Sun River Project

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The Sun River Project

Commerce, government, the military, and the homesteader followed their own separate paths toward domesticating the West. Occasionally, representatives from each group shouldered skills beyond their assigned roles. As the United States expanded into central Montana's Sun River Valley, soldiers found time to plant gardens, the United States Reclamation Service (USRS) platted new towns, and a vocal segment of the agricultural community almost killed irrigation before it got on its feet. Completing this string of ironies, the greatest support for an irrigation project in central Montana came from the nearby city of Great Falls. Leaders of Montana's biggest smelting town were not guided by charity toward their country cousins. Great Falls sought a stable, nearby agricultural base to achieve their humble aim to become "another Minneapolis." In 1907, the United States Reclamation Service (USRS) granted Great Falls' wish by approving construction of the Sun River Project. If judged on its engineering merits alone, the Sun River Project would stand as a triumph of the Reclamation story. However, irrigated farming's struggle against the dominance of dryland agriculture, and irrigators' battles with erratic, unproductive soil, came close to sinking the entire project more than once. A combination of Main Street backing and Federal patience carried the Project through four decades of instability and depression before growers saw their first glimpse of prosperity.

Project Location

The Sun River rises and flows across central Montana, cutting wide valley streams through long, gently sloping plateaus. The summits of these plateaus, or benches, rise in many places to form high, isolated buttes or long irregular ridges. The eastern valley is a rolling drift-covered plain, characterized by low mounds, ridges, and potholes interspersed with level beds of glacial lakes. To the west, the surface rises in successive benches, breaking abruptly into rolling glacial hills and hollows as it nears the mountains. Average elevation of the irrigable area is 3,700 feet. Project lands are predominantly loam, silt loam, and gravely silt loams, but soil quality varies from farm to farm. A farmer can plant his crops in gravelly and sandy loams while

a neighbor tills silt loams and light clays. The choicest farmland is a practically unbroken stretch known as the Greenfields Bench on the north side of the river. In 1917, Reclamation proponent George Wharton James raved about Greenfields being "a princely domain vast enough to quicken the pulses of hundreds of men to the possibilities of the independent life of the farmer or rancher."[1]

Central Montana's Teton, Cascade, and Lewis and Clark are the home counties for the 91,011 acre Sun River Project. The bulk of the project lies north of the river in the 81,000-acre Greenfields Division. The 10,000-acre Fort Shaw Division hugs the river's south bank. Project lands fall between the summit of the Lewis range of the Rocky Mountains to the west, the Dearborn and Missouri Rivers to the south, and the Teton River on the north, extending east as far as Fort Benton in the Fort Shaw Irrigation District, and to the town of Ulm in the Greenfields

1. U.S., Department of Interior, United States Reclamation Service, *Annual Project History, Sun River Project*, Vol. 1, 1909, 3; U.S., Department of Interior, Bureau of Reclamation, *Annual Project History, Sun River Project*, Vol. 70, 1969, 5, factual data map; George Wharton James, *Reclaiming the Arid West: The Story of the United States Reclamation Service*, (New York: Dodd, Mead and Co., 1917), 189.

Division.[2]

The project draws its water from the Sun River and its two main tributaries, the North and South Forks. Gibson Reservoir, located above Gibson Dam at the mouth of the Sun River watershed, stores an active capacity of 99,000 acre feet. The reservoir releases water into the Sun River for diversion downstream into the Pishkun Supply Canal, or the Fort Shaw Canal. The Sun River Diversion Dam moves water into the Pishkun Supply Canal. The canal carries the flow to the 32,050 acre feet active capacity Pishkun Reservoir or to the 32,300 acre feet Willow Creek Reservoir through the Willow Creek Feeder Canal. The feeder canal stems from the Pishkun Supply Canal and empties into a natural channel to the reservoir. Water released from Pishkun Reservoir also flows through the Sun River Slope Canal that branches into several main canals for distribution to the Greenfields Division. Formed by the Willow Creek Dam, storage in Willow Creek Reservoir returns to the Sun River. Water for the Fort Shaw Division diverts directly from the river into the Fort Shaw Canal. Nine canal systems cross the Project, totaling 131 miles, with 562 miles of laterals, and 265 miles of drainage ditches.[3]

Weather, in all its moods and extremes, shaped the Sun River Valley. A climatological quirk known as a chinook wind makes Montana's winter a bit more bearable. The power of the chinook is visible after heavy snows cover the remnants of bluejoint grass and barley in the late fall and winter. Drifts melt quickly once the warm blasts travel down the valleys off the east slope of the Rockies. The warm air turns snow into runoff on days when the temperature inches past freezing. Spring's arrival coincides with the last frost in mid-May. The length of the irrigation season is 150 days with demand for water peaking in July. In the Sun River Valley, the growing season averages 128 days between the season's last frost in May and the first freeze in mid-September. Average annual precipitation, recorded at the town of Fairfield, is 12 inches, with 9.4 inches falling between April and September. Temperatures slide between -40 degrees

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2. U.S., Department of Interior, Bureau of Reclamation, *Annual Project History, Sun River Project*, Vol. 70, 1969, 5; U.S., Department of Interior, Bureau of Reclamation, *Annual Project History, Sun River Project*, Vol. 1, 1909, 2-3.
3. U.S., Department of Interior, Water and Power Resources Service, *Project Data*, (Denver: 1981), 1197.

below in winter and 100 degrees at the height of summer.[4]

Historical Setting

Free for centuries to follow the buffalo, various native American tribes traversed the lands along the Sun River. The benchlands provided a thoroughfare between western hunting grounds and the Judith and Musselshell hunting grounds east of the Missouri River. During the seventeenth century, the Flathead-Salish-Kutenai tribes lived along the Sun River, but these groups lost control due to wars during the early 18th century with marauding Blackfeet. Eventually, over 10,000 Blackfeet commanded a 32,000 square mile territory extending from the Milk River to the north down to the Sun. The Blackfeet name for the Sun River, "The Great Medicine Road to the Buffalo," reflects the importance it held in their culture.[5]

In the summer of 1805, the Lewis and Clark party were the first whites to hear the Great Falls of the Missouri River and to walk along the banks of the Sun. Meriwether Lewis first saw the Sun as "a clear river, never overflowing its banks." More whites soon followed in the trailblazer's wake. The Blackfeet did not give up their lands easily, and other tribes and incoming whites feared them as the "Prussians of the Plains." In the 1830s, after whites brought smallpox to the tribe, an epidemic killed an estimated six thousand Blackfeet. An 1855 treaty with the survivors led to the Federal Government establishing an Indian agency a half-mile upriver from the present-day town of Sun River. Isolated from direct lines of supply, the agency had to be self-sufficient. The government's first agent, Colonel A. J. Vaughan, planted different varieties of fruits, vegetables, and small grains best suited to the soil and climate.[6]

In 1863, the discovery of gold in Alder Gulch (present-day Virginia City) opened Montana to a jumble of miners and adventurers. Boats ran up the Missouri River to Fort Benton, the western-most point of steamboat navigation. From Fort Benton, freighters hauled supplies to the placer diggings. During the same period, stockmen first drove cattle into the valley's

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4. *Annual Project History, Sun River Project*, Vol. 70, 1969, factual data map.
5. Judith K. Fabry, *Enlightened Selfishness: Montana's Sun River Project*, (unpublished Ph.D dissertation, Iowa State University, 1993), 7.
6. Newton Carl Abbott, *Montana in the Making*, (13th ed. rev.), (Billings, Montana: The Gazette Printing Co., 1964), 40.

foothills in spite of Indian protests. The Blackfeet responded by burning the Indian agency buildings. In 1866, the U.S. Army established their presence in Montana. On a southern bluff overlooking the Sun River, the government founded the post of Camp Reynolds. In a few months, the Army changed Camp Reynolds to Fort Shaw. The new name honored Colonel Robert G. Shaw of the 54th Massachusetts Volunteers, leader of a Civil War regiment of enlisted, black men. Around a 400 x 400 foot parade ground, Fort Shaw billeted 450 soldiers, and featured a hospital, library, and other buildings. Four years later, in 1870, Colonel John Gibbon marched his 7th U.S. Infantry into the Sun River Valley, taking station at Fort Shaw. Gibbon, like Colonel Vaughan before him, immediately took an interest in the soil and mountains. The surrounding topography inspired Gibbons to convert his sword into a ploughshare and plant flowers and vegetables along the parade ground.[7]

