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Edited by

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FOREWORD

This is the eighth volume of the *Forum of the Association for Arid Lands Studies*, published by the Association in cooperation with the International Center for Arid and Semiarid Land Studies (ICASALS). The Association for Arid Lands Studies (AALS) is dedicated to the interdisciplinary study of the world's arid and semiarid lands. It is headquartered at ICASALS in Texas Tech University, Lubbock, Texas. Since its founding in 1977, the AALS has held its annual meetings in conjunction with the Western Social Science Association.

The 15th annual conference of the AALS was held at the Radisson Hotel on the Mall, Denver, Colorado, April 22-25, 1992. The AALS program included nine topical sessions (32 papers) produced by AALS members. Six of our nine sessions were cross-listed by other groups of the Western Social Science Association, Agricultural Studies, Geography, History, Resources and Public Land Use, and Urban Studies, an indication of the diversity and wide applicability of the research activities of AALS members. In turn, AALS cross-listed a session from Agricultural Studies, and another from Borderlands Studies for a total program of 11 sessions.

This volume of the *Forum* consists of 14 of the papers presented at the 15th annual conference. The first three parts of the volume are based on the three sessions on Rationalizing Water Use in the West organized by Kenneth R. Weber of the Department of the Interior. The last four parts of the volume include contributed papers on early agriculture and recent commerce in the western United States, rainfall in Los Angeles, and developments in utilization of arid lands in Africa.

Approximately half of the papers presented by AALS members at the 15th annual conference were submitted to the *Forum*. Each was reviewed by a minimum of three referees, and those papers accepted for publication were arranged into subject groups that do not necessarily conform to the topical sessions on the meeting program.

The fine work of the 1992 Editorial Review Committee members and Editorial Assistant Jean L. Shultz is greatly appreciated. Special thanks goes to Idris R. Traylor, Jr., Director of ICASALS, for the support that permits the publication of this volume.

Eugene B. Shultz, Jr., Editor
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FOREWORD

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The 12th annual conference of the AALS was held at the Radisson Hotel on the Mall, Denver, Colorado, April [illegible]. The AALS program included nine topical sessions [illegible] organized by AALS members. [illegible] sessions were cosponsored by other groups [illegible] of the Western Social Science Association: [illegible] Agricultural Studies, Geography, History, Economics [illegible] and Urban Studies [illegible] and their applicability [illegible]. In turn, AALS cosponsored a session [illegible] Agricultural [illegible] for a total program of 11 sessions.

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[illegible] Jr., Editor
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PART ONE

WATER AND THE MAKING OF THE ARID WEST

BROAD BRUSH STROKES OF COLORADO WATER HISTORY

James E. Sherow[1]

One can picture Anasazi priests overlooking Chaco Canyon from a great kiva, today called Rinconada. Over a thousand years ago they could see a well-irrigated valley, thriving towns, and an elaborate educational center. Their trade networks extended into Central America and their own empire embraced the Four-Corners area of the American Southwest. In many respects, these people lived better lives than Europeans of the same time, and the priests must have been thankful for the bounty brought to them through irrigation.

These priests, however, were overlooking some serious maladaptive practices. The people of Chaco Canyon had cut nearly all of the trees on the surrounding plateaus for building their pueblos. This eventually had serious repercussions for their irrigation practices. The denuded plateaus no longer retained precipitation and the runoff streamed quickly down the slopes cutting deep arroyos through the canyon, which disrupted flood irrigation practices. In short, the manner in which the Anasazi supported themselves became self-destructive. The Anasazi's worldview, whatever it was, failed to give them an accurate picture of the environmental transformations they had wrought, and what those changes would mean for their way of life. By 1400 the Anasazi civilization had collapsed.

Today, Coloradans can stand on heights like Flagstaff Mountain just west of Boulder and take in a grand view of what the development of water has wrought. To the east great reservoirs shimmer in sunlight and green fields mark the extent of irrigation. At night the floor of the High Plains is ablaze with lights illuminating the sprawl of Front Range cities, each thriving because of the elaborate water systems feeding them. For nearly 120 years, Coloradans have employed sophisticated technologies and economics to overcome the problems of surviving in a semi-arid environment. The question is, "Has the worldview of Coloradans' given them an accurate understanding of their place in their environment and have they gained insights about maintaining their infrastructure in the face of the environmental changes swirling around them?" Are Coloradans atop Flagstaff Mountain blindly looking across the hills and plains not seeing in their great achievements the seeds of self destruction? Have Coloradans become unaware like the priests at Rinconada overlooking Chaco Canyon?

