

Rapid Valley Project

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Table of Contents

The Rapid Valley Project	2
Project Location	2
Historic Setting	3
Project Authorization	7
Construction History	9
Post-Construction History	15
Settlement of the Project	20
Uses of Project Water	20
Conclusion	21
About The Author	21
Bibliography	22
Manuscript and Archival Collections	22
Government Documents	22
Books	22
Newspapers	23
Journal Articles	23
Websites	23
Index	24

The Rapid Valley Project

As the 20th century progressed, the Bureau of Reclamation began focusing construction efforts on projects beyond agricultural use. The combined effect of several socio-economic and historical forces– the construction of Hoover Dam, the Depression and the “Dust Bowl” in the 1930's, the involvement of the United States in World War II, and population growth in the American West following the war– resulted in the construction of public works projects by Reclamation that were designated for municipal and industrial use, along with more traditional agricultural objectives. The construction of the Rapid Valley Project, 25 miles west of Rapid City, South Dakota, provides a microcosmic example of how these dynamics influenced water development in the West during the Depression and war years. Its presence demonstrates the continued necessity for small-scale projects that have helped to sustain mid-size but growing western metropolises, as well as the agricultural industry of the northern plains.

Project Location

The Rapid Valley Project is located on Castle Creek, a tributary of the larger Rapid Creek, in the Black Hills National Forest in Pennington County, South Dakota. The primary feature of this project, Deerfield Dam and Reservoir, is named after the nearby town of Deerfield. However, the project itself provides municipal water to the town of Rapid City and Ellsworth Air Force Base, and agricultural water for 8,900 acres of farmland under the jurisdiction of the Rapid Valley Water Conservancy District. This water delivery is performed in conjunction with the Rapid Valley Unit's Pactola Dam and Reservoir, a project built under the Pick-Sloan Missouri Basin Program after World War II. Pactola Dam is located on Rapid Creek, about 10 miles west of Deerfield Dam and Reservoir. Deerfield Dam is a zoned earthfill structure that stands 171 feet high and is 1,125 feet along the length of the crest. The reservoir

holds 15,700 acre feet, with a surface area of 414 acres. Project lands supported via irrigation water from the project lie to the east of Rapid City along Rapid Creek.¹

The Black Hills of South Dakota comprise a distinctive geological portion of the Great Plains region. Similar to Colorado's Front Range, the Black Hills range in elevation from 3,500 feet to 7,242 feet, the latter of which is the summit of Harney Peak and is the highest point in North America east of the Rocky Mountains. Thanks to its abundant sources of spruce and ponderosa pine, the region offers some startling visual contrasts to the remainder of the state, which is largely farmland or open grasslands. The region also undergoes extreme variances in weather and temperature, dropping below zero degrees Fahrenheit in the winter, up to 100 degrees or more in the summer.

Historic Setting

The Black Hills and the Rapid River region were sparsely occupied by nomadic hunter-gatherers until approximately the 16th century, when members of the Mandan and Arikara tribes migrated from southern Minnesota and the central plains of Nebraska and Kansas, respectively. The Arikara controlled most of the region, and were arguably the first people in the area to construct permanent settlements. These settlements were usually located along the terraces of the Missouri River and its tributaries, to take advantage of the riverbed and ravines for protection. The unprotected portions of the village were fortified behind wooden stockades and ditches, while village homes were constructed of earth and wood. These mini-forts allowed the Arikara to maintain an agricultural subsistence, living primarily on corn, beans, squash, and pumpkins. The Arikara reached their prominence around the late 1600's, maintaining as many as

1. U.S. Department of the Interior, Water and Power Resources Service. *Project Data* (Denver: Government Printing Office, 1981), 1041, 1043; United States Department of the Interior, Bureau of Reclamation, *Review of Operation and Maintenance—Deerfield Dam, Rapid Valley Project, South Dakota*, September 26, 1994, 2.

thirty villages capable of housing fifty to two hundred people each. After 1700, they came under pressure from the Sioux (known as the Dakota or Lakota in their native language).²

This group of Native Americans began migrating from their homes at the headwaters of the Mississippi in Minnesota about 1670, due to pressure from their rivals in Minnesota, the Cree tribes, who had acquired guns from French and British traders. For the next hundred years, various bands of the Sioux such as the Oglala, Brule, Yankton, and Santee migrated back and forth between the Missouri River and their former homelands in Minnesota. After acquiring guns and horses of their own, they quickly developed into a horse culture that became increasingly dependant upon the large herds of buffalo on the plains for their day-to-day existence, yet was ideally adapted for their semi-nomadic way of life in the region. By 1776, the Oglala had crossed the Missouri River and reached the Black Hills, then occupied by members of the Cheyenne tribe. The Oglala were soon joined by other bands of Sioux. Between 1800 and 1825, with the help of continuous trade along the Missouri and Mississippi Rivers, the tribe soon exerted their influence over a territory stretching from Minnesota to Colorado, and from Kansas at the Republican River north to the Canadian border. They also came to regard the Black Hills as a “holy land,” particularly specific sites such as Bear Lodge Butte (known by white pioneers as Devil’s Tower), Harney Peak, and the Rapid Creek Valley, using these sites and the fringes of the Hills for Sun Dances and individual vision quests.³

