VII

Evolving Political Institutions: A New Water Policy and its Impact on the Border Region

Daniel McCool

Abstract

All dams are temporary. Whether a dam is going to be decommissioned is not a question of if, but of when. Siltation, structural weaknesses, and changing social values will eventually combine to bring down the structures built in the dam-building era. Thus, a border region excessively dependent on dams is courting future disaster. As well, scarcity begets regulation. As water grows scarcer in the face of ever-increasing demands, government control over water will grow more pervasive and more restrictive. Individual freedom to use water will be dramatically curtailed.

That bleak assessment can be balanced against an alternative vision, presented here, called the River Commons. This is where river ecosystems—not just water—are managed primarily for the public good, not just for the economic gain of a few. Water use will focus on non-exclusive, non-consumptive uses. Such uses will serve the greatest number of people. Each individual will have the same potential access, which is determined by individual desires and values so long as that use does not appropriate the commons to the extent that it robs others of its value. The River Commons would be

governed by an open, participatory process that would stand in stark contrast to past traditions of closed, exclusionary politics.

Desarrollando Instituciones Políticas: Una Nueva Política y su Impacto en la Región Fronteriza

Daniel McCool

Resumen

Todas las presas son temporales. No es cuestión de que si una presa se va a cerrar o no, sino cuando. Sedimentación, debilidad estructural, y cambio de valores sociales se combinarán para destruir las estructuras hechas en la época de su construcción. Así que, una región fronteriza que depende excesivamente de presas tendrá desastre en el futuro.

La escasez produce regulación. Mientras la escasez de agua aumenta con el crecimiento de demanda, el control del agua del gobierno será más penetrante y restringido. La libertad de usar el agua será cortada dramáticamente. Así que, como una sociedad, hay que balancear el deseo de población infinita y crecimiento económico con nuestro deseo de libertad personal.

Esta valoración desolada se puede comparar con una visión alternativa que llamo River Commons. En lo cual el manejo de los ecosistemas de los ríos—no del agua solamente—está hecho para el bien público y no para el bien económico de unos pocos. El uso del agua se enfocará en los usos no exclusivos. Estos usos servirán un numero mayor de gente. Cada individuo tendrá el mismo potencial de acceso, determinado por los deseos y valores individuales por lo tanto que no se apropia de los comunitarios, robando el valor de los demás. River Commons será gobernado por un proceso transparente y participatorio que será muy distinto de las tradiciones políticas cerradas y exclusionarias.

Introduction

It is often said that water flows uphill to money, but that is not necessarily true. Water policy has often favored uses that are economically irrational, and the largest water consumers are not necessarily the wealthiest. Rather, politics determines who gets water and who pays for it, as evidenced by the highly institutionalized political system of distributing water and water development funding that has controlled western water policy for more than a century (Reisner 1986; Gottlieb 1988; Bates et. al 1993; McCool 1994). In that system there were very clear winners and losers. The winners included irrigators, hydropower producers, and special water districts; the losers were the environment, the taxpayers, and Native American Indian tribes. But the traditional politics of allocating water has collapsed: That "era has come to an end with much attention to [water] quality and ecosystems" (Rogers 2000). Economic pressures, changing demographics, issues of racial justice, and increasing emphasis on environmental protection—profound changes that are discussed in detail in the Western Water Policy Review Advisory Commission's 21 reports, available at http://www.den.doi.gov/wwprac—have combined to move the United States to the cusp of a new era in federal water policy.

This new era will have profound consequences for the U.S.-Mexican border region, especially with regard to the Colorado River and Rio Grande basins, the major river basins in the region. The U.S.-Mexican border is an arid region where decisions about the allocation of water have a direct impact on every aspect of life. The Colorado River and the Rio Grande are the lifelines of the communities along the border. Both rivers are highly developed with multiple dams and diversion structures. And both rivers are closely regulated by a complex panoply of treaties, compacts, court cases, statutes, and state and local laws. The politics of water in the southwest is Byzantine, complicated, and in the throes of fundamental change (Bates et al. 1993; World Commission on Dams 2000; Grossman 2002; McCool 2002). Anyone with a stake in these rivers needs to understand how these changes will affect them.

This chapter analyzes how new priorities are replacing traditional structural solutions to water problems. It describes the old net-

work of water interests—the iron triangle—and explains how changing political forces worked to undermine traditional federal water policy and replace it with a new agenda focused on water management, which, in turn, is being replaced by an ecosystem agenda focused on river restoration and dam removal. The chapter speculates about how this new federal water policy will affect the future of the border region.

The Dam Building Era

For 200 years the United States pursued a water policy exclusively focused on controlling rivers with dams, diversions, levees, and other human-made structures. The underlying belief was that more construction and development would solve all the nation's water problems. More than 75,000 dams, ranging from 700-foot behemoths to small weirs, have been constructed in the United States (Collier, Webb, and Schmidt 1996). By the 1970s, at the height of the dam-building era, the U.S. Army Corps of Engineers had constructed 19,000 miles of waterways, 500 harbors, 350 reservoirs, 9,000 miles of flood control structures, and 7,500 miles of "improved" channels. The U.S. Bureau of Reclamation had constructed irrigation works that serve 11 million acres, 50 powerplants, 345 diversion dams, 14,590 miles of canals, 990 miles of pipelines, 230 miles of tunnels, 35,160 miles of laterals, and 15,750 miles of drains (McCool 1994). The United States was not alone in its quest for countless dams. According to the World Commission on Dams, 45,000 large dams (defined as more than four stories high) have been built and half of all rivers have at least one large dam. Mexico has also seen considerable dam development (Barkin and King 1970).

The political alliance in the United States that drove the water development agencies for the first 200 years of their existence was a prime example of what political scientists and journalists call the "iron triangle." Iron triangles are alliances of convenience between congressional committees, government agencies, and interest groups that have common goals in public policy (Ferejohn 1974; Ripley and Franklin 1984; McCool 1998). For members of Congress, the goal is getting re-elected and collecting campaign donations. For government agencies, it is a desire to increase budgets and expand operations. For interest groups, the goal is to funnel public benefits to their members, be they funding, special privileges or rights, tax loopholes, or special services. When these three "corners" of the iron triangle work together, they can be more effective in meeting their goals.

But iron triangles can thrive only under certain circumstances. Two elements are essential. First, they need a political atmosphere of relatively low conflict, which, when it arises, is resolved by expanding the distribution of public benefits to include potential opponents. As long as this strategy is effective, conflict remains low and the iron triangle is unimpeded. The second element concerns the nature of the public policy that is the focus of the iron triangle's efforts. For this policy to be effective, the benefits must be concentrated among a specific set of beneficiaries—voters back home, supporters of special interests, and campaign contributors—but the costs must be widely distributed, and preferably hidden. That way, the people who receive the benefits of the iron triangle do not have to pay for it; this combination makes for strong alliances in politics (McCool 1998).

