

# [***ARTICLE: MANAGING RECLAMATION FACILITIES FOR ECOSYSTEM BENEFITS***](https://advance.lexis.com/api/document?collection=analytical-materials&id=urn:contentItem:3S3T-T7B0-00CV-N047-00000-00&context=1516831)

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**Text**

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[*I*](https://advance.lexis.com/api/document?collection=statutes-legislation&id=urn:contentItem:8T9R-T2X2-D6RV-H374-00000-00&context=1516831). Introduction

The Bureau of Reclamation ("Reclamation") played a major role in transforming many of the ***rivers*** and streams of the western United States into economically productive assets. It was a prodigious achievement: the construction of over 600 storage and diversion dams, more than 16,000 miles of canals and 37,000 miles of laterals, 280 miles of tunnels, and 52 hydroelectric powerplants. [[1]](#footnote-2)1 In the process, Reclamation emerged as the supplier of water to more than eighty percent of the irrigable lands in farms in the U.S., [[2]](#footnote-3)2 as the country's sixth largest generator of electric power, and as manager of forty-five percent of the West's surface waters. [[3]](#footnote-4)3 Because of Reclamation facilities, thirty million people in the seventeen western states receive water for irrigation, municipal, industrial, and other uses; agricultural crops valued at nearly $ 9 billion are produced; forty-eight billion kilowatt hours of electricity valued at $ 727 million are generated; and over fifty million recreational visitor days are recorded. [[4]](#footnote-5)4

Now, more than ninety years after its creation, Reclamation faces a different challenge: restoring and maintaining a functional level of ecological integrity in the ***rivers*** its facilities transformed. This task is indeed a challenge because, in many**[\*198]** respects, there is no going back. Despite serious consideration now being given to removing a few structures viewed as no longer necessary or desirable, the physical alteration of western ***rivers*** cannot be undone. Too much now depends on the economic benefits that these facilities make possible. Too much change has already occurred to the regulated ***river*** systems to warrant widespread consideration of returning these ***rivers*** to some "natural" (i.e., predevelopment) state.

Without dams, most western streams have a natural hydrograph that peaks in the late spring and early summer with the melting of the high-elevation snowpack - in some years with bankfull flows and even flooding of low-lying riparian areas. Surface flows taper off during the late summer and fall, in some cases disappearing altogether (ephemeral streams), and in others disappearing for stretches and reappearing again downstream. Stream conditions, including temperature and turbidity, vary with flows and with the nature of the land and vegetation through which the stream traverses. Stream channels form in relation to the scouring effects of the peak flows and the sedimentary materials contained in the flows. Biotic communities adapt themselves to these conditions.

In little over 100 years, this waterscape of the arid West has been transformed as completely and inalterably as the landscape. [[5]](#footnote-6)5 Accounts of the almost jungle-like delta at the mouth of the ***Colorado*** ***River***, [[6]](#footnote-7)6 the vast marshes and wetlands of places like Tulare Lake in the south Central Valley of California, [[7]](#footnote-8)7 and Lake Winnemuca and the Lahontan wetlands in the Great Basin of Nevada [[8]](#footnote-9)8 read like fairy tales - did these places actually exist? The more recently inundated natural wonders like Celilo Falls on the Columbia ***River*** [[9]](#footnote-10)9 and Glen Canyon on the ***Colorado*** ***River*** [[10]](#footnote-11)10 **[\*199]** have also become mythical places of the past. We are locked in a desperate, perhaps futile, struggle to maintain the natural salmon populations in the ***rivers*** of the Northwest. Similar though perhaps less dramatic efforts to recover endangered species exist within virtually every major ***river*** basin in the West. [[11]](#footnote-12)11

There is no escaping the legacy of the change that water development has brought to the ***rivers*** of the West. Words like "tamed" or "harnessed" often have been applied to the effects of western water development. [[12]](#footnote-13)12 The peaks of the hydrographs are largely gone, stored behind dams. Floods are controlled to protect development that has occurred in the bottomlands along ***rivers***. ***Rivers*** have been channelized, totally altering the manner in which the water moves in the adjacent riparian areas. Diversions for off-stream uses diminish flows at some locations, and flows are restored at other locations through return flows from drains, ditches, wastewater treatment plants, and subsurface seepage. Releases from dams may create high-quality, cold-water fisheries in the ***river*** segment immediately downstream of the dam. Reservoir releases in the late summer and fall provide flows in amounts greater than historically available. Reservoirs themselves provide flatwater recreation otherwise in very short supply in many parts of the West. **[\*200]**

These changes have produced irreplaceable losses in natural values, as well as incalculable economic benefits. We are now in a period in which the values and uses of water are shifting. [[13]](#footnote-14)13 A fundamental recognition of the functions of water throughout the hydrologic cycle is emerging, and with this recognition comes an understanding that every action taken to remove water from the hydrologic cycle for human use has consequences. Traditionally, the decision to use water depended only on human need and the availability of the means. Only in the last twenty-five years or so have we attempted to consider and weigh the consequences. Only in the last few years have the "experts" publicly acknowledged how little we understand about complex natural systems and, therefore, how ill-equipped we are to evaluate adequately the effects of human intervention on these systems. [[14]](#footnote-15)14

At this juncture, however, we are not faced so much with the question of whether or not to alter the hydrologic cycle for human benefit. Rather, we are asking questions about the manner in which human intervention has occurred. Given the physical infrastructure of water development already in place, are there ways to satisfy human needs that produce fewer adverse consequences on other values and uses of water? Are there changes that can be made to the infrastructure itself? Can changes be made in the manner in which the infrastructure is operated? Can changes be made in the manner in which developed water is used? Can we better meet human needs through changes in who uses developed water?

This article addresses these questions in the context of the water that has been developed by Reclamation projects. In the process of this development, a large number of arrangements have been established upon which thousands of people rely for water, power, and other benefits. In many cases, improving ecosystem benefits may require changes in these arrangements - potentially reducing benefits enjoyed by traditional project users. For many, the importance of ecosystem values**[\*201]** makes the need for such changes self-evident. Others remain unconvinced, sure only that they are likely to lose if things change. One thing is clear: change does not come easily under such circumstances.

Much of the research reflected in this article originated from a two-and-one-half-year study focusing first on fifteen selected Reclamation projects located in twelve different western states, and then on six different ***rivers*** or ***river*** segments significantly affected by the operation of Reclamation projects. [[15]](#footnote-16)15 In some important respects, this article serves as a summary of much of this project. It begins by exploring the nature of Reclamation project development in three western ***rivers***: the Truckee and Carson ***Rivers*** of California and Nevada, the Yakima ***River*** in Washington, and the Upper ***Colorado*** ***River*** in ***Colorado***. In particular, it describes the effects of that development on the "in-place" functions of the water in these ***rivers***. It then identifies five general approaches being used to provide ecosystem benefits in these and other settings around the West. It returns to the three ***rivers*** to explore applications of these approaches in each particular place. Finally, it addresses a few issues that may require special consideration.

The findings of this research highlight the increased attention now paid to the in-place values of water for such things as fisheries, and the pervasive effect that water development has had on those values. Considerable progress is, in fact, being made through the creative development of a variety of approaches. These approaches reflect the use of a mix of carrots and sticks to accomplish change. The success of these efforts to date varies widely, suggesting the need for further evaluation of this experience as an aid in formulating more effective approaches.

[*II*](https://advance.lexis.com/api/document?collection=statutes-legislation&id=urn:contentItem:8T9R-T352-D6RV-H379-00000-00&context=1516831). A Tale of Three ***Rivers***

Water development for out-of-stream uses occurred in the West long before Congress launched Reclamation in 1902. [[16]](#footnote-17)16 **[\*202]** Reclamation projects initially served primarily to enlarge and make more reliable water supplies that had already been developed. Originally, all Reclamation projects were for irrigation. With more federal financial resources available than were available from private sources, Reclamation projects provided large, permanent diversion structures capable of controlling the entire flow of a ***river***; canals capable of carrying large quantities of water - tunneled through hillsides and mountains if necessary - to larger areas of land than could be served with existing diversion facilities; and dams that could capture and store a large portion of the water supply for delivery as needed - for example, in the times when normal surface flows were insufficient. Once these projects were freed from the original expectation that their full costs would be repaid by the irrigators who used the water, the projects became even larger in scale and more multi-purpose. Revenues from hydroelectric power generators utilizing water controlled and released from Reclamation dams provided a source of funding that soon dwarfed payments made by irrigators and other project water users. Reclamation projects were publicly funded growth machines.

By no means did the construction and operation of Reclamation projects begin the process of transformation of western ***rivers*** described in the introduction. It did, however, introduce a scale of change not previously observed. The size and permanency of its facilities exerted a higher degree of control over a much larger portion of water than had previous development. Perhaps most dramatic were the large, mainstem dams constructed by Reclamation on the major ***rivers*** of the West: Minidoka and American Falls on the Snake, Hoover on the ***Colorado***, Grand Coulee on the Columbia, Shasta on the Sacramento, and Friant on the San Joaquin. Watersheds had never presented much of a barrier to water development in the West, [[17]](#footnote-18)17 but Reclamation soon found ways to disregard even water basins. [[18]](#footnote-19)18 What mattered was the**[\*203]** availability of an unclaimed water supply in some location that could be delivered to users needing water in another location. This widespread breaching of water basins produced what Gary Weatherford has referred to as the "hydrocommons." [[19]](#footnote-20)19

This Part describes the development of Reclamation projects in three western ***river*** systems: the Truckee-Carson in California and Nevada, the Yakima in Washington, and the Upper ***Colorado*** in ***Colorado***. It sets out the physical and hydrologic setting and the history of water development and use in each area, and describes the environmental effects of this water development. In most respects, the experience in these areas can be regarded as "typical" of western water development.

A. The Truckee-Carson [[20]](#footnote-21)20

The Truckee and Carson ***Rivers*** originate in the Sierra Nevadas of California and flow east into the Great Basin of Nevada. See Figure 1. The Great Basin is hydrologically "closed": the Truckee terminates in Pyramid Lake while the Carson ends in Carson Lake, Stillwater Marsh, and the Carson Sink. Average annual yields of water in these two basins are modest: 263,700 acre-feet in the Carson and 585,400 acre-feet in the Truckee. [[21]](#footnote-22)21

Between 1903 and 1915, Reclamation constructed facilities in these two basins to provide water to lands within what was known as the Newlands Project. The original plan for the project was to irrigate more than 200,000 acres of land in the vicinity of the towns of Fallon and Fernley, Nevada - ten times the amount of land in this area than was already in irrigation. In fact, the total land area irrigated peaked at about 65,000 acres; today, less than 60,000 acres of land within the project are in irrigation. **[\*204]**

[SEE FIGURE 1 IN ORIGINAL]

Figure 1: Truckee and Carson ***River*** Basins

Source: Michael S. Lico, U.S. Dep't of Interior, Water-Resources Investigations Rep. No. 92-4024A, Detailed Study of Irrigation Drainage in and near Wildlife Management Areas, West-Central Nevada, 1987-90: Part A. Water Quality, Sediment Composition, and Hydrogeochemical Processes in Stillwater and Fernley Wildlife Management Areas 4 (1992). **[\*205]** While the best water supply existed in the Truckee, the most readily irrigable land was found near the Carson. Reclamation constructed Derby Dam and the thirty-two-and-a-half-mile Truckee Canal (with an initial capacity of 1,500 cubic feet per second ("cfs")) to carry water from the Truckee ***River*** to the Carson "division" of the project. A low divide between the two basins in the vicinity of Fernley made it possible to move this water without pumping. The existing dam at the mouth of Lake Tahoe was enlarged, and Lahontan Dam was constructed on the Carson to store water brought from the Truckee.

Perhaps the first dramatic evidence of the hydrologic effects of operation of the Newlands Project was the total disappearance of Lake Winnemuca adjacent to Pyramid Lake. In the 1880s, Lake Winnemuca was twenty-five miles long, three-and-a-half miles wide, and contained over three million acre-feet of water. [[22]](#footnote-23)22 It served as a kind of overflow catchment from Pyramid Lake. As diversions from the Truckee ***River*** for the Newlands Project and other upstream uses reduced downstream flows, the level of Pyramid Lake declined. Little or no water was being backed up into Lake Winnemuca. By 1938, twenty-three years after completion of the Newlands Project, Lake Winnemuca was dry.

In the early 1940s, the Lahontan cutthroat trout disappeared altogether from Pyramid Lake. The life cycle of this large, flavorful trout involved migration out of the lake during the winter months to points as far upstream as Lake Tahoe for spawning. [[23]](#footnote-24)23 As Pyramid Lake declined, a delta formed at the point where the Truckee ***River*** enters the lake - creating what in many years amounted to an impassable barrier for the fish. The construction of Derby Dam already had blocked fish migration upstream of this structure. Unable to spawn at all during many of the dry years of the 1930s, the Lahontan cutthroat went extinct.

By the mid-1960s, the elevation level of Pyramid Lake had dropped more than sixty feet from its recorded level earlier in the century, further impeding fish migration out of the lake in many years. Despite these conditions, the other migratory fish species native to Pyramid Lake - the Cui-ui - had managed to survive. A species of sucker found only in Pyramid Lake, female Cui-ui**[\*206]** live for as long as forty-five years. [[24]](#footnote-25)24 This rather remarkable life span apparently enabled the Cui-ui to survive long periods without reproduction during those years when upstream migration out of Pyramid Lake was not possible. Even so, in 1969 the Cui-ui had the dubious distinction of being among the first species listed as endangered under the predecessor law to the Endangered Species Act. [[25]](#footnote-26)25

A different situation existed at the terminus of the Carson ***River***. Even in historical times (since the mid-1800s) the destination of the Carson ***River*** shifted markedly - from Carson Lake on the south, to Carson Sink on the north, to Stillwater Marsh on the east. In 1862, for example, a wintertime flood carved out a channel directly to the Carson Sink, with the flow split between the existing channel to Carson Lake and the new channel to Carson Sink. In the 1890s, Carson Lake was described as twelve miles long and eight miles wide, covering an area of about 25,000 acres. [[26]](#footnote-27)26 Overflow from Carson Lake passed through the Stillwater Slough into the Stillwater Marsh, a large wetland area comprised of a connected series of shallow ponds. In high flow years, water from both the Carson ***River*** and the Stillwater Slough (and occasionally even from the Humboldt Basin to the north) would reach Carson Sink. An observer in the very high runoff year of 1898 described the Carson Sink as a "half shallow lake, half tule swamp which extends for twenty miles along the valley bottom and furnishes enough salt grass, sedges, and tules to winter many thousand head of stock, and a breeding ground for great numbers of water and shore birds." [[27]](#footnote-28)27 Yet, in dry years the Carson Sink wetlands disappeared altogether as did portions of Stillwater Marsh and the wetlands around Carson Lake.