White Europeans, primarily French and British fur trappers and American explorers such as John C. Fremont, had traveled in the Black Hills and Rapid Valley region for decades since the late 17th century. However, the first permanent white settlements in South Dakota did not

2. Herbert S. Schell, *History of South Dakota*, 3rd ed. (Lincoln: University of Nebraska Press, 1975), 15-8.

3. Schell, 18-23; Linea Sundstrom, “The Sacred Black Hills: An Ethnohistorical Review,” *Great Plains Quarterly*, Vol. 17, No. 3/4, Summer/Fall 1997, 187-200.

begin until the late 1850's, mostly in the eastern portion of the territory. Following the Red Cloud War of 1866-1868, the Sioux were granted a sizable reservation of land in western South Dakota and northern Nebraska that included the Black Hills, along with hunting rights throughout the reservation. However, when a military expedition led by General George Custer brought news of gold in the Black Hills in August of 1874, the Sioux soon found themselves pressed by a massive influx of gold-seekers and settlers despite the efforts of General Phillip Sheridan to keep the trespassers out of the reservation.⁴

By 1876, the invasion of gold-seekers into the Black Hills region was in full force, as the new migrants established mining camps along the streams and creeks close to the gold fields. In late February 1876, a group of 12-15 men arrived at the present-day location of Rapid City. Having failed to find substantial amounts of gold, these gentlemen proceeded to lay out a town that they hoped would prove to be a “Denver for the Black Hills,” a supply town and transportation hub where miners could find the goods and services they needed before traipsing to the gold fields. The town’s population rapidly grew to approximately two to three hundred by June of that year, but an uprising of the Plains Indian tribes, including the defeat of Custer at Little Big Horn in Montana, caused the population to quickly dwindle to 20 people by August. However, the strength of the Sioux in the region, led primarily by Crazy Horse and Sitting Bull, quickly deteriorated. Under pressure from Congress and the U.S. military, the bands of Sioux who did not flee to join Sitting Bull in Canada signed a treaty in October of 1876 which opened the Black Hills to white settlement, although many of the bands which signed the treaty would not permanently move to the reservations until 1878.⁵

4. Schell, 88-9, 125-9.

5. Schell, 130-9, 141-2; Denver Public Library, Western History Department. “Rapid City, South Dakota: The Commercial, Manufacturing, and Mining Metropolis of the Black Hills Country, (Minneapolis : Northwestern Photo-Eng. Co., 1891), 12-3.

The arrival of the Fremont, Elkhorn, and Missouri branch of the Chicago & Northwestern Railroad in 1886 helped Rapid City to take its place as one of the commercial centers of the Black Hills region, particularly since it coincided with the rise of the cattle industry, sheepherding, and homesteading on the South Dakota plains. Booster pamphlets frequently expounded upon the industrial and manufacturing advances made in the town. One particularly boisterous tract crowed that “the time is now ripe for speculation in real estate...The advent of a new railroad has given fresh impetus to the spirit of investigation into the resources of this region.” The West River railroad and land boom at the turn of the twentieth century brought two new rail lines from east and west of Rapid City. In the tradition of railroad land speculation, the railroad companies also brought out potential buyers from other parts of the country to promote the land surrounding the city as ideal country for farming.⁶

Although farmers could grow an abundance of crops around Rapid City, it was often not without great effort and struggle. Because of the scarcity of precipitation, (annual figures average approximately 17.4 inches a year in the Deerfield Dam region) farmers and ranchers at first were forced to dig numerous wells, many of which often dried up in the heat of summer. If dependable wells could not be located, settlers usually shared facilities such as dams, wells, and canals with neighbors, or hauled water from creeks several miles away. Irrigation farming in the Black Hills region was practiced in some form for several years, and the annual flows along Rapid Creek and its tributaries were usually adequate to fulfill irrigation needs. Even then, the farmers who relied on irrigation as opposed to dry farming (or a combination thereof) were still

6. Denver Public Library, Western History Department. “The Black Hills: Their Wonderful Mineral Wealth and Products,” (Chicago: Poole Bros., 1883); David B. Miller, *Rapid City: Gateway to the Hills* (Northridge, California: Windsor Publications, Inc., 1985), 35-40.

subject to the cycles of drought and flood that are the norm in the arid West.⁷

In the meantime, Rapid City continued to develop as a vibrant small-town metropolis, building a municipal water delivery system in 1886 that utilized gravity-flow technology from Lime Springs three miles away, and stored the surplus in a 375,000 gallon reservoir 188 feet above the city. This system served the city well until the 1930's when drought, high winds, and overworked soils of the Dust Bowl depleted streams and aquifers. Combined with the Great Depression, these conditions led a number of farmers to sell their lands and move to Rapid City. Between 1920 and 1941, the town's population grew from 5,777 to 17,000. This created greater strain on the city's water resources despite the drilling of five new wells, between 1935 and 1938, in the present-day Canyon Lake residential area.⁸

