

## Evolution of U.S. Water Policy: Emphasis on the West

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When water is plentiful for everyone, people are not concerned much about water policy, but when droughts occur in different parts of the nation and there is less water to go around for many uses, the rights to who has access to the water and how they came to have it are very important.

Eighty percent of the Nation's water is used in the West—most of it for agricultural use (Case and Alward 1997). Both population and water demand have increased substantially since 1971. Water tables have dropped, resulting in increased costs for food and energy production. Urban areas are experiencing water shortages as their populations expand and compete with agricultural irrigators for limited water supplies (Case and Alward 1997). Downstream user demands for clean water are often in conflict with upstream user impacts on water quality.

In addition to increasing demands for drinking water, conflicts are arising between agricultural uses and demands for adequate in-stream flows to maintain aquatic species. The Klamath River, which originates in Oregon and flows into Northern California, was the site of threatened violent conflict in the spring of 2001 when, following several years of drought, the U.S. Fish and Wildlife Service ruled that water diversion for agricultural use would leave inadequate flows for the endangered suckerfish, a species resident in this river. Indian tribes also claimed that water diverted for farming left insufficient flows to sustain the salmon population, and thus deprived the tribes of their right to fish for salmon. While the Klamath River conflict appears to be caused by competing uses of water by farmers, Indian tribes, and protection of endangered species, it is more fundamentally caused by a lack of clear water policy and unclear property rights.

Although many previous studies have documented the West's chronic water problems (Frederick 1988; Guldin 1989; Anderson and Snyder 1997; Bell 1997; Riebsame 1997; Kenney 1999; Glasser 2000; Pisani 2000), in 1992 Congress established a commission to investigate and review Western water policy and institutions. Section 3{3003} of The Act of 1992 directed the President "to undertake a comprehensive review of Federal activities in the nineteen Western States which directly or indirectly affect the allocation and use of water resources, whether surface or subsurface, and to submit a report to Congress on the President's findings, together with recommendations." No specific actions were intended, though this information would be used to develop proposed legislation. Thus, the Western Water Policy Review Advisory Commission was established.

Among Congress's reasons for forming the Commission was its determination that current federal water policy suffered from unclear and conflicting goals, was implemented by a maze of agencies and programs, and that the resulting lack of clear policy and coordination

created gridlock that could not be resolved without addressing fundamental changes in institutional structures and governmental processes.

To better understand the origins of these complex institutions and different legal doctrines governing water resources in the United States, this paper will first explore:

The origins of the riparian and appropriation doctrines of water rights, including historic influences of Spanish and English law,

How the California Gold Rush changed historic water use patterns,

How the prior appropriation doctrine developed; and,

Why there is no federal water law.

It will conclude with a brief overview of major findings and recommendations of the Western Water Policy Review Advisory Commission, and some alternative proposals to provide answers to the dilemma of how best to manage water resource issues in the western United States.

### **Brief History and Evolution of U.S. Water Use**

The Spanish explorers of the sixteenth century brought with them their experience in diverting water from natural water courses to make arid lands productive. In their efforts to “civilize” native populations in what is now California, they collected and settled Indians into central communities that were often built around Catholic missions. Another goal of Spanish settlement was to mine the rich ore bodies of the New World, and collecting Indians at missions was in large part designed to assure adequate labor forces for the mines. Production of food and fiber in quantities beyond those required by the farmers themselves was necessary to support the mines, as well as the military bases that accompanied Spanish development. Irrigation was essential to accomplish these tasks, and the diversion of water for irrigation became widespread around Spanish towns and missions (Wilkinson 1992; Gillilan and Brown 1997).

The mines themselves required substantial quantities of water, often more than half a dozen towns or missions needed. Mining was a new water use in the West, and after mines became prevalent throughout New Spain by the eighteenth century, one that had significant potential to affect both water quantity and quality for downstream users (Gillilan and Brown 1997).

The use of water in the Spanish West was governed by the same laws enforced in Spain. Water was owned by the Crown and was available to all for purposes such as drinking, fishing, and navigation. Spanish law in the New World continued to protect public uses of water, giving first priority to its use by communities as a whole. Water was allocated to individuals only after sufficient quantities had been secured to meet the needs of the town. The law included protections for private water uses. Grants of water for specific purposes were generally associated with grants of land—but were issued separately. A land grant by itself entitled the grantee to the use of water only for domestic purposes. The grantee’s right was to use the water, while the state retained actual ownership (Wilkinson 1992; Gillilan and Brown 1997).