The ink was hardly dry on the U.S. Constitution when politicians realized that handing out local water projects, charged to the federal budget, was a great way to placate the voters and win the support of influential people. The U.S. Army Corps of Engineers, created in 1802, was one of the first federal agencies. As the nation expanded westward, the U.S. Bureau of Reclamation was created in 1902 to funnel federal water development money to that region. These agencies built water development projects with little or no regard for the environment because there was no political support for such actions within these very traditional iron triangles. As a consequence, the nation's waterways were subjected to significant environmental degradation. But when public values began to change in the 1960s and 1970s, the iron triangle was unprepared to respond adequately. The initial response was to resist change and treat environmentalists and other critics as implacable opponents (Palmer 1986; Gottlieb 1988; Andrews and Sansone 1983). But this was contrary to the true logic of iron triangles, which calls for placating opponents with an expansion of benefits. As a result, political conflict skyrocketed. The

costs of the dam-building era, both economic and environmental, went from hidden items in obscure budgets and reports to front-page news.

Inevitably this led to convulsive changes in the agencies and among supporters. The Corps and the Bureau were convinced, reluctantly, to expand gradually and include their former opponents in their network of benefits distribution. They have yet to abandon their old ways, but the future is clear, even to aging traditionalists—dams generate more controversy than electricity and powerful new political coalitions want water for cities, habitat, tourism, and recreation.

In a powerful act of symbolism, the Bureau of Reclamation was awarded Harvard University's "Innovations in American Government" award in 1995, noting that the scope of change at the agency was "unprecedented" and "went to the very heart of the organization." One bureau employee admitted that the agency had become "a New Deal agency in an e-mail age" and had needed the fundamental updating (Harvard Innovations 2002). The Corps also underwent a fundamental re-orientation. Without abandoning its traditional activities, it dramatically expanded its programs to include environmental protection. The agency's Chief of Engineers recently mandated a new set of "Environmental Operating Principles" to provide the Corps with "direction on how to better achieve its stewardship of air, water and land resources…." The first principle is a powerful statement about the Corps' new mission: "Strive to achieve environmental sustainability. An environment maintained in a healthy, diverse and sustainable condition is necessary to support life" (U.S. Army Corps of Engineers Operating Principles 2002). Twenty years ago the leaders of the Corps would have considered such a statement to be frivolous nonsense. Now it is their *raison d'etre*.

The Management Era

Today these agencies remain powerful and well-funded, but fundamentally changed. They have morphed from being solely water development agencies into water management agencies. In other words, their focus has shifted to include non-structural solutions

involving conservation, increased efficiency, as well as regulation and demand-control, rather than just pouring concrete to meet the needs of a narrow spectrum of the population. A brief look at their contemporary budgets reveals these new directions. Both the Corps and the Bureau of Reclamation requested appropriations for fiscal year 2001 to assist with the restoration of river systems. The Bureau requested $60 million for the California Bay-Delta Restoration Project and $38.4 million for the Central Valley Project Restoration Fund to restore fish and wildlife habitat. Typical of the Bureau's new direction is the CALFED program, which embodies both new missions and new decision-making processes. "The CALFED Bay-Delta program [is] a collaborative effort involving eighteen State and Federal agencies, and representatives of California's urban, agricultural, and environmental communities," according to the Budget of the United States for FY 2003.

The Corps' environmental programs accounted for 18.2% of its FY 2001 budget request, totaling $740 million. The projects included $91 million for Columbia River Fish Mitigation, $158 million to restore, preserve, and protect the Everglades and southern Florida, and $28 million for river restoration. The Columbia River basin project involves fish mitigation to increase fish population survival rates at the eight Corps dams on the Columbia and Snake Rivers. Perhaps the best known is the Corps' massive effort to restore the Kissimmee River, part of the Everglades and southern Florida restoration project (U.S. Army Corps of Engineers 2000). The total cost for the Kissimmee project is $518 million (U.S. Army Corps of Engineers 1999). The Corps is also responsible for administering some of the nation's most important environmental protection laws, including the Rivers and Harbors Act of 1899, the Clean Water Act of 1977, and the Marine Protection, Research, and Sanctuaries Act of 1972.

It is clear that these federal agencies have expanded their operations to include significant new environmental missions. However, they have not forsaken their traditional missions. There is still a strong engineering tradition in both agencies, with a predilection toward structural solutions. Their traditional political allies in the iron triangle still wield considerable influence in Washington. Thus, support for the environmental mission takes place within a context

that is not fully supportive of these new objectives. This has prevented the federal government from moving fully into the management era, and helps explain why the Corps and the Bureau were slow to respond to change. This dilatory response has, in effect, placed these agencies in a mindset that lags significantly behind the public, and will ensure that they are slow to adjust to new transitions and resistant to the next era of federal water policy, outlined below.

A Time of Transition

There is an old saying, "Land—they just don't make it like they used to." The same can be said for water and river ecosystems. As population and resource consumption continue to grow, these "commodities" will increasingly be in short supply, which in turn will dramatically enhance their perceived value. There is a basic rule in the politics of public resources: Scarcity begets regulation. This simple fact is driving the United States into another new era in water policy, characterized principally by river restoration and dam removal. This transition will be uneven and spasmodic. There will be variations among regions, presidential administrations, and social groups. But it is inevitable.

The population of the border region is growing at an unprecedented rate. Table 1 provides census data for the region for the last 20 years. Nearly 20 million more people are now living in the border states, an increase of nearly 50% in just two decades. On the Mexican side, millions of people have migrated to the border in search of jobs. Of course, there was no commensurate increase in river flows. There is no question that increasingly scarce supplies of water will severely constrain the use of that water. As a result, all water uses will become zero-sum—more water used for one activity will necessitate a commensurate reduction in water use for some other activity.

The zero-sum nature of water usage will pit user groups against each other. Those uses that are not economically justifiable or do not appeal to a broad spectrum of people will gradually lose political viability. This, in turn, will lead to a search for less-scarce resources to replace those in short supply.

This substitution will be accomplished through technological

advances and changes in the economy that increase efficiency and productivity. With regard to water, the uses most easily replaced will be irrigated agriculture, hydropower, and coastal urban water supply. Each of these will be discussed in detail.

Table 1. Total Population of States that Border Mexico

State	1980	1990	2000
Arizona	2,716,546	3,665,228	5,130,632
California	23,667,764	29,760,021	33,871,648
New Mexico	1,303,302	1,515,069	1,819,046
Texas	14,225,513	16,986,510	20,851,820

Source: U.S. Census 1990, 2000

Irrigated Agriculture

Irrigation in the American West expanded well beyond an economically rational level because of enormous subsidies. Farming operations that would lose millions of dollars annually if they paid all their business overhead (and environmental costs) could be made to look profitable with a powerful injection of public funds. As a result, more than 80% of water used in the American West goes to irrigation. The Bureau of Reclamation delivers water to more than 10 million acres in the West. By comparison, a total of 6.1 million hectares (about 15 million acres) of land are irrigated in Mexico, about half of which are publicly irrigated (Postel 2000).

