

# Hanover-Bluff Project: Pick-Sloan Missouri Basin Program

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## **Hanover-Bluff Project: Pick-Sloan Missouri Basin Program**

The Flood Control Act of 1944 authorized construction of literally dozens of irrigation projects, large and small, in the Missouri River basin. Some, like the Garrison Diversion Unit and the Oahe Unit, are large in scale and the subjects of much controversy; others are smaller and less known. The Hanover-Bluff Unit in north central Wyoming fits in the latter category. Planning for the unit called for rehabilitation of the Upper Hanover Canal and Bluff Canal, originally built by private interests in the early twentieth century, and construction of new pumping plants and portions of the canals and laterals that deliver water to over 7,000 acres adjacent to the Bighorn River in the Worland area. Now over fifty years old, the aging irrigation system plays a modest role in the program to harness the waters of the Missouri River and its tributaries for the benefit of man.

### **Project Location**

Wyoming's Bighorn River basin is 100 miles long and 70 miles wide, bowl shaped, and bounded by the Owl Creek, Big Horn, and Absaroka mountains. East of the continental divide, the basin drains into the Yellowstone River and eventually into the Missouri and Mississippi rivers. The Wind River originates in west central Wyoming, winds east then north around the Owl Creek Mountains and through Wind River Canyon where the name of the river becomes the Bighorn River, the largest tributary of the Yellowstone River. The river cuts the basin down the center through deeply eroded valleys of fertile fields several miles wide along its course. Several tributaries join the Bighorn including Nowood Creek, Greybull River, and Shoshone River near the

Wyoming-Montana state line. Rainfall ranges from 12 to 14 inches on the western slopes to six inches on the basin floor. The deep loam soils adjacent to the Bighorn River are permeable and well suited to agriculture.<sup>1</sup>

### **Historic Setting**

Archeologists believe the earliest peoples to inhabit Wyoming country were Palaeoindian hunters and gatherers. A site near Worland excavated in 1975 dated the remains of “six immature ice-age mammoths” killed by ancient hunters to about 11,200 years ago. Sites reveal these early peoples at a slightly later time to have killed ancient bison in arroyo traps or deep sand. Evidence from Middle Period after the region became dry then improved also exists, though in general little is known of prehistoric peoples in the area, except that their numbers were few.<sup>2</sup>

At the dawn of the nineteenth century, “probably no more than 10,000 nomadic Indians” occupied the whole of Wyoming, according to one estimate. The relative scarcity of buffalo in the area and intertribal warfare contributed to low populations.<sup>3</sup> This is not to suggest that the country lacked value. In the Big Horn basin, much like the Uinta Basin in northeast Utah, tribes, or bands, used the area as seasonal hunting grounds. For example, Crow hunters from Yellowstone Valley, along with Shoshone and Bannock hunters, came from the west to hunt buffalo.

In 1742 or 1743 the French Canadians Francois and Louis Joseph Vérendrye likely became the first Europeans in Wyoming. Francois Antoine Larocque followed in 1805, reaching the eastern base of the Big Horn Mountains and continuing northeast to

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<sup>1</sup> Robert E. Bonner, *William F. Cody's Wyoming Empire: The Buffalo Bill Nobody Knows* (Norman: University of Oklahoma Press, 2007), 3-5.

<sup>2</sup> T. A. Larson, *Wyoming, A Bicentennial History* (New York: Norton, 1977), 3-4.

<sup>3</sup> *Ibid.*, 5.

the Big Horn and Yellowstone rivers. John Colter was the first Anglo known to have entered the basin, and he was followed by a stream of other explorers and trappers who combed the rivers for beaver pelts. Historians estimate that relatively few mountain men spent time in Wyoming, though for those that did the payoff was lucrative. At Henry's Fork, William Ashley, the most successful of the Wyoming mountain men, collected 9,700 pounds of pelts worth \$48,500 in 1825. Instead of transporting the goods overland, he brought them through South Pass, then on bullboats on the Big Horn River to the Yellowstone and the Missouri rivers. The next year, 1826, he collected \$60,000 worth of pelts. Although never very important nationally, the fur trade constituted Wyoming's total economy up to 1840, the year of the final rendezvous. Wyoming as a center point of the trade became the most common location for the rendezvous.<sup>4</sup>