Protected by the military, commercial interests felt safe to develop and exploit Montana's resources. In the 1870s, Daniel Floweree drove large herds in from Oregon and Texas and established one of Montana Territory's largest ranching outfits. Town building occupied the dreams of other newcomers. One man, Paris Gibson, laid out the community of Great Falls next to the banks of the Missouri River. Another man, railroad tycoon James J. Hill, saw the economic potential of Great Falls. Hill's Great Northern Railway moved track by track to connect Montana to the rest of the nation. Along the way, the Great Northern promoted the city of Great Falls to settlers offering discounted rates on 160-acre dryland farms along the line. By mid-1880s, whites had obliterated the last great buffalo herds in Montana. With the buffalo on the verge of extinction, the Federal Government led the remaining Indians onto the reservations.[8]

In 1884, a group of Helena businessmen tried to dig the first canal from the North Fork of the Sun River north toward the Freezeout bench. Lack of money and interest soon ended their plans. As Montana joined the union as the 41st state in the nation in 1889, Herbert N. Wilson of the United States Geological Survey (USGS) led the first investigation of the new state's public

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7. *Annual Project History, Sun River Project*, Vol. 1, 1909, 50.
8. U.S., Department of Interior, Bureau of Reclamation, Miles Cannon, *Special Features in Relation to Government Reclamation Projects*, (1924), 2; Abbott, *Montana in the Making*, 155.

lands. Wilson and his men examined ten reservoir sites and several canal locations. As Wilson examined the surrounding canyons and benchlands, private interests launched the first successful attempt to divert water from the Sun. The Crown Butte Canal ran 18 miles, irrigating an area between Shaw Butte and Cascade. Crown Butte signaled a small triumph in a state where a dryland farming held most of most farmers' hearts, minds, and acreage.[9]

No authority took action on Wilson's survey until an investigation by the Montana Carey Land Act Board in 1901. Two years later, Charles H. Fitch of the United States Reclamation Service (USRS) conducted the Service's first reconnaissance of the region. Fitch estimated that almost 395,000 acres of land could be irrigated. The USRS saw the "possible future development" of Bowl and Basin Creeks, both tributaries of the Flathead River. Fitch believed canals would carry both creeks flow across the Continental Divide to the Sun River Valley. This plan included building an additional dam at Benton Lake, eight miles north of Great Falls, and a separate canal system. Reclamation later drop their plans to develop Bowl and Basin Creeks.[10]

One Montanan inside the USRS campaigned and strived to bring irrigation to the Sun River Valley. Samuel Bostwick Robbins graduated from Yale's Sheffield Scientific School, later working as an engineer for several Western railroads and mines. Beginning in 1891, he ran a civil engineering office out of Great Falls and dreamed of an irrigation project on the Sun River. Robbins believed upwards of a million acres near Great Falls could be watered by the Sun and Teton rivers. Robbins and some partners first tried to incorporate a canal and colonization company to irrigate the benchlands west of Great Falls, but the Panic of 1893 ended their plans. A decade later, in April 1903, the USRS needed a man familiar with the area and appointed Robbins as engineer. In contemporary photos, Robbins' gaunt face and choice of slouch hat and rough cut jacket, offered no indication that he was the driving force behind the project. Once in the employ of the USRS, Robbins' pen flowed with flowery descriptions designed to lure midwestern farmers and laborers to the valley. His encouragements to settle portrayed central

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9. Jane Willits Stuwe, ed., *Valley Ventures: Simms, Fort Shaw*, (Great Falls, Montana: Cascade County History, 1981), 2.
10. *Annual Project History, Sun River Project*, Vol. 1, 1909, 15, 41-2.

Montana as "the greatest farming country under the dome of Heaven," and Great Falls potential as "the greatest city in the northwest." Great Falls city fathers took up Robbins' call. They believed irrigation would reduce their costs for grain and vegetables and help diversify the local economy. By 1905, the USRS had just started massive undertakings on the Salt River in Arizona and the Newlands Project in Nevada. Promoters of a Sun River irrigation project realized they would have to make their case in Washington if their dreams were ever to become a reality.[11]

Project Authorization

In the summer of 1905, the USRS's Supervising Engineer Arthur Powell Davis advised Project Engineer Hiram Savage that if the people of central Montana wanted irrigation "they must hustle for it." By the winter of 1905-06, the people of Great Falls, and other smaller towns, heeded Powell's words. Citizens organized a series of public meetings to discuss the feasibility of a water project. Led by Robbins, the settlers subsequently sent a committee to Washington to lobby the Federal Government for a project. The developer of Great Falls, and former Senator, Paris Gibson, coordinated the settlers efforts and personally urged the Department of Interior and Reclamation Service to come to Montana. Their efforts convinced Secretary of the Interior Ethan A. Hitchcock to authorize construction of the Sun River Project under the tenants of the 1902 Reclamation Act on February 26, 1906. The authorization provided $500,000 from the Reclamation fund to irrigate approximately 100,000 acres of land. Congress approved opening the abandoned Fort Shaw military reservation to settlement, and in June 1906, the Department of Interior divided the military reservation into 206 farms averaging 88 acres in size.[12]

Construction History

Interior earmarked its $500,000 authorization for canal construction on the Fort Shaw

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11. *A Pictorial History of the Sun River Valley*, (Shelby, Montana: Promoter Publishing, 1989), 266-7; U.S., Department of Interior, Bureau of Reclamation, *Office of the Chief Engineer, General Correspondence*, entry 13, box 16, "Register of the Department of the Interior 1903," 211.

12. U.S., Department of the Interior, Bureau of Reclamation, *Repayment of Reclamation Projects*, (Denver: Government Printing Office, 1972), 460; *Annual Project History, Sun River Project*, Vol. 1, 1909, 53-4; Andrew Rodgers, *Federal Reclamation's Pioneer Period: A Biographical Study of Its Origins, Organization, and Early Work of its Engineer Corps*," Vol. 2, (Columbus, Ohio: 1966), 415-6; U.S. Department of Interior, Bureau of Reclamation, *General Administrative and Project Records, 1902-1919*, letter from A. P. Davis to H. N. Savage, August 10, 1905, entry 3, box 943.

Unit and building diversion dams. Besides digging canals and molding gravel into dams, Reclamation planned the development of two new towns, Simms and Fort Shaw, to encourage project settlement. Dam construction and town building were two lofty goals, but the isolation of Montana from the rest of the nation quickly hindered the Service's aspirations.

A board of engineers met at Great Falls on March 15, 1907 to open bids on the Sun River Project's first structure, the Willow Creek Dam. In an embarrassing turn of events, no firm submitted a bid. Reclamation's engineers tried to secure informal proposals for the work, but no contractor wanted to venture to Montana. Estimating the cost of building the dam at $105,000, the USRS ordered the work done by force account at a considerable savings over hiring a contractor.[13]

If contractors were hard to find, laborers were almost as scarce. Mining held first claim on the state's able-bodied working men. Boston and Montana Silver and Copper Smelter in Great Falls demand for local labor left Reclamation begging for workers and teams. The situation had the Director of the Reclamation Service, Frederick Newell, complaining to Secretary James R. Garfield in 1907, "Teams and laborers are scarce in the vicinity of the work, and such laborers as can be obtained are comparatively inefficient." As Reclamation geared up to construct Willow Creek Diversion Dam, a labor strike had just ended. Boston and Montana controls central Montana's labor force needed several hundred additional men to get their smelter back into operation. Common laborers at the smelter earned $3 a day and two horse teams with drivers received $6 a day for an eight-hour-day. Reclamation could only offer $2.50 for an eight hour day to both laborers and drivers with teams. To speed construction, Reclamation hired homesteaders to help build the dam "as an inducement to land seekers to settle Fort Shaw." A few months in, Reclamation saw the experiment as a mixed blessing. Some tackled their duties with gusto, while others "have an idea that as they are working for the U.S. they do not have to work as hard as for an individual. It is more satisfactory to use the ordinary 'hobo' and to hire

