The Kendrick Project (Casper-Alcova)

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At the convergence of the major westward pioneer trails, on the southern bank of the North Platte River, in the sloping plain of the Eastern Rockies, lies the town of Casper, Wyoming. The pioneers that passed through this area found one fact to be true, that "Wyoming is a land of great open spaces with plenty of elbow room...There are sections of the State where it is said you can look farther and see less than any other place in the world."[1] Across this great expanse, they drove their wagons on the Oregon and Mormon Trails, crossing the North Platte River at the current site of Casper. It has been said of the North Platte that it is 1000 miles long, one mile wide and six inches deep. Sometimes it is merely a steady trickle, and other times it is an angry torrent; much like the resistence of the Indians that guarded its waters against the ever pressing tide of Anglos. The unpredictability of the North Platte and the growing hostility of the Indians inhibited settlement in the area until such time as both problems could be rectified. The Indians would eventually retreat into historical curiosity as more and more people migrated to Wyoming instead of through it. The Bureau of Reclamation would try to harness the River, approving three separate projects to do so; first the North Platte Project (1905), then the Kendrick Project, originally the Casper-Alcova Project (1935), and finally the Pick-Sloan Missouri River Basin Program (1944). The Kendrick Project is the only one of the three of these designed to serve the Casper-Alcova area specifically with much needed irrigation and the added benefit hydropower.[2]

Project Location

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1. Quoted from *Wyoming: A Guide to Its History, Highways, and People* (1941) by Donadio, Stephen, Joan Smith, editors, et al., *The New York Public Library Book of Twentieth Century American Quotations* (New York: Warner Books, 1992), 462.
2. Larson, T. A., *Wyoming: A Bicentennial History* (New York: W.W. Norton Company, Inc., 1977), 47-65; Lamar, Howard R., Editor, *The New Encyclopedia of the American West* (New Haven: Yale University Press, 1998), 891; Department of the Interior, Water and Power Resources, *Wyoming* (Washington, D.C.: United States Government Printing Office, 1981), 7, 9, 13.

The towns of Casper and Alcova, Wyoming, for whom the Project was initially named, are located in Natrona County (population 64,358). Casper ranks as Wyoming's second most populated city at 49,131 people; an indicator of the sparse population of Wyoming. The Kendrick Project is located 5 miles east of the town of Alcova, about 30 miles southwest of Casper. Half the Project features are located in Carbon County (population 16,659), but it predominately serves Natrona County. The Rattlesnake Mountain Range to the west, the Shirley Mountains to the north, and the Deer Creek Mountain Range to the east provide a convenient valley for agriculture and irrigation. At 5,123 feet above sea level, however, the climate precludes the growth of many types of crops; restricting most agricultural activities to raising hardy grasses for livestock feed. Average annual temperatures range from 12 degrees Fahrenheit to 87 degrees Fahrenheit. And, as with the rest of Wyoming, the average annual rainfall of 6-15 inches is not quite enough to grow crops without the assistance of irrigation.[3]

Historic Setting

Wyoming has never attracted many settlers to its wind-blown, mountainous plains. But there are those that thrive in the harsh winters and summers, carving out their living in a place were man exists, "...but has not yet laid a heavy hand on his surroundings."[4] It is no coincidence that Wyoming is known as the "cowboy state," and not just because of its livestock industry. To exist there, you must be a loner of sorts, who is willing to be isolated and lonely in a land of wind and weather. These kinds of conditions shape people differently. "Things happen suddenly in Wyoming, the change of seasons and weather; for people, the violent swings in and out of isolation. But good-naturedness is concomitant with severity."[5]

Prehistoric Setting

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3. *Wyoming*, 3-4; *www.casperwyoming.org*, 14 July 2000.
4. Quoted in Margaret Murie, Wyoming Pioneer, *www.gorp.com*, accessed 10 July 2000.
5. Quoted in Gretel Erlich, author of *The Solace of Open Spaces* (1985) by Donadio, 462.

