

The Keyhole Unit

Toni Rae Linenberger
Bureau of Reclamation
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The Keyhole Unit

On July 18, 1996 Wyoming kicked off the 100 year anniversary of the “Daddy of them All” Cheyenne Frontier Days. Known for such things as wide open spaces, rugged individualism, and being the only state to successfully imprison the bank robbing Butch Cassidy, Wyoming honors her roots every year with ten days of rodeos, concerts and general celebration. Essentially, Wyoming has not changed in the last 100 years; people still seek out her finer qualities of solitude and independence. “Except for Alaska there is no American state on which the passage of time and man has left so small an imprint as Wyoming.”¹ More than anything else the lack of water, average annual precipitation in the semiarid land is only about 14.5 inches, has prevented population growth. Coupled with the lack of water is the knowledge that even if water could be found, the rights to much of Wyoming’s water have been preempted by downstream states.² A notable example of Wyoming’s water rights issues is the Keyhole Dam and Reservoir in the northeastern corner of the state.

Project Location

Located in the Missouri River Basin, the Keyhole Unit is a part of the Pick-Sloan Missouri River Basin Project – Cheyenne Division. The Unit is situated on the Belle Fourche River in Crook County, Wyoming, seventeen miles northeast of the town of Moorcroft. A multi-purpose unit, Keyhole Dam and Reservoir provides supplemental storage for the Belle Fourche Project located in South Dakota, limited irrigation in Wyoming, flood control, enhanced recreation, and fish and wildlife conservation.³ The Unit is named for the Keyhole Ranch, the large ranch on which the dam site is located.⁴

Historic Setting

Wyoming has long been a desolate and unforgiving place with few settlers. Early

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1. T. A. Larson, *Wyoming: A Bicentennial History*, (New York: W. W. Norton and Company, Inc., 1977), 160.
 2. T. A. Larson, *Wyoming: A Bicentennial History*, (New York: W. W. Norton and Company, Inc., 1977), 7.
 3. United States Department of the Interior, Bureau of Reclamation, *Repayment of Reclamation Projects*, (Washington: U.S. Government Printing Office, 1972), 296.
 4. Denver Colorado, National Archives and Records Administration: Rocky Mountain Region, Records of the Bureau of Reclamation, Record Group 115, “Definite Plan Report, Keyhole Unit, Cheyenne Division–South Dakota; Missouri River Basin Project,” Vol. II, October 1949, 19G.

exploration revealed it as a land of little water, making it merely an obstacle to be crossed and not enjoyed. Few on their cross-country travels appreciated the beauty of the unusual state, all they saw was the hot dry prairie that they had to cross to reach the waters and gold of California, Oregon and Washington. Until very recently Wyoming has been a have-not state with a very small population; location, resource limitations, high elevation, and aridity have combined to impede its growth. The country simply could not, and still does not sustain many people.⁵ Despite a substantial land area of 96,988 square miles, Wyoming boasts the smallest population in the United States, 455,975 people as of the 1990 census.⁶

Prehistoric Setting

Since primitive times, sparsity of population has been characteristic of the area. Paleo-Indian hunters and gathers were the first known human beings in the region. The first inhabitants of this unique land were few, estimates place the nomadic Indian population at no more than 10,000 when the Anglos arrived. Even the arrival of the Anglos did not denote permanence; the early hunters and trappers merely took what they needed off of the land before moving on.

Historic Setting

In spite of the lack of a stable population, Wyoming harbors many myths of the West: Lewis and Clark crossed her lands, as did George Armstrong Custer; the Oregon trail passed through her borders; and cowboys ruled the territory. It was the mountain men, however, that caught the eye of Wyoming residents. More than any other state, Wyoming has been identified as rendezvous country and as the home of the mountain men. The freedom, independence, and self-reliance of the trappers' life has been exaggerated, as has the economic importance and the color and romance of the annual gatherings, 1825-1840. The result is that many Wyomingites are still enamored of the mountain men.

Jim Bridger, the most famous mountain man of them all, owned a trading post in the

5. T. A. Larson, *Wyoming: A Bicentennial History*, (New York: W. W. Norton and Company, Inc., 1977), 3, 5.

6. Rand McNally and Company, *Road Atlas: United States, Canada, and Mexico*, (Chicago: Rand McNally, 1994), 108.

southwest corner of Wyoming. Bridger ranks as one of Wyoming's six outstanding deceased citizens, while historians rate his fort second only to Fort Laramie in terms of importance.