Contemporary ecologists teach that life is the environment. Scholars like Daniel B. Botkin, in his Discordant Harmonies, speaks to how people are a part of nature, not apart from nature. People can no longer afford to treat the Earth as a mere commodity to be engineered at whim. Rather, people must come to understand how

> ...to engineer nature at nature's rates and in nature's ways; we must be wary when we engineer nature at an unnatural rate and in novel ways. To conserve well is to engineer

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within the rules of natural changes, patterns, and ambiguities; to engineer well is to conserve, to maintain the dynamics of the living systems (Botkin, 190).

Environments, as people are a part of them, reflect the health of the species in them.

Modern Problems

If Botkin and like scholars are correct about ecology, then the history of water development in Colorado shows some serious problems. Undoubtedly, Coloradans have realized great social and economic gains from their use of water. But their will to dominate nature in the pursuit of market culture values flies in the face of modern ecological thought. Clearly, among the productive farmlands and growing cities some troubling signs have emerged over the years indicating some things amiss with the aspirations of water users in Colorado. Irrigators still complain about the lack of water for their crops and demand technological fixes. Many farmers have found irrigating less tenable each passing year and have sold out to urban interests. This transfer of water rights from the Arkansas River Valley, and other valleys as well, has left growing pockets of once productive agricultural lands as weed-infested wastes while at the same time it has filled bathtubs, watered green lawns all along the suburbs of the Front Range, and contributed to greater population density and its attendant pollution problems. People of the West Slope have grown alarmed about ecological disruptions as their watersheds are drained to feed city dwellers and irrigators east of the Continental Divide. Litigation, both intrastate and interstate, over water mounts and money largely directs the flow the water.

The problems Coloradans face are historical in their origins. The worldviews of Coloradans have not changed notably in the last 120 years while the environment in the state has deteriorated. There is a connection here, and this can be illustrated in a quick overview of water development in the state.

It is possible to divide the historical uses of water in Colorado into three periods. Private capitalists underwrote the first phase of water development followed by governmental technocrats guiding the development of water projects, which marked the second phase. The clamoring of a consumer based economy characterizes the third phase. As each succeeding phase took shape, elements from the preceding phase or phases still remained very much alive.

A disturbing worldview has shaped each of these periods, and all are more similar than they are different. Water is nothing more than a commodity that can be, and should be, controlled, divided, measured, and sold. In achieving these goals nature should be dominated by technology. What has divided people during these three periods is the who, how, and why of water development. This contention is easily illustrated in the watersheds of Colorado.

First Phase

When people first encountered the river valleys of Colorado they saw the possibilities of economic gain in the transformation of semi-arid lands into farmlands through irrigation. They were not bashful about expressing their aims. The Arkansas Valley, so one fellow boasted, could wave "with the products of field and garden" if its "wanting" nature were transformed by irrigation. The Arkansas River compared favorably to the Nile, so a newspaper editor rhapsodized, and it could be diverted to create an inland agricultural empire similar to the one in Egypt (Sherow, 1990, 11). In 1873, President Grant caught the fever and recommended to Congress "a canal for the purpose of irrigating from the eastern slope of the Rocky Mountains to the Missouri River." He believed this "arid belt [was] perfectly valueless for occupancy of man for want of sufficient rain to secure the growth of any agricultural products" (Sherow, 1988, 2). Cyrus Thomas, a biologist with the Hayden Survey of 1872, recommended joining the Arkansas and Platte Rivers with a 200 mile canal to create irrigation reservoirs, and also to modify the climate and to increase rainfall.

Each person who began digging a small ditch to tap some stream or river did so dreaming of profits through the domination of nature. In the early 1870s, people like George Washington Swink on the Arkansas River near present-day Rocky Ford developed successful small-scale truck farming for supplying local ranchers. William and Jonas Brantner, lured to the Denver area by the gold rush of 1858, dug a small ditch drawing from the Platte and grew staples for hungry prospectors. Many, like the Brantners, found mining the miners easier than mining the gold.

The initial high profitability of irrigation stimulated truly large private undertakings. But here the stretch to dominate nature fell short. Weak technology and capital guided by market culture values created unstable irrigation systems throughout the state. Theodore C. Henry, the one-time acclaimed "father of irrigation" in Colorado, built several frail, over-extended projects. Wracked by nature and investors, Henry died penniless in 1914. Edwin S. Nettleton, a renowned civil engineer in Colorado, designed the High Line Canal in the Denver area and created an inefficient system liable to frequent breakdowns and costly repairs, which was eventually absorbed by the city of Denver to supplement its water supplies. The story of large-scale irrigation building in Colorado is replete with such stories.

