

Belle Fourche Project

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The Belle Fourche Project

The Belle Fourche Project, located just north of the Black Hills in western South Dakota, is one of the first irrigation projects developed by the Bureau of Reclamation following the passage of the Reclamation Act in 1902. The history of Belle Fourche has provided an excellent example of the difficulties Reclamation encountered in trying to make the arid lands of the American West “blossom as the rose.” So maligned was the project’s reputation at one time that Congressmen on appropriations committees would specifically cite its problems whenever Reclamation officials attempted to justify the construction of new projects. Yet for all of its problems, the Belle Fourche Project remains an important component of South Dakota’s agricultural industry, while serving as a cautionary tale for future federal public policy.

Project Location

The Belle Fourche Project, authorized for agricultural development along the Belle Fourche River valley, is located in Butte and Mead Counties of South Dakota, about 25 miles northeast of the Black Hills. The project irrigates 57,068 acres of farmland near the towns of Newell, Vale, and Nisland. The project facilities consist of a diversion dam, two primary canals an inlet canal, and Belle Fourche Dam. The primary feature of the project is Belle Fourche Dam, formerly Orman Dam, a homogenous earthfill structure located on Owl Creek, a tributary of the larger Belle Fourche River. Belle Fourche Dam stands 122 feet high and 6,262 feet long at the crest. In 1977, construction on a new uncontrolled grass-lined spillway was completed; the spillway is located one mile south of the right abutment. The outlet works consist of two horseshoe conduits at the base of the dam for the North and South Canals. Behind the dam lies Belle Fourche Reservoir, which covers a surface area of 8,000 acres and holds 192,000 acre-feet

of water, 185,200 of which is active conservation storage. The diversion dam is a concrete gravity ogee weir structure located one and a half miles northeast of the town of Belle Fourche. The diversion dam stands 36 feet high and 40 feet long at the crest, with a 2,100 foot long earth embankment located at the right abutment. The inlet canal diverts water from this dam 6.3 miles to Belle Fourche Dam and Reservoir. The distribution and drainage systems encompass 94 miles of irrigation canals, 450 miles of irrigation laterals, and 232 miles of drains.¹

The lands of the Belle Fourche Project are located in the semi-arid region of South Dakota that comprises the Missouri Plateau of the Great Plains. This region is comprised primarily of buttes and canyons, known as “badlands,” but there are also vast stretches of tablelands that have proven suitable for limited agricultural developments. The soils on the north side of the project are a heavy, sticky residue of weathered shale, known as “gumbo” to the white settlers who migrated to the state in the late 19th century, while the lands on the south side of the project are a looser sandy loam. The average precipitation on the Belle Fourche Project is about 14-18 inches a year.²

Historic Setting

The name “Belle Fourche” means “beautiful forks” in French, and reflects the heritage of the French trappers and traders who explored the region in the 18th and 19th centuries. The “forks” refer to the confluence of the Red Water River and Belle Fourche River, where the town of Belle Fourche was established in 1891. Prior to this period, the lands of the project had been inhabited for several hundred years by bands of nomadic hunter-gatherers. In the 17th and 18th

1. United States Department of the Interior, Bureau of Reclamation, “Belle Fourche Project,” *Dataweb*, Internet, dataweb.usbr.gov/html/bellefourche.html, accessed July 24, 2001.

2. Herbert S. Schell, *History of South Dakota*, 3rd ed. (Lincoln: University of Nebraska Press, 1975), 3-13.

centuries by the Mandan, Arikara, and Cheyenne Indian tribes took control of the region. During the early 1800's, members of the Lakota (Sioux) nations began migrating into the region, eventually dominating trade and the hunting grounds in an area that spread north from Kansas into Canada, and west from Wyoming into Minnesota.³

For several years, thanks to their mastery of horse-riding and the acquisition of guns via trade, the Sioux controlled western South Dakota. The persistent raiding of white settlements by the Sioux in the area resulted in the Treaty of Fort Laramie in 1868, which granted the Black Hills to the Sioux, along with hunting rights and the removal of all military posts in the region. The power of the Sioux in western South Dakota received its most serious challenge following 1874, when a military expedition led by George Armstrong Custer confirmed the presence of gold in the Black Hills. Angered by the influx of white settlers and gold seekers onto the reservation lands, the Sioux retaliated in the summer of 1876, raiding settlements and defeating Custer at Little Big Horn with a coalition of Cheyenne and Arapaho Indians. The victory was short-lived, however, as several bands of the Sioux surrendered at Indian agencies throughout South Dakota beginning the fall of 1876. About 200 lodges under the leadership of Chief Sitting Bull, of the Oglalla band, escaped to Canada, remaining there until 1881; by May of 1877, over 4,500 of the Sioux had surrendered at the Indian agencies. Meanwhile, Congress took the subjugation a step further by passing an appropriations bill on August 15, 1876, which stipulated that further appropriations for the Teton Sioux tribe were dependant upon the tribe's relinquishment of the Black Hills. Faced with starvation and the loss of their horses and other supplies, the Sioux chiefs had little choice but to sign a new treaty on October 1876, which

3. Schell, 13-23; Brit Allan Storey, "Historical Overview of the Belle Fourche Project, South Dakota," Manuscript, (Denver: Bureau of Reclamation History Program, 1991) 4.

opened the Black Hills to settlement and removed the hunting rights of the Sioux in Wyoming and Montana.⁴

The removal of the Sioux from the Black Hills solidified the settlement of whites in the Hills and the surrounding countryside. Mining towns such as Deadwood gained a mythic reputation in the national folklore, thanks to the rowdiness that epitomized most mining camps and the death of shootist “Wild” Bill Hickock in a local saloon. The confinement of the Sioux to reservations and the quickly diminishing numbers of buffalo allowed the western Dakota plains to transform into rangeland for cattle, a business helped by the demand for meat in the mining towns and supply depots. The development of railroad infrastructure in the territory, and the decline of the mining industry in favor of agriculture and livestock, resulted in a land boom which lasted from 1878-1887. During this period, the population of the Black Hills region alone rose from 16,487 in 1880 to 32,559 by 1890.⁵