For American settlers and empire builders heeding the call of Manifest Destiny in the mid-nineteenth century, the primary route to California skirted along the south edge of Wyoming's Wind River basin on the North Platte River. Although about 350,000 to 400,000 emigrants took this route between 1841 and 1868, the year before completion of the transcontinental railroad, almost none of them settled in Wyoming. California, or, for the Mormons, the Great Basin, proved more alluring. For a time, gold seekers and settlers moving to the Montana Territory used the Bozeman Trail, but Shoshone, Arapaho, and Lakota aggression, the Red Cloud War, and the subsequent treaty of 1868 giving the Lakota the Powder River country essentially put an end to the trail. Whatever trail they followed, travelers probably unanimously would have agreed with William H. Russell who in 1846 wrote, "This is a country that may captivate mad poets, but I swear I

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<sup>4</sup> Ibid., 11-14, 23-24, 27-28, 34-35.

see nothing but big rocks . . . high mountains and wild sage. . . . It is a miserable country.”<sup>5</sup>

By 1868 probably about 20,000 people lived in newly created Wyoming Territory, but two years later the census counted only 9,118. The outmigration was no doubt due to losses in agriculture and mining. Neither industry surpassed livestock in importance. The cattle industry boomed in the early 1880s (in 1885 the count was as high as 1.5 million cattle in Wyoming), as it did elsewhere in the West, but remained prone to the whims of the market and vagaries of the land. No setback was more serious than the severe winter of 1886-1887 both in numbers of cattle lost and the subsequent rise of sheep that competed for range resources.<sup>6</sup>

If relatively few hardy men and women eked out a living on the harsh land, even fewer ventured into—let alone, settled—the Big Horn basin, the last area settled in Wyoming. On July 4, 1874, the U.S. military engaged renegade Arapaho who refused to go to a reservation outside Wyoming or stay put in the Powder River country. Captain A. E. Bates of the U.S. Cavalry attacked the Arapaho at the headwaters of Nowood Creek and achieved what the military at the time considered “as complete a victory as was ever gained by a single troop in the whole course of our Indian wars.” Five years later, in 1879, cattle men drove the first large herds of livestock into the basin. Henry Clay Lovell established several ranches on Nowood Creek, Shell Creek, and Five Springs in the 1880s, from where he ran his cattle operation. John Gottlieb Borner settled on the site that later became Greybull in the first decade of the twentieth century. Mormons settled

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<sup>5</sup> Ibid., 41-2.

<sup>6</sup> Howard R. Lamar, editor, *The New Encyclopedia of the American West* (New Haven, Connecticut: Yale University Press, 1998), 1237-38.

Burlington, Bryon, and Cowley in the northern part of the basin. In 1900 Henry Charles Worland settled the site that became his namesake.

Beginning in the 1890s the basin entertained large development schemes. Elwood Mead, then territorial engineer for Wyoming and later commissioner of Reclamation, proposed construction of a sixty-plus-mile canal from the Stinking River (now Shoshone River) winding around Cedar Mountain all the way to the Big Horn River and subsequently irrigating more than 200,000 acres in the basin. This plan never came to full fruition but Mead recommended 25,000 acres for irrigation development in the Sage Creek area. Around the same time, William F. “Buffalo Bill” Cody began to invest his name and money in a new town and irrigation of thousands of acres along the Shoshone River. He named his new town Cody, Wyoming, to attract settlers. Having acquired a permit to divert water from the South Fork of the Shoshone River, Cody’s new Shoshone Irrigation Company began construction of a canal on the south side of the river. In 1903 the Wyoming State Board of Land Commissioners petitioned the newly organized United States Reclamation Service to complete the irrigation development. On the Shoshone River, USBR constructed Shoshone Dam [later renamed Buffalo Bill Dam] that was, when completed in 1910, the tallest concrete dams in the world, fulfilling Cody’s vision of an irrigation empire in the Bighorn Basin.<sup>7</sup>

Agricultural development was not limited to the Cody area. The extension of the Chicago, Burlington & Quincy Railroad in 1906 gave an added boost to community building in the basin. The few buildings in Worland were relocated to the east side of the Big Horn River where the railroad ran. Mainly, the railroad accelerated irrigation