Spanish water law emphasized the need for fair division of the available water. While the water rights of individuals were to be protected, in the Spanish and Mexican judicial systems, the rights of the corporate community weighed more heavily than those of the individual.

In the East, the American colonies were established under the auspices of the English Crown, and were subject to English laws. English water law was relatively simple and undeveloped, having unfolded in a land where water was abundant and conflicts over its use were correspondingly rare. The navigable waters of England belonged to the Crown and were available to the public for the purposes of navigation and fishing. The Crown's ownership prevented these important economic activities from being monopolized by individuals, thereby reducing the potential for conflict. Rights to the use of waters not being used for navigation were held by those who owned the banks of the streams, and were therefore known as riparian rights (Wilkinson 1992).

Water resource conditions in the American colonies were similar to those in England, and there was not much incentive to adopt a different set of water use rules after American independence from England. Water use conflicts were so rare in England and in the original American states that a body of water law was not well developed in the first decades of this country's history.

### **Riparian Doctrine**

The heart of the original riparian doctrine as developed in Europe as the idea that rivers had value primarily as an amenity. Rivers enhanced the value of surrounding land, and each landowner along a river was entitled to receive the benefit of free-flowing water. This came to be known as the "natural flow" interpretation of the riparian doctrine. It held that landowners were allowed to remove water from streams only for basic domestic purposes such as drinking, bathing, cooking, and watering of limited numbers of livestock. Landowners were otherwise required to leave rivers in an undiminished and unpolluted condition (MacDonald 1990). This doctrine made sense where water was abundant and there were few out-of-stream uses of water. The natural flow doctrine often gave way, however, when advances in technology made rivers valuable as a source of energy for turning the wheels of industry and then as a waste disposal or coolant in next generations of industrial processes (MacDonald 1990; Anderson and Snyder 1997).

The riparian doctrine was modified during the Industrial Revolution to allow riparian landowners to make reasonable use of the waters flowing over their lands. This "reasonable use" interpretation gave each landowner the right to the use of water flowing over the land without diminution or obstruction. The landowner did not own the water itself—the right was solely to the use of the water. When water flows were insufficient to meet all uses, the deficiencies were borne as a common loss, with each user cutting back by the same proportion. The extent to which any particular use was allowed was determined by the potential injury to other riparian landowners should that use occur (Gould 1990).

The features of the reasonable use riparian doctrine were:



1. Only riparian landowners could have rights to the use of water.
2. Owners of non-riparian lands and any others wishing to preserve free-flowing waters could not have any legal rights to the water.

An exception to this general rule was the development of water rights under the riparian doctrine through direct appropriation. Appropriation of water for out-of-stream uses was legal under the English-American common law system if the new water user was able to obtain the consent of all affected riparian landowners. Consent was explicit, but may have been assumed, if the new water use negatively impacted riparian owners, but was nevertheless allowed to continue without interruption or objection usually for 20 years. Rights developed through implied consent were often referred to as “prescriptive” rights.

3. As the water right is a consequence of land ownership rather than a separate piece of property, the right is not lost simply because it has not been exercised.
4. The relationship among riparian landowners is one of “parity” rather than “priority,” and the doctrine allows the entry and accommodation of new water users. Water rights are relative rather than absolute; riparian rights do not attach to a fixed amount of water.

As conditions change, riparian rights for specific water uses may not be secure in situations where there is not enough water to accommodate all desired uses.

The riparian doctrine of water rights originated in lands with humid climates where precipitation easily supported agriculture and plentiful water supplies made conflicts between water users infrequent, and where the legal tradition was based on English riparian use. Much of the American West did not fit this description. As settlers moved west, the aridity of the land bore little resemblance to the eastern climates they had left behind. Politically, westerners were far removed from the national government in Washington D.C., and other sources of governmental authority were rudimentary or nonexistent. The new rules that they created with respect to water were often very different from those they had lived with in the East.

### **How the California Gold Rush Changed Historic Water Use Patterns**

Miners provided the primary impetus for changing the rules under the Spanish system allocating water in the American West, especially after gold was discovered in California in 1848. The population of California, and later the entire West, increased enormously after gold was found and as mining became the principal industry in with respect to water the West.