In the United States there is complex system of subsidies that maintains this enormous irrigation empire. Western irrigators reap the benefits of four forms of subsidies. The oldest one is the interest subsidy, which was built into the original reclamation act, signed in 1902. Although most irrigation projects take more than 50 years to repay, the farmers pay no interest on their federal loans. In 1987 the Bureau of Reclamation calculated that the interest subsidy alone has averaged $114 million per year since 1903, and by the 1980s had risen to $500 million per year (U.S. House 1988). Richard Wahl explains what happened:

> ...various pieces of general reclamation legislation have lengthened the interest-free repayment period for irrigation, thereby increasing the value of the interest subsidy. The effect of the interest subsidy in the Reclamation Act of 1902 was to forgive about 14% of construction costs, but by 1939 this level had reached 50%. In addition, the gradual rise in nominal interest rates has greatly increased the value of the subsidy since 1960, reaching levels as high as 95%. (1989)

A second form of subsidy is the "ability to pay" provision in reclamation law. It would be unimaginable for a private bank to offer a loan and then instruct the borrower to pay back whatever amount the individual feels is possible, but that is exactly what the federal government does for the beneficiaries of federal reclamation projects. It should come as no surprise that the Bureau routinely rates the irrigators' ability to pay as extremely modest. For example, farmers slated to receive water from the Central Utah Project would receive water that costs the government between $12,000 and $24,000 per acre to deliver, but the farmer's ability to pay was set at $9.40 per acre (U.S. Senate 1988).

Wahl calculated the difference between what irrigators claimed was their ability to pay and what they actually were willing and able to pay for federally irrigated land on the open market: "The ratios ... show that the willingness to pay ranges from 1.5 to 51 times the repayment to the federal government" (1989).

A third form of subsidy in the reclamation program concerns below-market water pricing. Farmers usually pay only a small fraction of what their water would cost on the open market. An analysis by the General Accounting Office (GAO) discovered tremendous pricing subsidies on large reclamation projects. For example, at California's huge Central Valley project, water users pay between $2 and $17 per acre-foot (the amount of water it takes to flood an acre to a depth of one foot, or 326,000 gallons) for water that costs between $42 and $72 per acre-foot on the open market. Central Arizona Project water users pay $40 to $50 for water that is valued

at $250 (GAO 1991a). Farmers receiving Central Utah Project water were slated to pay less than $3 for the same water that sells for $250 a few miles away in Salt Lake County (U.S. Senate 1988). The Imperial Irrigation District in California also receives water at a rate far below the market price (Erie 1997).

A fourth subsidy is the double-subsidy, which describes the practice of irrigators who receive subsidies from the Bureau of Reclamation to grow surplus crops and also receive subsidies from the Department of Agriculture not to grow the same crops. Surplus crops are those that are over-produced. The Department of Agriculture pays out approximately $300 million annually to farmers who agree not to grow these crops. This maintains a high price for these crops and thus increases the profit margin for farmers. A 1991 report by the GAO found that 38% of the Bureau of Reclamation's water subsidies were used to grow subsidized surplus crops. The report calculated that annual irrigation subsidies totaled $2.2 billion, of which $830 million was used to grow surplus crops (GAO 1991a). Simply eliminating the subsidy for surplus crops would free up millions of acre-feet of water for other uses. Some of this water would go to urban uses and much of it could be used for river restoration.

A final form of subsidy goes right to the heart of the reclamation philosophy. The original goal of the program was to provide water to family farms. Project farmers were originally limited to 160 acres but this was increased to 960 acres in 1982. However, enforcement of the acreage limitation has been so lax that many corporate irrigators, masquerading as family farms, rely on subsidized reclamation water and thereby dramatically increase their profit margins. Investigations by the GAO in the early 1990s revealed wide-spread abuse of the acreage limitation by corporate irrigators. For example, the Boswell Company set up a dummy trust to make it appear that its 23,238-acre farm was merely a collection of small family farms (GAO 1989; GAO 1990: GAO 1991b).

Of course, not all irrigated agriculture would be abandoned if these subsidies were eliminated. Specialized crops with a high market value will remain in production but would be forced to operate efficiently and use less water. For example, water from the Bureau of Reclamation currently irrigates 60% of the nation's vegetables and

25% of its fruits and nuts (Keys 2002). These crops are in great market demand and will remain economically viable even if subsidies are eliminated. However, 23% of the lands watered by the Bureau produce hay, a low-value crop that requires large amounts of water. This hay represents only 7% of the nation's hay production (Bureau of Reclamation 1986). If water were priced on the open market, the water used to grow the hay would in many cases be worth more than the hay itself. Changing economic forces will eventually eliminate such wasteful and un-economic uses of water.

To a certain extent this has already begun to happen in Mexico. Government subsidies have been greatly reduced for the 3.3 million hectares of publicly irrigated land. This has forced farmers to adopt more efficient, and more economically rational, production methods (Postel 2000). The United States would do well to learn from Mexico's progress.

Hydropower

Hydropower produces 10% of the nation's power. The Bureau of Reclamation operates 58 hydropower dams in the western United States with a generating capacity of 14,741 megawatts (MW) (Keys 2002). The U.S. Army Corps of Engineers operates 75 hydropower dams with a generating capacity of 20,720MW (U.S. Army Corps of Engineers 2002). This power currently plays an essential role in the nation's supply of electricity. Hydropower does not produce air pollution and is relatively cheap to generate. But, it produces a host of environmental problems that reduce its desirability. Hydropower dams, and the reservoirs they create, have an inimical impact on native fish populations. Nowhere is this more evident than in the Columbia River basin, where a debate is raging over the impact dams have on anadromous fish runs, especially salmon. In the Colorado River Basin, dams have reduced the viability of native fish populations to such an extent that four of them are now on the endangered species list—the Colorado pike minnow, the humpback chub, the bony-tail chub, and the razorback sucker. In the Rio Grande Basin there are three species that are endangered—the silvery minnow, the Pecos bluntnose shiner, and the Colorado pike minnow.

Hydropower also consumes water through evaporation loss and seepage from reservoirs. In arid parts of the country this loss is significant. For example, Lake Powell loses on average 566,000 acre-feet (af) to evaporation and 276,000af to seepage. Evaporation losses at other major reservoirs in the Colorado River Basin are equally disturbing:

- Lake Mead loses 897,000af per year
- Fontenelle Reservoir loses 12,000af per year
- Flaming Gorge Reservoir loses 75,000af per year
- Navajo Reservoir loses 28,000af per year

The total losses from just these five reservoirs is nearly 2 million acre-feet—enough water for 8 million people, assuming a typical daily use rate of 225 gallons per capita (Utah State Water Plan 2002). The total loss from reservoir seepage and evaporation nationwide is staggering. However, federal agencies either do not know the total losses, or have hidden that data from the public. One can get an idea of the losses just by looking at the surface area of reservoirs—those built by the U.S. Army Corps of Engineers have a total surface area of 9,934,000 acres at full pool (comparable figures for the Bureau of Reclamation are not available). As the price of water escalates, these enormous losses will become less acceptable and at some point the water lost will be worth more than the hydropower produced.

Another cost of hydropower production concerns the impact these dams have on sediment deposition. Natural rivers deposit sediment loads in flood plains and deltas, keeping these areas ecologically viable. A dam stops sediment migration, and as a result, it builds up in the reservoir bed. Eventually, all reservoirs become clogged with sediment, not only rendering the dam useless but creating a significant environmental hazard. A stark example of this is the Matilija Dam on the Ventura River. This 200-foot high dam holds back a great reservoir of—not water—silt. Even massive Lake Powell will eventually become a giant mud pit; estimates on when that will happen vary from 200 years to 800 years, but nearly all observers agree that sediment will eventually render Glen Canyon Dam useless.

