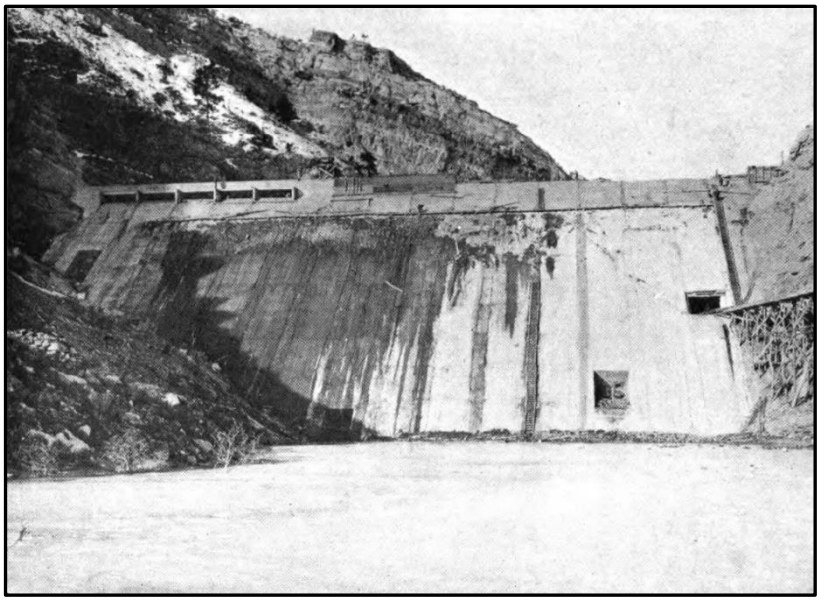


Figure 25. The La Prele Dam, circa 1910, in Converse County, Wyoming (Johnston 1910:60).

Figure 26. A circa 1909 photograph of the central headgate of the La Prelle Dam. La Prelle Dam, J.E. Stimson Collection, STIMSON NEG 2926, Wyoming State Archives.

North Platte and Encampment Canal
(Segregation List No. 38: 28,194 acres; Not Completed)

Water for the North Platte and Encampment Canal project was to come from the North Platte and the Grand Encampment rivers near the Colorado state line in Carbon County. The project was proposed by people interested in the North American Copper Company near Encampment, Wyoming. The North Platte and Encampment Canal Company applied for land on List 38 in 1905, and the land was segregated in 1907. The company was under contract with the state for construction in 1905 but was unable to secure financing to begin the work. The project was turned over to the French Creek Company, which abandoned the original irrigation plan but had not come up with an alternative by 1912. By 1914, the French Creek Irrigation-Development Company entered into a contract for the French Creek Canal and attempted to tie the project to land segregated on Lists 29 and 77 that they thought could be irrigated from Big Creek through the Casteel Canal (see French Creek Canal, above). Considerable work seems to have been done. The Chief Engineer of the Commission of Public Lands inspected the project and required that additional storage be constructed before the project could be finalized. As of the end of 1916, no work toward satisfying the storage requirement was done, and the project was not completed.

Reynolds/Hemmingway Ditch
(Segregation List No. 47: 320 acres; Patented: 320 acres)

Water for the Reynolds/Hemmingway Ditch is held in Reynolds Reservoir in Natrona County and originates from Natrona Creek and other unnamed creeks tributary to North Casper Creek. Land on List 47 was applied for and segregated in 1908, and the project was completed by 1912. The irrigation system was constructed by Ambrose Hemingway and George and Cora B. Reynolds. In 1914, it was reported that the capacity of the reservoir needed to be increased or the number of acres to be irrigated had to be reduced. The upgrading was completed by 1918.

James Lake Canal
(Segregation List No. 50: 14,544 acres; Patented: 5,534 acres)

Water for the James Lake Canal Project comes from the Little Laramie River through James Lake Canals No. 1-4 and Reservoir near Bosler, Wyoming, in Albany County. The project was initiated by the Tallmadge-Buntin Company of Chicago for the development of an agricultural community; it also proposed to enlarge the Oasis Canal. Land for the project was segregated in 1908, and the system was completed in 1910 and began water distribution in 1911. They were unable to complete the supply ditch in time to completely fill the reservoir in 1910. By 1912, it was found that several structures of the project had been poorly constructed, including the outlet structure on James Lake dam (**Figure 27**). In order to make the repairs, bondholders took over the project. After being nearly complete for years, it was finally finished by 1922. The project was constructed and managed by the James Lake Irrigation Company of Rock Springs, Wyoming and is no longer in existence.

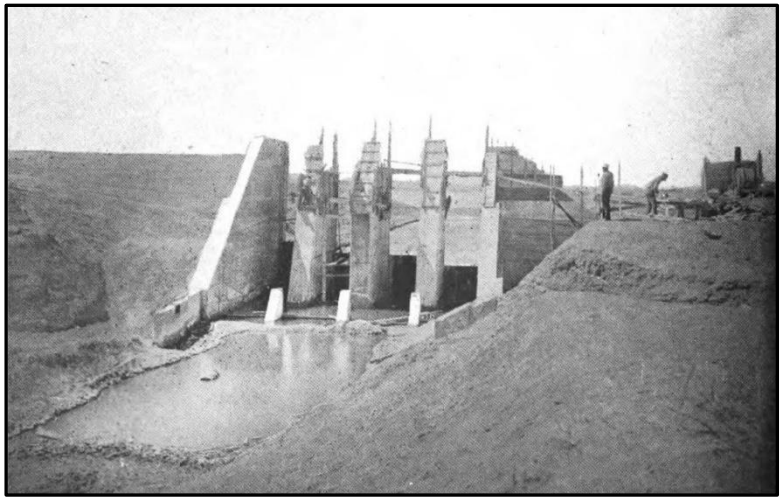


Figure 27. Historical photograph, circa 1910, of the construction of the James Lake outlet works (Johnston 1910:60).

McDonald Ditch and Reservoir
(Segregation List No. 53: 15,159 acres; Not Completed)

The McDonald Ditch and Reservoir project was an application by F. K. McDonald for land above the Government Goshen Hole Canal near Grange, Wyoming, in what is now Goshen County to be irrigated from Horse Creek with water stored in a reservoir. The project was initiated in 1908 when an application was made for land on List 53, which was segregated in 1909; however, McDonald did not enter into a contract with the state. The Greater Wyoming Irrigation and Investment Company entered into a construction contract in 1912. The State Engineer's report for the project indicated that the cost for construction would be prohibitive for the amount of acreage to be served, so the proponent asked the state to relinquish the segregated land.

Hawk Springs Project
(Segregation List Nos. 54: 9,402 acres and 102: 5,178 acres; Total Patented: 14,580 acres)

Water for the Hawk Springs Project comes from Horse Creek and its tributaries through the Hawk Springs Ditch and Reservoir near La Grange and Yoder, Wyoming, in Goshen County. The project was proposed by B. F. Yoder and his associates using water from Hawk Springs to be stored in a reservoir. Land on List 54 was applied for in 1908 and segregated in 1909; land on List 102 was applied for in 1915 and segregated in 1920. Construction was started under contract to Yoder in 1910 by the Hawk Springs Development Company. Some work was done in 1912, but more work was anticipated in 1913. The company entered into a new contract with the state, and the reservoir and canal system was nearly complete in 1916. It took until 1926 for all of the work to be done, because the project had entered into foreclosure in the late 1910s. The project was managed by the receiver of the Hawk Springs Tensleep Development Company of Torrington, Wyoming. The project irrigates 10,180 acres under the management of the Horse Creek Conservation District of Hawk Springs, Wyoming (AVI Professional Corporation 2013).

Red Lake Ditches and Richards Reservoir
(Segregation List No. 56: 5,087 acres; Not Completed)

Water for the Red Lake Ditches Project was to come from floodwaters of the Medicine Bow River and Muddy Creek, which was to be stored in Richards Reservoir to irrigate land 20 miles north of Medicine Bow, Wyoming, in Carbon County. The project was started by the Carbon County Land and Irrigation Company with an application for and segregation of land on List 56 in 1909.

Additional work on the storage reservoir was needed to make it functional in 1910. By 1912, over $15,000 of work was done, but the company was in financial trouble, and wanted to negotiate a new contract. A new contract was finalized in 1915, but work was delayed until a determination could be made about the amount of water actually available for the project. The project was evidently not viable and was not completed.

Patrick Reservoir Ditch
(Segregation List No. 60: 40 acres; Not Completed)

The Patrick Reservoir Ditch was proposed by Edwin L. and Lottie H. Patrick to use water from Rawhide Creek in Goshen County. Land on List 60 was applied for in 1909. Although the system had been completed in 1910, the application was rejected by the GLO by 1914 because it was too small to qualify under the Carey Act.

Snow Ditch No. 2 and Reservoir
(Segregation List No. 63: 1,398 acres; Not Completed)

Water for the Snow Ditch No.2 and Reservoir Project was to come from Rawhide Creek, a tributary of the North Platte River, in Goshen County north of Lingle and be held in proposed Snow Reservoir Nos. 1 and 2 for late-season irrigation. The project was proposed by John T. Snow, but was not approved because the land in the area was already in agricultural production without irrigation. Land on List 63 was applied for in about 1909 and initial engineering work was done by Bartlett Engineering of Cheyenne in 1910. The decision was appealed and under review from 1910 to about 1914, when it was rejected because the cost was projected to be excessive considering the number of acres that would be irrigated.

North Platte Valley Irrigation Company (Highland Canal)
(Segregation List Nos. 64: 11,177 acres, 65: 4,320 acres, 66: 7,453 acres, and 78: 13,857 acres, and 101: unknown; Not Completed)

Water for the North Platte Valley Irrigation Company project was to come from the North Platte River through the Highland Canal near Douglas, Wyoming, in Platte and Converse counties. The project was proposed by the North Platte Valley Irrigation Company of Douglas, Wyoming, which had taken over the La Prele Ditch and Irrigation Company system. The project was anticipated to irrigate 36,219 acres from La Prele Creek and 44,048 acres from Pathfinder Reservoir. Lands on Lists 64, 65, and 66 were applied for in 1909 and 1910. The project was rejected by the GLO because all of the water in the North Platte River had already been appropriated for the North Platte (Pathfinder) Project of the Reclamation Service. The decision was appealed and under review in 1910. Despite these problems, the dam for La Prele Reservoir was started in 1908 and completed in 1910. La Prele Canal was completed in 1908 and began to be extended in 1910 to irrigate land on the western side of La Prele Creek and land on the northern side of the North Platte River near Douglas. After being inspected in 1911, it was found that the tunnels on the canal required a concrete lining, as they had been constructed through shale. This problem, combined with attempts to solve seepage problems at the La Prele Reservoir dam, caused the company to go into receivership in 1912. Land on List 64 was canceled and applied to List 78. The Irvine Canal, planned to irrigate land on List 65, and the Glendo Canal, planned to irrigate land on List 66, were rejected again in 1912 and again were under appeal until finally canceled in 1917 or 1918. Land under List 78 was planned to be irrigated by pumping water from the North Platte River using power from La Prele Reservoir and conveying it in the Highland Canal, but was suspended by the GLO in 1912. By 1914, the

Highland Canal portion of the project had been rejected by the GLO because it was found to be in conflict with the Reclamation Service's North Platte (Pathfinder) Project. The requests for segregations for the project lands were withdrawn soon after 1916.

Sierra Madre Project
(Segregation List No. 67: 4,320 acres; Not Completed)

Water for the Sierra Madre Project comes from Jack Creek, Methodist Creek, and the North Fork of Spring Creek through canals and reservoirs near Saratoga, Wyoming, in Carbon County. A request for segregation of 13,865 acres was made in 1912 and was finally approved for a smaller acreage about 1922. Despite the Sierra Madre Land and Water Company of Denver, Colorado, not being under contract with the state for construction, 8.5 miles of the main canal were completed by 1930. The project was still not complete by 1940, and the time to complete the project was extended until 1945. Despite the additional time allowed, the contractor was financially unable to move forward and the project was canceled about 1941.

North Laramie Project
(Segregation List No. 68: 4,133 acres; Patented: 846)

Water for the North Laramie Project comes from the North Laramie River through canals and reservoirs near Uva, Wyoming, in Platte County. It was constructed by the North Laramie Land Company, and the water system to serve lands on List 68 was reported as being nearly complete in 1910. In 1912, the system was reported to be complete, and the company requested that lands on List 68 be opened to settlement. By 1918, all of the land on List 68 was open to settlement. The project was managed by the North Laramie Land Company of Chicago, Illinois.

Rock Creek Project
(Segregation List No. 71: 11,696 acres; Patented: 4,270 acres)

Water for the Rock Creek Project comes from Rock Creek River through Bosler Reservoir and the Rock Creek Canal system near Rock River, Wyoming, in Albany County. Construction was by the Rock Creek Conservation Company (**Figure 28**). Pierce Reservoir was completed by 1910, and the associated canals were expected to deliver water in 1911 to about 20,000 acres of land that included those segregated for the project and additional private land of the former Diamond Cattle Company, but additional water storage was needed. The Union Pacific Railroad's main line crossed the project lands, which was considered a benefit for the land's settlement. The project was reported as nearly complete from 1914 to 1924 and was completed in 1928. By 1930, 7,266 acres segregated for the project were canceled or relinquished to the U.S. government. The project was managed by the Rock Creek Conservation Company of Rock River, Wyoming.

Figure 28. The Rock Creek Ditch, circa 1914, in Albany County, Wyoming (Parshall 1914:52).

Big Bend Reservoir and Ditch
(Segregation List Nos. 72: 25,871 acres and 79: 10,602 acres; Not Completed)

Water for the Big Bend Reservoir and Ditch was to come from Muddy Creek through the Washakie Ditch for storage in Big Bend Reservoir. A. H. Allen, A. H. Christensen, and John K. Hart applied for segregation of the land in Carbon County, but their application was rejected because the land had been withdrawn for coal. The decision was under appeal in 1910, but to expedite the process, the Big Bend Reservoir Company of Baggs, Wyoming applied for a reduced amount of land as List 79 in 1912. They had not provided the state with information requested by the GLO by 1916, and the state withdrew its application.

Johnson Reservoirs and Ditches
(Segregation List No. 76: 14,051 acres; Not Completed)

Water for the Johnson Reservoirs and Ditches was to come from the Middle and South forks of Casper Creek and Wallace Creek near Casper, Wyoming, in Natrona County. The application for land on List 76 made by Henry M. Johnson of the Johnson Irrigation Company of Bucknum, Wyoming, was under review beginning in 1910 and appeared to be a viable project in 1912, but the request for segregation of land was withdrawn by the state at the request of the project proponent in 1914. The plan was to irrigate the land through the Johnson Canal, Supply Ditch Nos. 1 and 2, Johnson Canal Laterals A and B, the Six Mile Supply Ditch, and Wallace Creek Ditch, with water storage in Johnson Reservoir Nos. 1 and 2.

Plains Canal and Reservoir (North Laramie Project)
(Segregation List No. 84: 3,666 acres; Not Completed)

Water for the North Laramie project was to come from the North Laramie River near Wheatland, Wyoming, in Platte County. It was proposed by the North Laramie Land Company of Chicago, Illinois. Most of the canal work was completed in about 1910, but after being used for a year, the condition of the canals was demonstrated to be poor and the company endeavored to make the canal and an adjunct reservoir safe beginning in 1911. In 1914, the state asked for more time to show that sufficient water was available from the river. The project was still pending through 1922, but did not move forward.

Duff Ditch
(Segregation List No. 86: 1,320 acres; Not Completed)

A temporary withdrawal of 1,320 acres was made for study of the Duff Ditch project by the Wister Land and Irrigation Company of Rocky Ford, Colorado. The project proposed taking water from the Medicine Bow River in 1912 and included the proposed Wister Reservoir. The project was rejected by the Reclamation Service because it was in conflict with the Pathfinder Project and because it included the same lands that had been proposed for irrigation by the Medicine Bow Irrigation Company.

Sand Creek Canal/Cronberg Project/Medicine Bow Project
(Segregation List No. 99: 16,107 acres; Not Completed)

Water for the Sand Creek Canal, proposed by the Medicine Bow Valley Irrigation Company of Medicine Bow, Wyoming, was to come from the Medicine Bow River through Halleck Reservoir and the Sand Creek Canal in Carbon County. Land segregation from the U.S. government was pending from 1918 to 1928 and seems to have been approved in 1929. No construction contract was made by 1930, and the project was not carried out under the Carey Act.

Elk Hollow
(Segregation List No. 103: 2,276 acres; Not Completed)

A temporary withdrawal was made at the request of S. S. Wood for land in Carbon County to be irrigated from North Brush Creek through the Elk Hollow Ditch in 1916. No proposal for a project resulted, and the project was canceled after the period of withdrawal expired about 1917.

Johnson Reservoir
(Segregation List No. 105: 4,640 acres; Not Completed)

A request for temporary withdrawal of land in Carbon County near Saratoga, Wyoming, was made about 1920. The land was to be irrigated from Lone Tree and Sage creeks with storage in Johnson Reservoir. The request for withdrawal does not seem to have been granted.

Wheatland No. 2 Canal
(Segregation List No. 115: 19,994 acres; Not Completed)

Water for the Wheatland No. 2 Canal project was to come from the Laramie River and tributaries through a reservoir and canal system of the Wheatland Industrial Company near Wheatland, Wyoming, in Platte County (**Figure 29**). The land for the project was initially segregated on List 52 about 1909, but time expired. The project proponents requested the land to be segregated again under List 115 in about 1924, with no action through 1928, so the project was abandoned. The project was officially canceled about 1953.

Figure 29. Historical photograph, circa 1909, of the Wheatland Canal No. 2. Wheatland Canal No.2, J.E. Stimson Collection, STIMSON NEG 2904, Wyoming State Archives.

Highland Canal
(Segregation List No. 117: 3,883 acres; Patented: 3,883 acres)

No information could be found about the Highland Canal Project. It is possible that it was a spinoff of the Highland Canal Project of the North Platte Valley Irrigation Company, which had been canceled by 1916.

Green River Basin

Within the Green River Basin, 26 Carey Act Projects were completed between 1895 and 1921. This basin accounts for the third most projects within the state.

Blacks Fork Canal
(Segregation List No. 7: 24,023 acres; Not Completed)

The Blacks Fork Canal was proposed by the Blacks Fork Canal Company of Ogden, Utah. It was to take water from the Blacks Fork River for irrigation at Fort Bridger, Wyoming, in Uinta County. The project was proposed in September 1895 and approved by the state, which submitted a request for segregation of the land. The segregation was rejected by the GLO because the proposed land fell within the former Fort Bridger Military Reservation that was open for settlement only under the Homestead Act. After an appeal, the rejection was confirmed by the Secretary of the Interior on April 7, 1896.

Fort Bridger Canal
(Segregation List No. 8: 5,169 acres; Not Completed)

The Fort Bridger Canal was proposed by the Fort Bridger Canal Company of Fort Bridger, Wyoming. Like the Blacks Fork Canal project, the Fort Bridger Canal project was to take water from the Blacks Fork River for irrigation of land at Fort Bridger, Wyoming, in Uinta County. It was proposed in September 1895 and approved by the state, which submitted a request for segregation of the land. The segregation was rejected by the GLO because the proposed land fell within the former Fort Bridger Military Reservation that was open for settlement only under the Homestead Act. After an appeal, the rejection was confirmed by the Secretary of the Interior on April 7, 1896.

Fort Bridger Canal (Uinta Canal No. 2)
(Segregation List No. 10: 19,155 acres; Not Completed)

The Fort Bridger Canal (also known as Uinta Canal No. 2) and a reservoir were planned to take water from the Blacks Fork River east of Granger and near Ft. Bridger, Wyoming, in Uinta County. The water was for irrigation north of Fort Bridger and not within the former Fort Bridger Military Reservation. The Fort Bridger Irrigated Land Association obtained water rights from the Blacks Fork River on January 22, 1896. They applied for segregation of land on List 10, which was approved on October 1, 1896. The state initially contracted with the Ft. Bridger Irrigated Land Association, but they were unable to comply with the contract. The state then contracted with Uinta Alfalfa Irrigation Company on September 6, 1902. The project was contingent on the construction of a reservoir to supply the system, which was never constructed. The project was abandoned by 1909 and the land relinquished back to the U.S. government in 1912.

Pole Creek Ditch No. 2
(Segregation List No. 16: 320 acres; Patented: 320 acres)

The Pole Creek Ditch No. 2 takes its water from Pole Creek, a tributary of the Green River, in Fremont County. Land for the project on List 16 was applied for in 1901 and segregated in 1904. The project was built by Fred C. Fisher and Sylvia M. Stadin beginning about 1902 and was reported to be complete by the end of 1906. The project is also known as the Fisher Canal, as an enlargement of the Pole Creek Ditch No. 2, or as Fisher's Pole Creek Ditch No. 2.

Boulder Canal
(Segregation List No. 24: 6,120 acres; Patented: 5,736 acres)

Water for the Boulder Canal comes from Boulder Creek, a tributary of the New Fork River and Boulder Lake in Sublette County. The state contracted with the Boulder Lake Canal and Reservoir Company for construction of the project on April 1, 1904. Segregation of 6,120 acres of land was applied for under the Carey Act in January 1904. The canal was considered complete by 1906, but a small amount of work was contracted for in 1914 and completed in 1918. The project was subsequently managed by the Boulder Canal Company of Boulder, Wyoming. The project includes the Burkhalter Ditch, initially constructed in 1899, and the Oliver Ditch, initially constructed in 1901. The project was enhanced by 22,800 acre-ft. of water storage in Boulder Lake Reservoir with a water right dating to 1927. Since 1945, the project has been managed by the Boulder Irrigation District based in Boulder, Wyoming (Sunrise Engineering, Inc. 2020).

Eden Canal
(Segregation List Nos. 35: 56,323 acres and 37: 36,283 [95,658] acres; Total Patented: 13,466 acres)

The Eden Project takes water from the Big Sandy River through the Eden Canal and Reservoir No. 2, with a capacity of 18,000 acre-ft. of water, to irrigate land on both sides of the Big Sandy River about 40 miles north of Rock Springs, Wyoming, in Sweetwater and Fremont counties. The Eden Land and Irrigation Company had land on Lists 35 and 37 segregated for the project in 1905. The company was assisted by the Reclamation Service with the initial construction of the project in 1907; 30 miles of the canal were completed by the end of 1908, and settlers began to be allowed to settle on project lands. Water delivery to some of the project land on the eastern side of the river began in 1909. In 1908, they completed Eden Reservoir No. 1 for a storage reservoir above the Eden Canal headgate, which was nearly complete in 1914. They also planned to construct Leckie Reservoir sometime in the future. The company was in receivership in 1914 before completing the project, but some of the land was irrigated and settled upon. The project was taken over by the Rock Springs Water Company in 1927. That company failed, and their holdings were sold to the Wyoming Land and Water Company in 1932. They built a canal from the Little Sandy River to Eden Reservoir in 1935 and attempted to sell the project to the Resettlement Administration that same year, but failed to do so. Plans were made in 1939 to sell the project to the Resettlement Division of the Farm Security Administration, which was finalized in 1941. It became a Reclamation Service project in 1940. The Reclamation Service began construction of Big Sandy Dam in 1941, but the project stopped because of World War II. See the description for the Eden Project in the section about Newland Acts Projects for the later history of the project.

Green River Canal
(Segregation List No. 49: 75,257 acres; Not Completed)

Water for the Green River Canal was to come from the northern side of the Green River above Fontanelle Creek in Sweetwater County for irrigation of land on the northern side of the Green River and above the Big Sandy River. The project was initiated by the Tallmadge-Buntin Company of Chicago for the development of an agricultural community. Land was segregated for the project on November 11, 1908. The Green River Land and Irrigation Company (Ltd) was issued permits in 1908, but was unable to finance the construction. They passed the project to J. R. Carpenter and his associates of Cheyenne, who were in negotiations for a construction contract with the state in 1912. They planned to initiate construction in 1913, but time expired for them to become bonded in 1914, and the project was not constructed.

Cottonwood and North Piney Canals
(Segregation List No. 57: 26,080 acres; Not Completed)

Water for the Cottonwood and North Piney Canals Project was to come from Cottonwood Creek and North Piney Creek, tributaries of the Green River, through the Cottonwood Canal and North Piney Canal near Marbleton, Wyoming, in Lincoln County. Construction was completed on the first 6 miles of the Cottonwood Canal by the Uinta County Irrigation Company of Kansas City, Missouri, in 1910 (**Figure 30**). The total length of the canal was planned to be 15 miles, which they completed in spring 1911 in time to deliver water to settlers. In 1913, the company transferred their rights to the Cottonwood Development Company. The project was nearly complete in 1923, but the U.S. government would not convey the segregated lands to the state until a sufficient auxiliary water supply system was constructed to the project lands. From 1919 to 1923, the company constructed a large canal from the Green River to Cottonwood Creek to provide additional water to the Cottonwood Canal. About 10,000 acres had been opened for settlement under the Cottonwood Canal and 4,000 acres under the North Piney Canal by 1923. Evidently the project was never completed, and no mention of it was made starting in 1926. Management of the project was by the Cottonwood Development Company of Cheyenne, Wyoming.

East Fork Canal
(Segregation List No. 58: 4,902 acres and 104: 2,880 acres; Not Completed)

Water for the East Fork Canal was from the East Fork River near Boulder, Wyoming, in Fremont County. It was constructed by the East Fork Irrigation Company. Part of the project was an extension of an existing canal. Most of the system was completed by 1911, but some work was still needed on the headgate. Additional land was requested for the project about 1917 under List 104, which was still pending in 1920; Land on List 58 was finally segregated about 1921. The system was reported as almost complete from 1914 to 1923, but no mention was made of it in 1926, so the project evidently went unfinished under the Carey Act. The project was managed by the East Fork Irrigation Company of Glendale, California.

Figure 30. Workers constructing the wooden board-forms for the steel and concrete drop structure on the Cottonwood Canal, circa 1961. Drop structure construction, Department of Agriculture Collection, WY-6926-3, Wyoming State Archives.

Bertram Ditch
(Segregation List No. 59: 918 acres; Patented: 918 acres)

Water for the Bertram Ditch comes from the New Fork River near Daniel, Wyoming, in Sublette County. It was constructed by David H. Johnston. Construction of the system was started about 1913 and completed by 1926 when patents were pending for all of the land. The project was managed by Fred C. Fisher of Rock Springs, Wyoming in the 1920s and by J. F. Roten of Boulder, Wyoming, by 1930.

Fremont Lake Project – Highland Canal
(Segregation List No. 62: 5,199 acres and 101: 677 acres; Total Patented: 1,992 acres)

Water for the Fremont Lake Project comes from Pine Creek through the 10-mile-long Highland Canal near Pinedale, Wyoming, in what is now Sublette County. Land on List 62 was applied for in 1909 and segregated in 1913. The Highland Canal was nearly completed by 1912 by the Fremont Lake Irrigation Company, despite the land still awaiting segregation. The company was not under an official contract with the state for construction until about 1922. By 1923, the system was still reported as nearly complete, with land on List 62 opened to settlement by 1918; land on List 101 was not approved until about 1922. The company contracted for an extension of the canal to irrigate land on List 101 that was completed by 1927. The project was managed by the Fremont Lake Irrigation Company of Los Angeles, California, but is now managed by the Highland Irrigation District near Pinedale, Wyoming.

Sixty-Seven Reservoir
(Segregation List Nos. 69: 1,680 acres and 98: 480 acres; Total Patented: 2,080 acres)

Water for Sixty-Seven Reservoir near Big Piney, Wyoming, in Sublette County, was from North Piney Creek. The project was proposed by Amos W. Smith and initially involved the construction of the reservoir and enlargement of the existing Hughes Ditch in 1910. Review by the state showed that the project reservoir needed to be enlarged from 3,374 acre-ft. to 4,320 acre-ft. In order to fill the reservoir to its new capacity, the Hughes Ditch was enlarged. Land on List 69 was requested by 1914, and was still pending in 1916. Smith constructed most of the project without being under contract to the state; it was reported as mostly complete from 1916 to 1920. A construction contract was finally made with Smith, but was transferred to the A. W. Livestock Company of Big Piney, Wyoming, in 1920. Land on List 98 was applied for in 1917 and segregated in 1921, and the entire project was completed in 1922. The project was administered by P. W. Jenkins of Big Piney, Wyoming, by 1930.

Uinta Canal No. 3 and Reservoir
(Segregation List No. 70: 16,849 acres; Not Completed)

Water for the Uinta Canal No. 3 and Reservoir was to come from the Smiths Fork and Blacks Fork rivers for the Uinta Canal No. 3 system and its storage reservoir near Ft. Bridger, Wyoming, in Uinta County. George F. Chapman and his associates applied for the project under the Uinta County Development Company. The project was under study in 1910, but was found to be unfeasible and the company unable to construct it, so the request for land segregation was withdrawn by the state by 1912.

Paradise Canal
(Segregation List No. 80: 3,536 acres; Not Completed)

Water for the Paradise Canal was to come from the West Fork of the New Fork River in Sublette County. Land on List 80 was applied for in 1911 and segregated in 1918. The approval was delayed by requests for information from the GLO. Initial construction was by the Fremont Lake Irrigation Company of Los Angeles, California, beginning in 1920, which transferred the project to the Paradise Construction Company of Cheyenne, Wyoming, by 1922. The canal was reported as incomplete through 1930. By 1930, the project was back under the management of the Fremont Lake Irrigation Company of Los Angeles, California, but was canceled in 1935.

Tepee Canal and Middle Piney Reservoir
(Segregation List No. 87: 14,951 acres; Not Completed)

Water for the Tepee Canal and Middle Piney Reservoir was to come from Middle Piney Creek, a tributary of the Green River, to irrigate land near Big Piney, Wyoming, in Lincoln County. The project was proposed by W. H. Taylor of the Piney Lake Irrigation Company of Cheyenne, Wyoming in 1912. The state required the proponent to demonstrate that there was sufficient water for the project, and the project was canceled after 1914.

Uinta-Fremont Canal
(Segregation List No. 88: 14,303 acres; Not Completed)

A temporary withdrawal of land was requested in 1914 by F. C. Fisher that was to be irrigated by water from the Green River, but the Uinta-Fremont Canal project was canceled by the U.S. government after the one-year withdrawal period.

Hay Ditch and Reservoir
(Segregation List No. 90: 2,999 acres; Patented: 639 acres to state; 0 acres to settlers)

Water for the Hay Ditch and Reservoir comes from Bush Creek and Red Creek through Bush Reservoir and Hay Reservoir in Sweetwater County. The project was proposed by John Hay by 1912. After delays addressing requests from the GLO, work began on the project by at least 1918 and was completed by Hay by 1926. Hay then transferred the project to the Sweetwater Cattle Company. Most of the land (2,359 acres) segregated for the project was relinquished or canceled by the U.S. government by 1930. The project was managed by William Allred of Wamsutter, Wyoming.

Green River Supply Canal
(Segregation List No. 91: 13,584 acres; Not Completed)

A temporary withdrawal for land in Uinta County was made by W. H. Taylor of Cheyenne, Wyoming, by 1912, for the Uinta County Irrigation Company. Water was to come from the Green River to irrigate land in Fremont and Lincoln counties. The proponent failed to file a proper application, and the project was rejected by the GLO and then canceled by them when the time for the temporary withdrawal expired.

La Barge Canal
(Segregation List No. 93: 4,300 acres; Not Completed)

The La Barge Canal project was to use water from La Barge Creek in Uinta County near Evanston, Wyoming. Land on List 93 was applied for in 1912 by the La Barge Canal Company, but was immediately rejected by the GLO, because it was in a petroleum reserve.

Green River and Cottonwood Canals
(Segregation List Nos. 106, 108, and 114: 25,309 acres; Not Completed in its Entirety)

Water for the project comes from the Green River at Poole Slough through the Green River Supply Canal in Sublette County. The request for land on List 106 was withdrawn about 1920, and land on List 108 was pending as of 1922. Construction was initiated by the Cottonwood Development Company, but reported as incomplete through 1928 because the company was in financial trouble starting in 1924. John Hay acquired the two canals under construction from the County Treasurer in 1932. He transferred title to the canals to the Green River Development Company in 1936; the company was incorporated by Hay and others in 1932. This seems to have revitalized the project, as it began to be referred to as the Green River Development Company project. The project was considered to be important to complete because it retained water from the Green River that otherwise would have been used by lower basin users of the Colorado River Compact. The project was not completed by 1940, but was expected to be finished in 1941. Instead, the Green River Development Company was acquired by Jim Mikelson in 1948. The State of Wyoming applied for a patent for lands on List 114, but it was denied by the BLM in 1953 because, although the Cottonwood Supply Canal had been completed, it was in poor condition, and the Green River Supply Canal was only 60 percent complete. Consequently, the project was canceled by the state in 1953; however, private parties continued to work on the system. Mikelson reportedly completed the Green River Supply Canal in 1956. It is likely that lands on List 106 and 108 were supplied by the system at an earlier date and were patented to the state, but lands on List 114 were not. How much land went to the state and then to private individuals is not known. In 1985, the irrigation system was put under the jurisdiction of the Green River Supply Irrigation District based in Pinedale, Wyoming. The 35-mile-long canal irrigates 7,286 acres (Nelson Engineering 2003).

Willow Lake Project
(Segregation List No. 110: 1,047 acres; Not Completed)

A temporary withdrawal of land in Sublette County near Pinedale, Wyoming was made in about 1921. The Willow Lake project was to be irrigated from water in Willow Lake and Lake Creek. The withdrawal was pending in 1922, but does not seem to have been granted.

Green River Project
(Segregation List No. 112: 75,597 acres; Not Completed)

A temporary withdrawal for land to be irrigated from the Green River by way of the Green River Canal in Sweetwater County near Green River, Wyoming, was made about 1921 (**Figure 31**). The withdrawal request was pending in 1922, but does not seem to have been granted.

Figure 31. Undated historical photograph of the main headgate of the Green River Project. Main headgate Green River Project, Irrigation Folder 2, IRRIG 05, Wyoming State Archives.

Snake-Salt River Basin

Two projects were completed under the Carey Act within the Snake-Salt River Basin. These projects occurred between 1912 and 1916.