Most of Wyoming is part of the geologic formation known as the Wyoming Basin; a high plain among higher mountains. It is an arid region, not known for its lush soil and vegetation, but for its harshness (though it does contain good grazing lands). "If anything is endemic to Wyoming, it is wind. This big room of space is swept out daily, leaving a bone yard of fossils, agates, and carcasses in every stage of decay. Though it was water that initially shaped the state, wind is the meticulous gardener, raising dust and pruning the sage."[6] The Indian tribes who ended up populating its expanses were there not by choice, but out of necessity because there was nowhere else to go, having been pushed west by the increasing tide of European immigrants. The tribes that traversed Wyoming never developed much agriculture, but hunted and gathered their food as it was available, always more nomadic then sedentary.[7]

The Sioux migrated to the region of Wisconsin and Minnesota, having originated east of the Mississippi River, where the French found them in the 1600's. Pressured by the Ojibwa from the north and east (who were pressured by European settlers), they migrated into the Great Plains where they modified their lifestyle and became buffalo hunters in the Great American Desert. Sioux lands were divided among the three tribes: the Dakota, Nakota, and Lakota. The Dakota stayed in the Wisconsin/Minnesota area and were the most sedentary of the three, the Nakota lived to the south of the Dakota, and the Lakota lived on the Great Plains. Many Lakota bands maintained reasonably friendly ties to the Europeans, but a few bands, such as the Tetons and Oglalas, fought fiercely to maintain their territory. Most Lakota bands had acquired horses in the late seventeenth century which allowed them to follow the buffalo, only occasionally planting small amounts of food when it was convenient.[8]

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6. Quoted in Gretel Erlich by Donadio, 462.
7. Kopper, Philip, *North American Indians: Before the Coming of the Europeans* (Washington, D.C.: Smithsonian Books, 1986), 173.
8. Lamar, 1051-1052; Hoxie, Frederick E., Editor, *Encyclopedia of North American Indians* (Boston: Houghton Mifflin Company, 1996), 590-593.

The Cheyenne and Arapaho tribes also carved out territory in southeastern Wyoming. The Northern Cheyenne and Northern Arapaho dominated the North Platte River, often attacking groups of settlers moving west in the mid 1800's. Originally farmers from Minnesota, these tribes were pushed west by the Lakota in the eighteenth and nineteenth centuries. As more and more Europeans moved westward, across the Appalachian Mountains and then across the Mississippi River, the Plains Indians like the Sioux, Cheyenne and Arapaho were pushed into smaller and smaller spaces. They fought each other and they fought the Europeans for space; though in the end, they all were placed on reservations[9]

Historic Setting

When the Lewis and Clark Expedition of 1805-1806 passed north of Wyoming through Montana, an adventurous spirit named John Colter departed from the group and traveled into Wyoming, becoming the first Anglo to witness its wind-blown mountain plains. The Pacific Fur Company sent a party, led by Wilson Price Hunt, overland to Oregon in 1811, to find a better way across the Continental Divide. This group, known as the Astorians, after John Jacob Astor's trading post in the Pacific Northwest, discovered the best path across the Continental Divide, a place called the South Pass. By the 1820's, mountain men traversed Wyoming along the North Platte River, up the Sweetwater River, down the South Pass, and into the Green River Valley. They trapped for fur and hunted for skins, and established trading stations along the now well-worn trail.[10]

In 1841, a group of 70 settlers in covered wagons followed the Platte River on its south bank from Independence, Missouri, to its northern fork, the North Platte, continued through the South Pass (947 miles from Independence), and north into Oregon. This route became the

9. Lamar, 193-194.
10. Larson, 9-39; *www.swchm@sweetwater.net*, 3 July 2000.

Oregon trail, which in turn became the main overland artery from the east to the west coast of the United States until 1884, when shorter railroads were built to connect towns with the transcontinental railroad and could carry settlers west more swiftly and with less danger. The Mormon Trail in 1847, provided an alternate route on the north bank of the Platte River, but still traversing the same path between the future sites of Fort Laramie and Fort Bridger. Both of these trails, and several others that developed later, intersected and crossed the North Platte River at nearly the same spot; that part of Wyoming now known as Casper.[11]