Many irrigation reformers, like those supporters flocking to the Farmers' Irrigation and Protective Association in the 1880s and early 1890s, believed turning over ownership of a system to the farmers using the main canal would promote efficiency and democracy. In some respects this happened as irrigation systems in the state became governed by mutual stockholding companies. Still, irrigators had not changed their faith in the domination of nature or in the market culture. The droughts of the 1890s, 1900s, and 1930s along with chronic water shortages among most companies revealed weaknesses in Coloradans' approach toward water development.

Second Phase

In order to make such systems work required the contribution of government at both the state and federal levels. The state engineer's office, later supplemented by the Colorado Water Conservation Board in 1936, came to guide water development at the state level, and the U.S. Geological Survey followed by the Reclamation Service (later renamed the Bureau of Reclamation) and the Army Corps of Engineers directed the federal effort.

The engineers who worked for these agencies had the same underlying beliefs that the pioneering irrigators of Colorado had. When Coloradans talked about the "beneficial" use of water they meant the application of water to economic pursuit. Beneficial use has always guided the state engineer's office. In 1930, Michael Creed Hinderlider, a Colorado state engineer for over thirty years, stated: "In the arid West, practically all development and progress is dependent upon a consumptive use of its water supplies." And to achieve this goal meant the complete domination of nature. He once remarked; "Controlled and guided by the will of man, [water] becomes his never tiring slave, turning the wheels of industry, energizing the levers of force, and bearing the burdens of commerce" (Sherow, 1989, 43-45).

But the state engineer's office, the state courts, and the Colorado Water Conservation Board could not handle all of the intra-state squabbling over stream diversions among Colorado water users. Water disputes often led to serious confrontations. In the early 1900s, angry citizens of Victor, Colorado, thinking themselves robbed of water by the people of Colorado Springs, climbed Pikes Peak and while holding care-takers at gun point drained the reservoirs of Colorado Springs. In the 1920s the farmers from the Burlington Ditch Company, the Henrylyn District, and the Farmers Irrigation and Reservoir Company faced each other armed with shot guns. Cooler heads prevailed to stop a potential local war over water allocations. The irrigators of the Fort Lyon Canal Company and of the Amity Company engaged each other in state courts for years over the dispersal of water from a jointly shared headgate.

The Reclamation Service and Army Corps of Engineers helped to stem such intra-state water disputes by creating greater water supplies for the users without causing anyone to change their underlying assumptions about water development. For example, the Bureau-built Uncompahgre, Fryingpan-Arkansas, and Big Thompson projects are examples of such projects.

The federal government also stepped in to settle the contentions over the division of scant river flows with the neighboring states of Colorado. In such notable and precedent setting cases like Kansas v. Colorado, (1907), or in Wyoming v. Colorado, (1922), the Court developed the doctrine of equity, essentially an accounting procedure which measures the gains made by one state's use of water against another's. In developing this doctrine the Court held sacrosanct the market-culture values of American society. The Army Corps of Engineers also contributed; for example, in the 1940s the Corps built John Martin Dam and Reservoir to cork the then four-decade-long water dispute between Kansas and Colorado over the flows of the Arkansas River.

But Coloradans never came to trust the judicial system to determine the amount of water they should receive, and they did not want to leave the direction of water projects in the hands of the Corps or Bureau. This led Delph Carpenter to promote compacts as a means to settle interstate water disputes, and his drive led to the successful completion of the nine-state Colorado River Compact of 1922. Soon afterward Coloradans entered compacts in attempting to settle disputes on virtually every interstate stream. Still, as anyone who reads newspapers knows, severe implementation problems exist with the Colorado, Arkansas, and Rio Grande Rivers with troubles looming over the Laramie River and others.

Third Phase

A large part of modern water confrontations stems from the schizophrenic demands from rapidly growing Western urban areas. The water needs of Western cities, both in Colorado and in other states, have resulted from the development of a consumer-based economy as described by the historian Samuel Hays (1987). Not only do these urbanites demand water for their lawns and homes, and for the service industries in modern high rises, but also water left in rivers for rafting, fishing, and landscape aesthetics. This sort of water development is still governed by market considerations and is not a part of fundamental shifts in social values toward water or nature.

Conclusion

The overall results of water use in Colorado has been a mixed bag of blessings. Without the infrastructure of dams, irrigation works, aqueducts, pumping stations, and transmountain delivery systems, modern Colorado would simply not exist. But the environment of Colorado continues to degrade and the costs are mounting. Former irrigated fields stand impregnated with alkali and weeds as the water rights have been removed to cities. Beautiful canyons have been lost to reservoirs with others like Two Forks and the Upper Arkansas around Buena Vista are still threatened. Riverbeds have deteriorated and the salt cedar has taken over large sections of the Arkansas River bottoms. Groundwater under Denver is being pumped to exhaustion and so is the Ogallala Aquifer underlying the eastern plains of the state. As growth continues the air quality along the Front Range worsens, and more water to the cities means more urban pollution.

