Sevier River Water Users Association

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II. New Tools for Managing Resources

As the experiences of the Navajo Nation and the town of Mayville demonstrate, the well being of rural areas depends on how effectively people manage their most precious resources, natural and human. Two projects described in this chapter look more closely at this issue.

Irrigation provides the lifeblood of farming in Utah's Sevier River basin, but, as in much of the west, there isn't enough water. To improve their lot, farmers will have to find ways to stretch this scarce resource. A project launched by the U.S. Interior Department's Bureau of Reclamation is showing how the timely collection and distribution of information can significantly improve the efficiency of irrigation systems so that farmers get the most out of the limited supply of water. Meanwhile, in coastal Maine, a project is showing how better information systems also can improve the delivery of social services to needy families, improving their chances of achieving self-sufficiency while ensuring that taxpayers and charitable organizations get the best return on their investment in social programs.

A "Virtual" Watershed Saves Real Water

In the arid southwest, where water is so scarce that people sometimes call it "liquid gold," Ray Owens controls a mother lode. As commissioner of the upper basin of Utah's Sevier River, he manages the Otter Creek and Piute reservoirs, which capture precious run-off from nearby mountains each spring so that farmers can irrigate their land during the long, dry summer. There is not a drop of water to spare. If winter snows are deep enough to fill the reservoirs, and if Owens metes out the water judiciously, farmers can successfully raise three crops of hay during the six-month irrigation season. But if winter fails to bring enough snow to the mountains, or if he lets the water run out prematurely, their crops may wither under the relentless sun.

Although the stakes are high and the margin for error is low, Owens' job was, until recently, largely a guessing game. He could carefully add up how much water farmers needed, but once he opened the reservoir gates and sent the life-giving liquid rushing down-stream, any number of unpredictable factors — including an evaporation rate that varies with the weather, unpredictable thunderstorms, possible leaks along miles of irrigation canals, and theft — might prove his calculations wrong. To make matters more difficult, he couldn't keep track of the water during its four-day trip to the Vermillion canal east of Richfield, Utah, the last place farmers tap into the river before it passes to the lower basin where a different commissioner takes charge. "All I could do," Owens says, was wait the four days and "see how much came out at the end." By then, however, it was hard to correct a mistake; if the river was too low to meet the needs of the farmers at the end of the line, they would have to wait another four days before additional water released from the reservoir could reach them — a dry stretch that could leave their crops damaged, if not ruined.

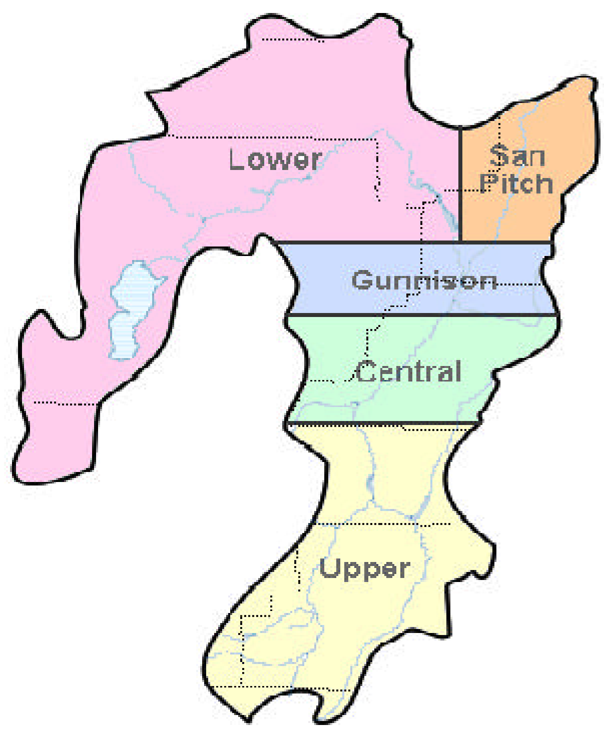
Owens' job has become a lot easier since 2000 — thanks to a new set of tools that are bringing the old art of irrigation into the information age. The U.S. Interior Department's Bureau of Reclamation has worked with the water users to install more than 20 solar-powered monitors that constantly measure water levels and the rate of flow at reservoirs, diversion dams, canals and key points along the river itself. All this information is relayed by radio to a "data hut" built with assistance from the Technology Opportunities Program near Richfield, Utah. There, it is amassed on a website that gives a round-the-clock snapshot of what is happening at every key point on the Sevier River's journey from a high plateau in southern Utah to a dry lake bed in the middle of a broad expanse of desert 225 miles north and west of the river's headwaters.