Upstream water development in the Carson Basin, both in the higher-elevation valleys and downstream in the Newlands project, altered the traditional rhythms of the ***river***. The Lahontan Dam captured much of the high spring native flows of the Carson ***River***. Deliveries of stored Carson ***River*** water as well**[\*207]** as water carried from the Truckee ***River*** depended on the needs of irrigators in the Fallon area. Water not consumed by these users eventually made its way back to the Carson ***River*** and to the wetlands below, but with a timing often quite different than prior to development and in a condition unavoidably changed by its irrigation use. Offsetting the effects of these changes for many years was the wintertime release of water from Lahontan Reservoir to generate electricity, with the revenue available to the irrigators to help pay the costs of the Newlands Project. After spinning the turbines at the Lahontan Powerplant, the water passed downstream directly into Carson Lake. Much of this water in effect came from the Truckee ***River***.

Efforts that began in 1967 to address problems in the Truckee Basin produced unanticipated adverse environmental consequences in the lower Carson. [[28]](#footnote-29)28 The Secretary of the Interior imposed for the first time a limit on Truckee ***River*** diversions into the Truckee Canal. One immediate effect was the cessation of wintertime operation of the Lahontan Powerplant, an operational change that sharply reduced flows of water into Carson Lake. Another effect was a reduction in deliveries of water into the main canals during the irrigation season, water that for the most part had passed through the system to return to the ***river***.

As a result, in the 1970s the Lahontan Valley wetlands began to recede noticeably. Between 1972 and 1977, wetland acreage in the area decreased in the fall from about 48,000 acres to about 12,000 acres. [[29]](#footnote-30)29 A series of wet years between 1983 and 1985 brought the wetlands back to approximately 46,000 acres in 1986, but the prolonged drought between 1986 and 1992 caused the wetlands to disappear almost entirely.

The reduced amounts of dilution water reaching the wetlands also highlighted water-quality problems in the Carson. The main contaminants of concern are arsenic, boron, lithium, molybdenum, and mercury. [[30]](#footnote-31)30 The mercury comes primarily from the**[\*208]** wastes of long-abandoned mineral processing facilities, located upstream in the vicinity of Virginia City and Dayton - an area now designated as a Superfund site. The other toxic constituents primarily result from irrigation drainage. Degraded water quality is believed to be the cause of the loss of the largemouth bass population that once supported a popular sport fishery in the Stillwater Wildlife Management Area and the severe reduction in other fish populations that provided a major food source for American white pelicans. [[31]](#footnote-32)31 Concentrations of mercury, boron, and selenium have been found at levels considered likely to produce adverse effects in both the eggs and the tissue of waterfowl in the area. [[32]](#footnote-33)32

B. The Yakima ***River*** Basin [[33]](#footnote-34)33

The Yakima Valley in the state of Washington is one of the most productive agricultural areas in the western U.S. With irrigation, the lands in this 6,000-square-mile basin produce high-value apples, cherries, grapes, and other fruit, as well as hops and many other crops. Despite signs of encroaching urbanization, it remains a predominantly rural setting with a population that still largely depends on agriculture, timber, and other land-based activities. This is the traditional West.

It is water from the Yakima ***River*** and its tributaries that makes this economy possible. The headwaters of the Yakima begin at the north end of the valley in the Cascade Mountains. See Figure 2. Other streams originate in the Cascades to the west and south and flow into the valley to join the Yakima on its way to the Columbia ***River***. Most prominent are the Naches and its major tributary, the Tieton, which join the Yakima just north of the city of Yakima, the largest in the basin.

A substantial irrigation economy already existed in the Yakima Basin when Reclamation began its investigations in**[\*209]**

[SEE FIGURE 2 IN ORIGINAL]

Figure 2: Yakima ***River*** Basin

Source: J.F. Rinnella et al., U.S. Dep't of Interior, Surface-Water-Quality Assessment of the Yakima ***River*** Basin, Washington 15 (1992) **[\*210]**

1903. Perhaps as much as 121,000 acres of land were in irrigation, served by an extensive network of privately constructed ditches. Very little water storage had been constructed in the basin, so irrigation depended almost entirely on the availability of natural flows in the ***river*** and its tributaries. Between 1906 and 1933, Reclamation constructed a series of facilities, including four reservoirs with a total storage capacity of nearly one million acre feet, greatly expanding irrigation in the basin. Now more than 450,000 acres of land are served, either totally or supplementally, with Reclamation-supplied water. This comprises most of the irrigated lands in the valley.

As irrigation was expanding rapidly in the Yakima Basin, the anadromous fishery was declining. According to the Northwest Power Planning Council, anadromous fish runs in the Yakima around the turn of the century may have totaled as many as 800,000 in a year. [[34]](#footnote-35)34 Between 1981 and 1990, an annual average of about 8,000 anadromous fish found their way back to the Yakima - perhaps as little as one percent of the historical run. Native summer chinook, coho, and sockeye are completely gone from the basin. In addition, spring chinook, fall chinook, and summer steelhead are severely diminished in number, and their survival is in serious question.

Problems of the anadromous fish that spawn in the Yakima Basin are much larger than those presented by water development and use within the basin. Even historically, only somewhere between four and eleven percent of the total Columbia ***River*** salmon run spawned in the Yakima ***River*** or its tributaries in any given year. [[35]](#footnote-36)35 Moreover, a salmon born in the Yakima spends most of its life in the Pacific Ocean. Nevertheless, fish biologists regard the Yakima ***River*** and its tributaries as still capable of supporting additional spawning habitat that could potentially aid in the recovery of the salmon. Extensive work already has been done to install fish ladders where structures block the stream and fish screens to keep fish out of canals and**[\*211]** ditches. And only four large, mainstem dams on the Columbia ***River*** hinder the migration of salmon between the Yakima and the ocean (compared with eight for salmon spawned in the Snake ***River*** Basin).

One major concern with the ability of the Yakima ***River*** and its tributaries to support additional salmon is the adequacy of flows of water at critical locations during migration periods. Salmon and steelhead evolved under streamflow and habitat conditions that no longer exist in the Yakima Basin. Upstream reservoirs store as much spring runoff as physically possible. On average, about 2.4 million acre-feet of water is diverted from the Yakima and its tributaries for irrigation use. [[36]](#footnote-37)36 While more than half of the diversions eventually return to the ***river***, there are critical segments below major diversion points that are seriously dewatered, and flows are considerably reduced from natural levels.

One example is the Prosser Diversion Dam, located on the lower Yakima ***River***. This dam serves to take out water for uses in the Kennewick Division of Reclamation's Yakima Project for irrigation in the summer and hydroelectric power generation year-round. As the dam was originally operated, diversions sometimes would almost totally empty the ***river***. In recent years, Reclamation has been seeking to maintain a minimum flow level below the dam. Studies suggest that desirable flows for fish passage may be twice the amount Reclamation provides, while optimal flows for spawning and rearing in the ***river*** below the dam might be four to five times as much. [[37]](#footnote-38)37 Moreover, the quality of the water below Prosser is "the poorest in the Yakima Basin with high water temperatures, high suspended sediment concentrations, and low dissolved oxygen levels in some of the deeper areas. Ammonia concentrations may reach toxic levels in some years and pesticide concentrations are the highest in the sub-basin." [[38]](#footnote-39)38

Fifty miles upstream at Sunnyside Diversion Dam, flows are sharply reduced during the irrigation season by diversions for the Sunnyside and Wapato Divisions. Upstream adult-fish passage**[\*212]** is difficult at the reduced flow, as is the passage of smolts on their way to the Columbia ***River***. [[39]](#footnote-40)39 Water temperature presents another concern. With reduced flows and a lack of riparian shading, temperatures may exceed seventy degrees Fahrenheit in the summer - only just tolerable for adult salmon and incompatible with spawning and rearing.

Other critical points are below the Wapatox Diversion Dam on the Naches ***River*** where water is diverted year-round for hydroelectric power generation, and the Roza Diversion Dam on the Yakima just upstream of its confluence with the Naches where water is diverted for use in Reclamation's Roza Division. In addition to these key points, there are numerous more localized flow problems, such as diversions within tributaries that reduce flows to levels below those necessary to permit passage for spawning and to provide suitable habitat for the rearing of fry. If this is the best the Columbia ***River*** Basin has to offer salmon, prospects for their recovery appear grim indeed.

C. The Upper ***Colorado*** ***River***, ***Colorado*** [[40]](#footnote-41)40

The ***Colorado*** ***River***, the major ***river*** of the American Southwest, begins on the western side of the Rocky Mountains in ***Colorado*** within the boundaries of Rocky Mountain National Park. See Figure 3. As it begins its journey to the Gulf of California, it passes through lands with only limited agricultural potential until it reaches the Grand Valley - a large, open, relatively flat expanse thirty miles long and roughly twelve miles wide near the border of Utah. Here, the initial settlers in the 1880s constructed a large canal that carried water to lands in the valley on the north side of the ***river***. [[41]](#footnote-42)41 Other smaller systems followed, providing water to perhaps 20,000 acres of land in total prior to the involvement of Reclamation beginning in 1908.

To provide water for higher lands on the north side of the valley not yet irrigated, Reclamation constructed the Grand Valley Diversion Dam upstream on the ***Colorado*** ***River*** in**[\*213]**

[SEE FIGURE 3 IN ORIGINAL]

Figure 3: Upper ***Colorado*** ***River*** Basin, ***Colorado***

Source: 2 Natural Resources Law Ctr., Restoring the West's Waters: Opportunities for the Bureau of Reclamation 5-2 (1996) **[\*214]**

Debeque Canyon and the Government High Line Canal with a capacity to carry 1,675 cfs. To move water down the canyon on the north side of the ***river***, Reclamation constructed three tunnels with a total length of well over two miles. [[42]](#footnote-43)42 In addition to new lands in the Garfield Division, the Grand Valley Project supplies water to two small districts located in the east end of the valley and, via a siphon under the ***Colorado*** ***River*** and a pumping plant that lifts water as much as 130 feet, to the Orchard Mesa Irrigation District on the south side of the ***river***.

At present, about 70,000 acres of land are irrigated in the Grand Valley. [[43]](#footnote-44)43 Despite elevations that range to over 5,000 feet, the valley's climate is generally mild, with a frost-free growing season of over 180 days. [[44]](#footnote-45)44 Higher lands in the east end of the valley support productive peach orchards, while most of the lands support a diversified production of alfalfa, corn, barley, oats, and beans. [[45]](#footnote-46)45 The valley is urbanizing, with a population expected to triple to 350,000 within fifty years. [[46]](#footnote-47)46

Beginning in the 1920s, large-scale water development moved water out of the ***Colorado*** ***River*** Basin for use in the Front Range of ***Colorado***. The first major transmountain-diversion project carried water to the City of Denver through the pioneer bore for the Moffat Tunnel, built to allow direct rail service through the mountains. [[47]](#footnote-48)47 In 1938, Reclamation began work on the ***Colorado***-Big Thompson Project, providing up to 310,000 acre-feet of water for irrigation and other uses in the northern Front Range. [[48]](#footnote-49)48 In the 1950s, Denver constructed Dillon Reservoir on the Blue ***River*** and the Roberts Tunnel to carry water to the Front Range. In the 1960s, Reclamation constructed the Fryingpan-Arkansas Project**[\*215]** to supply ***Colorado*** ***River*** Basin water to the southern Front Range in the Arkansas Valley. [[49]](#footnote-50)49 More recently, rapid growth in parts of the Upper ***Colorado*** Basin, tied largely to skiing and tourism, is placing increased demands for water use in this area.

Water development in the Upper ***Colorado*** ***River*** and its tributaries, and other development made possible with the availability of this water for out-of-stream use, have affected the instream conditions of the mainstem. For one thing, roughly one half million acre-feet of water per year is exported completely out of the basin. [[50]](#footnote-51)50 Irrigation uses consume about one million acre-feet of water per year and divert probably twice that amount. [[51]](#footnote-52)51 On the mainstem, water diversions for use in the Grand Valley take as much as 2,260 cfs of water from the ***river*** during the irrigation season. The Grand Valley Diversion Dam, completed in 1916, totally obstructs fish passage at this point of the ***river***. Upstream in the vicinity of Glenwood Springs, the Shoshone Power Plant diverts up to 1,250 cfs of water on a year-round basis from the ***river*** to generate electricity - an operation that has been in place since 1905.

Salinity is also a major concern in the ***Colorado*** ***River*** Basin. [[52]](#footnote-53)52 Much of what is now western ***Colorado*** once was part of a vast inland sea. The residues from that time, approximately 138 million years ago, are contained in what are called Mancos shales - marine shales containing "the shells and skeletons of innumerable marine animals: coiled ammonites, giant oysters, clams, and swimming reptiles." [[53]](#footnote-54)53 Mineral salts exist in these shales in great concentrations; when brought in contact with water the minerals tend to dissolve and become part of the water. The ***Colorado*** ***River*** acts as nature's drain for this area; water passing through the Mancos shales likely will find its way to the ***river***, carrying the "total dissolved solids" with it. **[\*216]**

Most of the salts added to the ***Colorado*** ***River*** come from natural sources. A prominent example in the Upper ***Colorado*** is eighteen springs located along the ***river*** around Glenwood Springs and Dotsero that add an estimated 500,000 tons of salts to the ***river*** each year. [[54]](#footnote-55)54 Human activities also add significant amounts of salts to the ***river***. For example, return flows from irrigation in the Grand Valley add large quantities of salts to the ***Colorado*** ***River***, estimated to be about 580,000 tons per year. [[55]](#footnote-56)55

Perhaps the most prominent environmental concern in the Upper ***Colorado*** ***River*** is the survival of four species of fish native to the basin now listed as endangered: the ***Colorado*** squawfish, the humpback chub, the bonytail chub, and the razorback sucker. Once these fish ranged the length of the ***river***, but now only the bonytail chub still inhabit the basin without stocking below Lake Powell. [[56]](#footnote-57)56 The survival and recovery efforts for these species have occurred largely in the Upper Basin, with considerable attention focused on the ***Colorado*** ***River*** mainstem in ***Colorado***. [[57]](#footnote-58)57

The ***Colorado*** squawfish has been listed as an endangered species since 1967. Despite an extensive program of research since that time, the biological requirements for their recovery still are not well understood. What is known is that the ***Colorado*** squawfish spawns between July and September; this timing appears to be closely linked to water temperature, which must reach or exceed sixty degrees Fahrenheit. [[58]](#footnote-59)58 The squawfish deposit their eggs in coarse cobble beds that must be relatively free of sediments. Hatching and survival of the larvae are most**[\*217]** successful under conditions of even warmer water temperatures. Upon hatching, the larvae apparently drift downstream, seeking backwater areas out of the ***river***'s current. In the fall and winter, the squawfish search out pools and other deepwater areas. ***Colorado*** squawfish can migrate considerable distances - in one case, a documented distance of nearly 200 miles between April and September. The segment of the ***Colorado*** ***River*** traversing the Grand Valley between the last major irrigation diversion point and the confluence with the Gunnison ***River***, known as the "Fifteen Mile Reach," is believed to be a squawfish spawning area. The ***river*** upstream to at least Rifle is regarded as potentially valuable habitat for the squawfish and the other endangered fish species.