Managing dams for maximum power production also conflicts

with other uses. Water-borne recreation prefers a release regime that is fairly consistent over time, lasting all summer. But hydropower flow regimes are driven by the demand for electricity. They release sudden bursts of water during peak hours, and reduced flows during non-peak times. This can create conditions for recreational users that are at best a nuisance, at worst a danger to life. Hydropower also conflicts with the regime flow preferred by agriculture, which prefers minimal releases in spring and early summer and heavy releases in late summer when other sources are dry. However, power demands are fairly consistent throughout the summer. Hydropower also has negative impacts on downriver riparian areas. Perhaps the best example of this is the impact Glen Canyon Dam has had on the Colorado River corridor through the Grand Canyon. In 1992 Congress required the Bureau of Reclamation to develop an Environmental Impact Statement as part of an effort to reduce damage to the downstream river corridor.

It is inevitable that we will develop new sources of energy, possibly from hydrogen, cold fusion, and non-consumptive alternative sources such as wind and solar. The demand curve will also be influenced by technological advances in insulation, building materials, and window design. Much of the energy that is now wasted through inefficient applications will be captured and used by these new technologies. As these technologies become more affordable and widely available, and the price of water increases, the attractiveness of hydropower will decline.

Urban Water Use

Undoubtedly urban water use will continue to spiral upward. More so than hydropower and irrigation, this water use is not easily replaced. However, there are two aspects of urban water use that will play an increasingly important role in mitigating, if not reducing, future demands for municipal and industrial water. First, much urban water use in the western United States is wasteful, inefficient, or foolish. Las Vegas wasted an estimated 10.4 billion gallons of water last year (Wagner 2002). In Salt Lake City, half of all water use is for outdoor watering—in a city that gets nearly 14 inches of precipitation per year. In Albuquerque, New Mexico, 40% of the

city's water is used for turf grass. Nationwide, 60% of all residential water use is for outdoor watering (U.S. Water News October 2002). In addition, many city water systems are hopelessly out of date, inefficient, and fraught with leaks and breakdowns. The U.S. Environmental Protection Agency (EPA) estimates it will cost a staggering $150.9 billion to update the nation's water systems; the American Water Works Association made an even higher—$250 billion—estimate (U.S. Water News July 2002). As water becomes more scarce, there will be increasing pressure on municipalities to eliminate unnecessary water use and adopt strict water conservation measures (Vickers 2002). This process has already begun in some places and promises to accelerate (Pole 1995; Berk 2002). As one southern California water official put it, "Conservation is becoming a way of life" (Gastelum 1999). Some western cities already have water police, and in the future these enforcers of water conservation will become a common site in all cities.

Urban water use will also be affected by new desalination technologies, especially in cities along the west coast. Desalination is already in widespread use. In 2000 there were 5,000 desalting facilities throughout the world with a daily capacity of 6 billion gallons. In the United States there are 1,200 desalting plants in operation, producing more than 300 million gallons per day (American Membrane Technology Association [AMTA] 2002). Perhaps the best known is the Santa Barbara plant, built during the drought years of 1990-91. That plant has the capacity to produce 7,500af per year at an annualized cost of $1,500 per acre-foot. That price is comparable to the city's other water sources (Santa Barbara 2002). A large seawater desalting plant is under construction in Tampa Bay, and will have a daily capacity of 25 million gallons (AMTA 2000). San Diego County has three desalination plants under construction that will deliver 50 million gallons per day and Los Angeles is planning a similar plant (U.S. Water News Oct. 2002). Desalination is not limited to the coasts, as briny groundwater is also being desalinated in Texas and Florida. As new energy technologies become available, the cost of desalination will drop significantly—at the same time that the cost of other water sources will be rising precipitously.

Desalination is just one of the new technologies and management tools that cities can use to reduce water use. Other strategies include

using water transport bags (giant bladders that can move water along the coast) low-water plumbing facilities, storm-water retention, treating effluent, gray water systems (re-using household water for outdoor uses), dual water systems (potable water for indoor use, untreated water for outdoor use), xeriscaping (gardening with low-water plants), groundwater recharge, and progressive pricing structures. All of these methods have proven successful in reducing urban water use. Thus, while urban water demand will continue to escalate, it will be mitigated by new technologies and more efficient uses.

In sum, there are technological, economic, demographic, and management scenarios indicating that irrigation, hydropower, and some urban water uses will be reduced significantly in future years. The rate of this reduction will be driven by economic and political considerations and the advent of affordable technological innovation. In stark contrast to these traditional uses of water, there are other water uses that cannot be substituted or replaced and are experiencing a continued and rapid increase in demand. These uses relate to quality of life issues and include tourism and recreation, access to wilderness and wild rivers, and the aesthetic value of unspoiled water and watercourses. We can find new sources of power, we can learn how to desalinate seawater, we can introduce market efficiencies into irrigated agriculture. But we cannot create new rivers, dig new canyons, replace extinct species, or re-invent nature. Thus, it is inevitable that the social and economic value of these uses of rivers will increase as they become relatively more scarce. This will lead to yet another era of federal water policy: the era of river restoration and dam removal.

The Dam Removal Era

Recreation is big business in America. According to the U.S. Travel Data Center the American West is the most tourism-dependent section of the country. Three western states along the U.S.-Mexican border (Texas was not included in their sample) generated $68.9 million in tourist revenues last year. These millions of tourists do not come out west to see hayfields and hog farms, nor do they want to see mine wastes and clear cuts or visit dried-up streams (Rothman

1999). If they wanted flat-water recreation they could have stayed in the East or in Europe. The great draw of the West is its natural scenery, which is blessed by beautiful—but rare—watercourses.

The natural beauty of the West appeals especially to the growing trend in eco-tourism. A recent study found that between 40% and 60% of international travelers are eco-tourists—those who "travel to enjoy and appreciate nature"—with an estimated direct economic impact of $416 billion world-wide (Fillion et al. 1992).

Much of this tourism is water-related. Both the U.S. Army Corps of Engineers and the Bureau of Reclamation provide recreation, but most of it is flat-water recreation. The Corps has recreational facilities on 463 reservoirs, while the Bureau has 348 reservoirs, of which 300 have recreational sites. Clearly there is no shortage of reservoir-based recreation. The "commodity" that is in short supply is naturally flowing rivers, especially those with white-water sections, wilderness scenery, deep canyons, abundant fish and wildlife, and relatively clean water. These are precisely the resources that cannot be obtained through technological development or resource substitution.

As people move to the West in search of a better quality of life and tourists flock to the West in search of a better vacation, naturally flowing rivers and the steep-walled canyons they carve will increasingly be viewed as a priceless resource that must be protected and, in some cases, restored. We are currently on the leading edge of a new era in federal water policy that will meet that demand. It is already reflected in some major policy decisions but has not been adopted fully by the Corps, the Bureau, and tradition-bound politicians. Nevertheless, the dawn of this new era is clear. The removal of dams is just part of this new era—the most dramatic part. Removing dams will be one aspect of a larger policy of restoring riverine ecosystems. In addition to removing dams, this effort will include water pollution abatement, riparian restoration, protecting existing wildlife, re-introducing species (in some cases), and a comprehensive approach to planning based on the principles of multi-jurisdictional ecosystem management.