Spread Creek Canal (Teton Project)
(Segregation List Nos. 92: 14,160 acres, 95: 1,659 acres, and 96: 960 acres; Not Completed)

Three temporary withdrawals of land in Lincoln County were made by C. C. Carlisle of Cheyenne, Wyoming, for irrigation of land by the Teton Irrigation Company from the Gros Ventre River, Spread Creek, and Dutch Creek. The proposed Spread Creek Canal project was on appeal in 1912, saw no action by the GLO, and did not move forward through 1920; the land on List 96 was rejected because it was in a phosphate reserve.

Jenny Lake
(Segregation List No. 97: 12,859 acres; Not Completed)

A temporary withdrawal was requested by C. C. Carlisle of the Jackson Hole Irrigation Company for land proposed to be irrigated from tributaries to Jenny and Leigh lakes and from Cottonwood Creek below the lakes in Lincoln County. No action was taken on the withdrawal until about 1916, when the acreage was reduced to 19,378 acres. Still, no approval of land segregation had happened by 1918. The project did not move forward.

Unknown Projects

Two projects, segregation list numbers 23 and 55, were identified. Land on List 23 was requested for segregation about 1903 and land on List 55 was requested for segregation about 1908 or 1909. No information could be found for either project, which evidently did not go beyond the application stage.

Projects Conducted under the Newlands Reclamation Act of 1902, 1902–1979

Eight major irrigation projects were completed under the Newlands Reclamation Act of 1902. These were the North Platte (Pathfinder), Shoshone, Kendrick (Casper/Alcova), Eden, Seedskadee (Colorado River Storage Project), Lyman, Minidoka, and Wind River and Riverton Area projects. The projects irrigate nearly 300,000 acres of land in Wyoming, though the proposed lands to be irrigated by the Seedskadee project never materialized, and the water from the Minidoka Project is utilized in Idaho. Newlands Reclamation Act projects occurred in the Green River Basin (a total of three projects), the Wind-Big Horn and Platte River basins (two projects each), and the Snake-Salt River Basin (one project) (**Figure 32**).

Wind-Big Horn River Basin

The two Wind-Big Horn River Basin projects include the Shoshone and Wind River Reservation and Riverton Area Irrigation projects. These projects occurred between 1904 and the 1920s. A summary of each project is presented below.

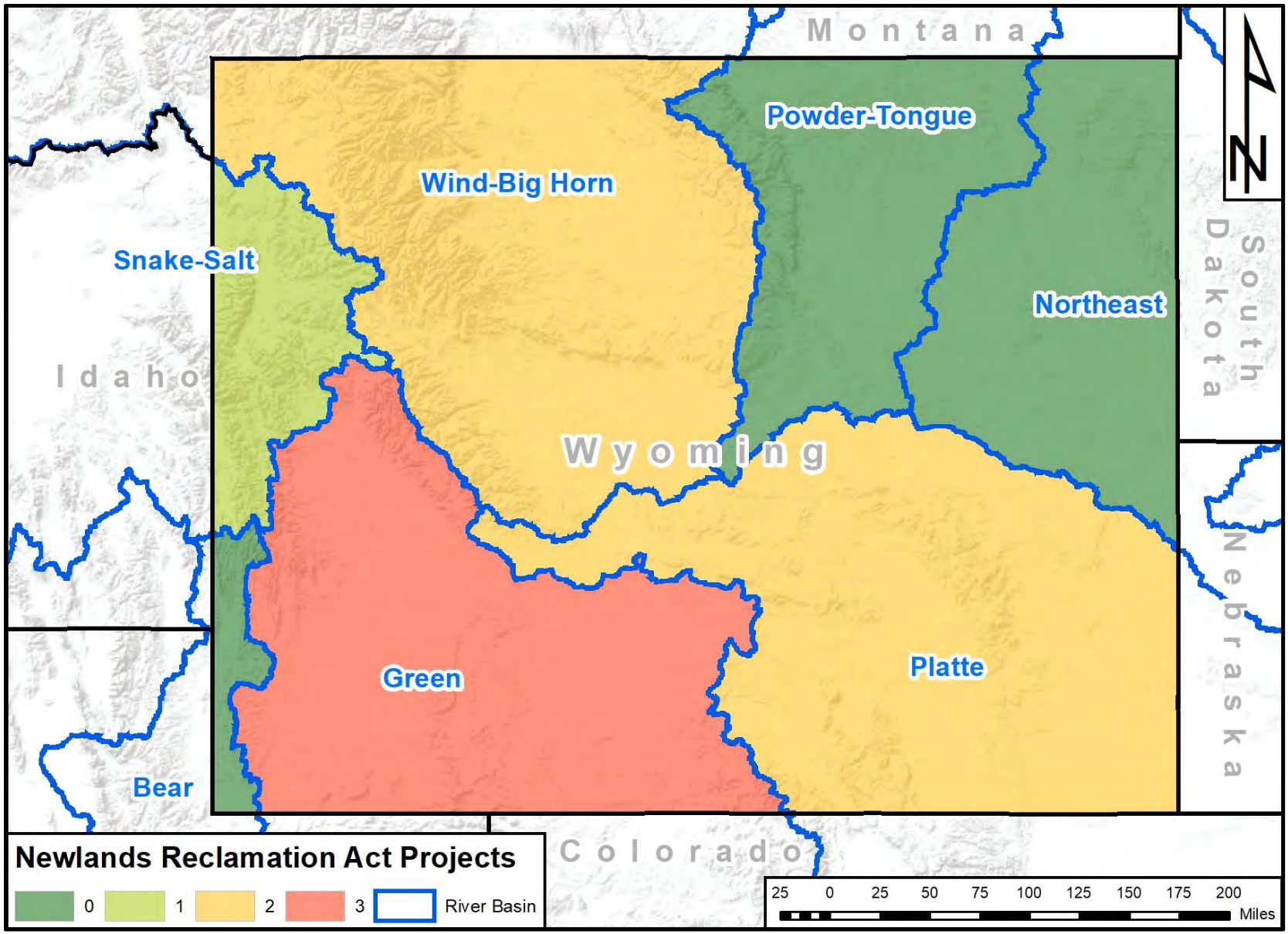


Figure 32. Frequency of Newlands Reclamation Act projects within Wyoming by river basin.

Shoshone Project

William R. "Buffalo Bill" Cody and Nate Salisbury obtained a permit from the State of Wyoming for sufficient water to irrigate 120,000 acres from the Shoshone River in 1897. They began constructing three canals that they were unable to complete. They reduced the size of the project to 60,000 acres, again obtained a permit for water from the State of Wyoming as the Cody & Salisbury Canal Company, and proceeded under the Carey Act in 1899. They did canal construction on the southern side of the Shoshone River, but, again, were unable to complete the project. The Wyoming State Board of Land Commissioners urged the Reclamation Service to complete the project in 1903, and it became authorized as the Shoshone Project in 1904. The first component was Shoshone Dam, built from 1905–1910 for water control; it was augmented by a power plant downstream later on. Shoshone Dam was later renamed Buffalo Bill Dam (**Figure 33**). Modifications to the dam have taken place in 1915, 1922–1923, 1959, 1986–1994. The next component of the Shoshone Project was Corbett Dam, constructed from 1905–1908. It diverts water through the Corbett Tunnel into the Garland Canal system, which was constructed from 1905–1907. Near the terminus of the Garland Canal, 18.5 miles from the Corbett Tunnel, Ralston Dam was built from 1906–1908 for storage of water from the Garland Canal and was the point of division of water into canals below it. It is no longer used as a storage reservoir, but as an ameliorating reservoir to contain excess water when needed. The Frannie Canal system was constructed from 1910–1921. It is fed by a siphon from the Garland Canal and runs 44 miles to and past Deaver Reservoir. Deaver Dam was completed in 1918. The Deaver Canal was constructed as part of the Frannie Division of the Shoshone Project and runs from the Frannie Canal past

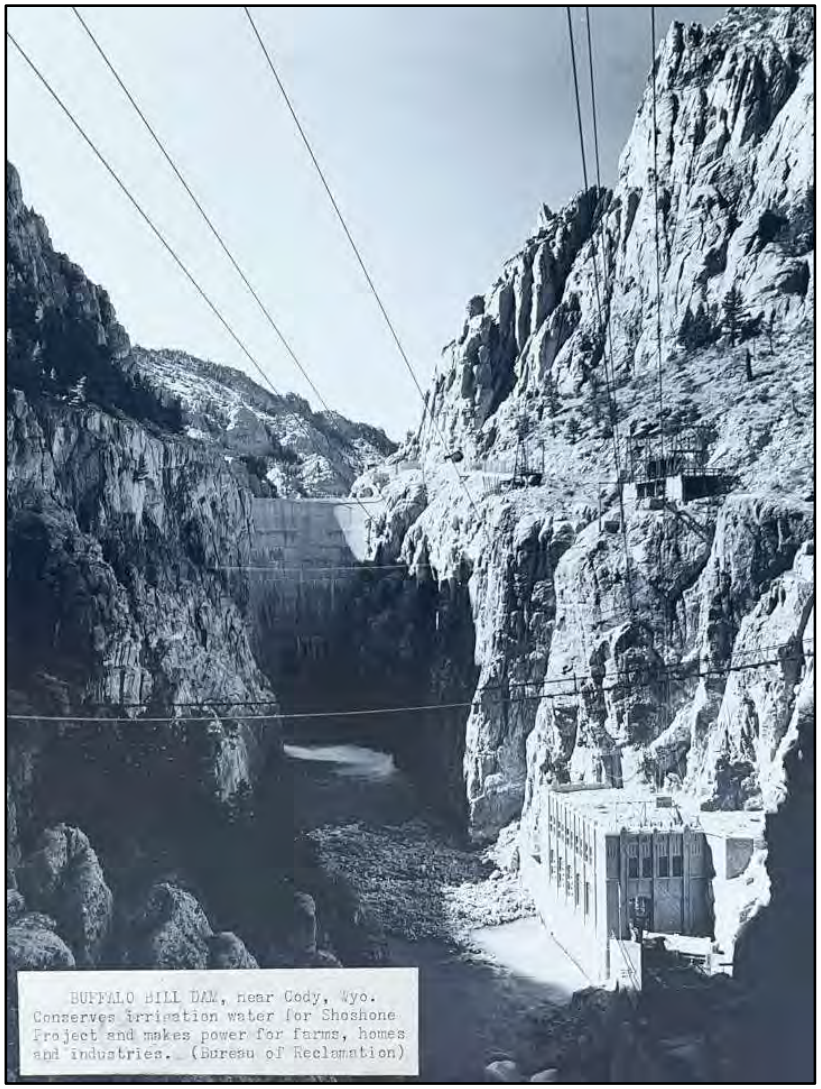


Figure 33. The Buffalo Bill Dam, circa 1930, showing the dam and hydroelectric facility downstream. Buffalo Bill Dam, Department of Agriculture Collection, no identification number, Wyoming State Archives.

Deaver Reservoir. The next component of the project was the Willwood Diversion Dam, constructed from 1921–1923. Water from the reservoir is conveyed through a diversion tunnel conduit, also constructed from 1921–1923, into the 24.8-mile-long Willwood Canal, which was built from 1922–1925. It currently includes 53 miles of laterals and irrigates 11,426 acres (Aqua Engineering, Inc. 2006). The final component of the project was the 26.2-mile-long Heart Mountain Canal that originates at the 2.8-mile-long Shoshone Canyon Conduit, built in 1937 and 1938. The Heart Mountain Canal was constructed from 1937–1947 and first delivered water in 1940; it was concrete lined in 1938.

The canal construction is notable because it used Civilian Conservation Corps labor in 1941 and 1942 and Japanese-American internees from the Heart Mountain Relocation Camp during World War II. The different divisions of the Shoshone Project are operated by four irrigation districts, the first three taking over from earlier water users' associations. The Shoshone Irrigation District took over the operation of the Garland Division in 1927, the Deaver Irrigation District took over the Frannie Division in 1930, and the Willwood Irrigation District took over the Willwood Division in 1949. The Heart Mountain Irrigation District has operated the Heart Mountain Division since it was first turned over to them by the BOR in 1953 (Stene 1996).

The project provides irrigation water to 93,113 acres of land and supplemental water for an additional 14,561 acres. Other water users that benefit from the Shoshone Project are the Cody Canal Irrigation District, Lakeview Irrigation District, Sidon Irrigation District, Elk Water Users Association, and the North Fork Valley Ditch Company (Stene 1996; Aqua Engineering, Inc. 2006; Engineering Associates 2016; Sage Civil Engineering 2016). Water used by the Lakeview Irrigation District irrigates 9,167 acres with water rights from 1903 through the Shoshone Canal and through the Hammitt Canal with water rights dating as early as 1900. The main canal of the system is 28 miles long; it has 9 miles of laterals (James M. Montgomery Consulting Engineers, Inc. 1986; Sage Civil Engineers 2013) (**Figure 34**).

Figure 34. A 1911 photograph of the One Hundred Second Feet Lateral diverging from the Main Canal on the Shoshone Project. Lateral diverging from the Main Canal, J.E. Stimson Collection, STIMSON NEG 3179, Wyoming State Archives.

Wind River Reservation and Riverton Area Irrigation

The Wind River Reservation was established by treaty in 1868 for the Eastern Shoshone tribe. In 1878, the Northern Arapaho were relocated there, supposedly as a temporary measure until they could be situated on a reservation of their own. The temporary relocation proved to be permanent, and the Shoshone and Arapaho have shared the reservation to the present day. In 1872 and 1896, the reservation was diminished in size through relinquishments of land. Small ditches—including the forerunner of the Ray Canal—were built to irrigate farms from the Little and Big Wind rivers and their tributaries, mostly south of the Big Wind River. The McLaughlin Agreement of 1905 diminished the size of the reservation even further when it was determined that 1.4 million acres of the reservation could be sold to non-Native American settlers with the proceeds applied to irrigation development, schools, and other projects on the reservation. The 1868 treaty reserved water rights to the tribes sufficient for the irrigation of 3,814 acres. As a result, the U.S. Indian Service started construction on five irrigation units beginning in 1905 for the irrigation of reservation land in Fremont County. Two of the primary canals of this initial project were the Dinwoody Canal and the Dry Creek Canal (Nelson Engineering 2005). The Wyoming Central Irrigation Company was granted a permit by the state of Wyoming in 1905 to construct the irrigation system (**Figure 35**).

Although the portion constructed by the U.S. Indian Service was thought at one time to have potential to irrigate a total of 78,660 acres, in practice, 36,789 acres were put under irrigation. Of that, only one-third of the irrigated land was in ownership by Native Americans. The project took its water from the Wind River, Little Wind River, Dinwoody Creek, and other streams and

Figure 35. A 1911 photograph of an unidentified Wyoming Central Irrigation Company canal associated with the Wind River Reservation and Riverton project. Wyoming Central Irrigation Company canal, J.E. Stimson Collection, STIMSON NEG 3115, Wyoming State Archives.

included 7,000 acre-ft. of water storage in Ray Lake Reservoir. The project is divided into the Lower Wind River, Upper Wind River, Lefthand, and Johnstown units. The Little Wind River Unit included the Ray Canal, which had been constructed in 1894–1895 and was enlarged beginning in 1907. The Coolidge Canal was initiated in 1905 and the Sub-Agency Canal in 1907. Work on the Upper Wind River Unit was initiated in 1907. It includes the Big Wind River Ditch, Big Wind Ditch No. 2, Meadow Creek Ditch, Willow Creek Ditch, and Dry Creek Ditch. The Bull Lake Creek Ditch was not authorized for government construction, but was built privately in 1916. Also initiated in 1907 were the Johnstown Canal in the Johnstown Unit and the Lefthand Canal in the Lefthand Unit. Under the project, the U.S. Indian Service engaged

in the construction of a portion of the LeClair Canal in 1905 in cooperation with the Riverton Ditch Company for irrigation of an additional 6,441 acres of private, former reservation land managed by the LeClair-Riverton Irrigation District (Fandrich 2008).

The Wyoming Central Irrigation Company was not financially able to complete the project, resulting in the Midvale portion becoming a Carey Act project by 1910. Settlers were encouraged to settle within the proposed project lands, but the harsh climate, poor soil, and slow development of the irrigation system was not encouraging. The company still failed to complete the proposed system, even after it was redesigned to cover a smaller amount of land, and the project fell into the hands of the Reclamation Service, which was authorized to proceed in 1918 with what became known as the Riverton Project. The initial portion of the Wyoming Canal of the project had been constructed by 1912 with some laterals built for distribution. Government development focused on two proposed canals—the Wyoming (Midvale) Canal and the Pilot Canal—and on additional soil surveys, which were not very promising because they identified drainage problems with much of the land in the area. Authorization of the project was under the Indian Appropriation Act, as nearly half of the 322,000 acres to be served by the Riverton Project was on the Wind River Reservation and most of the remainder was land ceded under the McLaughlin Act and subsequently withdrawn from entry for the project. The project came under the authority of the Reclamation Service in 1920, and the government paid $1.50 per acre for the 100,000 acres of ceded land to the Shoshone and Arapaho tribes. Lands proposed for irrigation under the Riverton Project of the Reclamation Service were available exclusively to war veterans until July 1926. Thereafter, the lands were open to settlement to all entrants (**Figure 36**). Work on the Wyoming Canal under the Reclamation Service began in 1920, and the Midvale Irrigation District was formed in 1921 as the entity to take over management of the irrigation system when completed. Water from the Wind River is diverted into the canal by the Wind River Diversion Dam, built from 1921–1923 (**Figure 37**). The first 9.2 miles of the Wyoming canal were completed in 1924 from the Diversion Dam to the Pilot Butte Power Plant, also constructed from 1923–1925. Water entered Pilot Butte Reservoir after passing through the power plant. Pilot Butte Reservoir was constructed from 1922–1926. By

Figure 36. An undated historical photograph showing irrigated fields associated with the Riverton project. Irrigated fields, Department of Agriculture Collection, no identification number, Wyoming State Archives.

Figure 37. The Wind River Diversion Dam, circa 1940. Wind River Diversion Dam, Department of Agriculture Collection, no identification number, Wyoming State Archives.

1926, when progress halted for a number of years, an additional 7.5 miles of the Wyoming Canal had been constructed, giving the Wyoming Canal a total length of 16.7 miles. Work continued slowly through 1936 with an additional 14.1 miles of the canal being built. Initial work was initiated on the Pilot Canal by 1926, but it ceased until increased settlement of project lands created demand for irrigation water (Autobees 1996b). Elsewhere in the Riverton Area, but not in the Riverton Project area of the Reclamation Service, the Public Works Administration did improvement work on the Dinwoody Canal, Washakie Dam, and a feeder canal for Ray Lake Reservoir in the early 1930s.

During the 1920s, it was difficult to entice settlers to the region. That changed when the Depression brought a wave of settlers displaced from elsewhere. To facilitate farm development, the Federal Housing Administration provided needed financing for settlers because local banks were unwilling to loan money on what they believed to be such risky ventures. Demand for water with land taken up in the early 1930s resulted in recognition that supplemental water storage was necessary above the Wind River Diversion Dam. Emergency Relief Act funds were designated for Bull Lake Dam on Bull Lake Creek in 1935; the dam was built from 1936–1938 as a storage reservoir for the BOR's project, releasing water into the Wind River that was diverted by the Wind River Diversion Dam (Autobees 1996b). With increased settlement into the early 1940s, expansion of the irrigation system was undertaken in the 1940s and early 1950s into the Lost Wells, Pilot Extension, North Pavilion, and North Portal areas.

Construction of the 62.4-mile-long Wyoming Canal resumed in 1947, running northeastward until it reached its final destination of Boysen Dam in 1951. An extension of 13.6 miles to North Portal, Cottonwood Bench, and Muddy Ridge was completed in 1948. The remaining 18 miles was completed in 1951. The system includes 212 miles of laterals and distribution ditches. Water released from Pilot Butte Dam enters the Pilot Canal through a regulating structure that shunts water back into the Wind River to the west. The 38.2-mile-long Pilot Canal was completed in 1947 with 300 miles of lateral canals and ditches and 335 miles of drainage, including 141 miles of pipelines (Autobees 1996b).

With completion of the system, the BOR turned the project over to the Midvale Irrigation District in 1951, which manages irrigation water to 73,000 acres of land. The project was made the Riverton Unit of the Pick-Sloan Missouri Basin Program in 1970 to enable rehabilitation of project facilities to take place. Sediment excluders were added to the Wyoming Canal headworks, repair of

the Wind River Diversion Dam was done, and lining and piping of lateral drains was conducted by 1986. The Pilot Butte Power Plant was shut down permanently in 1973 because of deterioration that was not economical to repair (Autobees 1996b; Nelson Engineering, Inc. 2001).

Platte River Basin

Two Newlands Reclamation Act Projects were completed in the Platte River Basin, including the North Platte Project (also known as the Pathfinder Project), and the Kendrick Project, which was previously known as the Casper-Alcova Project. This project occurred between 1903 and 1933 and a description of each project is discussed below.

North Platte Project [Pathfinder Project]

The North Platte Project, often referred to as the Pathfinder Project, came about as a way to irrigate former grazing land along the North Platte River as one of the first projects under the Reclamation Act of 1902. The project was authorized in 1903 and was initiated with the construction of Pathfinder Dam from 1905–1909. The dam stores and regulates the release of about 1,000,000 acre-ft. of water for diversion by the Whalen Diversion Dam near Whalen, Wyoming. The Whalen Diversion Dam was built from 1907–1909 and modified in 1918, 1921, and 1923. It puts water into the Interstate Canal on the northern side of the North Platte River and into the Fort Laramie Canal on the southern side of the river in Goshen County. The Interstate Canal was constructed from 1905–1915 and irrigates land in Wyoming and Nebraska (**Figure 38** and **Figure 39**); it was turned over to the Pathfinder Irrigation District in 1926. The Fort Laramie Canal, which was constructed from 1915–1924, also irrigates land

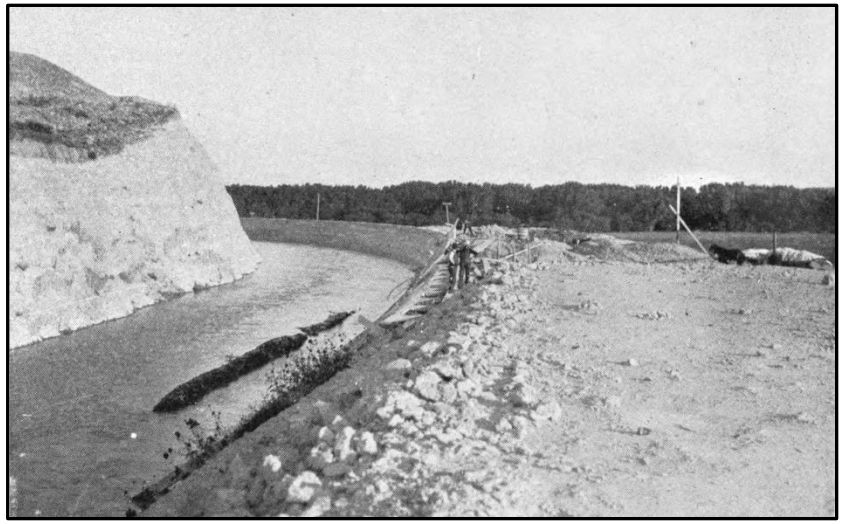


Figure 38. A section of the Interstate Canal circa 1906 (Johnston 1906:24).

Figure 39. The Interstate Canal showing modern conditions in Goshen County.

in Wyoming and Nebraska; the Wyoming portion of the canal has been administered by the Goshen Irrigation District since 1926 (Autobee 1996a). The district administers the 85 miles of the canal in Wyoming to the Nebraska border, which includes 300 miles of laterals and irrigates 52,284 acres (Lidstone & Anderson, Inc. 1991). The Horse Creek Diversion, built in 1923, is another component of the project that distributes water from Horse Creek to irrigate 40,000 acres of farmland and the Goshen Wetlands Complex in Goshen Hole. Guernsey Dam, upstream of Pathfinder Dam near Guernsey, Wyoming, was authorized in 1924 and built from 1925–1927 to regulate the flow of water into Pathfinder Reservoir. It has a desilting chamber and regulates the flow of 52,000 cfs of water through a gatehouse on its northern spillway. The Kendrick Project and the Kortes and Glendo Units of the Missouri River Basin Program were linked with the North Platte Project when they were built (Autobee 1996a). Among the water users that it serves, the Interstate Canal provides water to the Hill Irrigation District for the irrigation of 3,810 acres north and east of Torrington, Wyoming. The canal and ditch system originally diverted water directly from the North Platte River using 1901 and 1904 water rights (Lidston & Anderson, Inc. 1997).

Kendrick Project (formerly Casper-Alcova Project)

The Kendrick Project began with investigation by the BOR in 1921 for the placement of a reservoir in Alcova Canyon on the North Platte River to provide irrigation water for the Casper area. Further investigations in 1924 and 1929 resulted in the Casper-Alcova Project being authorized in 1933 for the construction of Alcova Reservoir and the Casper Canal. With authorization, the Casper-Alcova Irrigation District was created in 1933 for future operation and maintenance of the project. Investigations for a second reservoir about 30 miles upstream in Seminoe Canyon added authorization for Seminoe Dam in 1935. Together, the two dams were combined into the Kendrick Project in 1937. The contract for the construction of Alcova Dam was awarded in 1934, and the dam was built from 1935–1938. Construction of the Casper Canal began in 1935. The 59-mile-long canal runs northward through rugged country on the eastern side of the North Platte River on a winding route that incorporates six tunnels, including the outlet from the reservoir. The canal was completed in 1946, at which time the project was turned over to the Casper-Alcova Irrigation District (**Figure 40**). The project was initially constructed to irrigate 66,000 acres near Casper, and the canal was designed to carry water sufficient to do so, but only

Figure 40. Showing the modern condition of the Casper Canal.

24,253 acres have been put under irrigation by the project. A power plant was added to Alcova Dam from 1952–1955. Seminoe Dam was constructed from 1936–1939 for power production. It initially was also designed to store irrigation water that was conveyed by the North Platte River to Alcova Reservoir (Klajic 2000b).

Green River Basin

Three projects were completed within the Green River Basin under the Newlands Reclamation Act: The Eden, Seedskadee, and Lyman projects. These projects occurred between 1907 and the 1960s. Each project is discussed in more detail below.

Eden Project

The Eden Project is in the Eden Valley southwest of the Wind River Mountains. In 1905, 56,327 acres were withdrawn in the valley for a project proposed by the Eden Irrigation and Land Company under the Carey Act. They were unable to complete the project, so, beginning in 1907, were assisted by the Reclamation Service—which had helped them develop the plan for the project—to complete diversions and the Eden Canal from Big Sandy and Little Sandy creeks. Part of the project was construction of Eden Dam between the two creeks to serve as a storage reservoir. With completion of the irrigation system in 1914, the project was turned over to the company, then known as the Eden Irrigation District. The Eden Irrigation District had difficulty maintaining the system and the company failed financially in 1927. Responsibilities for operating and maintaining the system passed to others through the 1930s, but the system continued to deteriorate. The BOR took on the rehabilitation and enlargement of the system in 1940. They rehabilitated the canal and diversion system and began construction of the Big Sandy Creek Dam to provide a more reliable supply of water using Civilian Conservation Corps and Works Progress Administration labor. Work was delayed because of World War II, and the project was reapproved in 1949 and started again. Anticipating the successful construction of the project, the Eden Valley Irrigation and Drainage District was established in 1950 for future maintenance and repayment of construction costs. Work on Big Sandy Creek Dam took place from 1950–1953. Improvements were completed on Eden Dam in 1959. Big Sandy Creek Dam was built on Big Sandy Creek and is the primary storage reservoir for the project. Eden Reservoir is fed by the Little Sandy Creek Feeder Canal, which takes water at the Little Sandy Creek Diversion. Water exits Big Sandy Creek Reservoir by way of the 6-mile-long Means Canal, built in 1952, and runs southward to the Eden Canal, which was relocated in 1955 and carries the water to a large number of distribution laterals. The 94 miles of canals in the system were completed in 1970, and the project was turned over to the Eden Valley Irrigation and Drainage District. The system supplies 33,000 acre-ft. of water for irrigation of 17,010 acres of land near Farson and Eden and 1,400 acre-ft. for fish and wildlife (Klajic 2000a).

Seedskadee Project

As a result of the Colorado River Compact for the seven states within the Colorado River drainage basin, negotiated in 1922 and approved in 1928, upper-basin states began developing plans for water storage. The Colorado River Storage Project involved several projects in several states and included the Seedskadee Project on the Green River in Wyoming, comprising

Fontanelle Dam. It was approved in 1956. The decision to build Fontanelle Dam was as a result of studies by the BOR in the late-1940s to mid-1950s. Fontanelle Dam was originally conceived as an irrigation project for 58,875 acres of land, but evolved into a storage project for municipal, industrial, and fish and wildlife water because initial studies for irrigation showed little immediate benefit. Plans for Fontanelle Dam were approved in 1960, and a power generation component was added and approved in 1961. The dam was constructed from 1961–1964; repairs and construction of power-generation facilities were completed in 1968. An experimental farm on land below the dam near the town of Green River was operated from 1964–1969 to demonstrate the feasibility of growing crops on lands that had been withdrawn for the project. The 740-acre farm was offered for lease in 1972, but no one took up the land and no farming has taken place there since. An irrigation component of the project was never undertaken, and the withdrawn lands were returned to the public domain under the jurisdiction of the BLM. As part of the project, 22,000 acres of federal and private lands were acquired for the Seedskadee National Wildlife Refuge, which stretches along the Green River and its tributaries about 6 miles below the dam (Linenberger 1997; J-U-B Engineers, Inc. 2017).

Lyman Project

The Lyman Project provides supplemental irrigation water to 37,916 acres of farmland in the Bridger Valley and municipal water to the towns of Lyman and Mountain View in southwestern Wyoming. The project stores water from Blacks Fork and Smiths Fork of the Green River on the Wasatch National Forest in the Uinta Mountains. Water was initially diverted for irrigation around in the Bridger Valley as early as 1853 by Mormon settlers. By 1919, it was realized that water had been over-allocated from the two forks of the Green River. Water shortages resulted in inquiries with the Reclamation Service regarding the potential for a water storage project. Such a need was recognized in 1933, but no action was taken until studies started in the late 1940s and 1950s resulted in authorization of the Lyman Project in the 1960s using funds available for construction from the Colorado River Storage Project. Meeks Cabin Dam was constructed from 1966–1971 on the Blacks Fork, and the Stateline Dam was constructed from 1977–1979 on the East Fork about 0.5 miles south of the Wyoming border in Utah. Water from the two reservoirs is released into the two forks of the river for diversion through existing canals in the Bridger Valley, including the Blacks Fork Canal, Smiths Fork Canal, Bridger Canal, Twin Buttes Canal, Von Kleet Canal, Uinta Canal, and Pine Grove Canal (Klajic 2000c).

Snake-Salt River Basin

A single project, the Minidoka Project, occurred within the Snake-Salt River Basin under the Newlands Reclamation Act. It was initiated in 1906 and was completed by the late 1930s.

Minidoka Project

The Minidoka Project is mostly in Idaho, but includes Jackson Lake Dam in Teton National Park and Grassy Lake Dam just south of Yellowstone National Park in Wyoming. The project provides irrigation water to Idaho, but has two storage and regulating reservoirs in Wyoming. The Cascade Diversion Dam diverts water from Cascade Creek by a canal built in 1937 that feeds Grassy Lake Reservoir. All of the irrigation water is used in Idaho. The Wyoming reservoirs serve for storage and regulate high-water runoff so that the lower components are not inundated during spring runoff (Stene 1997). Jackson Lake Dam

began as a timber-crib, rock-filled dam built from 1906–1908 by the Reclamation Service on the Snake River in Teton National Park to raise the level of Jackson Lake and control its outflow. The dam failed in 1910 and was replaced with a concrete dam from 1911–1916. Its foundation was replaced from 1986–1989 (Stene 1997:9-10). Grassy Lake Dam was built on Grassy Creek on the Yellowstone Plateau from 1937–1939. Water stored in the reservoir is augmented by the Cascade Creek Canal from the Cascade Creek Diversion Dam constructed 1937. It is operated by the Fremont-Madison Irrigation District of St. Anthony, Idaho (Stene 1997:17-19).

Pick-Sloan Missouri Basin Program, 1944–1975

The Pick-Sloan Missouri Basin Program is a multistate flood-control effort within the Missouri River watershed. It was approved under the Flood Control Act of 1944 as a joint project of the BOR and the U.S. Army Corps of Engineers. Studies of the Missouri River Basin, including all of its tributaries, were completed in 1934. The study by the U.S. Army Corps of Engineers was prepared by Col. Lewis A. Pick and the BOR study was prepared by William G. Sloan. Flooding on the Missouri River in 1943 stimulated action to combine the two studies into a single plan that was approved the next year. The program was initially administered by the Missouri Basin Interagency Committee for projects within the 10 states included in the plan (Bureau of Reclamation 2022; Ostott n.d.).

Several Units of the Project are in Wyoming, including the Boysen, Hanover-Bluff, Keyhole, Kortes, Owl Creek, Riverton, Glendo, and Gray Creek units. The Pick-Sloan Missouri Basin Program provided a second phase of large-scale water development in Wyoming that often dovetailed with earlier Reclamation Act projects. Most of the water development was for supplemental irrigation water for existing projects. In Wyoming, hydroelectric power generation from the Kendrick, Shoshone, and North Platte Reclamation Act projects were integrated into the Pick-Sloan Missouri Basin Program for marketing to provide financing for the program's projects (Bureau of Reclamation 2022). Projects completed as part of the Pick-Sloan Missouri Basin Program occurred in the Wind-Big Horn River Basin (a total of four projects was completed), in the Platte River Basin (two projects), and within the Northeast River Basin (one project) (**Figure 41**).

Wind-Big Horn River Basin

Four of the Program units are within the Wind-Big Horn River Basin. These include the Boysen, Hanover-Bluff, Owl Creek, and Riverton units. The projects were constructed between 1944 and the 1970s. A description of each unit is presented below.