Project Authorization

The steady growth of Rapid City at the turn of the twentieth century prompted the Dakota Power Company of Rapid City to conduct studies, in 1915 and 1928, on the potential for irrigation and hydroelectric power on Rapid Creek. The Bureau of Reclamation conducted its own studies of the region in 1937, naming three feasible options for development– the Pactola dam and reservoir site fifteen miles upstream from Rapid City; an extension of the privately developed Iowa Canal, located just north of the Rapid River west of Rapid City, from three miles to approximately 10 miles; and a site near the town of Deerfield, west of Rapid City. Dust Bowl conditions and the Great Depression prompted Congress in May of 1939 to pass the Interior Department Appropriations Act, which provided \$5,000,000 in funds for water conservation

7. Schell, 178; Paula Nelson, *After the West Was Won: Homesteaders and Town Builders in Western South Dakota, 1900-1917*, (Iowa City: University of Iowa Press, 1986) 32-3; United States Department of the Interior, *Project Data*, 1043.

8. Robert Autobee, *The Rapid Valley Unit, Cheyenne Division, Pick-Sloan Missouri Basin Program*, (Denver: Bureau of Reclamation, 1996) 5-6; Denver, Colorado, National Archives and Records Administration: Rocky Mountain Region. Records of the Bureau of Reclamation, Entry 7. Rapid Valley Project, Folder 100.3.

projects on the Great Plains. This act was supplemented in August by the Water Conservation and Utilization Act, or Case-Wheeler Act, which was drafted to provide the Secretary of the Interior to investigate and construct water projects for the purpose of “stabilizing water supply and thereby rehabilitating farmers on the land and providing opportunities for permanent settlement of farm families.” Reflecting the desperation and insecurity felt by local residents, the *Rapid City Journal* proved to be a persistent booster of a dam and reservoir in the region, arguing in an article on November 10, 1939, that “without water, something of the horse and buggy days must cling to Rapid City.” On November 14, 1939, the Pactola site was chosen as the third of Reclamation’s projects to be recommended and authorized under these acts of Congress.⁹

The immediate feasibility of Pactola was soon re-evaluated. The site had actually been called into question as early as the spring of 1939. On March 3 of that year, Reclamation Commissioner John C. Page wrote a letter to South Dakota Representative Francis Case explaining the differences between the Pactola site and the Deerfield site. Pactola, Page wrote, would be a smaller dam at 111 feet rather than the 157 feet calculated for Deerfield. However, with only 20,000 acre-feet designated for storage, there was a severe risk of water shortage based upon calculations of stream-flow done from 1930-37, when the drought was at its worst. Although the Deerfield site would not have eliminated or reduced shortage during all of the calculated years, Page wrote, its storage capacity would have provided greater measures of drought relief than Pactola. The dam’s location also meant extra construction costs. If the Pactola site was chosen, the site’s geography necessitated construction of a channel spillway, whereas the north saddle of the Deerfield site could serve as a natural spillway. In addition four

9. Autabee, 5-6; United States Department of the Interior, *Project Data*, 1041; Records of the Bureau of Reclamation, Entry 7. Rapid Valley Project, Folders 023, 023.6.

miles of the Rapid City, Black Hills, and Western Railroad would have to be re-routed at a cost of \$200,000.¹⁰

The difficulties were compounded by the fact that in September of 1939, due to delays in land and water negotiations, President Roosevelt moved \$900,000 of the \$980,000 appropriation for the project to the Eden Project in Wyoming. Funding was also limited by the Case-Wheeler Act, which put a price cap of \$1 million dollars for construction of dams and reservoirs (This amount would be amended to \$2 million in July of 1943). Even with a donation of \$90,000 from the highway commission, the cost of the Pactola site would run to \$1,155,000. On March 10, 1941, Rapid City officials and the local farmers met with representatives from Reclamation and said that they could not afford the costs of building at Pactola, so Reclamation agreed to suspend construction on Pactola until a later date. In April, examinations began anew on the Deerfield site. The results of these surveys were presented to President Roosevelt, who approved the site on June 5, 1942. In addition, the Rapid Valley Water Conservancy District (RVWCD) was formed on July 12 as the water district which would negotiate the water-use contracts with the Federal Government.¹¹

Construction History

Although the Deerfield location was not approved by President Roosevelt until June of 1942, pre-construction preparations began on October 17, 1941, with the development of the Civilian Conservation Corps (CCC) construction camp. The camp was completed by the end of 1942, well after primary construction on the project began in during the summer. Work began with the diversion of Castle Creek from the dam site. Workers excavated a diversion ditch in the

10. Autobee, 8; Records of the Bureau of Reclamation, Entry 7. Rapid Valley Project, Folder 301.1.

11. Records of the Bureau of Reclamation, Entry 7. Rapid Valley Project, Folders 101.2, 301.1; Denver, Colorado, National Archives and Records Administration: Rocky Mountain Region. Records of the Bureau of Reclamation, Record Group 115. "Annual Project History, Rapid Valley Project, South Dakota," Volume 1, 1940-2, 3-4.