In 1842, John C. Frémont was sent by the U.S. Army Topographical Engineers to explore southern Wyoming, especially the area of the Oregon Trail, South Pass, the North Platte, and the emigrant trails, including the present-day towns of Casper and Alcova. What Frémont found was a landscape cut by wind and water and full of hostile Indian tribes. In his report of the trip, he wrote, that: "If it is in contemplation to keep open the communications with Oregon Territory, a show of military force in this country is absolutely necessary..." Fort Laramie in 1834, was the first military garrison to be established in protection of pioneers traveling the trails and in 1842, Fort Bridger followed. More forts were established to protect construction of the transcontinental railroad, and even more were built during the wars with the Sioux and Cheyenne in the late 1800's. Wyoming's population grew quickly, but it was safe to say that if you lived there, it was either because of the military or the railroad. No one settled in Wyoming to farm or ranch, it was just too hostile a place.[12]

One of these later forts, built to defend pioneers from the Indians, was named Platte Bridge Station. Built to guard a 1,000 foot bridge across the North Platte River on the Oregon and Mormon Trails, it became an important garrison for providing access to the South Pass.

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11. Lamar, 738, 834-835.
12. *www.casperwyoming.org*, 14 July 2000.

Originally, it was a trading post established by Louis Guinard that guarded the only bridge in Wyoming over the North Platte. After Colonel John Chivington's tragic error at Sand Creek in 1864, the Army sent troops to guard the crossing against Indian attacks. In July of 1865, as troops were escorting supplies to the fort, the Sioux attacked the supply wagons in the Battle of Platte Bridge. Lieutenant Caspar Collins was one of the unfortunate victims of their attack; he died protecting the troop's supplies and in his honor, the garrison was re-named Fort Caspar. The garrison would have been re-named Fort Collins, but there was already a fort of that name in Colorado; that fort was named after his father, Colonel William Collins, of the 11th Ohio Cavalry who was stationed at Fort Laramie.[13]

Before permanent settlements could be established in Wyoming, the matter of the Indians had to be settled. Neither the military nor the Indian tribes were fighting for dominance of the arid and unproductive territory in Wyoming. Rather, both the Americans and the Indians were struggling for control of their own destiny; Wyoming just happened to be the battlefield. After the Sand Creek Massacre, the Indians of the Great Plains entered a prolonged struggle with the Army until the Wounded Knee Massacre of 1890, and the gathering of the last of the resistant tribes onto reservations. As the Indians left, vast expanses of open range became available to the newly burgeoning livestock industry. But in the arid lands of Wyoming, the livestock industry would only be as profitable as grasslands were plentiful. To adequately increase the number of livestock on grazing lands, ranchers had to increase the amount of food available. As a result, irrigation became of great importance to the settlers of Wyoming; without irrigation, there would not be enough livestock feed because rain and the rivers would never supply enough water naturally.[14]

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13. *www.casperwyoming.org*; *www.ci.fort-collins.co.us*, 20 July 2000.
14. Larson, 113.

As the Indian threat decreased, Fort Caspar became more civilian oriented, decreasing its military focus. The Fort was abandoned by the military in 1867 but was repopulated by civilians in the 1870's as the town of Casper. Thirty-One miles to the south of Casper is Alcova, an old watering stop along the Oregon Trail. Laid out in 1891, the town was supposed to be the future site of a health resort; the hot springs in neighboring Fremont Canyon provided attractive mineral baths. In addition, water to be pumped from the North Platte River would be used for irrigation on the grounds of the resort. The resort died a death that many dreams do when there is not enough funding, but the site, called Fremont Canyon (later Alcova Canyon and Seminoe Canyon), houses several Reclamation dams and reservoirs.[15]