13. U.S., Department of Interior, United States Reclamation Service, *Sun River Project, Montana, Contracts, Contract Drawings and Specifications,* 1910, 119.

teams with no drivers."[14]

The labor situation convinced Reclamation to award contracts to private builders' to complete the Fort Shaw Canal. Four Montana contractors and one Minneapolis firm won the right to dig the five divisions of the Fort Shaw Canal. Government forces constructed all canal structures. The 12-mile long, 225 cfs canal supplied water to the Fort Shaw division through 85 miles of laterals. Construction began in May 1907, before concluding in July 1908. Twelve miles upstream from Fort Shaw, the Fort Shaw Diversion Dam is a rockfill overflow section dam that spans 400 feet across the Sun River. The diversion dam contains 3,000 cubic yards of material and stands nine feet high. At the point of diversion, the canal lies three feet lower than the river bed. The Government's foreman, Dick Atkinson, broke ground on the headworks on November 12, 1907. The concrete headworks feature four 4-foot x 4-foot cast iron gates that controlled the flow through the canal. The ditch has a maximum capacity of 225 cfs. Construction of a 1,565-foot-long siphon across Simms Creek began in June 1907 and took a year to complete.[15]

For the first time on a Reclamation project, electric draglines dug a canal system. The introduction of this new technology puzzled Reclamation engineers and potential contractors. After advertising the job, bidders expressed their skepticism over the efficiency of the new dragline. They submitted their offers based on the cost of moving dirt by the conventional method of teams and fresno scrapers. Through the efficiency of the two Bucyrus draglines, the contractor collected a larger profit.[16]

The drops are the most visually striking of the canal structures. Reclamation designed the drops to deliver water safely from higher to lower elevations. The project drops blend into their surroundings, instead of sticking out as a monument to man's control over nature. On the Fort Shaw Canal's lateral "C" wasteway, one-half to six foot boulders stand like sentries

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14. U.S., Department of Interior, Bureau of Reclamation, *General Administrative and Project Records, 1902-1919*, letter from Frederick Newell to James R. Garfield, April 27, 1907, entry 3, box 943; *Contracts, Contract Drawings and Specifications*, 120; *Annual Project History, Sun River Project*, Vol. 1, 1909, 168.
15. U.S., Department of Interior, United States Reclamation Service, *Seventeenth Annual Report of the Reclamation Service, 1917-18*, (Washington, D.C.; Government Printing Office, 1918), 126; *Project Data*, 1203.
16. U.S., Department of Interior, Bureau of Reclamation, *Fact Finders Commission Report*, (1923), sec. C, 5-6.

diffusing the force of the water as it travels down hill. The C Drop lowers the water 64 feet over a distance of 750 feet into the C Lateral. A surreal attempt to mimic a meadow brook, Reclamation designed the drop "to reproduce nature as exemplified by an ordinary mountain torrent, and at the same time to utilize materials nearest at hand and cheapest." Another unique drop is the Jewelson on the C-1 wasteway. The design of Jewelson resembles a natural falls, consisting of a sixteen foot baffled drop and a 29-foot sheer drop over a rock reef culminating in a stilling basin. The protruding baffle rocks also catch floating weeds before they gather and block the canal headgates. Other Sun River drops are concrete, trapezoidal chutes. The drops at Arnold Coulee, Pishkun Reservoir, and Big Coulee Drops No. 1 and 2 are larger pipe drops that terminate into a circular concrete stilling basin.[17]

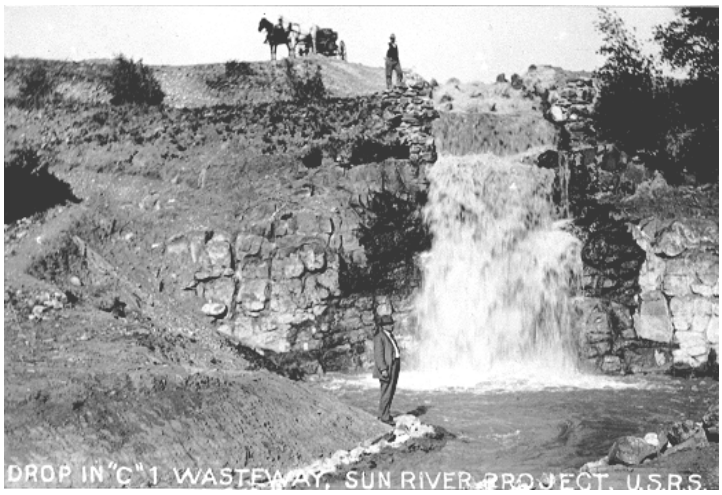

Figure 2 "C" drop waste way.

In 1905, Assistant Engineer F. F. Pendergrast surveyed the north fork of the Sun at a point near the mouth of a canyon. He found a site where the flow would travel into a natural channel. Two years later, a board of engineers recommended building Willow Creek Dam as one of Reclamation's first hydraulic fill structures. The hydraulic fill method of construction requires flumes to carry and deposit silt and clay to form the dam's core. The flumes also delivered sand and gravel to create the upstream and downstream faces. Reclamation used the waters of Willow Creek to sluice the material through the flume.[18]

Lack of Federal money suspended work from 1908 until October 1909. Late in 1909, a board of engineers led by Consulting Engineer D.C. Henny, changed construction methods. The

17. *Annual Project History, Sun River Project*, Vol. 1, 1909, 78, 94-8, 144.
18. Eric B. Kollgaard and Wallace L. Chadwick, eds., *Development of Dam Engineering in the United States*, (New York: Pergamon Press, Inc., 1988), 681-2.

board recommended placing materials on the top of the embankment with dump wagons, a grader, roller and steam shovel. Low flows in Willow Creek forced Reclamation to scrap the hydraulic fill method. Gravel and sand gathered from a nearby borrow pit would complete the dam. The honor of being Reclamation's first hydraulic fill structure went to the Conconully Dam on the Okanogan Project in Washington. In late 1910, the project took delivery of a new Atlantic Steam Shovel at the Vaughan rail station. Government crews knocked down the shovel at the station and freighted the pieces by team to the construction site for reassembly. From the Umatilla Project in Oregon, two 16-ton American Locomotive dinkies, 24 4-yard ballast side dump cars, one flat car, and rail steel arrived at the dam site. The machinery would collect and fill the material for the embankment. During 1910-11, crews placed two feet of riprap on the dam's upstream face, and excavated the gate shaft and lined the tunnel. Construction of the embankment resumed in April 1911, as dump wagons transported material to the embankment from a borrow pit 700 feet downstream. In May 1911, a 9-ton roller built on railcar wheels drawn by 12-ton Port "special" traction engine tamped gravel and rock into layers three to six inches thick. The government accepted Willow Creek Dam as complete in November 1911.[19]

The dam's construction camp featured a combined office and engineers quarters, two cottages, store house, mess house, five bunk houses, blacksmith shop, barn and corral, and government mercantile. A Model 10 Buick, shipped from Minneapolis with a sticker price of $1,162, transported engineers "two times" as fast as teams. By 1915, the project operated four 5-passenger touring cars to transport Reclamation's men and light freight. The repercussions of driving over unpaved benchlands resulted in a "pretty heavy" tire bill, but the engineers cherished the automobile as an improvement over horse and mule teams.[20]

The dam first stored water in 1916. Reclamation raised Willow Creek's crest by two feet in 1917, and by another 12 feet in 1941. Since 1941, Willow Creek Dam stands 93 feet high

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19. *Annual Project History, Sun River Project*, Vol. 1, 1909, 181; U.S., Department of Interior, Bureau of Reclamation, *SEED Report for Willow Creek Dam*, (Denver: 1985), 6-7.
20. *Annual Project History, Sun River Project*, Vol. 1, 1909, 184; U.S., Department of Interior, Bureau of Reclamation, *Annual Project History, Sun River Project*, Vol. 2, 1910-1, 37; Charles P. Williams, "The Automobile on the Sun River Project," *Reclamation Record*, (October 1917): 469.

with a crest length of 650 feet, containing 275,000 cubic yards of material. An open spillway channel 700 feet wide at the ground surface carries a capacity of 10,000 cfs. The outlet works tunnel runs through the right abutment controlled by one slide gate. The Willow Creek Reservoir holds 32,400 acre-feet of water.[21]