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<sup>7</sup> Bonner, *Cody’s Wyoming Empire*, 10-11, 14-15; United States Department of the Interior, Water and Power Resources Service, *Project Data* (Denver: United States Government Printing Office, 1981), 1155.

development. Private irrigation interests constructed Bluff Canal in 1904 to serve 2,800 acres of land on the east side of the river, the Lower Hanover Canal in 1906 and the Upper Hanover Canal in 1910. In 1907 Bighorn Canal was completed for irrigation of 25,000 acres on the west side between Gooseberry Creek and the Greybull River.<sup>8</sup>

### **Project Authorization**

In 1938 the Bureau of Reclamation began field work studies that ultimately led to a reconnaissance report for the Missouri River and its tributaries. In what was eventually published as *Missouri River Basin: Conservation, Control, and Use of Water Resources of the Missouri River Basin in Montana, Wyoming, Colorado, North Dakota, South Dakota, Nebraska, Kansas, Iowa, and Missouri*, published in Senate Document 191 (78<sup>th</sup> Congress, 2<sup>nd</sup> session), Reclamation laid out a comprehensive plan of development for the river basin and provided a positive assessment of agriculture and irrigation in the broad valleys and fertile soil along the Big Horn River. The idea was, seemingly, to transfer dry lands to irrigated lands. The Big Horn basin, which includes the Wind River basin and Lower Big Horn basin in Montana, supported an estimated 3,100,000 acres of dry farm land, but not all of that was farmed, depending on weather. In 1939 about 900,000 acres were dry farmed, while the other 2,200,000 lay fallow or were used for pasture. Dry farming produced on average only eight bushels per acre. The average value on irrigated lands is considerably more expensive but less common. The basin report anticipated that “an area equal to 23 percent of the arable dry land would ultimately be placed under irrigation.”<sup>9</sup>

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<sup>8</sup> Big Horn Basin Photos, From *Wyoming Tales and Trails*, <http://www.wyomingtalesandtrails.com/bighorn.html>.

<sup>9</sup> United States Congress, Senate, *Missouri River Basin: Conservation, Control, and Use of Water Resources of the Missouri River Basin in Montana, Wyoming, Colorado, North Dakota, South Dakota*, Hanover-Bluff Unit

The problem with past efforts to irrigate the Big Horn basin was that the waters of the river basin had been over-appropriated. In other words, the arable lands in the region outstripped the natural water supply. With this in mind, Reclamation proposed construction of storage reservoirs or augmentation of storage capacity at the Shoshone, Owl Creek, Paintrock, Big Horn Pumping, and Shell Creek units. Perhaps most important was the proposed Boysen dam and reservoir on the Big Horn River in Wind River Canyon. The reservoir would produce electric power, release water for irrigation downstream, “desilt” the river, provide flood control, and begin to resolve the interstate water conflict between Montana and Wyoming.<sup>10</sup>

Congress authorized the Big Horn Pumping Units as part of the Flood Control Act of December 22, 1944, Public Law 534, which approved the comprehensive plans of Reclamation and the Corps of Engineers for development of the Missouri River basin.

With the Pick-Sloan Missouri River Basin Program authorized, Reclamation began detailed surveys and investigations in the arable lands adjacent to Worland in 1949-1950, contemplating separate units in the Hanover and Bluff areas. In June 1953 Reclamation released the definite plan reports for each unit. No additional preconstruction work could be completed without additional construction appropriations, and Congress would not authorize funding until formation of the local irrigation districts. The president signed a supplemental appropriation bill on August 26, 1954, just a short time after the organization of the Upper Bluff Irrigation District and the Highland-

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*Nebraska, Kansas, Iowa, and Missouri*, S.Doc. 191, 78<sup>th</sup> Cong., 2<sup>nd</sup> sess., (Washington, D.C.: United States Government Printing Office, 1944), 31.

<sup>10</sup> *Ibid.*, 49-50.