While South Dakota rapidly developed, (the territory was designated a state in 1889), the U.S. government was trying to determine economically feasible ways of settling the western states and territories. However, despite laws such as the Homestead Act of 1862 and the Desert Land Act of 1877, much of the territory of the Intermountain West and Great Plains remained undeveloped and unsettled outside of the Indian reservations and major urban centers such as Salt Lake City or Denver. Much of the rest was controlled by large ranchers or the railroad corporations, with relatively few individual homesteads independent of these robber-baron interests. In Wyoming, for example, nearly 85 percent of the taxable land was owned by the

4. Schell, 125-39.

5. Schell, 150-74.

Union Pacific Railroad.⁶ To make matters more difficult, much of the land in the west open to settlement was located in the driest parts of the country. Although dry-farming was practiced throughout the West as a means of watering crops, in several places local private irrigation companies were established to construct small diversionary works such as canals and diversion dams. In western South Dakota, local companies such as these controlled irrigation works like the Redwater Canal, five miles above the confluence of the Red Water and Belle Fourche Rivers; the Edgemont Canal, on the Cheyenne River 15 miles above the town of Edgemont; and the Cascade Ditch on Cascade Creek.⁷

However, the concept of irrigation on a national scale was not implemented until the advent of two key events at the turn of the 20th century—the passage of the Carey Act in 1894, and the Reclamation, or Newlands, Act in 1902. The Carey Act granted each state one million acres of desert land (as defined under the Desert Land Act) for irrigation purposes, provided that delivery systems would be funded and constructed by the state, territory, and/or private irrigation companies. The passage of the Carey Act was reflective of a shift in national policy towards the settlement of the West and the Federal Government’s role in regulating that settlement through irrigation.⁸

The Reclamation Act arguably proved to be the most important piece of legislation ever devised in the history of the development of the American West. The law is rooted in the publication of John Wesley Powell’s 1878 *Report on the Lands of the Arid Region of the United States*, wherein Powell outlined a plan for the diversion of rivers and streams from their natural

6. Donald Pisani, *To Reclaim a Divided West: Water, Law, and Public Policy, 1848-1902*, (Albuquerque: University of New Mexico Press, 1992), 227.

7. Raymond Y. Chapman, *History of the Belle Fourche Irrigation Project*, Unpublished Master’s Thesis, University of South Dakota, 1931, 7-9.

8. Pisani, 252-4.

beds to reservoirs for agricultural and industrial development. Powell's report, and fame as the first published explorer of the Colorado River, earned him an appointment as head of the United States Geological Survey (USGS) in 1881. USGS received an appropriation from Congress in 1888 to conduct a survey of the West's irrigable lands, which took place until 1893. Powell's vision for the West would be laid out more clearly in 1890, during hearings conducted by Senator William Stewart of Nevada that called Powell's administration of the USGS and the irrigation survey into question. The arid West, Powell explained, comprised a total area of 1.34 million square miles, of which only 0.4 percent were under irrigation. Limited by geography, Powell felt that settlement of the arid West needed to be carried out along natural rather than economic lines, abandoning the township and county system for the formation of "natural districts" along river watersheds. These settlements would be limited to eighty acres, with water rights under control of three sets of water districts, and non-irrigable lands under the control of the Federal Government. Although Powell's method of land districting was never adopted, his concept of irrigation under Federal authority, administered by local water districts, would be incorporated into the Reclamation Act in 1902.⁹

The Desert Land Act and the Carey Act had been nominal efforts at developing the vast interiors of West, but by 1900, only 7 million of the 100 million acres of irrigable land estimated to exist by Powell had been developed. The Reclamation Act sought to remedy this, in theory, by providing thousands of families with subsistence farms, supported by a massive irrigation infrastructure funded through sales of public lands. As historian Donald Pisani explains,

"Under (Theodore Roosevelt's) leadership, federal reclamation would be a form of 'demographic planning,' a policy to redress a population imbalance, not an experiment in

9. Donald Worster, *Rivers of Empire: Water, Aridity, and the Growth of the American West*, (New York: Oxford University Press, 1985) 131-9.

socialism or community building. In the end, the Reclamation Act simply expanded the Homestead Act— a decidedly nineteenth century measure— to suit the new conditions of the arid West. It reaffirmed that, in spite of the vast economic changes that had taken place since the Civil War, the self-sufficient, independent family farm should remain the linchpin of American society, free from centralized planning and control.”¹⁰

In other words, the Reclamation Act was meant to be a “homemaking” law, providing homes for settlers from the east in the vast territory of the west, and farms for those in the burgeoning cities who wished to live out their own vision of the Jeffersonian agrarian ideal.

Under administration by the newly created Reclamation Service, the government would contract with water users’ associations and irrigation districts to provide interest-free loans for construction of water storage and delivery facilities. These projects were to be paid back over a ten-year period, and the water users were also responsible for payment of operation and maintenance. Among the first employees at the head of the Reclamation Service were Frederick Newell, who developed the administrative framework for Reclamation, and Arthur Powell Davis, nephew of John Wesley Powell. Both had served under the Irrigation Survey and spent time as both Director and Chief Engineer.¹¹

Project Authorization

Following authorization of the first Reclamation projects, the Reclamation Service moved to investigate opportunities for land reclamation in several other western states. The *First Annual Report of the Reclamation Service* reported in 1903 that “the chief opportunities for reclamation (in South Dakota) come from water storage in or adjacent to the Black Hills.” The Belle Fourche River looked particularly attractive; in January 1903, Congressman Eben Martin was told by booster P. P. Vallery of Soma, South Dakota, that “there is enough water which goes

10. Pisani, 324-325.

11. Storey, 2-3; Bureau of Reclamation History Program, “Bureau of Reclamation Historical Organization Structure” (Denver: Bureau of Reclamation, 1997) 4, 16.

down the Belle Fourche River annually to irrigate all of the valleys in our county(Butte County).”