Boysen Unit

The Boysen Unit was part of the original authorization of the Program in 1944. Boysen Dam, on the Yellowstone River about 20 miles south of Thermopolis, was constructed to capture floodwater for storage that is released back into the Yellowstone River for diversion downstream for late-season irrigation. No irrigation components are directly associated with the dam, but water for 7,400 acres of land under the Hanover-Bluff Unit and 2,300 acres under the Owl Creek Unit is stored in the reservoir and released into the Yellowstone River. Water storage in the reservoir enables upstream users to use water for irrigation as

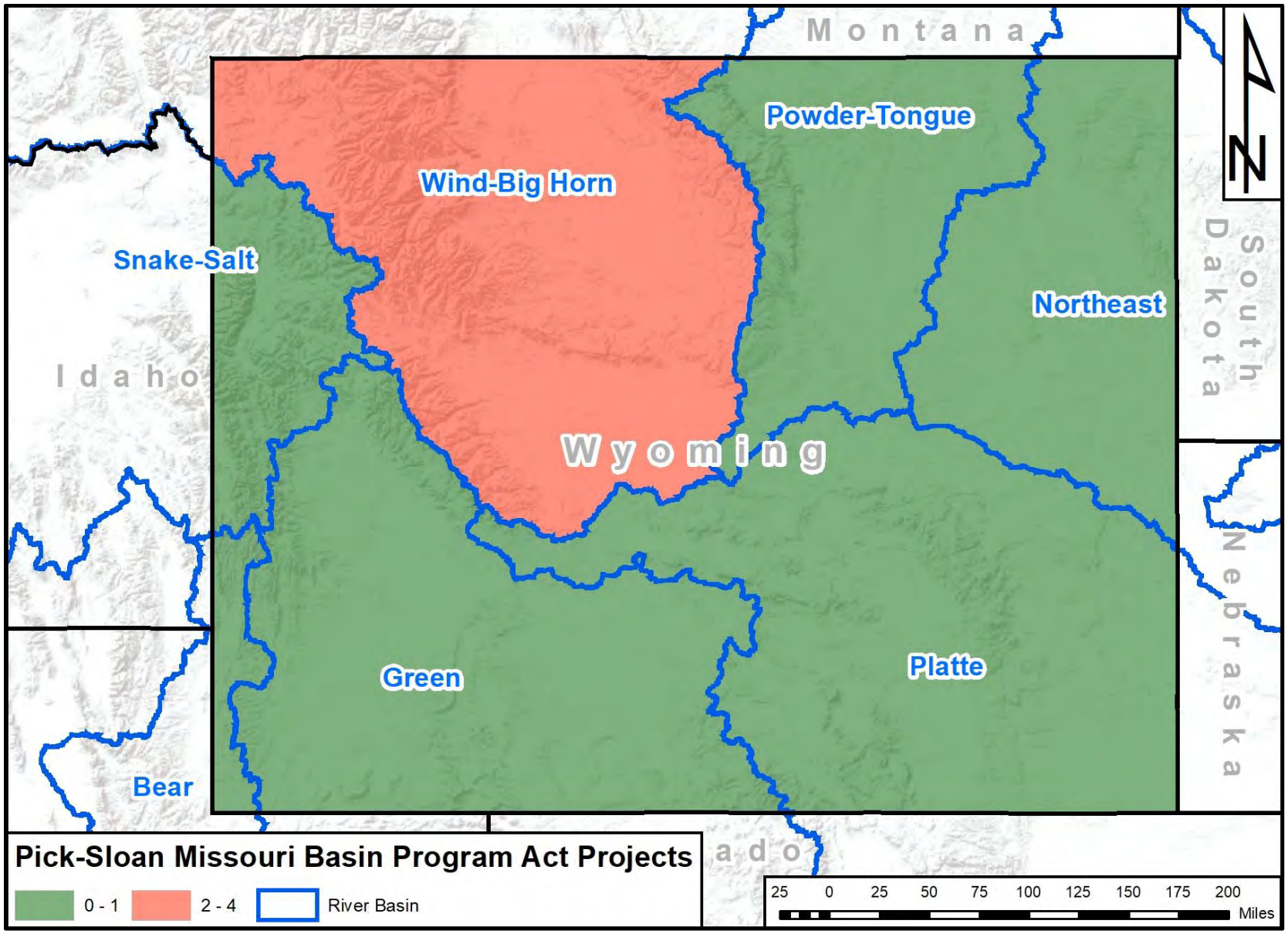


Figure 41. Frequency of Pick-Sloan Missouri Basin Program projects within Wyoming by river basin.

an exchange with downstream users. Preliminary work for the dam began in 1946, and actual dam construction took place from 1947–1952 (Simonds 1999a).

Hanover-Bluff Unit

The Hanover-Bluff Unit was authorized in 1944 for the rehabilitation of the existing Upper Hanover Canal (now known as the Hanover Canal) and Bluff Canal systems. The Bluff Canal was constructed in 1904 for irrigation of 2,800 acres on the western side of the Big Horn River. Extending farther northward was the Big Horn Canal, constructed in 1907–1908 to irrigate 28,000 acres as far as the Greybull River. On the eastern side of the river, the completely separate Lower Hanover Canal was completed in 1906 and the Upper Hanover Canal in 1910. Investigations were made in 1949 and 1950 and plans finalized in 1953 to improve and expand the existing irrigation systems. The Upper Bluff Irrigation District and Highland-Hanover Irrigation District were organized in 1954 to take over the project once it was completed. Water stored in Boysen Reservoir is released into the Wind River and diverted from a single diversion for the project on the Big Horn River south of Worland. Water is pumped from the diversion into the 35-mile-long Hanover Canal on the western side of the river and carried northward to a point where the Hanover Canal is siphoned across the river to the eastern side and the Bluff Canal continues on the western side. The project enlarged and extended the Bluff Canal an additional 1 mile for a total length of 9.1 miles in 1955. The Bluff Canal empties into the Big Horn Canal, which carries water northward to the Greybull River. The new system included a single diversion on the Big Horn River, six pumping plants (four for the Hanover system and two for the Bluff system), an enlarged initial canal to carry water of both canal systems from the diversion and pumping plant to the point of division, and a siphon across the Big Horn River for the Hanover system. The Upper Bluff irrigation system was constructed by the BOR between 1955 and 1957. It is supplied by water pumped from the Bluff Canal. The Highland Hanover system also takes water from the Hanover Canal; it includes four pump stations and five laterals and irrigates 6,500 acres. In all, 13 miles of canal were constructed for the new system, including new lateral canals that serve to irrigate 6,105 acres in the Highland-Hanover service area and 1,336 acres in the Upper Bluff service area. The diversion on the Big Horn River was replaced with a new concrete structure in 1975. Desilting basins for the pumping plants and conversion of 0.95 miles of open ditch to pipe took place in the early 1990s (Rogers and Gahan 2013; Centennial Engineering & Research, Inc. 1988; Donnell & Associates, Inc. 1988; Western Heritage Consulting & Engineering 2017; 2020).

Owl Creek Unit

The Owl Creek Unit of the Pick-Sloan Missouri Basin Program north of Thermopolis, Wyoming, was authorized in 1944. It supplies supplemental water to 12,740 acres to Wind River Reservation and adjacent private land along Owl Creek and on the northern side of the Big Horn River. Irrigation development from the 1880s to early 1900s resulted in allocation of water for 28,800 acres by 1905 with water sufficient for only 17,000 acres. Water users sought additional water, resulting in multiple studies from 1909 to the late 1930s. The Owl Creek Irrigation District was formed in 1935; only the Cyclone Ditch system was in operation under their management at that time. The BOR was approached, resulting in the project being approved as part of the Pick-Sloan Missouri Basin Program. With plans in hand, the Owl Creek Irrigation District was

reconfigured in 1946 as the entity that would take over the project once it was completed. The irrigation district entered into a contract with the BOR in 1955 to complete the Owl Creek Unit. The Lucerne Pumping Ditch was rehabilitated, but pumping facilities could not be rehabilitated, so two new pumping plants were constructed in 1956. Pumping Plant No. 1 lifts water from the Lucerne Pumping Canal into the Lucerne Ditch and to the 3-mile-long Lucerne Relift Canal. Pumping Plant No. 2 lifts water from the Lucerne Relift Canal into the Dempsey Ditch. To store supplemental irrigation water, Anchor Dam was built on the South Fork of Owl Creek from 1957–1961. It releases it water into the South Fork of Owl Creek for distribution through the two pumping plants. The dam area has sinkholes that prevent long-term water storage, and the reservoir has never filled completely, but the reservoir provides sufficient supplemental water to enable late-season irrigation (Simonds 1999b; Nelson Engineering 2004).

Riverton Unit

Under the Pick-Sloan Missouri Basin Program, the Riverton Project of the BOR was subject to improvement projects beginning in 1970. This included sediment excluders on the Wyoming Canal headworks, repair of the Wind River Diversion Dam, and lining of some of the canals and laterals and piping of others (Autobees 1996b).

Northeast River Basin

A single project, the Keyhole Unit, was completed as part of the Pick-Sloan Missouri Basin Program within the Northeast River Basin. It was constructed between 1949 and 1953.

Keyhole Unit

The Keyhole Unit comprises Keyhole Dam on the Belle Fourche River about 17 miles northeast of Moorcroft in northeastern Wyoming. It was constructed to store 57,068 acre-ft. of supplemental water storage for the Belle Fourche Project, with 10 percent of the water allocated for irrigation of 1,300 acres in Wyoming and the remainder for irrigation in South Dakota. Water stored in the reservoir is released into the Belle Fourche River for diversion downstream. No irrigation components are directly associated with the reservoir. Funding for the construction of Keyhole Dam was approved in 1948, preliminary work was undertaken in 1949, and actual dam construction took place from 1950–1952. Water was first released for the benefit of the Belle Fourche Irrigation District in 1953 (Linenberger 1996).

Platte River Basin

Two projects, the Kortes and Glendo units, were completed as part of the Pick-Sloan Missouri Basin Program within the Platte River Basin. These units were completed between 1951 and 1957 and are discussed in more detail below.

Kortes Unit

The Kortes Unit was authorized as an initial project of the Pick-Sloan Missouri Basin Program in 1944. It consists of Kortes Dam, built from 1946–1951, on the North Platte River 2 miles below Seminoe Dam and above Pathfinder Reservoir. The dam was built exclusively for power production and has no irrigation component. The three generators at the dam were installed from 1950–1952 and are operated by the Western Area Power Administration (Simonds 1996).

Glendo Unit

The Glendo Unit of the Pick-Sloan Missouri Basin Program is on the North Platte River and includes Glendo Dam near Glendo, Wyoming; Fremont Canyon Power Plant 4 miles below Seminoe Dam and just above the pool of Alcova Reservoir; and Gray Reef Dam 4 miles below Alcova Dam. The unit is operated in conjunction with the North Platte and the Kendrick projects and has no direct irrigation components. It releases stored water directly into the North Platte River for diversion downstream. The unit stores supplemental water for 37,251 acres of agricultural land, roughly 15,000 acres in Wyoming and 25,000 acres in Nebraska. The unit was initially authorized in 1944, but project details were controversial, causing delays in its planning. It was reauthorized in 1954 when it included Gray Reef Dam. Glendo Dam was authorized in 1954 and built from 1954–1957. It was built to retain 150,000 acre-ft. of irrigation water storage of return flow from the Kendrick Project in order to capture silt and prevent it from diminishing the capacity of Guernsey Reservoir, a few miles downstream. The dam stores 15,000 acre-ft. of supplemental irrigation water for use in Wyoming and 25,000 acre-ft. of supplemental irrigation water for use in Nebraska. The stored water also enables the power plants in Fremont Canyon and at Alcova Dam to run year-round. The Fremont Canyon Power Plant and Gray Reef Dam are a considerable distance upstream and west of Glendo Dam. The Fremont Canyon Power Plant was constructed from 1957–1961 and is supplied with water by a conduit from Pathfinder Dam that exits into Alcova Reservoir. Gray Reef Dam was constructed 2 miles below Alcova Dam from 1959–1961. It regulates the flow of releases from Alcova Dam.

Management and Maintenance of Irrigation Systems: Irrigation Districts and Federal Works Programs, 1907–1960s

Irrigation district laws were enacted in 1907 to manage Carey Act and Reclamation Act projects into the future. These enabled local irrigation districts to be organized through the counties. The irrigation districts were able to define the boundaries of their districts, hire personnel, acquire rights-of way, sell bonds, levy assessments, incur debt, and manage the districts for the benefit of its users. Irrigation districts continue to be the primary managers of irrigation systems in the state, and many have continuing relationships with the BOR, which often provides funding for maintenance and upgrading of systems.

Depression-Era Federal Works Programs Maintenance and Rehabilitation in the 1930s

Several years of drought leading up to and including the 1930s resulted in fewer applications for new water rights because available water had been fully appropriated or over appropriated. Drought made it clear to water managers that water in Wyoming was not inexhaustible. Those looking for water turned to abandonment filings as a way to acquire water from users who were not using the water they were allocated to its full extent, causing contention between water users and legal actions to refine how the abandonment process worked. As a result, most applications for water were for new small storage reservoirs or the enlargement of existing reservoirs. With scrutiny of available water at a peak, a system of gaging stations was found to be necessary to monitor the actual availability of water throughout the state. A small amount of stream measurement had been

initiated by the State Engineer in cooperation with the U.S. Geological Survey beginning in 1896. Public Works Administration (PWA) funding enabled the installation of numerous continuous-recording gaging stations between 1934 and 1939 that improved the data collection on actual stream flows. A snow survey program to monitor snowpack and predict available annual stream flows was implemented with 40 new snow courses in 1935. Snow surveys had been initiated in Jackson Hole in 1919, but had not been utilized in a comprehensive way. The program was carried out in cooperation with the U.S. Bureau of Agricultural Engineering and is now administered by the Natural Resources Conservation Service (NRCS).

The PWA offered an opportunity for federal funds to be applied to the upkeep and maintenance of irrigation systems operated by several Irrigation Districts. Applications for PWA assistance were received from the Greybull Valley, Washakie Needles, Yoder, Owl Creek, Fairview, and Fort Bridger irrigation districts and from the proposed Bear River, Weston County Beaver Creek, and La Barge irrigation districts. Although few projects were actually funded, the Greybull, Washakie Needles, and Bear Valley irrigation districts had projects funded by the PWA. In 1936, the PWA provided the Greybull Irrigation District with $1,108,000 for construction of Upper Sunshine Reservoir in Big Horn County and $443,636 to the Washakie Needles Irrigation Project in Hot Spring County. The Bear Valley Irrigation District was awarded $650,000 for construction of Coyote Creek Reservoir in Uinta County in 1937 (Raymond 1936:130; Drainage Basin Committee 1937:12; Western Construction News 1937; Cassity 2012).

The Indian Emergency Conservation Work program employed residents of the Wind River Reservation to do work throughout the reservation beginning in 1933. The program was operated by the CCC and became known as the Indian Division of the CCC (Hosmer and O'Neil 2004). Many of these projects included construction and rehabilitation of the irrigation system on the reservation, but the specific canals and ditches are not known. In addition, the Soil Conservation Service conducted rehabilitation of farming and grazing lands on the reservation using WPA-funded Indian labor (Cassity 2012).

In addition, the WPA funded a study that identified 16 potential irrigation projects and 36 potential reservoir sites in the Little Snake River and Green River drainage systems (Person et al. 1938). It is uncertain if any of these were constructed. BOR projects were put on a faster track as a way to put unemployed men to work. The Wyoming Reclamation Association, established in 1933 and renamed the Wyoming Water Association in 1946, provided public input in assessing the feasibility and nature of projects funded by the state.

During the 1930s and into the early 1940s, the CCC provided labor for some of the projects undertaken by the BOR from several of the BOR camps established in Wyoming. Camp BR-7 in Deaver was involved in construction of irrigation system improvements associated with the Shoshone Project and for the Shoshone and Deaver irrigation districts. Their work included construction of concrete drops, weirs, and checks; rip-rapping and rubble lining of canals; construction of flood-control structures; and clearing of vegetation from canals. Camps BR-72 at Powell and BR-87 were also involved with improvements for Shoshone Project components. Camp BR-79 in Alcova worked on elements of the Kendrick Project; Camp BR-83 in Goshen County did improvement work for the Goshen and Gering-Fort

Laramie irrigation districts including rip-rapping of 23.4 miles of canals on the upper end of the North Platte Valley Irrigation Project. Camp BR-101 in Farson and Camp BR-102 in Big Sandy in Sweetwater County worked on elements of the Eden Project (Cassity 2012; Pfaff 2010; Fechner n.d.). No CCC work seems to have taken place at any of the National Wildlife Refuges in the state or on irrigation projects on state lands.

Irrigation for Wildlife, 1912–1979

Using irrigation water for enhancement of the environment for wildlife is considered to be a valid use of water in Wyoming. Use of water in this way has taken place at several of the National Wildlife Refuges (NWRs) managed by the U.S. Fish and Wildlife Service and at many of the Habitat Management Areas (HMAs) managed by Wyoming Game & Fish. In addition to direct irrigation action at NWRs and HMAs, wetlands are managed that depend directly or indirectly on irrigation. Some wetlands are dependent on irrigation runoff from nearby agriculture on private lands. Changes in irrigation practices can have variable impacts on wetlands. For instance, water savings measures, such as conversion to pivot irrigation systems and canal lining or piping, reduces seepage or runoff that may eliminate or reduce wetlands. In other situations, water savings by these changes may result in greater water availability in streams or at the end of water systems that may improve groundwater availability or enhance wetlands. Storage reservoirs that provide water for late-season irrigation may sustain wetlands or improve water flow in streams later in the summer, thereby improving them. Diversions from streams typically reduce their flow overall, so have a diminishing effect on most wetlands. This complex situation is beyond the scope of this context, but is important to keep in mind when considering irrigation systems on NWRs and HMAs. In general, only irrigation systems designed to enhance land for wildlife should be considered when evaluating significance under this theme. Incidental changes to habitat from projects designed for agricultural use should not be considered. Irrigation for wildlife is multifaceted and has attempted to incorporate a wide variety of environmental issues beyond simply enhancing the environment for fish and game, but incorporates concern for endangered plant, animal, and insect species, water quality, and global warming. At all of the HMAs and NWRs, irrigation systems that predated the establishment of the state of federal units are of historic age, and some of the systems installed by the state or federal agencies have reached or will soon reach the threshold of 50 years to be considered historic.

Many of the 37 state HMAs use irrigation to provide food or nesting cover for gamebirds, wintering deer and elk, and migrating birds. Approximately 5,000 acres of land are irrigated at the HMAs using ditches, gated pipe, and pivot irrigation. In some HMAs, hay is grown and harvested for winter feeding of deer and elk (Wyoming Game & Fish Department 2017).

Pathfinder NWR consists of four units comprising 16,806 acres within the project boundary of the 1909 Pathfinder Reservoir of the North Platte Project in Natrona County; it was formally established in 1936. The four units are Sweetwater Arm, Goose Bay, DeWeese Creek, and Sage Creek. It has water rights that date from 1885–1898 through the Smith Ditch Nos. 1 and 2 and Bothwell Sweetwater Ditch Nos. 2 and 3. No irrigation for wildlife has been attempted, and historic ditches have been damaged, inundated, or obliterated by the reservoir (U.S. Fish and Wildlife Service 2008).

The National Elk Refuge in Teton County was established in 1912 as winter range for elk, but now includes bison. Its 24,777 acres was purchased from willing sellers to develop hayfields with flood irrigation from the Gros Ventre River. At present, it is not known what features of pre-refuge irrigation were used or what structures may have been added after establishment of the refuge. Existing and additional flood irrigation was used until a new piped irrigation system was installed in 2010 that uses K-Line sprinkler pods supplied by aboveground moveable pipe. The new system increased the acreage under irrigation from 900 to 3,300 acres with the potential to irrigate an additional 1,000 acres. Only a small amount of flood irrigation is still used (U.S. Fish and Wildlife Service 2015).

The Seedskadee NWR was authorized as part of the Colorado River Storage Project that constructed Fontanelle and Flaming Gorge dams. This 26,382-acre NWR in Sweetwater County was established in 1965 to mitigate the loss of habitat from the construction of the dams and the flooding of land with the resulting reservoirs. Water rights date from 1913–1945 through the Hamp No. 1 and 2, Rood, Herman, Otterson, and Tallman ditches and from Fontanelle Reservoir water rights dating to 1962 and 1965. Reutilization of the existing irrigation systems within the boundary of the project began in the 1960s and increased in the 1980s to develop the Hamp, Hawley, Lower Hawley, and Dunkle water management units for development of wetland habitat for the refuge. Diversion of water from the Green River through ditches and the establishment of dikes have created impoundments, marshes, and irrigated wet meadows within 1,700 acres of the NWR. It was expected that the project would result in irrigation of private lands below the dams, but this failed to happen, so wetlands dependent on irrigation runoff from the expected agricultural development also failed to be realized (U.S. Fish and Wildlife Service 2007).

Bamforth and Hutton Lake NWRs in Albany County were established in 1932; both were increased in size in 1933; and Hutton Lake was added to again in 1939. The 1,166-acre Bamforth Lake NWR includes Bamforth Lake and other ponds and wetlands and is served by the Park Ditch with an 1887 water right. The 1,928-acre Hutton Lake NWR includes Lake George and Creighton, Hutton, Hoge, and Rush lakes. Water rights for the NWR date from 1871–1939 and include Hutton Lake and Red, Richards, King, and Hutton Lake Reservoir ditches. The 1,968-acre Mortenson Lake NWR, also in Albany County, was established in 1993 and includes Mortenson, Soda, and Garber lakes, Gibbs Pond, and Last Chance, Osterman, and South ditches. Water rights date from 1947–1967 for Soda Lake Draw No. 1 Reservoir, Mortenson and Johnson Nos. 1 and 2 lakes, and Harmon and Soda Lake ditches. All of these units are managed with limited water rights in a closed basin; historic use of irrigation was for hay production, and all continued and additional development of irrigation systems was for refuge purposes (U.S. Fish and Wildlife 2007).

Cokeville Meadows NWR was established in 1993 on 6,466 acres along both sides of the Bear River in Lincoln County. It utilizes existing irrigation water with water rights dating from 1878–1925 from Pixley Dam, B-Q Dam East, Ellen Reservoir, Mau and Covey canals, and the Tanner Supply, BQ-Dam East, Pixley, Pixley Irrigation, and North Lake ditches all for refuge purposes (Heitmeyer et al. 2010).

Annual or quarterly narratives are prepared by each of the National Wildlife Refuges in Wyoming. These narratives can provide important information regarding the historical development, modification, maintenance, and uses of specific irrigation resources at a refuge relative to the refuge mission or conservation objectives. This information can be useful for evaluating resource integrity and developing significance evaluations. These narratives can be accessed online (https://ecos.fws.gov/ServCat/) or at the individual refuge administrative headquarters.

Private Irrigation Projects after Statehood, 1891–1970s

Although many of Wyoming's irrigation projects were connected to federal legislation as administered under the Carey and Newlands acts, numerous privately funded projects have occurred in Wyoming after statehood. Private irrigation projects can be divided into large-scale and small-scale projects. Large-scale projects were substantial irrigation projects that provided water for multiple users throughout a region, whereas smaller-scale projects provided water to an individual or a handful of users. Privately funded irrigation projects on large or small scales can be significant for their impacts on regional agricultural development. In addition, small-scale irrigation projects may retain historical features, considered to be rare survivals of engineering elements, because of deferred maintenance or an inability of small irrigators to afford the cost of replacement of irrigation features. For example, headgates and turnout structures may have been repaired rather than replaced, and canals and ditches are less likely to have been lined on small systems than on larger ones.

Large-Scale Private Irrigation Projects

Several large-scale irrigation projects were constructed that were not under the purview of the Carey Act or the Reclamation Act. Many of these were constructed by private mutual canal and ditch companies, and at least one was constructed to satisfy treaty obligations by the U.S. government (discussed previously on the Wind River Reservation). The State Constitution was amended in 1895 to include the necessity that constructors of dams over 5-ft.-tall across a stream had to have their plans approved by the State Engineer (Article VIII, Section 48). This was required so that no parties living near a dam would be inconvenienced or damaged. This provision seems to have been in place prior to the 1895 amendment to the constitution, as it was reported in the State Engineer's Biennial Report of 1894 (Mead 1894:236). The costs of constructing large reservoirs was beyond the ability of most private entities, so most large reservoirs were constructed as components of Carey Act and Reclamation Act projects. Although reservoirs were expensive, they were necessary elements of most irrigation systems serving arid land. Owners of reservoirs acquired liability for any damages that their reservoirs might cause. The benefit of these reservoirs was that they captured spring runoff so that it could be retained for late-season irrigation, a time of the year where irrigation from streams was unreliable at best. Water stored in reservoirs required secondary permits for beneficial use of the stored water tied to the places that the water would be used.

Fourteen important privately funded irrigation systems in the state are briefly summarized below. These projects were identified from the Wyoming Water Development Commission reports as substantial efforts that were not funded by the Carey

or Newlands acts. These projects represent privately funded projects that have continued to be maintained to the present day with some level of modern state oversight. Often included in these projects are substantial engineering modifications for modern upkeep. This list is not comprehensive; the historical context of these and other private ditch projects will need to be evaluated to determine if they were the catalyst for significant settlement or economic development and if they retain sufficient integrity to convey that significance.

Alliance Lateral Ditch

The 12-mile-long Alliance Lateral Ditch in Sheridan County is managed by the Alliance Lateral Ditch Company. It takes its water from Big Goose Creek, a tributary of the Yellowstone River, by way of the Alliance Ditch. It was constructed in 1915 and irrigates 1,395 acres west of Sheridan. Water for the ditch is stored in Dome Lake No. 1, Sawmill Reservoir, Weir Pond, and Park Reservoir with a total storage capacity of 14,374.5 acre-ft. (Centennial Engineering & Research, Inc. 1986).

Austin and Wall Canals

The Austin and Wall canals take their water from Blacks Fork River in Uinta County and are managed by the Austin-Wall Irrigation District of Lyman, Wyoming, serving land in the Bridger Valley near Fort Bridger, Lyman, and Mountain View. The Wall Canal was initiated in 1904 to irrigate 291 acres, but has been enlarged to irrigate 2,718 acres. The Austin Canal was initiated in 1909 with plans to irrigate 41,000 acres, but only 4,000 acres have been actually irrigated. Water storage is in Wall Reservoir, built in 1947, and Meeks Cabin Reservoir, constructed from 1966–1971 (Sunrise Engineering, Inc. 2009).

Farmers Canal

The Farmers Canal was built using water from the Greybull River to irrigate approximately 15,000 acres on the northern side of the Greybull River in Big Horn County near Burlington, Wyoming. The 12-mile-long canal was built between 1895 and 1910 by the Farmers Canal Company. The canal is currently within the Greybull Valley Irrigation District system; all of the users of the district share the first 0.9 miles of the combined Farmers Canal and Bench Canal and share water storage in Upper Sunshine, Lower Sunshine, and Roach Gulch reservoirs. The Farmers Canal system includes the Keystone, Jimmerfield, Smith, and Avent canals (Sage Civil Engineering 2011).

Ferris Ditch

The Ferris Ditch irrigates 1,655 acres with water rights dating as early as 1886. Water comes from the North Platte River in Goshen County west of Torrington, Wyoming, and is administered by the Ferris Ditch Company (Kennedy Engineering 1990).

Highline Ditch

The Highline Ditch takes water from the Tongue River about 0.6 miles above Tongue River Canyon in Sheridan County near Dayton, Wyoming, for the irrigation of 1,410 acres. The ditch was built about 1891 and enlarged in the early 1900s. Flumes in the canyon were replaced by pipe in 1953, and its headgate was rebuilt in 1984. The system is administered by the Highline Ditch Company of Dayton, Wyoming (Western Water Consultants, Inc. 1987).

Hunt Canal

The Hunt Canal takes water from the Shoshone River in Big Horn County, 1.4 miles west of Lovell, Wyoming, to irrigate 3,859 acres. The 9.4-mile-long canal also serves the Western Sugar plant. It is managed by the Hunt Canal Company of Lovell, Wyoming (Nelson Engineering 1989).

Interstate Canal

The Interstate Canal of the Interstate Irrigation and Reservoir Company of McKinnon, Wyoming, takes its water stored in Beaver Meadow Reservoir and two other lakes in the Uinta Mountains of northeastern Utah and diverts it from the Burnt Fork of the Henrys Fork northeastward into Sweetwater County near McKinnon, Wyoming, for the irrigation of 1,967 acres. The company was formed in 1916, which probably reflects the year the system was instituted. Beaver Meadow Reservoir was built in 1922 and enhanced in 1939, 1949, and 1982 (Hansen, Allen, & Luce, Inc. 2015).

Kirby Ditch

The Kirby Ditch takes its water from the Bighorn River in Hot Springs County, 1 mile north of Thermopolis, Wyoming. The 10-mile-long ditch was constructed in 1904 and irrigates 3,200 acres on the eastern side of the river. It is administered by the Kirby Ditch Irrigation District, based in Thermopolis, Wyoming (Sage Civil Engineering 2018).

LeClair-Riverton Canal

The LeClair-Riverton Canal takes its water from the Wind River to irrigate 15,075 acres on the northern side of the Wind River in Fremont County. The first 10 miles of the canal were built in 1905 by the U.S. Indian Service. It was enlarged in 1914 to its full length of about 33 miles by the Riverton Ditch Company in 1917. The LeClair-Riverton Irrigation District, based in Riverton, Wyoming, was formed in 1925 to administer the system.

Meade Creek-Coffeen Ditch

Meade Creek-Coffeen Ditch takes its water from South Piney Creek in Sheridan County. Water rights for the ditch date to 1884 with enlargements from 1896–1898, 1914, and 1942. The 13.6-mile-long ditch is managed by the Mead Creek Ditch Company of Big Horn, Wyoming (EnTech, Inc. 2005).

North Canal

The North Canal diverts water from Swift Creek to irrigate 2,844 acres in the Star Valley in Lincoln County near Afton, Wyoming. After 1.5 miles, the canal splits into the Upper and Lower canals for 4.75 miles and terminates after an additional 2.4 miles in the Tail End Canal, which discharges into Salt River. The canal was initiated in 1889 and is managed by the North Canal Irrigation Company of Grover, Wyoming (Aqua Engineering, Inc. 2003).

Oasis Ditch

The Oasis Ditch takes its water from the Big Laramie River 10 miles north of Laramie, Wyoming. Water was first diverted by the Needmore Land & Cattle Company in 1886 and the Oasis Land & Cattle Company in 1889, with water rights first acquired as early as 1877; enlargements took place in 1890, 1903, and 1908. It irrigates 9,180 acres of land in Albany County managed by the Laramie Valley Municipal Irrigation District based in Laramie, Wyoming (Short Elliot Hendrickson, Inc. 2019).

Riverton Valley Canal

Water for the Riverton Valley Canal, also known as the Wyoming No. 2 Canal, comes from the Wind River to irrigate 15,000 acres on the northern side of the Wind River in Fremont County. Initial construction was performed in 1906, and the canal system was extended in 1909 by the Wyoming Central Irrigation Company. The canal was extended to its full length of 18 miles in 1917 by the Riverton Valley Irrigation Company (Nelson Engineering 2005). The Riverton Valley Irrigation District, based in Riverton, Wyoming, was formed to administer the project in 1924.

Wagoner and Cherokee Ditches

The Wagoner and Cherokee ditches take their water from the Encampment River in Carbon County near Encampment and Riverside, Wyoming. The 5.3-mile-long Wagoner Ditch has water rights dating from 1885 and irrigates 1,114 acres. The 8.4-mile-long Cherokee Ditch has water rights from 1895 and irrigates 2,150 acres. Both are managed by the Wagoner Cherokee Irrigation District based in Encampment, Wyoming.

Small-scale Private Irrigation Projects

Many of the small-scale private irrigation projects within the state are not likely to be significant as they are not representative of important agricultural development. Most of these projects only provided water to a single or a few users. However, it is possible that small-scale projects may be representative of changes in legislation that allowed additional water to be appropriated. As a result, small-scale irrigation projects that have good integrity may be significant under the Conservation or Government/Politics themes if they can be shown to have been the result of the following changes:

- After 1907, drainage improvement projects resulted in excess water that was reintroduced into drainage systems and allowed users to file for water rights on the newly available water. Additional water in a stream also became available when unpermitted diversions were terminated.
- After 1913, water users were able to claim unused appropriated water.
- After 1922, water tied to the Colorado River Compact promoted irrigators to keep water within Wyoming.
- Beginning in 1923, irrigation projects began to be designed to reduce pollutants into a water supply or into water that would be diverted downstream.

If a small-scale project can be associated with one of these trends, it might be significant. The rationale behind the construction of a ditch or canal relative to these trends will be difficult to determine; however, water right documents sometimes discuss the details of appropriation of water. Court

cases in which one party challenges the use of water from another party might also provide evidence for one of the trends above. Finally, historical newspapers might also provide information regarding the appropriation and adjudication history of a water right. Should a ditch be associated with one of these trends, it will still need to retain integrity sufficient to convey that significance. Each of the legislative changes is presented in more detail below.

In 1907, it became officially illegal to appropriate water without a permit. This was intended to eliminate the illicit diversion of water by individuals without water rights and to strengthen the water rights of those that had gone through the proper process of acquiring the rights and having them adjudicated. Also, in 1907, it was realized that irrigation often resulted in water accumulating below a level in the soil that crops were unable to utilize and that overwatering could result in undesirable boggy condition requiring drainage through deep ditches or buried pipes. Excess water from field irrigation or from drains reentered streams and was available for downstream appropriation. Filing on that replenished water resulted in supplemental water for existing irrigation systems or made it possible for new, small irrigation systems to be built.

In 1913, it was determined that non-use of water by an appropriator constituted an abandonment of the water right, which was then subject to appropriation by someone else. This led to many lawsuits in order to define what constituted abandonment, resulting in limitations on the terms when such a loss of a water right could happen. Appropriations of abandoned water rights also provided supplemental water for existing systems or resulted in the development of new systems.

The 1922 Colorado River Compact included Wyoming water that entered the Colorado River by way of the Green River drainage system. The Compact went into effect in 1929 after ratification by six of the seven states involved. One of the impacts of the Compact was an increased focus on retaining and using water in the state before it flowed to downstream out-of-state users. This resulted in some large federal reservoir construction, but also provided impetus for more private irrigation or more fully utilized existing irrigation systems.