Hanover Irrigation District. With that piece in place, Reclamation resumed work on preparation of design data on a conjoined Hanover-Bluff Unit.<sup>11</sup>

Plans called for the unit to serve two major areas from a common diversion on the Bighorn River—the Highland-Hanover area with 6,105 acres of irrigable land and the Upper Bluff area with 1,336 acres of irrigable land. Water would be released from the Boysen Dam in the Wind River Canyon, diverted from the point downstream, and pumped to arable bench lands above the river channel. Reclamation proposed to enlarge the first thirteen miles of the Hanover-Bluff Canal to serve the Highland-Hanover area. Bluff Canal originally had a lower diversion on the Big Horn River, but reclamation planned to lengthen it one mile to join the Upper Hanover Canal three miles below the diversion dam.<sup>12</sup>

### **Construction History**

Compared to most water projects, construction on the Hanover-Bluff Unit was small in scale and relatively inexpensive. Reclamation oversaw the construction of the six pumping plants that took less than a year to complete. The canal work was mostly rehabilitation of existing canals, meaning the canals simply needed to be enlarged and expanded. The work on existing, as well as new canals, came to an end in 1957. In all, probably no more than a few dozen men worked on the unit's features at any one time over a two-year period.

Initially, Reclamation closely collaborated with the irrigation districts in moving forward on construction and rehabilitation of canals and laterals. Beginning in late

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<sup>11</sup> *Project Data*, 897. "Annual Project History, Hanover-Bluff Unit, Missouri River Basin Project," Volume IV, 1957, 1, in Record Group 115, Records of the Bureau of Reclamation, Entry 10, Project Histories, Feature Histories, and Reports, 1902-1932, Box 338, National Archives and Records Administration, Denver, Colorado; hereafter cited as "Project History" followed by appropriate volume and page numbers.

<sup>12</sup> *Project Data*, 895; "Project History," Volume I, 1954, 2.

August 1954 the parties discussed legal questions about work on the existing canals and laterals and settled on general agreements and specific contract terms. Reclamation submitted to the commissioner design data for work on the rehabilitation and construction of canals, laterals, flumes and siphons. The preparation of contract specifications fell to the individual irrigation districts. First the United States entered into a contract with each district then the districts prepared specifications, opened the contracts for bidding, and awarded contracts for canal work.<sup>13</sup>

The districts performed work on a similar schedule. On November 4, 1954, the Hanover Irrigation District signed a contract with the United States in which it agreed to perform or contract out the work on the canal at a cost not to exceed \$420,000. Bluff Irrigation District signed a similar contract the following spring, agreeing to enlarge the existing Bluff Canal at a cost not to exceed \$132,000. Each district performed a portion of the rehabilitation work on its own and contracted out other work to private companies.<sup>14</sup>

For enlargement of the first three miles of the upper canal, the Hanover Irrigation District performed the work itself; for work on the wasteway, Cottonwood siphon, and Big Horn River flume on the upper canal, the district awarded a contract to Charles M. Smith of Thermopolis, Wyoming, for \$47,855. The district also prepared the specs and awarded a second contract for additional canal work to Commercial Builders Inc. of Moscow, Idaho. The first contract was completed in late April 1955, and the second contract exactly a year later, except for work on extending the sloping walls of the canal. Later that year the district awarded a smaller third contract. The district's construction

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<sup>13</sup> "Project History," Volume 1, 1954, 2-3.

<sup>14</sup> "Project History," Volume I, 1954, 3; Volume II, 1955, 2, 4.

work ran through 1955, ceased in December for the winter, and then resumed early the next year. Construction stopped again in March for the irrigation season, then resumed the following October and was nearly completed by the end of 1956. The district requested several contract extensions and did not finish construction activities until 1958.<sup>15</sup>

In 1955 the Bluff Irrigation District drained and began work to enlarge a portion of the canal. Then, in August work began on the excavation to lengthen the canal one mile to connect it to the Hanover Canal. After a brief respite during cold weather, work on enlargement of the canal resumed the next year. When farmers turned water into the canal for irrigation that year, the district stopped construction activities except for “leveling of banks and minor cleanup.” Meanwhile, the district had awarded a contract for construction or rehabilitation of siphons and other miscellaneous canal structures to Eagle Construction Corporation of Loveland, Colorado. The only hitch in this work was that air trapped in the siphons created “objectionable spray and turbulence” and caused “scouring” at the outlets.<sup>16</sup>

While the districts rehabilitated or enlarged existing irrigation structures, in 1956 two private construction companies received contracts for new Main Canal No. 1 and laterals, Main Canal No. 2 and laterals, and Bluff Laterals No. 1 and No. 2. D. M. Manning of Hysham, Montana, began construction of the Main Canal Nos. 1 and 2 and laterals on June 22, finished Part I in November and Part II the next spring. At the same time, the Long Construction Company, Inc., of Billings, Montana, received the contract

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<sup>15</sup> “Project History,” Volume II, 1955, 4, 6, 8; Volume III, 1956, 4, 6, 8; Volume IV, 1957, 2-3.