Wyoming's greatest claim to fame, however, has always been her distinction of being "The Equality State." In 1869, Wyoming did what no other government had ever done before, she granted women the right to vote. Considerations of justice notwithstanding, the majority of the legislature passed the suffrage bill because of its public relations value; they thought that it would advertise the territory and attract population. An additional argument for suffrage was that the opportunity to vote would attract women from the east to balance out the dominantly male population. The suffrage bill did not attract population, but it did give the state a distinction which lives on. In fact, in 1955 the Wyoming Legislature proclaimed Esther Morris, the first woman judge, the outstanding deceased citizen.⁷

Wyoming is a land of many legends, but it has always had a scarce population and lacked of water. It is these two features of Wyoming that the Federal Government has attempted to address with projects such as the Keyhole Unit. But then there will always be those who prefer the pristine nature of the state.

Project Authorization

The Keyhole Unit was authorized as a part of the Missouri River Basin Project. The Pick-Sloan Missouri Basin Program was initially authorized by the Flood Control Act of 1944, which approved the general comprehensive plan for the conservation, control, and use of water resources in the entire Missouri River Basin. The Second Supplemental Appropriation Act, 1948 provided construction funds for the Keyhole Unit.⁸

Construction History

In the fall of 1917, the United States Reclamation Service in response to a petition from the water users association, investigated possible additional storage sites for the Intake Canal and Johnson Lateral, located on the Belle Fourche Project.

7. T. A. Larson, *Wyoming: A Bicentennial History*, (New York: W. W. Norton and Company, Inc., 1977), 3, 5, 38, 55, 76, 78, 84.

8. United States Department of Interior, Water and Power Resources Service, *Project Data*, (Denver: U.S. Government Printing Office, 1981), 777, 920-1.

In the 1930's the Army Engineer Corps conducted investigations in the Missouri River Basin. The results of these investigations failed to identify any possibilities for a new multi-purpose reservoir which would justify the cost involved. Uncertain water supply, disadvantageous locations, and excessive construction costs presented problems.

A basin-wide investigation of the Cheyenne River Basin was begun in the late 1930's by the Bureau of Reclamation. The survey included a study of the Belle Fourche River Basin. The final site on which Keyhole Dam has been constructed was a result of the latter investigation.⁹

Traversing the Belle Fourche River, Keyhole Dam, is the primary feature of the Keyhole Unit; the Dam forms a reservoir with a total capacity of 340,100 acre-feet and water surface of 13,686 acres.

A zoned earthfill structure, the Dam has a crest length of 3,420 feet, including the 2,120-foot dike extension of the right bank, and a maximum structural height of 168 feet.

The spillway, a vertical slot-type uncontrolled concrete-crested structure with a concrete-lined open channel, is located in the dike near the right abutment of the dam. Topped by a concrete bridgedeck on the crest of the dam, the spillway has a crest length of 19.25 feet. Discharge capacity of the spillway is 11,000 cubic feet per second.

A concrete-lined horseshoe-shaped tunnel 9.5 feet wide by 8.25 feet high through the left abutment houses the outlet works. Two vertical lift, high pressure, hydraulic slide gates control release capacities of about 1,480 cubic feet per second.¹⁰

Initial work on the Keyhole Unit began in March 1949, with construction of the Government Camp located on site. The Camp was finished later that same year and work was scheduled to begin on the dam March 1, 1950, with a completion date of June 30, 1952.¹¹

However, the contract for construction of Keyhole Dam was not awarded until June 8, 1950, delaying the start of construction until July 6, 1950. The Contract was awarded to Knisely-

9. Denver Colorado, National Archives and Records Administration: Rocky Mountain Region, Records of the Bureau of Reclamation, Record Group 115, "Final Construction Report on Keyhole Dam," July 1954, 6-7.

10. United States Department of Interior, Water and Power Resources Service, *Project Data*, (Denver: U.S. Government Printing Office, 1981), 919.