\* \* \* The Truckee-Carson, Yakima, and Upper ***Colorado*** ***Rivers*** illustrate the manner in which human needs and desires resulted in transformation of riverine systems. In each of these settings Reclamation projects helped to serve these human needs. The adverse consequences to the ecosystems of these ***rivers***, however, are increasingly apparent. Thus, attention is turning to restoring lost environmental values.

[*III*](https://advance.lexis.com/api/document?collection=statutes-legislation&id=urn:contentItem:8T9R-T372-8T6X-731R-00000-00&context=1516831). Approaches to Increasing Environmental Benefits

As restoring and enhancing environmental values in western ***rivers*** becomes a higher priority, a variety of creative strategies is emerging. This Part describes five general approaches identified as part of a study of fifteen Reclamation projects in twelve western states. [[59]](#footnote-60)59 The five approaches include structural changes, operational changes, improvements in project efficiency, defining project and user water rights, and water transfers.

A. Structural Changes

The design and construction of Reclamation dam and diversion structures emphasized the regulation of ***rivers*** to provide water for irrigation, hydroelectric, and other economic**[\*218]** uses. Not until the 1930s did Congress suggest that Reclamation should consider the environmental effects of constructing its facilities. [[60]](#footnote-61)60 Not until the Fish and Wildlife Coordination Act of 1958 did Congress require consideration of these values. [[61]](#footnote-62)61 By this time most Reclamation facilities had been constructed, transforming ***rivers*** all across the West. [[62]](#footnote-63)62

In some cases, it is possible to modify physically Reclamation facilities so that they can be made more environmentally friendly. Thus, for example, outlet works designed to make the kind of large-scale releases needed for irrigation deliveries can be modified to operate at lower rates appropriate for minimum streamflow releases to maintain a fishery during the nonirrigation months. Outlets designed to allow the fullest possible drainage of the reservoir by releasing water from the deepest part of the storage - typically, the coldest water - can be modified to allow releases from other levels.

A number of such changes have already been made or are proposed for Reclamation projects. For example, a new jet flow gate is proposed for installation at Deerfield Dam in the Rapid Valley Project in South Dakota to enable wintertime releases of water to maintain a fishery in Castle Creek. [[63]](#footnote-64)63 Reclamation has already tunneled through 800 feet of shales adjacent to the right abutment of Glendo Dam in Wyoming and installed a pressurized pipe system enabling low-flow releases during the winter months. [[64]](#footnote-65)64 At Shasta Dam in California [[65]](#footnote-66)65 and Hungry Horse Dam in Montana, [[66]](#footnote-67)66 Reclamation is working on ways to release water from different reservoir elevations to provide better temperature control in accordance with the needs of the downstream fishery.

Such structural changes of Reclamation facilities are unlikely to benefit existing project users, however. Indeed, such changes raise the possibility of diminishing benefits historically enjoyed - or at least the expectation of enjoying such benefits - through changes in the historical manner of project operation. **[\*219]** For example, installing an outlet worksto allow releases of water in the winter months means that reservoir water not previously released in this period will leave storage. Irrigators who want water delivered to them during the summer might ask, "Whose water is being released?" Moreover, retrofitting existing facilities can be expensive. There is the very real issue of who should pay for these changes.

B. Changes in Project Operations

Just as Reclamation's physical structures rarely were designed with the environment in mind, project operations were developed to serve best the needs and interests of traditional project beneficiaries, not the environment. Thus, for example, water was stored in Reclamation dams according to when the legal storage right was in priority - typically the periods of high spring runoff or during the winter. Releases were managed based almost solely on the demands of water users with legal rights to enjoy the benefits of the water. Environmental factors simply did not enter into these decisions. Fortunately, the operation of water storage and delivery facilities is usually quite flexible, at least within certain limits. A great deal of change in the use of Reclamation facilities is now occurring to take advantage of this flexibility.

Perhaps the most common reason for changing the operation of Reclamation projects is to reflect the needs of the fish living downstream. Thus, Reclamation has developed a plan to maintain flows in Rapid Creek below Pactola Reservoir in South Dakota to protect the trout fishery. Instead of sharply reducing releases during a drought as was its historical practice, Reclamation is working to establish a pool of water dedicated to ensuring its ability to maintain minimum releases while still providing water to its traditional project users, primarily irrigators. [[67]](#footnote-68)67 At McPhee Reservoir on the Dolores ***River*** in ***Colorado***, Reclamation shifted from a rigid, three-tiered minimum-release pattern to the creation of a pool of water that can be released in a flexible manner according to the biologically determined needs of the fish. [[68]](#footnote-69)68 At Meeks Cabin Dam and Stateline Dam, features of the**[\*220]** Lyman Project in Utah and Wyoming, Reclamation changed its winter release operations in a manner that was determined to be more beneficial to the fish and to other interests in the area. [[69]](#footnote-70)69

Changes in hydroelectric power operations have also occurred at a number of Reclamation facilities. Perhaps the best known example is Glen Canyon Dam. [[70]](#footnote-71)70 Concerns about the effects on the Grand Canyon of the rapid and large-scale changes in releases of water from Glen Canyon Dam, particularly those involved in generating peaking power, led to a lengthy and detailed study in the search for options. [[71]](#footnote-72)71 As a result, both the maximum rate of the releases and the timing with which those releases are achieved (the "ramping rate") have been changed. [[72]](#footnote-73)72 At Hungry Horse Dam on the Flathead ***River*** in Montana, [[73]](#footnote-74)73 Reclamation has moderated the ramping rate to reduce adverse effects of its operations on the downstream fishery. At Kortes Dam in Wyoming, Reclamation shifted operations from one that ran either peaking-power flows or released essentially no water, to one that maintains at least a minimum year-round release of 500 cfs to benefit the downstream fishery in the "Miracle Mile." [[74]](#footnote-75)74 At Shasta Dam in California, Reclamation has been releasing cooler water from outlets below the one that carries water through the powerplant in order to benefit salmon. [[75]](#footnote-76)75

Perhaps the most unique operational change occurred at Nelson Reservoir in Montana. [[76]](#footnote-77)76 Here the environmental concern was not fish but birds - the piping plover. The piping plover is a protected endangered species. The exposed, gravelly lakebed in the unfilled reservoir is regarded by the plover as desirable nesting habitat. The plover typically establishes its nest between April and June and finishes nesting about sixty days later. Traditionally, Reclamation filled Nelson in the high spring runoff period, sometimes inundating piping plover nests in the process. **[\*221]** In an attempt to accommodate the needs of the birds, Reclamation now begins filling the reservoir in the fall and tries not to increase the reservoir elevation between May and July.

In the Upper Arkansas ***River*** of ***Colorado*** and the Rio Chama in New Mexico, Reclamation projects have changed operations primarily to benefit recreational interests. The Fryingpan-Arkansas Project includes storage in the headwaters of the Arkansas ***River*** to hold water brought from the western slope of ***Colorado***. [[77]](#footnote-78)77 This water is released downstream and captured again at Pueblo Reservoir, upstream of the dominant irrigation uses of the water. Between these two locations, the Arkansas ***River*** supports a high-demand whitewater rafting industry during the summer months. Reclamation now regulates its releases of water between its two primary storage areas in a manner that assures a summertime flow (through August 15) of at least 700 cfs in the ***river***, the minimum necessary to support commercial whitewater rafting.

In the Rio Chama, the availability of additional water imported from the San Juan Basin allowed recreational interests, irrigators, and the City of Albuquerque to work out an operating plan that provides for releases from upstream storage on weekends during the summer of sufficient water to support high-quality rafting use of the ***river***. [[78]](#footnote-79)78 Water released for this purpose can be captured in Abiquiu Reservoir and remain available for downstream consumptive demands on the Rio Grande. Legal rights to the ultimate use of the water are tracked by Reclamation through an accounting process.

Losses of traditional project benefits may result from such changes of projectoperations. The most clear-cut examples of measurable losses have involved reductions of hydroelectric power generation. To bypass power releases from Shasta Dam, for example, the Western Area Power Administration had to purchase replacement power at a cost of $ 26 million between August 1987 and December 1992. [[79]](#footnote-80)79 The Montana Power Company gave up its peaking-power use of Holter Dam, located just downstream of Reclamation's Canyon Ferry Dam on the Missouri ***River***. [[80]](#footnote-81)80 The Bonneville Power Administration lost some of the**[\*222]** peaking-power benefits due to changed operations at Hungry Horse Dam on the Flathead ***River***. [[81]](#footnote-82)81 Peaking-power benefits also were lost at Kortes Dam on the North Platte ***River***. [[82]](#footnote-83)82

Reclamation systems typically are designed and operated conservatively, with the specific intention that those holding contracts can count on the services provided for in those contracts except in unusual conditions such as serious droughts. In most cases, there is some play in the systems, for example, with water released that does not have to be released or that can be released in a different pattern. To this point, most of the changes have taken advantage of the slack in the system. As this slack is taken up, the next generation of changes is likely to direct attention to the more difficult issues of project management control and legal claims to the benefits from Reclamation projects.

C. Improvements in Project Efficiency

The design and construction of Reclamation projects commonly represent a balance between utilization of the best engineering techniques available at the time and the cost of building and operating the system. The early Reclamation projects designed exclusively to provide water for irrigation had to be relatively low-cost. Consequently, those systems typically utilized facilities and approaches that today are regarded as inefficient. The large, primary delivery canals are unlined dirt structures likely to lose substantial amounts of water during transit to the adjacent ground and to phreatophytes growing along their banks. They are likely to be designed to operate on a continuous flow basis, with laterals able to divert water at any time according to demand. Even the laterals often operate on a continuous flow basis, with water not diverted for irrigation use flowing back into the ***river*** or to another ditch system.

From an irrigator's perspective, especially in a watershed context, these systems are not inefficient. Assuming there is a good water supply (and Reclamation storage facilities generally ensure such a supply even where natural flows would not), it is desirable to be able to irrigate on demand. The costs of maintain- **[\*223]** ing such systems are low. Unused water simply returns to the ***river*** to be used by the next irrigation system downstream.

From the ***river***'s perspective, however, such systems impose important costs. They require substantial dewatering of a segment of the ***river*** between the diversion dam and the points where return flows restore at least some of the ***river***'s flow. Water temperatures in these segments increase, and there is less dilution for any quality-degrading substances entering the stream. And as a portion of the water diverted for irrigation use returns to the stream, it carries with it sediment, salts, fertilizer and pesticide additives, and other contaminants affecting stream water quality.

Improved project efficiencies do not, of course, create new water. The potential benefits to the environment depend on the project setting. One potentially important benefit could be to reduce diversions of water from a stream. The environmental value of those reduced diversions could come from allowing that water to stay in a historically dewatered segment of stream below the diversion dam. A reduction in stream diversions might also reduce storage releases needed to supply historical diversions so that releases can be made at a more environmentally advantageous time. Providing an increased downstream supply of water might also be a benefit if the water diverted did not return to the ***river*** (for example, if it was diverted out of the watershed or water basin).

There are potential environmental costs, however, associated with improving project water-use efficiency. The water that leaks out of dirt ditches and laterals may help to recharge groundwater supplies and can be the source of supply for an incidental wetlands area. The phreatophytes growing along the ditches or along the border of irrigated fields may provide aesthetic benefits as well as valuable habitat for a number of species. In short, efficiency is not an end in itself but, in certain circumstances, it could be a valuable means to a desired end.

In the Reclamation Reform Act of 1982, [[83]](#footnote-84)83 Congress required all nonfederal users of Reclamation water to prepare water conservation plans. [[84]](#footnote-85)84 The plans were intended to "encourage the full consideration and incorporation of prudent and responsible**[\*224]** water conservation measures … where such measures are shown to be economically feasible ...." [[85]](#footnote-86)85 Plans are to contain "definite goals, appropriate water conservation measures, and a time schedule for meeting the water conservation objectives." [[86]](#footnote-87)86

Because conservation is not an end in itself, the planning requirement does little to motivate efforts to improve project efficiencies. Rather, efforts to promote the efficiency of water use in Reclamation projects arise when there are discrete and identifiable benefits to be gained. Such was the case with the Newlands Project in the Truckee-Carson, the Yakima Project, and the Grand Valley Project in the Upper ***Colorado***. Experience in these three areas is discussed in Part IV.

D. Defining Project and User Water Rights

The legal basis under which water is controlled and used in Reclamation projects is a complicated mix of federal statutory, administrative, regulatory, and contractual arrangements; state law water rights and statutes governing operation of water districts; and district rules and arrangements with water users. [[87]](#footnote-88)87 Despite this surfeit of legal arrangements, there is a remarkable lack of clarity, particularly regarding such critical matters as the quantity of water that may be used by the project generally and by individual water users. State water rights typically provide only for the storage and general use of water according to broadly described project purposes. At best they are likely to establish some maximum amount of water that may be controlled and used by the project. They are most clear respecting the priority that the project's rights hold in relation to other appropriations of water from the same source. The contract between the U.S. and a water district representing project water users is likely to speak in general terms about the amount of water that is to be provided to users from the project supply. District rules are likely to describe in general terms the process by which users are entitled to use water. In short, what is known is that the project itself holds some priority claim to a maximum amount of water and**[\*225]** that the users are entitled to receive and use some share of this water.

Reclamation has entered into thousands of contracts with water districts and other users for water from Reclamation projects. While the general kinds of provisions are similar in these contracts, each was negotiated individually between the U.S. and the water district, and specific provisions can be quite different. [[88]](#footnote-89)88 Most fundamentally, the purpose of the contract is to specify the charges to be paid by those receiving project benefits and the benefits they are to receive. The contracts are for a term of years, most commonly forty. In a standard repayment contract, this is the period during which the water district must repay its share of project construction costs to the U.S. Typically, for projects still operated by Reclamation, the water district also must pay an operation and maintenance charge.