In April, a group of 200 citizens from the Belle Fourche region sent a letter to Secretary of the Interior Ethan Allen Hitchcock, claiming that a site north of the Belle Fourche River would be enough to irrigate 100,000 acres of land. Intrigued by the possibilities, Reclamation began conducting surveys of the area in July of 1903 under the direction of Raymond F. Walter, investigating the Belle Fourche watershed from the Redwater River to Dry Creek, as well as Owl, Indian, Lone Tree, and Horse Creeks.¹²

During the course of these surveys, Reclamation established gauging stations in the Red Water and Belle Fourche Rivers, measuring streamflow from June to October. Surveys of potential damsites were also recorded, and on February 15, 1904, the first report was made to Frederick Newell, discussing streamflows, the kinds of crops that could be grown, and an estimate of 90,000 acres of irrigable land, 73,000 on the north side of the Belle Fourche, 17,000 on the south side. On April 25, a board of Reclamation engineers ordered another survey to identify irrigable lands, dam sites, and canal lines. On May 10, the Belle Fourche Project was approved by Hitchcock, along with a \$2,100,000 from the Reclamation Fund for construction costs. The Belle Fourche Valley Water Users’ Association (BFVWUA) was formed on June 1, 1904, to negotiate a repayment contract with the government. In the meantime, Frederick Newell received a report from the consulting board of engineers that three practical dam sites had been identified— two of the sites were located on Dry Creek, just above and just below the junction of Dry Creek and Owl Creek, and the third about half a mile below this junction. In August of

12. Storey, 3-5; Denver, Colorado, National Archives and Records Administration, Rocky Mountain Region, Records of the Bureau of Reclamation, Record Group 115, “Annual Project History, Belle Fourche Project, Vol. 1: Early History, Diversion Dam, Crow Creek Sluice, Main Supply Canal,” 6-7, 13-4.

1904, Engineer of Soils Thomas Means analyzed the soil composition of the proposed project lands, and the second dam site, below the junction of Dry Creek and Owl Creek, was chosen by the spring of 1905.¹³

Construction History

Final plans for the Belle Fourche Project were approved on July 13, 1905. Contracts for the first stages of construction opened as soon as April 26, 1904 (for the inlet canal), but bids for construction would not be opened on the dam until October 26, 1905. While the details of individual project features have changed since formulation of these plans, the basic delivery system remains the same. The Belle Fourche River would be diverted via a concrete gravity diversion dam two miles below the town of Belle Fourche into an inlet canal. The water is then transferred to Owl Creek, flowing into the Belle Fourche Reservoir behind Belle Fourche Dam. Water is released from the reservoir to North and South Canals, which provide water for most of the project lands. The inlet canal provides water to a small amount of land, but those lands are entirely dependant upon the flow of the Belle Fourche River and cannot draw water from the reservoir. The reservoir is capable of holding 192,000 acre-feet of water, which is transferred to the remainder of the project lands via the North and South Canals. In addition to the townsite of Newell and village sites set aside by Reclamation, land for an experimental farm was set aside by the Department of Agriculture.¹⁴

Diversion Dam

S. R. H. Robinson was awarded the contract for the Diversion Dam, which was planned

13. Chapman, 12-16; Storey, 4-6; Denver, Colorado, National Archives and Records Administration, Rocky Mountain Region, Records of the Bureau of Reclamation, Entry 3, Box 358, Folder 218.

14. Storey, 7-8.

as a concrete gravity ogee weir with earthen dikes on both flanks of the dam. The contract was awarded on April 24, 1905, and included work on the Inlet Canal as well. The completion date was set for March 1, 1906. Work began at the site on May 10, 1905, and by June, a steel and wood cofferdam had been erected around 230 feet of the south end of the dam for dewatering and to provide areas for the workers to operate. Concrete work on the dam began during August.

Wet weather from late 1905 into 1906 prevented a substantial amount of work from being accomplished, and in the spring of 1906, a small flood washed out fifty feet of the cofferdam. This cofferdam was replaced by July, and another cofferdam was erected from sandbags on the north end of the restored structure. By April of 1907, about nine feet of the diversion dam had been constructed, but another flood in May ruined not only the cofferdam but also the work on the dam that was completed. After the waters subsided, workers again resumed activity, and all concrete on the dam and the paving below the structure was placed by August of 1907. The wet weather and frequent floods prompted the contractor to request work extensions a total of three times before completion of the contract. When finished, the diversion dam lay 186 feet long at the ogee weir section, and the earthen dikes extended the total length to 2,523 feet, with a weir channel length of 45 feet.¹⁵

Belle Fourche Dam and Reservoir

Bids on Belle Fourche Dam opened October 26, 1905, and the Orman and Crook Construction Company of Pueblo, Colorado was awarded the contract on November 15. The contract consisted of three schedules: Construction of the dam and adjacent canals, and the first divisions of the North and South Canals, which constituted about eight miles apiece. The

15. Storey, 11; Chapman, 21-26.

construction camp for the dam was built during the winter of 1905-06, and work on the dam began March 1, 1906. Workers began by stripping and plowing the surface down to the clay and shale subsoil. A five foot by twenty foot wide trench was excavated and filled with compact earth to prevent seepage.

Workers placed the embankment material, then compacted it with steam rollers. When the rollers repeatedly stuck to the wet surface of the embankment's gumbo material, an 18 ton Reeves steam traction engine was used for compacting the remainder of the embankment. Workers continued placing embankment through 1907, and began creating the concrete slabs to be placed on the upstream face of the dam. These slabs are six feet long, four feet wide, and eight inches thick. Work in 1907 slowed because of wet weather in the spring, and then an extremely dry August which delayed the moistening of the embankment material for compacting. By the time construction shut down for the winter on December 5, 1907, the north and south conduits had been completed and a third of Orman and Crook's total contract was finished at that point.

Orman and Crook began experiencing financial problems late in 1907. The company had already been put under warning by Reclamation's engineers for lacking long-term work plans and slow progress on the dam. Although the weather conditions did their part to retard progress, labor conditions proved to be the real culprit of the company's woes. At the heart of these difficulties was passage of an eight-hour work law in the summer of 1907. According to former Colorado Governor Alva Adams, who wrote to President Theodore Roosevelt on November 13, 1907, on behalf of Orman and Crook, the contract finances were based on workers conducting ten hour rather than eight hour days. In addition, when employers near the work site began

offering eight hour jobs, many construction workers left the Project for these other places of employment. On January 19, 1908, Orman and Crook's contract was suspended due to "unsatisfactory progress and insolvency." The National Surety Company, which had provided the bond for Orman and Crook's completion of the contract, then signed a new construction contract on April 8 and relet it to a construction company from Janesville, Wisconsin.¹⁶

The Janesville firm resumed construction activities on April 21, 1908, placing 390,000 cubic yards of embankment material by the end of the year. A six-mile railroad line was built to transport the concrete paving slab from the gravel quarry to the dam site. Because of delays from the previous contract and the default process, the term of the contract was extended from September 1, 1909 to December 1, 1910. Workers also began closing the Owl Creek gap in Belle Fourche Dam. This gap was present because engineers were concerned that damming Owl Creek during most of the construction process could lead to flood conditions at the site. When material needed to be moved from the north side to the south side of the gap, a 220-foot Howe Truss bridge was built to span the gap. Workers completed filling the gap in September. A six-inch water pipe was installed in 1909, solving the difficulty of providing adequate moisture for compacting the embankment material. Placement of the embankment and concrete slabs continued throughout 1909 and into 1910. The contractor placed 30,000 cubic yards of material in 1910, and by the end of the year, completed the spillway at the north end of the dam. The year 1910 was also significant because it was the first year that storage began, on March 10, allowing water from the project to flow into the South Canal a month later and irrigation activities to begin on the south side of the Belle Fourche River in early May.

