Cutting the Bureau of Reclamation and Reforming Water Markets

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Overview

For more than a century, the Bureau of Reclamation has built and operated dams, canals, and hydroelectric plants in the 17 western states. The bureau is the largest wholesaler of water in the nation, and it is the second largest producer of hydroelectric power, with 58 plants. It owns about 250 dams and 350 reservoirs, which are used for power, irrigation, flood control, and recreation.[1]

In 2011 the Bureau of Reclamation's net budget outlays were $1.9 billion. Its gross outlays were larger at about $2.9 billion, but about $1 billion of the bureau's annual spending is offset by receipts from various sources.[2]

Many cities and farm businesses in the West have become dependent on water from Bureau of Reclamation projects. However, the agency's policies have created economic distortions and environmental damage. Numerous Reclamation dams have not made any economic sense because the costs of the dams have outweighed the benefits gained from irrigation farming and other marginal uses of water. Farmers have been the largest beneficiaries of federal water infrastructure in the West, and they generally receive water at a small fraction of its market value.

The era of major federal dam building is over, but Reclamation continues to provide water to the western states at artificially low prices. Without reforms, that policy will exacerbate the major water challenges facing the western states. About four-fifths of water supplied by Reclamation goes to farm businesses, and the agency provides the largest subsidies to those users.[3] As a consequence, agriculture must be at the center of efforts to reform federal water policies.

Constructing dams for irrigation and hydropower makes sense in some locations. But in the 20th century, the Bureau of Reclamation was an agency run amok with grand engineering plans that ignored economic and environmental logic. The bureau aggressively sought to dam nearly every major river in the West at multiple locations. Dams have harmed wetlands and salmon fisheries, and federal irrigation has generated ongoing problems such as heightened salinity levels in rivers.

Looking ahead, Congress should consider transferring Reclamation dams and other facilities to state and local governments and the private sector. The bureau's mission to reclaim arid lands in the West by constructing irrigation projects has long been complete. Today, water policy issues—which are increasingly contentious—would be better handled within states that control their own infrastructure and solve their own unique demand and supply problems.

Reforms are also needed with regard to water rights, water transfers, and water pricing in the West. Reducing restrictions on water transfers and allowing water prices to better reflect market supply and demand would promote efficiency and benefit the environment. In the West, new supplies of water have been generally exhausted, so avoiding shortages in the future will depend on greater efficiency in water allocation and consumption.

This essay examines the history of the Bureau of Reclamation, describes the poor economics of federal water projects, and discusses some of the environmental problems caused by federal irrigation. It then discusses reforms to water markets, particularly allowing greater water transfers. The final section discusses transferring Reclamation assets to state and local governments and the private sector, which would reduce federal taxpayer costs and allow for more diversity and innovation in water policy solutions.

History of Federal Irrigation

In the 19th century the federal government accumulated vast land holdings in the West as a result of the Louisiana Purchase of 1803, the Texas annexation of 1845, the Oregon treaty of 1846, and the Mexican Cession of 1848. While the federal government gained huge territory, it also had a general policy for more than a century of transferring its land holdings to state governments and the private sector.

Republican president Abraham Lincoln signed the Homestead Act in 1862, which allowed western settlers to receive title for up to 160 acres of free land if they lived on the land for five years and made improvements. The Republican Party strongly supported homesteading,

and passage of the legislation was made possible by the secession of the southern states from the union during the Civil War.

That important law facilitated the privatization of hundreds of millions of acres of federal lands in subsequent decades. However, the 160-acre homestead size limit was too small to meet the needs of many settlers in the arid lands in the West. Viable ranching operations needed much larger acreages, and it took Congress decades to revise homesteading rules to make them more suitable for western settlement.

However, the relatively small tracts available under the Homestead Act did make sense in the West if irrigation was available, and private efforts to increase water for agriculture began early on. The Mormons, for example, arrived in Salt Lake Valley in 1847 and within a year had created an irrigation system covering 5,000 acres.[4] By 1900 there were about 7.5 million irrigated acres in the 17 western states, with almost all of the irrigation stemming from private efforts.[5] By 1910 private irrigation had expanded to 13.5 million acres.

All over the West, mutual irrigation companies (or "ditch" companies) were created. These companies issued stock to members who used irrigation water on the basis of their share of water received. In addition, investors from all over poured funding into corporations that built some quite impressive canals, dams, and other water infrastructure in Colorado, Wyoming, Idaho, and other states.[6]

Many of the speculative corporate irrigation investments failed, as did some early state government irrigation efforts.[7] These failures, and a feeling that private efforts weren't moving quickly enough, led some settlers, businesses, and government officials to begin advocating for federal help. Special interest groups started lobbying for federal aid to western irrigation in the 1870s. Irrigation enthusiasts from across the western states held regular conferences to gin up support for funding.[8]

In 1891 William Ellsworth Smythe launched *Irrigation Age,* which promoted federal intervention. Elwood Mead, a Wyoming irrigation engineer, and Francis E. Warren, a U.S. senator from Wyoming, were also leading advocates of federal aid.[9] These leaders helped organize national irrigation congresses in Salt Lake City, Denver, Albuquerque, Phoenix, and other cities during the 1890s. The National Irrigation Association was founded in 1899 to press for federal legislation.[10]

In 1896 Senator Warren secured a federal reservoir survey in order to provide support for federal flood control. The survey was led by Captain Hiram Martin Chittenden of the Army Corps of Engineers.[11] Chittenden visited many areas in the West to examine potential reservoir sites, and he met with leaders of the reclamation movement. His report to Congress in 1897 provided support for federal dams in some locations but not others.