In May 1912, the local press published a memo written by Reclamation Director Frederick Newell criticizing area roads, the project's agricultural potential, and the engineering difficulties the USRS encountered. Publication of Newell's memo in the *Great Falls Daily Tribune* angered both dryland and irrigated farmers. Farmers blamed Great Falls for only wanting the government to spend money in town and not caring for the farmers' welfare. A *Tribune* editorial accused President William Taft and the Department of the Interior of "pettifogging, shyster, hair-splitting talk" accusing the government of lacking the enthusiasm for this mission. A group of dryland farmers opposed to any further construction gathered in the summer of 1913 to decide what further action to take against Reclamation.[22]

By a cruel coincidence, the weather also conspired against the irrigators. The wet springs and summers of 1914 to 1916 gave the drylanders a sense of security and fueled antagonism toward Reclamation. By 1916, they held a parade on the streets of Great Falls displaying large banners that read: "We are dryland farmers from the Fairfield Bench. We don't want water." The anti-irrigation forces sent a dryland farmer to Washington to lobby Montana's Congressional delegation into supporting abandonment of the project. Back at Sun River, dry-land farmers denounced their irrigation neighbors as incompetent farmers. Only the start of a dry cycle by decade's end, cooled the arrogance of the drylanders. Locals tell of one farmer who mortgaged his property to buy a big car to drive in the Great Falls parade to flaunt his prosperity. As seasons without rain mounted into years of drought, the farmer lost both the car and his farm.[23]

The USRS ran the Sun River Project out of the abandoned Fort Shaw military post. After

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21. *Fifteenth Annual Report of the Reclamation Service, 1915-16*, 227-8.
22. *Great Falls Tribune*, May 18, 1912, p. 4; *Great Falls Tribune*, July 13, 1913, p. 4; *Enlightened Selfishness*, 62.
23. *Boots & Shovels: A History of the Greenfield Irrigation District*, (Fairfield, Montana.: The Fairfield Times, 1978), 41.

the Army left the post in 1891, an Indian Service school briefly occupied the fort before Reclamation. On their arrival, Reclamation forces found crumbling abode walls, clogged sewer pipes, and offices and quarters in need of renovation. Stoves and kerosene lamps did nothing to quiet complaints from staff about the cold offices during the long Montana winters. In spite of its disintegrating condition, the post remained a beacon for weary newcomers at journey's end. Many families spent their first night in the Sun River Valley sleeping on the floor of the Reclamation office. The few available diversions at the old post could be found in the abandoned harness shop nicknamed "the opera house." Reclamation employees turned the large, wooden-floored space into a stage for presentations and dances. Dance fever reached such a pitch that the Reclamation staff sent for an instructor from Great Falls to teach them some new steps. Time and the elements eventually caught the old military post, and Reclamation moved to downtown Great Falls in 1919. By 1924, Reclamation moved again to a 2.5 acre lot west of the railroad tracks in Fairfield. Since then, Fairfield has been home to both Reclamation's project office and the Greenfields Irrigation District.[24]

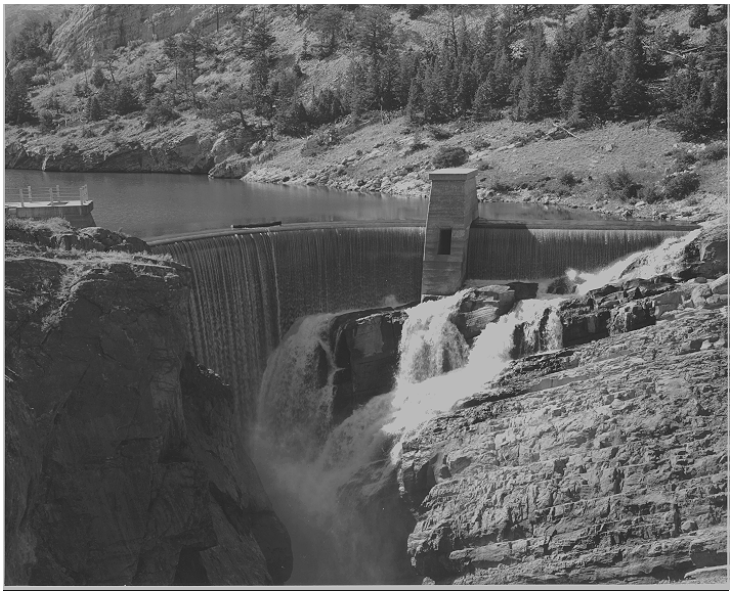

Figure 3 Sun River Diversion Dam.

After completion of Willow Creek Dam, Reclamation proceeded to build the Sun River Diversion Dam. The dam stands 132 feet tall above the mouth of the Sun River Canyon. The crest of this concrete arch dam is 261 feet long and contains 6,500 cubic yards of concrete. Similar to the canal drops, Reclamation's designers and engineers attempted to recreate nature, as the dam's spillway overflow crest resembles a cascading waterfall. Initial construction work from

24. U.S., Department of Interior, Bureau of Reclamation, *General Correspondence File, 1902-42*, entry 3, box 1376, letter from Arthur P. Davis to Alexander T. Vogelsang, November 29, 1919; Stuwe, ed., *Valley Ventures*, 147.

April to December 1911 involved crews conducting diamond-drill borings on the North Fork of the river. In the fall of 1912, Reclamation established a temporary camp on the flat below the dam site. They also contracted with John L. B. Mayer of Augusta, Montana to cut lumber for a camp to house 200 men, and build a temporary flume, forms, and miscellaneous structures. By May 1913, crews began to raise a 1,500-foot-long temporary diversion flume to carry away water from the construction site. The flume carried the flow from the lower falls above the dam through the canyon to the open channel downstream. The work took the entire summer of 1913 to complete. During foundation stripping, water seeped through the temporary diversion dam. An electric centrifugal pump diverted seepage back into the flume. By December 1913, a thousand cubic yards of concrete formed the dam's base, bringing the dam to 10 feet above the sill of the lower temporary outlet gate. Water gushed through this outlet as Reclamation ordered the temporary flume dismantled. Winter sent operations into hibernation until July 1914.[25]

By July 1914, spring run-off had subsided to the top of the concrete in the base of the dam. After the long break, crews erected a new concrete plant at a point high enough to complete the dam. With the plant in place, concrete placement began in August 1914. As the dam rose 10 feet above the gate sill of the temporary outlet, crews closed the lower temporary gate and filled the lower temporary outlet conduit with concrete. Crews finished placing concrete in November 1914, with all work complete by March 1915. The upper outlet gate closed and water turned over the dam crest in April 1915.[26]

Between 1911 and 1915, government forces built roads and strung telephone lines to open access and speed communication. Roads were necessary to haul the diamond drill, lumber from a sawmill on Beaver Creek and to transport other material. Branching out from Willow Creek Reservoir out to Sun River Diversion Dam, a little over 40 miles of telephone wire webbed the landscape by the late summer of 1915.[27]

On December 8, 1914, Reclamation's engineers mulled offers to construct the Pishkun

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25. *Fifteenth Annual Report of the United States Reclamation Service, 1915-6*, 230.
26. *Ibid*.
27. *Ibid*., 233-4.