Charles F. Wilkinson in The Eagle Bird has built on the thinking of Aldo Leopold to illustrate the crux of the problem.

> We will not have done right on our western waters until we broaden the inquiry and give a fair say to economics, conservation, good science, Indian people, Hispanic subsistence farmers, canyons, animals, beauty, magic, and even the Spirits (Wilkinson, 61).

If modern ecology is correct, and people are a part of nature, then people must come to terms with how past views of water development are dangerously out of step with ecological reality. In destroying the environment around themselves Coloradans are destroying themselves. Hopefully they can see their place in nature more clearly than did the priests atop Rinconada; for failing this Coloradans will leave monumental wastes far larger than those in Chaco Canyon today.

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THE DITCHRIDER: WATERHERDER OF THE IRRIGATION SYSTEM– THE FLATHEAD IRRIGATION PROJECT IN WESTERN MONTANA, CIRCA 1910 - 1960

Roger M. Baty[1]

Introduction

Water is the "blessed tie that binds" neighbor to neighbor on an irrigation community. Water can also be a devilish source of discord that can set neighbor against neighbor. Irrigation farmers must depend on one another. Their survival dictates that they live as close to the Golden Rule as is humanly possible. Irrigators are, however, only human. If their water doesn't come when they need it, or if they don't get what they think they are entitled to, they get upset.

When water is plentiful, it is taken for granted. When water is scarce, however, controversy ensues over its use. Mark Twain summed things up when he quipped, "Liquor is for drinking; water is for fighting." In an irrigation community, the task of rationing scarce water among competing uses becomes a source of community tension. Tempers flare and patience wears thin. Meanwhile, the irrigation system must continue to operate as best it can.

On the Flathead Irrigation Project (FIP) in western Montana, the task of managing the storage and delivery of irrigation water falls to the Irrigation Superintendent and his workers. Reporting to the Superintendent are several watermasters. Each watermaster has several ditchriders working for him. The ditchriders patrol the canals and ditches during irrigating season. They virtually herd the water along. When necessary, they ration the water among the users. During the rest of the year, some of them hire on to help with construction and maintenance tasks required to ready the system for the following year.

This article is about the ditchriders on the Flathead Irrigation Project. After describing the legislative origins of the project, the author reviews the connections between the FIP and the region's farming history, and mentions the physical structures used in the course of the ditchrider's rounds. On that foundation rest the ditchrider narratives, based on oral histories collected during the summers of 1985-1987.

Legislative Origins of the FIP

Two governmental policies led to construction of an irrigation system on the Flathead Reservation: 1) Indian Policy, and 2) Reclamation Policy. As guardian of the Indians, the national

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government began constructing irrigation projects on Indian reservations soon after the Civil War (Huffman, 1953). Conventional wisdom held that the so-called "civilizing" of the Indians required teaching them to farm. Congress acknowledged that farming in the arid West required irrigation, and authorized irrigation systems to store water for delivery to farms during the growing season.

Reclamation policy evolved with the desire to fully colonize the West. The idea of farming this vast unpopulated region captured the imagination of government scientists and non-farmer enthusiasts alike. They considered reclamation of the West a cause worthy of national attention and support. Government surveys proved water existed. All that remained was to move people onto the land and require that they irrigate it. Through the Desert Land Acts (1875, 1877), the Carey Act (1894), and the Reclamation Act (1902), Congress opened public lands to settlement and attracted homesteaders by the enticement of "free" land. By the Reclamation Act of 1902, Congress established the Reclamation Service with responsibility for constructing irrigation systems for the new farmers.

In the case of the Flathead Reservation, the Indian and Reclamation policies converged in a law passed on April 23, 1904 (H.R. 12231). Congress appropriated $75,000 for a survey of the Reservation. The Commissioner of Indian Affairs was to allot the lands "to all persons having tribal rights with said confederated tribes of Flatheads, Kootenais, Upper Pend d'Oreille, and such other Indians and persons holding tribal relations as may rightfully belong on said Flathead Indian Reservation." [Sec. 2]

The act stipulated that after the lands were classified they would be opened to settlement by proclamation of the President [Sec. 9]. Proceeds from the sale of lands would be used in part to construct irrigation ditches, and purchase cattle for the Indians as well as farming implements and other articles to aid in their education and civilization. [Sec. 14]

In January 1908, legislation was proposed as an amendment to Section 14 of the 1904 law. This would allow the Secretary of the Interior to spend funds to construct "irrigation systems for the irrigation of irrigable lands within the limits of the reservation...." (60th Cong. 1st Sess. SR No. 65. v.1; 5218).