Irrigation advocates used a variety of arguments in favor of federal aid for dam-building. Crittenden believed that federal aid was necessary because "private enterprise can never accomplish the work successfully."[12] Other advocates argued that federal dams were needed to control floods in the West. That argument was pressed after major floods occurred, such as when the Imperial Valley in California flooded in 1891.[13]

Another argument for federal support was the view that irrigation would spur western population growth, which would be good for the whole nation. Irrigation would provide opportunities for poor Americans to gain access to land, which would decrease social unrest. This "safety valve" thesis was an important part of the 19th century political debate. Wesley Jones, a representative and later a senator from Washington, for example, posited that putting people on small farms in the West was good for social order because wage laborers in the East could be subject to "anarchist disorder and revolution."[14]

There were some very dubious arguments in favor of federal irrigation aid. One widely believed theory was that irrigated farming would increase rainfall in formerly arid regions—rain would "follow the plow" it was said. That theory turned out to be false. Another argument, made by Frederick Newell, the chief hydrologist for the U.S. Geological Survey and later the first director of the Reclamation Service, was that there would be spillover effects from irrigation—irrigation from surface water would create increases in western groundwater.[15] That idea is no longer supported.

In 1901 Francis Newlands, a representative and later a senator from Nevada, introduced the first major legislation for federal construction of dams. The bill failed to pass, but the national mood was changing. All of the major political parties—the Democrats, Republicans, and the short-lived Silver Republicans—included support for federal irrigation in their platforms.[16] And by this time, the Geological Survey was preparing plans for reclamation projects at 147 specific sites.[17]

In 1902 another reclamation bill was introduced and President Theodore Roosevelt provided his strong support. The act passed easily in the Senate, but there was opposition in the House, with 146 voting in favor and 55 against it.[18] Representative William Hepburn from Iowa called federal irrigation "larceny" because it benefited private property owners at the expense of the general public.[19] Others resisted federal dam building as a step towards socialism.

Historically, it would have been cheaper to bring additional land into cultivation in the Southeast than in the dry West.[20] However, advocates of federal irrigation subsidies for the West gained the upper hand in the political arena. The Reclamation Service was established in 1902 within the U.S. Geological Survey. In 1907 the service was established as a separate agency within the Department of Interior. Then, in 1923, it was renamed the Bureau of Reclamation.[21]

Supporters of federal aid for western dams had political advantages. They argued that the Army Corps of Engineers had long invested in river and harbor improvements in the East, and the West had been left out of these federal subsidies.[22] Also, the West was slowly increasing its representation and influence in Congress. In 1895 only 2 of 8 members of the Senate committee responsible for the Reclamation Act were from west of Colorado. By 1902, the numbers had increased to 9 of 13.[23]

The railroads were major supporters of federal irrigation legislation, and they financed lobbying efforts in favor of passage.[24] The railroads were supporters because irrigation would increase the value of the western land they held. It would also increase immigration to the West, which would boost the number of railroad passengers.

Note that if the federal government had not stepped in to provide irrigation in the West, the railroads might have been important backers of private irrigation projects for those same reasons. But federal intervention ended opportunities for private development of western water

infrastructure. The federal government secured for itself the best dam locations in the West, and the Commerce Clause of the Constitution allowed it to aggressively assert control over all navigable rivers and their tributaries.[25]

The Poor Economics of Federal Irrigation

The 1902 Reclamation Act required the full repayment of irrigation project costs by the beneficiaries. Initial funding for reclamation projects was to come from the sale of federal land in the western states. As projects were completed and revenues were raised from water users, the government could then fund new projects.

Reclamation projects were supposed to involve no direct costs to federal taxpayers, but Congress soon reneged on that promise and began to increase subsidies in various ways. One reason was that "early on, it was discovered that the costs of establishing irrigated farming . . . were much higher than expected, and the costs of building water projects were much higher than originally estimated," noted the Government Accountability Office.[26]

Despite the high costs, Reclamation was eager to build dam after dam. One strategy it employed for many decades was to fudge its analyses of proposed projects to make the costs look lower, and the benefits higher, than they really were. The agency would paint a rosy economic picture to gain project approval, and then it would allow the full information to trickle out later. For example, Reclamation began constructing the Grand Coulee Dam with $63 million in funding from Congress, but it later became clear that the agency had a $270 million project in mind.[27]

This strategy has long been employed on government infrastructure projects.[28] The Army Corps of Engineers, for example, has a history of distorting its analyses of water projects in order to secure project approval.[29] Or consider that in pushing for approval of the huge State Water Project in California in 1959, Gov. Pat Brown kept throwing out a bogus cost estimate of $1.75 billion, even though he knew it would cost far more, as he later admitted.[30]

From the beginning, political factors undermined the possibility that Bureau of Reclamation investment decisions would be made in a rational economic manner. As Marc Reisner noted in his history of the agency, *Cadillac Desert*, "Every Senator still wanted a project in his state; every Congressman wanted one in his district; they didn't care whether they made economic sense or not."[31]

To secure support from the western states, the 1902 legislation required that 51 percent of the revenue from federal land sales in each state be spent on Reclamation projects within that state.[32] However, there wasn't necessarily a relationship between land-sale revenues and the locations of the best projects. This requirement "seriously compromised the ability of government engineers to select projects objectively."[33]

After the Reclamation Act passed, the Republican Party saw political advantage in quickly proposing a large number of projects in as many states as possible.[34] This rush to launch projects for political reasons reduced efficiency. By 1907 Reclamation had requested and received congressional approval for 24 projects, with every western state receiving at least one.[35] "Most of the projects were begun in great haste with little attention paid to 'economics, climate, soil, production, transportation, and markets.'"[36]