16. Chapman, 35-45; Storey, 16-20.

During the summer of 1910, seepage was noticed below the embankment of Belle Fourche Dam, leading to the construction of a drainage trench which has discharged as much as forty-five gallons of water a minute. Inspectors also noticed that the concrete slabs used on the upstream face of the dam were crumbling badly in some places. An investigation by J. Y. Jewet found that the slabs were not created using an inferior quality of cement, as originally thought, but that the fault lay in the process of manufacture. The particular brand of cement used by the contractors had a slower setting time, and was thus susceptible to moisture and cooler temperatures, the type of weather which occurred frequently during the slabs' construction.

The construction contract was extended to June 30, 1911, and the remainder of this time was spent installing the conduit lining and valves in the North and South Canals. Workers installed the 54-inch Ensign valves during the winter of 1910-1911, two in the North Canal and one in the South Canal. The conduits were prepared for valve installation in 1910, and the valves arrived in February 1911. The thawing of the ground presented problems in transporting materials to the site, so a half mile plank road was built to accommodate the two traction engines employed by the workers to move the valves and cast iron pipe to the site. The contractor finished installing the valves on March 16, 1911, and concreting the chambers two days later, allowing water to be turned into the Inlet Canal for the 1911 storage season.¹⁷

Inlet Canal and Structures

The contract for the Inlet Canal was awarded to the Widell-Finley Company of Chicago on April 26, 1904. Work on the structure began in May, but crews experienced problems almost from the very beginning. To begin with, much of the equipment was faulty or outdated; the

17. Chapman, 45-60; Storey, 20-2.

seventy-ton shovel used in the Giles' cut along the canal was so defective that it had to be condemned and rebuilt for the construction process, and much of the rest of the equipment was "all old and in very depleted condition." Nature also worked against the crews, who had to work through heavy rainfall through the summer and had much difficulty excavating the canal through the rough shale ground. In one particular spot, known as Gilbert's cut, crews had to blast the ground several times before material could be removed. The delays resulting from these problems forced the construction company to ask for an extension of the contract from March 1, 1906 to March 30, and this was granted. However, inept management by Widell-Finley forced the company to declare bankruptcy on February 15, 1906. When the company defaulted on March 7, the receivers turned the work back to Reclamation. Bids were opened on May 29 to complete the canal, but no bids were received, so the remainder of the canal was completed by government forces through a force account, using the former contractor's equipment.

Work on the Inlet Canal involving other contractors included the Crow Creek Weir, begun in 1905 by S. R. H. Robinson Company and completed in 1906. The weir is located a half mile below the diversion dam, where it diverts water from Crow Creek into the Inlet Canal. Reclamation installed a regulator, with six 6'X10' gates, just below the weir to control water flow into the canal. The weir was completed in November of 1906. Work on the canal was completed in September 1907 at a cost of \$242,923.86, but the installation of a drop-check structure east of Gilbert's Cut and the Johnson lateral for the inlet canal remained to be completed. The Johnson Lateral was part of Reclamation's plan for nine major laterals on the project, including along the North and South Canal. Contracts for the lateral system opened April 30, 1907, and work began in June, built by government forces. The Johnson Lateral was

completed in the spring of 1908. When completed, the drop-check structure held back water which would go into the Johnson Lateral, while allowing a quick drop in elevation for the canal's water designated for the Belle Fourche Reservoir. The Johnson Lateral and its sublaterals diverted water to 4,000 acres of land above Belle Fourche Reservoir.¹⁸

South Canal

Bids for the first division of the South Canal contract were opened October 26, 1905, with the contract being awarded to Orman and Crook, which completed its work on June 30, 1907. The second division was much more complex, containing three siphons, a flume, and a tunnel under a high bluff two miles east of the Belle Fourche River siphon, all along thirty-seven miles of canal and structures. Despite twice opening bids for construction of the second division, Reclamation was required to construct the majority of this portion of the South Canal with government workers under a force account. The only contract not completed by government forces on the second division was completed by J. E. Hilton for twelve miles of the canal near the town of Vale. The Hilton firm fulfilled their contract in November of 1907. Work on the remainder of the division began in May of 1907 on the canal, the flume, the Belle Fourche River siphon, and the South Canal Tunnel. The South Canal tunnel was completed first in August of 1908. Workers began by boring the horseshoe cross section through the high bluff at both ends of the tunnel's location, completed excavation in May of 1908, and lined the tunnel with concrete by August. When finished, the tunnel measured 1,306 feet long, 9.5 feet wide, and 10.5 feet high.

The Belle Fourche River siphon was considered a crucial structure for the delivery of

18. Storey, 12-16; Chapman, 30-4.

water from the canal to the lands south of the river. Workers began in August of 1907 by excavating the siphon and diverting the river through temporary cofferdams. The siphon itself was designed as a reinforced concrete pressure pipe, five feet in diameter and 3,565 feet long. Concrete placement was accomplished with a collapsible centering for the inside forms. The siphon was completed in October of 1908. The other two siphons, at Anderson Draw and Whitewood Creek, were constructed from the spring of 1908 to September and October of 1908, respectively. The Whitewood siphon proved tricky to construct because much of the pipe had to be laid in ten to fifteen feet of wet mud. When completed, the siphons conveyed water from the South Canal to the project lands south of the Belle Fourche River. The Anderson Draw siphon measured 425 feet long by seven feet in diameter, and the Whitewood siphon measured 350 feet long by six feet in diameter. Work began on the South Canal's minor structures such as lateral headgates and outlets, and water was ready for delivery through the structure by the spring of 1910.¹⁹

North Canal

The Orman and Crook Construction Company began initial work on the North Canal on March 26, 1906, completing the first eight miles to Indian Creek, as stipulated in their contract, by May 21, 1908. No further work was done on the North Canal until 1910; in the meantime, the completed segment of the canal was used for irrigation. Between 1911 and 1914, Reclamation used government workers to extend the North Canal southeast from Indian Creek, following the contours of the land across Deadman Creek and Dry Creek, to Deer Creek. Workers built the distributing laterals necessary for these extensions, and lands were opened for settlement after the

19. Storey, 23-6; Chapman, 64-8.

laterals were built for the extensions.