rock along the length of the right abutment. Water was diverted through the ditch beginning August 29, but seepage soon developed along the upper end of the cutoff trench. After the workers excavated and backfilled trenches into the base of the adjacent rock and at the toe of the dam's upstream slope, about two-thirds of the seepage was halted and the rest removed with a small pump. In addition, approximately 5,000 cubic yards of earthfill was placed at the upstream slope of the dam to shift water into the diversion ditch.¹²

Stripping and excavation of the cutoff trench took place from September 1 through September 29. Workers employed a one and one-half cubic yard dragline, with the assistance of a bulldozer to clear rock from the bottom of the cutoff trench, removing approximately 40,000 cubic yards of material. The excavated material could not be used for fill in the dam, so it was deposited upstream from the site. A concrete cutoff wall foundation was also excavated from abutment to abutment, then up the left abutment to the conduit's edge. Drilling and grouting operations encountered some difficulties due to the easily fractured schist rock that composed approximately half the trench's length. After grout leaked from the application areas, a diamond drill was ordered to drill the grout holes, since it was no longer practical to use jack hammers in the broken rock. Excavation of the conduit was accomplished, allowing work to begin on the conduit itself. C.C.C. workers began clearing the reservoir site through June 30, 1942, when the program was disbanded by the government. Workers from the Civilian Service Program (CSP) were then brought in to finish the task, hauling the cleared timber to a local sawmill and using the salvageable material for fences, posts, firewood, and project structures.¹³

The presence of the Civilian Service Program workers, conscientious objectors primarily

12. Denver, Colorado, National Archives and Records Administration: Rocky Mountain Region. Records of the Bureau of Reclamation, Record Group 115. "Annual Project History, Rapid Valley Project, South Dakota," Volume 1, 1940-2, 28.

13. *Ibid.*, 28-30.

from the Mennonite faith, caused a brief controversy in the local area. In October of 1942, a letter was sent to South Dakota Senator Chan Gurney by 43 signatories, protesting the presence of the CSP workers on the premise that they occupied jobs normally provided to local residents. When Senator Gurney and Commissioner John C. Page inquired further into the matter, Project Construction Engineer H. V. Hubbell informed them in a letter on November 19 that the reason the CSP workers were relied upon was because the war had stripped the project of local workers in the CCC and Works Progress Administration programs after June 30. Since the question had also arisen as to whether a significant number of the protestors were former workers on the project, Hubbell revealed that out of the 43 signatories, only seven were former workers. Thus, the nature of the protest letter appeared to be politically motivated rather than personal. Hubbell also took pains to indicate that more local labor would be hired in the spring of 1943.¹⁴

By the beginning of 1943, the access roads to the camp and work sites were practically finished, including the CSP camp a half mile from the dam. The crews began work on the conduit on January 5, 1943. Because of the cold temperatures, about two hundred linear feet of the conduit, from the second joint of the conduit to the gate chamber, was housed and heated to allow crews to proceed with construction. By July 12, workers completed the conduit, allowing diversion of Castle Creek into the structure. Work on the concrete cutoff wall, which would extend from the gate chamber to halfway up the right abutment, was also begun during this year. Crews excavated the wall's foundation three to eight feet deep into the bedrock, depending upon the rock's hardness. The base was then drilled and grouted, after which placement of the wall began. Excavation of the spillway began in the spring, when workers excavated and sloped the banks of the spillway's overflow section, above the spillway lip's elevation. A shovel and

14. Records of the Bureau of Reclamation, Entry 7. Rapid Valley Project, Folder 107.

dragline were employed to excavate the chute channel; the hard rock from these excavations were hauled to the embankment sections for use as Zone 2 and 3 material. Zone 2 consists of clay, sand, and rock conglomerates, while Zone 3 consists of larger rocks, or “riprap,” which stabilizes the embankment.¹⁵

Before placement of the embankment began August 2, 1943, a system of drains was installed at the dam’s foundation in July to catch seepage from the re-diverted Castle Creek. Workers also stripped abutments to rock ahead of fill placement. Earthfill was then placed, first at the left abutment to allow trucks access to the concrete cutoff wall, then at the right abutment to near level. Work crews placed fill on a two shift basis, concentrating on the clay fill at the upstream edge of the Zone 1 impervious clay core. When frost and cold on October 31 forced placement to stop for the season, workers spread two feet of loose clay over the top and four feet of the substance at the front edge, to prevent frost penetration through the winter months.¹⁶

The year 1943 was also a significant for the project’s water users. On July 23, 1942, a repayment contract had been drawn up and approved by farm representatives and Rapid City commissioners. However, the contract was not signed by the RVWCD until July 27, 1943. On December 2, 1943, the First Assistant of the Secretary of the Interior signed the repayment contract into action. The contract itself was very plain and straightforward. The cost of Deerfield Dam and Reservoir was determined at \$920,224, with a total contractual repayment of \$1.1 million. Rapid City possessed the senior priority to 7,000 acre-feet of active storage, and was responsible for a repayment of \$500,000 made in 40 annual installments of \$12,500. The RVWCD possessed a junior right to the remaining 8,100 acre-feet of active storage, and was responsible for repayment costs of \$600,000 over 40 years for irrigation facilities. The district

15. “Annual Project History, Rapid Valley Project,” Volume 2, 1943, 3-4, 20-3.