The reason the legislation was passed is clear from statements made by the authors of the Indian Appropriation Bill for 1908 (61st Congress, 1st Sess. HR 437.27 Jan 1908). "The success of the Reclamation Service in the West, and the experiments so far entered into by Congress with reference to the reclamation of Indian lands by irrigation has demonstrated that the idea is of great value, and this bill carries the sum of $725,000 for the purposes of irrigating Indian lands. The greater share of it is reimbursable, and *it is found that when Indian lands are placed upon the market, facilities for irrigation being at hand, they are sold much more readily and at a very considerable increase in price. This fact enables the Indians to secure more funds and the Government to be reimbursed for its expenditure.*" [Italics provided by author]

An irrigation system was linked to opening the reservation because it was good business. It would help the Indians and it would make it much more likely that the land could be sold for a good price and actually be settled and reclaimed. The Reclamation Service was responsible for the construction, operation, and maintenance of the system until 1924 when the U.S. Indian Irrigation Service assumed responsibility.

The FIP and the Farmers

Most of the farmers who moved into this area were inexperienced. Few of the experienced farmers knew how to irrigate. A regular refrain in the annual reports of the project was the need for progressive farmers who understood irrigation. The first project manager, E. F. Tabor, complained in 1914 that "many irrigators do not apply water while there is a rain cloud in sight or until the land is thoroughly dried out after a rain." The farmers were left pretty much on their own to discover what methods would work best for them.

Commercial development of the project looked more optimistic with the completion of the Flathead Branch of the Northern Pacific Railway in 1918. This branch extended from Dixon north to Polson on the lake. Rail service cut down considerably on the twenty-mile hauls farmers had been making in order to get their produce to shipment points.

More farmers arrived during 1919 and land values rose one third. Some of the newcomers were experienced irrigators from Yakima, Washington. Irrigated farms surged to 1,077 units compared to only 833 the year before. The value of irrigated crops increased 43 per cent.

The prosperity did not last. Depressed market conditions hit the country toward the end of 1920. The market for hay disappeared. Wheat prices were so low farmers refused to sell at prevailing levels. In 1921 conditions worsened. The total value of irrigated crops was down from more than one million dollars in 1919 to $456,588 in 1921. Total crop value per irrigated acre was only $15.84. Moreover, farmers who had homesteaded on 20,000 acres of land some ten years earlier were not yet receiving the water they had been promised.

Concern for the plight of the farmers was widespread as were proffered solutions. The Director of the Montana Agricultural Experiment Station at Bozeman believed remedies would be found by improving irrigation practices through State-supported technical assistance. The message he sent to Governor Dixon in February, 1923 was based on Canadian experience. They have concluded, he wrote, that "to turn a settler loose with 160 acres of raw land in a raw country does not make for the maximum of results in land settlement."

By 1922 the Reclamation Service shared this view. Mr. A. C. Cooley, Agriculturist in charge of demonstrations on Reclamation projects, visited the Flathead in the fall. The next spring an arrangement with the Department of Agriculture led to the arrival of Mr. L. B. Miller, the first resident agriculturist on the project. By this time 82 per cent of the farmers were experienced irrigators.

In 1926, Indian Commissioner Frank Knox noted in his report that only one year out of the previous six were good crop years. There was also too much reliance still on grain growing.

What really bothered him was the enormous cost of the irrigation project. "Thus far," he reported, "at an expense of over $5,000,000 for putting 112,000 acres under ditch, only 29,839 acres are actually irrigated, which means that the irrigated land has cost about $175 an acre.... In 1924 the gross crop value of this entire acreage averaged $19.07. Thus the entire crop value, ignoring labor and other costs, represented only 11 per cent on the sum actually invested to provide the water to irrigate the crops, and this ignores entirely operation and maintenance costs for the project itself....The present cost is an impossible one, viewed from an economic standpoint..." (Annual Report , 1926).

Rather than expand the project he urged Congress to negotiate a lease of power from the Montana utility commission that had applied to develop water power on Flathead River. This power could be used to pump water impounded by Flathead Lake into the established irrigation system. This is in effect what happened. The system continues to this day.

Structural Components of the FIP

Each structural component has its associated technical terminology which is part of the daily language of those who operate and maintain the system. Some of these terms will become clear by tracing the path of water from a reservoir to a farmer's take out.