Reisner noted that "by building so many projects in a rush, the Reclamation Service was repeating its mistakes before it had a chance to learn from them."[37] Indeed, many early Bureau of Reclamation projects were failures.[38] The bureau gained experience, and went on to build some tremendous dams in subsequent decades. Still, there were boondoggles and disasters, such as Reclamation's Teton Dam in Idaho, constructed in 1975. The dam was built on the basis of a flawed economic analysis, and the dam's engineering was so poor that it collapsed catastrophically in 1976.[39]

Private companies often make mistakes, but they systematically aim to make the investments that have the highest net returns. By contrast, government projects are often chosen on the basis of factors such as political pull, which often results in projects with low or negative returns. The history of Reclamation reveals that it systematically followed poor policies regarding its infrastructure investments, decade after decade.

One early decision by the Bureau led to large investment inefficiencies for much of the 20th century. The 1902 legislation stated that "charges shall be determined with a view of returning to the reclamation fund the estimated cost of construction of the project."[40] In interpreting this, the Bureau decided to exclude interest costs, so that project beneficiaries would be required to pay back only the original project costs over time. The effect was to greatly reduce the real value of repayments, thus creating large subsidies on Reclamation projects.

Congress further increased subsidies by extending required repayment periods. The original repayment period of 10 years was extended to 20 years in 1914 and to 40 years in 1926.[41] Some later projects, such as the Central Arizona Project, had even longer repayment periods. In 1939 Congress increased subsidies further by instituting a 10-year grace period before project repayments had to begin.

Economists Price Fishback and Randall Rucker estimated that Reclamation projects with 40-year repayment periods and 10-year grace periods had interest-related subsidies of 57 percent with a 3 percent discount rate and 91 percent with a 10 percent discount rate.[42] Economist Richard Wahl finds similar high levels of interest subsidies on Reclamation projects.[43]

Congress increased reclamation subsidies in other ways. In 1910 it added $20 million of taxpayer money to the Reclamation Fund. In the 1920s and 1930s, Congress passed numerous deferrals of repayment because of economic hardships in agriculture.[44] The secretary of Interior was also given discretion to reduce repayment obligations on the basis of reassessments of land productivity.[45]

With the approval of Hoover Dam construction in 1928, "large appropriations began to flow to Reclamation from the general funds of the United States."[46] In the 1930s, the New Deal ushered in a huge expansion in taxpayer-financed dam building. The idea was to spend money to create government jobs, not to spend money efficiently.

In the mid-20th century, the federal government went on a massive dam-building binge. Looking at Reclamation's full list of dams today, 85 were built between 1902 and 1930, and 203 were built between 1930 and 1970.[47] Meanwhile, the agency's bureaucracy jumped from a few thousand employees in the 1920s to nearly 20,000 by the 1940s.[48]

Politics, not economics, continued to be the driving force of Reclamation projects. For example, a whole series of dams forming the Colorado River Storage Project, including the Glen Canyon Dam, were authorized in 1956. These dams made little sense from an economic or environmental point of view. Sen. Paul Douglas of Illinois—a PhD economist—lambasted these projects relentlessly when they were being considered in Congress. But in the end, the economics of the projects didn't matter, only the political drive for Reclamation to spend money in certain states did. As Reisner notes, California had won a series of big projects from Reclamation, so now it was the turn of the Upper Basin region of the Colorado River to win some. So the projects were approved, even though power production and irrigation didn't make much sense in the region.[49]

That sort of political logic was then transferred to Arizona. If California, Colorado, and other states got big projects, why shouldn't Arizona? Arizona is one of the driest states in the nation, but it has groundwater sources that had long provided water for irrigation in the state. However, by the 1960s the groundwater was becoming harder to get and Arizonans were looking for new sources of water.

In 1922 the Colorado River Compact divided Colorado River water between adjacent states. It allocated 7.5 million acre-feet to the lower Colorado basin, which includes Arizona, California, and Nevada. In 1928 Congress subdivided that water among the three states, with Arizona receiving 2.8 million acre-feet. To use the Colorado River water, Arizona would have to transport it from the western part of the state to the southern part, but at the time that was considered to be too costly—even the Bureau of Reclamation said it was a "mad man's dream."[50]

By the 1960s, however, the situation had changed. For one thing, the Bureau of Reclamation was eager to find big new projects to keep the agency's large workforce employed. The Central Arizona Project (CAP) fit the bill since it would be hugely expensive to construct the needed pumps to lift water up great elevations and to deliver it more than 300 miles through aqueducts to Phoenix, Tucson, and surrounding areas. The bureau seized on the opportunity and "refused to believe any expert who told it what it didn't want to hear."[51] Dan Dreyfus was the Bureau of Reclamation official in charge of providing benefit-cost estimates at the time, and he later confessed: "I had to fly all the way out to Denver and jerk around the benefit-cost numbers to make the [CAP] look sound."[52]

In 1968 after years of political infighting, Congress authorized the Central Arizona Project within a broader bill that included numerous other projects.[53] The bill exemplified the power of congressional logrolling—new projects were spread across many different states and congressional districts. Dreyfus later said that some of projects in the bill were "pure trash," but stubborn members of Congress, defending their states, wanted them in the bill.[54]

The Central Arizona Project was completed in 1993 at a cost of about $5 billion. Economists Steve Holland and Michael Moore completed a detailed analysis of the benefits and costs of CAP.[55] They found that rather than provided net benefits to society, it resulted in imposing deadweight losses on society of more than $1 billion. Like numerous prior Bureau of Reclamation projects, the CAP was a net waste of resources.