The first gold deposits were found primarily along streams, and early miners usually established claims along the stream banks, where they could pan for gold directly. Those arriving later, after the streamside locations had all been claimed, were forced to establish “dry diggings” some distance removed from the streams and then haul gravel in sacks or wheelbarrows to the water to be washed. As mining operations grew in size and sophistication, instead of bringing gravel to the water, streams were diverted from their natural channels to bring water to the claims (Gillilan and Brown 1997). Hydraulic mining



utilized water pushed through hoses under great pressure to wash entire hillsides directly into wooden sluices. This mining method became widespread in the 1850s, and it required the diversion and delivery of huge volumes of water to sites often far from natural channels (Wilkinson 1992).

The use of water was so basic to the production of gold that enterprising miners discovered that they could make more money providing water to the mines than they could from mining the gold itself. Private companies were organized to build dams and canals. The size of the companies and the scale of their waterworks was huge, and reservoirs impounded billions of gallons of water.

### **The Prior Appropriation Doctrine**

Spanish colonists settled the West in the sixteenth century under sponsorship of the Spanish Crown, which provided the colonists with established systems of government and law. Three centuries later when the miners and other migrants moved to California, no government awaited them. The Gold Rush occurred near the end of the U.S.-Mexican War, after the Mexican government had been expelled, but before the region had been officially transferred to the United States. There were no rules to define property rights in the gold fields—either between individual miners or between miners and the federal government (Fischer and Fischer 1990).

The miners did not own the land they were occupying, the minerals they were seeking to remove, or the water they were using. It was not even clear what rules should eventually apply—those of the federal government, which owned the land, or those of the state government, which had not yet been created, but was widely anticipated. Rather than waiting for clarification of the rules by some level of government, the miners treated the problem as an opportunity. As there were no existing rules to guide their use of land and its resources, they made their own.

The miners' rules were created independently in each mining camp and administered by committee. Adjudication of disputes and enforcement of rules was undertaken by committees—if not by the aggrieved individuals themselves. The miners' greatest need was to establish rules governing access to the gold. Because they did not own the land or minerals, the usual rules of property ownership did not apply. Instead, the miners adopted the "first come, first served" principle already in wide use on the public domain, where rights were based on occupation rather than ownership (Gillilan and Brown 1997).

The miners also needed rules to govern the allocation of water. The first to arrive at the gold fields, in the earliest months of the rush, often had their choice of land to claim and water to use. The later arrivals often were able to find promising, previously unclaimed land, but discovered that there was not enough water available to work the claims. Water was frequently the limiting factor in the production of the region's mineral wealth.

The riparian principles used to allocate water in the East would have been of little use to the miners even if they had been inclined to use them. Water allocation principles based on plentiful rainfall, numerous streams, and the need to leave water in the stream for downstream users made little sense in regions where rainfall and streams were less



abundant. Instead, the miners applied the same rules they used to govern access to mining claims. When applied to water, these rules became known as the prior appropriation doctrine.

The miners staked a claim to water by physically taking, or “appropriating,” what they needed. Construction of the diversion necessary to take the water served as notice to other miners that the water was being appropriated. The first miners to appropriate water had the best right to continue using it. Subsequent appropriators were required to make do with what was left, if anything. Even if located upstream from a prior user’s diversion works, a subsequent “junior” water user was required to allow enough water to pass to meet the need of the downstream “senior” appropriator.

The “use it or lose it” principle was also incorporated within the prior appropriation system, so that miners not making beneficial use of their water were forced to surrender it to those who would. Limits were seldom placed on the amount of water that an individual could use. A miner or company was free to appropriate as much water as could be put to use, even if that meant there would not be any left for those who arrived later, or to sustain the integrity of the stream and its biota (Anderson and Snyder 1997).

California gold soon attracted investments from all over the world, and the gold fields became dominated by increasingly larger and more sophisticated mining and water supply operations. In the absence of definitive guidance from federal or state legislatures, the task of defining uniform principles fell to the California state courts.

The California courts faced a difficult task. The courts had been organized following California’s admission to the Union as a state in 1850 and derived their jurisdiction and powers from the California state constitution. The mining camps, however, were located almost exclusively on federal land and it was not clear whether the state or the federal government had jurisdiction over activities occurring there. The courts had also been given conflicting directives from the state legislature. In 1850, California’s first legislature had adopted the common practice (or common law) as the state’s legal foundation, and this meant that the allocation of water would be governed by riparian principles. But just one year later, the legislature adopted a statute that sanctioned the use of prior appropriation (Gillilan and Brown 1997).