11. Denver Colorado, National Archives and Records Administration: Rocky Mountain Region, Records of the Bureau of Reclamation, Record Group 115, "Keyhole Unit: Missouri River Basin Project, Annual Project History, Cheyenne Division, Wyoming," Vol. II, 1949, 9, 10.

Moore Company of Douglas, Wyoming.¹² Work proceeded on schedule and water storage in Keyhole Reservoir began February 12, 1952, after placement of the temporary bulkhead in the inlet structure of the outlet works. The permanent bulkhead was installed six weeks later on March 26, 1952, at which point the outlet tunnel was closed. Even though the Dam was still under construction, the first water releases from the Reservoir were made on August 1, 1952. Subsequently, the final spillway concrete was placed and the hoist house completed, signaling the end of the concrete work on the Keyhole Unit. Nearly six weeks after the final concrete had been placed, on October 25, 1952, Keyhole Dam was completed by Knisely-Moore Construction Company; the Bureau of Reclamation accepted the dam the same day.

At the beginning of December 1952, the construction field office was closed by the Bureau of Reclamation. The files and equipment were moved to Pactola Dam, South Dakota, where future construction matters would be handled. Closing of the field office preceded the relocation of the temporary residences, occupied during construction to the Pactola construction office site—Rapid Valley Unit.¹³

Keyhole Reservoir began to release waters on April 20, 1953, to satisfy the prior downstream rights of the Belle Fourche Irrigation District. Later the same year, on June 30, 1953, the official transfer of Keyhole Dam and Reservoir facilities from construction status to operation and maintenance (O & M) status occurred.¹⁴ All O & M was transferred to the Pactola Unit beginning January 1, 1959, after discontinuing the services of the Resident Superintendent at the close of the proceeding year.¹⁵

Post-Construction History

Prior to the summer of 1958, operation of Keyhole Dam and Reservoir proceeded without incident. On August 30, 1958 a fire near the outlet works stilling basin got out of

12. "Keyhole Unit: Missouri River Basin Project, Annual Project History, Cheyenne Division, Wyoming," Vol. III, 1950, 6.

13. "Keyhole Unit: Missouri River Basin Project, Annual Project History, Cheyenne Division, Wyoming," Vol. V, 1952, 8, 12, 13.

14. "Keyhole Unit: Missouri River Basin Project, Annual Project History, Cheyenne Division, Wyoming," Vol. VI, 1953, 4.

15. "Keyhole Unit: Missouri River Basin Project, Annual Project History, Cheyenne Division, Wyoming," Vol. XI, 1958, iii.

control, burning over half of the downstream side of the Dam and destroying all of the vegetation. Extremely dry soil conditions prevented regrowth of the grass during the remainder of the growing season, but it was expected that the grass would recover in the spring when sufficient moisture becomes available.¹⁶ Expectations proved to be well-founded and the grass made a good recovery during the 1959 growing season. In late June a when heavy rainstorm occurred, the lack of grass cover did not have a noticeable effect on the erosion of the Dam; however, the heavy rainstorm did prompt the application of fertilizer to the burned area the following year, to prevent further erosion of the Dam face.¹⁷

By 1961, a satisfactory plan of operation for Keyhole Reservoir did not exist due to the lack of a suitable contract with the water users. It was subsequently decided in 1961 to restore original streamflow conditions, which necessitated an “open gate policy” allowing the water to flow through the dam as opposed to being stored in the reservoir. The open gate policy would begin January 1, 1962, and remain in effect until such time as contracts were executed for the use of the storage water or until inflows were large enough to dictate either storage or flood control operations.¹⁸ To facilitate the open gate operation, the trashrack on the twenty-four inch outlet was removed and replaced with a stop-log type of gate. Freezing conditions delayed, until February 15, 1962, the controlled releases necessary in order to lower the Reservoir level to an elevation at which open-gate operations could begin without causing undue inconveniences downstream from the Dam. Ice jams and flooding caused the releases to be discontinued on March 6; releases were resumed on March 24, with the gates going to the full open position on April 7, however heavy rains and increased accretions to the Belle Fourche River in mid-June prompted closing of the gates for the remainder of the year.¹⁹ A forty year contract between the Belle Fourche Irrigation District and the United States of America, providing the District with

16. “Keyhole Unit: Missouri River Basin Project, Annual Project History, Cheyenne Division, Wyoming,” Vol. XI, 1958, 3.