Project Authorization

The desire to harness and maximize use of the waters of the North Platte River is as old as the Reclamation Service itself. During the dry summer season, tributaries of the North Platte and the River itself are not able to provide enough water for farmers in eastern Wyoming. In 1902, the North Platte, from its headwaters in northern Colorado through Wyoming and into Nebraska, was investigated for possible water storage sites. The North Platte Project, which includes Pathfinder Dam and Reservoir and Guernsey Dam and Reservoir in Wyoming, was developed for that purpose. As part of these investigations, Alcova Canyon was surveyed with a report on the survey issued on October 1, 1903. It was determined, however, that building a dam and canal system along that section of the North Platte could be very costly and further investigation would be necessary to determine the feasibility of such a project's construction.[16]

After the North Platte Project was completed, successfully irrigating eastern Wyoming

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15. Gavin, Ava Hays, "Civilian Conservation Corps at Alcova Reservoir, Kendrick Project–Wyoming," *The Reclamation Era* (May 1939), 100.

16. Department of the Interior, Reclamation Service, *Second Annual Report of the Reclamation Service* (Washington, D.C.: United States Government Printing Office, 1903), 505-506; Department of the Interior, Bureau of Reclamation, *Annual Project History, 1933* (Denver: United States Printing Office, 1933), 6-13.

and western Nebraska, another investigation in Alcova Canyon was authorized in a cooperative agreement of June 20, 1921, between the State of Wyoming and the Reclamation Service, in which each would share the cost of the investigation. A diversion dam at Alcova Canyon was proposed with a canal that would divert water to the town of Casper, 30 miles north, and to an approximate 100,000 acres of irrigable land surrounding Casper. Reclamation and the state of Wyoming signed another contract on June 7, 1924, for further investigations in Alcova Canyon and Seminoe Canyon. On May 1, 1929, Reclamation and the state of Wyoming signed a third cooperative agreement to share the cost of a final investigation. The USGS conducted the investigation, at the request of Reclamation, for the Casper-Alcova Project, submitting their report to Reclamation in June 1930, which was subsequently submitted to Congress on December 5, 1930. According to the USGS, of a total of 210,000 acres of land surrounding the Project site, 66,000 were found adequate for irrigation service, and capable of generating revenue to repay the construction charges.[17]

Under the National Industrial Recovery Act of June 16, 1933, President Franklin Roosevelt authorized construction of the Casper-Alcova Project. In October of 1933, the Casper-Alcova Project was allotted $12,000,000 for the cost of labor by the Public Works Administration to start construction on Alcova Dam and Reservoir and Seminoe Dam, Reservoir, and Powerplant. By 1936, that amount had increased to $15,000,000. The Casper-Alcova Irrigation District was created on November 29, 1933, to oversee the operation and maintenance of the Project upon its completion. Final authorization on the Project was given on August 30,

17. Department of the Interior, Reclamation Service, *Twenty-First Annual Report of the Reclamation Service* (Washington, D.C: United States Government Printing Office, 1922), 133; Department of the Interior, Bureau of Reclamation, *Federal Reclamation Laws, Annotated* (Washington, D.C.: United States Government Printing Office, 1958), 271, 525; Department of the Interior, Bureau of Reclamation, *Twenty-Eighth Annual Report of the Commissioner of Reclamation* (Washington, D.C.: United States Government Printing Office, 1929), 35; Department of the Interior, Bureau of Reclamation, *Twenty-Ninth Annual Report of the Commissioner of Reclamation* (Washington, D.C.: United States Government Printing Office, 1930), 51-52; Department of the Interior, *Annual Report of the Secretary of the Interior* (Washington, D.C.: United States Government Printing Office, 1934), 45.