Watershed run-off collects in **reservoirs** where it remains until time for release to the farmers. When first released from the dam the water courses down the former stream bed. At some point there is a **diversion structure** with a **headgate.** The headgate insures a measured flow of water into a **canal. Trash racks** in front of headgates prevent damage from fallen trees or dead animals swept away in the stream by high water. Some canals have concrete linings to prevent waste, protect against breaks, inhibit moss growth and cut down on maintenance costs.

Canals distribute the water to a number of smaller reservoirs nearer the farms. When it is time to deliver water to the farmers, the operator (ditchrider) opens a **release gate.** The low-tech way of judging water flow is by counting the threads on the valve stem. Water leaving the reservoir passes over a **Cipolletti weir,** a device for measuring the flow more precisely.

Drops and **chutes** shunt water to a lower elevation without causing erosion. Engineers situate a drop where the natural slope would cause excessive velocity through the canal. Wood or concrete bulkheads are set in place and the water forced to drop over them. Water then passes down a chute to a **stilling basin** where the energy dissipates, then the water continues along its way.

Where the soil is unsuitable for canals the engineers designed **flumes** or artificial ditches. Flumes span narrow canyons or carry the irrigation water along steep side hills. Wood, metal, or concrete are possible construction materials. In some places a trestle supports the flume.

Checks regulate water velocity. Each check has flashboards that fit between upright posts. A cat-walk across the canal permits the ditchrider to get close enough to pull the boards or add them, as necessary.

When the water finally reaches the farmer's land it is regulated by a **take-out**, or **turn-out**. This is analogous to the headgate of the main diversion works on the creek. The turn-out allows a measured amount of water into the farmer's ditches for his irrigation needs. Once the water enters the farmer's land he must control it. He gets no further assistance from the Project.

The FIP includes 16 dams, several large feeder canals which connect the reservoirs, and 108 miles of main supply canals. The supply canals connect to 1,077 miles of distribution canals and laterals. Included in this network are 10,000 minor structures. The project employee closest to the farmer's needs on a daily basis during the irrigating season is the ditchrider.

Ditchrider Narratives

The ditchrider herds the water along to the individual users. As the spring thaws begin in the Mission Mountains, so does his work. He regulates the water into the feeder canals, controls water leaving the storage reservoirs and measures the water delivered to the farmers. He opens and closes gates, inspects checks, and controls turnouts to distribute the waterflow through the intricate system of canals and laterals.

Every day during the irrigating season the ditchrider receives orders for water from the farmers, calculates the requirements for his area and arranges the quantity, time, and duration of water delivery. He maintains daily records of water measurements and deliveries.

Anything that blocks water delivery is the ditchrider's business. He looks for leaks, breaks or weak areas in the ditches, spots and corrects obstructions, removes debris and makes emergency repairs. Patrolling his area by foot, horseback or motor vehicle, the ditchrider repairs those breaks he can and reports any misuse of the system to the watermaster.

When everything is functioning properly, the work day is straight forward -- almost janitorial. But moments of real drama can punctuate the routine. Talking with old timers about their work one hears about physically challenging rescues, near drownings in turbulent streams as well as close calls with angry farmers.

Al Barnier recounted some adventures when interviewed by the author at his home in Dixon, where he retired in 1974 after twenty nine years as ditchrider and watermaster for the Project.

"I was coming down about noon one day, went to turn some water in. I was hauling gravel for the slick spots along the Moise canal. I would bring back a jag of gravel each time. I was unloading the gravel and I heard this 'help!' I stopped shoveling, but couldn't see a thing. That happened a couple of times. Finally, I figured I'd hurry up and unload the gravel and act like I am going home. If there is somebody hollering 'help' then he will holler, which he did. He seen me open the car and he started hollering. He was up on the hill. It was Jim Perry. He'd gone up the hill in a tractor -- a John Deere -- to fix fence, and it got away on him. The tractor split right in two and broke his leg. He tied his shoe lace around his dog's neck and sent him home. When they took the shoe lace off the dog I was just getting there. We made a stretcher and walked up there and got him on the stretcher. We took two poles and tied a canvas across and laid him on it. Brought him back out -- about three miles.

"Nowadays," Al continued, "the fellas ride pickup trucks, but when I started we was horseback. The only tool I carried was a shovel. I rigged a strap for it on my saddle and fixed a hook to the strap. I made a hole in the shovel, hooked the shovel to the strap and ran the handle down through the stirrup. My weed hook I left by the ditch. Nobody would bother it.

"I was living at the home of my father-in-law. I would get up about five in the morning and help milk the cows, feed the pigs and do other chores. Then I got ready, saddled my horse and rode to the project camp a half mile away. I would get my orders from there and go ride my ditches. I rode about twenty miles a day. I would ride right along the ditch bank, go down the laterals and all that. That was the first year. The second year this guy got hurt so I rode his canal too. A lot of times I would put in ten or eleven hours. Then at night I would do the book work. My wife helped with that. There was plenty of overtime!"