<sup>16</sup> “Project History,” Volume II, 1955, 2, 4; Volume III, 1956, 2, 4.

for Bluff Laterals No. 1 and No. 2. Like D. M. Manning, the contractor began work in the summer, concluded Part I in the fall, and completed Part II in spring.<sup>17</sup>

Aside from canals and laterals, Reclamation directed its resources to the construction of six pumping plants on the Big Horn River. It divided the construction of these plants into two schedules—Schedule No. 1 for construction of the four plants and appurtenant works at Hanover, and No. 2 for construction of two plants and works at Bluff. In April 1955 Commercial Builders, Inc. of Moscow, Idaho, received the contract for construction of the Hanover Pumping Plants at a low bid of \$311,488.28. Later in the month Reclamation awarded the second contract to Eagle Construction Corporation worth \$82,513.15.<sup>18</sup>

In May the contractors working on Schedules 1 and 2 began construction activities and over the course of the year placed concrete at each of the six plants, built discharge lines and inlet channels from the plants, and erected the steel super structure for the building at plant #2. In 1956, after waiting for delivery of government-furnished materials, the contractor working on Schedule 1 installed the motor control board, centrifugal pumps, gate valves, and electrical controls at pumping plant #2 by October. On Schedule 2 the same progress on construction was made. By fall all construction on the two schedules had come to an end, and Reclamation accepted the contracts as completed.<sup>19</sup>

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<sup>17</sup> “Project History,” Volume III, 1956, 13, 15.

<sup>18</sup> “Project History,” Volume II, 1955, 8-9.

<sup>19</sup> “Project History,” Volume II, 1955, 9; Volume III, 1956, 8, 10.

Contract for switchyards at the Hanover and Bluff pumping plants was issued on March 15, 1956. The contractor completed Schedule No. 2 on August 16 and Schedule No. 1, delayed briefly due to a change in voltage of the power supply, on October 16.<sup>20</sup>

Reclamation executed several minor contracts, in addition to the major contracts, in the two-year construction period. These included construction of road culverts and siphons, relocation of gas and oil pipe lines, and installation of cattle guards on roads and pipe inlets and road culverts. The districts petitioned the government to construct structures to return wastewater and return flows from new agricultural land to the distribution system, but it does not appear these structures were ever built. However, Reclamation did use information from some 200 groundwater observation wells for construction of drains in the project area. On September 21, 1959, the Holm-Sutherland Company, Inc., received the contract for construction of open and closed drains.<sup>21</sup>

### **Post-Construction History**

Reclamation opened public lands adjacent to the existing Hanover and Bluff canals to entry and coordinated with federal and state agencies and private landowners on land exchanges and farm operations. According to the 1954 annual project history, the Bureau laid out farm units based on a new law that increased the size of farms from 160 to 320 acres.<sup>22</sup> In 1957 Reclamation estimated the cost of clearing, leveling, and constructing ditches, drains and turnouts—preparing land for irrigation—to be from \$28 to \$37 per acre. Building homes, farm buildings, fences, and domestic water systems were additional.<sup>23</sup>

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<sup>20</sup> “Project History,” Volume III, 1956, 10, 13.

<sup>21</sup> “Project History,” Volume II, 1955, 1; Volume III, 1956, 1; Volume IV, 1957, 6; Volume 5, 1958, 3.

<sup>22</sup> “Project History,” Volume I, 1954, 5; however, I can find no evidence of “the new law increasing gross farm unit area from 160 to 320 acres.”

<sup>23</sup> “Project History,” Volume IV, 1957, 18-19, 26.