Flumes were installed at various points in the canal as a means of extending the structure. Between 1911 and 1912, Hess flumes were installed at Indian Creek and Horse Creek; these flumes were later replaced with siphons. Two more flumes were installed in 1914 at Dry Creek and Deer Creek. The Dry Creek flume was 800 feet long and built by government workers. The North Canal had to cross Deer Creek at two points. The Deer Creek flume was installed by government workers at the first crossing, and a siphon was installed at the second crossing by the Washington Pipe and Foundry Company of Tacoma, Washington. The final work done on the North Canal during this period consisted of the installation of sixty inch redwood pipe between stations 2257+15 and 2290, which took place from April 26 to August of 1916. The agricultural boom that resulted from the entry of the United States into the First World War led to investigations into extending the canal further. Reclamation constructed the Willow Creek extension from 1921 to 1922. Plans were made in 1922 for construction of a siphon at Willow Creek, but the agricultural depression of 1922 prevented these plans from being carried forward. However, in 1926, a waste chute was built at the end of the canal between Deer Creek and Willow Creek, completing construction on the North Canal and the Belle Fourche Project.²⁰

Post-Construction History

The history of the Belle Fourche Project following completion of its primary structures provides the perfect example of the early and persistent difficulties Reclamation encountered in trying to make its projects vital. These problems soon became so pervasive that they eventually reflected upon Reclamation as a whole, providing a convenient target for Congressmen who were

20. Storey, 26-9.

hostile to the program.²¹ Much of these problems stemmed from the unrealistic expectations of Reclamation's supporters and local boosters, which in turn placed a greater burden on those who were responsible for implementing the Belle Fourche Project, and later, those who settled the project lands.

In the project's early years, the most frustrating aspect of efforts to make the project a success involved the settlers and the expectations that were placed on them upon arrival. The project (and this reflected on the philosophy behind the Reclamation program as a whole) was heavily promoted as a means for individuals to acquire land and build up an "independent" existence on lands receiving a stable source of water. Because irrigation would supposedly solve the question of how the farmers were to acquire water for their crops, it was assumed that the prospect of owning one's own land, away from the crowded cities, would be so immensely attractive to people that they would flock to the project in record numbers.

However, what boosters of the project never took into account was the relatively high cost, both in capital and in sheer effort, of starting up a farm on a Reclamation project. A Reclamation farm required capital to purchase the land, develop it for irrigation, construct a dwelling, purchase water, equipment, and seed for raising crops, meet day to day living expenses, and pay a share of operation and maintenance costs of the project works, just within the first year of settlement. Former Commissioner of Reclamation Floyd Dominy once stated in an interview that the accepted time frame for a Reclamation farm to become profitable took three generations, although periodicals such as *The Reclamation Record* and booster pamphlets continually

21. Marc Reisner, *Cadillac Desert*, (New York: Viking Penguin Books, revised ed., 1993) 222.

promised that “with effort,” a reasonable profit could be made.²² Furthermore, many of the early settlers were not well-qualified or experienced enough to put forth the effort necessary to establish a steady farm in the first place. In a report on the Belle Fourche Project in 1914, Frederick Newell pointed out that about one-fourth of the project’s farmers were former miners in the Black Hills, who were “making good progress.” However, at the time the project first opened lands for settlement, a great number were also “professional and clerical men and others who had not had experience in irrigation...There is still too large a proportion of lawyers, doctors, mechanics, and clerks,” who treated farming as a pastime and not as the full-time occupation expected of the project’s settlers.²³

Furthermore, the great exodus from the cities to the farms never materialized as expected. The original plan of settlement called for the size of farms to be 40 acres in areas near towns, and 80 acres at a distance from the towns. Private lands brought into the project were allowed a 160-acre limit. Although the project was capable of irrigating 90,000 acres on 900 farms, the number of acres irrigated on the project has never exceeded 60,000. This placed a greater financial burden on the settlers inhabiting the project. Subject to an increasingly fickle market for agricultural produce, farmers often did not know from one year to the next if they would be able to produce enough crops to simply pay for the expense of running a farm, let alone their share of costs of repaying and running the project. As a result, land speculation was practiced by several project settlers, who would buy, but not develop, lands in anticipation of selling them for a greater profit in the future. This led to even more instances of farmers going broke and selling

22. Floyd Dominy, oral history interview. Transcript of tape-recorded oral history interview conducted by Brit Allan Storey, Senior Historian, Bureau of Reclamation, Bellevue Farm, Boyce, Virginia, April 6, 1994, 119.

23. Records of the Bureau of Reclamation, Entry 3, Box 358, Folder 17-A.

out. In his report, Newell remarked that “few newcomers can handle effectively even forty acres. If they obtain a larger area, they must struggle to pay taxes and water charges with the products of less than forty acres or with the scanty returns of lands ineffectively tilled.”²⁴

The very nature of the lands upon which the Belle Fourche Project lay, also played a role in the project’s early difficulties. For decades, Anglo settlers had relied on ranching as the backbone of the local economies, not the farming of produce. Due to the difficulty in growing any kinds of crops other than hay in the soil, most cultivation took place to grow feed for the sheep and cattle on the local ranges. As one rancher succinctly remarked, when approached to sign onto the Belle Fourche Project:

“This ain’t no farming country. It’s a stock country. Nothing except grass will grow here. Springs are late, winter comes early, the crops will all fail. These farmers will plow up all the creek bottoms and then we won’t have any wild hay for winter feed.”²⁵

One of the first reports given on the project lands stated that “Grain, hay, alfalfa, and perhaps small fruits will constitute the main crops,” which was not much different than what had already been grown in the region for several years. Thus, beginning in 1915, farmers increasingly turned to stock operations, mostly in sheep, to try and turn a profit, as alfalfa became the primary crop of the project.²⁶ Farmers also had trouble adjusting to irrigating in the disparate soils of the project. The lands north of the Belle Fourche River were largely composed of the sticky “gumbo” soils, which effectively retained water. However, lands farmed in these soils required extreme diligence in the application of water, because the soils took longer to dry out and quickly became impervious, retarding the growth of crops. The lands south of the Belle Fourche River are

24. *Ibid.*, Storey, 42.