This new era is already under way (Grossman 2002; McCully 1996) as evidenced by:

- The removal of 480 dams in the United States, most of

them in the last 20 years, according to the non-profit organization American Rivers (2001a)
- Former Secretary of the Interior Bruce Babbitt's appearance at nine dam removal ceremonies and four dam sites that were candidates for removal
- A combination of stakeholders agreeing, after years of contention, to a plan to demolish the Elwha and Glines Canyon dams on the Olympic Peninsula of Washington
- The continuing long and bitter controversy over the removal of four dams on the lower Snake River (Larmer 1999; CQ Weekly Report 1999), dams that a new study by the Rand Corporation recommends be removed (Pernin 2002)
- The 200-foot high Matilija Dam on the Ventura River, probably the largest, being slated for removal

Glen Canyon Dam has also been the focus of a concerted political effort, although it is unlikely this effort will succeed in the near future. However, the fact that the debate is taken seriously indicates how much public attitudes have changed in recent years. The dam's supporters in Congress are sufficiently concerned that they routinely add a rider to water appropriations bills prohibiting the Bureau of Reclamation from expending any money for even studying the dam's removal.

In addition to efforts to remove dams, there are innumerable projects to restore aquatic habitats and river ecosystems. The Bureau of Reclamation and the U.S. Army Corps of Engineers now devote a considerable portion of their budgets to restoring damaged rivers. These restoration efforts literally range from coast to coast and border to border. In the border states, the Bureau is working on a Lower Colorado River Operations Program that funds restorative and protective measures required under the Endangered Species Act. Some $12.4 million was requested in fiscal year 2003. The Bureau is also working to restore the river channel through the Grand Canyon, including mimicking spring run-off with large dam releases (Sibley 2000; Newcom 2000-01).

Other river restoration efforts in the border region involve a coalition of public and private groups. On the Lower Rio Grande, the U.S. Fish and Wildlife Service, the Nature Conservancy, Texas

Parks and Wildlife, and the Audubon Society teamed up to create an acquisition program for the Lower Rio Grande, which buys land along the river to protect riverine habitat (Oko 2002). Smaller rivers in the region are also receiving attention. Arizona's Verde River, part of which is in the Wild and Scenic River system, will be protected by a new Forest Service management plan (American Rivers 2001b). Efforts are being made to restore and protect the Virgin River in southern Utah (Israelsen 2001; Grand Canyon Trust 2001). The San Pedro River, which rises in Mexico and flows through Arizona to the Gila River, is being restored (Hanson 2001). And even the much-abused Los Angeles River is making a comeback (Gumprecht 2000).

Riverine protection and restoration are also taking place on the Mexican side of the border. The Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT) is attempting to preserve 35 different areas, including six in the border region (Campoy 1999). The Río Alamar corridor in Tijuana is being turned into an urban park (Michel 2001) and the effort to restore the Colorado River Delta is just beginning—something former Interior Secretary Bruce Babbitt called "the single most important piece of unfinished business on the Colorado River" (Western Water 2000; Cohen and Henges-Jeck 2001). In 1993 the Mexican government created the Upper Gulf of California and Colorado River Delta Biosphere.

This fundamental shift in policy occurred as a result of several factors. The environmental movement sensitized the public to the value of rivers as critical components of the biosphere that provide water supply and habitat for fish and wildlife. As well, there has been a tremendous increase in water recreation; fly fishing, white-water rafting, and kayaking are now a major part of the travel/tourism industry. White water sports have become so popular that government agencies have instituted permit systems on most rivers to control the crowds. Perhaps the best-known whitewater experience is running the Colorado River through the Grand Canyon. Private rafters who want to run this river must put their name on a waiting list; the wait is now approximately 20 years. On the Salmon Middle Fork, another popular wild river, only one in 24 applicants is actually awarded a permit to run the river. This is symptomatic of the nation-wide problem of too many people crowding onto the few remaining natural rivers. The economic impact of

these white-water users is enormous. In Colorado, commercial white-water trips generate an estimated $125 million (Colorado River Outfitters Association 2001).

River running is just part of a larger movement to enjoy and recreate in and around natural rivers. A recent U.S. Forest Service survey found that 25 million Americans engaged in kayaking and rafting, 26 million engaged in backpacking, and 70 million said they visited a wilderness or primitive area (U.S. Department of Agriculture 2000). A survey of recreation on Bureau of Land Management (BLM) lands found that 22 million visitors engaged in ecotourism and 13 million engaged in water sports (BLM 1997). A 2001 survey by the U.S. Fish and Wildlife Service (USFWS) found that 82 million Americans engaged in wildlife-related recreation, primarily bird-watching, and spent a whopping $108 billion on those activities that year (USFWS 2002). Bird watching, which often takes place within a riverine or wetland ecosystem, is now a booming $25 billion a year activity (Clines 2001). All of these activities value water—not as a separate commodity, but as an integral part of a riverine landscape.

Another major factor pushing restoration is the Endangered Species Act, which requires the preservation of habitat for plants and animals listed as endangered. This act has forced government agencies to preserve critical riverine and wetland habitat and has fundamentally altered the management of both the Colorado and the Rio Grande rivers.

Restoring rivers and removing dams is an overtly political process and often provokes bitter controversy. But despite the resistance, dams have been removed in nearly every state of the union. The political impact of this new preservation approach will be enormous, but three facets of this political struggle are especially noteworthy.

First, discussions between the United States and Mexico regarding management of the Colorado River and the Rio Grande will become even more multi-faceted and complex. The International Boundary and Water Commission (IBWC) may well become the most important political body in the region as people on both sides of the border become desperate for more water—and more natural rivers.

River restoration and ecosystem preservation may actually work to the advantage of Mexico. Water to meet U.S. obligations under

the 1944 Water Treaty comes primarily from the Upper Basin of the Colorado River. Those in the Lower Basin use their share and more, thus any remaining flow must come from the Upper Basin. Due to concerns over endangered species and the political shifts described earlier, the Upper Basin missed the development-at-all-costs era that typified activity in the Lower Basin. As a result, the Upper Basin uses only about 4.2 million acre-feet of its river allocation of 7.5 million acre-feet, and probably will never divert its full allocation. If the Lower Basin ever succeeds in living within its Colorado River allocation, this water could end up in Mexico, especially if it is used to restore the Colorado River delta (Hunter 1999; McClurg 1999, 2001; Marston 2001).

Second, the politics of the new water era will be complicated by federally reserved water rights. In 1908 the U.S. Supreme Court in *Winters v. U.S.* ruled that Indian reservations have an implied water right that is sufficient to meet the purposes for which the reservation was created (207 U.S. 564). This right was expanded in 1963 in *Arizona v. California* (373 U.S. 546) to include all federal lands that have been withdrawn from the public domain. Thus, it is in direct conflict with Prior Appropriation, which is the prevailing water doctrine of the western states. The potential claims under this doctrine are practically limitless, given the large amount of land preserved for Indian reservations and other federal programs.