1935, by President Roosevelt, though construction had already commenced. The Casper-Alcova Project was re-designated the Kendrick Project on August 9, 1937, in honor of one of Wyoming's founders, John Benjamin Kendrick; a cattleman and millionaire who served as State senator, governor, and U.S. Senator who helped expose the Teapot Dome Scandal. The Alcova Powerplant was authorized separately under the Reclamation Project Act of 1939, to provide additional hydropower .[18]

Construction History

The main features of the Kendrick Project include two storage dams and reservoirs, two powerplants, six substations, and a series of canals, laterals, drains, and transmission lines. Initially, the original plans for the Casper-Alcova Project only included the construction of one dam at Alcova Reservoir and a canal ending north of Casper to service local farmers with irrigation water. The Project was expanded in 1935 based on the need for greater water storage along the North Platte River and the feasibility of selling hydropower to southeast Wyoming. Irrigation is the primary purpose of Alcova Dam and Reservoir although it does include a powerplant constructed two decades after the Dam. Seminoe Dam and Reservoir provides storage for irrigation and generates hydropower. Both sites support a host of recreational activities.[19]

In early 1934, the original estimated cost of the Project was $22,700,000 for one unit of 66,000 irrigable acres. This figure was revised, in 1935, down to a sum of $20,004,254 for one unit of 35,000 irrigable acres and a second unit of 31,000 irrigable acres. It was determined that the first unit of the Project would be constructed immediately and the second at a later date, but

18. Denver, National Archives and Records Administration, Rocky Mountain Region, Records of the Bureau of Reclamation, Record Group 115, Entry 10, *Annual Project History*, 1960, 7; Department of the Interior, Bureau of Reclamation, *SEED Report on Alcova Dam* (Denver: Technical Services Center, 1983), 6-7; "Power Plant for Alcova Dam Proposed," *Reclamation Era* (August 1950), 200.
19. *Project History, 1933*, 9.

that the canal carrying the irrigation water would be of a size that could irrigate the maximum acreage. In addition, Seminoe Dam, Reservoir, and Powerplant were added as part of the Project to provide additional water storage and as a revenue generating powerplant and included in the 1935 cost estimate. Between these two modifications, the Project became less expensive and at the same time, more effective.[20]

Alcova Dam and Reservoir are located about 30 miles south of Casper, near the small town of Alcova. On October 21, 1933, the contract to construct the diversion and outlet tunnel for Alcova Dam was awarded to Lawlor-Woodward Company. Construction of the diversion and outlet tunnel was completed in October of 1934. The contractors W. E. Callahan Construction of Dallas, Texas, and Gunther and Shirley of Los Angeles, California, began construction of Alcova Dam on August 15, 1935. In order to save on labor costs, Reclamation contracted with the Natrona County Transient Relief Camp to send volunteers to clean the Alcova Reservoir site. Excavation of the damsite was uninterrupted throughout 1935, and by May 25, 1936, placing of the earthfill material began. Alcova Dam is a zoned earthfill dam containing three sections of earthfill: an interior section of rolled clay, sand and gravel, an upstream facing of rock riprap, and a downstream facing section of rockfill. Placement of the earthen material was completed on September 21, 1937.[21]

The finished Alcova Dam stands at 265 feet high with a hydraulic height of 180 feet, a top width of 40 feet, base width of 1,202 feet, and a crest length of 763 feet. The total volume of the earthen material in the Dam is 1,635,000 cubic yards. Beginning on February 8, 1938, Alcova Reservoir was filled for testing purposes and by June, it contained 125,000 acre-feet of water. The Reservoir holds a total of 184,300 acre-feet of water and has a surface area of 2,470

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20. *Annual Report* (1934), 24; "Revised Plan for Casper-Alcova Project," *The Reclamation Era* (March 1935), 66. *Project History, 1933*, 7.
21. Project History, 1935, 1936, 1937, 1-3.

acres. On May 8, 1938, construction on the Dam was completed. The outlet works of the Dam include a concrete-lined, open-channel spillway in the left abutment controlled by three fixed-wheel gates and a concrete lined tunnel through the right abutment, originally controlled by two needle valves that channel water into the Powerplant. Construction on Alcova Powerplant began in January 1952, by A. S. Homer Construction Company of Denver, Colorado, and was completed with the generators brought on line in December 1955. It contains two generators, has a nameplate capacity of 36,000 kilowatts, and produces approximately 130,000,000 kilowatts annually. From the Alcova Dam, water either flows north towards Casper in the North Platte River or is diverted for irrigation into the Casper Canal.[22]