16. *Ibid.*, 23.

would be paying for water from Deerfield Reservoir at a rate of \$1 per acre-foot used, to be applied to the cost of the dam.¹⁷

Work progressed slowly, yet steadily throughout 1944. Work on the concrete cutoff wall was completed following the grouting of thirty-five foot holes, at five-foot centers, under the wall from the conduit to the top of the right abutment. In effort to prevent water from migrating around the dam, grout holes were also drilled and pressure-grouted along the left abutment and underneath the cutoff trench of the spillway crest. The grouting process was completed by July 28. Workers also continued construction on a stairway up the left abutment from the gate chamber to the top of the left abutment, which was done as fill placement continued. Placement of earthfill commenced again after May 9, including the placement of Zone 3 riprap material. By October 25, placement of clay fill was halted when the cold weather of fall and winter began to hinder fill placement. In response, a quarry was opened 1000 feet upstream of the dam site. Rock from this location and the spillway excavation was placed on the downstream portion of the dam. Workers also began relocation of two, 2.25 mile county roads around the north and south sides of the reservoir.

The reservoir was 95% cleared by the end of 1944, and the spillway excavations were 80% complete, save for difficult hand trimming operations on the latter. Construction of a power plant was briefly considered during this year, with the goal of capturing and using the stream flow before it sunk into the limestone formations seven miles above Rapid City. However, reports revealed that the largest water loss in the region was between Big Bend and Jackson Springs, below the site for the proposed plant. Furthermore, a small power plant had operated

17. "Annual Project History, Rapid Valley Project," Volume 1, 1940-2, 3-4; Volume 2, 1943, 3, 9; United States Department of the Interior, Bureau of Reclamation, *Reclamation Repayments and Payout Schedules, 1902-1957*, (Washington, D.C.: United States Government Printing Office, 1959) 238-9.

briefly at Big Bend, but soon closed due to the low stream flows in Rapid Creek. Thus, it was determined that the potential benefits of constructing a powerplant were outweighed by the geographic realities of Rapid Creek and the Black Hills.¹⁸

By the end of 1945, the Civilian Service Program workers completed almost all construction on the dam and reservoir. Finished tasks included relocation of the county roads, reservoir clearing, and spillway excavation. On May 12, concrete placement began; because of labor shortages (only about ninety-five of the C.S.P. employees were used on the entire Rapid Valley Project during the course of the year), work on this structure went quite slowly. By the end of the year, 3,057 cubic yards of concrete had been placed, much of it an aggregate brought from Rapid City, unloaded by hand, and hauled to the dam's stockpiles. Placement of clay fill in the embankment resumed on June 16, and was complete by November 1, with the top five feet using disintegrated schist rock rather than clay. The rest of the year, workers placed Zone 3 riprap on the upstream slope of the dam. In December, water storage in Deerfield Reservoir began.¹⁹

Almost all construction was completed on the project by the end of 1946, although minor work remained on the spillway and the stilling basin below the conduit. Due to the evacuation of the C.S.P. camp on February 28 and the lack of skilled laborers, especially carpenters, work on the project proceeded very slowly. All earthfill and riprap was placed by December 15, and another 1,299 cubic yards of concrete was placed in the spillway. The labor shortages extended into June of 1947, after which completion and cleanup of the project went much smoother, especially on the spillway. To reduce the amount of time needed to complete the spillway, crews

18. "Annual Project History, Rapid Valley Project," Volume 3, 1944, 3, 15-8; Records of the Bureau of Reclamation, Entry 7. Rapid Valley Project, Folder 320.

19. "Annual Project History, Rapid Valley Project," Volume 4, 1945, 3, 16-20.

created forms for the sidewalls. The forms allowed workers to place the concrete sidewalls in sections that measured five feet high by twenty feet long. This method eased the raising of concrete forms, lessened the amount of tracing required, and lowered the time needed for placements to less than eight hours. This allowed the workers to complete the spillway on August 30, 1947, and cleanup of the project was completed by the end of the year. Deerfield Dam gained full operating status on July 1, 1948.²⁰

The Rapid Valley Project consists of Deerfield Dam and Reservoir, twenty-five miles west of Rapid City, South Dakota. The project provides municipal water for Rapid City, and irrigates 8,900 acres of land on the Rapid Valley Water Conservancy District east of the city along Rapid Creek. Deerfield Dam is a zoned earthfill structure, 133 feet high at the time of its completion and 825 feet long at the crest. Overflows rush through an uncontrolled concrete-lined spillway along the right abutment. Water is released through a concrete conduit at the base of the dam, via two 27-inch hollow jet valves. Deerfield Reservoir holds a total capacity of 15,700 acre-feet, with 15,200 considered to be active storage, and a surface area of 414 acres.²¹

Post-Construction History

The validity of the repayment contract signed by RVWCD was challenged in the case of Robbins vs. the City of Rapid City, et.al., in 1945. After making it to the South Dakota Supreme Court, the court ruled on May 6, 1946, that the contract was valid, allowing RVWCD to send notices of water deliveries to its clients on December 5, 1946. The notices informed the recipients that up to 9,000 acre-feet of water would be available for delivery during 1947.