There are nearly 300 Indian reservations in the U.S. that total 52 million acres. In the past the federal government made little effort to reserve and divert water for Indian tribes. But this began to change in the 1960s when tribes began to assert their rights forcefully. By one account, tribes have potential claims in excess of 46 million acre-feet (Western Governors' Association 1984). In recent years the federal government has pursued a policy of negotiating settlements to Indian water claims rather than litigating them, and 17 settlements have been signed thus far reserving more than 2.8 million acre-feet of water for Indian use. Another two dozen potential settlements are currently under negotiation (McCool 2002).

Indian water rights have fundamentally changed some major western water projects in the border region. The Central Arizona Project has evolved from a cotton farmer pork-barrel to a device to help the federal government meet its legal obligations to Indian

tribes. One component of that project will deliver water to the Tohono O'odham Nation, which abuts the U.S.-Mexican border. The Animas-La Plata Project was originally designed to provide water for non-Indian hay farmers, but in its latest re-incarnation it is principally a holding tank for Ute water rights and now includes the Navajo Nation Municipal Pipeline. A major reason for lining the All-American Canal was to provide 16,000 acre-feet of water to the Mission tribes on the San Luis Rey to meet the requirements of their water settlement. The lining of the canal was approved in the "4.4 plan" developed by former Secretary of the Interior Babbitt (McClurg 2000).

Federally reserved water rights can also be claimed for withdrawn public lands. Consider that:

- BLM has 264 million surface acres (only BLM lands that have been specifically withdrawn from the public domain are capable of generating reserved water rights, including national monuments and wilderness areas; most BLM land remains in the public domain)
- The National Park Service has 83.6 million acres
- The U.S. Forest Service has 191 million acres
- USFWS has 93 million acres of refuges
- The Department of Defense has 18 million acres

These are precisely the lands (except the Department of Defense lands) that are now the focus of so much public recreational activity. The demand for water to maintain public watercourses, scenery, wildlife, and water-related recreation will pressure the federal government to protect these water sources and associated ecosystems.

A third complication will be water quality, especially salinity. The Colorado River carries 9 million tons of salt annually, and this salt accumulates with successive water withdrawals. In 1974 Congress responded to this problem by passing the Colorado River Basin Salinity Control Act, which sets limits and authorized the Bureau to take corrective action. There were two possible solutions to the salinity problem. One solution was to retire irrigated lands that were high in salt content; this would have been economical, long-lasting, and good for the environment. It also would have placed the burden of the solution on those who principally caused the problem.

Instead, the Bureau chose to build a de-salting plant just above the border near Yuma. This plant has been a conspicuous failure and is currently not in operation, although the Bureau has spent nearly $400 million on salinity reduction (McClurg 1997). The principal reason the United States has been able to meet its obligation to Mexico to deliver water at the accepted salinity level is that the Upper Basin's unused water is diluting the salt content of the Lower Basin. More diversions will greatly exacerbate the salinity problem. A related problem will be the increased salinity of the Salton Sea and the impact that has on fish and wildlife in that area.

In the Rio Grande basin, the problems are two-fold: siltation and pollution. The siltation is so great that the reservoir behind Elephant Butte Dam has lost 25% of its capacity. The U.S. Army Corps of Engineers built dams on tributaries just to trap silt (Bates et al. 1993). In the lower basin, agricultural run-off and pollution from maquiladoras and other urban sources has seriously degraded water quality. The river has become, in the words of one author, "a drainage ditch and a dumping ground for a growing border population" (Oko 2002). Increased up-stream diversions will only make these problems worse. In 2000, American Rivers placed the Rio Grande on its "most endangered" list.

Conclusion

We do not have a water crisis in the border region. We have a crisis of innovation, a lack of vision, and an unwillingness to face a future that will be radically different from the past. Relying upon existing models of resource use and distribution will not only fail to solve our water problems, it will create even greater problems. Then, we will have a water crisis. In the future, four basic factors should be considered.

First, the United States has become the most profligate society to ever inhabit the earth. Consumption of natural resources, especially water in the western United States, is way out of proportion to population. This makes western population growth even more ominous—it is not just the number of people, but their consumption level that threatens quality of life. In this there is a stark irony—quality of life is dependent on unprecedented consumption, but

efforts to sustain that level of consumption threaten to make such a lifestyle unsustainable eventually. A healthy dose of common sense now could avoid draconian measures later.

Second, it is important to remember that all dams are temporary. Decommissioning of a dam is not a question of if, but of when. Siltation, structural weaknesses, and changing social values will eventually combine to bring down the structures built in the dam-building era. Anti-dam sentiment and the new interests and values described above will make it nearly impossible to simply replace a failed dam with another. Thus, a border region excessively dependent on dams is courting future disaster.

Third, scarcity begets regulation. As water grows scarcer in the face of ever-increasing demands, government control over water will grow more pervasive and more restrictive. Individual freedom to use water will be dramatically curtailed. Thus, society needs to balance its desire for infinite population and economic growth against its desire for personal freedom. Do people really want to live in a society where access to water, especially in its natural state, is strictly rationed? Imagine the day when a permit is needed to wash a car, people are forbidden to water their lawns, and that dream fishing trip has to be planned ten years in advance to wait out the waiting list.

Fourth, that bleak assessment can be balanced against an alternative vision called the River Commons. This is where river ecosystems—not just water—are managed primarily for the public good, not just for the economic gain of a few. Water use will focus on non-exclusive, non-consumptive uses and thus will serve the greatest number of people. Each individual will have the same potential access to be determined by individual desires and values—so long as that use does not appropriate the commons to the extent that it robs others of its value. The River Commons would be governed by an open, participatory process that would stand in stark contrast to the traditional iron triangle. This idea correlates well with the concept of a "water ethic" proposed by others researchers (Bates et al. 1993). Rivers would be valued as a complex of public resources in a natural system, rather like thinking of forests as living ecosystems rather than merely a vertical lumber supply.

Given the economic, social, and political changes leading to the

era of river restoration and dam removal, river ecosystems will begin to play a fundamentally different role. They will become linear public parks with priority given to fish and wildlife habitat, recreation and tourism, open space and aesthetics, and riparian preservation. Remember that these are precisely the resources that cannot be replaced by technological substitution and do not possess the burden of economic irrationality that characterizes so much irrigated agriculture in the West. The River Commons makes sense socially, economically, and ecologically; gradually, it is beginning to make sense politically.

The enormous price paid for the singular drive to dam, divert, and destroy natural river systems has led to a re-evaluation of national policy. We have begun a new era in water policy that focuses on mitigating past damages and solving water problems through efficient management and water conservation, rather than building new dams. In effect, this new era of water policy will attempt to repair the damage done by the first era of water policy.

Thus far only the modest beginning of this new era has been seen, but changing political and economic realities guarantee that future water policy will give priority to dam removal and river restoration. For 200 years the nation abused its rivers; now begins the effort to bring them back to life.