In 1923, the first state law was passed that pertained to preventing pollution of water in an attempt to protect clean drinking water. Most of the attention was paid to industrial pollution that might contaminate municipal drinking water supplies. The law also brought awareness to water quality of irrigation return into streams and—after the widespread introduction of chemical fertilizers, herbicides, and pesticides for agricultural use after World War II—chemical contamination from farm fields carried by irrigation systems that might impact groundwater and downstream users.

EXPECTED PROPERTY TYPES

IRRIGATION SYSTEMS ARE MORE THAN just the canals and ditches, but incorporate a wide variety of other features. These include a water source, intake structures, conduits in addition to the canals and ditches, water control features, measurement devices, distribution features, protective features, fish exclusion structures, and safety devices. All of these features should be noted during recording. It is typical for canal and ditch features to be replaced as routine maintenance as they wear out. In many cases certain features, such as turnout gates, require replacement at 20-year intervals, so are usually not of historic age. Replacement enables a system to continue to function efficiently as it was originally designed. On occasion, features survive that are more than 50 years old. These usually have an older appearance because of style or deterioration, but exact age is not readily evident. Manufactured equipment frequently has manufacturer's marks that can help ascertain age and concrete elements sometimes have dates or other information inscribed. Ditch companies sometimes have records of maintenance activities for their systems that may be helpful in ascertaining the ages of features that are currently in place or of projects that have resulted in lining, piping, or realignment of sections of a system. Features that are of historic age are usually considered to be rare survivals that may be worthy of preservation, interpretation, or mitigation, if their removal is necessary for upgrading of a system. Otherwise, irrigation-system components are rather mundane and repetitive, so only brief mention of their identification and function is sufficient when they are known or suspected to be of recent age. Some irrigation features are built of monolithic concrete that is poured in place using forms or of precast concrete built off site to the specifications of the installation location. A wide variety of related sites may be associated with irrigation systems that may or may not be worthy of recordation and evaluation in their own right. These may be such things as irrigation company offices, ditch-rider's residences, construction camps, and equipment yards. In addition, modern irrigation has developed mechanical pressurized water-distribution systems for agricultural fields that may require consideration.

Irrigation is represented by two Property Types: Canal and Ditch Systems and Mechanical Pressurized Water Distribution Systems. It should be noted that determining the exact age of an individual element of a property type might not be possible as many have been continually maintained. However, the locations of existing features typically represent locations of historical features of the same function. Some indicators of past to present transitions might be apparent, such as Portland cement versus concrete or modern PVC piping versus steel-riveted pipes. Additionally, in some cases, inscriptions on cement and concrete will provide an age, be it historical or modern. In terms of the ditch or canal, the system will be maintained, so historical records indicating the alignment of the ditch will assist in determining the

age of the ditch itself. Although features have been maintained and integrity of materials might be impacted, the function of the feature will be intact, retaining the property's integrity of design. For example, although a headgate or a drop structure has been replaced with modern materials, the function of the ditch or canal is still reliant on the element for the system to function as originally designed. As such, although the element might contain modern materials, it still functions as originally designed. The exception is if the ditch has been piped or realigned.

Canal and Ditch Systems

The primary element of a canal or ditch system is the canal or ditch. Canals and ditches are typically artificial, human-made earthen channels or conduits, but are commonly lined in whole or part with formed, unformed, or precast concrete or, sometimes, rubberized-sheet liners (**Figure 42** and **Figure 43**). The most efficient canal shape is semicircular, but most large canals are rather rectangular with flat bottoms and sloping sides. Because they are designed to carry water by gravity, they gradually descend in elevation at a typical rate of between 1–5 ft. per mile with grades of 1.5–2.75 ft. per mile most typical. Smaller ditches require steeper grades because of drag friction of the bank. Too steep of a grade creates erosion, and too low of a grade results in sedimentation and growth of vegetation that can reduce flow. The proper grade of a canal or ditch allows water to pass efficiently through the landscape from its point of origin to its point or points of use, ideally without causing erosion or without becoming filled with sediment (**Figure 44**). Canal lining reduces water loss due to seepage, prevents canal breaks, prevents vegetation growth, decreases erosion, reduces maintenance costs, and increases canal capacity, as a smooth

Figure 42. Historical photograph, circa 1961, of a ditch. Man standing with shovel next to ditch, Irrigation #3 of 3, IRRIG 47, Wyoming State Archives

Figure 43. Portion of a concrete-lined canal associated with the Shoshone Project, unknown date. Canal carrying water, Kuska Collection, P72-79/1019, Wyoming State Archives.

Figure 44. Historical photograph, unknown date, of a steam-powered shovel cleaning out, or dredging, the Green River Canal. Green River Canal, Irrigation #2 of 3, IRRIG 31, Wyoming State Archives.

channel conveys water more rapidly. Concrete-lined canals can be narrower and of a steeper grade because erosion of banks is not a concern (Knight 2009:119-120) (**Figure 45**). Canals and ditches on side slopes have spoil from the channel placed on the downhill side to form an embankment. Early construction was by hand or using horse-drawn scrapers. Later, mechanical ditchers or steam shovels came into use, first using steam power and later using internal-combustion engines. More recently, heavy equipment came into use, including backhoes, front-end loaders, and bulldozers. Early concrete-lined canals were surfaced with cement to make them smoother. Shotcrete, a small-aggregate concrete sprayed under pressure through a hose, also known as gunite, was first used in the 1930s. Modern lining materials include high-density polyethylene (HDPE), polyvinyl chloride (PVC), and rubber membranes (Knight 2009:121-122).

The difference between a canal and ditch is not readily definable, but is more of a subjective judgment in the difference in size, with canals being larger than ditches. The point at which a canal is small enough to be considered a ditch may be at a division or diversion point beyond which water is carried in a smaller conduit or may be at a subjective point where water delivery has diminished the size of the channel. In recording a ditch or canal, the width, depth, and profile shape should be noted, though a canal or ditch that is full of water creates problems in being able to readily ascertain depth and profile. The age of a canal and ditch can be ascertained from historical records. Depending on the system, ditches and canals generally consist of a primary conveyance ditch. Water is then diverted into secondary, and possibly diverted again into tertiary, lateral ditches. To reach an individual field or user, water is then diverted into a field ditch. This diversion can occur off any of the primary, secondary, or tertiary ditches. The number of ditches that might be present in a given system is based on the complexity and expanse that the system is used to irrigate, both in terms of acreage and number of users. Field ditches are small ditches with a low carrying capacity, which are the responsibility of the individual landowner and not the larger system operator. As such, it is not uncommon for these ditches to be altered frequently by the landowner to meet the needs of the farming or ranching operation.

Figure 45. Example of a concrete lined ditch of the E 7 Ditch No. 1 in Laramie County.

Water Source

Typically, streams, reservoirs, enhanced natural lakes, and ponds are not recorded as features of an irrigation system, but the source of water for a system is important to acknowledge in the recording of an irrigation system, as the intakes for the system will vary depending upon the water source. The intakes are determined by the water source. Canals and ditches obtain their water from surface water or below-ground aquifers. Most commonly, they obtain their water from live streams, which require a diversion of some sort to force water into a system, usually through regulated gates. Considerable effort has taken place to retain water in reservoirs so that it can be used throughout the growing season. Reservoirs are most often built across live streams or rivers and incorporate a dam with outlet features, including irrigation intakes. These intakes release water through regulated gates, but have no need for a diversion as they take water from a pool of water. Their design takes into account that the pool of water may diminish in size as water released may not be replenished by corresponding inflows, so will usually tap the water source at a level well below the maximum height of a reservoir. In some cases, reservoirs are built in basins away from live water and are supplied by canals or ditches of their own from a live water source. Sometimes, natural lakes have been enhanced to raise their water level or have had their outlets modified to enable them to be the source of an irrigation system. Ponds are often features of an irrigation system on or off of an irrigation canal or ditch. These can allow water to drop sediment by slowing the flow of a canal or ditch; provide a place for water to go within a system at times of high-water flow; or provide storage for irrigation water than can be tapped by gravity flow or by pumped delivery. In some instances, pumps or water wheels are used to introduce water into an irrigation system, usually when the land desired to be irrigated is at a higher elevation than a surface water source. Pumps are also used when no surface water is available and wells tapping below-ground aquifers are required. Pumping plants are usually recorded as part of an irrigation system.

Water Wheel: A water wheel is a mounted wheel with buckets that uses the flow of a stream, canal, or ditch as the motive power to lift water from the watercourse to the height of the diameter of the wheel for deposition into a ditch at a higher elevation (**Figure 46**). Waterwheels are sometimes used to feed a lateral canal or ditch at a higher level than the main ditch or canal.

Figure 46. Example of a waterwheel along a ditch, circa 1903. Water wheel, J.E. Stimson Collection, STIMSON NEG 0677, Wyoming State Archives.

Water wheels were reported to be in use on the North Platte River and on the Shoshone River in 1911 (*The Wyoming Farm Bulletin* 1911:48). The first mention of a water wheel for use in irrigation was by the Douglas-Willan company that powered two pumps to lift water from the North Platte River (*Cheyenne Daily Sun,* October 28, 1886:3). Another water wheel was used on the northern bank of the North Platte River three miles above Douglas, Wyoming. The 10-ft.-diameter, 14-t.-long water wheel was used to power a pump that lifted 1,000 gallons of water per minute to a height of 16 ft. that flowed into an irrigation ditch (Breckons 1894:246-247). More traditional water wheels that used buckets or troughs to lift water from streams to feed irrigation ditches were considered to be rather common, but were frequent victims of washouts by seasonal high water. Most of these were constructed by farmers or ranchers with small acreages, mostly along the North Platte River from Casper to Wheatland where direct diversion from the river was difficult (*Bill Barlow's Budget* [Douglas, Wyoming], June 14, 1893:4; *Wyoming Derrick* [Casper, Wyoming], May 28, 1903:1; *The Wheatland World,* April 1, 1904:4). A water wheel installed by J. D. Carmichael lifted water 9 ft. from the Wind River near Riverton (*Natrona County Tribune* [Casper, Wyoming], February 12, 1908:1; *Cheyenne State Leader, May 25, 1909:3*).Unless a water wheel has survived rather intact, the remains may be difficult to identify. The shaft of a wheel was mounted on wood, stone, or concrete piers adjacent to a stream bank forming channel through which the stream flowed or straddled a canal. The lifted water entered an elevated trough that transported it to a nearby ditch. Water wheel foundations adjacent to streams are likely victims of erosion, but those along canals may appear as a paired foundation on either side of the canal.

Intake Structures

Diversion Dam: A diversion dam is a human-made structure built to raise the water level in a surface water source into a canal or ditch (**Figure 47** and **Figure 48**). Diversion dams do not store water, but direct the flow of water.

Outlet Control Structure: An outlet control structure regulates the release of water from a storage feature, such as a reservoir or canal, for utilization elsewhere (**Figure 49**). These can be a flat-bottomed weir regulated by gates, a gated culvert, or a siphon. A weir is a low dam used to raise the water level upstream and to regulate the water flow. Weirs are low enough that water can flow easily across its crest.

Figure 47. Historical photograph, circa 1915, downstream of a diversion dam. Diversion dam, J.E. Stimson Collection, STIMSON NEG 3629, Wyoming State Archives.

Figure 48. A diversion dam on an unidentified ditch of the Robinson-Hardee Ditch Company, 1957. Diversion dam, Department of Agriculture Collection, WY4079-1, Wyoming State Archives.

Figure 49. Undated historical photograph of a simple wooden outlet structure. Irrigation ditch gate, Wyoming Game & Fish Department Collection, P98-31/2051, Wyoming State Archives.

Pumping Station: A pumping station is where pumps lift water from a water source to a higher elevation for distribution. Pumps are typically run by electricity, but other pumping mechanisms, such as a water wheel or a hydraulic ram, are used on occasion.

Headgate/headworks: A headgate or headworks is a human-made structure used to draw water in a regulated fashion from a source, such as a reservoir outlet control structure or a stream diversion, for conveyance in a canal, ditch, or pipeline. A single water-control intake structure is often referred to a *headgate*, not to be confused with a turnout structure, which is also commonly referred to as a headgate. A complex water-control intake structure, often incorporating more than one headgate, is a *headworks* (**Figure 50** and **Figure 51**). Both may include other features, including a diversion dam, water measurement devices, protective features, and safety devices. Many of the headworks will utilize a similar design, especially when documenting larger-scale projects. In other states, headgates that include masonry walls built or rebuilt by the CCC are known, but are rare. It is not known if any exist in Wyoming. Headgates are typically top-lifting metal gates in a metal frame raised and lowered by handwheels on threaded stems or geared mechanisms or pulleys on shafts turned by hand cranks or electric motors. Some large diversions are regulated by radial gates that pivot on pins on the sides of the channel they open into and are operated by motor-driven gear or pulley lift mechanisms. Radial gates have the benefit of being able to be lifted above the water level of the canal or ditch to enable debris to pass through easily.

Figure 50. A 1962 photograph of the headgate on the Laramie Canal. Headgate on Laramie Canal, Department of Agriculture Collection, WY-7906-5, Wyoming State Archives.

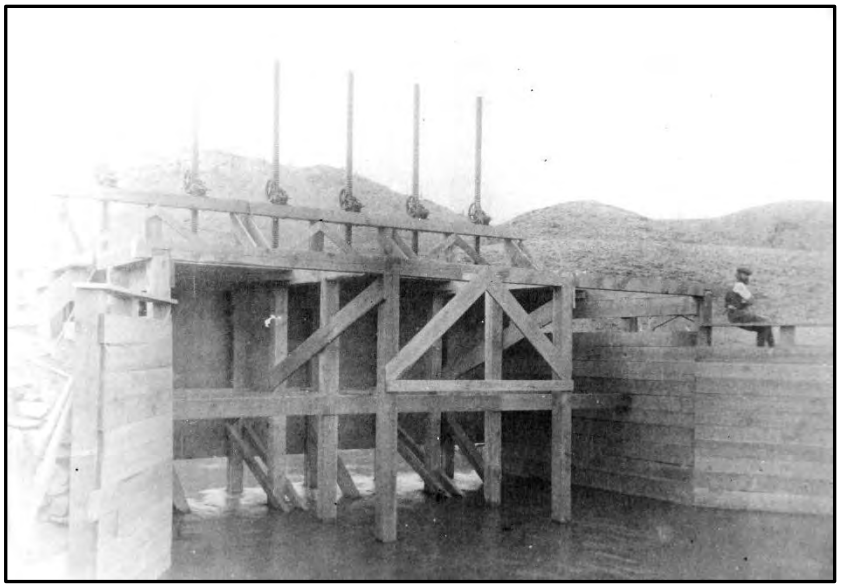


Figure 51. Historical photograph, unknown date, of a large headgate. Wooden irrigation ditch gate, Platte County Library Collection, P2009-14/059, Wyoming State Archives.

Conduits

Lateral: A lateral is a canal or ditch that distributes water from a larger canal or ditch. On larger systems, laterals are often named or numbered. Distribution ditches to fields can also be termed field laterals, but are usually referred to simply as ditches. Water delivered to a user from a company-operated canal or ditch may enter a lateral or ditch that is the responsibility of the user to construct or maintain. Water enters a field by way of a field lateral (ditch or pipe) that distributes water by spreaders, gated pipe, or siphon tubes to the top of furrows of a flood-irrigated field. Water can be delivered to a user into a pipe for flood irrigation or to a pump that serves sprinklers or drip irrigation.

Culvert: A culvert allows water to flow under a road, railroad, trail or other obstruction in a contained conduit that is enclosed on the top, bottom and sides and is open on the ends to allow water to flow through (**Figure 52**). Culverts can also be topped by bridges. Culverts can be of pipe, concrete, stone, or wood construction in a variety of configurations, including round, oval, and rectangular.

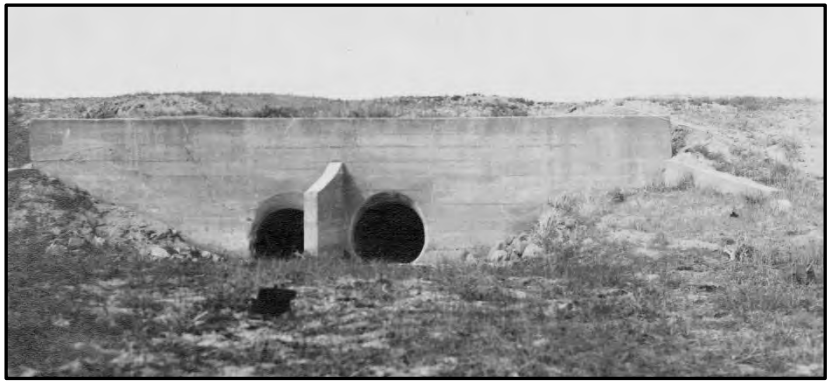


Figure 52. A concrete culvert on the Big Sandy Canal, unknown date. Big Sandy Culvert, Irrigation #2 of 3, P95-22/9, Wyoming State Archives.

Flume: A flume is a human-made water channel in an inclined chute or trough for carrying water. Early flumes were typically wooden boxes, but these had a limited lifespan and were quickly replaced. Remnants of box flumes would be a rare survival. Iron or steel semi-circular flumes began to be used about 1900. Flumes are also often constructed of concrete. Flumes are usually used to carry water over rough or irregular terrain as part of a canal or ditch. Bench flumes are built on side slopes directly on the ground where soils or slopes cannot support traditionally built canals or ditches. Elevated flumes are usually supported by leg supports or trestles over irregular ground (**Figure 53**). The entry and exits of flumes are typically concrete aprons wider than the flume to control turbulence and prevent erosion. Maintenance requirements of elevated flumes have reduced their use in favor of siphons. The constricted nature of flumes often makes them suitable for measurement of water flow. A flume that carries water of a ditch or canal over a watercourse or another irrigation system is sometimes called an *overchute*.

Chute: A chute conveys water from a higher to lower elevation (**Figure 54**). They usually have an intake element to direct flow into the chute, often with a flat-bottomed check or weir, and an outlet that dissipates the energy of the water where it rejoins the canal or ditch, often a stilling basin or baffles.

Tunnel: A tunnel may be used when it is more economical to build through a topographic obstruction, such as a hill or ridge, than to construct around it, pump over it, or dig a deep trench through it (**Figure 55**). Tunnels can be unlined if they are dug through solid rock or lined with cement or other materials when they pass through less solid soil or sediment. Tunnels through solid rock require drilling and blasting similar to techniques used in lode mining. Tunnels through less solid soils or sediments may be blasted, drilled, or dug by hand or with mechanical assistance (**Figure 56**).

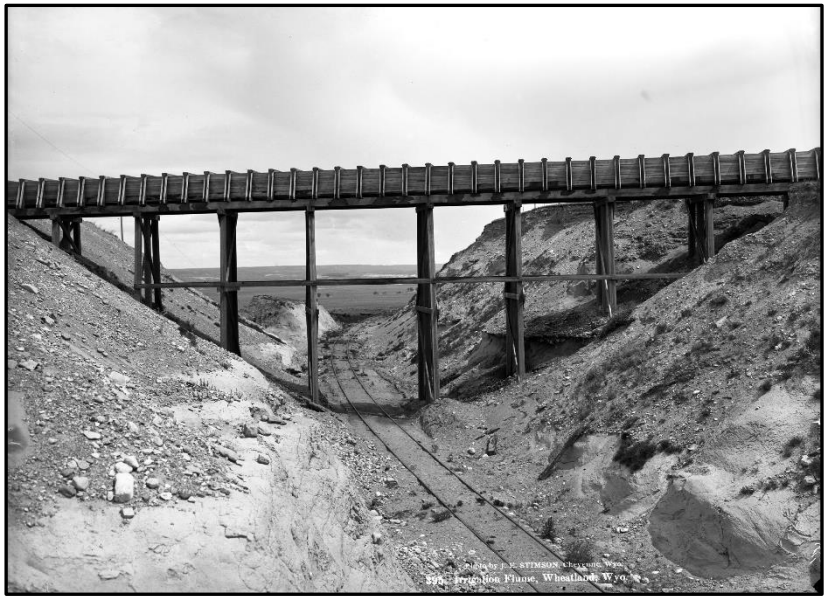


Figure 53. A wooden flume near Wheatland, Wyoming, circa 1903. Irrigation flume, J.E. Stimson Collection, STIMSON NEG 0395, Wyoming State Archives.

Figure 54. Example of a chute, circa 1912, into "Little Reservoir," unknown location. Chutes on Little Reservoir, J.E. Stimson Collection, STIMSON NEG 0395, Wyoming State Archives.

Figure 55. Historical photograph, circa 1909, of construction of a tunnel on the West Side Ditch by the North Platte Valley Irrigation Company. Tunnel on West Side Ditch, J.E. Stimson Collection, STIMSON NEG 2927, Wyoming State Archives.

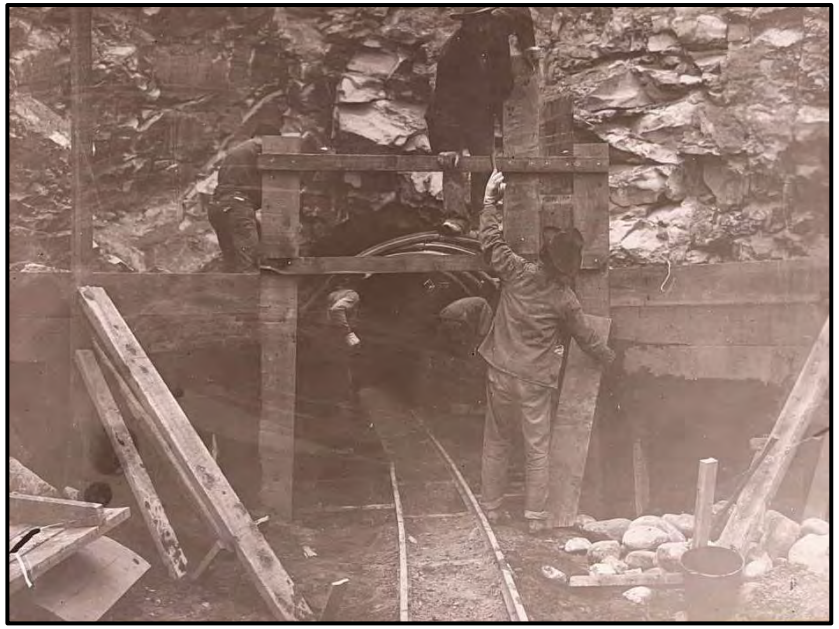


Figure 56. Construction of a tunnel on the Shell Canal, circa 1909. Image shows workers and forms used for the concrete tunnel structure. Tunnel portal Shell Canal, Canals Folder, C1226-48, Wyoming State Archives.

Siphon (inverted siphon): A siphon is an enclosed conduit, typically a pipe, which conveys water to a slightly lower level from one side to the other of some sort of topographic irregularity, such as a valley or other drop in the topography, or an obstruction, such as a road or railroad (**Figure 57**). Siphons are typically iron or steel pipes, but precast concrete pipes are also used. Very early siphons were of wood-stave pipe banded with wire. Siphons allow water to be transported in a more direct manner across the landscape where a more circuitous route might otherwise be necessary. Siphons typically have inlet and outlet structures. Inlet structures direct water into the siphon through the narrowing of a canal or ditch where a certain amount of head is created. The head provides the force necessary for the water to flow through the siphon. Outlet structures allow unimpeded flow from the siphon and flare outward to the width of the ditch or canal that conveys the water beyond. Outlet structures are constructed at a slightly lower elevation than intake structures to facilitate water flow.

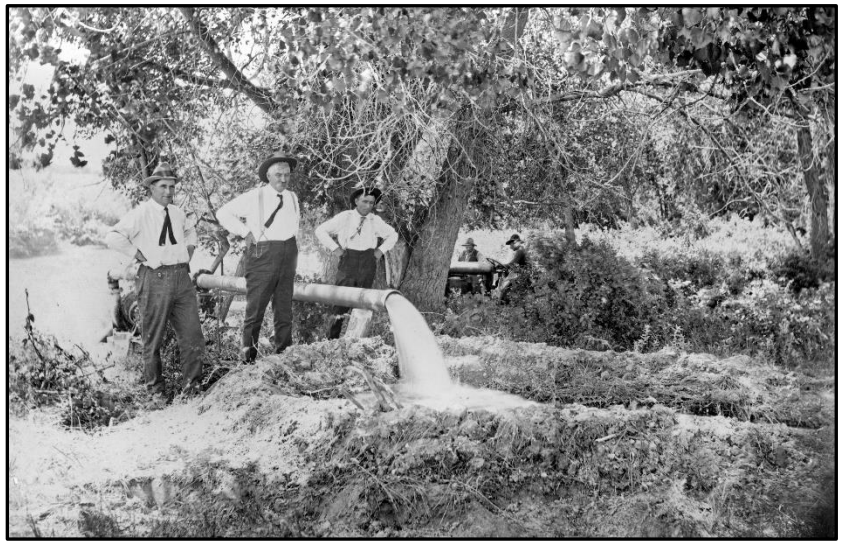


Figure 57. Undated photograph of individuals at the exit of water from a siphon into an open earthen ditch. Irrigation pipe, Irrigation #1 of 3, P71-69/04, Wyoming State Archives.

Pipeline: Pipelines can be either aboveground or buried, depending on the situation (**Figure 58**). Pipelines often replace open irrigation ditches in situations where a ditch cannot be built or easily maintained because of topography or convenience, to prevent water loss through seepage or evaporation, or to prevent contaminants, such as naturally occurring salts (e.g., selenium) from being introduced. Pipelines are also used in situations where pressurizing water through gravity is desired. A variety of pipe materials have been used through time with vitrified clay pipe being the oldest, followed by cast iron, which dates into the 1600s and was first used in America in the 1810s and commonly used into the 1900s; it was largely replaced by ductile iron pipe beginning in the 1950s. Early pipelines used for water distribution were frequently wire-reinforced, wood-stave through the early 1900s. Various types of iron and steel sheet metal pipe to transport water were used beginning with riveted pipe beginning in the 1850s; corrugated pipe was available beginning in 1896. Electric welded pipe was devised in the 1920s, but advanced rapidly in the 1930s and 1940s. Seamless metal pipe was first invented in the 1880s, but it was not until the 1960s that extruded seamless steel pipe production became dominant. PVC pipe was first made in Germany in 1935, but did not become viable as an industrial material until further development took place after World War II. Widespread application of PVC pipe took place beginning in the 1950s and 1960s with improved extrusion processes (Envirosight 2018; Pipe Factory 2019).

Figure 58. Historical photograph, circa 1910, of a buried water pipeline. Caulking water main, Lantern Slides, H55-53/074, Wyoming State Archives.

Air-Vacuum Valve: Air-vacuum valves allow air to escape a pipe so that water can fill it and allows air into a pipe when necessary to prevent the pipe from collapsing when water is being evacuated from it. These are commonly incorporated into siphons and pipelines.

Outlet Channel: Water at the end of a canal or ditch is frequently drained off into an otherwise natural drainage that enters a stream or reenters another canal or ditch downstream, sometimes with a formal outlet comparable to a field turnout. Often, canals and ditches are equipped with outlet gates at key points along their lengths to expel excess water that may have been collected from side drainages at times of high runoff from storms or from field runoff in order to prevent overtopping its banks. These irrigation-return or excess-water-removal channels are usually not of formal construction beyond their outlet. The absence of formal construction beyond their outlet would preclude the necessity for their recordation, in most instances.

Water Control Features

Check: A check is a small dam that regulates the upstream water surface level to enable water delivery. Water usually flows through a rectangular opening above the check with slots to accommodate stopboards to further raise the water level or stop the flow entirely. Occasionally, they are equipped with gates instead of stopboards. As a result, checks can be used to isolate sections of a canal to eliminate complete dewatering in the event of a break.

Drop Structure: A structure within a canal or ditch made of concrete, stone, or wood that allows water to pass to a lower level without causing erosion (**Figure 59** and **Figure 60**). Designs usually direct water from or armor the banks of the canal or ditch and have a solid floor or stilling basin at the base of the drop to alleviate turbulence.

Check Drop: A check drop is a structure that includes elements of a drop structure and a check (**Figure 61**). It ensures that the water level upstream is sufficient for diversion and controls water flowing to a lower elevation.

Figure 60. Undated historical photograph of a drop structure on an unidentified canal. Typical drop in main canal, Canals Folder, Neg. 0090A, Wyoming State Archives.

Figure 59. Example of a concrete drop structure, showing modern condition, on the Wyoming Canal Lateral 27.3 in Fremont County.

Figure 61. Example of a check drop on the Long Ditch in Converse County.

Measurement Devices

Water-measuring devices are used throughout Canal and Ditch systems to determine the amount of water in a stream or waterbody, but are most important when used to properly allocate the flow of water into a system and to ensure accurate water delivery from a system. Several different measuring devices are used.

Gaging Station: A gaging station is a facility to monitor the water in a stream, well, lake/reservoir, canal, or ditch (**Figure 62**). Examples of complex gaging stations would be a gaging house that contains recording apparatus and satellite/telephone line communications or a vertical pipe gage with a data recorder. Simple gaging stations include a staff gage that is essentially a wire weight gage that is lowered to the water from above, or a scale mounted on the side of a weir that shows the water level or enables the water depth to be determined. Early gaging stations sometimes included a mechanical self-recording apparatus that recorded water levels on a continuous roll of paper. More sophisticated electronic recording devices are now used that are connected by communication lines or by wireless transmitters.

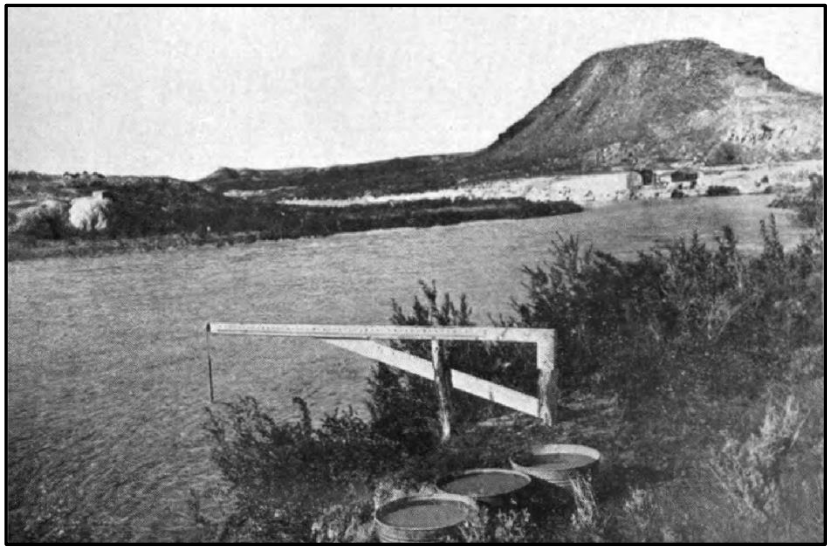


Figure 62. Example of a wooden gaging station along the Big Horn River, circa 1914 (Parshall 1914:64).

Measurement Weirs: For large volumes of water, measurement weirs are most frequently used. Similar to a check because they incorporate a low dam, weirs have restricted openings through which the water flow passes and is measured using a staff gage by which calculations of volume are made (**Figure 63**). The three types of weirs have openings that are either rectangular, trapezoidal (Cipolletti), or triangular (90-degree V-notched). These are usually permanent concrete structures with a mounted staff gage for consistent measurement. The Cipolletti weir was invented in the early 1890s by Cesare Cipolletti, an Italian hydraulic engineer working in Argentina.

Parshall Flume: On smaller canals or ditches, particularly on ditches used for water delivery, Parshall flumes are most frequently used. These are sometimes permanent concrete structures, but are more often constructed of sheet metal and set directly in the canal or ditch in close proximity downstream from an outlet gate so that water flow can be easily adjusted. Parshall flumes are hourglass shaped with flaring inlets and outlets and straight channel sections at their centers where the depth of the water is measured using a mounted staff gage to calculate the flow volume. Parshall flumes were invented by Ralph Parshall of Colorado Agricultural College (now Colorado State University) in 1921.

Figure 63. Historical photograph, circa 1909, of a weir along the Farmers Lateral near Wheatland, Wyoming. A measuring weir in Farmers' Lateral, J.E. Stimson Collection, STIMSON NEG 2905, Wyoming State Archives.

Water Wheel: A water wheel was installed to measure the flow of the Green River near Green River, Wyoming, in 1895. This was a large wooden wheel that rotated with the current (Newell 1901:302). It is not known if water wheels were installed elsewhere in the state for the same purpose. As was mentioned previously, water wheels were more typically used to lift water for distribution from a large stream.

Constant-Head Orifices: Constant-head orifices are openings of a regular size set below the source water level that allows a predetermined amount of water to flow through at fixed or variable settings. The orifices can often be adjusted by reducing or enlarging the opening with a sliding piece either by hand or with the assistance of a handwheel (**Figure 64**).

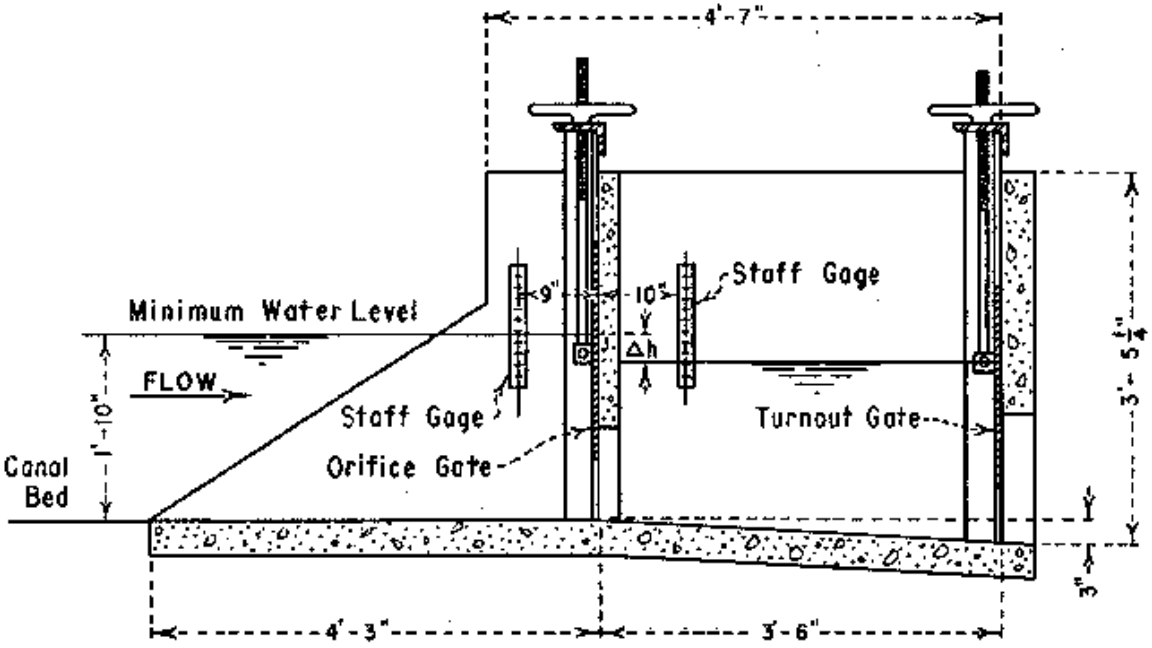


Figure 64. Constant-head orifice (Bureau of Reclamation 2001).