Less Guesswork

The new "virtual watershed" has taken a lot of the guesswork out of managing the basin's water supply. Instead of having to wait four days to determine how to adjust gates controlling the flow from the top reservoir in the basin, Owens now can constantly track the water all the way from the canal to the end of his section of the river and beyond. Any time the flow diverges from what farmers need, he can use a system of remote controls to fine-tune the rate at which water flows from reservoirs into the river and canals.

The instant calibration of water flows has made a huge difference to the farmers who depend on the river for their livelihood. "The river used to run dry about once a month," recalls Ivan Cowley, who operates a 900-acre farm near the Vermillion canal. "But that hasn't happened once since this started." Cowley said he never knew for sure how much water he would receive to water his crops until it flowed around a bend in the river just above Vermillion canal. But now, he says, "I can see the whole river in five minutes. I know exactly what's coming. This is the greatest thing that has ever happened here."

The Sevier Valley, about 100 miles south of Salt Lake City, illustrates just how important water is in the southwest. Mountains rising on either side of the valley are a harsh, monochromatic brown, dotted with dull spots of sagebrush. But the valley between them, nourished by the river and a network of canals that branch from it, is an inviting patchwork of green alfalfa, grains, pastures and cornfields. The mountains collect about 40 inches of precipitation a year, mostly in the form of winter snowfall. Without that



snow, the valley would be barren: it averages a foot of rain a year.

Irrigation may be nearing its limits, however. The most effective dams, reservoirs, irrigation canals and flood detention basins have already been developed, and environmental restrictions make construction of major new water projects unlikely. “New methods of managing water resources have become a necessity,” says Roger Hansen, activity manager in the Provo, Utah, office of the Bureau of Reclamation.

Measuring the Benefits

Hansen and his colleague, Arlen Hilton, worked with a team that included web-site developer StoneFly Technology, Utah State University and others to develop the real-time monitoring and control system for the Sevier Basin. They have won invitations to present their ideas from as far away as China. The project managers are reluctant to make specific claims for how far the virtual watershed can stretch the basin’s limited water supply. Too many variables — fluctuations in annual rainfall, for instance — make a controlled experiment impossible, he says. But people who depend on water day-to-day in the Sevier Valley are less reticent. Ivan Cowley, who serves as president of both the Sevier River Water Users Association and the Otter Creek Reservoir Company, estimates the project could be conserving as much as 12 percent of the basin’s water supply a year.

In the past, Cowley explains, every time the Sevier River would run dry, the Vermillion Canal would dry up, too. Its soil would become more porous, so that it would absorb more water when it refilled than if it had stayed wet continuously. What’s more, water managers, fearing the wrath of farmers unable to water their crops, often tended to overshoot their target, sending more water downstream than was needed. The excess would flow over the Vermillion Dam, lost forever to the farmers of the upper basin.

Russell Anderson, who manages two large canals from his home in Richfield, agrees that the new system is saving a substantial amount of water. In the past, Anderson had just two opportunities a day to adjust the gates controlling how much water flowed from the river into his canals. A “water master,” usually a farmer with many other things to do, would walk the canal early in the morning and again at the end of the day. Also known as a “ditch rider,” he would clear away any debris from the diversion channel and reset the gates to whatever height Anderson ordered. If conditions changed between these visits—say, farmers on the canal decided they wanted less water—Anderson had no choice but to wait for the water master’s next rounds to have the

gates adjusted. Now, though, he can make the changes instantaneously with a few strokes on his computer. What's more, a remote camera enables him to actually see the diversion structure, so that he can double-check the gate setting or check for any accumulation of debris or vandalism. And if the water flow diverges from his target while he is asleep or away, the system will trigger an automatic telephone call to his cell phone or his home telephone. "My girlfriend," as Anderson calls the female voice that delivers the warning, "won't stop calling until she gets me."