In turn, the contract states the obligation of the U.S. for delivering water from the project. Commonly, an irrigation contract provides for the delivery of water to some described maximum number of acres of land for irrigation use within the boundaries of the project service area. It may specify a maximum total quantity of water, a maximum quantity per acre irrigated, or, most likely, simply assure the availability of the amount of water reasonably necessary to irrigate the lands. The basis for this allocation usually reflects assumptions concerning the total number of irrigable acres within the water district and the amount of water necessary to grow crops on these lands - the "duty" of water. As mentioned, in most cases the U.S. itself holds the appropriative state water right in its name (legal title), but the U.S. Supreme Court has made it clear that the U.S. acts on behalf of the water users who complete the act of appropriation by applying the water to beneficial use (beneficial title). [[89]](#footnote-90)89 Thus, at least with respect to the water that has been legally applied to beneficial use by authorized irrigators, the U.S. has a continuing obligation to deliver water - so long as the contract has been validly maintained by, for example, making all required payments. Extensive litigation related to water use in the Newlands Project suggests that the amount of water legally obligated to**[\*226]** irrigation users in Reclamation projects will be scrutinized closely in the face of legitimate competing demands. [[90]](#footnote-91)90

Water spreading - the practice of using Reclamation project water on lands not legally authorized for such use - provides an example of a situation in which Reclamation may have the legal authority to reduce deliveries of water to some water districts. [[91]](#footnote-92)91 In some cases, lands not authorized to receive project water simply were never properly characterized or were not reclassified after improvements made them irrigable under Reclamation standards. In other cases, the lands were never contemplated to be irrigated with project water - for example, lands outside the boundaries of the project and the water district. This is a widespread and complicated problem that is receiving considerable attention from Reclamation and water users throughout the West. It seems possible that, in some situations, water deliveries to water districts may end up being reduced. Subsequent use of this water remains uncertain, however.

Contract renewals present another situation in which Reclamation will be faced with questions regarding its legal authority and responsibility to make changes that, among other things, seek to provide greater environmental benefits from project operations. [[92]](#footnote-93)92 At least in the context of certain water service contracts, courts have upheld changes in contract terms at the time of renewal, including raising the price of project water. [[93]](#footnote-94)93

Another prominent example of ways in which project commitments may be altered is through congressional action. A notable illustration is the Central Valley Project Improvement Act, [[94]](#footnote-95)94 which dedicated about 800,000 acre-feet of the yield of the Central Valley Project ("CVP") to fish and wildlife use. Strictly speaking, all Congress did was to dedicate the uncontracted-for**[\*227]** portion of the CVP yield to environmental uses. In fact, however, existing project users benefited from the availability of this previously uncontracted-for project capacity even if they were not regarded as directly paying its costs. Water stored in this space in high-runoff years had been available to project water users in drought years. In the prolonged drought that began in 1988, CVP users eventually suffered sharp curtailments in supply. Such curtailments will be more common in the future with the commitment of this portion of project water to environmental uses.

Involuntary changes to existing assumptions regarding the availability and use of project water are likely to be contentious. Nevertheless, there is typically considerable ambiguity respecting the quantity of water that is legally obligated for delivery and use in Reclamation projects. Where there are valuable competing environmental (and other) uses, it seems likely that there will be continuing efforts to determine just how much water is in fact required to be delivered so that limited water resources can meet the broadest possible set of needs, including those of the environment.

E. Water Transfers

Transfers of Reclamation project water from historical uses, such as irrigation, to new uses, such as for cities, have not been common in the past. [[95]](#footnote-96)95 Projects were planned and built with specific uses and users in mind. The costs of the projects were highly subsidized for the purpose of encouraging these uses. Understandably, there has been resistance to allowing project users to sell their water allocations to others at what many would regard as a windfall gain. In the end, the necessity for some reallocation of project water, and general acceptance of the idea that market-based approaches are the best mechanism for achieving this reallocation, outweighed concerns about private interests gaining what might be viewed as public benefits.

There are a number of legal issues presented in making transfers of Reclamation project water, particularly to environmental uses. In some cases, the original authorization for the project may not specifically recognize fish and wildlife purposes. **[\*228]** This raises questions of whether project water can be transferred to such uses absent explicit congressional authorization and whether the new use must be within the existing project service area. Questions arise regarding whether the existing contract arrangement between Reclamation and the water users allows transfers and, if so, under what terms. There are questions about the payment obligation that should attach to project water transferred to environmental uses. And so on. None of these questions necessarily prevents such transfers, and growing experience with making transfers helps to answer many of them. Nevertheless, under existing federal law there are a number of substantial hurdles to be cleared before voluntary transfers of water from existing consumptive uses to nonconsumptive environmental uses can occur. [[96]](#footnote-97)96 And, of course, this does not even consider equally important state law questions that affect water transfers. [[97]](#footnote-98)97

Transfers of Reclamation-supplied water have long occurred though a water bank in the Upper Snake ***River***. [[98]](#footnote-99)98 The Upper Snake bank is run by the irrigation-water interests in the area and facilitates transactions between those with extra storage water and those needing more water. Reclamation has utilized the bank to provide additional water downstream for salmon. There are several features of the bank, however, that put these fish-related purchases at a disadvantage. The cost of water that is to be utilized outside of the bank service area is about three times the cost for use of water within the service area. The storage space from which this water comes is regarded as the lowest priority space during the next filling period. If runoff is low the following year, this space may not fill, and the holder of the rights to that space will have nothing to use or sell that year. And, of course, the owners of the storage space may simply choose not to make water available through a water bank - a situation that occurred in 1994 in the Upper Snake.

Environmental uses of water often provide diffuse benefits that are not readily represented through the market by interests**[\*229]** able to purchase water. For voluntary transfers to play a real role in meeting ecological needs in ***rivers*** across the West, funding will have to be found to purchase water or water rights associated with Reclamation projects.

[*IV*](https://advance.lexis.com/api/document?collection=statutes-legislation&id=urn:contentItem:8T9R-T3H2-D6RV-H37G-00000-00&context=1516831). A Return to the Three ***Rivers***

This Part returns to the three areas described in Part II and discusses efforts to apply some or all of the approaches outlined in Part III to increase ***river***-based ecosystem benefits. This experience illustrates both the variety of creative approaches that are available as well as the importance of designing the particular approach to meet the available needs and opportunities. Environmental gains are apparent in all three areas, but considerably more remains to be done.

A. The Truckee-Carson

The Truckee-Carson is a good place to begin because of the prolonged efforts in this area to reallocate historical uses of the limited water resources in these basins to support better critical water-based environmental needs. As described in Part II, for much of this century the Newlands Project laid claim to the lion's share of the water of both the Truckee and Carson ***Rivers***. So dominant was the project's use of water that, as of 1967, diversions of Truckee ***River*** water had never been regulated in any way - users simply took all they needed. The same was essentially true for the Carson ***River***.

Important as the Newlands Project was, it was far from the only major water development within the two basins. Irrigation developed as early as the late 1850s in what is known as the Truckee Meadows, the area now largely occupied by Reno and Sparks, and the Orr Ditch Decree recognized water rights to irrigate 32,000 acres of land between Nevada's boundary with California and the Truckee Meadows. [[99]](#footnote-100)99 Irrigated agriculture also developed in the Carson Valley at the upper end of the Carson ***River*** in Nevada, with an irrigated land area estimated to be**[\*230]** about 47,000 acres. [[100]](#footnote-101)100 Smaller irrigated areas exist in other valleys in the upper portion of the ***river*** in California and Nevada, parts of which are in the process of becoming urbanized. [[101]](#footnote-102)101

When a series of drought years in the 1920s and 1930s made it clear that the water supply developed by the Newlands project was inadequate to meet the demands that then existed in the Truckee Basin, Reclamation built Boca Dam on the Little Truckee ***River*** under the Truckee Storage Project to supply supplemental water for irrigation in the Truckee Meadows. [[102]](#footnote-103)102 In the 1940s, Reclamation began investigations that led to the congressional authorization in 1956 of the Washoe Project. [[103]](#footnote-104)103 As originally planned, the Washoe Project would fund the construction of three new storage reservoirs - two in the Truckee Basin and one in the Carson - to provide supplemental irrigation water to 43,380 acres, forty million kilowatt hours of hydroelectric power, and water for the Reno/Sparks area. [[104]](#footnote-105)104

Actual construction under the Washoe Project reflects the increasing importance of environmental concerns at about this time. Watasheamu Dam, planned for the East Fork of the Carson ***River***, remains unbuilt. Prosser and Stampede dams, located in the Truckee Basin, both have been constructed, but neither provides water under contract for either irrigation or urban use. Water from Prosser, completed in 1962, is exchanged for deliveries from Lake Tahoe so that Tahoe water can be used to maintain a minimum streamflow in the Truckee ***River*** below Tahoe. [[105]](#footnote-106)105 Stampede, completed in 1970, is used to provide water to support the springtime spawning needs of the Cui-ui out of Pyramid Lake. [[106]](#footnote-107)106 Marble Bluff Dam, completed in 1975, was constructed**[\*231]** three miles upstream of Pyramid Lake to stop the land erosion that was obstructing fish passage out of the lake. [[107]](#footnote-108)107 A separate three-mile channel allowing fish to move up and out of the lake to a point on the ***river*** above the dam was constructed as well. Thus, Reclamation has made a number of structural improvements specifically intended to provide environmental benefits in the Truckee-Carson.

Perhaps the most protracted struggles to reflect environmental values in the water uses of the Truckee-Carson have centered around water rights. It is worthwhile to review this complex, prolonged, and still unresolved effort to clarify the legal control that users within the Newlands Project hold over the water resources of these two ***rivers***. [[108]](#footnote-109)108 As was common with its projects throughout the West, Reclamation itself initiated legal claims to appropriate water necessary to meet the needs of the Newlands Project. Irrigation was already occurring on some of the lands, and Reclamation essentially exchanged a contract right for water from the project for the existing appropriative right to irrigate these lands. [[109]](#footnote-110)109 Owners of not-yet-irrigated lands within the project boundaries filed water-rights applications with the U.S. under which, in return for fixed annual payments based on the number of acres of land to be irrigated, the U.S. agreed to supply water to those lands. [[110]](#footnote-111)110 In 1913, the U.S. filed a quiet title action in federal district court to settle its claims to Truckee ***River*** water for the project. [[111]](#footnote-112)111 In 1925, the U.S. filed a comparable action regarding its claims for water from the Carson ***River***. [[112]](#footnote-113)112

The Truckee ***River*** action resulted in a settlement in 1944 known as the Orr Ditch Decree. Under this decree the right of the U.S. to divert up to 1,500 cfs of water from the Truckee ***River*** at Derby Dam for irrigation use for up to 232,800 acres was recognized, with a priority date of 1902. [[113]](#footnote-114)113 The decree specified**[\*232]** a water duty of 4.5 acre-feet per acre on "bench" lands and 3.5 acre-feet per acre on "bottom" lands, but made no attempt to identify such lands.

U.S. claims in the Carson ***River*** were not decreed until 1980 in United States v. Alpine Land & Reservoir ***Co***. [[114]](#footnote-115)114 The federal district court established water duties for bench and bottom lands in the same quantities as in the Orr Ditch decree and established consumptive use of irrigation water in the project of 2.99 acre-feet per acre. [[115]](#footnote-116)115 It declared that the U.S. held a "duty" of 30,000 acre-feet of water in Lahontan Reservoir for fishing and recreation. [[116]](#footnote-117)116 Aside from its finding that the U.S. obtained preexisting water rights from 29,884 acres of land, the court said nothing about the amount of land either in irrigation or potentially irrigable within the Newlands Project.

A close examination of these two decrees provides remarkably little clarity concerning actual claims by the Newlands Project for water from these two ***rivers***. The Orr Ditch diversion right of 1,500 cfs greatly exceeds the 800 cfs physical capacity of the Truckee Canal to move water to project lands. While the project was envisioned to provide irrigation water to 232,800 acres, the actual land-area irrigated within the project never exceeded about 65,000 acres, [[117]](#footnote-118)117 and the total land-area covered by water rights in some form is about 73,000 acres. [[118]](#footnote-119)118 Moreover, the decrees establish water duties but offer no guidance on what constitutes an acre of bench or bottom lands and make no effort to identify lands that hold these duties. The 1926 contract between the U.S. and the Truckee-Carson Irrigation District ("TCID") simply provides that TCID may divert "an equitable proportion … of the water actually available at that time for all the irrigable area of the Carson and Truckee Divisions of the Newlands Project." [[119]](#footnote-120)119 The contract goes on to assure TCID of the "economical and beneficial use of all such waters in sufficient quantity to properly**[\*233]** irrigate 87,500 acres of land...." [[120]](#footnote-121)120 Given this typical lack of definition, it is not surprising that the water users within the project simply took as much water as they needed.

The first attempt to bring definition to the diversion and use rights of the project was not until 1967 when the Secretary of the Interior promulgated regulations establishing a maximum quantity of water that could be diverted annually for use within the project. [[121]](#footnote-122)121 Under those regulations (known as "Operating Criteria and Procedures for the Truckee and Carson ***Rivers***" ("OCAP")), Secretary Stewart Udall determined that quantity to be 406,000 acre-feet for the roughly 65,000 acres under irrigation. In 1972, in response to new OCAP regulations setting the maximum project diversion at 378,000 acre-feet, the Pyramid Lake Paiute Tribe initiated the first of what has become a large number of lawsuits aimed at reducing diversion and use of water in the Newlands Project from the Truckee ***River***. [[122]](#footnote-123)122 The federal district court in this case struck down the Secretary's regulations as arbitrary and capricious and ordered amendments that would assure the delivery of at least 385,000 acre-feet annually to Pyramid Lake. [[123]](#footnote-124)123 In a supplemental memorandum issued in 1973, the court ordered an OCAP limiting diversions for agricultural purposes to 288,129 acre-feet, making the "maximum use" possible of Carson ***River*** water. [[124]](#footnote-125)124

Shortly thereafter, TCID intentionally diverted more water than permitted under the OCAP. [[125]](#footnote-126)125 TCID then filed suit to prevent the Secretary from terminating the contract it held with the U.S. to operate the project. Eleven years later, the Ninth Circuit Federal Court of Appeals rejected TCID's claim that regulation of diversions under the OCAP constituted a taking of its property right to water from the Truckee ***River*** and that termination of its contract deprived TCID of property. [[126]](#footnote-127)126 The Court characterized TCID as a "manager" rather than as a**[\*234]** property owner. Consequently, it possessed no interest that was harmed by a lawful termination of the contract.

In 1973, the U.S. instituted an action seeking a reserved water right in the Truckee ***River*** for the Pyramid Lake Paiute Tribe in order to protect Pyramid Lake and flows in the lower ***river*** necessary for fish spawning. [[127]](#footnote-128)127 The Orr Ditch Decree recognized an irrigation water right for the tribe, but there had been no claim for water based on the needs of the fishery. Relying on the doctrine of res judicata, the U.S. Supreme Court held that the U.S. had fully asserted the tribe's reserved rights in the original litigation and could not reopen its claims. [[128]](#footnote-129)128

The U.S. had argued successfully in the Ninth Circuit Court of Appeals that, since the tribe and TCID were not parties to the Orr Ditch litigation, their respective claims to water from the Truckee ***River*** had not been at issue. [[129]](#footnote-130)129 When the case went to the U.S. Supreme Court, the U.S. characterized the appellate decision as simply reallocating water within a water right decreed to the U.S. [[130]](#footnote-131)130 However, the Supreme Court quoted from a series of decisions involving the relationship between the U.S. as legal holder of the appropriative water right for a Reclamation project and the beneficial users of project water, and concluded:

The Government is completely mistaken if it believes that the water rights confirmed to it by the Orr Ditch decree in 1944 for use in irrigating lands within the Newlands Reclamation Project were like so many bushels of wheat, to be bartered, sold, or shifted about as the Government might see fit. Once these lands were acquired by settlers in the Project, the Government's "ownership" of the water rights was at most nominal; the beneficial interest in the rights confirmed to the Government resided in the owners of the land within the Project to which these water rights became appurtenant upon the application of Project water to the land. [[131]](#footnote-132)131

Because the case was decided on res judicata grounds, this discussion can be regarded as dicta. Still, given our focus on more**[\*235]** carefully defining legal rights to use water under federal Reclamation projects, it seems worth considering the implications of the Court's words.