During and after World War 2, growth in Rapid City strained water resources. This

20. "Annual Project History, Rapid Valley Project," Volume 5, 1946, 3, 14-8; "Annual Project History, Rapid Valley Project," Volume 6, 1947, 3, 13-4; "Annual Project History, Rapid Valley Project," Volume 7, 1948, 1-2.

21. *Project Data*, 1043.

occurred primarily because of the construction of Ellsworth Air Base in 1942(which purchased water from Deerfield Reservoir via Rapid City) and an economic boom in western South Dakota following World War 2, resulting in an expansion of jobs and a migration of new residents from the eastern United States. The eventual construction of Pactola Dam from 1952 to 1958 meant that a new water-use contract would need to be drawn up and agreed upon by Rapid City and the RVWCD. A series of meetings were held from January 16, 1960 to December 13, 1960 to address these concerns. Due to the rising costs of water, allocations from Deerfield Reservoir were set at \$1.65 an acre-foot. On July 15, RVWCD decided that instead of paying Rapid City \$750 to reserve 3,000 acre-feet from Pactola Reservoir, the district would pay \$1000 to reserve all the available water in Pactola not allocated elsewhere. While this could have been seen as a risk in dry water years when the reservoirs lowered, it was noted at the time that Rapid City had 14,000 acre-feet of storage reserved between Pactola and Deerfield Reservoirs. The board of RVWCD felt that it would prove much more economical to pay a little more to reserve as much water as they could. The RVWCD approved the purchase of water from Pactola Reservoir on December 13, 1960.²²

At the time of its authorization, construction for the Rapid Valley Project had been justified based upon stream-flow calculations during the 1930's. Data collected between 1939 and 1942, when the location for Deerfield Dam and Reservoir was approved provided further justification. During the years 1930-1942, Rapid Creek averaged 46,835 acre-feet a year, with a high of 87,200 acre-feet in 1933. From 1936-1940, streamflows trickled in between 21,000 and 31,000 acre-feet a year. Flows along Castle Creek were relatively very similar– in 1933, flows topped out at 18,840 acre-feet for the year, but between 1936-1942, yearly flows never rose

22. “Annual Project History, Rapid Valley Project,” Volume 19, 1960, 9-19.

above 7,250 acre-feet. Only six of the fifteen years between 1930 and 1944 saw flows rise above the 7,992 acre-foot average, and four of those were from 1930-1933. However, Rapid Creek experienced high streamflows from 1942 to 1944, (between 59,000-68,000 acre-feet) and in 1947 and 1948, no requests were made for irrigation water by RVWCD.²³

These streamflow fluctuations have continued through the latter twentieth century. Flooding in May of 1952 washed out bridges in the Black Hills, damaged property in Rapid City, and flooded 150 acres of farmland. A dry season in 1959 forced irrigators to extend the irrigating season into October, after beginning canal diversions in April and using their allotment of water from Deerfield Reservoir by the end of the summer season. Arrangements were made with Reclamation in this instance to release natural flows from Deerfield and Pactola Reservoirs to provide for irrigation needs. Water supply was not a problem in the mid-1960's when streamflows were approximately the same as the averages of 7,992 acre-feet for Castle Creek, and 46,835 acre-feet for Rapid Creek. However, the 1970's saw an extended dry period across the nation that forced Congress to pass the Emergency Drought Relief Act in April of 1977. The project suffered through another dry period in the 1980's, while wet years beginning in 1993 restored reservoirs to more acceptable levels.²⁴

These streamflow levels are important for several reasons. The Rapid Valley Project was partially designed to promote settlement on farmlands east of Rapid City, subdivided by the Department of Agriculture for about 60 families. Construction on homes in this area began in

23. "Annual Project History, Rapid Valley Project," Volume 3, 1944, 28-9; "Annual Project History, Rapid Valley Project," Volume 4, 1945, 13; "Annual Project History, Rapid Valley Project," Volume 5, 1946, 8, 13; "Annual Project History, Rapid Valley Project," Volume 7, 1948, 10.

24. "Annual Project History, Rapid Valley Project," Volume 11, 1952, 22-5; "Annual Project History, Rapid Valley Project," Volume 18, 1959, 13-5, 17; "Annual Project History, Rapid Valley Project," Volume 24, 1965, Appendix; "Annual Project History, Rapid Valley Project," Volume 25, 1966, Appendix; "Annual Project History, Rapid Valley Project," Volume 27, 1968, Appendix; "Annual Project History, Rapid Valley Project," Volume 36, 1977, Appendix; Steve Miller, "Reservoirs in Good Shape Entering Dry Spell," *Rapid Valley Journal*, August 22, 2000, Internet, www.rapidvalleyjournal.com, accessed July 26, 2001.