Advocates for government infrastructure spending seem to imagine that well-meaning officials will rationally weigh the costs and benefits of projects, and then make decisions with the broad public interest in mind. But it hasn't worked that way with the Bureau of Reclamation. The agency was headed by a series of leaders fixated on building just about every project that any important politician wanted. As with leaders of the Corps of Engineers, Reclamation had an engineering mindset, and it was eager to conquer nature with huge concrete facilities.

Michael Strauss headed Reclamation from 1946 to 1953. He was a New Deal liberal and a "public power ideologue" who hated private utilities.[56] He wanted to build as many huge power dams as he could, and he didn't seem to care whether they made any economic sense. Floyd Dominy, who headed Reclamation from 1959 to 1969, was another liberal public-power advocate, and he was apparently a zealous anti-environmentalist. He saw little if any value in free-flowing rivers or wildlife-supporting wetlands.[57] He manipulated Congress, ignored laws that were inconvenient, and used his office and staff to arrange liaisons with young ladies.

To a remarkable degree, both Reclamation and the Corps were insulated during the 20th century from control by presidents, their opponents in Congress, and critics outside of the government. Leaders of these agencies simply needed to stay tight with the few key members of Congress who controlled their funding. The two bureaucracies competed to outspend each other. In California, for example, "their rivalry was a wonderful opportunity for the state's irrigation lobby; the growers could sit back and smile coyly as they were madly pursued by rival suitors in hard hats."[58]

Since the 1950s, the Bureau of Reclamation has been required to perform benefit-cost analyses of its projects. There is a strong incentive for the bureau to underestimate costs and overestimate benefits, and for decades independent economists have argued that the bureau distorts its analyses for political reasons.[59] One trick the bureau has used is to count the total value of irrigated crops as project benefits, even though a sounder analysis would only count the net increase in crops.[60] The tendency of the bureau to exaggerate project benefits is exacerbated by the fact that its analyses are not reevaluated once a project has been completed to ensure accountability.[61]

Agriculture has received by far the largest subsidies from Reclamation projects. In calculating repayment requirements, Reclamation allocates substantial costs related to irrigation to other project beneficiaries, such as power customers and urban water customers. Also, a law change in 1939 allowed the bureau to reduce costs to irrigators on the basis of "ability to pay," which has saved farmers billions of dollars over the decades.[62] A 2006 CBO report found that irrigators have been required to repay only about 37 percent of total original costs allocated to them over the decades.[63]

Most independent studies find that 15 percent or less of project costs are typically repaid when interest costs are included.[64] Looking at projects built between 1902 and 1980, for example, Richard Wahl found that irrigators only paid back 14 percent of total project costs.[65] The Congressional Budget Office concurred that "the federal government's contribution to the cost of constructing and financing irrigation projects amounts to about 85 percent to 90 percent of the total cost allocated to irrigation."[66]

Even these estimates don't take into account the full costs of federal water infrastructure and irrigation subsidies. An additional cost is that the government spends taxpayer money to mitigate the environmental damage done by federal dams and irrigation systems, as discussed next.

Dams, Irrigation, and the Environment

The large subsidies built into many Reclamation projects indicate that they have been a loss to taxpayers and the economy. But Reclamation projects have also harmed the environment, which has prompted Congress to burden taxpayers with further spending aimed at mitigating the damage. Historically, the bureau was mainly focused on building dams to increase farm production, and it generally ignored the harm it was doing to in-stream uses of water. Losses to salmon fisheries, wetlands, and other natural habitats were of little concern to the agency.

With the rise of the environmental movement since the 1970s, the bureau has been forced to be more environmentally friendly. Indeed, public sentiment has shifted so much that some dams today are considered to cause overall harm, not create public benefits.[67] The environmental group American Rivers describes 10 sorts of harm done to rivers, and the use of rivers, by dams.[68] The issue is not just the harm done by dams to nature, but the harm to the human benefits of free-flowing rivers, such as recreational activities and the fishing industry.

President Jimmy Carter was an early anti-dam crusader and he famously tried to terminate 19 major projects of the Bureau of Reclamation and the Corps of Engineers. Carter examined the environmental and economic effects of these projects, and he concluded that they were boondoggles. However, Carter misplayed the politics of the issue, and his spending cuts to water infrastructure projects went nowhere in Congress.[69] Carter's skepticism of dams is more widespread today, and a movement has developed to remove dams where the costs seem to outweigh the benefits.[70]

Many federal dams do provide substantial benefits, but the benefits are sometimes exaggerated. For example, Reclamation has often claimed large flood control benefits from projects. However, some water resource experts argue that the infrastructure of the Bureau of Reclamation and the Corps of Engineers has tended to eliminate the natural floodplains of rivers, confining them to narrow passages, which can concentrate water flows and exacerbate flooding. The damage to wetlands caused by federal water infrastructure can also encourage flooding. Looking at the big picture, we've had huge federal spending on water infrastructure over the last century, and yet floods cause more damage today than in earlier decades, when measured in constant dollars.[71]

In the West, federal irrigation has created a mix of benefits and costs. One ongoing environmental problem stemming from irrigation is salt build-up in soils. "Salinity is a worldwide threat to the sustainability of irrigated agriculture [but] both the accumulation of salt and the extent of salt-affected soils are more prevalent in the West," noted a recent study by the National Academy of Sciences.[72]

Irrigation also causes salinity problems in river systems. As irrigation waters run through fields and flow back into rivers, they pick up salts and other minerals from the land. Western rivers that are heavily tapped for irrigation become very saline downstream. The Colorado River, for example, is notoriously saline by the time it reaches the Mexican border. Indeed, because of Mexican concerns, Reclamation built an expensive desalting plant—the Yuma Plant in Arizona—at a cost of $245 million to treat irrigation water before it reached the border.[73] As it turned out—after that large taxpayer cost—the plant hasn't been used since it was completed in 1993. Maintenance costs at the plant are piling up at $6 million a year, or more than $100 million over the last two decades.[74] These sorts of costs related to environmental cleanup are an additional negative factor that policymakers should consider when debating federal irrigation policies.