Water measurement is in terms of "acre feet" and "second feet." An acre foot is the amount of water that will cover an acre of land one foot deep. The farmer's quota is expressed in terms of acre feet. The ditchrider measures the flow of water in terms of "second feet" or cubic feet per second. This amounts to 7.48 gallons per second which can be visualized as what it takes to fill a bath tub, flowing by every second. The flow measurement is taken at a weir. Say the head of water (the height of the water on the weir stick above the weir crest) is 0.22 feet and the weir crest is three feet long. Using these figures the ditchrider checks a table in "the book" which tells him that at this rate of discharge the farmer will receive close to an acre foot in a twelve-hour period. After using the tables for a while the ditchrider has these relationships memorized.

Each area has its special characteristics of soil, water supply and potential threat. The Revais "R" lateral that runs south of Dixon is not a dangerous assignment. One of the first ditchriders of "R" lateral is Art Cantrel, ninety and a half years old at the time of the interview. He began working for the project in the late twenties and stayed with it until 1946. His family originally emigrated from Arkansas to Oregon by covered wagon. From there they came to Idaho and then to Montana with the opening of the reservation. The family lived in a tent at first. His father was hired to fence the Bison range and then began dry farming southeast of Dixon up Valley Creek.

When Art Cantrel began working for the Project the job was every other day during the irrigating season. He earned $75.00 per month. "In the winter time I never had any job. I'd work on the ranch. Fed cattle. Any money went for food. The family also got money from selling cattle in the fall. But that wasn't too bad. You forget what a dollar could buy in those days. A pound of beefsteak for 25 cents or less; a fifty pound sack of flour for a dollar."

"I used a car to go out," Art related. "In the spring it was pretty busy, just turning on water and shutting it off. I'd leave home at 8 o'clock. If I didn't have any trouble I'd be home by five. Sometimes I'd have trouble and wouldn't get home before six or seven. My area was a half mile below Revalli to Revais Creek."

Troubles caused by "mother nature" along Art's route were relatively minor. Ditch breaks and gopher holes presented typical problems. Left unattended, water would go through the breaks or holes and wash the ditch out. Whenever possible, Art made immediate repairs. Where breaks were too big, he would have to shut the water off and alert the main office. (Normally the ditchrider would alert his supervisor, the watermaster; but this area had no watermaster at the time. Art contacted the main office directly.)

One challenge was due to the fact that the Revais "R" lateral was stream fed and not connected to a reservoir. "The other ditchriders had a better deal than I did," Art continued. "They knew how much water they had. I didn't. I had to divide that up even between those farmers, without knowing how much water was comin' down that creek. Sometimes it would run through August; sometimes the first or fifteenth of July. It was hard to divide it when you didn't know how much you had!"

Indian water rights made it even harder to judge the flow. During the early years of the Project, surveys determined who had rights to use the water. Indians who had been diverting water with their private ditches before the construction of the Project had prior rights. On Revais Creek there are two Indian water rights up ahead of the farmers. "They could take out water any time they wanted to," Art explained. This could cause the supply to change without notice.

Other problems surfaced through interaction with the farmers themselves. Art got his job because his predecessor could not get along with the farmers along the lateral. "They were all mad at him." Art recalled. "He didn't get fired, he just quit. I had to have a job, so I took it. They got mad at me too. Mostly they'd think that I gave somebody else more water than I did them. Some of 'em thought I cheated them, and some I did, but I couldn't help it. It was a pretty hard deal before they put the pumping plant in."

Each ditchrider has to decide how he will work with the farmers in his territory. In the spring, when water was plentiful, Art would allow the farmers to tell him when they wanted water. Later on when it was time for the second irrigating, he would tell the farmers when they would get water. Bad ditchriders would get in a fight with the farmers. Art's formula was this: "You have to take bawlin' out and everything and not pay attention to it. Just walk on and leave 'em."

Another ditchrider, Lewis Palmer, elaborated his experiences with farmers who got too greedy. "If there is a shortage of water," he explained, "the neighbor above the farmer you are watering may throw flash boards and take more or take it all. There is a lot of them who do that. Well, just going and pulling the boards and shutting the gate or locking the gate, none of that really answers the problem because the next time they would do the same thing. But you have to take care of your own problems."

Lewis recounted how he solved his own problem one season. "We'd ride until noon every Saturday. One farmer would wait until after dinner that day. Then he'd throw in big flash boards in the main canal, over by Ben Williamson's place. And he would irrigate his grain. He was irrigating oats. I wouldn't catch it then, but Monday morning I'd put in more water up on F canal to supply the farmers. Then I would get a call from Williamson that the water was running over in his barn yard. I beat it down there and found these flash boards, so I knew what was going on and I would go down and pull them.