Meanwhile, having organized earlier in 1954, the boards of the Highland-Hanover and Upper Bluff irrigation districts approved repayment contracts on December 10 and 17, respectively. The next year, the districts officially signed repayment contracts with the United States and in 1957 began operation of the irrigation works under supervision of the Bureau's field office at Worland, Wyoming. They assumed full O&M responsibility on January 1, 1958. In the first year heavy rains kicked up silt and debris in the Bighorn River, which deposited in the inlet channels to Hanover Pumping Plants No. 1 and No. 2 and Bluff Pumping Plants No. 1 and No. 2. Crews removed the silt and debris from the inlet channels and trash racks and repaired canal banks washed out from the high waters.<sup>24</sup>

Since original construction, Reclamation and the irrigation districts have been involved in periodic rehabilitation and construction on the irrigation system. In 1975 the Highland-Hanover Irrigation District initiated construction when it secured an emergency federal loan to cover its portion of the cost of replacing the original timber-crib and rockfill diversion dam on the Bighorn River with a concrete weir diversion dam. Located on the Bighorn River approximately 17 miles south of Worland and constructed within the year, the diversion dam had a crest length of 250 feet. The district also replaced the outlet works to the Hanover Canal and the No Water Creek Siphon. The new reinforced concrete pipe siphon, completed in 1976, was 2,264 feet in length with a capacity of 500 cubic feet per second.<sup>25</sup>

These construction projects may be considered preliminary to more extensive construction and rehabilitation efforts. Initiated in 1990 under Rehabilitation and

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<sup>24</sup> "Project History," Volume I, 1954, 5; Volume II, 1955, 1; Volume IV, 1957, 4, 7-9.

<sup>25</sup> *Project Data*, 897-98.

Betterment contracts, Reclamation and the Highland-Hanover and Upper Bluff Irrigation Districts entered into a partnership for “reshaping and relining of main irrigation canals, conversion of over 5000 feet of laterals to buried pipe, construction of desilting basins at four pumping plants, replacement of pumping plant electrical equipment, and rehabilitation of moss removal equipment at two of the plants.”<sup>26</sup>

Local water groups and districts keep close watch on the condition of canals, siphons, drains, turnouts and other irrigation structures. In 2005 the Wyoming Water Development Commission (WWDC), on behalf of five irrigation districts in the Worland area, sponsored the creation of a Geographic Information System (GIS) and database to serve as “a living, updateable map of the area allowing them [the districts] to each modernize their maintenance schedules as well as defining their rehabilitation needs.” Using this technology, the irrigation systems were then inventoried and evaluated. Most structures were in “fair” or “good” condition but several were also old and in need of repair or replacement.<sup>27</sup>

### **Project Benefits**

In 1975 the 7,354 acres receiving irrigation service produced a crop value of \$3,511,724. Within two years the value dropped nearly half, although the irrigated acreage remained the same. Recent data on crop production and value are not available, but we do know that in the fifteen years after 1977 the number of farms dropped from 36

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<sup>26</sup> U.S. Department of the Interior, Bureau of Reclamation, “PSMBP, Big Horn Basin Division, Hanover-Bluff Unit, Wyoming,” <http://www.usbr.gov/dataweb/html/hanoverbluff.html>; hereafter cited as Project Data, Online.

<sup>27</sup> Anderson Consulting Engineers, Inc., *Executive Summary for Worland Area Irrigated Lands Geographic Information System (GIS) Level II Feasibility Study*, Prepared for Wyoming Water Development Commission, Cheyenne, Wyoming, March 2007.

to 25. Farmers in the Hanover-Bluff area grow mostly low-value crops: small grains, alfalfa and other hay crops, silage, and sugar beets.<sup>28</sup>

### **Conclusion**

Like many Pick-Sloan projects, the Hanover-Bluff Unit is a typical, small-scale irrigation project. Serving only approximately 7,000 acres of farmland, the unit augmented the agricultural economy in the Bighorn River basin but was too small to entirely revitalize the area. Nevertheless, the water project is considered vital enough to continually invest funds for maintenance of the aging water system. Since initial rehabilitation and construction, the unit has undergone several phases of Betterment and Rehabilitation in the Worland area. Neither extensive nor complex, the unit is a modest yet key piece in the massive program to harness the waters of the Missouri River basin for the benefit of man.

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<sup>28</sup> *Project Data*, 897-98; *Project Data*, Online.

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