25. C. J. Blanchard, “Belle Fourche, The Beautiful,” *The Reclamation Record*, Vol. 8, No. 12, 578.

26. Records of the Bureau of Reclamation, Entry 3, Box 357, Folder 217; Marvin P. Riley, W. F. Kumlein, and Duane Tucker, *50 Years Experience on the Belle Fourche Irrigation Project, Bulletin 450*, (Brookings, South Dakota: South Dakota State College, 1955) 13.

largely composed of sandy loam, which proved perfect in later years for growing more profitable crops such as sugar beets, but also proved to be an extremely thirsty soil that required frequent applications of water.²⁷

The lack of knowledge in irrigating the soils soon came back to haunt Reclamation and the project settlers. Over-application of water on project lands resulted in seepage of the water into subsoils as early as 1909, in the Sorenson Flats area, causing salts to rise to the surface as the water table rose. Normally, if provisions are made for proper drainage, this is not a problem. However, Reclamation had assumed that the need for drainage would be minimal, at best, and that these needs would be provided by the farmers who would construct the necessary drainage facilities. While this may have taken place on a small scale, most farmers did not have the means or the motivation to do this. By mid-1914, about 1,500 acres were rendered unirrigable due to seepage, a number that increased to nearly 4,000 acres by 1921. Because of the reluctance of farmers to add the costs of drainage to their already high debts, a contract for drainage construction was not signed between Reclamation and the Belle Fourche Water Users Association (which had become the Belle Fourche Irrigation District (BFID) by this time) until October 4, 1927. The contract specified work to be done over a five-year period from 1928 to 1932.²⁸

By the 1920's, the Belle Fourche Project had gained some measure of stability, but it was a precarious stability at best. In the Belle Fourche project histories, one of the reported needs was a “greater community spirit...every man seems content to go his own way and work out his

27. Riley, Kumlein, and Tucker, 48-9.

28. Storey, 47-9; Denver, Colorado, National Archives and Records Administration, Rocky Mountain Region, Records of the Bureau of Reclamation, Record Group 115, “Annual Project History, Belle Fourche Project,” Volume 173, 1921, 32.

own problems and difficulties instead of asking the advice or co-operation of his neighbors. It will take years however for this condition to change.” Productivity on the project had begun to recover thanks to crop prices during the First World War, to the point that farmers were able to hold down and even reduce their debts. The Reclamation Extension Act of 1914 helped farmers by increasing the repayment period from ten to twenty years, interest free, and forgiving all accumulated debts up to that point.²⁹

However, the agricultural crash of the 1920's soon brought the viability of the project into question again. In contrast to the boosterish optimism expressed in *The Reclamation Record*, the project histories were quite blunt as to the difficulties experienced on the project, most of them blamed on the lack of quality resident farmers on the project lands. From 1922-23, five major banks closed in the towns of Fruitdale, Nisland, Newell, and Belle Fourche, straining the finances of the project's farmers. In an attempt to defer unpaid water rights from the period 1920-22, the Belle Fourche Water Users' Association was re-formed as the Belle Fourche Irrigation District in 1923. In 1924, BFID began a three-year promotional campaign in partnership with newspapers in Sioux Falls and Sioux City to try and attract more settlers to the project. By this time, forty-nine percent of the farms had no population at all, and twenty-five percent of the irrigable area remained idle. Much of this was due to the fact that the cost of developing the farms scared off many potential buyers. Despite these realities, the managers of the project continued to insist that the lands needed “only the right kind of man to yield good returns.”³⁰

29. Storey, 37-8; “Annual Project History, Belle Fourche Project,” Volume 170, 1918, 13.

30. “Annual Project History, Belle Fourche Project,” Volume 175, 1923, ix, 45; “Annual Project History, Belle Fourche Project,” Volume 176, 1924, vii, 24-8.

The promotional campaign to lure settlers to the Belle Fourche Project was largely a failure. Despite a goal to increase the number of farmers on the project by half, several farms in the mid-1920s were abandoned because of the slumping agricultural economy. According to an article in the *Belle Fourche Bee* in 1930, the situation was so severe that the government nearly abandoned the project. In 1926, the BFID agreed to an annual \$40,000 payment before water could be released for irrigation. This agreement was altered in 1927 to encompass the payment of operation and maintenance charges prior to water release, and also provided for the transfer of operation and maintenance to the BFID in 1934.

The newer, more stable repayment contract, the construction of a sugar beet factory by the Utah and Idaho Sugar Company in 1927, and the beginning of construction of a drainage system in 1928, brought a temporary respite to the project's fortunes. The construction of the sugar beet factory was particularly helpful. The presence of the factory brought a new influx of farmers into the area to farm sugar beets, a crop that yielded a high per-acre cash return. In 1925, sugar beets grown on 1,238 acres brought a return of \$164,975 (by contrast, 20,731 acres of alfalfa, the principal crop, brought a return of \$219,193). By 1928, sugar beets grown on 6,929 acres brought a return of \$608,811. Cucumbers, another high-yield crop, were also pickled at the project's pickling plants. Reclamation expanded the drainage program in 1930, from the original plan for 150 miles of drains in 1928 to a projected need for 200 miles of drains, which would protect about 20,000 acres of land. The drainage system was completed in 1932, and contained a little more than 200 miles of drains.³¹

31. Storey, 39, 49; "Annual Project History, Belle Fourche Project," Volume 177, 1925, 14, 51; "Annual Project History, Belle Fourche Project," Volume 180, 1928, 58; Records of the Bureau of Reclamation, Entry 7, Box 21, Folder 023.

The boom and bust activity on the project continued into the 1930's, after the Great Depression had a devastating effect on the Belle Fourche Project, as it did on the rest of the country. In one of the project's continuous efforts to attract more settlers, an "Open Door" event was held on the project in October and November of 1930. The promotional booklet for the event advertised, "No Panic! No Drouth! No Unemployment! Prosperity Reigns on the Belle Fourche Project." This rosy statement was quickly refuted following the droughts of the 1930s. Although the sugar factory had improved the fortunes of the project somewhat, the prevailing economic conditions of the agricultural market— high debts, low crop prices, expanding production(to offset the low returns) and limited overseas demand— made the farmers of the project ill-prepared for any large-scale economic downturns. That the droughts primarily affected the south-central and western portions of the state did nothing to help the situation.