Contaminated runoff from irrigation is a huge and costly problem in the Westlands Water District of California's San Joaquin Valley.[75] The area receives irrigation water from Reclamation's Central Valley Project (CVP), San Luis Unit, which was built in the 1960s. Land in this area contains high concentrations of selenium and other chemicals, which are picked up by irrigation waters and poison downstream ecosystems. Furthermore, without proper drainage in the area, salts are apparently building up and destroying about 200,000 acres of irrigated farmlands.

Reclamation spent $55 million to build a drainage system to fix the problem, but that project was abandoned as a failure in the 1970s.[76] Since then, the bureau, landowners, courts, and politicians have battled over how to fix the problem. A more sophisticated water treatment system for the region could cost more than $2 billion—a cost about three times larger than the original cost of the area's irrigation infrastructure.[77] It appears that Reclamation's entire project to irrigate this area of California was a huge blunder, and the former leader of the bureau admitted it in an interview.[78]

The Environmental Working Group (EWG) argues that federal irrigation to this area of California should be ended because the area is inherently unsuited to farming.[79] That could save millions or even billions of dollars for a new treatment system, and it would allow a huge volume of irrigation water to be diverted to higher-valued uses in the state. The Westlands District contains just a few hundred very large farm businesses, and they have become wealthy from federal water and farm subsidies. It makes little sense for taxpayers to pay for a huge new treatment system for these businesses, especially when irrigated agriculture in this area makes such little economic and environmental sense.

Environmental problems caused by federal subsidies have followed a similar pattern in the Florida Everglades as they have in California. First, the federal government provides large subsidies to agriculture—in Florida that has included sugar subsidies and Army Corps of Engineers water infrastructure.[80] Second, substantial environmental damage is caused, which in Florida includes damage to wetlands and the contamination of water systems by irrigation runoff. Third, the federal government steps in with billions of dollars of taxpayer funds to try and fix the environmental problems.[81] This funding has been called "green pork."[82] Fourth, the federal subsidies that caused the underlying problems remain in place!

The lesson is that the costs of federal water infrastructure are often more than just the original construction costs. The EWG has tallied up the costs of the various types of federal subsidies received by farm businesses in California's Central Valley Project. The CVP is Reclamation's largest irrigation project, providing roughly 6,800 farmers irrigation water for about 3 million acres of land. The farmers

receive the water at roughly 10 percent of its market value, which in 2002 worked out to an annual subsidy of about $416 million a year, according to EWG.[83] Another way to illustrate the magnitude of the subsidies to CVP water users is to look at the costs of the project. In 2006 the CBO found that CVP farmers had paid back only 14 percent of the project's construction costs thus far, even though water from the project has been flowing for decades.[84]

On top of the irrigation subsidy, about one-fifth of CVP farmers who receive federal irrigation water also receive crop subsidies from the U.S. Department of Agriculture (USDA).[85] Put another way, about one-third of federal irrigation water in the CVP went to crops receiving USDA subsidies. Those subsidies total about $90 million a year and mainly go to cotton and rice farmers.[86] This subsidized production of often water-intensive crops in the arid West competes with more efficient production of the same crops in other regions of the country. Federal farm subsidies encourage overproduction of crops in all parts of the nation, and so the government is exacerbating the overproduction with irrigation subsidies in the West.

CVP farmers also receive electricity subsidies. In the CVP, farmers receive discounted prices for the electricity that is used to pump water in irrigation operations.[87] The CVP uses massive pumps to push water through 1,400 miles of canals. The EWG found that low-cost power creates a subsidy of about $100 million a year to CVP farmers.

In sum, many western farmers receive irrigation subsidies, farm subsidies, and electricity subsidies. In the CVP, those subsidies add up to roughly $600 million per year, according to the EWG. Furthermore, taxpayers get hit paying the additional costs of cleaning up the environmental problems created by federal irrigation.

Who benefits from all these federal subsidies? Generally, it's a small number of large farm businesses and landowners. In the CVP the subsidies are heavily slanted toward the largest farms. The largest 10 percent of farms (roughly 700 farms) in the CVP receive about two-thirds of the project's entire water supply.[88] This group received average subsidies worth $349,000 each in 2002. Major petroleum and railroad companies—as landowners—have historically been some of the largest beneficiaries of irrigation subsidies in California.[89] The USDA's farm subsidies are also notoriously slanted to the very largest farms and landowners.[90] Thus, to a substantial extent, subsidized irrigation farming in the West is "corporate welfare," which comes at the expense of average taxpayers, citizens, and the environment.

Reforming Water Markets

The Bureau of Reclamation's original function of building major water infrastructure in the West has been largely completed. Today, its main function is being the largest wholesaler of water in the nation.[91] It diverts a vast amount of water from rivers, and delivers it to farmers, industries, and cities. Interestingly, about one-quarter of the water it diverts from rivers is lost through spills and transportation even before it reaches any customers.[92]

About four-fifths of Reclamation water is directed to agriculture.[93] The bureau generally sells the water to local irrigation districts under long-term contracts. The contracts specify the water allotments and applicable prices. The bureau's water pricing on each project depends on original construction costs, calculations of irrigators' "ability to pay," the allocation of costs among different water users, and other factors. Generally, the higher prices paid by urban water users and power customers subsidize the much lower water prices paid by irrigators. Prices vary widely in the West, but farmers often pay no more than 10 percent of the water's market value.