In Ickes v. Fox, [[132]](#footnote-133)132 one of the cases relied upon by the Supreme Court in Nevada v. United States, [[133]](#footnote-134)133 Reclamation had sought to reduce its delivery commitments to water users in the Yakima Project below the amount agreed to in the original contract. The U.S. Supreme Court analogized the role of the U.S. to that of a "carrier" of water. [[134]](#footnote-135)134 While its facilities may physically appropriate the water, and while the U.S. may hold the decree in its name, the water right itself exists only because of the application of water to a beneficial use. The U.S., as carrier, acts as an "agent" for the beneficial user. [[135]](#footnote-136)135

In the Newlands context, the Court simply asserted that perfected water rights exist only to the extent that water rights have been applied to actual use - a standard principle of western water law. The Court's discussion, however, failed to address the legal status of water rights claimed for lands within the project that have never been irrigated. The larger claim by the U.S. for water to irrigate up to 150,000 acres of additional lands has never been perfected. [[136]](#footnote-137)136 The Court does make clear, however, that the U.S. cannot unilaterally declare additional project purposes and then allocate the unperfected portion of its original claim to these new uses with the priority of that claim. Litigation has tested the murky line between changing a water right and changing the classification of lands that affects the quantity of water to be provided to the lands. In 1986, the Secretary proposed a "Final OCAP" for the Newlands Project that included maps prepared by Reclamation specifying which lands were bench or bottom. [[137]](#footnote-138)137 **[\*236]** TCID challenged these designations, primarily on the grounds that such designations should be based on historical water-use practices as a matter of water law rather than using soil characteristics and water tables as had been done. The federal district court, acting under its retained jurisdiction in the Carson ***River*** adjudication, agreed. The Ninth Circuit reversed, [[138]](#footnote-139)138 finding that the Secretary had acted within his authority under section 10 of the Reclamation Act, which provides broad rulemaking powers "necessary and proper for the purpose of carrying out the provisions of this Act into full force and effect." [[139]](#footnote-140)139 The court did stipulate, however, that state law beneficial use standards must be followed. [[140]](#footnote-141)140

Through the detailed scrutiny given to water use in the Newlands Project, it became evident that water was being used on lands not identified on certificates or contracts as those to be irrigated. Following final determination of project water rights in the Carson ***River*** adjudication, landowners within the project filed 129 applications with the Nevada State Engineer to change the place of water use to comport with actual practices. [[141]](#footnote-142)141 The Pyramid Lake Paiute Tribe challenged these change-of-use applications on a number of grounds, including harm to tribal water rights, harm to the public interest, and invalidity of the basic right due to failure to perfect, abandonment, or forfeiture. [[142]](#footnote-143)142 The state engineer granted the applications, finding no factual or legal basis to support the tribe's claims. TheNinth Circuit held that the transfers were properly governed under Nevada state law and that the state engineer's findings respecting harm to water rights and the public interest were supported by substantial evidence. [[143]](#footnote-144)143 Regarding the current validity of the water rights, **[\*237]** the court remanded for review twenty-seven applications specifically challenged by the tribe on the basis of lack of perfection, forfeiture, and abandonment. [[144]](#footnote-145)144 On appeal, following the federal district court's decision to uphold the state engineer, the Ninth Circuit reversed and remanded once again for a specific determination of whether the rights proposed to be changed in place of use had been perfected as a matter of Nevada water law and, if so, whether they have been abandoned or forfeited. [[145]](#footnote-146)145 The court specifically rejected the state engineer's "project-wide" approach and, instead, required a specific evaluation of the status of each water right. [[146]](#footnote-147)146 The court concluded that a water right must be perfected - that is, actually applied to beneficial use - in order for it to be transferred. [[147]](#footnote-148)147 Consideration of abandonment requires a case-by-case review of the reasons for nonuse of water by the transferor and whether there is evidence of intent to abandon the use of a water right that had been perfected. [[148]](#footnote-149)148 Finally, in evaluating forfeiture the court concluded that the Nevada forfeiture statute enacted in 1913 (under which a vested water right can be lost upon evidence of nonuse for five successive years) [[149]](#footnote-150)149 potentially applies to any water right perfected after enactment of the statute. [[150]](#footnote-151)150 Perfection of a water right dates from actual use of water on the land, not from the 1902 appropriation date that applies to the project water rights held by the U.S.

In short, litigation in the Truckee-Carson is forcing a detailed examination of the extent of the water rights for the project generally and for individual users specifically. To summarize briefly what has been a long and complex series of decisions, the decreed water rights for the project determine in a broad sense uses for which project facilities may appropriate water. The U.S. as the legal holder of the project water rights generally acts as the agent for individual water users within the project who, by their beneficial use of the water, hold vested water rights. The U.S. cannot take away or reallocate those rights. The existence of vested individual water rights requires that water must in fact**[\*238]** have been put to actual use and that the use must have been neither abandoned nor forfeited under Nevada law. The maximum amount of water that may be used depends on whether the lands being irrigated are bench or bottom. The Secretary may, however, enact regulations classifying lands into these two categories on the basis of a field determination of soil characteristics even if the result is to change the historical understanding of the water duty on those lands. The holders of valid rights may transfer the rights to another and the use may be changed under Nevada law.

Beyond this ongoing struggle over control of the limited water resources in the Truckee-Carson, the process of change can be tracked through changes in the role of Reclamation itself. [[151]](#footnote-152)151 Until at least the 1960s, Reclamation had understood its charge to be the development of water supplies to support economic development. In the Fish and Wildlife Coordination Act of 1958, [[152]](#footnote-153)152 Congress elevated wildlife conservation to "equal consideration" with other features of water resources development. The transformation of the Washoe Project, described above, reflects in part this shift in priorities.

Through the OCAP process, Reclamation went from a passive observer of the Newlands Project operations to a more active participant, developing project operating requirements and monitoring their implementation. As mentioned, TCID had taken over as operator of the Newlands Project in 1926. The Secretary of the Interior terminated the contract following TCID's intentional violation of the OCAP diversion requirements in 1973, but kept TCID as the project operator on a year-to-year basis thereafter. Initially, Reclamation's attention focused on placing maximum limits on diversions of water with special emphasis on meeting project demands to the degree possible with Carson ***River*** water. In particular, diversions of water from Derby Dam into the Truckee Canal were tied to the elevation level of Lahontan Reservoir and water availability in the upper Truckee watershed. [[153]](#footnote-154)153 Next, attention turned to a more careful definition**[\*239]** of the actual land area irrigated, the status of lands as either bench or bottom, and the efficiency of the water delivery system. Detailed, expensive studies of each of these aspects occurred in preparation for issuance of what was called the "Final OCAP," finally adopted in 1988. [[154]](#footnote-155)154 Central to the OCAP is what is called "project efficiency," defined as total headgate deliveries divided by total project diversions. A "target" of sixty-eight percent efficiency was set for 1992 (compared to a calculated efficiency in 1987 of about fifty-six percent). TCID's ability to achieve this efficiency level assumed that implementation of Reclamation-identified conservation measures would produce substantial water savings. [[155]](#footnote-156)155 Failure to achieve the efficiency targets would result in a reduction in the quantity of water that can be diverted into the project in the following year (conversely, exceeding the target would allow increased diversions in subsequent years).

There is much discussion about Reclamation becoming the "premier water management agency" in the world. [[156]](#footnote-157)156 In the minds of some, this new role might mean more of the sort of efforts that have been underway in the Newlands Project to improve project efficiency. If so, the Newlands experience should be carefully evaluated. A detailed study in 1993 of ways to improve water-use efficiency indicates that efficiency gains are expensive and that the most cost-effective strategies emphasize retirement of certain irrigated lands. [[157]](#footnote-158)157

The most recent strategy to be employed at Newlands is the use of market-based transfers of water from irrigation use to the**[\*240]** Lahontan Valley wetlands. This approach was instigated by the Environmental Defense Fund in the 1980s and first implemented by the Nature Conservancy in 1989, when it purchased and transferred water from agricultural to wetlands use. In the 1990 Truckee-Carson-Pyramid Lake Water Rights Settlement Act, [[158]](#footnote-159)158 Congress authorized the Secretary of the Interior to acquire water and water rights within the project for transfer of the water to support a "primary wetland habitat" of 25,000 acres within the Lahontan Valley wetlands. As of October 1993, over 12,000 acre-feet of water had been purchased and transferred under a program managed by the U.S. Fish and Wildlife Service. [[159]](#footnote-160)159 The Fish and Wildlife Service estimates that it will have to purchase about 125,000 acre-feet of water to support the 25,000 acres of wetlands - requiring the dry-up of somewhere between one-half and three-quarters of all of the lands presently irrigated within the project. [[160]](#footnote-161)160

The legal issues involved in making transfers of water from the Newlands Project have been largely addressed, but only as a result of lengthy litigation and an act of Congress specifically including fish and wildlife as a purpose of the project and setting up the Fish and Wildlife Service water purchase program. Unresolved is the more troubling question of the potential effects of water transfers on the irrigated agricultural community within the Newlands Project. What is the viability of an agricultural area half, or even less than half, the size of that presently existing? What becomes of the lands previously irrigated? What happens to that segment of the economy dependent on agriculture? What replaces agriculture as a source of economic support for the community?

Water transfers provide a potentially valuable means of addressing the needs of the wetlands, at least in part. The manner in which transfers occur, however, matters greatly. The traditional approach, involving the permanent purchase of all water rights and the total cessation of agriculture on the lands, needs to be supplemented with a broader menu of options - ones that provide greater flexibility in the manner in which water uses**[\*241]** are changed. [[161]](#footnote-162)161 One particularly promising approach is the use of water-banking mechanisms specifically designed for this purpose. [[162]](#footnote-163)162

Thus the Truckee-Carson provides examples of all of the approaches discussed in Part III. Physical and operational changes have been made to Reclamation projects. Special attention has been given to improving the efficiency of project water use. Water-use entitlements have been narrowed and defined, primarily through litigation. And voluntary water transfers are being used. Despite these efforts over what has now been more than twenty-five years, critical environmental needs remain unmet.

B. The Yakima

Important changes have occurred in the Yakima Project in an effort to accommodate better the needs of the anadromous fish within the basin. Initially, attention was placed on structural improvements to existing dams and diversion facilities. Fish ladders or passageways now exist at every diversion structure on the Yakima ***River*** and its tributaries up to the point of the high elevation storage dams. These facilities often are quite elaborate. There are two counting stations on the mainstem, and fish screens have been installed at all diversion structures. A large salmon hatchery has been designed for possible construction and operation in the basin. In recent years, the Bonneville Power Administration has spent approximately $ 70 million on such changes. [[163]](#footnote-164)163

The September 1990 discovery of sixty salmon redds in an area of the Yakima ***River*** no longer believed to be spawning habitat prompted important changes in the manner in which project facilities are operated. [[164]](#footnote-165)164 The redds were found in the bed**[\*242]** of the upper mainstem just downstream of the point where the CleElum ***River*** joins the Yakima. Historically, flows in this portion of the ***river*** would be sharply decreased at the end of the irrigation season because releases from Cle Elum Reservoir are cut back. However, Federal Judge Justin L. Quackenbush ordered that reservoir releases continue as necessary to maintain a minimum flow of 650 cfs in this portion of the ***river*** during the nonirrigation season, which is the flow considered necessary to maintain the redds and to support spawning. He further ordered that certain physical actions be taken, such as directing flows to the redds, and ordered that Reclamation consult with a group of fish biologists respecting ways to protect the salmon. [[165]](#footnote-166)165

From this experience emerged what is known as the "flip-flop" operation. [[166]](#footnote-167)166 Instead of drawing more or less evenly from storage in the Upper Yakima and the Naches to meet downstream demands during the irrigation season, Reclamation began in 1981 to release water heavily from reservoirs in the Upper Yakima until September when it would draw instead from the Naches. The idea was to get the flow levels in the Upper Yakima down to levels that would be maintained during the winter months before the salmon established their redds. The biologists identified by Judge Quackenbush in his opinion became the System Operation Advisory Committee ("SOAC"), with representatives from the state of Washington, the U.S. Fish and Wildlife Service, the Yakima Indian Nation, and the water users. Reclamation also has initiated the so-called "mini flip-flop" in managing releases from Keechelus Dam and Kachess Dam to support spawning in the reach of the Upper Yakima below these dams.

Congress enacted legislation in 1994 that directly affected management of the Yakima project. [[167]](#footnote-168)167 "Target" minimum flows were established at Sunnyside Diversion Dam and Prosser Diversion Dam, ranging from 300 to 600 cfs, depending on the estimated water supply. [[168]](#footnote-169)168 In addition, this legislation authorized funding to modify the radial gates at Cle Elum Dam and to**[\*243]** replace the hydraulic pumps at the Chandler Pumping Plant with electric pumps in order to reduce diversions at Prosser Dam. [[169]](#footnote-170)169 The primary intent of the legislation was to promote water conservation in the basin. To accomplish this purpose, it provides fifty percent federal cost sharing (matched by state cost sharing) for the water users in the basin to develop water conservation plans,thirty percent cost sharing for "investigation" of specific water-saving measures (again the state would bear fifty percent), and sixty-five percent of the costs of monitoring and evaluating the measures. [[170]](#footnote-171)170 As water conservation activities reduce diversions, the target minimum flows at Sunnyside and Prosser are to increase: fifty cfs for every 27,000 acre-feet of reduced diversions.