1950, while the water allocation accorded to the RVWCD was divided between fifteen ditch companies and twenty-five appropriators, according to seventeen priority rights. These diversions are accomplished by a makeshift series of diversion timber dams, which often have to be rebuilt after floods. The oldest water right is held by the Leedy, or Sickler, Ditch, which dates back to April 1877. The project also averages water losses of about eighteen percent a year, due partially to evaporation and primarily from seepage into limestone and sandstone outcrops in the river channel. Since streamflow is an important indication of yearly precipitation, there is a significant risk of fire hazard if the area experiences several dry years in a row, or years where the heat is particularly intense and the precipitation extremely low. This was demonstrated in the year 2000, when a series of fires in the Black Hills were begun by lightening storms, forcing the evacuation of homes near Deerfield Reservoir in August. At one point in September, firefighters battled 30 fires throughout the Black Hills which had started in the course of one day.²⁵

Recreation is an important benefit of the project, and the project's recreational opportunities were quickly taken advantage of by locals and tourists, especially the record numbers of fish that could be caught. Because no construction of recreational facilities took place during the primary construction period, those who visited the site generally tended to camp and fish wherever they pleased. The Forest Service constructed basic recreational camps with volunteer fire crews and equipment donated by Reclamation in 1948. By 1950, visitation was becoming high enough that the United States Forest Service began regular patrols in the recreation areas in order to quell the fire hazards from the presence of the extra people. The

25. "Annual Project History, Rapid Valley Project," Volume 2, 1943, 30; "Annual Project History, Rapid Valley Project," Volume 7, 1948, 10-5, 36; "Annual Project History, Rapid Valley Project," Volume 13, 1954, 18; Stephen Buchholz, "30,000-acre Blaze Forces Evacuations," *Rapid Valley Journal*, August 26, 2000, Internet, www.rapidvalleyjournal.com, accessed July 26, 2001; Bill Harlan, Denise Ross, and Stephen Buchholz, "Firefighters Battle 30-plus Lightning Starts," *Rapid Valley Journal*, September 6, 2000, Internet, www.rapidvalleyjournal.com, accessed July 26, 2001.

construction of improved roads to the reservoir in 1952 increased visitation to 15,600 visitors, and the development of recreational facilities on the south and west sides of the dam in 1965 resulted in an increase to 39,225 visitors, 24,950 of whom were fishermen. By 1970, The Forest Service calculated that the reservoir was receiving 223,600 visitors, a 570% increase in the span of five years. However, this counts all visitors to the reservoir. Using calculations based on twelve-hour visitor days, Reclamation determined that Deerfield Reservoir only had 35,689 visitors in 1992, a significant difference. However, the raw numbers indicate that Deerfield Reservoir is a popular destination for recreationists who wish to make a brief visit.²⁶

Very little modification and maintenance on Deerfield Dam has had to take place since its completion in 1947, focusing mainly on preventative maintenance projects such as spillway and embankment repair. The first major repairs that needed to be made were done on the hollow-jet valves in 1966, to remove build-up that had been causing difficulty for the gates to open and close, along with replacement of the bolts holding the retaining rings, and new bearings and seals. In May of 1982, Reclamation was awarded with a \$2.6 million appropriation under the Reclamation Safety of Dams Act of 1978 to modify Deerfield Dam. Reclamation awarded the construction contract to Dave Gustafson and Company, Inc., of Sioux Falls, South Dakota that same month. Construction began in May 1982 and was completed in October of 1984. During this period, workers raised the crest of the dam 38 feet, extended the passageway of the emergency gate chamber to the top of the new crest, and expanded the spillway.²⁷

26. "Annual Project History, Rapid Valley Project," Volume 7, 1948, 29A-29C; "Annual Project History, Rapid Valley Project," Volume 9, 1950, 23; "Annual Project History, Rapid Valley Project," Volume 11, 1952, 27; "Annual Project History, Rapid Valley Project," Volume 24, 1965, 7; "Annual Project History, Rapid Valley Project," Volume 29, 1970, 6; United States Department of the Interior, Bureau of Reclamation, *1992 Summary Statistics* (Denver: U.S. Government Printing Office, 1992), 115.

27. "Annual Project History, Rapid Valley Project," Volume 25, 1966, iii, 3-5; United States Department of the Interior, News Release, "Reclamation Awards \$2.6 million Contract for Deerfield Dam in South Dakota," May 3, 1982, Bureau of Reclamation, Denver Office of Records, Folder 146672-0; United States Department of the Interior, (continued...)