Seminoe Dam and Reservoir are located 76 miles southwest of Casper and 45 miles south of Alcova. It is upstream of Alcova Dam and Reservoir on the North Platte River. The Winston Brothers Company and Associates won the contract to construct Seminoe Dam and Powerplant in 1934 and excavation of the damsite began on February 20, 1936. Operations at the damsite were flooded out on April 15, 1936 which set back construction temporarily. The contract for the preparation of the concrete aggregates was awarded to the Mountain States Company of Billings, Montana on August 3, 1936. Acceptable aggregates were located about four miles downstream from the damsite and were collected and stored throughout 1936. For the Seminoe Powerplant, Francis type, vertical shaft, single runner turbines and governors were furnished by the Pelton Water Wheel Company and the Allis-Chalmers Manufacturing Company provided the generators based on contracts awarded on October 6, 1936. Unfortunately, in that same year, while working in the spillway tunnel, John B. Mabrite, a worker for the contractors, was fatally injured by a falling rock on November 4, 1936. Drilling for foundation rock began on December

22. *Project Data*, 560; *SEED Report Alcova Dam* (1983), 7; "Construction of the Casper-Alcova Project," *The Reclamation Era* (December 1936), 282-283.

10, 1936, and by January 17, 1937, placing of the concrete in the upper twenty feet of the diversion tunnel and in the bell-mouth entrance was completed. But another death occurred on March 29, 1937, when Bert A. Barnes, a steel nipper working on the west abutment, was killed instantly when a falling rock struck him and knocked him to the canyon's floor. In the same accident, a jackhammer operator sustained a broken leg from the falling rock.[23]

By May 4, 1937, the contractors laid the rubble masonry wall at the damsite. Monolith Portland Midwest Company was contracted to provide cement for the dam on May 5, 1937. Transformers were provided by the Kuhlman Electric Company, the Pennsylvania Transformer Company, and the American Transformer Company in July 1937. On January 19, 1938, the first concrete was placed in the base of the Dam. Because of the severity of Wyoming winters, placing the concrete had to occur in one season. In July of 1938, it was discovered that two faults had caused instability in the damsite. The Red and Black Faults (so named because of their color) were excavated and filled with cement to stabilize them. Despite this, by December 21, 1938, the Dam was completed and enough water was allowed to rise to a sufficient height behind the Dam to test the outlet works. On April 2, 1939, the outlet works were closed and first storage began in the Reservoir. By July of 1939, the three turbines and generators were completed and tested; they were found to be binding and dismantled for repairs. They were reinstalled at the end of the month and tested and found to be satisfactory. On August 3, 1939, the Seminoe Powerplant was put into active operation and Casper received its first delivery of power.[24]

Seminoe Dam is a medium-thick concrete arch and is 295 feet high, has a hydraulic height of 206 feet, is 85 feet wide at the bottom, 15 feet wide at the top, and has a crest length of

23. *Project History, 1935, 1936, 1937,* 1-3.
24. *Project History, 1937, 1938, 1939,* 1-3.

530 feet. The Dam contains 210,000 cubic yards of material, of which 173,127 cubic yards is concrete made from natural aggregate, (found several miles upstream) and modified Portland cement. The Reservoir holds up to 985,608 acre-feet of water and covers 20,291 acres. The outlet works include a concrete lined shaft and tunnel spillway through the right abutment controlled by three fixed-wheel gates, two 72 inch steel conduits through the Dam controlled by 60 inch needle valves, and three 120 inch steel penstocks through the Dam controlled by 96 inch ring seals. The Seminoe Powerplant contains three generators, has a nameplate capacity of 13,500 kilowatts, and produces approximately 150,000,000 kilowatt-hours of power per year. Water flows north from the headwaters of the North Platte and the Medicine Bow Rivers into Seminoe Reservoir and then through the outlet works to Kortes Dam, Pathfinder Reservoir and Dam, and into Alcova Reservoir and Dam before continuing onto Casper.[25]