The troubles began in 1931, during the first period of drought, and for this, Reclamation could take some of the blame. The hydrology studies of the Belle Fourche watershed prior to authorization were only conducted from June to October of 1903, during what the surveyor admitted was an above normal year for rainfall. When the droughts of 1931 began, farmers began irrigating in greater quantities, rapidly drawing down the reservoir, causing damage to the dam itself, and leading the project managers to call for greater conservation measures. Whereas in the early years farmers could acquire as much as 18 inches of water per acre, during the 1930's these numbers dropped to 12 inches in 1934, and 9.5 inches in 1935. During 1937 and 1938, special irrigation schedules had to be devised to alleviate the strain on the limited water

resources.³²

Remarkably, the Depression accomplished what all the efforts of BFID and the booster organizations could not—attract a substantial number of settlers to the project. Economic conditions on the project worsened, to the point that in 1937, BFID made a plea for leniency by the government for some of its repayments. Yet, the population on irrigated farms rose from 2,106 in 1930 to 2,807 by 1935. This may have been due to an individual perception that farming on the project offered the best chance for economic recovery. However, drought, the decline in crop prices, difficulty in obtaining credit for livestock, land, and crops, and rising tax burdens and debt forced a number of foreclosures, and the population soon dropped to 2,092 by 1942, soon after the United States entered the Second World War.³³

By this time, the project had gained a reputation as an absolute fiasco. In a 1938 letter to Commissioner John Page for Reclamation's Repayment Commission, R. W. Reynolds stated that "If many Reclamation projects made similar hopeless presentations...(the Commission) will gain an unjustified unfavorable opinion as to the economic soundness of reclamation projects in general," while the BFID's own secretary, W. D. Buchholz, unequivocally stated that "the project has been backward in settlement, farm improvements, and a profitable system of farming." Project superintendent F. C. Youngblutt summed up the current problems of the project during the Depression when he asked, rhetorically, "Where can we find farmers with \$4,500 cash who would come to the Belle Fourche Project when so many other opportunities are available for men with this much money?" Youngblutt would go on to publish an extremely critical article on the

32. Riley, Kumlein, and Tucker, 18-9; Schell, 282; Records of the Bureau of Reclamation, Entry 3, Box 357, Folder 217; Records of the Bureau of Reclamation, Entry 7, Box 023, Folder 21, Folder 040.14.

33. Riley, Kumlein, and Tucker, 16-9.

Belle Fourche Project in the serial *Dakota Farmer* in 1946, an article so critical that even Senator Chan Gurney wrote to then-Commissioner of Reclamation Michael Straus attacking the project.³⁴

Project managers made halting steps to improve conditions on the project after the entry of the United States into World War Two. These included the replacement of wooden structures along the distribution system with more durable concrete, requesting deferments on unpaid charges in 1946, and approving construction of the Keyhole Unit, a dam authorized under the 1944 Flood Control Act. The Keyhole Unit would provide supplemental water to the Belle Fourche Project. The war promised to provide a boost to the local economy in the same way the First World War did. This was particularly critical because of the inevitable labor shortages that resulted from individuals joining the military, and the migration of jobs to those on the West Coast in defense industries— by 1945, the farm population had dropped to 1,616 people. These labor shortages, combined with a decline in long distance livestock hauling and natural disasters such as grasshoppers and hailstorms, affected the project in that it did not parallel the success that other Reclamation projects experienced during the war. German POWs, as well as Mexican and Jamaican migrants, were brought in to alleviate the labor shortage, but harvests still proved difficult.³⁵

It was not until after the war ended that the project gained a measure of stability that had proven extremely elusive. Thanks to a rise in farm commodities and advances in production, crop values rose from 1946 to 1948. Construction on the Keyhole Unit began in 1949 and was completed in 1952. Under the Belle Fourche Compact signed between Wyoming and South

34. Records of the Bureau of Reclamation, Entry 7, Box 79, Folder 040.15; Schell, 360, Footnote 16; Dominy, oral history interview, 120.

35. “Annual Project History, Belle Fourche Project,” Vol. 197, 1945, 34, 43; “Annual Project History, Belle Fourche Project,” Vol. 198, 1946, 11, 28, 42; Riley, Kumlein, and Tucker, 20-1.

Dakota in 1943, this project provided supplemental storage water for Belle Fourche Reservoir, entitled South Dakota to ninety percent of the Belle Fourche River's unappropriated flow, and provided flood control benefits to residents along the river in both states.³⁶

Perhaps the greatest step towards stability on the project was the signing of a new contract between Reclamation and the BFID on November 29, 1949. This contract served multiple purposes: it turned operation and maintenance responsibilities over to the BFID; set the annual construction repayments at \$38,700; set forth a new system of land reclassification that eliminated 13,605 acres of land from the assessment rolls, and reported actual farms rather than total farm units (this dropped the number of farms from 900 to 423); released farmers from the joint liability of the district's repayment policy, making it easier to secure loans; and provided a loan of up to \$400,000 from the Federal Government for rehabilitation of the project's irrigation infrastructure.³⁷

Rehabilitation activities commenced in January of 1950, beginning with the North and South Conduits, the outlet works, and Belle Fourche Dam. During the year, workers cleaned drains, strengthened canal banks, repaired gate structures and stilling basins in wasteways, and extended the concrete sidewalls of the North and South Canal weir pools. Rehabilitation continued on all irrigation infrastructures through 1954, with particular attention paid to the South Canal, Belle Fourche Dam, and the drainage system. Work on the drainage system continued after work on the rehabilitation program was complete— in 1958, the BFID constructed

36. Toni Rae Linenberger, "The Keyhole Unit, Cheyenne Division, Pick-Sloan Missouri Basin Program," (Denver: Bureau of Reclamation, 1996) 5-10.