While operational changes have been made, water transfers have not yet been used in the Yakima as a means of addressing environmental concerns. In 1989, the Washington legislature authorized a "trust water rights" program for the Yakima Basin. [[171]](#footnote-172)171 This program provides a legal mechanism through which water or water rights can be transferred to the state without loss of priority. The state can then make use of the water for instream or other uses. The incentive for the water user is provided by state funding that can be made available to water districts for conservation activities or simply to forego the use of water for some period of time. The Environmental Defense Fund also has proposed a water leasing program for the Yakima that would make water available for instream uses. [[172]](#footnote-173)172 In 1994, Congress authorized expenditures of up to $ 10 million for the acquisition of water from willing sellers in the Yakima. [[173]](#footnote-174)173

Water rights in the Yakima Basin have a long history of controversy and litigation. [[174]](#footnote-175)174 Since 1977, a general adjudication has been underway in the basin seeking to clarify rights to the**[\*244]** use of the basin's surface water supplies. Perhaps the most important result of this adjudication to date has been the determination that the Yakima Indian Nation holds a reserved water right to "the minimum instream flow necessary to maintain anadromous fish life in the ***river***, according to annual prevailing conditions." [[175]](#footnote-176)175 The actual flows of water needed to maintain the fish are to be determined by the superintendent of the Yakima Project in consultation with SOAC, irrigation district managers, and others.

Beyond this, however, the adjudication has largely just confirmed the status quo in the basin. It is interesting to compare the results of the Yakima adjudication (initiated in 1977) with the results of the protracted litigation in the Truckee-Carson. The cases involving the Truckee-Carson emphasize the necessity for actual use in order to demonstrate the existence of a valid water right and require a case-by-case determination of abandonment and forfeiture in cases where water is not being used on water-righted lands. These cases also uphold a careful scrutiny of soil types on all irrigated lands to determine the appropriate water duty rather than simply following historical practices. In contrast, the Yakima adjudication has determined that claims to water are to be based on irrigable rather than actually irrigated lands, on paper claims rather than actual use. The Yakima cases also hold that beneficial use can be inferred from the general production of valuable agricultural products on lands in irrigation and need not be examined for each parcel of land. [[176]](#footnote-177)176 The striking difference between these outcomes may be explained in part by the fact that an adjudication is intended merely to determine the existence of claims to water and the priorities of those claims. In any case, the Yakima litigation has not served as a forum for examining and evaluating historical water-use practices, even though these issues have been raised by the state on several occasions.

In 1994, interests within the basin, led primarily by agricultural producers and business people, formed the Yakima ***River* [\*245]** Watershed Council. [[177]](#footnote-178)177 With a membership of about 1,000, the Council operates through committees focusing on topics such as water quality, water storage and conservation, and water transfer and marketing. The Council is seeking to develop consensus on ways to use the water resources of the Yakima Basin that are sustainable, both economically and environmentally. Such an effort could help to avoid the rancorous fights that have characterized the uses of the Truckee-Carson over the years.

Emphasis in the Yakima has been placed on structural improvements to protect fish. Operational changes also have been made. Funding is now available for water districts to explore ways to use water more efficiently so that streamflows can be improved. Relatively little change has occurred through changes in water-use entitlements or through voluntary transfers of water. Efforts of the Yakima ***River*** Watershed Council to find mutually acceptable approaches for meeting environmental needs stand in sharp contrast to the acrimonious history of the Truckee-Carson.

C. The Upper ***Colorado*** Basin

In comparison with the Truckee-Carson and the Yakima, efforts to address environmental concerns have been more modest at Reclamation facilities in the Upper ***Colorado*** ***River*** Basin in ***Colorado***. The most active effort to this point has been to reduce salinity loadings to the ***Colorado*** ***River*** from sources in the Grand Valley. The Grand Valley Unit, authorized under the ***Colorado*** ***River*** Basin Salinity Control Act of 1974, [[178]](#footnote-179)178 supported the concrete lining of nearly seven miles of the Government Highline Canal and the transformation of thirteen unlined laterals into twelve pipes in Stage One; additional improvements are being made under Stage Two. [[179]](#footnote-180)179 As of 1994, Reclamation had expended $ 145 million toward this effort, producing an estimated reduction in salinity loadings of 99,000 tons. **[\*246]**

Purely incidental to its intended purpose of reducing salt loadings, the Grand Valley salinity project focused attention on the irrigation systems in the Grand Valley and made it clear that these lands could be irrigated with the diversion of considerably less water from the ***Colorado*** ***River*** than had historically been the case. [[180]](#footnote-181)180 The two major irrigation water delivery systems in the Grand Valley follow practices characteristic of operating a low-cost water supply from a generally abundant water source: divert water from the ***river*** at a point that allows gravity to move the water; build a large main canal to carry the water, with laterals located at topographical points enabling gravity diversion of canal water to laterals and to farm headgates; and run the canal (and the laterals, if possible) on a continuous-flow basis so that irrigators can simply take water as needed from the system. Irrigation in the Grand Valley developed well ahead of most other out-of-stream uses of ***Colorado*** ***River*** water in ***Colorado***, enabling the irrigation systems to establish senior water rights to divert the quantities of water necessary to make their gravity-driven, continuous-flow approach work. Subsequent water development in the Upper ***Colorado*** ***River*** Basin necessarily accommodated itself to this substantial senior downstream demand.

Thus, when Reclamation sought to build the ***Colorado***-Big Thompson Project to take up to 310,000 acre-feet of ***Colorado*** ***River*** Basin water to the Front Range of ***Colorado***, it had to construct Green Mountain Reservoir as "compensatory" storage for the West Slope. [[181]](#footnote-182)181 One of the explicit purposes for the water stored in Green Mountain was to assure that senior water rights on the West Slope, including those in the Grand Valley, would continue to receive a full supply as water was being taken out of the basin for other uses. [[182]](#footnote-183)182 Similarly, Reclamation constructed Ruedi Reservoir as compensatory storage for the Fryingpan-Arkansas project, which takes water out of ***Colorado*** ***River*** tributaries for use in the Arkansas Valley of ***Colorado***. [[183]](#footnote-184)183 **[\*247]**

In fact, even before this considerable upstream water development occurred, Reclamation recognized that the water supply for its Grand Valley Project was not as secure as it had thought. There were times when the more senior downstream call of the Grand Valley Irrigation Company ("GVIC") would limit Reclamation's ability to provide water to the Orchard Mesa Irrigation District ("OMID"). [[184]](#footnote-185)184 In 1926, Reclamation constructed a "check" structure at the point where water used hydraulically to lift other water onto Orchard Mesa would return to the ***Colorado*** ***River***. [[185]](#footnote-186)185 The purpose of the check was to move this return flow upstream so that it was available for diversion at the GVIC diversion structure, thus enabling sometimes limited ***Colorado*** ***River*** water to do double duty.

Not only are upstream water uses now competing with Grand Valley irrigators for the water of the ***Colorado*** ***River***, so too are the mostly downstream water needs of a number of endangered fish. The initial Fish and Wildlife Service response to protect the ***Colorado*** squawfish and other listed species was to find that any proposed water development in the Upper ***Colorado*** jeopardized the continued existence of these species, but that a reasonable and prudent alternative to the proposed development was to proceed in conformity with a management plan it was developing. [[186]](#footnote-187)186 This approach evolved into the "Recovery Implementation Program for Endangered Fish Species in the Upper ***Colorado*** ***River*** Basin" ("Recovery Program"), a federal, state, and private program that set out a number of actions to be taken that, it was believed, would protect the fish and eventually lead to their delisting under the Endangered Species Act.

As revised in 1993, the program contains seven elements, estimated to require funding of as much as $ 134 million between**[\*248]** 1994 and 2004. [[187]](#footnote-188)187 First, the instream flow needs of thefish are to be identified and protected. Second, important habitat areas are to be restored and managed. Third, the adverse effects of nonnative fishes are to be reduced. Fourth, the genetic resources of the species are to be protected and managed. Fifth, monitoring and research are to be conducted as necessary to support recovery efforts. Sixth, education of the public is to be pursued through an active program of information dissemination. And seventh, overall planning and coordination of recovery program activities are to be pursued, as is obtaining adequate funding support.

The Upper ***Colorado*** ***River*** contains valuable habitat essential for the recovery of the ***Colorado*** squawfish. At present, the upper limit of habitat used by the squawfish is the Grand Valley - apparently because of obstructions in passage caused by water diversion structures in both the ***Colorado*** and Gunnison ***rivers***. Relatively large numbers of squawfish have been found in the Fifteen Mile Reach segment of the ***Colorado*** ***River*** between the GVIC diversion dam and the confluence with the Gunnison ***River***, and the area has been identified by the Fish and Wildlife Service as a "suspected ***Colorado*** squawfish spawning area." [[188]](#footnote-189)188 Consequently, the Fifteen Mile Reach has been a focal point of recovery efforts.

Successful spawning of ***Colorado*** squawfish appears to be closely correlated with high levels of spring runoff water in the ***river***. Biologists now believe that the flooding of low-lying areas adjacent to the ***river*** is important because these areas provide nutrient-rich settings in which the squawfish can feed and warm prior to spawning. High flows also are important for cleaning the gravel substrates where the eggs are laid.

Water storage in the Upper ***Colorado*** generally reduces high spring flows. Moreover, diversions for irrigation in the Grand Valley sharply reduce flows passing through the Fifteen Mile Reach. The Recovery Program has focused in part on increasing flows through this segment of the ***Colorado*** ***River***. [[189]](#footnote-190)189 The first additional increment of water to help increase flows came from**[\*249]** Ruedi Reservoir. Reclamation agreed in 1990 to release 5,000 acre-feet per year out of uncontracted storage space in the reservoir and committed an additional 5,000 acre-feet per year in four years out of five based on operational changes. [[190]](#footnote-191)190 In 1991, Reclamation committed an additional 10,000 acre-feet per year.

A study of other potential sources of water concluded that structural and management changes in the irrigation operations in the Grand Valley would provide the lowest cost supply of water. [[191]](#footnote-192)191 From an engineering and management perspective, there are a number of ways that diversions of water in the Grand Valley could bereduced. [[192]](#footnote-193)192 A more fundamental barrier to implementing water-management changes is the legal uncertainty of the status of the water that would no longer be diverted. [[193]](#footnote-194)193 Understandably, no one will make the investments necessary to reduce diversions without legal assurances that they will realize the benefits of those investments. This is, in part, an issue of ***Colorado*** water law, which lacks a trust water rights program like the state of Washington's or some other mechanism for addressing such situations.

[*V*](https://advance.lexis.com/api/document?collection=statutes-legislation&id=urn:contentItem:8T9R-T3X2-8T6X-731X-00000-00&context=1516831). A Few Critical Issues

The kinds of changes that may be required in the management and use of western water resources to provide adequately for the ecosystem functions of these resources raise many difficult issues. This Part discusses a few of these issues. In particular, it addresses the fundamental question of who pays the costs of obtaining environmental benefits in the context of Reclamation water facilities. It explores the question of how the risks of adopting such approaches should be shared. It discusses the notion of getting the signals right so that affected interests are more likely to take the desired actions. And it explores basic issues of equity implicated by the sorts of changes proposed in this article. If the kinds of approaches outlined in this article are to work, these issues must be addressed and resolved. **[\*250]**

A. Who Pays?

The issue of who pays for environmental benefits is difficult. It is particularly challenging in the context of Federal Reclamation projects that have enjoyed substantial public support. A cornerstone of U.S. environmental law is the "polluter pays" principle. Applied to western water, proponents of this principle argue that those who develop and use water in a manner that causes environmental damage should pay.

Unfortunately there are some complicating problems with this principle. It is not illegal to deplete a ***river***, for example, as it is to discharge a pollutant into a ***river*** without a permit. Indeed, water-quality regulation in western states typically goes to great lengths to insulate water development and use from any water-quality responsibilities. [[194]](#footnote-195)194 The only federal environmental law that places any real limits on water use is the Endangered Species Act. [[195]](#footnote-196)195 In short, there are no established legal standards by which to measure objectively the environmental harm of water development. Thus it is difficult to know the nature and extent of the environmental damage that water users might be held responsible for redressing.

There is the equally vexing problem of sorting out responsibility in the case of a Federal Reclamation project. On one hand, it can be argued that these projects have not yet been completeduntil they are capable of being operated with acceptable environmental effects. The existence and use of these facilities impose environmental "externalities" with real costs that are not being borne by the beneficiaries of the facilities. Just as the beneficiaries were expected to pay part of the costs of construction, this line of thinking goes, so too should they be expected to pay for the changes necessary to make them operate in an environmentally acceptable manner. They should "internalize" these costs so that they will be factored into their decisions to use water from the project.

On the other hand, the U.S. constructed these facilities and subsidized their costs to encourage people to make additional investments in irrigated agriculture and other productive**[\*251]** activities that were made economically viable by the availability of cheap water (and power). These facilities met all the legal requirements in existence when they were constructed. The contract between the U.S. and the water district setting out the payment obligations of the water users represents a binding agreement respecting the costs that these users were expected to pay.

There is no question that some of these changes will be expensive. For example, structural changes at Glendo cost $ 1.5 million. [[196]](#footnote-197)196 The multilevel release system at Shasta is expected to cost more than $ 50 million. [[197]](#footnote-198)197 Beyond the monetary costs involved in physical improvement there are the costs measured in losses of benefits. One previously mentioned example is the Western Area Power Administration's expenditure of $ 26 million between 1987 and 1992 to replace the electricity that was not generated at Shasta. [[198]](#footnote-199)198 Even more difficult to quantify are the costs that might be associated with a reduction in the availability of water due to releasing additional water from a facility for non-economic project benefits, such as restoring a fishery.

These considerations lead to several conclusions. One is that there is a continuing federal responsibility to address the environmental impacts of its facilities. It is a responsibility that should be addressed directly through a systematic evaluation of the present effects of their operation. At the same time, this responsibility is shared with those who now benefit from the operation of these facilities. To fail to acknowledge this responsibility financially would be to continue to encourage a level of use that is both environmentally and economically inefficient. If this is, then, best understood as a joint responsibility there is the question of where the money would come from. One approach might be to impose user fees on the products of the facilities (water and power) that would go into a fund to help pay the very substantial costs of necessary environmental restoration. State matching grants are another potential source of funding. Finally, federal funding also should be made available. **[\*252]**

B. Sharing the Risks

Reclamation facilities typically were designed in a conservative manner so that beneficiaries usually receive much or all of the water supply that was originally expected to be available. This security of supply resulted from such things as Reclamation's efforts to obtain secure senior legal title to a substantial portion of the water supply in the project area and from Reclamation's ability to construct large storage facilities able to capture this supply for later delivery and use. One beneficial but unintended consequence of this conservative strategy is that there is now often a considerable amount of play in the operation of these systems. As the competition for the water increases, Reclamation frequently has been able to accommodate additional interests without impairing the full delivery of historically available project benefits. Such opportunities still exist in other projects.

Increasingly, however, the easy changes are being made. The systems are getting tighter. Additional changes will begin at least to increase the risk that users will not get the same secure supply to which they have become accustomed. That increased risk already is apparent in drought years and will become more common even in normal years. In this context, the uncertainties in the legal regime governing the provision of project benefits become important.