The uncertainty of their jurisdiction and the conflicting guidance given by the state legislature made it difficult for the early courts to define a uniform set of water allocation principles. Occasionally the courts developed hybrid doctrines that merged aspects of both the competing doctrines. Over time, their rulings increasingly reflected the precepts of the prior appropriation doctrine that prevailed in the mining camps. In 1855, the California Supreme Court clearly set forth its justification for adopting priority principles to resolve water disputes on the public domain. The court reasoned that the federal government had implicitly validated the new legal system by failing to object to it. *Irwin v. Phillips* (1855) is often cited as marking the birth of the prior appropriation doctrine (Gillilan and Brown 1997). By the 1860s, the use of the prior appropriation doctrine was firmly established as the mechanism by which the California courts would resolve water conflicts occurring on the public domain.

Miners were not the only ones to divert water from rivers and streams. There was a massive infusion of settlers of all kinds to the West throughout the latter half of the



nineteenth century, and many of these settlers needed to divert water out of natural channels to sustain their livelihoods. Those who were able to claim land near rivers and streams were able to raise crops with the aid of relatively primitive diversion and irrigation works. But more widespread settlement required more sophisticated irrigation methods. Irrigation soon became the dominant water use in the West, far exceeding mining in terms of number of locations in which it was practiced and the total volume of water used.

By the beginning of the twentieth century, the principles of the prior appropriation doctrine had been widely adopted throughout the West. The basic features of the prior appropriation doctrine were:

1. The right to use water could be obtained by taking the water and putting it to beneficial use.
2. The right was limited to the amount of water that was beneficially used.
3. First in time was first in right.
4. The water must be used or the right was lost.

These rules had a major impact on the uses of western rivers and streams. For instance, to take water and put it to a beneficial use, one had to exercise some form of physical control over it. Control was exercised by building storage and diversion dams or otherwise “developing” rivers, thereby altering natural patterns of water flow. The allocation of water to those who took it first provided incentives for settlers to take and put to use all the water that they could possibly use as quickly as possible, rather than leaving it for instream use or for potential out-of-stream use by future settlers. Furthermore, beneficial use requirements had the effect of excluding some water uses—such as many of those that took place instream—that were not considered beneficial at that time. Leaving water in streams was widely considered to be a waste of water (Wilkinson 1992).

Allocation of water according to the principles of the doctrine of prior appropriation was consistent with the cherished American ideal that individuals, not society, should control their destiny. It soon became apparent that there were a number of problems with the operation of this system. One of the greatest problems was the prevalence of claims for excessive amounts of water. These problems eventually led people to call for adoption of new administrative systems to control the allocation and distribution of water.

In the prior appropriation system, to ensure that water was distributed in accordance with the priorities of the rights, any water user not receiving their legal share of a river's flow could place a “call” on the river. In response to the call, agents of the state required any water users with rights junior to those of the calling water user to curtail their diversions until the senior right was satisfied. Diversions of the most junior water rights on the watercourse were shut down first, the next most junior, and so on until enough water was left in the stream to fulfill the senior right.

The shift to the prior appropriation doctrine was handled differently by each state. Some states, particularly those where rainfall was more abundant, saw no reason to completely eliminate the riparian doctrine as they expanded the appropriation doctrine, and so made great efforts to accommodate both doctrines. The Pacific states of California, Oregon, and

Washington, and the states of North and South Dakota, Nebraska, Kansas, Oklahoma, and Texas all tried to take advantage of the developmental benefits of the new prior appropriation doctrine without upsetting the expectations of citizens who based their water claims on the common law riparian doctrine (Fischer and Fischer 1990).

The accommodation of both doctrines was largely accomplished by applying each within its own limited sphere of influence. For example, in California, the state best known for its adoption of both doctrines, the State Supreme Court decided in an 1886 case that common law riparian rights—authorized by the state's first legislature in 1850—would prevail on lands the federal government granted to the state or to private individuals, whereas appropriative rights—as authorized by the federal General Mining Law of 1862 and the state legislature's adoption of appropriative principles in 1872—would prevail on the public domain (Wilkinson 1992).

Texas, on the other hand, segregated the domains of the two doctrines through geography, passing legislation that authorized appropriative rights only in the arid western half of the state, leaving the riparian doctrine as the sole method of establishing water rights in the more humid eastern half of the state (Gillilan and Brown 1997).

Over time, most of the mixed doctrine states took steps to ensure the supremacy of the appropriation doctrine, and that has become the primary means by which the western states allocate and administer property rights in water.