37. Riley, Kumlein, and Tucker, 21-4; "Annual Project History, Belle Fourche Project," Vol. 2001, 1949, 3-5, 26.

an additional 2,640 linear feet of drains, and cleaned another 42,240 feet.³⁸

The combination of the new repayment contract, post-war economic boom, and construction of the Keyhole Unit allowed the Belle Fourche Project to focus on other programs that heretofore had been considered unnecessary. Although recreation had been an important benefit of the project since the early 1910s, serious consideration was not given to construction of recreational facilities until the mid-1960s. The first review of the limited facilities that were available was conducted in 1963, and by 1967, plans for recreational development at a cost of approximately \$57,000 had been laid out. These plans included gravel access roads, a concrete boat launching ramp, camping areas, parking, and restrooms. Reclamation and the South Dakota Department of Game, Fish, and Parks would be responsible for construction of the recreation facilities. Construction began in 1971 and was completed in 1972.³⁹

The project lost one of its more significant institutions in 1965 when the Utah and Idaho Sugar Factory shut down for good. The sugar beet industry on the project had been in decline since the Second World War, despite the use of immigrants and German POWs to harvest the crops. In 1946, students from the local high schools even volunteered to harvest the beets before they froze in the ground. This lack of labor contributed to a decline in beet acreage from 4,734 acres in 1947, to 2,781 acres in 1948, leading some farmers to replace their beet crops with beans. Lands devoted to sugar beets remained low throughout the 1950s, and despite a brief recovery in 1959 and 1960, acreages soon declined to the point that the Utah and Idaho Sugar

38. Storey, 70-1; "Annual Project History, Belle Fourche Project," Vol. 2002, 1950, 22-9; "Annual Project History, Belle Fourche Project," Vol. 2003, 1951, 8; "Annual Project History, Belle Fourche Project," Vol. 2005, 1953, 4, 13; "Annual Project History, Belle Fourche Project," Vol. 2006, 1954, 13; "Annual Project History, Belle Fourche Project," Vol. 2010, 1958, 13.

39. "Annual Project History, Belle Fourche Project," Vol. 2015, 1963, v; "Annual Project History, Belle Fourche Project," Vol. 2019, 1967, 18-20; "Annual Project History, Belle Fourche Project," Vol. 2021, 1969, 6; "Annual Project History, Belle Fourche Project," Vol. 2023, 1971, 4.

Company could no longer justify continuing operations. After the factory closed, the production of sugar beets on the project, one of the crops early boosters predicted would be a principal commodity, ceased altogether.⁴⁰

Major alterations on Belle Fourche Dam took place from 1976-1977, under the Reclamation Development Act of 1974. A new grass-lined spillway was constructed on the south side of the dam, and riprap was placed on the upstream face of the dam from elevation 2,950 to the dam's crest. In 1981, a rehabilitation and betterment report was issued on the Belle Fourche Project. The report recommended another large-scale rehabilitation program to replace the diversion dam and headworks, protection of most of the carriage and distribution systems, riprapping of canal curves to stabilize the embankments, lining of canals and laterals with plastic membrane, concrete, and pipe, construction of gravel roads to aid access to various points of the project, replacement of water control structures in canals in laterals, and replacement of underdrains and checks in the North and South Canals. The total cost of the program was estimated at approximately \$9.4 million. If the project was integrated into the Pick-Sloan Program, the repayment costs would be increased to \$21.6 million, however, future power revenues would help offset these costs. The project has been integrated into the Pick-Sloan program, as evidenced by its listing in the Bureau of Reclamation's annual *Summary Statistics*, and construction on the rehabilitation program continued into the 1990s.⁴¹

Settlement of the Project

Population on the Belle Fourche Project has fluctuated throughout its history, but has

40. Storey, 51-2; "Annual Project History, Belle Fourche Project," Vol. 2000, 1948, 32; "Annual Project History, Belle Fourche Project," Vol. 2016, 1964, v, 30.

41. Storey, 65-9.

generally been on the downswing since 1940. The largest populations on the project occurred during the First World War through 1924, when the farm population was above 2,000, and during the Great Depression. Since that time, however, the farm population has been steadily declining. In 1971, 328 farming units had a farm population of 1,038. These numbers dropped further by 1992, to a farm population of 817 and a total project population of 1,764.⁴²

Uses of Project Water

Although the Belle Fourche Project was originally designed to irrigate up to 90,000 acres, land reclassification in 1949 reduced those irrigable acres to 59,000, and further reclassification in 1970 reduced them to their current irrigable acreages of 57,068 acres. In 1992, 51,043 acres were irrigated. In the project's early years, crops such as potatoes, cucumbers, and sugar beets were grown in limited quantities, but the intense labor required to harvest them led to their eventual abandonment. Potatoes are the exception, but they are grown on an extremely limited basis; while profitable in terms of per acre returns, they are not grown in the abundance necessary to consider them a current significant crop. Today, the project grows more traditional staples such as corn, alfalfa, and other forage crops. These crops primarily provide feed for the project's livestock industry, which specializes in sheep and cattle. The gross crop value for 1992 was \$161.48 per acre.

Recreation has been a significant, but under reported, feature of this project. Fishing has been a perennially popular activity; Belle Fourche Reservoir was stocked with fish as early as 1915, and fishing during all seasons continues to attract prospective anglers. Since 1955, the

42. Riley, Kumlein, and Tucker, 17; "Annual Project History, Belle Fourche Project," Vol. 223, 1971, 24; United States Department of the Interior, Bureau of Reclamation, *1992 Summary Statistics* (Denver: Bureau of Reclamation, 1992), 64.

Belle Fourche chapter of the Isaac Walton League has run two five-acre ponds for pike-rearing. Since 1962, all lands within the take line of the Belle Fourche Reservoir has been considered a wildlife refuge. The reservoir is currently under the administration of the South Dakota Department of Game and Fish, and received 24,467 visitor days in 1992.⁴³

Conclusion

The Belle Fourche Project is a classic example of an early Reclamation project, a grand experiment designed to subdue the arid west through irrigation, while providing a safety valve for the populations of the rapidly growing cities in the United States. The project's tumultuous history is demonstrative of the struggles Reclamation encountered in properly surveying and analyzing lands for future use, developing policies such as realistic repayment schedules, and the inherent difficulty in attracting settlers to lands where opportunities could be had elsewhere for the same amount of money and work required to make the lands profitable. Although the Belle Fourche Project never became as grandiose as its boosters hoped it would, the lessons Reclamation learned from these early struggles enabled it to eventually stabilize the project and make it a viable part of Reclamation's infrastructure and the South Dakota economy.

About The Author

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43. *1992 Summary Statistics*, 46, 115, 283.

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