Open Flow Meters: An open flow meter is a water-driven propeller mounted at the outlet of a pipe to measure the volume of water through the pipe. The rate of rotation allows calculation of flow volume. These require the pipe to be full for accurate measurement.

Distribution Features

Turnout: A turnout, also frequently referred to as a headgate, is a gate or valve on a watercourse (stream, canal, or ditch) that regulates the flow of water from a canal into a smaller lateral or ditch or from a ditch system for distribution. Turnouts at a major division of water within a system, such as at the head of a lateral canal, are often termed *control headgates*. Major divisions of this sort are often regulated by large sliding lift gates that are opened and closed by hand or are sometimes motor driven. Gates along the sides of a canal or ditch that release water into lesser ditches or at distribution points for individual users are often termed lateral headgates or delivery gates; all are classed as turnouts. Various methods are used to divert water from canals or ditches. Most common are lift gates in angle-iron frames that regulate water by lifting sliding sheet metal covers from above by a handwheel on a threaded stem. These typically open into an open channel or a buried pipe. The flow through a gate is usually measured by a weir or Parshall flume a short distance downstream, enabling the gate to be adjusted for the proper, allocated flow. A gate opening into a pipe typically has an air vent just beyond the gate. On smaller diversions, gates are sometimes simple sliding gates lifted by hand. Sometimes water below a gate enters a pipe-intake box that may have multiple outlets, each regulated by its own lift gate. Creative outlet structures may be unique to a particular irrigation system. For instance, a hinged piece of sheet metal may point upstream within a ditch and can be adjusted from side to side to divide the flow of a ditch and direct a portion of a flow out a side channel. Another example is where a check drop structure enables a portion of the flow of a ditch to enter a box with an adjustable side outlet that takes a measured amount of water into a delivery box and ditch outlet.

Division Box: A division box is a wood, metal, or concrete container that divides the water flowing in proportion to two or more regulated outlet openings. The outlets can be controlled with gates or stop/flash boards. In addition to allowing free flowing water to exit into an open ditch an outlet can also put water into a pipeline, so is similar to a pipe intake structure.

Pipe Intake: A pipe intake is a box of concrete, wood, or precast concrete pipe on end that is fed by a canal or ditch outlet that serves as a small reservoir from which water is introduced into one or more pipes regulated by slide gates. These are sometimes also referred to as a junction box or a hydrant, if more than one outlet is incorporated.

Protective Features

Drop Structure: A drop structure conveys water to a lower elevation in a controlled manner (**Figure 65** and **Figure 66**). It usually has a small dam over which water flows with a rock or concrete lower wall to prevent erosion cutting back upstream or is an inclined channel or pipe. A drop structure frequently incorporates a check to raise the water level to enable water to be taken through a diversion above. A stilling basin may be at the base of a drop structure, and bank reinforcement may also be installed to eliminate erosion.

Figure 65. Example of a wooden drop structure, circa 1920s. Irrigation dam, Dams, SUB NEG 18828, Wyoming State Archives.

Figure 66. Series of drop structures on the Wyoming Central Irrigation Company's ditch, circa 1910. Drop structure Wyoming Central Irrigation Company, J.E. Stimson Collection, STIMSON NEG 3100, Wyoming State Archives.

Stilling Basin: A stilling basin is a depression in a channel or reservoir deep enough to reduce the velocity or turbulence of the flow of water. These are frequently at the base of a dam spillway or at a point where water measurement takes place. Some stilling basins also serve as sand or silt traps that reduce sediment in transported water, frequently with a complex system for its removal and deposition elsewhere.

Drain Inlet: Water from side drainages or storm runoff sometimes is allowed to enter a canal or ditch by a flume or pipe drain inlet. These are usually constructed in such a way as to prevent erosion of the canal or ditch bank.

Overchute flume: A flume or pipe that carries water over a stream or another canal or ditch is sometimes called an overchute. Overchute flumes often carry water from side drainages or runoff over a ditch or canal. In addition to being flumes, some overchutes are pipes.

Debris Grates/Trash Racks, Grates, or Screens: A debris grate or trash rack is a wooden or metal structure that incorporates a grate, rack, or screen to prevent debris from blocking an intake or outlet structure. Trash racks at intake structures may prevent only large debris from entering. Finer grates may be used at other distribution points. Structures sometimes include a mechanical self-cleaning apparatus.

Wasteway/Waste Gate: A wasteway or waste gate is an overflow structure that allows excess water to be released from a canal or ditch to prevent damage from too high of flow or overtopping of a canal or ditch. These are often equipped with a spillway to prevent erosion and may have intakes covered by a debris grate, trash rack, or screen. They are usually side channel outlets and can include gates that enable the canal or ditch to be emptied. Wasteways usually open into a natural channel, but can have a human-made channel at its outlet to control outflow to prevent erosion. Wasteways are also used to remove sediment where it has settled from transported water.

Side-Channel Spillway: Similar to wasteways, side-channel spillways allow water to spill out of the side of a canal or ditch into a natural channel when the water level exceeds its height. These are sometimes equipped with a boom to remove ice or floating debris from a canal or ditch. A boom is a linear floating impediment usually installed on a diagonal across a channel to direct floating debris or ice toward an outlet for removal.

Protective Weir: A protective weir (**Figure 67**) is a low dam built across a stream, lake or reservoir outlet, canal, or ditch to raise the water level upstream to enable water to be diverted or to cause a regulated flow of water over the weir so that it can be measured. Weir outlets are usually contained by side walls that extend above the dam portion, making them rectangular and suitable as measuring devices (as described previously).

Baffled Apron Drop: A baffled apron drop is concrete blocks on the floor of a chute to reduce the energy of water flow. The blocks can catch vegetation, reducing the chute's effectiveness, and may be hard to clean.

Baffled Outlet: A baffled outlet is a boxlike structure with a vertical hanging baffle and end sill that breaks the fall of water and creates eddies that reduce water energy.

Rip Rap/Retaining Wall: Rip rap is loose rock, broken concrete, or similar material used to stabilize canal or ditch banks. Rip rap contained in wire cages are called gabions. Gabions are often stacked to form retaining walls. Retaining walls can also be constructed of mortared or unmortared stone, poured concrete, cribbed logs, or wooden beams.

Figure 67. Example of a protective weir on the Fivemile Lateral in Fremont County.

Fish-Exclusion Structures

Wyoming law requires that fish be excluded from irrigation systems. Four types of fish-exclusion structures are typical for water diversions: in-canal, in-river, in-diversion pool, and closed conduit. Historic fish-exclusion structures will most often be in-river and in-canal structures and may be incorporated into debris grate/trash rack, grate, or screen protective devices. All fish-exclusion structures consist of screens, and some incorporate bypass features through which fish are directed. Fish-exclusion structures are typically physical barrier screens that are most often flat plate or inclined. The mesh of screen used may be specific to the fish species, size, or stage of life. Larger diversions typically have more complex fish-exclusion structures, and modern fish-exclusion structures are often more technologically complex. In addition to physical barriers, behavioral barriers are being experimented with that include louvers, light and sound (sonic) devices, air bubble curtains, hanging chains, turbulent water jets, and electrical fields (Bureau of Reclamation 2006).

Safety Devices

Fencing: Particularly dangerous locations may have fencing erected to prevent entry.

Guard Rails, Pipe Rails, and Hand Rails: Railings are installed to prevent vehicles or people from entering hazardous areas or to provide a barrier or something secure to hold onto.

Stairway or Catwalk: Walkways provide safe passage around or over a hazardous area and nearly always incorporate a guard rail or hand rail.

Safety Nets and Cables: Safety nets or cables are sometimes run across canals where they can be grasped by someone who has fallen in, particularly above siphons, tunnels, or other dangerous structures.

Warning Signs: Signage provides warning of particularly hazardous areas to prevent entry.

Safety Ladder: Safety ladders are sometimes installed within concrete-lined canals to provide a means of escape for someone who has fallen in. Ladders are often incorporated into larger irrigation structures to provide access for maintenance, often when an irrigation system is dewatered, but they may also provide a means of rescue in an emergency.

Mechanical Pressurized Water Distribution Systems

Mechanical pressurized water distribution systems are usually the result of using pumps to lift water from a water source to convey in pressurized pipes for use with sprinklers. The water source can be ground water in wells, ponds filled by irrigation ditches, or directly from canals or ditches. Sometimes water conveyed by canals or ditches is placed in a pipe that develops enough pressure by gravity to supply a sprinkler system. The most common mechanical pressurized water distribution system is center-pivot irrigation, but side-roll and large individual sprinklers are also used. These systems are usually privately owned and installed for field irrigation and are the end use of water, just as flood irrigation is. As a result, it is not expected that they will require recording in the field, just as traditional field irrigation systems of pipes and ditches installed by water users who are delivered water from canals and ditches should be exempt from recording as sites. The reason that mechanical pressurized water distribution systems are being included in this context is so that researchers are made aware of their existence and historic development, which is just now reaching the 50-year threshold for NRHP consideration, and for consideration of their impact on the historic agricultural landscape (**Figure 68**). Such awareness may be important in considering their transformation of the historic agricultural landscape over the past 50 or so years and into the future in transforming the appearance of agricultural land and expanding it into areas not previously served by irrigation. This might be particularly important in considering areas as Rural Historic Landscapes.

Center-Pivot

Center-pivot irrigation is an elevated pipe on regularly spaced wheels that pivot from a central point from where a water connection is made with pressurized water, usually from a stationary pump. Water from the central point enters the elevated pipe and is distributed through sprinklers. Center-pivot irrigation was the invention of Frank Zyback of Strasbourg, Colorado, who began working on the idea in 1940. His invention was patented in 1949; manufacture began in 1952 when a few were produced. Robert Daugherty, owner of Valley Manufacturing in Valley, Nebraska, saw value in the idea and obtained the license to the patent in 1954. Valley Manufacturing made improvements to the system and expanded manufacturing in the 1960s, at which time Valmont Industries was formed for manufacture and distribution. Since then, pivot irrigation systems have been installed throughout the world. Ten or so companies manufacture the systems in the U.S. (Alfred 2008; Mader 2010; Valley Irrigation 2020). Because center-pivot irrigation systems sprinkle water from above using water pumped from aquifers, their circular patterns of up to ½ mile in diameter and irrigating about 125 acres of land have changed the agricultural landscape. It is unknown when the first center-pivot irrigation systems were installed in Wyoming, but it was likely in the 1960s; thus, historical, center-pivot irrigation systems are likely to exist. The equipment itself will likely be the only clue as to the age of a system and it is probable that equipment old enough to be historic will have been replaced before it becomes 50 years or older in age on continuing systems. Relic equipment may have manufacturer's identification that can assist in dating. The most dramatic evidence of these systems is the circular pattern of the

Figure 68. Historical and modern aerial images of the Interstate Canal near Lingle, Wyoming, showing the transition of agricultural fields and the associated historical landscape. Note the change from all rows in 1954, to a mix of both rows and center-pivot in 1979, to dominance by center-pivot irrigation in 2016. Aerial images courtesy of the USGS EarthExplorer and Google Earth.

fields that they serve, which has changed the agricultural landscape (**Figure 68**). Even low-resolution aerial photographs are likely to show the circular patterns and may demonstrate the conversion in irrigation practice or show expansion of agricultural land into previously unirrigated areas.

Side-Roll (Wheel-Line)/Linear-Move

Similar to the center-pivot irrigation method is side-roll (wheel-line) or linear-move irrigation machines that move through agricultural fields on wheels in a linear fashion. These are supplied by pumped water conveyed by hose to the apparatus or from a mobile pump that draws water from a ditch that runs along one end of the system. Side-roll (wheel-line) and linear-move irrigation systems convey water through an elevated pipe on regularly spaced wheels to sprinklers, just as the center-pivot machines. Although more difficult to operate, they have the advantage of irrigating a rectangular piece of land, thereby putting more land into production than a center-pivot system. Wheel-line sprinkler irrigation equipment was invented by Glee John Melcher in the late 1940s when working on a method to irrigate arid land made available by the construction of Grand Coulee Dam in 1946. His work was financed by a grant from Washington State College (now Washington State University) in Pullman, Washington. He applied for a patent for the system on October 27, 1952, which was granted U.S. Patent No. 2,741,509 on April 10, 1956 and assigned to the R. H. Pierce Manufacturing Company of Eugene, Oregon. These irrigation systems are more limited in their use than center-pivot machines, as they work best on level ground, whereas center-pivot machines can traverse irregular ground.

Large Sprinklers

Pressurized sprinklers are used where water is pumped under pressure into a system or where water in a pipe uses gravity to develop pressure sufficient to disperse water through a variety of sprinkler nozzles (**Figure 69**). Sprinklers are attached directly to pipes, usually in fixed locations, or can be moved along an alignment through a field, often on a carriage attached to a hose. Impact sprinklers were invented in 1932 and became commonly used in the 1950s. The high-volume impact sprinklers used for agricultural irrigation, known as Big Gun, were introduced by Nelson Irrigation in 1972. As with other mechanical irrigation equipment, manufacturer's marks on the sprinklers will be useful for dating as the systems begin to exceed 50 years in age.

Figure 69. Large sprinkler irrigation system, unknown date, of a grain field in Goshen County. Sprinkler irrigation Goshen County, Irrigation #1 of 3, P88-63-86, Wyoming State Archives.

Related Sites

A variety of sites related to irrigation may be encountered on or near irrigation systems. Some of these, such as access roads to facilitate access for management and maintenance of irrigation canals and ditches, field or pedestrian bridges for agricultural use that cross canals and ditches, and communication lines for remote data transmission of stream flows and regulation of canal and ditch apparatus, should be mentioned in the recordation of a canal or ditch system, but are typically related infrastructure. More formal bridges on county roads or highways should also be mentioned, but may require formal recordation as sites in their own right. Government construction/administrative facilities, construction camps, canal or ditch company office complexes, ditch rider housing, and electrical generation facilities should also be recorded individually as sites, though their connection to a canal or ditch system should be made clear.

Access Roads

Many Canal and Ditch Systems have access roads that run along one or both sides of a canal or ditch to facilitate inspection, maintenance, or access to features along their lengths. These are usually simple graded dirt or gravel roads that sometimes have gates at intersecting roads (**Figure 70**). Roads along canals and ditches should be mentioned as features of a canal or ditch system, but require no individual recordation.

Bridges

Bridges may be a component of access roads, may provide access to ditch or canal structures from access roads, may be informal canal or ditch crossings between farm fields for farm equipment, or may be pedestrian crossings to enable access to regulatory features, such as lateral headgates or measuring devices (**Figure 71**). Those directly associated with a canal or ditch system should be mentioned as features of the system. More formal bridge crossings on county roads, driveways, or highways should also be mentioned in canal or ditch recordings, but typically will not be recorded as a component of the canal or ditch system. If of historic age, they may require recording as sites in their own right.

Administrative Facilities

Many of the canal projects in Wyoming were constructed by large construction companies or overseen by government entities, such as the Reclamation Service/BOR. Administrative facilities for these projects may be found in nearby communities or as individual complexes near a particular construction project. With federal projects, local ditch companies or water users associations were formed to manage and maintain the projects once completed. In all cases, these should be recorded as individual sites and not as components of a canal or ditch system.

Ditch Rider Housing

Some large Canal and Ditch Systems employ or formerly employed ditch riders to oversee and maintain all or part of a system. Frequently, ditch riders were provided with company housing on or in close proximity to the canal or ditch that they were responsible for. In addition to a residence, these complexes often included garages, machine sheds, shops, and storage yards. As with administrative facilities, ditch rider housing should be recorded as a distinct site.

Figure 70. A modern graded access road along the Cherry Creek Lateral Canal in Goshen County

Figure 71. Historical photograph, unknown date, of a bridge over the Coolidge Canal near Ethete, Wyoming. Coolidge Canal, Ethete Collection, P81-48/14642, Wyoming State Archives.

Construction Camps

Large canal or ditch projects often employed large numbers of construction workers that were sometimes housed in temporary camps. General construction camps for multiyear projects may have included barracks and cookhouse facilities in wood-frame buildings or tents, shops, machinery sheds, garages, and storage yards, sometimes at an administrative facility (**Figure 72**). Other, more short-term camps may have been established in close proximity to sections of a canal or ditch that required considerable effort, such as where extensive grading, deep cuts, or tunnels were required. Even if in very close proximity to a canal or ditch, construction camps should be recorded as individual sites.

Communication Lines

Communication lines typically connected specific facilities, most often gaging stations, to an administrative site or company office. These should be mentioned in the course of recording a facility that is a component of a canal or ditch system, but do not require recordation in their own right.

Electrical Generation Facility

In recent years it has become more common for steep drops on a canal or ditch system to be developed for the generation of hydroelectric power. It is possible that small electrical generating facilities may have been constructed in suitable locations along canal or ditch systems in the past. These would not be electrical generation plants associated with dams at major reservoirs, but might be as simple as a water wheel that turns a generator using water flow as its motive power or turning water into a penstock at a drop that is then returned to the system once it has been run through a turbine or water wheel. Generation facilities should be recorded as individual sites.

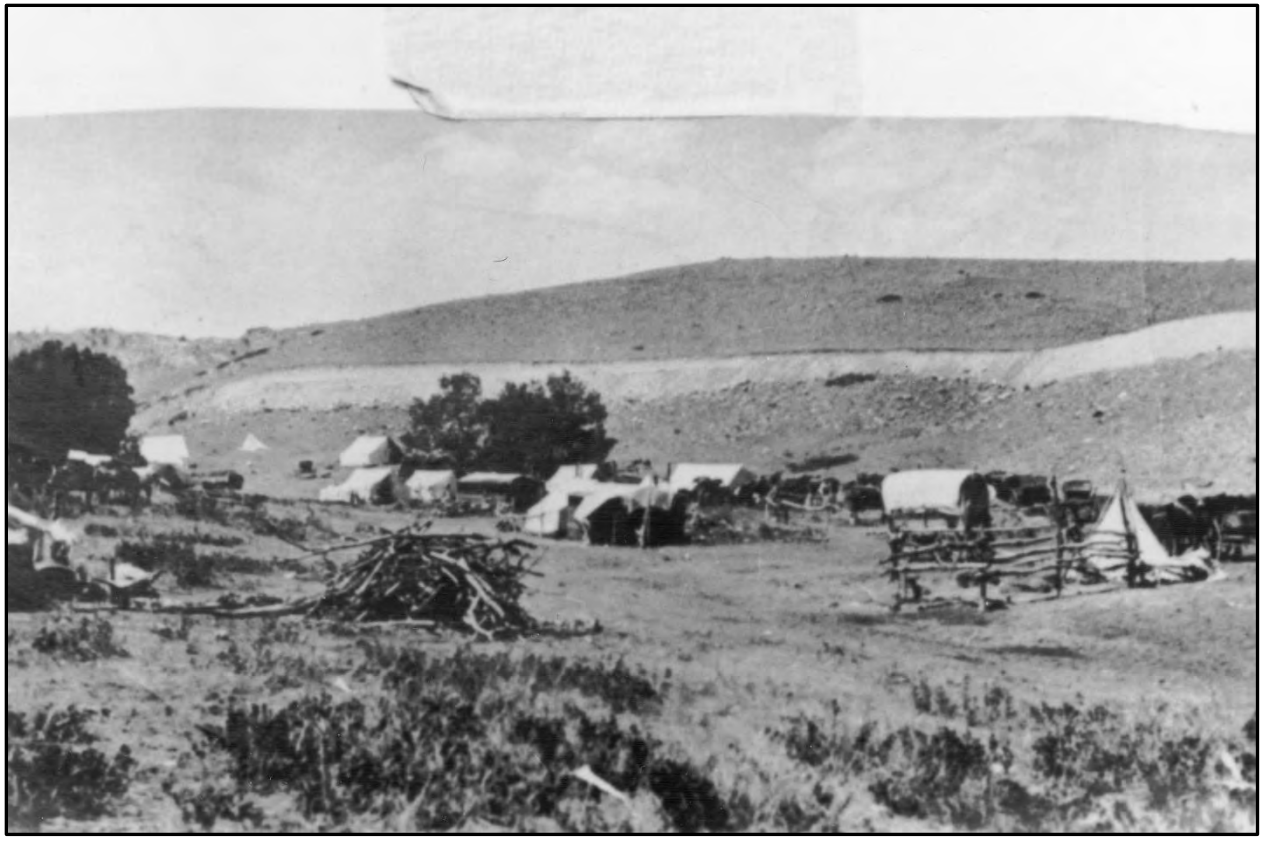


Figure 72. Historical photograph, circa 1900, of an irrigation ditch construction camp, unknown location. Building irrigation ditch, Platte County Library Collection, P2009-14/118, Wyoming State Archives.

EVALUATION OF SIGNIFICANCE AND NATIONAL REGISTER OF HISTORIC PLACES CRITERIA

Significance Evaluations

UNDER THE NRHP GUIDELINES, CANALS and ditches are classified as structures that have been engineered to convey water for agriculture. Even though they are comprised of various parts, they are not classified as historic districts, though it is possible that two independent ditch systems that serve agricultural land in a contiguous area or are under the management of a single irrigation district or similar management entity could be considered together as a historic district.

It is important to recognize canals and ditches as systems that were designed and built to convey water from a water source to a place of use (Horn and Norton 2021). Canal and ditch systems typically comprise multiple features that are specific to a particular system, usually without individual distinction, but collectively the components form a cohesive system. It is the design and function of a system that is important. Replacement of parts that do not change how a system was designed to function should be expected, though rare survivals may exist that can be considered important. Missing or replaced historic features of a system may diminish a system's integrity, but so long as the system continues to function as it was designed or as it functioned with modifications that are more than 50 years old, it may retain significance. Design and function can be seen as two sides of the same coin. A correctly designed system will function as intended, and the intended function of a system will require the design of features that provide solutions to difficulties along the entire route of a conveyance. Because mechanical features of a system, such as turnout lift gate structures, or non-mechanical elements, such as siphons or retaining walls, have a lifespan and wear out or erode, replacement is necessary for the system to continue functioning. So long as those elements are replaced in kind—a top-lifting headgate with a top-lifting headgate or a pipe siphon with a pipe siphon—and the system remains on its original route with the same basic configuration, the system can be said to retain its historical design. So long as a system continues to serve as a conveyance for irrigation water in the same or a similar capacity and to the land it was originally destined, it can be said to retain its historical function.

A functioning system should include the means for diverting water into a conveyance (canal or ditch) in a controlled manner and then from the conveyance onto the agricultural land that it serves. Between the diversion in and the diversion out, the conveyance system must be built in a way that the water moves safely and efficiently across the landscape. It is where topographic difficulties arise that individual features of a system are required that give the system its unique characteristics. These might include such things as flumes, siphons, tunnels, or other elements as listed above in the Property Types section. It is entirely possible for a flaw in the original design of a system to be corrected at a later date or for more modern technology to be used to make a

system operate more efficiently or safely. Other modifications to a system may have occurred so that the system is in compliance with changing environmental or safety regulations, such as a fish screen. If the correction or modification results in the retention of the system's intended historical function, it will not have an adverse effect on the system's significance. It is also possible that the change may have gained historical importance of its own if it is greater than 50 years in age. Because functioning systems will be subject to ongoing replacement of elements as maintenance or that the installation of new components may be required, care should be taken that replacements are done in kind and new elements do not impair the historic function. "In kind" replacement in these cases should not prevent the installation of more modern or efficient versions of a feature, only that they should of similar scale and general appearance. For instance, a lift gate should be replaced with a lift gate, but the new gate may have more efficient seals or other components and may be installed on a replacement concrete headwall to replace one that has deteriorated.

Because no two irrigation systems will be exactly the same, each must be assessed on its individual characteristics, though it is also important that an evaluator have an understanding of character-defining features of systems on a regional basis (Knight 2009:221-233). It is possible for an irrigation system that is no longer in use to be considered NRHP eligible if it retains outstanding engineering features of importance, is considered to have been a pioneering system for a region, or demonstrates (with sufficient integrity) the work of a master water engineer or other individual who is important to the irrigation history of the state. Other features associated with operation and management of a canal and ditch system, but not directly part of a canal or ditch, such as an irrigation district office or ditch rider's residence, may be considered separately for NRHP eligibility.

It may be difficult to know with certainty what features of a canal or ditch may be representative of the original design. Because of a lack of original plans for most canals and ditches, the original components and construction details for most will not be known, and only rarely will survivals from the original construction be identifiable. A certainty with all functioning canals and ditches is ongoing maintenance resulting in replacement of headgates, turnout structures, and other features as they deteriorate. As a result, most canal components will have been replaced within the last 50 years. Consequently, it is the continued function of the canal or ditch as a conveyance of water from a source to its points of use that will be most important in ascribing significance. So, the earthen construction of a canal or ditch that retains that earthen construction may be considered to have retained sufficient integrity to warrant consideration as a significant resource on that aspect alone, so long as it compliments its role in history. Retention of historic features along a canal or ditch can be seen as increasingly rare survivals, perhaps worthy of some level of documentation, but not necessary for a canal or ditch to be considered significant. In a sense, the most important characteristic of a canal or ditch will be as a landscape element and its role in developing a historic agricultural landscape. The scale of this landscape transition, the role of a canal or ditch in developing agriculture as an important economic driver for an area or region, or the pioneering role a canal or ditch may have had in the settlement of an area are all

aspects to consider, primarily under Criterion A and, perhaps, under Criterion C. The integrity of a particular resource may rely more on its physical appearance on the landscape than on the survival of individual features of a canal or ditch. In this age of transitioning open canals and ditches to piped systems, the disappearance of the canals and ditches on the landscape will need to be considered even when the pipes that they have been converted to still deliver water to agricultural fields that form the greatest visual element of the agricultural landscape.

In addition to being significant as individual entities, irrigation systems form linkages with other sites, for instance from a reservoir to an agricultural property or between agricultural properties. An understanding of these linkages may be important in interpreting the irrigation system and those connected sites. For instance, rural homesteads depended on irrigation water; without it, farming would not have been possible. Conversely, the temporal patterning of initial settlement in an area served by a canal might help us understand the canal's sphere of influence and clarify its construction and expansion history. This larger view may be important in determining if the land served by a canal or ditch system may be considered a Rural Historic Landscape with the canal or ditch being a contributing element. A canal or ditch system can be eligible under Criteria A, B, or C. Most irrigation systems will be significant under Criterion A for their association with the development of agricultural and settlement patterns. Under Criterion B irrigation systems might be significant for its association with an important engineer or architect, so long as it is demonstrative of some important aspect of their career. Under Criterion C, the layout or design of a system may be the most important aspect and may be the most likely criterion for consideration for small systems, though they may also be considered significant under Criterion A if they can be seen as part of a larger pattern of irrigation history. Irrigation systems that display unique engineering aspects may also be considered important under Criterion C. The primary themes associated with canals and ditches are **Agriculture** and **Conservation** (National Park Service 1991). Both of these basic themes can be ascribed on the basis of the primary function of a canal or ditch. Most canals and ditches were constructed strictly for agricultural irrigation; however, not all water conveyed in ditches and canals is diverted onto agricultural land. In some instances, the water is utilized for wildlife feed or habitat enhancement or development. In some places, canals and ditches were constructed to drain marshy areas for agriculture, to develop wetland habitat, or grow food for wildlife, all of which would fall within the **Conservation** theme. Ascribing significance under one of these themes alone is possible, but significance can often be more completely ascribed when associations with secondary themes are considered. Such secondary themes include:

- **Community Planning and Development:** A canal or ditch may be considered important to community planning and development if the system was the key element in the establishment of a town or community (Criterion A). Communities that came into existence largely because irrigated agriculture of nearby land resulted in its establishment would be the focus of this theme. In order for an irrigation system to be considered under the theme, it should retain sufficient character-defining elements as the system was designed to demonstrate its importance in successful agricultural development for an area for the community to have become established.

- **Engineering**: A canal or ditch may have engineering importance if it is a good example of a method or type of construction or if it had an innovative design to overcome some obstacle (Criterion C). Properties must retain sufficient character-defining engineering attributes from the period of significance to convey its significance. Frequently, engineering is best ascribed to physical elements of workmanship, such as masonry retaining walls. Associated features—such as bridges, culverts, and tunnels—may also have engineering importance if they are good examples of a particular method or type of construction (Criterion C) or if they are associated with a noteworthy engineer or designer (Criterion B). Note that for a property to be eligible under Criterion B, it must reflect the person's important work in the development of the system and retain integrity of project elements relevant to their involvement.

- **Industry**: A canal or ditch may have importance to industry if its use enabled agricultural products to be produced on a commercial scale, thereby furthering the development of goods and services (Criterion A). An example of this might be an irrigation system that enabled sugar beets to have become a major crop for an area during a particular period of time. The property must retain sufficient integrity of defining elements, such as design, materials, workmanship, or association that date to the period of significance, to be considered under this theme. It should be noted that canals and ditches sometimes were constructed to facilitate industrial development other than agriculture. For instance, ditches are known to have been constructed for placer mining, concentration mill operation, or to deliver water to steam engines for such things as sawmills or other early industries that depended upon boilers to provide steam for engines. In addition, ditches were often built to introduce water into penstocks for water power for electrical generation, hydraulic mining, or other industrial uses. Such canals and ditches should be evaluated relative to the industries they serviced.

- **Landscape Architecture**: A canal or ditch, or its constituent features, may be considered to have importance to landscape architecture if it has design features that further our enjoyment or appreciation of the land (Criterion C). For instance, a flume may have been created by design, workmanship, or materials to blend with its natural surroundings in such a way that we find it aesthetically pleasing or enhancing.

- **Politics/Government**: A canal or ditch may have importance to politics or government if it was the result or a good example of a particular political event, series of events, or governmental policy or philosophy (Criterion A). For instance, a canal or ditch system may be considered significant under this theme if it is a particularly good example of a project conducted under the Carey Act and retains integrity as a system constructed during the 1894–1930s.

- **Social History**: A canal or ditch may have importance to social history if it was constructed to promote the welfare of society (Criterion A). For instance, a project undertaken to stabilize the lives of individuals and families thrown into turmoil by economic distress, such as the Depression, or by environmental degradation by providing a reliable source of water for agriculture and making additional lands available for sustainable farming may be attributable to the theme. To be considered under this theme, the property must retain sufficient integrity of design and association to convey its significance under this theme.

Period of Significance

Critical to assigning and considering themes for significance evaluations is defining the Period of Significance for a resource (Horn and Norton 2021). The period of significance is the span of time when the property was associated with important events, activities, individuals, or use, or when it acquired its important physical characteristics. Each irrigation system can be expected to have a specific and individual period of significance at a local, state, or national level that will be based on its history. A property may have more than one period of significance, depending upon its historic associations. Continued use of a resource does not necessarily justify a period of significance that corresponds to its full period of use. Rather, the period of significance should correspond to the period of time the resource made important contributions under a particular theme or area of significance. For both the identification of pertinent themes and assigning a period of significance, it is crucial that sufficient historical research be conducted so that these tasks are soundly based. It is through such historical research that thematic contexts are developed to demonstrate resource significance. Thematic contexts can also account for sites where the period of significance is thought to extend to within the last 50 years and for which significance may be ascribed under National Register of Historic Places (NRHP) Criterion Consideration G.

Aspects of Integrity

When an irrigation site or component is found to have significance under the NRHP Criteria, the integrity of the property requires evaluation. Insignificant sites do not require evaluation of integrity. The qualities of integrity are spelled out under the NRHP guidelines.[5] Historic integrity may have a strong influence in determining if a historic resource has sufficient integrity to convey its significance. Those segments and features of an irrigation system that do not retain sufficient integrity to convey their significance are considered noncontributing. Integrity, under the NRHP guidelines, considers qualities of location, design, setting, materials, workmanship, feeling, and association.

Location, Setting, and Feeling

Some of the qualities of integrity to be considered reflect the landscape setting, whereas others bear directly upon the physical characteristics of the resource. In the case of many irrigation systems, **location** is not at issue, because they are part of the landscape and are immovable; however, in cases where a canal or ditch has been rerouted its integrity of location will have been impacted, the degree to which will depend upon how much of the route has been changed. Some resources may have suffered from degradation or modification sufficient that their location may have become obscured or no longer recognizable, which would be a clear detriment to historic integrity. For

[5] NPS Bulletin 15 discusses the seven aspects of integrity—Location, Design, Setting, Materials, Workmanship, Feeling, and Association—as well as how to apply the aspects in relation to the four significance criteria (National Park Service 1997:44-49).

example, piping a canal or ditch not only abandons the original alignment but obliterates the configuration of a canal, either of which would be considered a loss of locational integrity in its entirety or for that portion piped. At what point a system that has been partly buried no longer retains sufficient integrity to be considered significant will be a subjective determination by a researcher. The determination will need to take into account whether the route of a canal or ditch is still cohesive enough to be recognizable as an irrigation system as a whole and if important features of the system have survived. In some cases, a canal or ditch has been reengineered to flow on an entirely new route, which would completely diminish the integrity of its location, though the new alignment could be evaluated for significance if it has reached the 50-year threshold as a historic system of more recent age. Minor realignments may not impact the integrity of location so long as they have not impacted the function of the system. In all instances, piping of a previously open canal or ditch should be considered a change of location (Knight 2009:234). Other landscape qualities include setting and feeling. Assessing integrity of these landscape qualities is necessarily a subjective process.