Despite Reclamation's huge investments to increase supply over the decades, many areas in the West face a looming water crisis. Groundwater levels are falling and surface sources of water are tapped out. Major river systems in the West have been engineered by federal and state water infrastructure to maximize water consumption. Even if new water supplies could be developed, accessing those sources would be likely blocked by environmental concerns. Governments have responded to tightening water supplies with a wide range of bureaucratic and regulatory initiatives.

However, the underlying problems of water in the West relate to inefficient policies regarding water prices and water transfers. Governments have kept prices artificially low for so long that it has encouraged water waste and water usage in low-value activities. The Bureau of Reclamation charges users only a fraction of the full costs of water, as we have discussed. Also, local irrigation districts partly rely on taxes to finance their activities, and that reduces their incentive to efficiently price water. Water prices in most districts do not reflect the opportunity costs of the water.[94]

The prices for Reclamation water are not set by market supply and demand. Prices are set far below the marginal costs of new supplies, which would be the efficient level in normal competitive markets. For example, in 2003 California's Imperial Water District proposed to sell a portion of the Reclamation water it receives at $15 per acre-foot to the City of San Diego for $225 per acre-foot.[95] That indicated that the irrigation district was receiving federal water at a price that is a small fraction of the market value. Water prices vary widely across the West, but such large differentials between prices paid by irrigators and prices that other users would be willing to pay are typical.[96]

If Reclamation charged higher prices, it would encourage a range of conservation efforts. For example, it would induce farmers to reduce leakage in irrigation systems and to switch to less water-intensive crops. Research has shown that irrigation water use is quite sensitive to water prices, such that price increases would induce substantial reductions in demand. One estimate found that a 10 percent increase in water prices would bring about a 6.5 percent reduction in irrigation water use in California.[97]

The problem of artificially low water prices is compounded by restrictions on water transfers between users. Surface water in the West is generally allocated by government rules, not by markets. Farmers who receive Reclamation water usually don't have the option to resell it, so it gets locked into current uses. Reclamation doesn't have an across-the-board ban on water transfers, but current rules do not facilitate easy transfers.[98] If water cannot be resold, it gets stuck in lower-valued uses while higher-valued uses go undersupplied. Water "shortages" are usually caused by restrictions on transfers, not from overall shortages in a region.

In most places in the West, agriculture is central to the challenges facing water. Because irrigation represents such a large portion of western water use, increased efficiency of water use in agriculture would free up large amounts of water for other uses. Allowing farmers to freely sell water would encourage them to conserve and to reduce irrigation on their least productive lands. The value of marginal water use

in agriculture is low, according to the Congressional Budget Office, while the value of water to growing cities is higher.[99] Thus, allowing greater water transfers could be a win-win for all interests.

The water industry in the West operates within a complex web of water rights, water legislation, and court rulings enforced by the federal and state governments. At the federal level, Reclamation projects create entitlements to the water supplies from its facilities. The federal government also asserts control over navigable waterways, a power derived from the Commerce Clause of the Constitution. And since the 1970s, federal environmental laws have imposed rules on water systems regarding endangered species, wetlands, and other items.

At the state level, water law in the West developed in the 19th century based on the principle of "prior appropriation." Those people who first diverted water from a river and put it to a beneficial use had a priority right to it in the future. This doctrine separated water rights from land ownership, which allowed water to be diverted to the place of use at a distance from the source. Under prior appropriation rules, the ownership of water rights can also be transferred.

In market economies, strong property rights are essential to encouraging the efficient allocation and use of resources. Property rights allow individuals to plan ahead and make long-term investments, or to sell their resources to others who may have a higher-valued use. Unfortunately, water markets have suffered from increasingly complex and restrictive rules layered on top of original prior appropriation rights, and these layers of rules have often encouraged inefficient water consumption.

Water rights in the West today are generally "usufructuary," meaning that they confer the right to use water in certain ways, but they don't confer absolute ownership. "Beneficial use" rules in the states allow governments to confine water use to certain activities, sometimes at the expense of other higher-valued uses. "Use-it-or-lose-it" rules require that those people with rights to water use their full allocations currently, else they risk losing them in the future. These rules and others create disincentives for water conservation.[100] If farmers and other end users risk losing their water rights if they don't consume their allocations, and if they can't profit from selling any excess water, they will have little incentive to use water efficiently.

Another way to describe the problems is that when governments assert public water rights through various laws and regulations, it often erodes private water rights, and it is those private rights that generally promote efficiency in use. Some people have a knee-jerk response with respect to water policy—they think that because it is an important resource, it should be owned by the government. But that's exactly backwards notes water expert James Huffman: "Because water is such a critical resource it should be allocated under a regime that will assure its efficient use," and that regime is open markets based on private rights.[101]

Given the pressing need to use water supplies more efficiently in the West, policymakers need to reexamine the rules that discourage conservation, block transfers, and keep prices artificially low. Given the resistance by farmers to large and sudden price increases in water, many experts think that near-term reforms should focus on allowing increased water transfers. Wahl argues that "voluntary exchanges can be as effective as appropriate pricing in leading to efficient water use."[102] Water demands change over time, for example, as demands for certain types of crops change. Allowing greater water transfers would allow water to move between areas to meet changing market conditions.