"So one Saturday, I went back about three o'clock in the afternoon. I took a chain and padlock. Sure enough, he had the boards in with the turnout wide open. I never said a word. I just slapped the chain on and locked the turnout wide open and come home. Sunday afternoon he come beggin' me to go down and take that lock off. His oat field was washing out.

"I said, 'Hey, I didn't open that turnout.' So I didn't offer to go down right away; and he kept a beggin' and a coaxin'. But I wasn't in any hurry to go out there. Finally he said, 'If you come and take that lock off and shut it, I'll never touch it again.' And he didn't, either."

There are other times when the work of a ditchrider can be life-threatening. Lewis told me about the time he nearly drowned. "Well, it was in the spring when the high water'd come. There was a big runoff. Marion, the watermaster, went up to pull some boards. He couldn't pull them alone so they sent for me with another fellow who didn't know anything about pulling boards.

"I had it pretty near tripped. I had the flash board pullers and I grabbed it and handed it to him and I grabbed the other side. I said, 'When that thing goes it flips. Just let loose the handle! We don't care about losing the flash board puller.' Well, he didn't and it flipped him. There was four hundred second feet of water coming through and it was either jump in above or fall in below. He jumped in above. The water was just below the walk so I got down on my hands and knees and when he went through I grabbed him. It was like grabbing a wagon going through -- you couldn't slow it down. I let loose and went over on the back side below the check. So we went through I suppose one hundred feet or more before we came up. It was so swift there were high white caps. I finally got over to the edge where I could watch, but I couldn't do anything. He was up and down, up and down, and as he went 'round the bend, there was a tree that the winter snow had pushed over and as he come up, just like that he got his arm around the tree and it saved him, otherwise he would have drownded. We was beat all up because we were down on the bottom hitting them rocks and everything. Anyway, we beat it home and changed clothes right quick. We didn't catch no cold or nothin'."

Lucille, his wife, added "He lost his glasses and his cap." After a pause, she shivered, "The runoff in spring was always a very dangerous time. In the night time they used to have to go out. Sometimes I used to go with him in case something happened; then I could call for help."

It is clear from their stories that a good ditchrider is almost a deputy sheriff in addition to knowing his technical job. The author asked Murl Axtell, retired Project Engineer, to tell me his criteria for a good ditchrider. Mr. Axtell has close to forty-five years of government service related to irrigation engineering and twenty-five years with the FIP. He emphasized certain personality attributes.

"Dedication," Murl said. "I mean real dedication to the job. A good ditchrider is a fellow who doesn't let the weather bother him, whether he is going to go out or not." They must be good with farmers and good observers. "A good one," he continued, "is alert to what can be seen in the field just driving down the road. If there is a trickle of water that shows up where it shouldn't be, the good ones will notice it. They are also alert to notice if there is a different color. If the water suddenly shows up murky or cloudy from silt or from washing someplace, they are pretty sure that something is wrong. Maybe not wrong to the extent of danger, but possibly it is indicating that there is a washout, that the canal or ditch has given away some place, or it might be just a farmer that has started something in his ground and has let a stream of water get away and it started washing. Or there might be animal activity. Maybe cattle are tearing up the banks of the ditch because they are crowded in their pasture and perhaps the flies are raising cane with them. Maybe the whole herd will be over in the ditch trying to protect themselves from the flies and in the process they may be wearing down the ditch bank to the point of endangering the structure. Those boys will notice all of those things."

As important as being a good observer and being alert to the signs of water, the good ditchrider must be caring enough to follow up. "It doesn't matter whether it is quitting time, so called, at 4:30 or whether it is 8:00 in the morning or noon or in the middle of the night that things like that show up. Good ditchriders will respond to it and check into it then, and not say, 'Well, I'll come back tomorrow. Next time I'm on that shift I'll go look at it then.' No," Murl concluded, "the good ditchriders follow up on it right away."

Waterherder, farmer's helper, deputy lawman, ombudsman, skilled communicator, disciplined observer, all these attributes are the hallmark of a good ditchrider. Often the job seems janitorial and routine. However, as the author has shown, there are times of high drama as the job gets done far beyond the view of the casual observer. It is the ditchrider who ensures that the water is delivered to the farmer, the water that is essential for raising crops that contribute to the economic livelihood of the valley. "Progress" may mean more automation and centralized control of gates and turnouts. Meter readers may replace the ditchriders; but, for the FIP, that time is still beyond the horizon.

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