The **setting** is the physical environment of the resource. Ideally, the setting should be the same as when the resource was in use during its period of significance, but the degree to which this is important should be considered against the themes under which the site is considered important. For instance, if a resource is considered important because of an aspect of its engineering, then its surroundings would be less important than if it were considered important for landscape architecture. Natural changes to the environment should also be taken into consideration, as should human-made changes. If a resource is considered significant for its role in industry, then perhaps the industrialization of its surroundings should not be considered a detriment to its integrity, but rather, should be considered a reflection of the success of the resource. Setting for most canals and ditches are typically rural with a clear relationship with agricultural lands. A change from an agricultural setting to one of urbanization would be a clear loss of integrity of setting and will mostly be seen in burgeoning expansion of towns and cities (Knight 2009:250).

Feeling is an intangible characteristic of the physical characteristics of the historic scene that alone is insufficient for significance to be ascribed (National Park Service 1997:45), but should be considered in conjunction with the setting, design, materials, and workmanship in assessing the scene relative to its period of significance and theme. Alterations dating after the period of significance, particularly those that are cumulative, should be carefully considered as to their degree of impact on the feeling of the resource as should urbanization and abandonment of a system (Knight 2009:253).

Design, Materials, Workmanship, and Association

Design, materials, workmanship, and association are less subjective qualities of integrity. Most irrigation resources were not constructed with harmonious blending with the environment in mind. Rather, they were put in place on the most expedient course from one place to another, given the technology available. Integrity of **design** is the most important aspect to be considered. To be considered significant, an irrigation system should, at a minimum, continue to function as it was originally designed to carry water from a source to its places of use or

retain sufficient evidence of its functional design. This would be primarily that the route constructed originally or used during its period of significance is the current route and that the configuration in terms of width, depth, and side slopes conforms to its configuration during its period of significance, if that can be ascertained from historical records. Features of a canal or ditch, such as turnouts and other elements, are of secondary importance because of the likelihood of their having been replaced as routine maintenance. Their presence, even if less than 50 years of age, are important to the understanding of how a water conveyance works, so should be considered when evaluating integrity of design. So long as the system continues to function as historically engineered and designed, the significance of an irrigation system or component usually also continues. Considerations of design as a process of conscious placement of an irrigation resource should be made because the design is a result of engineering. The form, plan, and spatial organization of a system are its most recognizable characteristics, and it is engineering that made a system functional (Knight 2009:237). It should be recognized that the environment usually influences the placement of an irrigation system or irrigation element, and topography impacts its nature in terms of the level of technology brought to bear in its construction and innovations incorporated into its design for its successful implementation. As a result, an irrigation system or component may be a good example of typical technology in use at the time of its construction or innovations that made its installation possible.

Assessment of **materials** relative to an irrigation system or component will likely be restricted to determining if the materials now visible are the same materials that were used in the original construction. Materials incompatible with the period of significance will be an indication of subsequent modification and loss of historic integrity. Integrity of materials should not be an overarching consideration for assessing the significance of an irrigation system, because ongoing maintenance is a necessity to keep them functioning efficiently, and use of modern materials is expected. For components utilizing human-made materials, the most modern materials were typically used in construction. As time passes, wear and tear often requires replacement of site features. Typically, replacement is with the most modern and functional materials. Consequently, original materials may be a rarity on certain site types with the design and function retained. For example, canals and ditches are routinely cleaned out and headgates and other regulating features replaced. It is usually not possible to know with certainty what the original historic components were for a system, and it is likely that original features may have been replaced more than once. For example, a ditch constructed in 1900, may have had its turnout gates replaced in 1930 and 1960. It is likely that the replacements were comparable in type to the original installation, but that is not likely to be known with certainty. The next replacement would be of the 1960 installation, which would now be of historic age, so in-kind replacement of it would be appropriate to maintain integrity of materials. Such replacement with in-kind modern components would not diminish the integrity of materials markedly. For instance, replacing hand-wheel operated lift gates with identical or similar gates that are still available would be less impactful to integrity than replacement with gates opened using electrical motors. Because irrigation systems have usually evolved with the introduction of new technology or expansion of systems, documentation of the

evolution of systems through their periods of significance may be an important documentary task (Knight 2009:240).

Evidence of **workmanship** may be variable for irrigation systems. For example, early irrigation systems may show little or no evidence of workmanship, as they became established simply through use. Other irrigation systems may show considerable workmanship in basic construction or by the presence of functional features that may be particular to that system or the technology in use. Although rather mundane, the earthen or lined construction of canals and ditches demonstrates their basic workmanship. More outstanding features might include pumping plant architecture or gate construction details with vernacular construction techniques forming links between workmanship and materials. Modern lining of canals, replacement of gates with modern mechanized technology, dredging of canals or construction of levees to significantly different profiles, and lining of canal banks with rip-rap or other materials may negatively impact integrity of workmanship (Knight 2009:246). Again, themes and period of significance should be taken into consideration in determining how important workmanship is to the historic integrity of an irrigation resource.

Association connects the property to the activity that makes the site significant. Physical characteristics must remain that relate to that activity. In the case of irrigation sites, the physical remains that make it recognizable provide the association. In most cases, continued use of a system demonstrates its relationship to its history. The introduction of modern technology may diminish the integrity of association, as would conversion of the use of water for non-agricultural purposes (Knight 2009:257).

Other Considerations for Significance

When considering significance for irrigation systems, the period of time and sponsor for construction of a system should be taken into account. It may also be important to consider the laws in effect at the time a system was constructed to put a system into good context. Maintenance and management of a system will have an effect on significance and integrity evaluations, as will conversion of a system from agricultural use to irrigation for wildlife, when such a situation exists.

Early irrigation systems built during the Territorial period and during early statehood from 1868–1894 were typically simple and not highly engineered. They usually served limited acreages and were built by or financed privately by a single user or a few adjacent landowners. The components of a system were fairly simple, consisting of a diversion from a stream, an earthen ditch, and side outlets that likely have completely deteriorated or have been replaced, as some were superseded by later irrigation systems that served more users and others were enlarged substantially as more nearby settlement took place and a greater quantity of water was diverted. Systems that have not been enlarged are unusual, and those that retain early features can be considered to be rare survivals; these will have a higher likelihood of being considered to be significant if they retain sufficient integrity. Later systems that served one or a few users will be similar to the early systems, but can be separated from the early systems through historical research. These later small systems are more in line with basic irrigation infrastructure and are less likely to be considered significant unless they retain some unusual engineering or feature component(s).

Irrigation systems constructed under the Carey Act from 1894 to the 1930s may differ in the type and variety of components that they contain because they were constructed by a number of different contractors. Components such as lift gates are likely to have been mass produced and purchased from a national supplier, but some may be specific to a particular project and may be unusual solutions to the requirements of a project or, perhaps, be of local manufacture. If such components have not been replaced and still exist, they would be considered rare survivals. Large privately funded projects from the 1890s to late 1920s may have an appearance similar to Carey Act projects and may exhibit more creative solutions to construction difficulties because of their private financing and less formal engineering than was required of Carey Act projects. Carey Act projects underwent considerable engineering that required formal approvals from the state. As a result, it may be easier to assess the integrity of a Carey Act project if engineering files can be found than for projects planned and developed entirely by private entities. Later U.S. government projects constructed under the Reclamation Act and the Pick-Sloan Missouri Basin Program from 1907 to the 1960s were increasingly highly engineered, sometimes with innovative practices incorporated. More standardized components can be expected throughout each system, with upgrades likely to incorporate more highly engineered solutions and replacement of features using more up-to-date standard equipment. Upgrades of systems already in existence by the Reclamation Act and Pick-Sloan Missouri Basin Program may be best considered for significance under those later programs because the earlier components were completely revamped and the modifications have gained significance of their own. Because of the complex irrigation history of the Wind River Reservation and Riverton area, those irrigation systems can be expected to be a composite of Carey Act and Reclamation Act projects.

For all systems that were managed and maintained by irrigation districts and those that saw assistance under federal works programs, particularly from the 1910s through the early 1940s, variability in materials and replacement components can be expected. Such variability shows creativity in finding solutions to problems, patchwork maintenance, and reliance on in-house expertise in construction, repair, and fabrication because of budget constraints. Unusual or creative solutions exhibited by features of an irrigation system may enhance the significance of a system. Similar budget-conscious approaches to maintenance resulting in creative approaches to system maintenance can probably be expected from the 1940s to the present day, as well. It is possible that maintenance conducted by the PWA, WPA, and Civilian Conservation Corps (CCC) may have historical documentation that has survived that can assist in significance evaluations and enable integrity to be better assessed. Maintenance funded by the BOR may also have historical documentation that may assist in significance and integrity evaluations, with records potentially available from the BOR or a particular irrigation district. Where such documentation does not exist, integrity assessments will be the same as for other systems without documentation.

Irrigation for wildlife may have distinctive characteristics for consideration when evaluating significance. Most of the irrigation systems for the growth of feed or for the maintenance or establishment of wetlands utilize irrigation systems that were in place for earlier agricultural purposes. In many cases, the systems may use the earlier systems with little modification. In

other cases, the systems have been reengineered so that they function for the enhancement of wildlife habitat. For systems little changed from what had been installed historically, the systems should be evaluated relative to their earlier agricultural use. For those that have been altered to satisfy the needs of wildlife management, the systems should be evaluated on the historic merits of the new use to fulfill a refuge's mission, if they now exceed 50 years age, under the Conservation theme.

Historic Agricultural Landscapes

One of the key things that irrigation systems have done is transform natural landscapes into agricultural landscapes. This broader view of irrigation is beyond the basic property types and extends to the lands served by the systems.

Agricultural landscapes are rural landscapes with intensive agricultural crop lands. In the arid West, agricultural landscapes are most frequently associated with irrigation systems and are defined by the area served by a system or systems. The exception to this is areas of dryland farming where natural precipitation makes agriculture possible and irrigation-system infrastructure was unnecessary, such as around the African-American community of Empire in eastern Goshen County. Historic agricultural landscapes resulting from irrigation include all of the land served by an irrigation system. It is possible that a historic agricultural landscape might be of sufficient historical merit to warrant consideration for NRHP listing as a Rural Historic Landscape. For guidance, see National Register Bulletin 30, *Guidelines for Evaluating and Documenting Rural Historic Landscapes* (McClelland et al. 1999).

The period of significance of an agricultural landscape begins when a system began delivery of water to an area of land and can be considered to end when the land under a system was farmed to or near its full extent. It is likely that the acreage under cultivation can be shown to vary through time because of economics, the variable output of systems, enlargement of systems, water-saving techniques, and technological changes. Major changes that have resulted in substantial changes in the amount of land under cultivation may result in refinement or expansion of a period of significance for an agricultural landscape or a portion of a landscape.

Agricultural landscapes include the agricultural fields in use and the irrigation systems that serve them. Irrigation systems may undergo substantial changes, such as piping of ditches and canals, so that they no longer appear as they did historically. Consideration will need to be made as to the impacts those changes make to the significance of a system itself, but also to the agricultural landscape. For instance, a system may appear different on the landscape than it did historically when open ditches and canals are no longer extant, but the system may still function as it was designed in delivering water for use with agricultural fields that appear as they always have. Furthermore, piping of ditches and canals may result in a change in vegetation along their routes. This may be a loss of trees or reduction in nearby riparian habitats that were inadvertent beneficiaries of seepage and became components of the agricultural landscape. The degree of change and its impact to the historical significance and integrity of an irrigation system and its resultant vegetation as agricultural landscape features would be important topics for discussion of possible mitigation should there be a potential impact to the system.

In addition, new technologies may have an impact on the agriculture landscape. Pivot irrigation has transformed rectangular fields into circular fields and has increased land under cultivation that previously was not served by canals and ditches. Pressurized sprinkler irrigation has similarly expanded agriculture onto previously unirrigated land. Historic and modern aerial photography can be an important tool in showing these transformations, which are just now becoming historic in age.

IMPACTS AND THREATS TO RESOURCES

ASSESSING AND UNDERSTANDING POTENTIAL IMPACTS and threats to cultural resources is an important aspect of cultural resource projects. By understanding these potential effects, federal and state agencies, private landowners, and historic preservationists can better manage irrigation-related resources. Furthermore, defining potential impacts better prepare agencies and organizations by providing the tools needed to anticipate future management goals, priorities, and strategies. The following discussion will describe the most common potential impacts to irrigation-related resources. It should be noted that every potential impact associated with a potential project cannot be identified here. Resources should always be evaluated for potential project impacts on a project-by-project basis.

The most common impact to an irrigation system is the piping and pressurization of a system for salinity control projects or to prevent water loss from seepage, which are frequent throughout the western U.S. These types of projects generally result in placing an irrigation pipe in the canal or ditch and burying it, abandoning the canal or ditch in favor of a more suitable pipeline alignment, or the lining of a canal or ditch to limit erosion or prevent seepage. Typically, components and features (e.g., headgates) of the system will be dismantled or moved. Other impacts might include the realignment of a system as a result of erosion, project design, or some other factor, which has the potential to change a canal, ditch, or components of a system. For NRHP-eligible resources, these types of impacts alter the integrity of design and, in some cases, the integrity of location of a system. These impacts will alter the overall historical function of the system as it had been original designed. If in-period features are still present and are removed as a part of a project, integrity of materials and workmanship might also be impacted. This is especially true when materials not congruent with the period of significance are used. For resources that are determined not to be significant under any NRHP criteria, or do not retain sufficient integrity to convey the resource's significance, project impacts to integrity are not applicable.

Because irrigation property types are generally significant under Criterion A for their importance to local history, routine maintenance of a system should not be considered an impact or a threat as long as the system functions as originally designed. For example, routinely cleaning out a ditch will not impact the overall design of the system and should not be considered an impact. Additionally, the replacement and addition of components or features (e.g., a headgate or diversion structure) that allows for a system to continue functioning as intended should also not be considered an adverse impact. As long as the change is consistent with the original functional design, modern replacements are in keeping with the expectations of the designers because mechanical equipment in particular has an expectation of a functional lifespan. However,

if original features or components—such as headgates, diversion structures, or other features—are identified that date to the resource's defined period of significance, impacts from maintenance activities should be reevaluated as integrity of materials and workmanship might be altered. Original surviving features (such as a CCC-built headgate) may require some sort of documentation prior to replacement because its removal and replacement could adversely affect the site's eligibility under Criterion C.

Other project types, such as oil and gas development projects, construction and maintenance of utility lines, or road development projects, might intersect irrigation resources. The impacts for these projects should also be evaluated on a case-by-case basis, but some general impacts are discussed here. It should be noted though, that as irrigation systems are active, maintained infrastructure, many development projects will avoid the systems in the project design, similar to active highways or railroad grades. However, in some instances, impacts might occur. Construction of a pipeline or road can adversely impact a canal or ditch should such linear projects intersect the resource and alter its integrity of design; however, should the resource be re-contoured and the canal or ditch original function is not altered, those impacts should not be considered an adverse effect. Overhead utility lines, many of which were constructed prior the enactment of cultural resource legislation, tend to intersect irrigation-related resources. Cultural resource surveys for maintenance and recertification of these types of infrastructure often result in documentation of irrigation resources. As the utility lines have generally already been constructed, maintenance activities associated with utility lines should not be considered an impact to the irrigation-related resource. Other impacts, such as access road improvements, should be evaluated individually. If an irrigation system is significant to the development of a rural, agricultural landscape, broader setting impacts, such as large housing developments, will adversely impact the resource's rural setting. If a linear project intersects a resource at a perpendicular angle, it should not be considered an adverse impact to the resource's setting. These projects will only impact a small section of the overall system and do not detract from the overall rural setting. If the linear project parallels the resource for an extended length, however, the resource's setting might be impacted.

Impacts and threats to a resource will ultimately need to be determined on a case-by-case basis. General impacts to irrigation-related property types are mostly related to the piping of irrigation ditches or impacts from proposed projects that intersect the resource. Impacts should be discussed in terms of how they affect the resource's integrity and significance under applicable NRHP criteria. Regular maintenance activities associated with the operation of a canal or ditch generally do not impact the integrity of design of an irrigation system and should not be considered an impact or threat to the resource; however, this might not be the case in all instances, and these impacts should be reevaluated based on the individual project and irrigation system.

HISTORY OF PREVIOUS RESOURCE DOCUMENTATION

PREVIOUS DOCUMENTATION OF IRRIGATION-RELATED resources in Wyoming is drawn from several sources, including historical backgrounds for individual irrigation companies, history of the water rights in the state, or summaries of large-scale individual projects. Most of the previous work, however, is a result of historical and archaeological investigations associated with various development or land-management projects. The nature of these projects generally have not include documenting or investigating the entire extent of an irrigation system, but rather partial documentation of a system (such as a segment of a ditch or canal within an individual project area). The following section presents a synopsis of previously documented irrigation-related resources within Wyoming.

As of April 2021, nearly 850 sites or structures related to irrigation had been documented in Wyoming. It should be noted that the number of resources is constantly increasing as new work occurs throughout the state. Although the data presented represents a specific moment-in-time, it is indicative of greater trends and patterns. The remainder of this section discusses general trends derived from the April 2021 data. Out of the 23 counties within the state, irrigation-related resources have been formally documented through the SHPO in 20 counties, with Campbell, Crook, and Niobrara counties having no documented irrigation resources (**Figure 73**). Fremont County accounts for the highest percentage of previously recorded resources, followed by Natrona, Big Horn, and Park counties. This distribution is likely a result of a few factors, but is largely affected by the number of previously conducted cultural resource projects in the area. For example, Fremont County has the second-highest number of public land acres (i.e., lands managed by the BLM, United States Forest Service, State of Wyoming, etc.) in the state and has the highest number of irrigation-related resources documented (**Figure 74**). Given requirements for cultural resource studies to be conducted on public lands for most projects, it would be expected that a higher frequency of resource recordations would occur in areas with the largest quantity of public lands. Similarly, it would be expected that a high number of resources would be recorded where projects have occurred, regardless of landownership. For example, areas with relatively higher energy development—especially from oil-and-gas well pads, pipelines, wind farms, or transmission line projects—would result in a higher percentage of all lands being inventoried. This is evident in Natrona, Albany, Carbon, and Converse counties. These factors ultimately contribute to a higher number of resources being documented. Conversely, counties with either a larger quantity of private acres or that have not been subjected to frequent cultural resource inventories would not have a high number of previously documented resources.

It should be noted that when public lands were not converted to agriculture, it was because the lands were generally considered not suitable for irrigation and agricultural development. This may have been for a number of reasons,

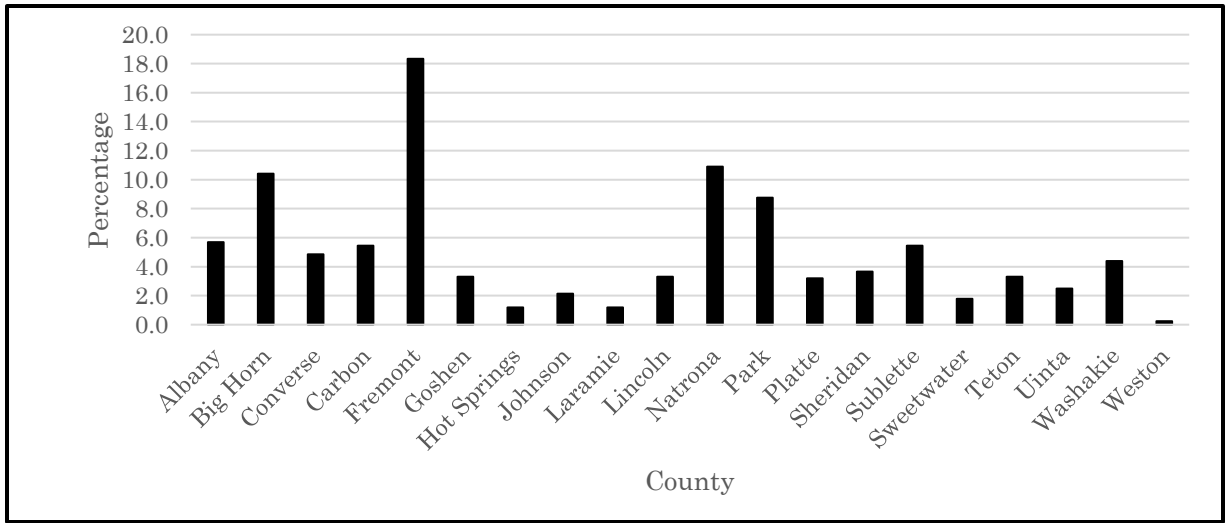


Figure 73. Distribution of previously documented irrigation-related resources by county.

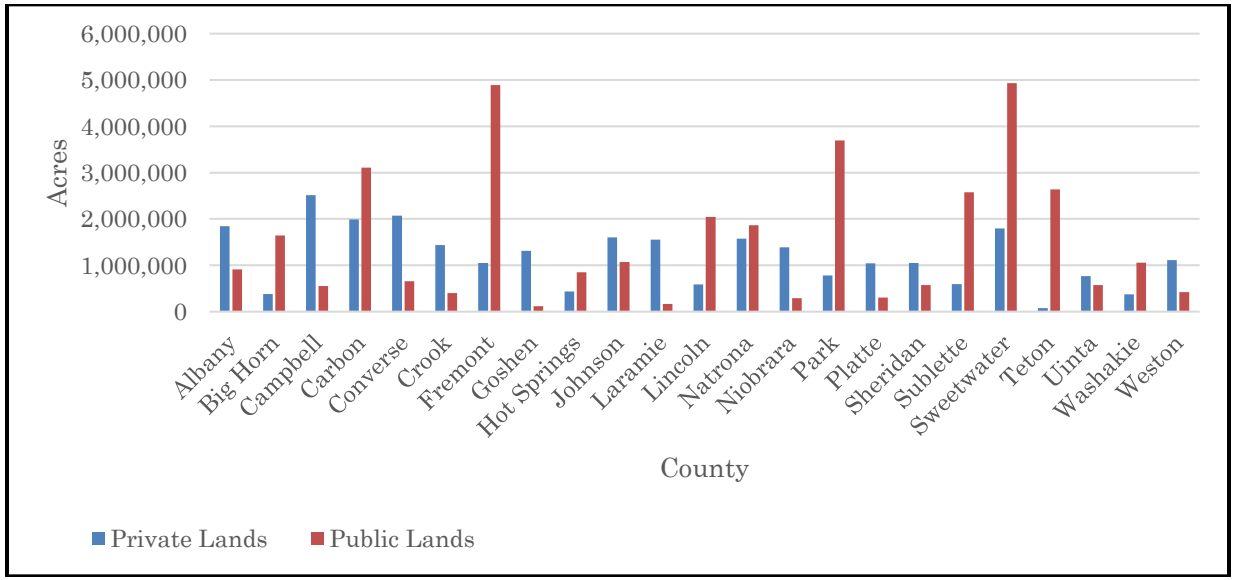


Figure 74. Frequency of private and public lands by county within Wyoming.

including a lack of access to sufficient water. Those lands, even though they might be subject to inventory because of federal mandates, should be expected to have a lower potential for irrigation resources, although smaller, failed systems might be present. Ultimately, suitable agricultural land that was served by irrigation systems came out of federal ownership, which was the intent of the Carey and Newlands acts, and is where the highest number of resources should be expected to be encountered. It is likely that irrigation systems recorded on federal lands are mostly adjacent to productive, privately owned farmland or represent portions of an irrigation system that pass through public lands and convey water from upper extents down to the lower, agriculturally suitable valleys.

Similarly, the number of resources documented by river basin is not only driven by land ownership and frequency of previous investigations by county, but also by the size of the overall river basin. Nearly two-thirds of the state is encompassed by the Wind-Big Horn and Platte river basins (**Figure 75**). As such, it is not unexpected that these areas account for three-quarters of the previously documented irrigation-related resources (**Table 3**). Furthermore, these river basins were historically subjected to large-scale irrigation projects along the Big Horn, Wind, and Platte rivers under the Carey and Newlands acts. Therefore, it is reasonable to assume that numerous irrigation systems would be encountered in these areas. In comparison, the Northeast River Basin covers a substantial portion of the northeastern portion of the state. However, few irrigation resources have been documented there (less than one percent of the total number of previously documented resources used for this study), despite major irrigation projects constructed within the Belle Fourche, Cheyenne, and Niobrara watersheds. This is likely a result of both the high number of private acres within this river basin, coupled with a lower frequency of cultural resource surveys that have occurred. River basins, such as the Bear or the Snake-Salt, alternatively, cover a fraction of the state as compared to the larger river basins. However, together, these two river basins account for nearly 10 percent of the previously recorded resources. This is likely due to the substantial number of public lands in Lincoln, Teton, Sublette, and, to a less extent, Uinta, counties.

Table 3. Previously Documented Resources by River Basin.

River Basin	Percentage
Wind-Big Horn	41.8
Powder-Tongue	6.0
Northeast	0.4
Platte	34.2
Green	10.5
Bear	3.0
Snake-Salt	4.1
Total	**100**

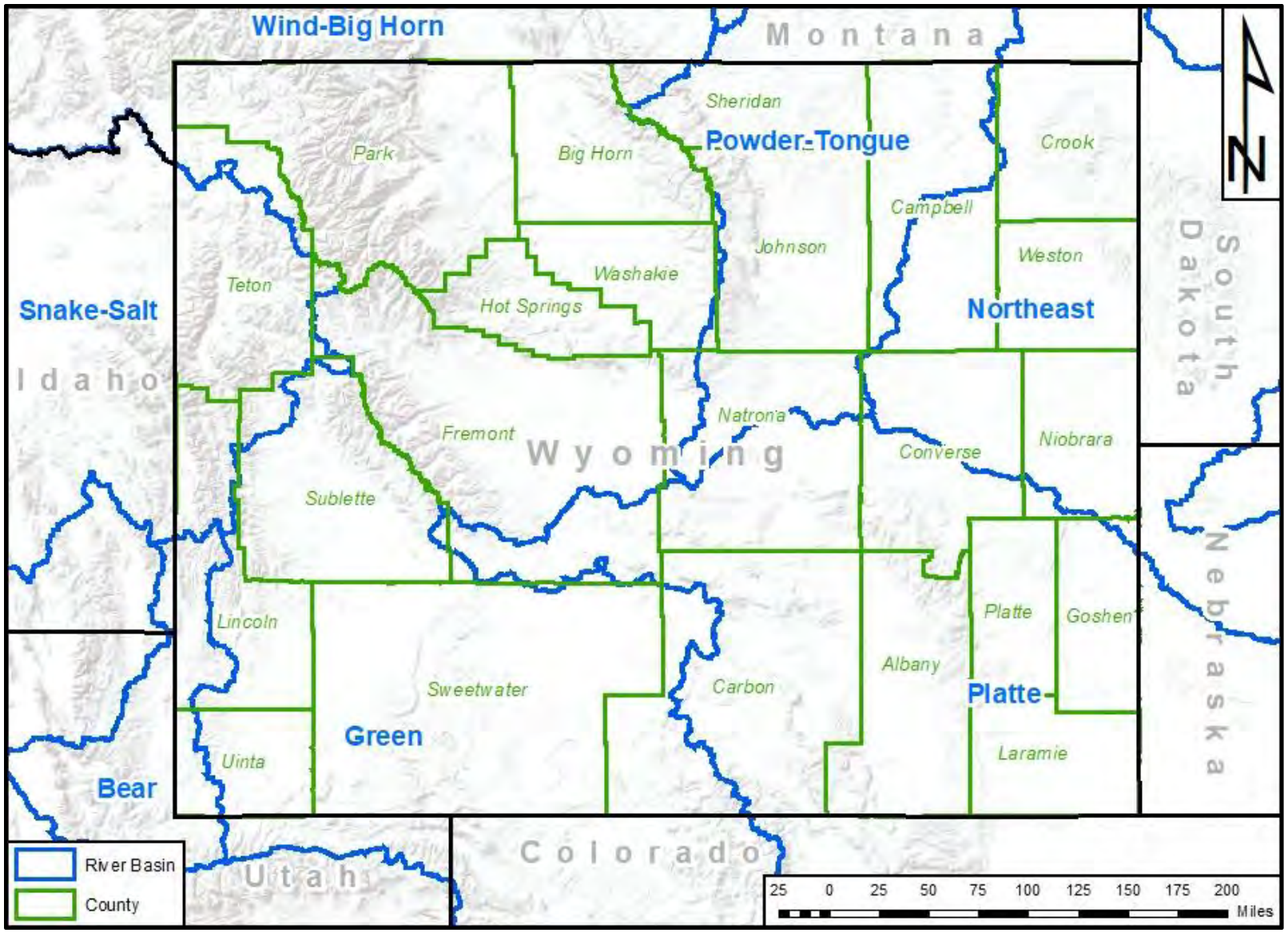


Figure 75. Map of Wyoming showing river basins and associated counties.

Statewide, the most common, documented property types are segments of ditches or canals. For this purpose, the two will be referred to separately, although the distinction between the two is often subjective and is dependent on the recordation at the time of the original visit. Within the study sample, over 96 percent of the property types documented have been classified as either a ditch or canal (**Table 4**). A variety of features of the ditch/canal property type have been documented, including flumes, pipelines, and reservoirs. Additionally, features that would be generally documented as part of a ditch/canal property type (e.g., headgates, diversion structures, or waterwheels) have also been recorded as separate resources. Other associated property types, including construction camps and irrigation-related buildings, have also been documented.

The frequency of documented irrigation-related resources is also influenced by the period in which cultural resource inventories occurred. Because cultural resource inventories are continually on-going, only irrigation-related sites documented prior to 2020 will be discussed herein. Of the nearly 850 resources received from SHPO as of April 2021, 90 percent were documented prior to 2020, with the remaining 10 percent being documented post-2020. Many of these resources have been re-documented since the original recordation; as such, only the date of the first documentation is considered in this analysis to better understand trends of when irrigation-related resources where documented. Generally, few resources were documented in the 1980s, whereas most of the resources were initially documented during the 1990s and the 2000s (**Figure 76**). A relatively few resources do not have an associated date assigned as to when they were original documented. The higher percentage of sites documented in the 1990s and 2000s is likely a result of cultural resource specialists and federal agencies recognizing the need to document irrigation-related resources and making a concerted effort to document them. Additionally, the availability of historical and archival data increased during this period, which allowed for better determinations of the age of a given resource.

Table 4. Summary of Previously Documented Irrigation Resources in Wyoming.

Property Type	Percentage	Quantity
Bridge	0.6	5
Building	0.2	2
Canal	46.0	389
Cistern	0.1	1
Construction camp	0.1	1
Dam	0.1	1
Ditch	50.3	425
Ditch & Reservoir	0.2	2
Diversion structure	0.1	1
Flume	0.6	5
Headgate	0.5	4
Pipeline	0.4	3
Reservoir	0.1	1
Siphon	0.2	2
Tunnel	0.1	1
Unknown	0.1	1
Waterwheel	0.1	1
Total	**100.0**	**845**

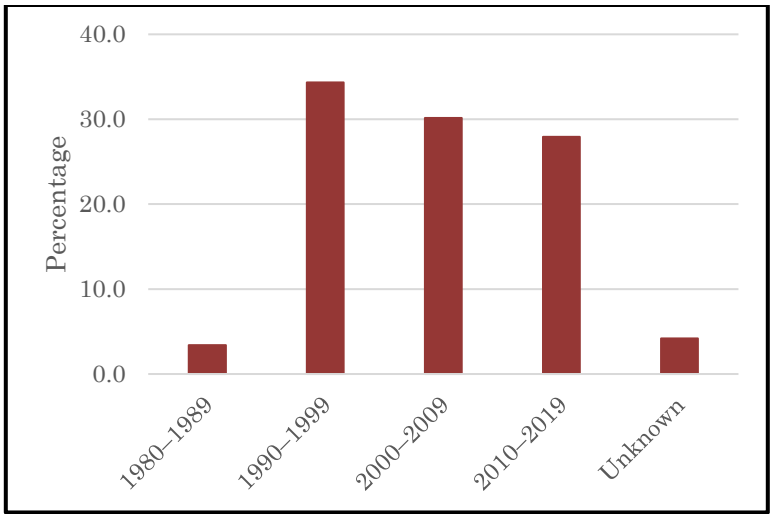


Figure 76. Distribution of irrigation-related resources documented prior to 2020.

Geographically, irrigation-related properties have been documented within each river basin throughout each period (**Figure 77**). In the 1990s, the Wind-Big Horn and the Bear river basins had the most resources documented, whereas during the 2000s, the Powder-Tongue and Platte river basins had the most resource documented. From 2010–2019, the Snake-Salt and Green river basins had a substantial increase in resource documentation as compared to the decades prior. Similar to the statewide trend, these patterns might be a result of an increase in recognition of the resource type and better access to archival data to help determine the age of a property. It also might be influenced by where projects have occurred throughout the state. For example, within the Wind-Big Horn, Powder-Tongue, and Platte river basins, significant oil-and-gas development projects occurred during the 1990s and 2000s; in more recent years, there have been shifts to different energy production areas, such as the Green River Basin. The significant increase in recordation in the Snake-Salt River Basin, however, is more likely related to the vast amount of public lands in Teton and Lincoln counties. Additionally, it is also associated with an increase of cultural resource inventories in the Teton and Shoshone national forests or within Yellowstone National Park.

In summary, previously documented resources, which primarily consist of ditch or canal segments, have been heavily influenced by the nature and location of cultural resource inventories from the 1980s to the 2010s. The amount of resource documentation in an area is often directly related to the number of projects associated with energy development and extraction within the state. These projects (as well as other project types) have affected the recordation of irrigation-related properties. As most projects require federal authorization or public lands to initiate a cultural resource investigation, many of the previously documented resources have occurred in counties or river basins that have a high amount of public lands. Conversely, regions in the state that are dominated by private lands have not had nearly the same number of resources documented.