This examination of Reclamation-project water rights and contracts suggests that there are a number of bases on which the sharing of project water with the environment can be legally justified. Litigation in the Truckee-Carson has demonstrated ways that water-use entitlements associated with a Reclamation project can be forced to go through a process of definition that has the effect of reducing the quantity of water historically dedicated to project uses. As courts are asked to examine more closely the "needs" of out-of-stream users for the quantities historically diverted, they are very likely to conclude that once acceptable practices are no longer warranted. The frontier conditions that justified essentially unlimited use of resources no longer exist. We are closer today to a "spaceship" economy than a "cowboy" economy, to use the evocative metaphors of Kenneth Boulding. [[199]](#footnote-200)199 **[\*253]** In a spaceship economy, the stewardship of resources is likely to weigh more heavily than expectations about being able to command the use of a resource beyond that reasonably necessary to accomplish the basic purposes for which that resource is taken. Despite the protestations of some that water rights somehow are immune from this sort of scrutiny, [[200]](#footnote-201)200 there are no such absolute legal barriers to the more careful determination of the amount of water obligated for diversion from a stream under a water right. On the contrary, as claims on the finite water resource increase, such scrutiny will become increasingly common.

C. Getting the Signals Right

It may be possible to avoid at least some of the legal battles over water rights, however, if changes can be made to improve the signals that Reclamation projects and its associated system of water rights now send water users. First, and perhaps most fundamental of all, the price of water needs better to reflect its cost. Irrigators sometimes tend to use more water than necessary to grow crops because the water is cheap and because the investment and effort required to produce the same output ofcrops with less water probably costs more than simply continuing to use water in the same manner as always. [[201]](#footnote-202)201 It is a rational decision from the perspective of the irrigator given the cost of water.

Most Reclamation projects were constructed prior to the advent of federal requirements to consider environmental effects. Thus, these external costs were never factored into the cost of constructing the facilities. Compounding this fact was the policy decision to subsidize the costs of these projects so that irrigation-water users end up paying, in some cases, as little as five or ten percent of the share of the construction costs associated with providing water to these users. [[202]](#footnote-203)202 In many cases, the operation and maintenance costs are subsidized as well. At a minimum, it would seem that when project contracts come up for renewal, **[\*254]** federal policy should be to ensure that the payments in those projects reflect the actual cost of delivering the water. In addition, to reflect the externalities of water development and use, a user charge should be assessed and the funds directed to environmental restoration activities in the watershed.

Second, to provide incentives for water users to make conservation investments, state and federal law should be clarified to assure that the user is able to control the subsequent use of the "saved" water. [[203]](#footnote-204)203 Without such assurances there is no economic reason for irrigators to become more efficient. Clearly, such water cannot come at the expense of other water users who have relied on the availability of this water. The traditional principle of no injury (a change of use of a water right will not be permitted if it causes injury to another water user) is sensible and should be applied to this situation.

Third, efforts to clarify the rules guiding voluntary transfers of Reclamation-project water need to continue. [[204]](#footnote-205)204 At the same time, states need to develop affirmative systems designed to facilitate transfers - what I have referred to in a broad sense as "water banking." [[205]](#footnote-206)205 Voluntary, market-based reallocation of water provides perhaps the best means by which water already developed and used can be shifted to meet more contemporary needs. Because environmental values of water tend to be general in nature, there is the difficult question of who will be willing and able to buy water for this purpose - particularly in these times of shrinking governmental budgets. Nevertheless, it is an option that will be valuable in some settings and that should be available under clearly articulated rules that facilitate beneficial changes of the use of developed water while protecting other important values. **[\*255]**

D.

Equity

The kind of changes contemplated in this article necessarily raise issues of fairness. Who should bear the burden of change? Who receives the benefits? Should losses be compensated? It is fair to say that most traditional beneficiaries of Reclamation projects will not necessarily see ecosystem improvements as benefits to them, even though it may be possible sometimes to make this case. [[206]](#footnote-207)206 Few irrigators will be impressed by arguments about the larger benefits to be gained if they pay more for their water. Nor will many irrigators respond well when asked to share voluntarily more of the water they have traditionally regarded as "theirs" with fish or the environment, to increase the risk of having a reduced water supply, or to have to make investments in order to maintain traditional levels of crop production with less water.

It is true that everyone must respond to a large number of limitations of the use of their property because of governmental restrictions that have been imposed in the name of public health, safety, and the environment. In this sense, water users are no different from anyone else. Norms once considered acceptable often change in response to public needs and desires. It seems difficult to argue that Reclamation project users are somehow immune from changing policies that once favored public subsidies but no longer do. It is becoming increasingly difficult to argue that water-use practices should remain immune from improvement just because it costs money.

For example, in the 1970s, Congress did not hesitate to require that businesses make major investments in pollution control. Even in the face of growing evidence of the enormous costs that were being imposed, in some cases causing businesses to close down, public support for these required expenditures remained strong. There was a strongly shared sense that "polluting the environment," whatever that meant, was not acceptable and that certain minimum standards should be met by (nearly) all those whose activities generated these pollutants. **[\*256]**

Once again, we seem to be presented with a case that "water is different." As already mentioned, there are few legal limitations directly restricting the diversion and use of water. There are also a number of explicit exemptions of legal liability, such as for return flows from irrigation under the Clean Water Act. [[207]](#footnote-208)207 However, the difference may not in fact be attributable to some special treatment of water, but instead to the fact that most of the water is used for agriculture. There is a longstanding tradition in this country (and in others) of providing special treatment for agriculture. [[208]](#footnote-209)208 It may well be that irrigation-water-use benefits from this traditional attitude.

Another factor may simply be our limited understanding of natural systems, including water-based ecosystems, and our inability to connect clearly water development and use with unacceptable environmental harms. In many cases the environmental values are simply gone; we can only imagine that they once existed. In other cases we are unaware of their loss because we never knew they existed. Dramatic examples like the Columbia ***River*** salmon have greatly increased both scientific and public awareness of the ecosystem implications of water development and use. Until we better understand biotic needs and can better define the acceptable limits of human water use in this context, it is difficult to demand that existing water users give up benefits they presently enjoy and that provide benefits to others in the form of food and power, among other things.

Nevertheless, there is a compelling basis for revisiting water storage and delivery operations in western ***rivers***. Indeed, changes already are occurring, and much more is likely to happen. The considerations outlined above advocate the importance of proceeding with care to identify those situations most in need of attention and to implement the most cost-effective measures possible to achieve the desired environmental conditions. It seems likely that in many cases a sustainable riverine ecosystem can be restored and maintained without unacceptable costs to existing users. In situations where this is not the case, public investments will be needed. In some cases, changes could even produce benefits in the form of water delivery and use systems requiring less labor to operate, reduced water require- **[\*257]** ments costing less money, more effective water use increasing crop yields, and better-quality water providing better instream fisheries and better irrigation water. [[209]](#footnote-210)209 An effective water bank facilitating temporary transfers of water could bring much needed capital into an irrigation operation, enabling investments not otherwise possible. [[210]](#footnote-211)210 For many reasons, such approaches are desirable.

[*VI*](https://advance.lexis.com/api/document?collection=statutes-legislation&id=urn:contentItem:8T9R-T4F2-D6RV-H37N-00000-00&context=1516831).

Conclusion

Among the "new" responsibilities for the Bureau of Reclamation as it moves away from project construction and toward area management is one of stewardship for the ***rivers*** of the West it regulates. While continuing to meet its traditional commitments, Reclamation is now broadening its view of its role and the interests that its projects should seek to serve. Reclamation could now set for itself a goal of restoring and maintaining the ecological integrity of the western ***rivers*** its facilities regulate. In some of these ***rivers***, Reclamation so controls the ***rivers***' flows that changes in Reclamation facilities and operations alone can make significant improvements. In most cases, however, there are many factors affecting the ecological viability of a ***river*** in addition to those more or less under Reclamation's control. Nevertheless, Reclamation could assume a position of leadership - through partnership - in taking steps necessary to assure the long-term sustainability of western waters. In those ***rivers*** with Reclamation projects, probably no one better understands how they operate. Armed with this unique knowledge, and sometimes with the direct ability to make necessary changes, Reclamation is well suited to play this role.

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11. 11 W.L. Minckley & Michael E. Douglas, Discovery and Extinction of Western Fishes: A Blink of the Eye in Geologic Time, in Battle Against Extinction: Native Fish Management in the American West 7-17 (W.L. Minckley & James E. Deacon eds., 1991). [↑](#footnote-ref-12)
12. 12 A good example of the kind of language once applied by water developers to explain their activities is provided in this 1946 report to Congress by Reclamation:

    Yesterday the ***Colorado*** ***River*** was a natural menace. Unharnessed it tore through deserts, flooded fields, and ravaged villages. It drained the water from the mountains and plains, rushed it through sun-baked thirsty lands, and dumped it into the Pacific Ocean - a treasure lost forever. Man was on the defensive. He sat helplessly by to watch the ***Colorado*** ***River*** waste itself, or attempted in vain to halt its destruction.

    Today this mighty ***river*** is recognized as a national resource. It is a life giver, a power producer, a great constructive force. Although only partly harnessed by Boulder Dam and other ingenious structures, the ***Colorado*** ***River*** is doing a gigantic job. Its water is providing opportunities for many new homes and cities and for the growing of crops that help feed this nation and the world. Its power is lighting homes and cities and turning the wheels of industry. Its destructive floods are being reduced. Its muddy ***rivers*** are being cleared for irrigation and other uses.