Discussion Points

1. What political strategies and political coalitions will be most effective in the new era?

2. What will be the role of water marketing? (For an excellent analysis see Charles Howe, "Protecting Public Values in a Water Market Setting." *University of Denver Water Law Review* 3 [Spring 2000]: 357-372.)

3. How can local water agencies take advantage of these changes to enhance their water supplies?

4. Due to concerns about water quality, what will be the role of the EPA in managing the river?

5. Will the "Law of the River" be adjusted to meet new water demands? Specifically, will the Colorado River Compact be replaced or modified by a more contemporary approach to water allocation?

6. Will the Prior Appropriation doctrine be adjusted to accommodate in-stream flow needs?

7. Will the political movement to remove dams affect any structures in the border region? (See "Colorado River Report," report by the Sierra Club, February 2001. http://www.sierraclub.org/rcc/southwest/COreport.)

8. How will the new "4.4" agreement with California affect other water users in the Colorado River basin? Will the new limits on California's diversions be used for environmental purposes? (See H.R. 2764, the "Colorado River Quantification Settlement Facilitation Act." For an analysis see Ed Marston, "Quenching the Big Thirst." *High Country News* May 21,2001. For a more positive assessment see Bruce Babbitt, speech to the Colorado River Water Users Association, Dec. 17, 1999, at http: //www.doi.gov/news/archives/speeches&articles/nevada.htm.)

9. Will limits on groundwater mining affect the political equation?

10. Will efforts to achieve sustainability lead to more efficient and more responsive water institutions? For example, would the proposed basin-wide Colorado River commission improve management of the river? (See Sue McClurg, "Managing the Colorado River," *Western Water Magazine* November/December 1999.)

11. Will litigation continue to result in decisions that determine the basic allocation of water in the basin? (The most recent decision in the long-running *Arizona v. California* case was decided on June 19, 2000. See 530 U.S. 392 [2000].)

12. Will basin-wide water management—an approach endorsed by eight federal agencies that manage water—change the way the Colorado River is managed? (See "Clean Water Action Plan:

Proposed Unified Federal Water Policy for Ensuring A Watershed Approach to Federal Land and Resource Management." http://www.cleanwater.gov/ufp/proposal.html.)

13. Will globalization and increased cross-border economic activity change the way the United States and Mexico manage the major rivers in the region? (For context on a global look at water management and dams, see *Dams and Development: A New Framework for Decision-Making*, by The Report of the World Commission on Dams. London: Earthscan Publications. Nov. 2000. Also see "Water: A Special Edition Edited by Mikhail Gorbachev," *Civilization: The Magazine of the Library of Congress*. October/November 2000.)

14. To what extent will the Endangered Species Act and the U.S. Fish and Wildlife Service determine water allocations along the border? (See U.S. Department of the Interior news release titled "Landmark State-Federal Water Agreement Protects Endangered Fish and Water Users in New Mexico," June 29, 2001.)

References

American Membrane Technology Association. 2002. http://www.membranes-amta.org. Cited November 14, 2002.

American Rivers. 2001a. "Dams Removed in 1999, 2000 and 2001." http://www.amrivers.org/damremoval/damremovals2001.htm. Cited November 14, 2002.

American Rivers. 2001b. *American Rivers Newsletter* 28:3. Washington, D.C.

Andrews, Barbara, and Marie Sansone. 1984. *Who Runs the Rivers? Dams and Decisions in the New West*. Stanford, California: Stanford Environmental Law Society.

Barkin, David, and Timothy King. 1970. *Regional Economic Development: The River Basin Approach in Mexico*. London: Cambridge University Press.

Bates, Sarah F., David H. Getches, Lawrence J. MacDonnell, and Charles F. Wilkinson. 1993. *Searching Out the Headwaters: Change and Rediscovery in Western Water Policy*. Washington, D.C.: Island Press.

Berk, Richard. 2002. "California's Water Resources Continue to be a Growing Issue." *U.S. Water News* July.

Bureau of Land Management. 1997. *Bureau of Land Management Land Statistics for 1997 Part 4, Recreation and Leisure Activities*. http://www-a.blm.gov/natacq/pls97/part4.html. Cited November 14, 2002.

Bureau of Reclamation. 1986. Data on crop production. Supplied by the Bureau on CD-ROM.

Campoy, Jose. 1999. Remarks made at the Colorado River Project symposium, 16-18 September, Keystone, Colorado.

City of Santa Barbara, California. 2002. Official website of the city of Santa Barbara. www.santa-barbara.ca.us. Cited November 14, 2002.

Clines, Francis. 2001. "As Their Numbers Soar, Birders Seek Political Influence to Match." *New York Times* 4 February.

Cohen, Michael, Christine Henges-Jeck, and Gerardo Castillo-Moreno. 2001. "Missing Water: The Uses and Flows of Water in the Colorado River Delta Region." Oakland, California: Pacific Institute.

Collier, M. J., R. H. Webb, and J. C. Schmidt. 1996. "Dams and Rivers: Primer on the Downstream Effects of Dams." *U.S. Geological Survey Circular* 1126.

Colorado River Outfitters Association. 2001. "Executive Summary: Commercial River Use in Colorado." http://www.croa.org. Cited November 14, 2002.

CQ Weekly Report. 1999. "House Panel Votes to Keep 4 Dams." July 24: 1801.

Department of the Interior. 2002. *Budget of the U.S. for FY 2003 Department of the Interior Appendix: Water and Science, Bureau of Reclamation*. Washington, D.C.: U.S. Government Printing Office.http://w3.access.gpo.gov/usbudget/fy203/app_down.html. Cited November 14, 2002.

Erie, Steven. 1997. "San Diego/Imperial Valley Water Deal: Who Stands to Gain? Who to Lose?" *Metro Investment Report*. Los Angeles: Metropolitan Water District of Southern California.

Ferejohn, John. 1974. *Pork Barrel Politics: Rivers and Harbors Legislation, 1947-196*8. Stanford, California: Stanford University Press.

Fillion, Fern, James Foley, and Andre Jacquemot. 1992. "The Economics of Global Ecotourism." Paper presented at the Fourth World Congress on National Parks and Protected Areas, 10-12 February, Caracas, Venezuela.

Gastelum, Ron. 1999. Remarks made at the Colorado River Project symposium, 16-18 September, Keystone, Colorado.

Gottlieb, Robert. 1988. *A Life of Its Own: The Politics and Power of Water*. New York: Harcourt Brace.

General Accounting Office. 1989. "Water Subsidies: Basic Changes Needed to Avoid Abuse of the 960-acre Limit." General Accounting Office Report GAO/RCED-90-6.

General Accounting Office. 1990. "Water Subsidies: The Westhaven Trust Reinforces the Need to Change Reclamation Law." General Accounting Office Report GAO/RCED-90-198.

General Accounting Office. 1991a. "Reclamation Law: Changes Needed Before Waters Service Contracts are Renewed." General Accounting Office Report GAO/RCED-91-175.

General Accounting Office. 1991b. "Water Subsidies: Views on Proposed Reclamation Reform Legislation." Testimony of James Duffus III before the Subcommittee on Water and Power, Committee on Energy and Natural Resources, U.S. Senate. General Accounting Office Report GAO/T-RCED-91-90.