Supply Canal from the Sun River Diversion Dam to the Pishkun Reservoir. The Bates and Rogers Construction Co., of Spokane won the job on a $40,000 bid. Bates and Rogers installed 800 feet of rectangular concrete conduit, about 2,000 feet of open-cut canal in heavy gravel, and a concrete lip spillway and discharge channel. Work began in March 1915 through reaches of broken seamy rock and coarse gravel. A drag-line excavator, running on compressed air from a USRS plant, moved the bulk of the excavation. The porous canal banks required engineers to experiment with hydraulic sluicing, (also called long-distance silting), to prevent excess seepage. Reclamation installed a series of electric pumps on various points on the canal's upper slope to ground-sluice material into the canal. Engineers hoped the river's flow would carry and deposit the silt over the sides and bottom of the canal. Long-distance silting proved inaccurate and costly. Reclamation decided to scatter fine material over the canal's leakiest sections. The 12 mile long canal flows through two tunnels, 980 feet long and 2,280 feet long, and into many drain and control structures after crossing the river. The Sun River Crossing is a 700-foot-long riveted steel pressure pipe conveying water across to the north side of the canyon. Pacific Tank & Pipe Co. executed the $7,817 contract to place the pipe. A steel truss bridge built by Des Moines Bridge & Iron Co. held the pressure pipe over the river. In 1920, the government determined the Pishkun Supply Canal ready for service. Between 1935 and 1938, the government enlarged the canal's diversion capacity of 1,400 cfs.[28]

Pishkun is a Blackfoot word conservationist George Bird Grinnell translated as "deep-blood kettle," or a buffalo jump or kill area. Blackfoot warriors stampeded the buffalo over the 30 foot high sheer cliff. White settlers first called the area "Stone Johnnie," before the government settled on Pishkun as the name of the storage reservoir. Eight zoned earthfill dikes seal the low ground around the reservoir. The dikes range in height from 12 to 50 feet, feature a top width of twenty feet, and a total crest length of 9,050 feet. A concrete conduit located in Dike No. 4 serves as the reservoir's outlet works. The outlet structure has a maximum capacity of 1,600 cfs. There is no spillway at the reservoir. After a year of construction, the reservoir first

28. *Ibid*., 231; R. B. Stevens, "Engineering Investigations: Hydraulic Sluicing for Blanketing Porous Canal Banks, Sun River Project," *Reclamation Record*, (March 1918), 125-7.

stored water in 1931. The contractor Smith and Thornquist enlarged Dikes No. 1 and 2 in 1940. Since the 1940s, the Pishkun Reservoir holds 30,200 acre-feet of water.[29]

The Sun River Slope Canal system furnishes water for the Greenfields Division. The Sun River Slope and Spring Valley Canals combined extend 32 miles from the Pishkun Reservoir to a drop at Fairfield. The diversion capacity is 1,600 cfs. Three major drops and various control structures and lateral turnouts are a part of the canals. The MacArthur Brothers Company of New York constructed the canal between 1917 and 1919. Greenfields Main Canal heads at the end of Spring Valley Canal, extending 25.4 miles northeast. Greenfields Main has an initial capacity of 1,200 cfs, but gradually reduces in size to 10 cfs at its terminus. The Greenfields Main supplies the Greenfields South Canal at a point about two miles below the main canal's start. Greenfields South's initial capacity is 425 cfs, running over 16.7 miles of benchland.[30]

America's involvement in World War I added another demand on finding employable men. Native Americans from the Rocky Boy's Indian Reservation, trimmed and laid the canal's drain tile for $4 a day. An employment recruiter, nicknamed a "Man Catcher," walked the streets of Great Falls and Butte with little success in locating willing, or desperate, laborers.[31]

O'Connor and Helean Construction of Great Falls constructed Greenfields Main and South from 1913 to 1920. Greenfields South supplies the Mill Coulee Canal. The 10.7-mile long Mill Coulee's initial capacity is 200 cfs. Mill Coulee has an initial capacity of 200 cfs that shrinks to a minimum capacity of 54 cfs after its 10.7 mile long run. An impressive engineering achievement, the network of canals, laterals, and drops were only a prologue to the technical centerpiece of the Sun River Project.[32]

In the 1920s, most water users could not repay the government. Still, the gradual expansion of the irrigated lands during the same period and increased water requirements

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29. *Project Data*, 1199. George Bird Grinnell, *Blackfoot Lodge Tales: The Story of a Prairie People*, (New York: Scribner, 1892), 228.
30. *Fifteenth Annual Report of the Reclamation Service*, 231-2; U.S., Department of the Interior, Reclamation Service, *Annual Project History, Sun River Project*, Vol. 16, 1915, 20; *Project Data*, 1200.
31. *General Correspondence File, 1902-42*, A. H. Ayers to F. E. Weymouth, September 12, 1918 and November 23, 1918; open letter from A. H. Ayers to Project water users, September 12, 1918, George O. Sanford to Weymouth, May 23, 1919, all entry 3, box 1352.
32. *Annual Project History, Sun River Project*, Vol. 70, 1969, factual Data map.

dictated the construction of Gibson Dam. The government's interest in the future location of Gibson Dam reached back to Herbert Wilson. In 1889, Wilson designated a canyon on the north fork of the Sun as an excellent location for a dam. In 1911, an USRS Board of Engineers agreed that Wilson's choice of Site No. 2 would be the best place for a large dam. Reclamation launched a preliminary survey in 1914, drawing up the first designs by decade's end.

Led by Chief Design Engineer, John (Jack) L. Savage, Gibson was the first arch dam Reclamation designed by the trial-load method. Trial-load relies on correct mathematical analysis to determine deflection, moment, thrust, and shear in the design of both fixed and hinged arch dams. First proposed by mathematics professor William Cain in 1922, trial-load grew to be a point of contention in the engineering community. Some engineers opposed Cain's theories on the grounds his methods relied too heavily on mathematics. Cain's concepts did intrigue one group of engineers and these men sought to put his ideas to the test. In the mid-1920s, engineers assigned to the Reclamation Designing Section in Denver believed Gibson Dam's entire load could be carried by compressive stresses in both the arch and cantilevers. The wide, flat-bottom valley serving as the dam site demanded that most of the cantilevers stand at approximately the same maximum height. Economics, more than experimentation, drove design. Reclamation estimated the trial-load method could save 41,000 cubic yards of concrete over a gravity dam alternative. Unlike other contemporary Reclamation arch dams of the variable radius type, Gibson featured a vertical upstream face. The upstream face has a uniform radius of 405 feet while the downstream face has a varying slope from top to bottom and from crown to abutments. The radius of downstream

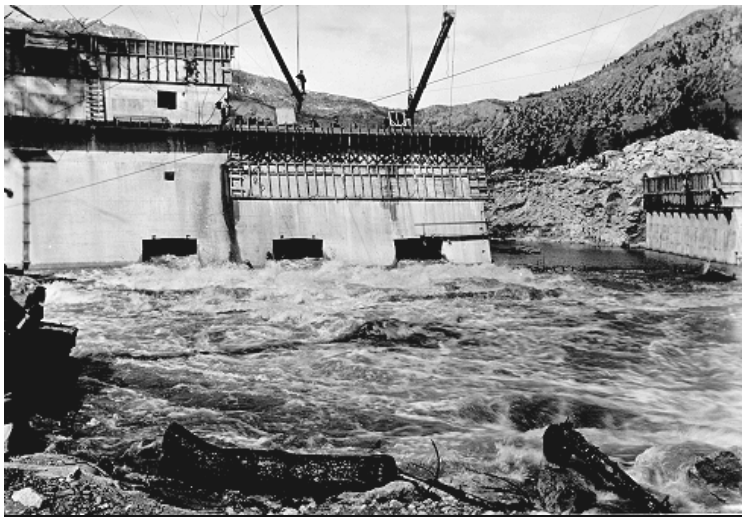

Figure 4 Gibson Dam construction.

face reduces from 390 feet at the top to 201 feet, at 195 feet below the crown. The dam is 15 feet thick at its top, descending to a maximum base width of 117 feet.[33]

Gibson Dam was more than a new example of structural design. It reflected a period when dams allowed engineers a chance to make an aesthetic statement. The half-moon, concrete arched dam stands 199 feet high with a top width of 15 feet and a base width of 117 feet, trapping 99,000 acre feet of water when full. The crest length is 960 feet and more than 167,000 cubic yards of concrete formed the dam. In August 1924, Reclamation established an engineering camp at the dam site, naming Homer Gault as engineer in charge of construction. The Utah Construction Co. of Ogden, in September 1926 won the construction contract with a bid of $1.5 million. Utah Construction's Albert E. Paddock served as the contractor's production superintendent. After Reclamation reassigned Homer Gault to another project, Washington appointed Ralph Lowry construction engineer. Lowry later worked as construction engineer for the Shasta Dam on California's Central Valley Project.[34]