Reducing barriers to water transfers would create broad benefits. Cities and industries that have growing demands would be able to access new sources of water. Farmers would be able to sell their excess water and earn profits. Some people might view such profits as unfair, but they would drive increased efficiency in water use to everybody's benefit. Currently, farmers earn profits from crop production based on artificially low water prices. Allowing farmers to earn profits on water transfers merely changes the form of profits that stem from low-price federal water.[103]

Allowing more water transfers could ease increasingly contentious water conflicts in the West. The San Joaquin Valley, for example, has been one battleground in recent years, stemming from federal decisions to reduce water deliveries to farmers and to leave water instream to benefit fish.[104] Some members of Congress are furious that environmental laws are trumping irrigation water use and putting the livelihoods of farmers in jeopardy.[105] Indeed, there can be a high cost to humans of overzealous federal environmental laws. But the basic cause of water conflicts in the West is that allocations are being made on legal and political grounds, which are typically zero-sum decisions. If, instead, water was allocated by market transfers, it could create win-win solutions because competing claims could be met through voluntary agreements.[106]

To sum up, moving toward water trading and market pricing would encourage more efficient water use. In a 2006 report on federal water policies, the CBO endorsed the "broader use of markets in deciding how scarce water resources are allocated" and suggested that Congress "reconsider subsidies that support the use of water at prices that do not reflect opportunity costs."[107] There have been some moves in the direction of market reforms in recent decades, such as changes to the Central Valley Project in 1992. Some nations have moved toward freer markets in water. Chile, for example, has established secure and transferable water rights, which allow farmers and cities to buy, sell, or lease water with prices set by supply and demand.[108] Thus, as federal and state policymakers try to avert water crises in coming years, there are some real-world market models for them to consider.

Reducing the Federal Role in Water Infrastructure

A century ago, proponents of irrigating the West argued that federal involvement was crucial because the job was simply too big for state, local, and private efforts. Those arguments have no relevance today because the western states are populated by tens of millions of people with the incomes and resources to handle their own water supply needs.

Today, all the goods and services provided by the Bureau of Reclamation—water, electricity, and recreation facilities—could be provided by state governments, cities, local irrigation districts, investor-owned utilities, and nonprofit groups. As such, federal policymakers should explore how Reclamation facilities could be transferred to state, local, and private ownership.

The single largest Reclamation project is the Central Valley Project (CVP), and its dams, canals, and other facilities are all located within California. The CVP was originally supposed to be a state project, and only became a federal project by "historical accident."[109] The

project was approved by the California legislature and by a state referendum in 1933.[110] But then the state decided to lobby Washington for funding and was successful, so the federal government took it over. Today, California has its own large water infrastructure project, the State Water Project, which could be the home for CVP assets if they were transferred to the state.

In the 1990s there were efforts to transfer some Reclamation facilities to nonfederal owners. Under its "reinventing government" initiative, the Clinton administration sold some federal projects to local irrigation districts.[111] In 1996 Reclamation sold 141 miles of canals, 462 miles of lateral channels, and 457 miles of drains to the Elephant Butte Irrigation District in New Mexico. The same year, Reclamation transferred its Vermejo Project in New Mexico to the Vermejo Conservation District. In 1997 Reclamation transferred irrigation facilities to the Oroville-Tonasket Irrigation District in Washington State. And, at the time, there were proposals to transfer the CVP to either private owners or the State of California, but those reforms did not come to fruition.[112] Nonetheless, 19 Reclamation projects had been transferred to nonfederal owners by 2006.[113]

Acts of Congress were required to facilitate these ownership transfers. However, Reclamation has standing authority to move the responsibility for operation and maintenance of its projects to local irrigation districts, and it has done so hundreds of times.[114] Indeed, about two-thirds of Reclamation facilities are "transferred facilities," which are operated and maintained by end users such as irrigation districts.[115] That is a step in the right direction, but transferring the ownership of facilities would have further advantages, such as making it easier for irrigation districts to borrow funds for capital investment and using owned facilities as loan collateral.[116]

Local control of irrigation infrastructure would likely reduce costs. One estimate found that local control of operations and maintenance reduces costs by about 25 percent from "cheaper labor costs, less paperwork, [and] faster decisionmaking."[117] In 2008 a western farm organization that was testifying to the House in favor of Reclamation facility transfers noted: "Experience throughout the West demonstrates that when control of projects is assumed by local interests, the projects are run more effectively and with far fewer items of deferred maintenance."[118]

In 1995 legislation to encourage facility transfers was introduced in the House and Senate, but it made no headway.[119] In 2008 the Commissioner of Reclamation, Robert Johnson, supported legislation (H.R. 6992) that would have authorized the Department of the Interior to transfer ownership of smaller-scale facilities to nonfederal entities.[120] Congress should move ahead with such legislation to give Reclamation the authority to sell or transfer assets to willing buyers, subject to certain general parameters established in law.

Policymakers should recognize that many Reclamation facilities are more than a half a century old, and they may need costly repairs or replacement in coming decades. The Congressional Research Service estimates that the replacement value of all Reclamation assets is more than $100 billion.[121] Because of today's huge federal deficits and the advanced age of federal water infrastructure, the CRS says that there will be increasing conflicts over funding the maintenance of these assets if they remain under federal control.[122]

State and local officials are in a better position to make decisions on water infrastructure investments that will be needed in the future. The Bureau of Reclamation says that investments in water conservation—such as reducing water losses on irrigation canals—can generate high returns.[123] That's the type of investment opportunity that local owners of infrastructure would be eager to pursue. But if water investment decisions are left to Washington, good opportunities may be foregone because of the general fiscal mess.