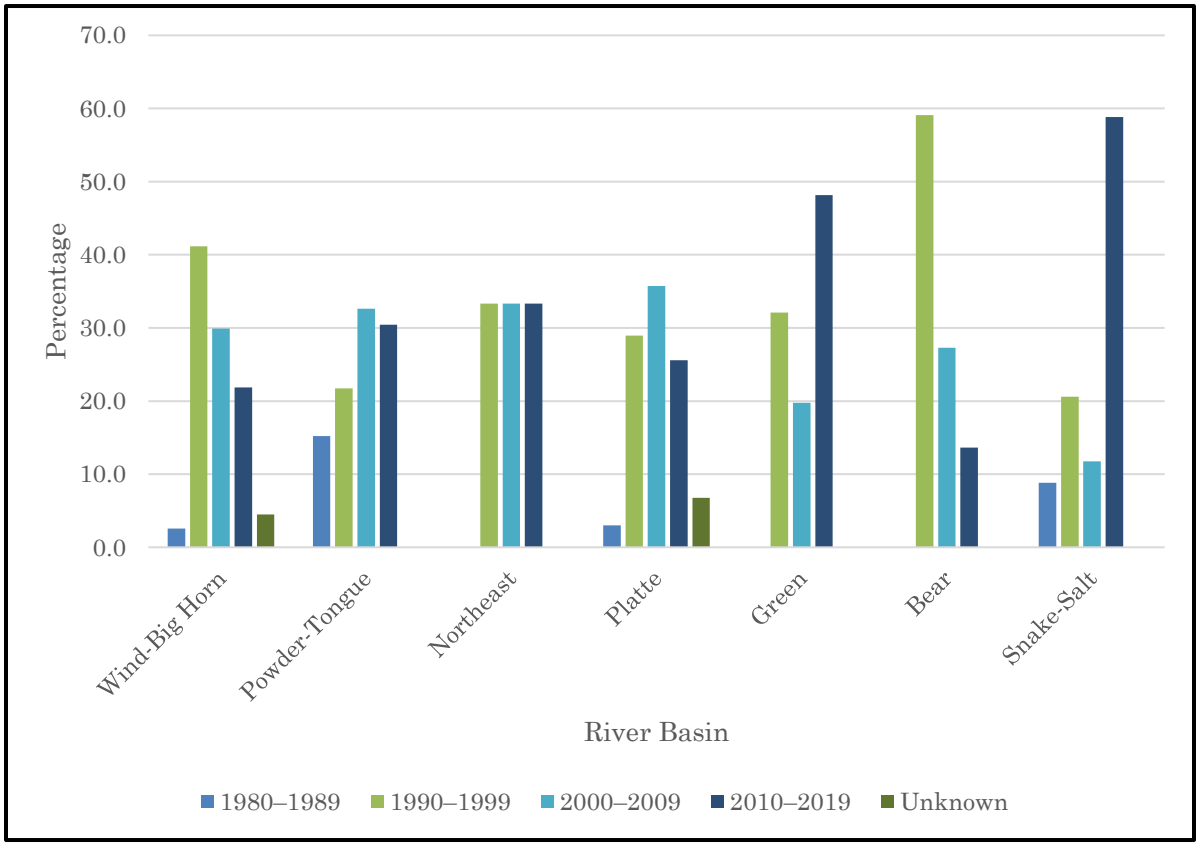


Figure 77. Distribution of resources documented by river basin prior to 2020.

DATA GAPS AND FUTURE RESEARCH STRATEGIES

THE PRECEDING SECTION HIGHLIGHTED PATTERNS OF recordation of irrigation-related resources in Wyoming. These patterns are not only useful in determining what has already been documented, but what resource data gaps also exist. The following section discusses identified data gaps and presents future research strategies derived from those identified data gaps.

When examining the previously documented irrigation-related resources, one major data gap is apparent: the geographic distribution of recorded resources. Most of the resources documented are a result of cultural resource inventories. As those inventories are often driven by federal mandates, it is clear that numerous irrigation properties on private lands have not been documented. This is especially true within the Northeast River Basin, which accounts for less than a half percent of the total previously documented resources. The primary data gap is the low representation of resources within the following river basins:

- Northeast
- Powder-Tongue
- Green

The Northeast and Powder-Tongue river basins have a large quantity of private lands and have had fewer cultural resource inventories conducted compared to other regions. Both the Northeast and Powder-Tongue river basins, account for few major projects completed under the Carey and Newlands Reclamation acts (a total of five projects, all of which were Carey Act projects) or as part of the Pick-Sloan Missouri Basin Program (one project). The lack of major irrigation projects completed in these regions suggests that irrigation projects, if completed, were undertaken by private landowners without the assistance of state or federal funds. Regarding the Green River Basin, which encapsulates large expanses of public lands, relatively few irrigation-related resources have been recorded compared to other areas, such as the Wind-Big Horn River Basin. It would be expected that the resources on public lands would be related to areas adjacent to prime agricultural areas or represent portions of the irrigation systems that pass through public lands. Resource documentation, however, has increased from 2010–2019 within the Green River Basin, suggesting that additional resources will continue to be documented. Furthermore, the Green River Basin also had the third-most Carey Act projects as well as major projects completed under the Newlands Reclamation Act. Therefore, it is expected that additional work in this river basin will identify additional irrigation resources.

Irrigation systems are comprised of two property types: Canal and Ditch Systems and Mechanical Pressurized Water Distribution Systems. The majority of the previously documented resources are segments of various canals or ditches, although individual features or components (e.g., headgates or

waterwheels) associated with those systems have also been documented. As such, there are no glaring data gaps regarding the documentation of the Canal and Ditch Systems property type, aside from the geographic distribution that was discussed above. A review of the previously documented sites, elements of the property type (e.g. a headgate) have been documented as individual sites or isolated features, rather than being incorporated into a larger canal or ditch system. Regarding Mechanical Pressurized Water Distribution Systems, as of mid-2021, none have been documented in the state. This is not unexpected as these systems started being used in the 1950s and the primary features of the system—for example, a center-pivot system—are usually not encountered during fieldwork. Additionally, those of historic age are probably rare and it is difficult to recognize a system that is old enough to record. Old systems are made up of mechanical parts that wear out and have been replaced by more modern equipment. Although the basic system may be of historical age, it may not be recognizable as such in the field.

In order to address the data gaps identified above, additional cultural resource inventories would be required. However, as many of these inventories are limited by landownership and project constraints, it is often difficult to target specific areas to document resources. Federal and state agencies (such as the Natural Resources Conservation Service or the BOR) that work closely with private landowners are best positioned to document irrigation-related resource in areas of private landholdings. Therefore, when projects allow, additional work should focus on identifying and documenting irrigation systems in the Northeast and Powder-Tongue river basins. Continued work within the Green River Basin should also prioritize documenting irrigation-related resources.

Regarding property types, future research should focus on documenting the extent of the property type that is realistic for a project. This includes documenting associated features and components of part of a property type and move away from documenting these components and features as individual resources. For example, recording an outlet gate as part of a canal and ditch rather than as an individual resource. Work should continue to document Canal and Ditch Systems. This work should include inspecting historical aerial images or historical topographic maps to identify potential canal or ditch alignments prior to fieldwork. Additionally, it is recommended that isolated elements of a ditch or canal system, such as a headgate recorded as an isolated feature or site, should be incorporated into the larger property type to better convey its historical context. To better document Mechanical Pressurized Water Distribution Systems, research should include inspecting historical aerial images to identify potential systems prior to fieldwork. Historical aerials have the potential to assist in identifying agricultural fields that might have historically used a center-pivot system. Side-roll/linear-move systems and large sprinklers might be difficult to discern from historical aerial images. However, given the current availability and quality of historical aerial imagery, evidence of these fields might be hard to discern. It should be noted, though, that elements of these systems might not be encountered during fieldwork based on project constraints. Additionally, agricultural fields should not be documented as part of irrigation systems.

Although irrigation-related resources have been documented throughout the state, there are areas that require additional work. Many of these areas are dominated by private lands and, as such, are typically not subjected to intensive cultural resource inventories. Projects that work closely with private landowners can help address the private land data gap. Additionally, fieldwork can begin to address identifying and documenting Mechanical Pressurized Water Distribution Systems moving forward, as no examples of this property type have been recorded. To reiterate, however, it is recommended that agricultural fields should not be documented. Rather, only period-appropriate mechanical systems should be documented, if encountered. Evaluating a Mechanical Pressurized Water Distribution System should focus on the integrity of the system features, but not the agricultural field. That is, the resource is significant based on the physical remains of the system, not the evidence of the historical agricultural field. If historical aerial imagery indicates that a Mechanical Pressurized Water Distribution System has been used in association with the period-equipment, those images can be used to help create a historical context for the resource. Furthermore, utilizing historical aerial images might assist in identifying prior to fieldwork, potential areas with systems that might encountered by field personal.

GOALS, PRIORITIES, AND STRATEGIES FOR MANAGEMENT

PRECEDING SECTIONS HAVE OUTLINED AND summarized previously documented resources, identified data gaps, and suggested future research strategies for documenting irrigation resources in Wyoming. These aspects lead to the overall management of various resources that can guide state and federal agencies and cultural resource specialists. The following section presents goals and priorities for management and proposes best-practice strategies for the future management of irrigation-related resources.

Taking into account the information presented in the data gaps and future research strategies, three primary goals have been identified. These goals consist of increasing the documentation, representation, and archival data related to irrigation property types. The goals will assist with fieldwork, but will also contribute to our understanding of Wyoming's irrigation systems. These goals include:

Goal 1: *Increased and Improved Documentation of Irrigation Property Types.* This goal is focused on documenting both the Canal and Ditch System and Mechanical Pressurized Water Systems property types statewide. This goal is dependent on project specifics and landowner constraints. A variety of sub-goals is included within this goal and is applicable to documentation standards. Sub-goals include:

- 1.a. – Update older documentations to current federal and state standards.
- 1.b. – Incorporate previously documented individual features into the larger property types.
- 1.c. – Document the fullest extent of a resource as possible, reducing the number of multiple segments of a resource.
- 1.d. – Document primary, secondary, and, possibly, named tertiary canals and ditches.[6] Field ditches do not need to be documented.

Goal 2: Increased Documentation of Irrigation Properties Where Underrepresented. This goal focuses on increasing the number of documented resources statewide. Specifically, this goal focuses on increasing the number of documented resources within the Northeast River Basin and within other counties that are underrepresented in the current dataset.

[6] The Wyoming SHPO's exclusion list allows for unnamed ditches on historical maps not to be documented; however, many of the historical topographic maps do not name major irrigation systems and most irrigation systems are not included on the maps. As such, additional historical research should be conducted to determine if a water right, and, thus, a named system, is represented but is unnamed or unmapped on a topographic map prior to excluding it from formal documentation.

Goal 3: Increase Use of Archival Data. Utilize various archival resources to better understand the history of individual irrigation systems. This historical background will help identify the geographic extent, the chronology, and the impact of a system on its surrounding community. Historical aerial images will assist in identifying the changes to the landscape and alterations of a system through time. These aspects will ultimately strengthen discussions about the significance of a system.

From these goals, two primary priorities are evident: ***high-quality documentation of irrigation resources*** and ***documentation of resources in underrepresented areas***. The continued documentation of resources will achieve all three goals presented above. As discussed previously, projects are often limited by landowner and project constraints; however, continued documentation of irrigation resources will grow the overall sample size. In addition, appropriate pre- and post-field identification of potential systems will assist in the documentation of resources. Although often limited by project constraints, identifying resources in underrepresented areas should be a priority. These resources likely contributed significantly to the development of irrigation and agriculture in Wyoming and their recording will help provide context to the economic, commercial, and social development of these areas.

To meet the goals and priorities, two management strategies are suggested. These strategies are designed to assist in the identification of resources and to present a plan for mitigation of resources that may be impacted. These strategies are:

Strategy 1: Develop historic property management plans (HPMPs) for individual irrigation systems still in use or for irrigation districts with multiple systems in use, when appropriate. The HPMP would be developed as a supplemental document to the Wyoming Irrigation Programmatic Agreement (PA) and this context. In accordance with the Wyoming Irrigation PA, and this context, HPMPs can assist irrigation companies, Tribal offices, land-managing agencies, state agencies, and cultural resource specialists in the identification, documentation, and management of irrigation resources specifically related to the individual irrigation system in question. HPMPs should identify and analyze the extent of the previous documentation of the system or district in question and define goals to fully document that system and/or district; identify regular maintenance activities to facilities and exclude them (when appropriate or if not covered within Appendix A of the Wyoming Irrigation PA) from future cultural resource oversight; identify specific individual system features that are particularly important and warrant protection; and devise specific management strategies unique for that system or district.

Strategy 2: Implement appropriate mitigation, should it be required of a system or district, as outlined in Appendix B of the Wyoming Irrigation PA. Mitigation may include a number of options to contribute to the development of a Wyoming Irrigation Wiki. Data collected for the Wiki should focus on the public dissemination of the history of a system or district. If feasible, data collection of a system or district should focus on a landscape perspective. That is, as an irrigation system was not only important to convey water to individual or groups of users, the systems also facilitated the alteration of the landscape from a natural landscape to an agricultural landscape. Defining and documenting that landscape will provide a more complete understanding of the development and influence that a system had on a population or region. It should be noted, though, that if historically significant components or element are present or if significant engineering is evident, additional mitigation strategies might be appropriate, such as archival photographic or records documentation.

As cultural resource work continues within Wyoming, it is important to outline the goals of documenting irrigation resources. In many cases, the documentation of a resource is important, as that documentation contributes to the overall dataset and informs our understanding of the development of irrigation in Wyoming. To meet the goals and priorities, strategies that guide resource documentation and mitigation are needed. These strategies include developing HPMPs for systems and to understand that a system's influence is on a landscape level, not at an individual segment level. Implementation of these practices will assist in the overall management of irrigation property types in Wyoming.

SUMMARY

IRRIGATION WITHIN WYOMING HAS BEEN vital to the development of agriculture, industry, and settlement of the state. The development of irrigation systems has been the result of work by individual farmers and ranchers, but also by mutual ditch companies and highly capitalized ventures. These systems have prompted the adoption of various legal precedents that still influence the way water is managed and distributed throughout the state. These systems are often encountered and documented during cultural resource inventories. Because irrigation systems have had a significant influence within the state, the preceding context was developed to assist in the documentation, evaluation, and management of these resources.

The history of irrigation spans from the pre-Territorial era through modern times. Although many ditches and canals were established prior to Wyoming becoming a state, the development of irrigation was especially prevalent with the introduction of federal aid. This federal aid manifested in two primary ways: irrigation projects constructed under the Carey Act from 1894–1954 and projects enacted as part of the Newlands Act from 1902–1979. These two federal programs not only spurred and facilitated construction of irrigation systems, but influenced historical settlement in Wyoming. Concurrent with these acts, various private irrigation projects were constructed throughout the state. Overall, the development of irrigation in Wyoming was influenced by numerous environmental, legislative, and economic factors.

Irrigation-related resources can be assigned to two primary property types: Canal and Ditch Systems and Mechanical Pressurized Water Distribution Systems. These systems include a variety of features and components that are used to convey water in safe and economical ways and to distribute it to users. Each of the property types can be significant under applicable NRHP criteria. In a preceding section, we presented suggestions on how to evaluate irrigation resources, including applicable aspects of integrity, thematic associations, and periods of significance. Evaluation of aspects of integrity is also important when assessing various potential impacts to a system.

The identification and evaluation of irrigation resources is important because it assists cultural resource specialists in appropriately documenting these resources. On a statewide level, previous documentation of irrigation resources has been influenced not only by project locations, but also by where irrigation-related resources would be expected to be encountered. Assessing the distribution of where irrigation resources have been recorded identifies data gaps and assists in formulating future research strategies. These data gaps and research strategies also influence the overall goals, priorities, and strategies for management. In short, the development of HPMPs for individual irrigation systems or districts that are still in use, provide a mechanism for the documentation and mitigation of

systems on a landscape level. The documentation of a system or district at this scale recognizes the wider influence that an irrigation system has had and facilitates their appropriate management as historical and, often, still functioning cultural resources. That is, the vast majority of irrigation systems were not isolated, individual segments that served a single user. Rather, most were constructed to serve multiple users and altered the land from a natural setting to an agricultural one. It is our hope that this context will facilitate a landscape-level approach that highlights the historical and continued importance irrigation systems have on Wyoming's landscape and people.

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Appendix A

TERRITORIAL PERIOD DITCH COMPANIES AND DITCHES

1870–1890

DITCH COMPANIES & DITCHES

The following table was compiled from data included in the 1885 annual Wyoming Territorial report to the Secretary of the Interior (Warren 1885), the 1890 U.S. Senate special report on irrigation of arid lands that included Wyoming (U.S. Senate 1890), examining historical newspapers between 1868 and 1890, and searches of the Wyoming Secretary of State and Water Rights eTrac online databases. As a result, it is not a comprehensive list of all companies engaged in irrigation projects in Wyoming and only reports the information contained in the reports and news items. Additional research would be required to flesh out the histories of the individual companies and to determine whether they actually constructed or completed the projects they were formed for. Information in the table provides some sense of the intensity at which irrigation projects were being pursued during the Territorial Period and the magnitude of their efforts, as indicated by the company stock values.

Territorial Period Ditch Companies and Ditches

Name	Water Source	County	Date	Stock	Acres	Owners	Still in Operation?	Associated Ditches	Reference
Wyoming Ditch and Water Co.*	Unknown	Unknown	1870	$12,000	N/A	Jervis Joslin	No	Unknown	*Cheyenne Daily Leader,* July 22, 1870:4; Warren 1885:1191
Laramie Water and Ditch Co.*	Unknown	Albany	1871	$10,000	N/A	Ira A. Pease, agent	No	Unknown	*Laramie Daily Sentinel,* June 3, 1871:3; Warren 1885:1191
			1874	$10,000	N/A				Warren 1885:1191
Albany County Ditch Co.	Unknown	Albany	1874	$100,000	N/A	Unknown	No	Unknown	Warren 1885:1191
Big Laramie River Water Co.	Laramie River	Unknown	1875	$500,000	N/A	Unknown	No	Unknown	Warren 1885:1191
Evanston Ditch and Water Co.	Unknown	Unknown	1878	$4,000	N/A	Unknown	No	Unknown	*Uintah Chierftain* (Evanston), May 7, 1881:3); Warren 1885:1191
Laramie River Ditch and Water Co. No. 1	Unknown	Unknown	1879	$300	N/A	Unknown	No	Unknown	*Cheyenne Daily Sun,* March 9, 1884:3; Warren 1885:1191; U.S. Senate 1890:531
Pioneer Canal Co.	Big Laramie River	Albany	1879	$100,000	N/A	Unknown	Yes	Pioneer Canal, High Line Canal, Blake Drain Ditch, Pioneer Reservoir	*Laramie Daily Sentinel,* November 16, 1878:4; Warren 1885:1191; U.S. Senate 1890:531
Rocky Mountain and Bear River Ditch Co.	Bear River	Uinta	1879	$10,000	N/A	William Sims, John Sims Jr.	No	Rocky Mountain and Bear River Company Ditch (also known as John Sims Ditch)	*Cheyenne Daily Sun,* March 9, 1884:3; Warren 1885:1191
Jack Creek Irrigating Co.	Unknown	Unknown	1881	$1,000	N/A	Unknown	No	Unknown	*Cheyenne Daily Sun,* March 9, 1884:3; Warren 1885:1191
Union Ditch and Water Co.	Unknown	Albany	1881	$100,000	N/A	Unknown	No	Unknown	*Cheyenne Daily Sun,* March 9, 1884:3; Warren 1885:1191
Utah and Idaho Land and Irrigation Co.†	Unknown	Unknown	1881	$100,000	N/A	Unknown	No	Unknown	*Cheyenne Daily Sun,* March 9, 1884:2; Warren 1885:1191
Big Piney and Prairie Dog Ditch and Tunnel Co.	Unknown	Unknown	1882	$3,000	N/A	Unknown	No	Unknown	Warren 1885:1192

Territorial Period Ditch Companies and Ditches

Name	Water Source	County	Date	Stock	Acres	Owners	Still in Operation?	Associated Ditches	Reference
Chugwater Ditch Co.	Chugwater Creek	Sheridan	1882	$2,000	N/A	Unknown	No	Unknown	*Cheyenne Daily Sun,* March 9, 1884:2; Warren 1885:1191; *Democratic Leader* (Cheyenne), July 29, 1886:3
East Side Ditch and Irrigating Co.	Unknown	Unknown	1882	$2,000	N/A	Unknown	No‡	Unknown	*Cheyenne Daily Sun,* March 9, 1884:2; Warren 1885:1191
Hurlburt Creek Ditch Co.	Unknown	Unknown	1882	$400	N/A	Unknown	No	Unknown	*Cheyenne Daily Sun,* March 9, 1884:2; Warren 1885:1191
North Piney and Prairie Dog Irrigating Canal and Tunnel Co.	Unknown	Unknown	1882	$1,500	N/A	Unknown	No	Unknown	*Cheyenne Daily Sun,* March 9, 1884:2; Warren 1885:1191
Rawlins Artesian Well and Water Co.*	Unknown	Unknown	1882	$60,000	N/A	Unknown	No	Unknown	*Cheyenne Daily Sun,* March 9, 1884:2; Warren 1885:1191
Trabing Creek Ditch Co.	Trabing Creek	Sheridan	1882	$400	N/A	Unknown	No	Unknown	*Cheyenne Daily Sun,* March 9, 1884:2; Warren 1885:1191
Upper East Side Goose Creek Ditch and Irrigating Co.	Unknown	Unknown	1882	$1,500	N/A	Unknown	No	Unknown	*Cheyenne Daily Sun,* March 9, 1884:2; Warren 1885:1191
			1882	$5,000	N/A				
White and Jackson Creek Ditch Co.	Unknown	Unknown	1882	$500	N/A	Unknown	No	Unknown	*Cheyenne Daily Sun,* March 9, 1884:2; Warren 1885:1191
Wyoming Five Mile Ditch Co.	Hewes Creek (now Columbus Creek)	Johnson	1882	$5,000	N/A	George Ohlman, Joseph Engle, Leroy Tyler, William Wagner	Yes	Wyoming & Five Mile Ditch	*Cheyenne Daily Sun,* March 9, 1884:2; Warren 1885:1191
Bordeaux Ditch Co.	Chugwater Creek	Laramie	1883	$45,000	N/A	F. O. DeBillier, A. M. Teschemacher, and John Hunton	No	Bordeaux Ditch	*Cheyenne Weekly Leader*, January 10, 1884:2; *Democratic Leader* [Cheyenne], February 22, 1884:3; *Cheyenne Daily Sun,* March 9, 1884:2; Warren 1885:1191
Colorado Colony Co.	Little Goose Creek	Laramie	1883	Unknown	8,000	J. W. Denio, Thomas Williams, and L. E. Martin	No	Unknown	*Big Horn Sentinel* [Buffalo], October 1, 1887:5; U.S. Senate 1890:531-532

Territorial Period Ditch Companies and Ditches

Name	Water Source	County	Date	Stock	Acres	Owners	Still in Operation?	Associated Ditches	Reference
Goshen Hole Ditch Co.	Unknown	Unknown	1883	$300,000	N/A	Unknown	No	Unknown	*Cheyenne Daily Sun,* March 9, 1884:2; Warren 1885:1191
Hellman Ditch and Irrigating Co.	Unknown	Laramie	1883	$30,000	N/A	Unknown	No	Unknown	*Cheyenne Daily Sun,* March 9, 1884:2; Warren 1885:1191
Little Horse Creek Irrigating Co.	Horse Creek	Laramie	1883	$100,000	N/A	W. C. Lykens, W. L. Wood, and C. W. Perry	No	Unknown	*Cheyenne Daily Leader*, November 2, 1883:3; *Cheyenne Daily Sun,* March 9, 1884:2; Warren 1885:1191
McKuen Ditch and Reservoir Co. of Wyoming Territory	Unknown	Unknown	1883	$25,000	N/A	Unknown	No	Unknown	*Cheyenne Daily Sun,* March 9, 1884:2; Warren 1885:1191
North Platte Irrigating and Ditch Co.	Platte River	Laramie	1883	$60,000	N/A	J. G. Coy, A. Barry, and W. R. Akers	No	Unknown	*Cheyenne Daily Leader*, September 26, 1883:4; October 4, 1883:4; *Cheyenne Daily Sun,* March 9, 1884:2; Warren 1885:1191
Rutledge & Hellman Ditch Co.	Little Horse Creek	Laramie	1883	$30,000	N/A	B. Hellman, Gustave Lehman, and Thomas Rutledge	No	Rutledge and Hellman Ditch	*Cheyenne Daily Sun,* January 3, 1884:8; March 9, 1884:2; Warren 1885:1191
Wyoming Development Co.	Unknown	Unknown	1883	$1,000,000	N/A	Unknown	No	Unknown	*Cheyenne Daily Sun,* March 9, 1884:2; Warren 1885:1191
Bear Creek Ditch Co.	Bear Creek	Goshen	1884	$10,000	N/A	Charles D. Syars, Reuben Martin, and George B. Dunham	No	Bear Creek Ditch	*Democratic Leader* [Cheyenne], October 14, 1884:1; Warren 1885:1192
Beaver Dam Ditch Co.	Crow Creek	Laramie	1884	$15,000	N/A	Alonzo Martin, Mark, and Charles W. Riner	No	Beaver Dam Ditch	*Daily Boomerang* [Laramie], October 3, 1884:4; *Democratic Leader* [Cheyenne], October 9, 1884:2; Warren 1885:1192
Calland and Culver Ditch Co.	Horse Creek	Unknown	1884	$10,000	N/A	H. A. Calland, Frank L. Culver, and James M. Culver	No	Unknown	*Daily Boomerang* (Laramie), April 28, 1884:3; Warren 1885:1192
Clear Creek Land and Ditch Co.	Unknown	Unknown	1884	$50,000	N/A	Unknown	Unknown	Unknown	Warren 1885:1192

Territorial Period Ditch Companies and Ditches

Name	Water Source	County	Date	Stock	Acres	Owners	Still in Operation?	Associated Ditches	Reference
Cloud Peak and French Ditch Co.	Unknown	Johnson	1884	$5,000	N/A	Orrin Westman, Gustave E. A. Moller, and Peter Georgen	No	Unknown	*Democratic Leader* [Cheyenne], August 31, 1884:3; Warren 1885:1192
Crow Creek Ditch & Reservoir Co.	Crow Creek	Laramie	1884	$15,000	N/A	F. E. Warren, C. P. Organ, and W. H. Lowe	No	Crow Creek Ditch	*Democratic Leader* [Cheyenne], June 19, 1884:4; Warren 1885:1192
Deer Creek Canal and Improvement Co.	Deer Creek	Converse	1884	$50,000	N/A	Frank Wollcott	No	Deer Creek Canal and Improvement Ditch	*Cheyenne Daily Sun,* March 9, 1884:2; Warren 1885:1191
Gordon Ditch Co.	Horseshoe Creek	Converse	1884	$10,000	N/A	David Gordon	No	Gordon Ditch	Warren 1885:1192; *Democratic Leader* (Cheyenne), March 21, 1885:1
Horseshoe Creek No. 1 Ditch Co.	Horseshoe Creek	Converse	1884	$1,800	N/A	Unknown	No	Unknown	Warren 1885:1192
J. H. Gordon Ditch Co.	Horse Creek	Laramie	1884	$50,000	N/A	Unknown	No	Unknown	Warren 1885:1192
			1885	Unknown	17,500				*Cheyenne Daily Sun*, March 29, 1885:3; April 19, 1885:3; March 10, 1889:1
Lodge Pole Ditch and Reservoir Co.	Lodge Pole Creek	Laramie	1884	$15,000	N/A	Lodge Pole Ditch and Reservoir Co.	No	Lodge Pole Ditch	Warren 1885:1192; *Democratic Leader* (Cheyenne), July 29, 1886:3
Meade Ditch Co.	Piney Creek	Unknown	1884	$2,500	N/A	James Terrill	No	Unknown	*Democratic Leader* [Cheyenne], November 25, 1884:3
North Lodge Pole Ditch and Reservoir Co.	Lodge Pole Creek	Laramie	1884	$15,000	N/A	S.B. Tuttle	No	North Lodge Pole Ditch	*Democratic Leader* (Cheyenne), March 25, 1884:3; Warren 1885:1192
Organ Ditch Co.	Crow Creek,	Laramie	1884	$15,000	5,000	Caleb P. Organ, John B. Sloan, John F. Bailey, Matthew Sloan, and John P. Shaver	No	Organ Ditch	*Democratic Leader* [Cheyenne], August 31, 1884:3; *Cheyenne Daily Sun*, February 18, 1885:3; Warren 1885:1192
Phillips Ditch Co.	Unknown	Unknown	1884	$1,000	N/A	Unknown	No	Unknown	Warren 1885:1192

Territorial Period Ditch Companies and Ditches

Name	Water Source	County	Date	Stock	Acres	Owners	Still in Operation?	Associated Ditches	Reference
Prairie Dog Water Supply Co.	North and South Piney and Prairie Dog creeks	Sheridan	1884	$3,000	N/A	Marcellus Swain	Yes	North Piney and Prairie Dog Irrigating Canal and Tunnel, Big Piney and Prairie Dog Ditch and Tunnel, Prairie Dog Cutoff	*Cheyenne Daily Sun,* March 9, 1884:2; Warren 1885:1191
Sherman and Wood Ditch Co.	Unknown	Unknown	1884	$3,000	N/A	Unknown	No	Unknown	*Cheyenne Daily Sun,* March 9, 1884:2; Warren 1885:1191
South Side Ditch and Reservoir Co.	Unknown	Unknown	1884	$15,000	N/A	Unknown	No	Unknown	Warren 1885:1192
Springvale Ditch Co.	Little Horse Creek	Laramie	1884	$5,000	700	Springvale Ditch Co.	No	Springvale Ditch	Warren 1885:1192
Whitehead Ditch Co.	Unknown	Unknown	1884	$28,000	N/A	J. W. Whitehead, M. E. Ellis, and J. W. Whitehead, Sr.	No	Unknown	*Democratic Leader* [Cheyenne], December 24, 1884:3; Warren 1885:1192
Unknown	Crazy Woman Creek,	Johnson	1885	Unknown	3,000	Grubb & Zweck	Unknown	Unknown	*Democratic Leader* [Cheyenne], June 4, 1885:1
Unknown	Unknown	Johnson	1885	$3,000	6,000	Steve, George, and Michael Swain	Unknown	Unknown	*Democratic Leader* [Cheyenne], June 4, 1885:1
Unknown	Powder River	Johnson	1885	$4,000	3,000	William Davis	Unknown	Unknown	*Democratic Leader* [Cheyenne], June 4, 1885:1
Unknown	Unknown	Johnson	1885	$1,000	3,000	Fred G. S. Hesse	Unknown	Unknown	*Democratic Leader* [Cheyenne], June 4, 1885:1
Agricultural Ditch Co.	Unknown	Unknown	1885	$10,000	N/A	Unknown	No	Unknown	Warren 1885:1192
Bates Creek Irrigating Ditch Co.	Bates Creek	Carbon	1885	$9,000	N/A	Alexander Bonire, Ferdinand W. Lafrentz, and Will R. Swan	No	Unknown	*Democratic Leader* [Cheyenne], October 13, 1885:3; Warren 1885:1192
Beaver Ditch Co.	Beaver Creek	Weston	1885	$20,000	N/A	J. C. Spencer, W. R. Stoll, and J. M. Tompkins	No	Beaver Ditch	*Sundance Gazette,* November 14, 1885:8

Territorial Period Ditch Companies and Ditches

Name	Water Source	County	Date	Stock	Acres	Owners	Still in Operation?	Associated Ditches	Reference
Big Goose and Beaver Ditch Co.	Big Goose, Rapid, Little Rapid, and Beaver creeks	Johnson	1885	$16,000	N/A	Olin E. Ostenson, Henry N. Robinson Jr., Joseph Morrow, Walter S. Quimby, Charles C. Robinson	Yes	Big Goose and Beaver Ditch, Big Goose and Beaver Lateral Ditch, Big Goose and Beaver No. 3 Ditch, Big Goose and Beaver No. 5 Ditch	Warren 1885:1192
Big Goose and Soldier Creek Ditch Co.	Big Goose Creek	Unknown	1885	$30,000	N/A	John Kerr, Milton Ashley, and E. B Viall	No	Unknown	*Democratic Leader* [Cheyenne], April 10, 1885:3; Warren 1885:1192
Big Horn Ditch Co.	Buffalo and Willow creeks, and Powder River	Unknown	1885	$50,000	15,000	Thomas W. Peters, Truman B. Hicks, and George E. Abbott	No	Unknown	*Democratic Leader* [Cheyenne], October 22, 1885:3; *Cheyenne Daily Sentinel,* October 22, 1885:3; Warren 1885:1192
Bresnahan Ditch Co.	Clear Creek	Unknown	1885	Unknown	N/A	L. R. Bresnahan, Owen McKay, and John H. Smith	No	Unknown	*Democratic Leader* [Cheyenne], October 13, 1885:3; Warren 1885:1192
Blue Grass Ditch Co.	Unknown	Unknown	1885	Unknown	N/A	Unknown	No	Unknown	U.S. Senate 1890:531-532
Central Ditch Co.		Johnson	1885	$100,000	N/A	Unknown	No	Unknown	*Daily Boomerang* [Laramie], June 20, 1885:3; Warren 1885:1192
East Beaver Ditch Co.	Unknown	Unknown	1885	$20,000	N/A	Unknown	No	Unknown	Warren 1885:1192
Fort Collins Land & Improvement Co.		Johnson	1885	$12,000	21,760	Unknown	No	Unknown	*Democratic Leader* [Cheyenne], June 4, 1885:1
Four Lakes and French Creek Ditch and Flume Co.	Clear and French creeks	Johnson	1885	$5,000	N/A	Frederick Myers, Richard S. Hopkins, and Orin J. Westman	Yes	Four Lakes & French Creek & Flume Company Ditch, Hopkins Ditch, French Creek Ditch	Warren 1885:1192
Goshen Hole Irrigation Co.	North Platte River	Unknown	1885	$1,000,000	N/A	Unknown	No	Unknown	Warren 1885:1192; *Weekly Boomerang* (Laramie), November 5, 1885:8
Grinnell Livestock Co.	Wolf and Soldier creeks	Johnson	1885	$8,000	5,000	Unknown	No	Unknown	*Democratic Leader* [Cheyenne], June 4, 1885:1