17. “Keyhole Unit: Missouri River Basin Project, Annual Project History, Cheyenne Division, Wyoming,” Vol. XII, 1959, 3.

18. “Keyhole Unit: Missouri River Basin Project, Annual Project History, Cheyenne Division, Wyoming,” Vol. XIV, 1961, appendix.

19. “Keyhole Unit: Missouri River Basin Project, Annual Project History, Cheyenne Division, Wyoming,” Vol. XV, 1962, 2.

10,000 acre-feet of storage space, was executed on January 2, 1963, ending the need for an open-gate operation.²⁰

A “Review of Maintenance of Keyhole Dam” was undertaken in 1965. No problems were observed, however, the reviewer did notice improvements that had been made to the gate control house: “The exterior of the gate control house of Keyhole Dam has been painted with a pleasing white concrete paint since the 1963 examination. This white paint greatly improves the appearance of the house and makes it look very neat and very attractive there on top of the dam.”²¹

In 1966, the Belle Fourche Irrigation District contracted with the Bureau of Reclamation to store additional water in Keyhole Reservoir while the spillway at Belle Fourche Reservoir was being repaired. The term of the contract was not to exceed the year 1969.²²

Subsequent to 1966 no further repairs, excepting routine maintenance, have been required on the Keyhole Unit. The Unit remains in operation by the Bureau of Reclamation in conjunction with the Wyoming Recreation Commission, which administers the recreation areas.

Settlement of the Project

In the vicinity of the Keyhole Unit there are no important irrigation developments. The Unit has had little or no effect on existing or proposed irrigation development on surrounding lands. However, supplemental water is furnished to the Belle Fourche Project to aid in the irrigation efforts on that Project. The Keyhole Unit has eliminated the need for voluntary water appropriations by water users residing on Redwater and Spearfish Creeks during critical periods to aid the lands on the Belle Fourche Project served by the Johnson Lateral.²³

Uses of Project Water

On March 4, 1943, the Belle Fourche River Compact was approved by the United States.

20. “Keyhole Unit: Missouri River Basin Project, Annual Project History, Cheyenne Division, Wyoming,” Vol. XVI, 1963, 1.

21. “Keyhole Unit: Missouri River Basin Project, Annual Project History, Cheyenne Division, Wyoming,” Vol. XVIII, 1965, Appendix XVIII.

22. “Keyhole Unit: Missouri River Basin Project, Annual Project History, Cheyenne Division, Wyoming,” Vol. XIX, 1966, Appendix.

23. “Definite Plan Report, Keyhole Unit, Cheyenne Division–South Dakota; Missouri River Basin Project,” Vol. I, October 1949, 8.

The Interstate Compact negotiated between Wyoming and South Dakota provides for the appropriation of the waters of the Belle Fourche River which flows in both states. The Compact dictates that the unappropriated flow of the Belle Fourche River, as of the date of the compact, shall be allocated ten-percent to Wyoming and ninety-percent to South Dakota, provided that Wyoming is guaranteed unrestricted use for domestic and stock water purposes. Wyoming can purchase ten-percent of the storage capacity of Keyhole Reservoir to regulate its portion of the unappropriated water. The apportionment of inflows to Keyhole Reservoir is set according to the provisions of the Compact.

In addition to the supplemental water supply of stored water for the Belle Fourche Project, the Keyhole Unit provides flood control benefits for those residents living along the Belle Fourche River. Keyhole Reservoir is the largest body of water in northeastern Wyoming, making it a popular recreation spot providing campgrounds, boating, swimming, and scenic overlooks for nearby residents.²⁴

About the Author

Toni Rae Linenberger, a Colorado native, received her B.A. in History from The Colorado College in Colorado Springs, Colorado in 1996. In 1998, she earned a M.S. in Western American History from Utah State University in Logan, Utah. Ms. Linenberger's final paper, a case study entitled *A Dam for All Seasons: Hollywood, the Bureau of Reclamation, and Construction of Parker Dam*, explored the relationship between the growth of a small town in California and the development of the Colorado River.

24. United States Department of Interior, Water and Power Resources Service, *Project Data*, (Denver: U.S. Government Printing Office, 1981), 919, 921.

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