Congress should consider privatizing some of the Bureau of Reclamation's 58 hydroelectric power plants. Perhaps the first step would be to transfer plants to the two federal power utilities in the West—Bonneville Power Authority (BPA) and the Western Area Power Administration (WAPA). The second step would be to privatize BPA and WAPA.

Federal ownership of BPA and WAPA is an anomaly. The bulk of U.S. power generation is by investor-owned utilities. Even just considering hydropower, more than two-thirds of the roughly 2,400 plants in the nation are owned by the private sector, although about three-quarters of the capacity is in publicly-owned plants.[124] While federal facilities are dominant in some western states, other states have substantial private hydropower, such as New York and North Carolina. Note that the Clinton administration privatized the Alaska Power Administration in 1996, and it also studied how to transfer other federal power assets to nonfederal owners.[125]

Privatizing Reclamation dams as part of BPA and WAPA would save taxpayers hundreds of millions of dollars a year in taxpayer-funded appropriations. In addition, billions of dollars could be raised by selling these utilities to investors, which would help reduce the federal debt. In 1997 the CBO estimated that private businesses would be willing to pay $23 billion or more for the power assets of BPA, WAPA, and two smaller federal utilities.[126] That figure includes the sale of generating plants owned by Reclamation and the Corps of Engineers.

Privatizing BPA, WAPA, and federal hydropower plants would likely improve operational efficiency. The Congressional Budget Office found that "private operators of hydropower facilities would generally produce electricity at a lower cost than the federal operators currently do."[127] The CBO further noted that "the managerial structure of the federal power program ... makes it hard to operate efficiently."[128] As examples of inefficiency, the CBO pointed to the inadequate maintenance of federal power assets and the low utilization rates of facilities.

Reforming federal water policies and downsizing the Bureau of Reclamation would be challenging.[129] But avoiding such reforms will probably deepen the water crisis in the West. The Bureau of Reclamation noted in its report "Water 2025" that without reforms, rising population in the West could lead to frequent water shortages and growing political battles in the southwestern states from Texas to California.[130]

The Water 2025 report noted that current regulatory approaches to water allocation problems were causing angry conflicts in the West, but that market-based solutions have worked well where they have been tried.[131] So the sooner we can substitute local water markets for government central planning of water the better. Indeed, "it is unlikely that the institutions necessary for a well-functioning [water] market can be imposed through a central government," note Terry Anderson and Pamela Snyder. [132]

By decentralizing the infrastructure and decisionmaking for water, the states would be the "laboratories of democracy" for meeting their water needs. The states have different legal structures for water rights, different types of farming, and different access to groundwater, and so they may evolve different responses to their water challenges. The "Water 2025" report found that water stakeholders across the West favored water policy decisions being made at the local level.[133]

Aside from the reforms discussed above, there are other ways that Congress could alleviate pressures on water supplies. One reform would be to repeal the large farm subsidies handed out by the USDA, which provide an extra incentive for western irrigation farmers to put low-value lands into production.[134] Another reform would be to repeal federal ethanol subsidies, which encourage the building of water-glutton ethanol refineries. And yet another reform would be to repeal federal import barriers and regulations that support the production of sugar beets, which are "one of the most water-intensive crops grown in the West."[135]

A recent report by the National Academy of Sciences concluded that "the capacity for water to support cities, industry, agriculture, and ecosystems in the U.S. West is near its limit under current management practices."[136] We need new "management practices" in water, and a growing number of economists, environmentalists, and resource experts believe that the answer is to pursue market-oriented reforms to federal and state water policies.

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[123] Bureau of Reclamation, "Water 2025: Preventing Crises and Conflict in the West," August 2005, p. 16.

[124] Douglas G. Hall and Kelly S. Reeves, "A Study of United States Hydroelectric Plant Ownership," Idaho National Laboratory, June 2006, p. 2.

[125] In 1995 the Clinton administration proposed the Federal Power Administration Transfer Act.

[126] Congressional Budget Office, "Should the Federal Government Sell Electricity?" November 1997, p. xv. An additional $22 billion or more could be raised by selling the Tennessee Valley Authority.

[127] Congressional Budget Office, "Should the Federal Government Sell Electricity?" November 1997, p. xv.

[128] Congressional Budget Office, "Should the Federal Government Sell Electricity?" November 1997, p. xiii.

[129] For a discussion of some of the complexities, see William H. Holmes, "Dams for Sale: The Ins and Outs of Federal Facility Transfers," Rocky Mountain Mineral Law Foundation, 1997.

[130] Bureau of Reclamation, "Water 2025: Preventing Crises and Conflict in the West," August 2005.

[131] Bureau of Reclamation, "Water 2025: Preventing Crises and Conflict in the West," August 2005, p. 4.

[132] Terry L. Anderson and Pamela Snyder, *Water Markets* (Washington: Cato Institute, 1997), p. 13.

[133] Bureau of Reclamation, "Water 2025: Preventing Crises and Conflict in the West," August 2005, p. 7.

[134] Chris Edwards, "Agricultural Subsidies," Cato Institute, June 2009, www.downsizinggovernment.org/agriculture/subsidies.

[135] Congressional Budget Office, "How Federal Policies Affect the Allocation of Water," August 2006, p. 18.

[136] John L. Sabo, et al., "Reclaiming Freshwater Sustainability in the Cadillac Desert," *Proceedings of the National Academy of Sciences* 107, no. 50 (December 14, 2010), www.pnas.org/content/107/50/21263.full.

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