Territorial Period Ditch Companies and Ditches

Name	Water Source	County	Date	Stock	Acres	Owners	Still in Operation?	Associated Ditches	Reference
Hereford Home Ditch Co.	Crow Creek	Laramie	1885	$20,000	N/A	Amaziah H. Hord, Josephus E. Rugg, and William Phillips	No	Hereford Home Ditch, Hereford Home Irrigation Ditch No. 2	Warren 1885:1192; *Democratic Leader* (Cheyenne), October 8, 1885:3
			1886	Unknown	6,000				*Democratic Leader* [Cheyenne], May 16, 1886:3
Hillsdale Irrigating Co.	Unknown	Unknown	1885	$25,000	N/A	Unknown	No	Unknown	Warren 1885:1192
James Labban	Dry Fork of Crazy Woman Creek	Johnson	1885	Unknown	8,000	James Labban	No	Unknown	*Democratic Leader* [Cheyenne], June 4, 1885:1
L Z Ditch Co.	Rawhide Creek	Goshen	1885	Unknown	1,018	Thomas H. Williams	No	L Z Ditch	Warren 1885:1192
LaPrele Ditch Co.	LaPrele Creek	Converse	1885	$10,000	185	Eugene L. Baker, Horace W. Emmerson, and Joseph R. Kennedy	No	LaPrele Ditch Co. No. 1 Ditch	Warren 1885:1192; *Democratic Leader* [Cheyenne], October 14, 1885:3
LaBonte Ditch Co.	Bonte Creek	Albany	1885	$10,000	N/A	W. E. Guthrie, A. M. Crafts, and C. W. Steward	No	Unknown	*Daily Boomerang* [Laramie], September 1, 1885:3; Warren 1885:1192
Lake DeSmet Ditch Co.	Rock Creek	Johnson	1885	$25,000	9,000	W. A. Holland, Ruth A. Holland, G. N. Munkins, and E. B. Mathers	No	Unknown	*Democratic Leader* [Cheyenne], May 29, 1885:3; *Daily Boomerang* (Laramie), May 11, 1885:3; *Buffalo Echo,* January 7, 1887:2; Warren 1885:1192
Little Medicine Bow and Richards Creek Irrigation Ditch Co.	Richards Creek and Medicine Bow River	Unknown	1885	$15,000	N/A	Unknown	No	Unknown	*Cheyenne Daily Sun*, February 18, 1885:3; Warren 1885:1192
Little North Fork Ditch Co.	Unknown	Unknown	1885	$6,0000	N/A	Frank M. Canton, Annie Canton, A. L. Bareck, and J. M. Bockler	No	Unknown	*Cheyenne Daily Sun*, March 29, 1885:1; Warren 1885:1192
Maverick Ditch Co.	Unknown	Unknown	1885	$10,000	N/A	Unknown	No	Unknown	Warren 1885:1192
Mead Creek Ditch Co.	Mead Creek	Sheridan	1885	$4,000	N/A	Unknown	Yes	Mead Creek Ditch (also known as Coffeen Ditch)	Warren 1885:1192

Territorial Period Ditch Companies and Ditches

Name	Water Source	County	Date	Stock	Acres	Owners	Still in Operation?	Associated Ditches	Reference
Muddy Creek Ditch Co.	Muddy Creek	Laramie	1885	$10,000	N/A	Daniel Fallen, Lucinda Fallen, and Charles N. Potter	No	Muddy Creek Ditch, Muddy Creek No. 1 Ditch, Muddy Creek No. 2 Ditch	*Cheyenne Daily Sun*, October 6, 1885:3; *Democratic Leader* (Cheyenne), October 6, 1885:3; Warren 1885:1192
	Muddy Creek	Platte	1885	$6,000	N/A	A. B. Clark, E. W. Stone, and E. P Browning			*Cheyenne Daily Sun,* December 15, 1885:4
North Bear Ditch Co.	Unknown	Unknown	1885	Unknown	N/A	Unknown	No	Unknown	U.S. Senate 1890:531-532
North Crow Ditch Co.	North Crow Creek	Laramie	1885	$10,000	300	North Crow Land and Cattle Company	No	North Crow Ditch	Warren 1885:1192
North Laramie Ditch Co.	North Laramie River	Platte	1885	$20,000	N/A	A. R. Mitchell, secretary	No	North Laramie Ditch No. 1, North Laramie Ditch No. 2, North Laramie Ditch No. 3	Warren 1885:1192; *Democratic Leader* (Cheyenne), March 3, 1887:8
North Platte Irrigation and Ditch Co.	North Platte River	Laramie	1885	$6,000	N/A	Unknown	Yes‡‡	North Platte Irrigation Ditch Company Ditch, North Platte Irrigation Ditch Company Ditch – Arnold Drain Diversion	*Cheyenne Daily Sun,* March 9, 1884:2; Warren 1885:1191
Ontario Water Ditch and Irrigating Co.	Bear Creek	Unknown	1885	$10,000	N/A	Unknown	No	Unknown	Warren 1885:1192; *Democratic Leader* (Cheyenne), March 26, 1885:1
Payson &Hutchinson Ditch Co.	Rawhide Valley	Unknown	1885	$15,000	N/A	Frank Payson, Charles M. Lamson, and F. T. Gleason	No	Unknown	*Cheyenne Daily Sun*, March 1, 1885:3; Warren 1885:1192
			1886	Unknown	N/A	Unknown			*Democratic Leader* [Cheyenne], June 9, 1886:3
Piney, Prairie Dog and Mead Creek Irrigating Co.	Piney, Prairie, and Mead creeks	Johnson	1885	$6,000	N/A	Lobon Hillberry, A. E. Hillberry, and William Sherman	No	Unknown	Warren 1885:1192; *Democratic Leader* (Cheyenne), April 12, 1885:3

Territorial Period Ditch Companies and Ditches

Name	Water Source	County	Date	Stock	Acres	Owners	Still in Operation?	Associated Ditches	Reference
Powder River Livestock Co.	Unknown	Johnson	1885	$1,500	3,000	Unknown	No	Unknown	*Democratic Leader* [Cheyenne], June 4, 1885:1
Rawhide Irrigating Co.	Unknown	Laramie	1885	$10,000	N/A	Cornelius Ferris, Walter C. Brown, and Charles W. Wright	No	Unknown	Warren 1885:1192; *Democratic Leader* (Cheyenne), February 15, 1885:3
Rawlins Improvement and Water Co.*	Unknown	Unknown	1885	$10,000	N/A	Unknown	No	Unknown	Warren 1885:1192
South Clear Creek Ditch and Flume Co.	Clear Creek	Johnson	1885	Unknown	N/A	John K. Spearing, William M. Erhart, and Jacob Hahenborger	No	Unknown	*Democratic Leader* [Cheyenne], April 4, 1885:3; Warren 1885:1192
			1886	Unknown	N/A				*Sundance Gazette,* April 18, 1885:8; U.S. Senate 1890:531-532
South Spring Creek Irrigation Co.	Spring Creek	Unknown	1885	$10,000	N/A	Unknown	No	Unknown	Warren 1885:1192; *Saratoga Sun,* August 25, 1891:2
Tongue River Ditch Co.	Tongue River	Johnson	1885	$3,000	N/A	Samuel H. Early	Yes (reformed in 2004)	Tongue River Ditch Company's Ditch	Warren 1885:1192
Tyler Ditch	Little Goose Creek	Johnson	1885	$22,000	11,620	Unknown	No	Unknown	*Democratic Leader* [Cheyenne], June 4, 1885:1
Valley Ditch Co.	Muddy Creek	Laramie	1885	$20,000	2,500	Robert M. Walker, Edith Walker, Edward Slack, and Sarah Slack	No	Unknown	*Cheyenne Daily Sun*, December 30, 1885:5; U.S. Senate 1890:531-532
Wagon Hound Ditch Co.	Wagonhound Creek	Albany	1885	$50,000	N/A	S. A. Guthrie, W. E. Guthrie, and C. W. Stewart	No	Wagon Hound Ditch Company No. 2 Ditch	*Democratic Leader* [Cheyenne], September 2, 1885:3; Warren 1885:1192
Willow Creek Ditch Co.	Unknown	Carbon	1885	$20,000	N/A		No	Unknown	Warren 1885:1192; *Carbon County Journal* (Rawlins), December 5, 1885:2
Wisconsin Land and Cattle Ditch Co.	Unknown	Laramie	1885	$150,000	N/A	J. M. Chadwick, president; F. B. Chadwick, general manager	No	Unknown	Warren 1885:1192; *North West Livestock Journal* (Cheyenne); December 3, 1886:10
Big Horn Mountain Ditch Co.	Big Goose Creek	Unknown	1886	$35,000	12 Sections	Unknown	No	Unknown	*Bill Barlow's Budget* [Douglas], August 4, 1886:5

Territorial Period Ditch Companies and Ditches

Name	Water Source	County	Date	Stock	Acres	Owners	Still in Operation?	Associated Ditches	Reference
Big Sandy Colony and Canal Co.	Green River	Unknown	1886	Unknown	40,000	Unknown	No	Unknown	*Daily Boomerang* [Laramie], September 4, 1886:2
Butte Ditch Co.	Unknown	Unknown	1886	Unknown	N/A	Unknown	No	Unknown	U.S. Senate 1890:531-532
Colorado Ditch and Reservoir Co.	Unknown	Unknown	1886	Unknown	N/A	Unknown	No	Unknown	U.S. Senate 1890:531-532
Darlington Ditch Co.	LaBonte Creek	Converse	1886	$10,000	645	John London, James B. Jackson, and E. W. Hall	No	Darlington Ditch	*Democratic Leader* [Cheyenne], March 12, 1886:3
Douglas Ditch and Water Co.*	Unknown	Unknown	1886	Unknown	N/A	Unknown	No	Unknown	U.S. Senate 1890:531-532
Fetterman Ditch Co.	La Prele and Box Elder creeks	Converse	1886	$10,000	N/A	William E. Guthrie, Frank S. Lusk, and Albert M. Crafts	No**	Fetterman Ditch	*Democratic Leader* [Cheyenne], January 5, 1886:3; *Cheyenne Daily Sun*, January 6, 1886:3
Fourney Ditching Co.	Jack Creeks	Carbon	1886	Unknown	N/A	William G. Fourney and Donald McPhail	No	Unknown	U.S. Senate 1890:531-532; *Daily Boomerang* [Laramie], June 13, 1893:2
Home Irrigation Co.	Unknown	Unknown	1886	Unknown	N/A	Unknown	No	Unknown	U.S. Senate 1890:531-532
Laramie Peak Ditch Co.	Unknown	Unknown	1886	Unknown	N/A	Unknown	No	Unknown	U.S. Senate 1890:531-532
Little Box Elder Ditch Co.	Little Boxelder Creek	Converse	1886	$10,000	N/A	William S. Weaver, Wilbur C. Sampson, and Joseph E. Crow	No	Little Box Elder Ditch Co. No. 3 Ditch, Little Box Elder Ditch Co. No. 4 Ditch	*Democratic Leader* [Cheyenne], June 17, 1886:3
McDonald Ditch and Irrigating Co.	Shell Creek	Big Horn	1886	Unknown	N/A	Unknown	Yes (reformed in 1950)	Shell Canal, McDonald Ditch	U.S. Senate 1890:531-532
Niobara Ditch Co.	Unknown	Unknown	1886	$5,000	N/A	Nat Baker, Frank S. Lusk, and Jack Baker	No	Unknown	*Lusk Herald*, July 9, 1886:1
North Fork and French Creek Ditch Co.	North Fork Clear Creek	Johnson	1886	Unknown	N/A	Earl Hillard	No	North Fork and French Creek Ditch	U.S. Senate 1890:531-532
Piney Divide Ditch Co.	South Fork of Big Piney Creek	Johnson	1886	Unknown	N/A	W.W. Harvey, Sardis W. Flower, and George A. Sonnamaker	Yes (reorganized in 1938)	Piney Divide Ditch	U.S. Senate 1890:531-532
Rawhide Irrigating Ditch Co.	Middle Crow Creek	Unknown	1886	Unknown	N/A	Unknown	No	Unknown	*Democratic Leader* [Cheyenne], June 9, 1886:3

Territorial Period Ditch Companies and Ditches

Name	Water Source	County	Date	Stock	Acres	Owners	Still in Operation?	Associated Ditches	Reference
Silver Crown Ditch Co.	Middle Crow Creek	Laramie	1886	$20,000	N/A	James Adams, Iver Johnson, and Isaac Greentree	No	Silver Crown Ditch	*Democratic Leader* [Cheyenne], February 9, 1886:3; *Cheyenne Daily Sun*, February 9, 1886:3
Union Ditch Co.	Unknown	Carbon	1886	$75,000	N/A	Joseph Rosenbaum, Morris Rosenbaum, Godfried Snydacher, Thomas F. Durbin, and Charles N. Potter	No	Unknown	*Cheyenne Daily Sun,* July 6, 1886:3
Belle Fourche Ditch and Irrigating Co.	Unknown	Crook	1887	$70,000	N/A	A. T. Babbitt, B. F. Fowler, and Maurice Heining	No	Unknown	*Cheyenne Daily Sun*, June 21, 1887:3
Enterprise Irrigating Co.	Unknown	Carbon	1887	$3,000	N/A		No	Unknown	*Democratic Leader* [Cheyenne], March 9, 1887:3; U.S. Senate 1890:531-532
Fort Laramie Irrigating Canal Co.	Platte River	Unknown	1887	Unknown	40 Sections	John C. Mathews, Walter D. Pease, Cornelius Ferris, and Edgar W. Mann	No	Unknown	*Cheyenne Daily Sun,* April 10, 1888:3
Highland Ditch and Water Co.	Unknown	Unknown	1887	Unknown	N/A	Unknown	No	Unknown	U.S. Senate 1890:531-532
Little Popoagie Ditch Co.	Unknown	Fremont	1887	$5,000	N/A	Robert H. Hall, George D. Rogers, and H. E. Blum	No	Unknown	*Cheyenne Daily Leader*, August 19, 1887:3; *Northwestern Livestock Journal* [Cheyenne], August 26, 1887:5
Mead Ditch Co.	Platte River	Laramie	1887	$12,000	N/A	Tacey A. Gleim, Celia F. Osgood, and Lenora Bloom	No	Unknown	*Cheyenne Daily Leader*, November 1, 1887:3; U.S. Senate 1890:531-532
Mesa Irrigating Canal Co.	Savery Creek	Carbon	1887	$21,000	1,397	James Douglas	No	Mesa Irrigating Canal	*Cheyenne Daily Leader,* April 7, 1888:3; U.S. Senate 1890:531-532
Rialto Ditch Co.	Unknown	Unknown	1887	Unknown	N/A	Unknown	No	Unknown	U.S. Senate 1890:531-532
Baggs Ditch Co.	Little Snake River	Carbon	1888	Unknown	N/A	Edward Bailey, Robert Temple	Yes (reorganized in 1993)	Baggs Ditch	U.S. Senate 1890:531-532

Territorial Period Ditch Companies and Ditches

Name	Water Source	County	Date	Stock	Acres	Owners	Still in Operation?	Associated Ditches	Reference
Murphy-Collins Ditch Co.	Laramie River	Unknown	1888	$8,000	N/A	James W. Collins, F. D. McFadden, Herman Romine, Charles Murphy, P. G. Murphy, Ellen Smith, and Jacob Farr	No	Unknown	*Cheyenne Daily Leader,* August 12, 1888:3; U.S. Senate 1890:531-532
Willan Sartoris Co.	North Fork of the Little Laramie River	Unknown	1888	$20,000	60,000	Unknown	No	Unknown	*Weekly Boomerang* [Laramie], July 12, 1888:8; *Bill Barlow's Budget* [Douglas], November 28, 1888:4
Bridger's Ferry Ditch Co.	Unknown	Unknown	1889	Unknown	N/A	J. C. Shaw and Edward Burns	No	Unknown	*Bill Barlow's Budget* [Douglas], April 23, 1890:4
Crown Ditch Co.	Clear Creek	Johnson	1889	$3,250	N/A	Edward E. and Jon F. Adams	Yes (reorganized in 1991)	Crown Ditch	*Cheyenne Daily Sun,* April 6, 1889:3; U.S. Senate 1890:531-532
Glenrock Land and Canal Co.	Deer Creek	Converse	1889	$5,000	N/A	Henry R. Fry, Albert M. Crafts, Ed M. Fry	No	Unknown	*Cheyenne Daily Leader,* March 21, 1889:33; U.S. Senate 1890:531-532
Jones Ditch Co.	East Pass Creek	Sheridan	1889	$10,000	424	Frank A. Jones, Stephen E. Mills, and Arthur Cassett	No	Jones Ditch	*Cheyenne Daily Leader,* July 18, 1889:3
Mammoth Canal and Improvement Co.	Big Sandy Creek	Sweetwater	1889	$1,000,000	N/A	George A Croffutt, James B. Cooper, Alex C. Ray, and W. A. Underwood	No	Unknown	*Cheyenne Daily Leader,* June 11, 1889:3; U.S. Senate 1890:531-532
Piney and Cruse Creek Ditch Co.	South Fork of Big Piney River	Sheridan	1889	$7,500	N/A	John W. Price, William Sherman, Sidney Smith, James H. Hopkins, and Charles Bard	Yes	Piney and Cruse Creek Ditch, Brooks Lateral of the Piney and Cruse Creek Ditch, Robinson Zullig Ditch	*Cheyenne Daily Leader,* November 1, 1889:3

Territorial Period Ditch Companies and Ditches

Name	Water Source	County	Date	Stock	Acres	Owners	Still in Operation?	Associated Ditches	Reference
Battle Creek Ditch Co.	West Fork of Battle and Little Sandstone creeks, and a tributary of Savory Creek	Carbon	1890	$10,000	8,000	James and Mary Douglas, James Goldy, and D. H. Craig	No	Battle Creek Ditch	*Cheyenne Daily Leader,* February 28, 1890:3; *Cheyenne Weekly Sun,* March 6, 1890:6

*Primarily a domestic water company.

†Water used outside of Wyoming.

‡A new company using the name of East Side Ditch Company was formed in 1979.

‡‡Company was acquired by The New North Irrigation and Ditch Company" in 1904.

**A new company using the name of Fetterman Ditch Company was formed in 1965.

Appendix B

GUIDANCE FOR FIELD RECORDATION

GUIDANCE FOR FIELD RECORDATION

IT IS EXPECTED THAT MAJOR historic irrigation systems can be identified through the examination of literature, historic maps, and historic aerial images. State agencies responsible for managing irrigation resources have historical information and detailed maps showing not only major irrigation features, but divisions of water from them, often including field ditches, irrigation returns, and drains. In most cases, larger ditches and canals appear on current USGS quadrangles, but most of the intermediate and smaller ditches are not depicted on the maps. If a ditch is identified on the landscape that either currently carries water or carried water in the past, it almost certainly has, or had, a water right associated with it. In many parts of the West, agricultural expansion was the result of extending irrigation systems into previously unirrigated lands. Excess or wastewater from irrigated lands is often channeled back into drainages by small ditches, making it once again available for use downstream. The broad pattern of these dendritic systems can usually be seen on state water rights maps. As such, recordation of irrigation systems should utilize a two-fold approach: archival research and field recordation.

Archival Research

Conducting research in the state databases or through federal agencies to properly identify a canal or ditch of interest will assist the researcher in identifying possible property types and features. Historical maps, such as General Land Office (GLO) survey plats or USGS maps can be used to identify the potential for a canal or ditch system. Care should be taken in using the name of a canal or ditch on these maps, especially on USGS maps, because it may not be the historic name or the name in the state water rights database. GLO maps, in particular, may not accurately depict the route of a canal or ditch because their intent was to define section or township lines and not physical elements away from the lines. They are typically accurate for historic features where they cross a section line, but not beyond them. It should also be noted that ditches no longer in use that do not appear in current water rights databases can still be identified through water rights adjudication records or ditch plats frequently housed in the Wyoming State Engineers Office (website https://seo.wyo.gov/documentsdata/linen-plats) or in county courthouses. Water rights search and associated information can be gathered from the State of Wyoming's online e-Permit water rights database. The search can be done both using an online mapping function or by the search of the facility name. Associated records, such as applications, survey plats, and court rulings for systems are included (**Figure 1 and 2**).

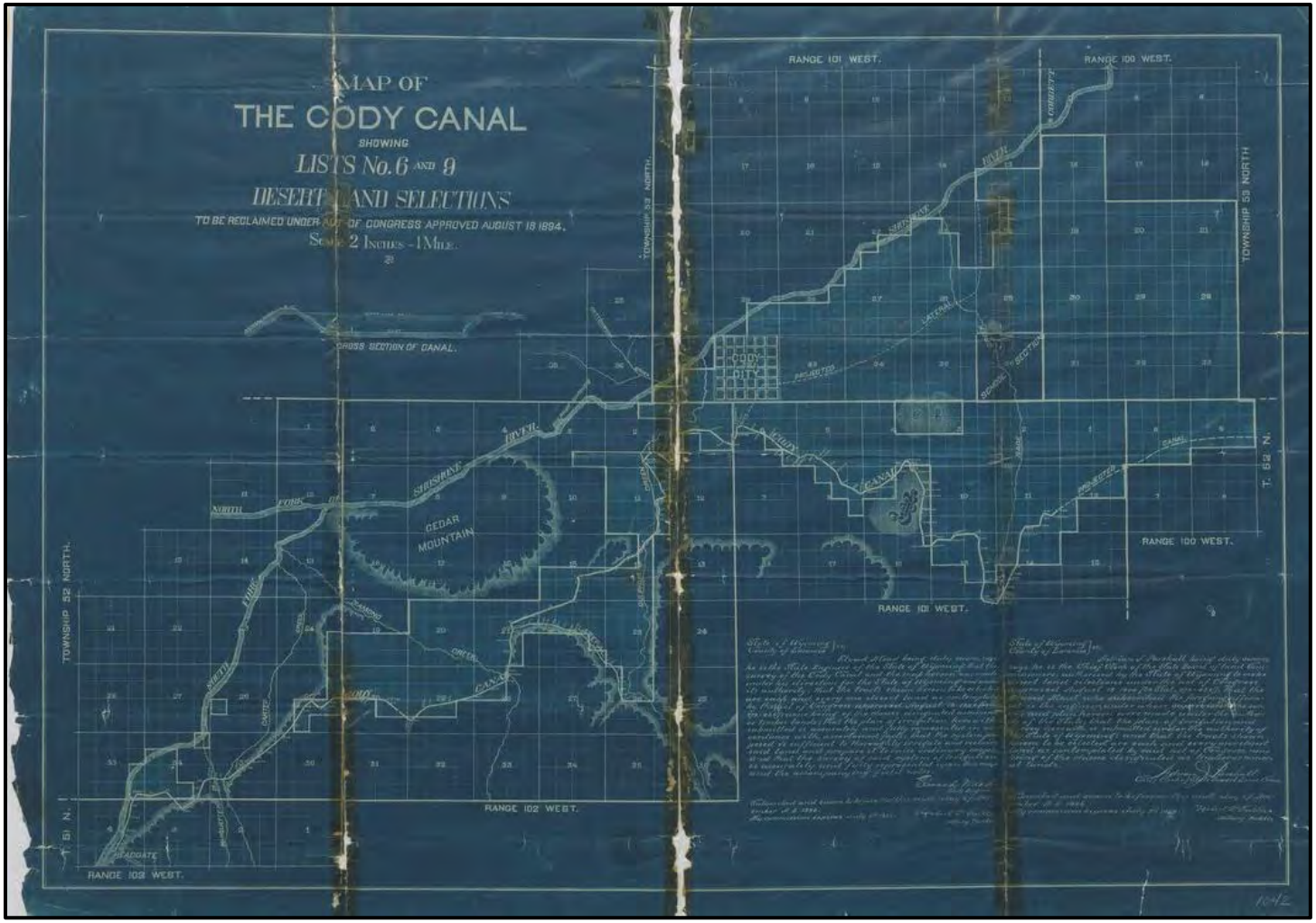
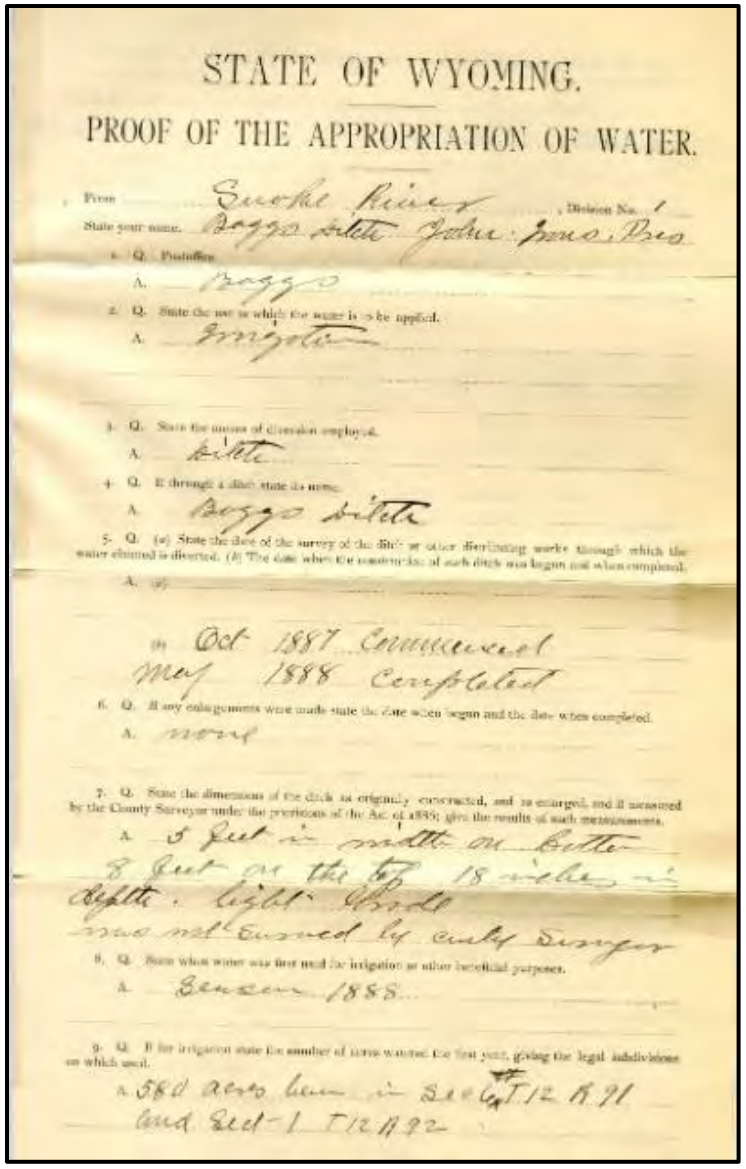


Figure 1. The Cody Canal irrigation system map, circa 1896, showing an example of a map that is available through the Wyoming ePermit water rights search.



STATE OF WYOMING.

PROOF OF THE APPROPRIATION OF WATER.

From Smoke River, Division No. 1

State your name. Baggs ditch John Jno. Bro

1. Q. Postoffice

A. Baggs

2. Q. State the use to which the water is to be applied.

A. Irrigation

3. Q. State the means of diversion employed.

A. ditch

4. Q. If through a ditch state its name.

A. Baggs ditch

5. Q. (a) State the date of the survey of the ditch or other diverting works through which the water claimed is diverted. (b) The date when the construction of such ditch was begun and when completed.

A. (a)

(b) Oct 1887 Commenced
May 1888 Completed

6. Q. If any enlargements were made state the date when begun and the date when completed.

A. none

7. Q. State the dimensions of the ditch as originally constructed, and as enlarged, and if measured by the County Surveyor under the provisions of the Act of 1895; give the results of such measurements.

A. 5 feet in width on bottom
8 feet on the top 18 inches in depth. Light Grade
was not measured by county Surveyor

8. Q. State when water was first used for irrigation or other beneficial purposes.

A. Season 1888

9. Q. If for irrigation state the number of acres watered the last year, giving the legal subdivisions on which used.

A. 580 acres here in Sec 6 T 12 R 91
and Sec 1 T 12 R 92

Figure 2. Example of a proof of appropriation document, in this case for the Baggs Ditch from 1892, available on the Wyoming ePermit water rights search

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- When using the Wyoming Water and Climate Web Atlas (http://www.wrds.uwyo.edu/Map/#):
    - To select a water right, click the "Water Layers" tab on the right side of the map screen. Then select "Water Layer" box that will bring up various GIS layer options. Canal and ditch property types can be selected from the "Points of Diversion" layer option and reservoirs can be selected from the "Dams (USGS)" layer option.
    - Once the appropriate point of diversion or dam layer point is identified for the property type in question, select that point from the map and open the subsequent folders until reaching a hyperlink to the water right documents.
- When using Wyoming's e-Permit system (http://seoweb.wyo.gov/e-Permit/Common/Login.aspx):
    - A water right can be searched through a variety of options that are available in a drop-down menu next to the "Search Option." This includes a simple and detailed water right search and a PLSS mapping function.
    - When using the PLSS mapping tool, the map will depict points of diversion/water rights with a label of the permit number; however, these points are not selectable. Rather, the permit number should be recorded, then used in the simple search.
        - Once the permit number is recorded, return to the simple search and enter the permit number. The search will display the water right.
    - Using the detailed search allows a researcher to enter the name of the property type (i.e. "Facility Name"). This search will bring up all permits and water rights with that name.
    - Once a water right has been selected, the e-Permit system will display various pertinent data, including priority date, appropriated carrying capacity, and name of claimant, among other information. A link to a summary page for that water right provides additional information, including digitized document images.

It should be noted though, that not all documents will be available for every named facility. Local irrigation district offices may have the most comprehensive records. They may also have a GIS layer of all of the ditches or canals under their jurisdiction. Another possible method to find the name of an unnamed ditch is to identify a nearby named ditch and, using that named ditch, search for the adjudication decree to establish the appropriate pertinent drainage and all associated ditches for that drainage system.

Historic aerial images can also be a valuable resource when conducting archival research. These images date back to the 1930s or 1940s and continue through present day. Because many of the aerial images vary in quality and scale, smaller elements of a property type, such as intake structures or water control features, are likely to not be apparent on the image. However, the image will provide the general alignment of a canal or ditch system through the landscape.

For ditches and irrigation systems that are associated with the Carey Act, the Wyoming State Archives has project folders for

most of the projects listed above. These records include a variety of documents, including applications, segregation list descriptions, correspondence, survey plats, and engineering draws, among others. These documents are useful to flesh out individual histories for projects and to help determine NRHP significance.

Recommended Field Methods

The primary ditches and canals of the larger irrigation systems oftentimes feed numerous laterals and secondary ditches that were further divided into smaller and smaller ditches that cover the agricultural landscape. The small divisions of water beyond a primary ditch or canal and small return ditches are so ubiquitous across the agricultural landscape as to be rather meaningless background noise in terms of historical significance. Although a large number of these small infrastructure ditches are certainly old enough to be recorded and evaluated under the NRHP criteria, they are commonplace and of such uniformity that they do not offer any significant physical characteristics or important data. Consequently, documenting them as cultural resources cannot be expected to enhance our understanding or appreciation of history. As a result, only primary and secondary canals and ditches that are 50 or more years old should be recorded, and unnamed smaller field ditches should be excluded from the necessity of recordation or evaluation (Horn and Norton 2021). Current SHPO policy defines how to use topographic maps in identifying ditches and canals for recordation, and the principles contained herein meaningfully help in establishing the historic significance of these types of sites.

Irrigation systems should be recorded from their point of diversion (or origin) from a water source to the point that water is delivered to the user. As such, recordation should not include the lands that the water serves–the agricultural fields–or the water-delivery pipelines, field ditches, or other features devised, constructed, or installed by the final user of the water. This, typically, will preclude actual recording of mechanical pressurized water distribution systems (center pivot, side-roll/linear-move, and large sprinkler systems), except in perhaps very rare circumstances. These mechanical field-irrigation systems should only be considered for their role in altering or expanding the historic agricultural landscape, which may be important for the Agriculture theme under Criterion A. The actual recording of the mechanical equipment is considered to be of little or no importance and is not encouraged. The extent of the change wrought by mechanical pressurized water distribution systems on the agricultural landscape can probably best be assessed through the use of aerial photography.

Canals and ditches should be described in terms of their width, depth, and linear extent; if they are earthen, concrete lined, or lined with other materials; if they are cut-and-fill construction on a side slope or built directly into level ground; and which side spoil from the canal or ditch is deposited. Adjacent access roads should also be described. Constituent elements encountered in the field should also be described, mapped, and photographed, though redundant features may be described in tabular form and representative examples photographed. Features that are encountered should be documented to ascertain the function of the element (headgates,

drops, flumes, weirs, etc.). When features are presented in tabular form, relevant data should include the feature type, basic size or dimensions, age (historic, modern, unknown), and impacts from a proposed project. Global Positioning System points of features should be taken so that they can be presented on a map. Most turnouts have some sort of designation associated with them, assigned by the managing association, that should be noted. Rare survivals, particularly interesting elements, or historic features should be fully described, measured, and photographed as part of the evaluation process. Care should be taken to collect data that can address various aspects of integrity of the system, including design, location, materials, and workmanship. Documentation of features should include the basic layout and measurements, direction of water flow through the element, and materials used in their construction. Photographs should be taken to supplement the description and to provide an understanding of the feature and how its relationship to the overall irrigation system. Included should be photographs showing typical sections of a canal or ditch and photographs showing the canal in the landscape through which it passes.

The full extent of the ditch or canal will need to be digitized for SHPO submission. A site line should be created using current aerial imagery to map the current extent of the ditch or canal. Assistance in determining the full extent of a canal or ditch may be found through reference to historic ditch plats (linen plats) or Wyoming state water rights records. Do not digitize the ditch or canal using the USGS topographic map because these are known to contain errors in location and often do not show the full extent of the historic resource. USGS maps may be helpful in identifying the general route of a resource and the potential headgate location as a starting point, as described above. The entire resource will be evaluated as eligible or not eligible based on archival research and field recording. The larger view will enhance the ability to properly evaluate the significance of a smaller segment of an irrigation system. Any eligible ditch or canal may have contributing or noncontributing segments recorded as appropriate for the project impacts and area of potential effects. It is enticing to consider a portion of an irrigation system as non-contributing because it is mundane or contains few or no features. So long as the portion examined is part of a system that functions as originally designed, it would be considered a contributing element of the system.

In many cases, previous eligibility determinations may need to be revisited given the information presented in this context, new historical information that has been collected, and construction work that may have been done on the canal or ditch since the previous recording was done. Official eligibility determinations and changes in eligibility will be determined on a project-by-project basis by the lead governmental agency, usually in consultation with the SHPO. In cases where a recording is done that is not under Federal or State oversight, the SHPO will be the decision maker for eligibility.