Excavation began in December 1926. The underlying rock formation is crystalline limestone with several large fissures following the bedding. During initial construction, crews excavated five to 30 feet of solid rock before the various seams and joints were tight enough for the foundation. The contractor's men used air-hammer drills, shot, steam shovel, and muscle to clear the foundation and abutment's limestone. Initial operations also included pressure grouting the full length of the cutoff trench to form an impermeable curtain and the installation of a drainage system to relieve uplift pressures.[35]

A wooden flume first diverted the flow of the river, but as the dam rose, three 12 x 16 feet wide openings allowed the river to pass through the dam. Bulkheads formed of 24 x 24-inch timbers, and held open by a cable, fitted into the openings. In June 1929, men suspended on chairs lowered the bulkhead gates into eight feet of water, dropping the flow through the dam to 1,500 cfs. The third gate ring stuck, and the cable had to be cut with a torch. Cinders dumped in

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33. Kollgaard and Chadwick, eds., *Development of Dam Engineering in the United States*, 229, 266-8.
34. "Design and Construction of Two New Reclamation Dams," in *Engineering News-Record*, (June 18, 1931), 998-1000; Rodgers, *Federal Reclamation's Pioneer Period, Part II*, 429.
35. "Design and Construction of Two New Reclamation Dams," 998.

front of the gates prevented water leaking from the bulkheads. Concrete and grout filled the remaining openings and gaps. Reclamation designed the spillway as an uncontrolled drop inlet into a 29.5 foot diameter vertical shaft, turning into a horizontal tunnel of the same size. Concrete lines the shaft and tunnel while the outlet channel remained unlined.[36]

A site 1,500 feet downstream from the dam served as the gravel deposit for concrete production. Concrete spun in two 2-yard mixers, each discharging into a hopper for delivery into 2-yard bottom-dump cars hauled by 7-ton gasoline locomotives, known as dinkies. These cars emptied their load into 4-yard hoppers. The hoppers fed buckets attached to two steel hoisting towers 280 feet high. Before placement, workers wire brushed and cleaned the joints with a water-jet and coated the horizontal joints with an inch thick layer of grout. Towers stood at the canyon's abutments while a chute-type placement system rose on scaffolds. From the towers, concrete flowed down chutes before reaching a vertical drop pipe. Located six to eight feet above placement, winds frequently rocked the terminal end of the chute. Utah Construction avoided placing concrete during winter's bitterest days. A canvas cover thrown over the concrete warmed operations during winter while steam heat and oil-burning salamanders heated the enclosure. Montana Power and Light linked 28 miles of transmission line from Augusta to the dam site. Originally designed to deliver power through two 6-foot diameter penstocks through the dam on the south side of the river, Reclamation bulkheaded the penstocks after construction. Gibson Dam never generated power because the reservoir cannot store enough water to provide a continuous supply of electricity.[37]

As a prototype of the trial-load method, Reclamation intended to study how Gibson performed in the field. Gibson is also the first dam built with instrumentation to measure structural behavior. The controls measured uplift pressure at the base and within the concrete, variations in temperatures, loads at various points, and radial deflections due to changes in concrete temperature, and water load. Twelve feet from the upstream face, three shafts for

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36. *Ibid*., 999.
37. U.S., Department of Interior, Bureau of Reclamation, *Annual Project History, Sun River Project*, Vol. 28, 1927, 36, 38; "Design and Construction of Two New Reclamation Dams," 1000; Kollgaard and Chadwick, *Development of Dam Engineering in the United States*, 398.

experimental purposes, housed the necessary instrumentation. Horizontal vent pipes embedded in the concrete about ten feet above the bottom of the shafts extended to the downstream face of the dam. Engineers collected information on the dam's behavior periodically until 1942.[38]

During three years of construction, the number of men working at Gibson Dam varied from 115 to 225. In that period, pay remained constant for common labor at 50 cents an hour, drillers earned 65 cents an hour, and carpenters took home 80 cents an hour. In February 1929, a carpenter's helper died after an 80 foot drop down a spillway shaft. That mishap preceded a bizarre accident that resulted in the death of Albert E. Paddock, Utah Construction's project superintendent. A little after 8 a.m. on April 20, 1929, Paddock stood at the dam's south tower when a workman fell from a tower 60 feet to his death. The falling worker knocked Paddock down too, causing the superintendent to tumble another 40 feet. Paddock's internal injuries led to his death two hours later. Paddock came to Utah Construction from Reclamation and helped the contractor develop the Hetch Hetchy Project, bringing water to San Francisco from Yosemite National Park.[39]

The Gibson construction camp included twelve bunkhouses, five houses for the foremen and clerical staff, store, office, warehouse, machine shop, and recreation hall. At the height of prohibition, there were other diversions available in the immediate area that the camp could not offer. As *Montana: A History of Two Centuries* related, "prohibition failed all across the country, and nowhere more spectacularly than in Montana." One pool hall in Great Falls sold alcohol "over the counter about as freely as soft drinks" to both Federal and the contractor's men. In October 1929, Project Manager George O. Sanford reported Government employees openly drank and the contractor's dragline operators lost several shifts. In prohibition Montana it was just as easy to find a drink on the farm as it was down a back alley. Sanford reported to his supervisors in Washington that one homesteader ran a still out of his house. He also identified

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38. *Development of Dam Engineering in the United States*, 400; "Design and Construction of Two New Reclamation Dams," 999.
39. U.S., Department of Interior, Bureau of Reclamation, *Annual Project History, Sun River Project*, Vol. 30, 1929, 45; *Western Construction News*, (May 10, 1929), 252; *Annual Project History, Sun River Project*, Vol. 28, 1927, 40.

other homesteads across the Sun River Canyon where a man could find an illegal drink.[40]

Three years of designs, accidental deaths, and illicit diversions culminated in the dam's first storage in December 1929. Gibson's completion coincided with the arrival of the Depression, adding another burden to irrigators. Ironically, Sun River was about to know its first successes.

Post Construction History

The arrival of the Civilian Conservation Corps (CCC) bolstered the Sun River Project during the mid-to-late 1930s. CCC enrollees of Company No. 1999 first appeared at Camp BR-33 in 1935, establishing a camp of tents and temporary structures near the Pishkun Reservoir and the Sun River Slope Canal. The 146 men of CCC Company No. 1999 improved the canal and reservoir, conducted wildlife biology studies, and constructed campsites, hearths and shelters. On June 18, 1936, the enrollees responded to the failure of concrete lining on the Pishkun canal below the tunnel no. 3 outlet. A new camp, BR-80, absorbed BR-33 in 1938. This new group made improvements to the Willow Creek Feeder Canal, fought forest fires and maintained local roads.[41]

The Gibson reservoir increased from 88,560 acre-feet to its present capacity of 105,000 acre feet after a 1938 spillway modification. Provisions in the original design allowed for installation of radial gates on the spillway lip later. The gates increased the storage capacity of the reservoir by 15,000 acre feet without raising the crest of the dam. Reclamation installed six 34-by-12 foot radial gates around the 29.5 foot diameter morning glory spillway. Other improvements to project structures included enlarging the Pishkun Reservoir to 32,000 acre-feet in 1940, and raising the crest of the Willow Creek Dam by 12 feet in 1941. Barnard-Curtiss Co. of Minneapolis won the right to enlarge the Willow Creek Dam, replace the outlet works and

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40. *General Correspondence File*, George O. Sanford to S. E. Roddis, October 30, 1929, entry 3, box 1376; Michael P. Malone, Richard B. Roeder, William L. Lang, *Montana: A History of Two Centuries*, (Seattle: University of Washington Press, 1991), 265.
41. U.S., Department of Interior, Bureau of Reclamation, *Annual Project History, Sun River Project*, Vol. 37, 1936, 11-2, 14.

construct the spillway. The dam's reservoir subsequently held 32,400 acre-feet of water.[42]

In August 1959, Reclamation entered a $100,000 program of rehabilitation and betterment with Fort Shaw Irrigation District. This included the reconstruction of laterals, replacement of wooden structures with concrete, and extensive repairs on Simms Creek Siphon and the collapsed outlet tunnel on the Willow Creek Dam.[43]