### **The Lack of Federal Water Law**

Before 1890, the federal government's primary emphasis was on settling the West and public land disposal. The transfer of public lands to private ownership generated concern about the application of the riparian doctrine to those lands. Under the assumption that there would be no lands retained in federal ownership, Congress addressed this issue through a series of laws passed in the 1800s that rejected the riparian doctrine, but did not develop an independent, federal system for allocating water on federal lands. Through laws such as the General Mining Law of 1862, the Act of 1870, and the Desert Land Act of 1877, Congress passed the allocation of water to the states (Rogers 1993).

Beginning in approximately 1890, Congress changed its public land policy and began to retain and develop federal lands by passing laws that established the Forest Reserves, National Monuments, and added more National Parks. It also started managing water resources and conducting large-scale water development and allocation projects through the 1902 Reclamation Act and the 1920 Federal Power Act. Congress's new policy for retaining federal lands and actively managing them in a manner that required water was not in keeping with its previous policy of leaving water allocation to states and local users (Wilkinson 1992).

A fundamental tenet of water law widely ignored or misunderstood was that a water right gave someone the right to use water *rather than actual ownership of water*; ownership resided with the public. As states adopted water administration systems, many chose to clarify this fact. In general, the creation of such administrative systems, though supported by reformers, seems to have been more of an effort to make existing priority systems work better, rather than to make substantive changes in such systems. However, the shift to public administration of water rights did result in some changes in the way water was



allocated. These changes were accomplished through the use of public interest or public welfare requirements in state constitutions and statutes. Constitutions or statutes of many western states emphasize the fact that appropriations will no longer be valid just because they benefit someone; rights will be granted only if proposed water uses are also consistent with the public interest.

However, "the public interest" is very difficult to define. Most states have left questions of the public interest to the discretion of administrative officials. Many of the western states have also established water use preferences among beneficial uses.

Presently, water for domestic and for municipal needs receives the highest priority in all of the states that have established preferences, although there is considerable variation in other preferred uses among the states. For instance, the use of water for agriculture is favored over all but domestic uses in most states because agricultural interests usually dominated state legislatures in the early part of the twentieth century, when preference statutes were written. Industrial, manufacturing, and electrical generation purposes are usually less preferred, and the use of water for recreation, fish, and wildlife purposes is usually at or near the bottom of preference lists, if listed at all. The order of these preferences may have changed with the implementation of the Endangered Species Act of 1973 (Wilkinson, 1992).

Maintaining supplies of clean water and protecting watersheds were major reasons why public domain forests and rangelands were reserved by the federal government at the end of the nineteenth century. Use and development of water resources of the United States underwent major changes at that time in response to the growing demands of a population that had increased nearly twenty-fold since the founding of the country. Westward expansion and the use of navigable rivers, canals, and harbors for transportation transformed the nation's economy. As the nation experienced this period of massive development, major problems emerged from overuse and poor management of its water resources: Urban water supplies were a major source of disease; the capacity of many lakes and streams to assimilate wastes was exceeded; the survival of people living in arid or flood-prone areas depended on unpredictable precipitation patterns (Sedell et al. 2000). The 1897 Organic Administrative Act said these forest reserves were set aside to protect and enhance water supplies, reduce flooding, secure favorable conditions of water flow, protect the forest from fires and depredations, and provide a continuous supply of timber. At that time, few federal forests were designated in the East because of the relative lack of public domain lands. Public demands for eastern National Forests resulted in passage of the 1911 Weeks Act, authorizing the acquisition of federal lands to protect the watersheds of navigable streams. So, it was the headwaters of the western rivers and the cutover and eroded lands in the East that became the National Forest System.

Increasing population and demographic changes in the U.S. will intensify public concern about adequate future supplies of clean water. The population of the West has increased 50 percent in the last 20 years and is expected to increase another 30 percent by 2040 (Case and Alward 1997). The U.S. population will nearly double within the next 50 years. While irrigation remains the major use of water, especially in the West, the population surge in the West is increasing diversion and consumption use of water and, at the same time, the demand for water-based recreation (Brown 1999). This trend will continue and intensify. Most recreation in the U.S. takes place on National Forests and is associated with some body of water such as lakes, reservoirs, or streams. Recent publications (e.g., Gillilan and

Brown 1997) have more closely linked instream flow problems to recreational activities and have described the complex relationships of recreation uses and water. For example, even without incorporating many of the economic facets of the recreational uses documented in the arid West, the value of instream flows for recreational fishing is greater than the value of water for irrigation (Hansen and Hallam 1990).

Considering the existing challenges and the likelihood of increasing conflicts over water policy in the future, the time has come for Congress to seek solutions for how best to manage the nation's water resources.