With all of these features, Anderson says he now adjusts the gates numerous times a day, rather than just twice. As a result, he says, the "shrink"—the amount of water he loses in the canals—has dropped in half, from 41 percent of the water he diverts from the river to 21 percent.

Anderson believes the increased efficiency of the irrigation system already is paying dividends to farmers: since the system of remote monitoring and control was installed, he said, they have been planting more corn and alfalfa, which require a lot of water but fetch higher prices, and less barley, which grows better in dry conditions but is less profitable.

The End of the Line

The system hasn't been in place long enough for experts to verify such a trend, but farmers agree the system may be improving their decisions about what—and when— to plant. That may be especially important in the lower basin, where the high plateaus of the upper basin give way to a low-lying, windswept expanse. In this part of the basin, sand dunes form in fields that aren't irrigated, and farmers operate closer to the edge. For them, being able to predict early in the season how much water will be available late in the year could be invaluable, according to Jim Walker, the lower basin's water commissioner. Normally, farmers water their farms until the water supply runs out. In a dry year, then, the third hay crop is the most likely one to fail. But late-season crops tend to have more protein, and hence, are more valuable. The virtual watershed may enable farmers to predict with greater certainty when there will be enough water for just two hay crops, so that they can forego the middle crop in order to save precious water for the more profitable third one, Walker says.

Farmers in the lower basin face other challenges unfamiliar to their counterparts upstream. Generally, by the time water reaches them, it already has watered other crops higher in the basin, gaining in salt content in the process. As a result, farmers are forced to pump ground water into their canals to make sure the irrigation water doesn't harm their crops. Trevor Hughes, a former professor at Utah State University, says data from real-time monitoring for salt content could be fed into to a mathematical model that balances the cost of pumping ground water against market prices for farm produce to tell farmers when it is cost effective to "sweeten" the water and irrigate rather than let the water flow on downstream.

Other elaborations of the project are in the works. The water users and Utah's State Climatologist have installed weather stations at four points in the basin that give farmers information that could increase the efficiency of the system even further. A farmer who sees storm clouds forming at a point upstream, for instance, might be able to forego irrigation — and thereby save water — knowing that Mother Nature would soon be watering his crops. Meanwhile, kayakers and fishermen also have expressed an interest in using the system to monitor river and reservoir conditions.

What's Next?

The system also may come in handy on those rare occasions when the Sevier River floods. "We could monitor the frequency of lightening strikes to predict when we are going to have unintended flows from thunderstorms," says Hughes. That, in turn, would enable water managers to open floodgates in a timelier manner. Jim Walker, the lower basin commissioner, believes severe floods also might be handled differently. In 1983, a spillway from the

DMAD reservoir in the lower basin gave way during an unusual flood, causing serious damage to the town of Deseret and leaving farmers without an effective irrigation system for two weeks. Ironically, that led many farmers, including Walker, to lose crops later for lack of water. Walker subsequently learned that officials higher up the river had been releasing pressure from higher reservoirs, a move that had increased pressure on the reservoir that ultimately failed. "If that happened today, I would be able to see what they're doing," Walker says. "I'm not saying I could have changed what they did, but at least I would have been able to argue they should keep more of that water."

Many water users are enthusiastic about modern information technology, though. Russell Anderson, the canal manager in Richfield, now says he feels like he is "blind after being able to see" whenever the new system goes down and he has to go back to the old way of doing business. Anderson says he wants the system to be refined to project in advance what water levels will be at various points on the river after he releases various amounts of reservoir water. Beyond that, he says, "I foresee a merge with canal automation and the web to the point I can wear a device right here behind my ear. All I have to do is think, 'What is the gate set at? One hundred feet.' Then I think, 'It should be at 95-feet, and the gate goes down.'"

On this last point, he has his tongue planted in his cheek. Or does he?

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