Grossman, Elizabeth. 2002. *Watershed: The Undamming of America*. New York: Counterpoint Press.

Gumprecht, Blake. 2002. *The Los Angeles River*. Baltimore: Johns Hopkins University Press.

Hanson, Roseann. 2001. *The San Pedro: A Discovery Guide*. Tucson: University of Arizona Press.

Harvard University. 2002. Innovations in American Government. http://www.innovations. hardvard.edu/winners/rrfed95.htm. Cited November 14, 2002.

Hunter, Duncan. 1999. *Colorado River Quantification Settlement Facilitation Act H.R. 2764*.

Israelsen, Brent. 2001. "Imagine a Treeless Zion." *Salt Lake Tribune* 17 February.

Keys, John W. 2002. Testimony before the Senate Appropriations Subcommittee on Energy and Water Development. Hearings on the FY 2003 Bureau of Reclamation Budget Request. 8 March.
Larmer, Paul. 1999. "Unleashing the Snake." *High Country News* 20 December.
Marston, Ed. 2001. "Quenching the Big Thirst." *High Country News* 21 May: 1, 8-13.
Michel, Suzanne. 2001. "The Alamar River Corridor: An Urban River Park Oasis in Tijuana, Baja California, Mexico." Borderlink Final Report. San Diego: Institute for Regional Studies of the Californias, San Diego State University.
McClurg, Sue. 1997. "The Colorado River Compact: 75 Years Later." *Western Water* September/October: 4-17.
McClurg, Sue. 1999. "Managing the Colorado River." *Western Water* November/December: 4-13.
McClurg, Sue. 2000. "A Colorado River Compromise." *Western Water* November/December: 4-13.
McClurg, Sue. 2001. "The California Plan and the Salton Sea." *Western Water* November/December: 4-13.
McCool, Daniel. 1994. *Command of the Waters: Iron Triangles, Federal Water Development, and Indian Water*. Tuscon: University of Arizona Press.
McCool, Daniel. 1998. "Field Essay: The Subsystem Family of Concepts: A Critique and a Proposal." *Political Research Quarterly* 51(2): 551-570.
McCool, Daniel. 2002. *Native Waters: Contemporary Indian Water Settlements and the Second Treaty Era*. Tucson: University of Arizona Press.
McCully, Patrick. 1996. *Silenced Rivers: The Ecology and Politics of Large Dams*. London: Zed Books.
Moody, Tom and Jim McMahon. 2001. "Virgin River Riparian Restoration." *Colorado Plateau Advocate* Winter: 22-23.
Newcom, S. Joshua. 2000-01. "Glen Canyon at a Glance." *Colorado River Project River Report* Winter.
Oko, Dan. 2002. "Running for Cover on the Rio Grande." *High Country News* 18 February.
Palmer, Tim. 1986. *Endangered Rivers and the Conservation Movement.* Berkeley, California: University of California Press.

Pole, Ann. 1995. "Municipal Water Conservation." In *Waters of Zion: The Politics of Water in Utah*, Daniel McCool, ed. Salt Lake City: University of Utah Press.
Postel, Sandra. 2000. "Redesigning Irrigated Agriculture." Pages 39-58 in *State of the World 2000*, Lester Brown and the World Watch Institute, eds. New York: Norton and Co.
Pernin, Christopher G., Mark A. Bernstein, Andrea Mejia, Howard Shih, Fred Reuter, and Wilbur Steger. 2002. *Generating Electric Power in the Pacific Northwest: Implications of Alternative Technologies*. Santa Monica, California: Rand Corporation.
Reisner, Mark. 1986. *Cadillac Desert*. New York: Viking Press.
Ripley, Randall, and Grace Franklin. 1984. *Congress, the Bureaucracy, and Public Policy*. 3d ed. Homewood, Illinois: Dorsey Press.
Rogers, Peter. 2000. "Water Resources in the Twentieth and One Half Century, 1950-2-50." *Water Resources Update* 116.
Rothman, Hal. 1999. *Devil's Bargain: Tourism in the Twentieth Century American West*. Lawrence, Kansas: University Press of Kansas.
Sibley, George. 2000. "Glen Canyon: Using a Dam to Heal a River." Pages 110-122 in *Water in the West*, Char Miller, ed. Corvallis, Oregon: Oregon State University Press.
U.S. Fish and Wildlife Service. 2002. "National Survey of Fishing, Hunting, and Wildlife-Associated Recreation." U.S. Fish and Wildlife Service. http://federalaid.fws.gov/surveys/surveys/html. Cited November 14, 2002.
U.S. Army Corps of Engineers. 1999. Kissimmee River Restoration. http://www.saj.usace.army.mil/dp/Kissimmee/Kissimmee.html.
U.S. Army Corps of Engineers. 2000. Everglades Restoration. http://www.hq.usace.army.mil/cepa/pubs/Everglades.htm
U.S. Army Corps of Engineers. 2002. *Civil Works Programs 2002*. Washington, D.C.: U.S. Army.
U.S. Army Corps of Engineers. 2002. *Environmental Operating Principles*. www.hq.usace.army.mil/cepa/envprinciples.htm.
U.S. Bureau of the Census. 1990. Population and Housing Unit Counts, Table 16. http://www.census.gov/population/www/censusdata/hiscendata.html.
U.S. Bureau of the Census. 2000. Census Quickfacts. http://quick

facts.census.gov/qfd.
U.S. Department of Agriculture Forest Service and the University of Tennessee, Knoxville. 2000. *National Survey on Recreation and the Environment*. Washington, D.C.: U.S. Department of Agriculture.
U.S. House of Representatives. 1988. "Energy and Water Appropriations for 1989." Hearings before the Subcommittee on Energy and Natural Resources, Committee on Appropriations.
U.S. Senate. 1988. "Miscellaneous Water Resources Measures." Hearings before the Subcommittee on Water and Power, Committee on Energy and Natural Resources.
U.S. Water News. 2002. "Water Shortages and Drought Take Toll on Parched U.S." October: 5.
U.S. Water News. 2002. "Florida Desalination Project is Gaining Attention from Texas, Other States." October: 6-7.
U.S. Water News. 2002. "Report Identifies Best Practices for Long-term Contracting of Water and Wastewater Services." July: 7.
Utah Division of Water Resources. *2002 Utah State Water Plan Glossary*. http://www.water.utah.give/waterplan/uwrpff/glossary.htm. Cited November 14, 2002.
Vickers, Amy. 2002. *Handbook of Water Use Conservation*. Amherst, Massachusetts: Waterplow Press.
Wagner, Angie. 2002. "Careless Waste of Water Threatens Las Vegas' Growth." Associated Press. 25 August.
Wahl, Richard. 1989. *Markets for Federal Water: Subsidies, Property Rights, and the Bureau of Reclamation*. Washington, D. C.: Resources for the Future/Johns Hopkins University Press.
Western Governors' Association. 1984. "Indian Water Right in the West." A study prepared by the Western States Water Council for the Western Governors' Association. May.
Western Water. 2000. http://www.water-ed.org/novdec00.asp.
World Commission on Dams. 2000. "Dams and Development: A New Framework for Decision-making." London and Sterling, Virginia: Earthscan Publications Ltd.