On June 7 and 8, 1964, a combination of heavy rains along the Continental Divide and heavy snowmelt lifted 60,000 cfs of floodwater three feet over the top of Gibson Dam. The flood was the largest in the recorded history of the Sun River Valley, as certain places along the river received 14 inches of rain during the 37-hour storm. In 1971 and 1972, Reclamation installed two hydraulically controlled jet-flow gates to replace the old needle valves in the outlet works. The new gates increased the discharge capacity to 30,000 cfs.[44]

The events of June 1964 occupied Reclamation's policy toward Gibson for the next decade-and-a-half. During the 1970s, a variety of studies found Gibson could not withstand an "once in a century" flood, or major earthquake. Reclamation authorized many different modifications from July 1980 to January 1982 to bolster the dam. Reclamation contracted with Morning Star Enterprises of Lame Deer, Montana to place a series of knob-shaped rock bolts to anchor a concrete cap. A concrete strip covers about 1,900 cubic yards of the dam's right abutment. The cap protects the downstream abutments, but detracts from the surrounding natural beauty. Final cost of the concrete cap totaled $1.8 million. Morning Star also placed aeration piers on top of the dam to maintain the downstream face, installed controlling equipment in the spillway gates, and placed structural behavior monitors to monitor the dam's stability. The contractor also widened a road leading to the damsite.[45]

Fort Shaw Canal required another rehabilitation and betterment make-over by the mid-

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42. U.S., Department of the Interior, Bureau of Reclamation, *Annual Project History, Sun River Project*, Vol. 42, 1941, 31-80, 186.
43. *Annual Project History, Sun River Project*, Vol. 70, 1969, 4.
44. *Development of Dam Engineering in the United States*, 400.
45. U.S., Department of Interior, Bureau of Reclamation, *Technical Report of Construction: Gibson Dam Modification, Sun River Project, Montana*, (Billings, Montana: September 1982), 1; U.S., Department of Interior, Bureau of Reclamation, *Design Summary for Gibson Dam Modification, Sun River Project, Montana*, (March 1979), 3, 9, 42. *Development of Dam Engineering in the United States*, 400.

1980s. At a cost of one million dollars, the modifications reduced excessive seepage from canals, upgraded existing lateral systems, and reduced excessive maintenance costs. In 1996, two hundred cubic yards of material sank in the center of the Willow Creek Dam. Eroded material from the 1958 repair of the dam's outlet tunnel caused the rock and gravel to fall in. The situation prompted a visit by Reclamation Commissioner Eluid Martinez with local irrigators in Great Falls discussing a timetable to fix Willow Creek and other aging features. While no structure on the Sun River Project has ever failed, almost every decade since its conception has seen modification and rehabilitation of some kind.[46]

Settlement of Project

The Sun River Project's birth place was not on the benchlands, but in the offices and homes along Great Falls' Main Street. The town's support did not prevent the project spending 40 years in the fiscal wilderness. In the century's first decade, the capitalists of Great Falls believed that a Federal reclamation project would create economic opportunities for the surrounding rural area, ultimately benefitting their interests. A correspondent in the *Great Falls Tribune* writing in August 1913, saw Great Falls' promotion of irrigated farming as "enlightened selfishness."[47]

Because of various public land laws, more people homesteaded more land in Montana than they did in any other state. Reclamation's contribution to the land rush was the creation of two new towns, Simms and Fort Shaw. One of the oldest towns in Montana, Sun River, already existed at the division's eastern end. At the western end, the USRS founded Simms, and the near the old fort, located Fort Shaw. The USRS created these farm villages to encourage the growth of strong rural communities and eliminate the isolation felt by most farm families. The Federal Government planned Fort Shaw and Simms on 160-acre sites. Designers laid out eight main streets radiating from a central square, resembling spokes in a wheel. The USRS offered the lots at public auction at minimum prices to homesteaders. Avoiding the prospect of sprawl, the USRS sold lots in only one quarter of the townsite at a time. After selling the properties,

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46. U.S., Department of Interior, Bureau of Reclamation, *Report on Proposed Rehabilitation and Betterment Program, Fort Shaw Division, Sun River Project, Montana*, (Billings, Montana: October 1984), 5; Interview with Steve Davies, Billings office of the Bureau of Reclamation, August 28, 1996.
47. *Great Falls Tribune*, 2 August 1913, p.4; Fabry, *Enlightened Selfishness*, 62.

Reclamation appraised and opened the next quarter for development, all the while encouraging commercial development and colonization.[48]

The differences and similarities between those who first settled the Fort Shaw and Greenfields Divisions offers insight into the character of both divisions. Holding farms ranging in size from 40 to 80 acres, Fort Shaw newcomers were overwhelmingly native born with over 60 percent experienced in either dryland or irrigated farming. Once on the farm, settlers in the Fort Shaw division secured short-term loans from the Great Falls banks at 10 percent interest. The credit bind resulted in scant development on the southern bank for many years. The Greenfields' settlers were a little more industrious. Over 70 percent of Greenfields' early homesteaders came from Scandinavia bringing with them an average of $1,000 to $2,000 in start-up capital. Holding tracts up to 160 acres, many original entrymen left their farms to work in the Boston and Montana smelter. With the money they earned, they fenced their property and raised their first barns and storage buildings.[49]

A public notice of March 26, 1908, set the construction charge for the Fort Shaw unit at $30 an acre, payable in ten equal yearly installments. Charges escalated over the next decade, eventually topping out at $60 an acre by 1920. In 1926, the Fort Shaw and Greenfields Irrigation Districts formed. Both irrigation districts agreed to repay construction costs relative to production with annual installments of 5 percent of average gross income for the preceding 10 years. The Fort Shaw District agreed to assume their obligations totaling $475,840 under individual water-right applications with delinquent charges and penalties funded. The Greenfields Irrigation District assumed operation and maintenance of the Greenfields Division on January 1, 1931. The district headquarters is 37 miles northwest of Great Falls in the town of Fairfield. It is also the headquarters of the entire Sun River Project.[50]

In attempting to clear a path for both agriculture and business, the belief spread that Reclamation over played its hand. In testimony given before a Reclamation board of review

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48. Malone, Roeder, and Lang, *Montana: A History of Two Centuries*, 232; *Enlightened Selfishness*, 16-7.
49. *Fact Finders Commission Report*, F-1, F-2.
50. *Annual Project History, Sun River Project*, Vol. 70, 1969, 3; U.S. Department of Interior, Bureau of Reclamation, *Repayment of Reclamation Projects*, (Denver: Government Printing Office, 1972), 460-4.

held in Great Falls in June 1915, land owner A.W. Stedman stated the government "misrepresented" Sun River's chances for success to prospective pioneers. Stedman singled out Samuel Robbins for misleading newcomers "time and again" regarding the soil's "excellent drainage." In spite of the growing realization that soil may not have been as fertile as advertised, the demand for irrigated land reached a peak in the spring of 1920. The arrival of rainless summers curbed rising land prices.[51]

By the early to mid-1920s, Reclamation faced a predicament at Sun River. As of October 31, 1923, the government had spent $4.7 million dollars to water 10,579 acres of the Fort Shaw Division and 40,000 acres of the Greenfields Division. The value of the two divisions together came to a little over $2 million, $2.7 million short of the Federal investment. To prevent further Sun Rivers, Reclamation spent two years developing the Fact Finders Commission to study the triumphs and setbacks of reclaiming the West.[52]

Published in 1924, the *Fact Finders'* report found, "Before a project can be a success, it is necessary that the farmer on the land be successful. The acid test comes when it is time to make payments." From 1915 to 1920, the homesteaders at Sun River paid on time. A drought and post-war inflation shook the project's foundations. By 1922, 47 percent of Sun River Project water users could not pay their charges. A majority made an honest effort to pay all charges as they became due. *Fact Finders* singled out "a certain percentage" who "piled up debts to Reclamation, merchants, banks, and private individuals, and then left the country." To offer a simple illustration, Reclamation's Field Commissioner, Miles Cannon, graded each project on a scale of A to E. Sun River received an "E." On Cannon's scale, "E" meant if Sun River was a private business instead of a federal water project, it would be "Entirely insolvent, doubtless requiring liquidation through court proceedings."[53]

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51. U.S., Department of Interior, Bureau of Reclamation, *Sun River Project Montana, Fact Finders File, Vol. 5*,(1923), F-1-n; U.S., Department of Interior, Bureau of Reclamation, *Annual Project History, Sun River Project*, Vol. 51, 1950, 34; U.S., Department of Interior, United States Reclamation Service, *Report of Board of Review, Sun River Project Montana, Fort Shaw Unit*, (June 1915), 125.
52. *Annual Project History, Sun River Project*, Vol. 30, 1929, 73-4; *Special Features in Relation to Government Reclamation Projects*, 1.
53. *Fact Finders Commission Report*, J-4; U.S., Department of Interior, Bureau of Reclamation, *Sun River Project, Data Compiled for the Fact Finders Commission at the Request of the Field Reclamation Commissioner*,

(continued...)