The Casper Canal was constructed by the Utah Construction Company, J. A. Terteling and Sons, and Edward Peterson beginning in 1935. Flowing from its headworks at Alcova Reservoir (an inlet structure controlled by a radial gate about one mile west of the Dam), the Canal is 59 miles long and has a diversion capacity of 1,200 cubic feet per second. The water depth is 9.75 feet. There are six concrete lined tunnels located at various points along the Casper Canal to further transport and divide the irrigation waters. Their total length is 3.4 miles with a carrying capacity between 1,200 cubic feet per second to 964 cubic feet per second.[26]

Post Construction History

When Alcova Dam was completed in 1938, the residents of Alcova had the best summer ever. The new reservoir was like a new toy; Reclamation's offices in Casper were jammed with

25. Department of the Interior, Bureau of Reclamation, *Project Data* (Denver: United States Government Printing Office, 1981), 559; Department of the Interior, Water and Power Services, *SEED Report on Seminoe Dam; Kendrick Project, Wyoming, Missouri Basin Region, Volume 1* (Denver: United States Government Printing Office, 1987), 28; Department of the Interior, Bureau of Reclamation, *SEED Report on Seminoe Dam* (1983), 149; *Reclamation Era* (December 1936), 282-283.
26. Project Data, 560.

recreational use requests. As a result, the Civilian Conservation Corps (CCC) was enlisted to construct recreational facilities around the 33 mile shoreline of Alcova Reservoir. The CCC cleared the shoreline, dragged the lake, built campgrounds, picnic grounds and docks for boats. They built a road around part of the Reservoir for easy access to all the new recreational facilities.[27]

At the time of its construction, Seminoe Dam was considered a "state-of-the-art" structure. However, Reclamation observed in 1987 that cracks had developed in the dam's surface, and determined the need for a permanent system installed to monitor the movement of the Dam. Concrete cores were taken and studied to determine the extent of the deterioration of the concrete in the Dam in 1998. In 2000, after further examination, it was discovered that silica gel is forming around the quartz aggregate, causing it to disbond with the concrete paste and cracking the upper part of the dam. Further study of the Dam is recommended.[28]

In the 1980's, use of needle valves as part of the outlet works for many Reclamation dams concerned engineers after several of them failed, injuring dam operators. Improper operation of needle valves can create a condition called a "water hammer" in which pressurized water in the conduit is forced against the needle valve, causing it to fail. In an intermediate report on Seminoe Dam in 1986, engineers recommended replacement of all the needle valves by 1990 and their careful operation in the interim.[29]

Settlement of Project Lands

For the Kendrick Project, Reclamation withdrew 66,000 irrigable acres. That amount was divided into two units, one of 35,000 acres and the second of 31,000 acres, but only the first

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27. *The Reclamation Era* (May 1939), 100.
28. *SEED Report on Seminoe Dam*, 32; Department of the Interior, Bureau of Reclamation, *Seminoe Dam: Report on the Preliminary Crack Survey Using Photographs of the Downstream Face of Dam and Borehole Images* (Denver: Technical Service Center, 2000), 4-5.
29. *SEED Data Book, Volume 4*, 18.

unit was actually constructed. A maximum of 160 acres in one ownership was eligible for irrigation service until an amended contract of September 4, 1957. Because 48% of Project lands were not yet sold, an exception was made to Reclamation policy to increase the maximum acres to be irrigated in one ownership from 160 acres to 480 acres, thereby encouraging sale of the lands for development. All project lands that are served by the Casper Canal are administered by the Casper-Alcova Irrigation District (except for grazing lands around Seminoe Reservoir administered by the Bureau of Land Management) which is also responsible for operation and maintenance of the Project. Construction charges are $80.00 per irrigable acre paid over 40 years without interest; in addition, landowners are required to meet the cost of operation and maintenance of the irrigation service.[30]