Settlement of the Project

The increased migration to Rapid City during the drought years of the Depression soon strained the city's water resources, despite the drilling of five wells in the Canyon Lake area in 1935 and 1938. The project was partially designed to alleviate this strain by promoting the settlement of farmers on land holdings purchased by the Department of Agriculture. By 1950, 92 irrigated and dryland farms were located on project lands, with 258 people out of 410 irrigating their crops. By 1992, 95 full-time farms were in operation, with a total population of 272 individuals. Rapid City grew as quickly as its name implied. In 1950, Rapid City held 25,310 people; by 1960, its population of 42,650 made it the largest city in South Dakota, and recently, its entire metropolitan area now numbers approximately 88,117.²⁸

Uses of Project Water

Rapid City possesses a senior right to 7,000 acre-feet of active storage from Deerfield Reservoir, supplementing the streamflows from Rapid Creek and storage from Pactola Reservoir. This water is used by the citizens of Rapid City as well as Ellsworth Air Force Base, which was built in 1942. The Rapid Valley Project provides farmers in the Rapid Valley Water Conservancy District with a junior right of 8,100 acre-feet of storage. Their diversions water crops such as oats, alfalfa, and corn. In the project's early years, farmers could sell these products at a cost of about \$34.50 per acre, which was the amount sold in 1965. In 1992, this had risen to \$149.50 an acre. This is not a significant rise in crop prices, since crops were selling for \$121.05 an acre as early as 1977, and is perhaps more reflective of the steady urbanization of

27. (...continued)

Bureau of Reclamation, *Review of Operation and Maintenance-- Deerfield Dam, Rapid Valley Project, South Dakota*, October 1, 1985, 6.

28. Autabee, 6, 15-6; Miller, 98; Population Estimates Program, Population Division, U.S. Census Bureau, Washington, DC, "Metropolitan Area Population Estimates for July 1, 1999 and Population Change for April 1, 1990 to July 1, 1999 (includes April 1, 1990 Population Estimates Base)," Internet, <http://www.census.gov/population/estimates/metro-city/ma99-01.txt>, accessed July 26, 2001.

Rapid City which has occurred since World War 2. Recreation is also a significant benefit of the project, attracting tens of thousands of visitors to the reservoir, primarily to fish. Deerfield Reservoir contains many varieties of trout and suckerfish for anglers to try their luck in catching.²⁹

Conclusion

The construction of the Rapid Valley Project reflected the evolution of the purpose of Reclamation projects from agricultural development to public works projects that provided water for both agricultural and municipal uses. The project's history also provides a glimpse into the Great Depression and how the economic and natural hardships that resulted led to the implementation of drought relief and public works programs across the Great Plains by Franklin Roosevelt's Administration. In modern times, the presence of the project has been validated because of the long-term growth that has been experienced by Rapid City, which mirrors the growth of the American West as a whole.

About The Author

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29. "Annual Project History, Rapid Valley Project," Volume 24, 1965, 5; "Annual Project History, Rapid Valley Project," Volume 36, 1977, 3; *1992 Summary Statistics*, 52.

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Index

Black Hills	3, 4, 6, 14, 17
Bear Lodge Butte	4
First Anglo explorers and settlers	4
Gold Rush	5
Harney Peak	3, 4
Bureau of Reclamation	2, 7, 17, 19
Canyon Lake	7, 20
Case, Francis	8
Castle Creek	
Streamflows	16, 17
Chicago & Northwestern Railroad	6
Civilian Conservation Corps (CCC)	9, 10
Civilian Service Program (CSP)	10, 11, 14
Custer, George (General)	5
Dakota Power Company	7
Deerfield	2, 7
Deerfield Dam	2, 12, 15
Maintenance	19
Safety of Dams Act, 1978	19
Deerfield Reservoir	2, 12, 14-17, 19, 21
Department of Agriculture	17
Safety of Dams Act, 1978	20
Eden Project(Wyoming)	9
Ellsworth Air Force Base	2, 16, 20
Emergency Drought Relief Act, 1977	17
Great Depression	7
Gurney, Chan (Senator)	11
Hubbell, H. V.	11
Native Americans	
Arikara	3
Cheyenne	4
Cree	4
Indian Wars	5
Mandan	3
Sioux	4
Page, John C.	8, 11
Pick-Sloan Missouri Basin Program	2
Pactola Dam	2, 16
Pactola Reservoir	20
Rapid Valley Unit	2
Rapid City	2, 3, 5-7, 13, 15, 16, 21
Water development	6, 7
Rapid City Journal	8
Rapid City, Black Hills, and Western Railroad	9

Rapid Creek	2, 6, 14, 20
Castle Creek	2, 9, 11, 16
Streamflows	16-18
Rapid River	7
Rapid Valley Project	2, 15, 20, 21
Construction	9-14
Repayment	12
Settlement	20
Switched to Deerfield site	8
Rapid Valley Water Conservancy District	2, 9, 15-17, 20
Construction	12
Recreation	18, 19, 21
Roosevelt, Franklin (President)	9, 21
Sheridan, Phillip (General)	5
South Dakota	2, 3, 15
Black Hills National Forest	2
Pennington County	2
Settlement	20
West River land boom	6
Water Conservation and Utilization Act of 1939(Case-Wheeler Act)	8, 9
Water Development	
Iowa Canal	7
Irrigation farming	6
Leedy (Sickler) Ditch	18