The situation brought Secretary of Interior Herbert Work and the Commissioner of Reclamation Elwood Mead out to Great Falls in 1925. A June 26 meeting between Interior's leadership and the people of the Sun River Project resulted in "a hot night in Great Falls; hot both oratorically and climatically." Mead told the audience the Government had spent over $15 million in construction in Montana and over $2 million in operations. Repayments from Montana irrigators totaled $1.9 million. Mead threatened, "We must put an end to supplying water to people year after year without requiring them to pay for it." According to a 1972 Reclamation account study, the total contracted repayment charged to the Fort Shaw division totaled $548,380. Greenfields contracted repayment eventually amounted to $9.5 million. Sun River's total cost came to $10.4 million.[54]

Construction of the Gibson Dam stood as the government's solid commitment to Sun River. However, the repayment situation forced the railroads and Reclamation to spend the rest of the 1920s searching for homesteaders. On March 15, 1930, the Agricultural Development and Colonization Committee of the Chicago, Milwaukee and St. Paul Railroad visited the project. Ralph Reynolds, commissioner of the committee looked into transporting Mormons from Federal reclamation projects in Idaho and Utah. That suggestion met with negative reaction among the existing residents, but the railroad began promoting Sun River throughout the midwest.[55]

Because of the railroads' efforts, the project determination to succeed blossomed. The 1931 *Project History* commended Sun River's "excellent progress," pointing to the increase in the number of debt-free farmers deciding to go ahead with developing their farms. As clouds of dust choked dryland farming across the Great Plains, farmers moved in rising numbers to irrigated sections like the Sun River Project. Like much of the rural west, the Dust Bowl struck Montana hard. Many dryland farmers, in and around the project, abandoned their homes, leaving county assessors statewide to sell off the acreage for as little as a dollar an acre.

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53. (...continued)
(1923), 28; *Special Features in Relation to Government Reclamation Projects*, (1924), 2-3.
54. U.S., Department of Interior, Bureau of Reclamation, *Studying Reclamation with Secretary Work and Doctor Mead*, (Washington, D.C.: 1926), 41, 43; *Boise Statesman*, 18 January 1924, 2; U.S., Department of Interior, Bureau of Reclamation, *Repayment of Reclamation Projects*, (Denver: Government Printing Office, 1972), 460, 462, 464.
55. *Annual Project History, Sun River Project*, Vol. 30, 1929, 70.

Established land owners unable to farm their holdings, gladly leased portions of their acreage. The irrigated farmers now held an advantage and retained their farms, eventually adding to their holdings as the effects of the Depression lessened. During 1939 and 1940, the Farm Security Administration (FSA) administered the first Federal settlement program in the history of the Sun River Project. The FSA developed 228 farm units and opened to settlers more than 20,000 acres under Public Notices No. 27 and 28 in the Greenfields Division. A few of the settlers were unable to succeed. The FSA subdivided their holdings and combined them with adjacent units. By the end of World War II, there were more farmers in a better financial state thanks to the FSA. The stability generated by the FSA grew over the following decades. By 1992, a farm population of 1,680 people worked on 517 full-time farms. Sun River growers boasted of a gross crop value of $22.7 million that year with each irrigator averaging a return of $200 per acre.[56]

During the early days of the project, cattle, horses, and sheep grazed on grass and hay. By the 1920s, irrigators plowed under much of the grassland for wheat. Unfortunately, one or two good crops could not compensate for several years of crop failure. From the 1920s to the 1980s, principal crops grown on the project included wheat, oats, barley, flax, alfalfa, peas, and pasture grass. In the mid-1980s, individual growers in the Greenfields Division contracted to grow malting barley for the Anheuser-Busch Company. A decade later, the brewery has contracted around 60 percent of Greenfields' 80,000 acres. The $16 million return from the 1992 crop underlines malt barley's role as the project's savior. By the mid-1990s, an average size farm on the Greenfields Division totaled 320 acres. Project veterans state it would be impossible to make a profit if growers still farmed 80 acres as they did during the project's beginnings.[57]

The military, besides mining and agriculture, is a leading employer in central Montana.

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56. *Annual Project History, Sun River Project*, Vol. 28, 1927, 58; U.S., Department of Interior, Bureau of Reclamation, *Annual Project History, Sun River Project*, Vol. 32, 1931, 33; U.S., Department of Interior, Bureau of Reclamation, *Annual Project History, Sun River Project*, Vol. 51, 1950, 28; D. R. Davies, *Why Reclamation?*, in "The Reclamation Era," (February 1960), 24; U.S., Department of Interior, Bureau of Reclamation, *1992 Summary Statistics: Water, Land, and Related Data*, (Denver: 1992), 319.

57. U.S., Department of Interior, Bureau of Reclamation, *Annual Project History, Sun River Project*, Vol. 52, 1951, 4; Interview with Ron Dale, Greenfields Irrigation District, August 19,1996. Conducted by author. In 1996, Mr. Dale completed his 35th year as the Greenfield Irrigation District's clerk.

Malmstrom Air Force Base in Great Falls a part of the Strategic Air Command, and buried deep in the benchlands, several Intercontinental Ballistic Missile installations rust. The second largest city in Montana got a little bigger by the 1990s. According to the 1990 census, Great Falls' population stood at 55,097. By the middle of the decade, similar to other isolated places in the West, people found their way in greater numbers. Tract housing is beginning to consume farmland that once grew hay and wheat.[58]

Uses of Project Water

The alkali carried by the river left its mark on every aspect of the project from crumbling siphons to infertile soil. Engineers first noticed alkali eating away at the canal's pipes and structures. Irrigation farmers recognized the residue of salts on the surface of their land. Despite their best efforts, many irrigators' crops choked on salt. Project landowners made the best of the situation for most of Sun River's history. It took an ecological disaster in California to find out what flowed in the Sun.

Televised images of the dead wildlife at the Kesterson National Wildlife Refuge in California's San Joaquin Valley put Congress in an uproar by the mid-1980s. Ecological groups suggested the inclusion of Sun River as one of 19 Western locations targeted for Federal investigation. Led by the USGS, the study attempted to discover the effects of irrigation drainage on man, fish, and wildlife. In 1986, the Geological Survey found nitrate concentrations in the river over the Federal standard of 10mg per liter of nitrogen. Local groundwater carried traces of pesticides, but other toxins like mercury and selenium were at an acceptable level.[59]

Gibson, Pishkun and Willow Creek are three popular recreation spots. The man-made lakes offer boating and brown and rainbow trout fishing. Freezeout Lake on the Greenfields Division is a stopping place in the central flyway of the Canadian, Ross and Snow Goose, and other species of ducks and birds.[60]

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58. Interview with Ron Dale; *Montana: A History of Two Centuries*, 345.
59. J. R. Knapton, William E. Jones, and J. W. Sutphin, *Reconnaissance Investigation of Water Quality, Bottom Sediment and Biota Associated with Irrigation Drainage in the Sun River Area*, (United States Geological Survey, Helena, Montana: 1988), 56; *Seventeenth Annual Report of the United States Reclamation Service, 1917-18*, 176.
60. *Project Data*, 1201.

Conclusion

The "invisible hand" of the free market never lifted a shovel to dig a canal, and cavalry officers never intended to raise crops, but survival pushed the representatives from each group to do things outside their normal capabilities. In their wake, irrigators squared off against dryland farmers, townspeople pushed harder for irrigation than most farmers, and stability and success did not come overnight. Going into the game, Reclamation knew that irrigation in Montana was a gamble, but the government was willing to wait decades to collect.

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