Uses of Project Water

Irrigation is the primary purpose of the Kendrick Project via the Casper Canal heading at Alcova Dam. In 1960, the average delivery at each farm headgate was approximately 2.5 acre-feet per acre. Farmers harvested crops in 1960 on 19,759 acres with a gross crop value of $47.30 per acre; in 1977, 22,894 acres yielded a gross crop value of $112.37 per acre; in 1992, 22,808 acres had a gross crop value of $114.24 per acre. There are currently 300 farms served, with a total population of 650, by the Kendrick Project. On a total acreage of 24,265 available for irrigation service in 1992, major crops include barley (494 acres), oats (1,902 acres), alfalfa (9,559 acres), grass hay (3,277 acres), irrigated pasture (1,371 acres), and fertilizer production (1,433 acres).[31]

Both the Alcova Dam and the Seminoe Dam have powerplants that provide hydropower; though only Seminoe Dam was built expressly for that purpose. Alcova Power Plant (completed

30. *Project History* (1940), 5; *Project Data*, 559.
31. *Project History* (1960), 8. *Project Data*, 559; Department of the Interior, Bureau of Reclamation, *1992 Summary Statistics* (Denver: Water, Land, and Cultural Resources, 1992), 19, 45, 64, 273.

in 1955) has two generators capable of producing 36,000 kilowatts and Seminoe Powerplant (completed in 1939) has three generators capable of producing 17,000 kilowatts of power. There are six substations in the Project and 13 transmission lines that run 572.8 miles. The Bureau of Reclamation generates power at Seminoe and Alcova Powerplants. Power generation is coordinated through the Pick-Sloan Missouri River Basin Transmission Division. Marketing and distribution is handled through the Western Area Power Administration.[32]

In 1982, the City of Casper, the Casper-Alcova Irrigation District, and the Bureau of Reclamation entered into a 15 year contract in which 7,000 acre-feet of water would be provided to the City of Casper in exchange for the City of Casper's making improvements to the District's distribution system. The Soil Conservation Service was also enlisted to assist in making improvements to the distribution system. The municipal and industrial water supplements the City of Casper's water needs.[33]

Alcova and Seminoe Reservoirs provide recreational services to the residents of Natrona and Carbon Counties. Camping, boating, fishing, and picnicking, are all available to visitors on warm, sunny summer days. For those who indulge in fly-fishing, the Miracle Mile lies on the North Platte between Seminoe Dam and Pathfinder Reservoir. Blue Ribbon Trout play just under the waters' surface, enticing fishermen from all over to test the waters. Thanks to Reclamation's efforts to stabilize the North Platte, these trout are some of the largest caught in the world of freshwater fishing. Alcova and Seminoe Reservoirs also help control flooding of the North Platte during particularly moist years and supply reserve water in dry years, thereby regulating the flow of the river to maintain normal levels for both irrigation and wildlife. Recreational facilities are administered by Wyoming Game and Fish Department, Natrona

32. Project Data, 561; *1992 Summary Statistics*, 129.
33. Denver, National Archives and Records Administration, Rocky Mountain Region, Bureau of Reclamation, Record Group 115, Project History, *Kendrick Project, Wyoming* (Denver: United States Government Printing Office, 1982), 18.

County Parks and Pleasure Grounds, the Wyoming Department of Commerce, and the State Parks and Historic Sites Department. Total visitation to the Reservoirs annually was 106,404 persons for Alcova and 195,177 persons for Seminoe in 1992.[34]

Conclusion

Although the Kendrick Project overlaps both the North Platte Project and the Pick-Sloan Missouri River Basin Program, it is unique in that of the three projects it is the only one to provide irrigation and power to the local areas of Casper and Alcova. But together with the other two projects, it commands control over the North Platte River for the benefit of farming and industry in Wyoming. The residents of this section of Wyoming owe much of their livelihood to the Project for the water it brings to their farms and the electricity it generates for their homes and businesses.

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34. www.casperwyoming.org; *1992 Summary Statistics*, 111, 116.

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