### **Findings of the Western Water Policy Review Advisory Commission**

In a 1989 report, the western governors identified some major causes of conflict and frustration with current federal water policies:

A principal characteristic of federal water policy is that policies are made in an ad hoc, decentralized manner. No agency of the executive branch or committee of Congress is responsible for keeping an eye on the "big picture." Thus, federal water policy lacks a unifying vision or even a set of guiding principles. This state of events is not appropriate in an era in which supplies are threatened by chronic drought . . . while demand continues to grow. A host of on-the-ground problems are created by, or at least related to, the absence of a unifying vision, including redundancy of functions across programs, protracted disputes, interagency turf battles, absence of policies, and lack of finality of many water disputes (Western Governors Association 1989, p. 1).

The Western Water Policy Review Advisory Commission members learned that western water planners would be addressing staggering population growth projections in the twenty-first century. For the past two decades the West had been experiencing the most dramatic demographic changes of any region or in any period in the country's history (Case and Alward 1997). The West is rapidly becoming a series of large urban clusters (such as Denver, Salt Lake City, Boise, Portland, Phoenix, Albuquerque, Dallas, Houston, and Seattle) arrayed across a mostly arid landscape. Should present trends continue, by 2020 the West's population may increase by more than 30% with its attendant pressure on the West's limited water resources.

Part of the impetus for establishing the commission was Congress's finding that current federal water policy suffered from unclear and conflicting goals implemented by a maze of agencies and programs. Even Congress itself adds to this confusion: Congress is the nation's primary water policy-making body and has 14 House committees with 102 subcommittees, plus 13 Senate committees with 82 subcommittees, exercising responsibility over various aspects of water resources. Seventy-six separate congressional appropriation accounts for water have been identified, resulting in legislative enactments that overlap, duplicate, and are often inconsistent (Rogers 1993).

The Commission concluded that these problems could not be resolved piecemeal, but rather, had to be addressed by fundamental changes in institutional structures and government processes. The Commission's work led them to an even more basic



conclusion: *That the geographic, hydrologic, ecologic, social, and economic diversity of the West would require regionally and locally tailored solutions to effectively meet the challenges of 21st century water management* (Report of the Western Water Policy Review Advisory Commission 1998).

The Commission's recommendations included employing participatory decision-making and emphasis on local implementation, innovation, and responsibility (Riebsame 1997, Rieke and Kenney 1997). Federal, tribal, state, and local cooperation toward achieving national water standards should be the basis of water policy, and where possible, responsibility and authority for achieving these national standards should rest with non-federal governing entities. The Commission also recommended organizing around hydrologic systems—natural systems such as watersheds and river basins—that would require conflicting jurisdictions to integrate their institutional missions, budgets, and programs.

Seeking the goal of sustainable use of water links the diverse elements of the water use community together and provides for common dialogue and problem solving; and seeks to achieve a balance between a system's capability to meet social needs and its biological and hydrological capacity. For example, increased public awareness of the damaging impact of massive water development in places such as the Sacramento River in California, the Everglades in Florida, and others, is resulting in listings of aquatic species as threatened or endangered. This is prompting the federal government to file suits against regional management agencies for lax enforcement of water quality standards, and reaching settlements that call for mitigating impacts of excess nutrients from farmland runoff, and increasing instream flows during critical times for sensitive species. When Congress asked the U.S. Army Corps of Engineers (the original builders of the massive water projects that led to ecological degradation of the Everglades) to develop a plan for recreating original water patterns, it prompted sugarcane growers and other agricultural interests to become involved in developing alternative strategies (Postel 1997).

## Conclusion

The Nation needs to complete and implement a policy framework and operating system that regularly and periodically integrates shifting water use priorities as American megatrends evolve, measures changes in priorities when and where they occur, and then creates and incorporates a concomitant learning system that anticipates and makes changes in policies and practices to meet newly emerged needs and uses. The new system must find ways to prevent most current obstacles and conflicts along the path toward new and more fitting policy—such as by assigning only a few, or perhaps one, agency and committee in each body of Congress to have jurisdiction over water. It must be able to modify, diminish, or escape the constraints of historic priority uses as they become obsolete or less significant and it needs to be able to correct itself with sound hydrologic data and set sustainability and renewability as its absolute constraint to prevent depletion of fresh water supplies or damage to watersheds.

Solutions to these problems need to be coordinated so that hydrologic, ecological, social, and economic issues are appropriately addressed and tailored to meet the water management challenges of the coming decades.