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14. 14 As government scientists were struggling to articulate management prescriptions that would protect the endangered spotted owl in the Pacific Northwest, one of their number stated publicly that ecological systems are not only more complicated than we understand, they are more complicated than we can understand. For one view of the implications for resource management, see Donald Ludwig et al., Uncertainty, Resource Exploitation, and Conservation: Lessons from History, 260 Science 17, 36 (1993). [↑](#footnote-ref-15)
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20. 20 Much of this discussion is derived from [*Restoring the West's Waters, supra*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4W-W4S0-003B-G0DY-00000-00&context=1516831) note 15 (manuscript at pt. 2, ch. 14 & pt. 3, ch. 3). [↑](#footnote-ref-21)
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71. 71 U.S. Dep't of Interior, Glen Canyon Environmental Studies, Final Report (1989). [↑](#footnote-ref-72)
72. 72 Id. [↑](#footnote-ref-73)
73. 73 [*Restoring the West's Waters, supra*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4W-W4S0-003B-G0DY-00000-00&context=1516831) note 15, vol 1, 2, at 4-14 to 4-15. [↑](#footnote-ref-74)
74. 74 Id. ch. 6. [↑](#footnote-ref-75)
75. 75 Id. at 15-7 to 15-11. [↑](#footnote-ref-76)
76. 76 Id. at 2-10. [↑](#footnote-ref-77)
77. 77 Id. at 7-6 to 7-8. [↑](#footnote-ref-78)
78. 78 Id. ch. 9. [↑](#footnote-ref-79)
79. 79 Id. at 15-12. [↑](#footnote-ref-80)
80. 80 Id. at 3-4. [↑](#footnote-ref-81)
81. 81 Id. at 4-14. [↑](#footnote-ref-82)
82. 82 Id. at 6-4. [↑](#footnote-ref-83)
83. 83 [*43 U.S.C. 390aa*](https://advance.lexis.com/api/document?collection=statutes-legislation&id=urn:contentItem:8SDD-0HD2-8T6X-7387-00000-00&context=1516831) (1988). [↑](#footnote-ref-84)
84. 84 Id. 390jj. [↑](#footnote-ref-85)
85. 85 Id. 390jj(a). [↑](#footnote-ref-86)
86. 86 Id. 390jj(c). [↑](#footnote-ref-87)
87. 87 For a more complete discussion, see 1 Lawrence J. MacDonnell et al., Facilitating Voluntary Transfers of Bureau of Reclamation-Supplied Water (1991) [hereinafter Facilitating Reclamation Transfers I]. [↑](#footnote-ref-88)
88. 88 Id. [↑](#footnote-ref-89)
89. 89 Id. at 12-15; see also discussion infra part IV.A. [↑](#footnote-ref-90)
90. 90 For a discussion of the litigation surrounding the Newlands Project, see infra part IV.A. [↑](#footnote-ref-91)
91. 91 Office of Inspector Gen., Bureau of Reclamation, Irrigation of Ineligible Lands, Audit Report No. 94-I-930 (1994); Reed D. Benson & Kimberly J. Priestley, Making a Wrong Thing Right: Ending the "Spread" of Reclamation Project Water, 9 Envtl. L. & Litig. 89 (1994). [↑](#footnote-ref-92)
92. 92 Duane Mecham & Benjamin M. Simon, Forging a New Federal Reclamation Water Pricing Policy: Legal and Policy Considerations, [*27 Ariz. St. L.J. 507 (1995)*](https://advance.lexis.com/api/document?collection=analytical-materials&id=urn:contentItem:3S3T-9890-00CV-80B8-00000-00&context=1516831) [hereinafter Reclamation Pricing Policy]. [↑](#footnote-ref-93)
93. 93 [*Madera Irrigation Dist. v. Hancock, 985 F.2d 1397 (9th Cir. 1993).*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4X-HXB0-003B-P4HC-00000-00&context=1516831) [↑](#footnote-ref-94)
94. 94 Pub. L. No. 102-575, ***106 Stat. 4706 (1992).*** [↑](#footnote-ref-95)
95. 95 For an examination of transactions to date, see 2 Lawrence J. MacDonnell et. al., Facilitating Voluntary Transfers of Bureau of Reclamation-Supplied Water: Case Studies (1991) [hereinafter Facilitating Reclamation Transfers II]. [↑](#footnote-ref-96)
96. 96 These federal law issues are discussed in Facilitating Reclamation Transfers I, supra note 87, at 9-33. [↑](#footnote-ref-97)
97. 97 For a discussion of state law issues, see Lawrence J. MacDonnell, Transferring Water Uses in the West, 43 Okla. L. Rev. 119 (1990). [↑](#footnote-ref-98)
98. 98 [*Restoring the West's Waters, supra*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4W-W4S0-003B-G0DY-00000-00&context=1516831) note 15, vol. 2, at 2-31; see also Lawrence J. MacDonnell et al., Water Banks in the West 2-1 to 2-22 (1994). [↑](#footnote-ref-99)
99. 99 Project Data, supra note 18, at 1217; Truckee ***River*** Atlas, supra note 22, at 72. The remaining irrigated land in this area is estimated at about 10,000 acres. Id. [↑](#footnote-ref-100)
100. 100 [*Carson* ***River*** *Atlas, supra*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4W-W4S0-003B-G0DY-00000-00&context=1516831) note 26, at 91. [↑](#footnote-ref-101)
101. 101 Id. at 93. [↑](#footnote-ref-102)
102. 102 The background of this project and the facilities that were constructed are described in Project Data, supra note 18, at 217-22. [↑](#footnote-ref-103)
103. 103 Act of Aug. 1, 1956, Pub. L. No. 104-45, [*70 Stat. 775*](https://advance.lexis.com/api/document?collection=statutes-legislation&id=urn:contentItem:5CFP-G8X0-01XN-S0D5-00000-00&context=1516831) (omitted from current codification). The background and project facilities are described in Project Data, supra note 18, at 1289-98. [↑](#footnote-ref-104)
104. 104 Project Data, supra note 18, at 1293. [↑](#footnote-ref-105)
105. 105 Truckee ***River*** Atlas, supra note 22, at 93. [↑](#footnote-ref-106)
106. 106 Id. at 94. Stampede was built without any contracts between the U.S. and water users for delivery of water. While it has a storage capacity of 226,500 acre-feet of water, its water right on the Little Truckee ***River*** is very junior. As discussed below, the decision of the Secretary of the Interior to dedicate this storage to fish recovery rather than to sell the water to consumptive users was upheld in [*Carson-Truckee Water Conservancy Dist. v. Clark, 741 F.2d 257 (9th Cir. 1984).*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4W-W4S0-003B-G0DY-00000-00&context=1516831) [↑](#footnote-ref-107)
107. 107 Project Data, supra note 18, at 1291. [↑](#footnote-ref-108)
108. 108 More detail is provided in Facilitating Reclamation Transfers II, supra note 95, at 124-31, and in [*Restoring the West's Waters, supra*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4W-W4S0-003B-G0DY-00000-00&context=1516831) note 15, vol. 2, ch. 3. [↑](#footnote-ref-109)
109. 109 [*Nevada v. United States, 463 U.S. 110, 126 n.9 (1983);*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4X-4MR0-003B-S3TM-00000-00&context=1516831) [*United States v. Alpine Land & Reservoir* ***Co****., 503 F. Supp. 877, 881 (D. Nev. 1980),*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4N-WWK0-0039-S4J6-00000-00&context=1516831) aff'd, [*697 F.2d 851 (9th Cir. 1983),*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4X-0TK0-003B-G43F-00000-00&context=1516831) cert. denied sub nom. ***Pyramid Lake Paiute Tribe of Indians v. Truckee-Carson Irrigation Dist., 464 U.S. 863 (1983).*** [↑](#footnote-ref-110)
110. 110 [*Alpine Land & Reservoir* ***Co****., 503 F. Supp. 877.*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4N-WWK0-0039-S4J6-00000-00&context=1516831) [↑](#footnote-ref-111)
111. 111 [*Nevada v. United States, 463 U.S. at 113.*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4X-4MR0-003B-S3TM-00000-00&context=1516831) [↑](#footnote-ref-112)
112. 112 [*Alpine Land & Reservoir* ***Co****., 697 F.2d 851, 853.*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4X-0TK0-003B-G43F-00000-00&context=1516831) [↑](#footnote-ref-113)
113. 113 [*Nevada v. United States, 463 U.S. at 117.*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4X-4MR0-003B-S3TM-00000-00&context=1516831) [↑](#footnote-ref-114)
114. 114 [*503 F. Supp. 877.*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4N-WWK0-0039-S4J6-00000-00&context=1516831) [↑](#footnote-ref-115)
115. 115 [*Id. at 888.*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4N-WWK0-0039-S4J6-00000-00&context=1516831) [↑](#footnote-ref-116)
116. 116 [*Id. at 888-89.*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4N-WWK0-0039-S4J6-00000-00&context=1516831) [↑](#footnote-ref-117)
117. 117 [*Nevada v. United States, 463 U.S. at 119 n.7.*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4X-4MR0-003B-S3TM-00000-00&context=1516831) [↑](#footnote-ref-118)
118. 118 [*United States v. Alpine Land & Reservoir* ***Co****., 878 F.2d 1217, 1221 n.7 (9th Cir. 1989).*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4X-B7K0-003B-50JJ-00000-00&context=1516831) [↑](#footnote-ref-119)
119. 119 Contract Between the United States of America and the Truckee-Carson Irrigation District Providing for the Transfer of the Management of the Irrigation Works to the District and for the Repayment of Construction Charges, art. 35 (Dec. 18, 1926) (on file with author). [↑](#footnote-ref-120)
120. 120 Id. [↑](#footnote-ref-121)
121. 121 This background is described in [*Pyramid Lake Paiute Tribe of Indians v. Morton, 354 F. Supp. 252, 255 (D.D.C. 1973).*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4V-KJC0-003B-32CR-00000-00&context=1516831) [↑](#footnote-ref-122)
122. 122 Id. [↑](#footnote-ref-123)
123. 123 [*Id. at 258-60.*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4V-KJC0-003B-32CR-00000-00&context=1516831) [↑](#footnote-ref-124)
124. 124 [*Id. at 262.*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4V-KJC0-003B-32CR-00000-00&context=1516831) [↑](#footnote-ref-125)
125. 125 [*Truckee-Carson Irrigation Dist. v. Secretary of Dep't of Interior, 742 F.2d 527, 530 (9th Cir. 1984).*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4W-VM20-003B-G4VW-00000-00&context=1516831) [↑](#footnote-ref-126)
126. 126 Id. [↑](#footnote-ref-127)
127. 127 [*Nevada v. United States, 463 U.S. 110, 119 (1983).*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4X-4MR0-003B-S3TM-00000-00&context=1516831) [↑](#footnote-ref-128)
128. 128 [*Id. at 145.*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4X-4MR0-003B-S3TM-00000-00&context=1516831) [↑](#footnote-ref-129)
129. 129 [*United States v. Nevada, 649 F.2d 1286 (9th Cir. 1981),*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4X-1BT0-0039-W1VN-00000-00&context=1516831) modified sub nom. [*United States v. Truckee-Carson Irrigation Dist., 666 F.2d 351 (9th Cir. 1982),*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4X-46V0-003B-G3B1-00000-00&context=1516831) aff'd in part and rev'd in part sub nom. [*Nevada v. United States, 463 U.S. 110 (1983).*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4X-4MR0-003B-S3TM-00000-00&context=1516831) [↑](#footnote-ref-130)
130. 130 [*Nevada v. United States, 463 U.S. at 121.*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4X-4MR0-003B-S3TM-00000-00&context=1516831) [↑](#footnote-ref-131)
131. 131 [*Id. at 126.*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4X-4MR0-003B-S3TM-00000-00&context=1516831) [↑](#footnote-ref-132)
132. 132 [*300 U.S. 82 (1937).*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4X-9GP0-003B-72BJ-00000-00&context=1516831) [↑](#footnote-ref-133)
133. 133 [*463 U.S. 110.*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4X-4MR0-003B-S3TM-00000-00&context=1516831) [↑](#footnote-ref-134)
134. 134 [*Ickes v. Fox, 300 U.S. at 95.*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4X-9GP0-003B-72BJ-00000-00&context=1516831) For a more complete discussion of this issue, see Facilitating Reclamation Transfers I, supra note 87, at 12-15. [↑](#footnote-ref-135)
135. 135 See [*Murphy v. Kerr, 296 F. Supp. 536, 545 (D.N.M. 1923),*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4V-PJ00-0054-84G4-00000-00&context=1516831) aff'd, [*5 F.2d 908 (8th Cir. 1925).*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4X-1JX0-003B-K0GP-00000-00&context=1516831) [↑](#footnote-ref-136)
136. 136 By comparison, the United States was able to obtain a decreed right to 30,000 acre-feet of water in Lahontan Reservoir in the Carson ***River*** adjudication for uses that were not described as part of the Newlands Project but were allowable as a matter of Nevada state law. [*United States v. Alpine Land & Reservoir* ***Co****., 503 F. Supp. 877 (D. Nev. 1980),*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4N-WWK0-0039-S4J6-00000-00&context=1516831) aff'd, [*697 F.2d 851 (9th Cir. 1983),*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4X-0TK0-003B-G43F-00000-00&context=1516831) cert. denied sub nom. ***Pyramid Lake Paiute Tribe of Indians v. Truckee-Carson Irrigation Dist., 464 U.S. 863 (1983).*** [↑](#footnote-ref-137)
137. 137 The background is discussed in [*United States v. Alpine Land & Reservoir* ***Co****., 887 F.2d 207 (9th Cir. 1989).*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4X-9080-003B-54SV-00000-00&context=1516831) [↑](#footnote-ref-138)
138. 138 Id. [↑](#footnote-ref-139)
139. 139 [*43 U.S.C. 373*](https://advance.lexis.com/api/document?collection=statutes-legislation&id=urn:contentItem:8SDD-0HD2-8T6X-7346-00000-00&context=1516831) (1988). [↑](#footnote-ref-140)
140. 140 [*United States v. Alpine Land & Reservoir* ***Co****., 887 F.2d at 212.*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4X-9080-003B-54SV-00000-00&context=1516831) On remand, the federal district court found no conflict with beneficial use standards under state law. United States v. Alpine Land and Reservoir ***Co***., No. D-185-HDM, at 8-9 (D. Nev. Aug. 8, 1994) (denying applicants' motion for a preliminary injunction). The decision specifically notes that crop yields would probably not be diminished, id. at 7, and suggests that a reduced water duty could be increased again if necessary to offset this result, id. at 10. [↑](#footnote-ref-141)
141. 141 The background is presented in [*United States v. Alpine Land & Reservoir* ***Co****., 878 F.2d 1217 (9th Cir. 1989).*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4X-B7K0-003B-50JJ-00000-00&context=1516831) [↑](#footnote-ref-142)
142. 142 [*Id. at 1221.*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4X-B7K0-003B-50JJ-00000-00&context=1516831) [↑](#footnote-ref-143)
143. 143 [*Id. at 1222.*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4X-B7K0-003B-50JJ-00000-00&context=1516831) [↑](#footnote-ref-144)
144. 144 [*Id. at 1229.*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4X-B7K0-003B-50JJ-00000-00&context=1516831) [↑](#footnote-ref-145)
145. 145 [*United States v. Alpine Land & Reservoir* ***Co****., 983 F.2d 1487 (9th Cir. 1993).*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4X-J240-003B-P0RV-00000-00&context=1516831) [↑](#footnote-ref-146)
146. 146 [*Id. at 1494.*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4X-J240-003B-P0RV-00000-00&context=1516831) [↑](#footnote-ref-147)
147. 147 Id. [↑](#footnote-ref-148)
148. 148 Id. [↑](#footnote-ref-149)
149. 149 [*Nev. Rev. Stat. Ann. 533.060(2)*](https://advance.lexis.com/api/document?collection=statutes-legislation&id=urn:contentItem:5B62-NHM1-6X0H-00KD-00000-00&context=1516831) (Michie 1995 Repl. Volume). [↑](#footnote-ref-150)
150. 150 [*United States v. Alpine Land & Reservoir* ***Co****., 983 F.2d at 1496.*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4X-J240-003B-P0RV-00000-00&context=1516831) [↑](#footnote-ref-151)
151. 151 The Newlands Project was among the very first projects to be authorized following passage of the 1902 Reclamation Act and was named for Francis Newlands who sponsored the bill in the House of Representatives and, in 1903, became Nevada's senator. Donald J. Pisani, To Reclaim a Divided West: Water, Law, and Public Policy, 1848-1902, at 302 (1992). [↑](#footnote-ref-152)
152. 152 [*16 U.S.C. 661*](https://advance.lexis.com/api/document?collection=statutes-legislation&id=urn:contentItem:8VJ8-TRY2-D6RV-H527-00000-00&context=1516831) (1994). [↑](#footnote-ref-153)
153. 153 The Truckee Canal diversion criteria are presented in [*Pyramid Lake Paiute Tribe of Indians v. Morton, 354 F. Supp. 252, 263 (D.D.C. 1973).*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4V-KJC0-003B-32CR-00000-00&context=1516831) [↑](#footnote-ref-154)
154. 154 43 C.F.R. 418 (1994). For a thorough discussion of Reclamation's thinking at the time the OCAP was finalized, see Franklin E. Dimick, Conserving Water Through Management Changes on the Newlands Project (1988) (paper presented at Environmental and Energy Study Institute Conference on Western Water, Denver, on file with the University of ***Colorado*** Law Review). [↑](#footnote-ref-155)
155. 155 In fact, many of the measures have been implemented but with considerably less savings than expected. U.S. Dep't of Interior, Final Report of the Secretary of the Interior to the Congress of the United States on the Newlands Project Efficiency Study (1993). [↑](#footnote-ref-156)
156. 156 Daniel P. Beard, Bureau of Reclamation, U.S. Dep't of Interior, Blueprint for Reform: The Commissioner's Plan for Reinventing Reclamation (1993). [↑](#footnote-ref-157)
157. 157 U.S. Dep't of Interior, Final Report of the Secretary of the Interior to the Congress of the United States on the Newlands Project Efficiency Study 171-74 (1993). The least-cost alternative is estimated to have a total capital cost of $ 62.5 million. The major savings would come from retiring about 7775 acres of specifically identified irrigated lands. Id. [↑](#footnote-ref-158)
158. 158 Pub. L. No. 101-618, 206(a), ***104 Stat. 3294, 3308-09 (1990).*** [↑](#footnote-ref-159)
159. 159 Fish & Wildlife Serv., U.S. Dep't of Interior, Report on the Truckee-Carson-Pyramid Lake Water Rights Settlement Act (1993). [↑](#footnote-ref-160)
160. 160 Id. at 3-4. [↑](#footnote-ref-161)
161. 161 Lawrence J. MacDonnell & Teresa A. Rice, Moving Agricultural Water to Cities: The Search for Smarter Approaches, 2 Hastings W.-Nw. J. Envtl. L. & Pol'y 27 (1994) [hereinafter Smarter Approaches]. [↑](#footnote-ref-162)
162. 162 For a detailed discussion of water banks, see Lawrence J. MacDonnell, Water Banks: Untangling the Gordian Knot of Western Water, 43 Rocky Mtn. Min. L. Inst. 22-1 (1995) (proposing a water bank for the Newlands Project at pp. 22-42 to 22-49). [↑](#footnote-ref-163)
163. 163 Conversation with Walt Larrick, U.S. Bureau of Reclamation, Yakima Area Office, Aug. 15, 1994. [↑](#footnote-ref-164)
164. 164 Kittitas Reclamation Dist. v. Sunnyside Valley Irrigation Dist., Civil No. 21 (E.D. Wash. Nov. 28, 1980) (supplemental instructions to the watermaster). [↑](#footnote-ref-165)
165. 165 [*Kittitas Reclamation Dist. v. Sunnyside Valley Irrigation Dist., 763 F.2d 1032 (9th Cir. 1985).*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4X-JK00-0039-P4WX-00000-00&context=1516831) [↑](#footnote-ref-166)
166. 166 This operation is described in much greater detail in [*Restoring the West's Waters, supra*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4W-W4S0-003B-G0DY-00000-00&context=1516831) note 15, vol. 1, 2, at 13-7 to 13-8. [↑](#footnote-ref-167)
167. 167 Yakima ***River*** Basin Water Enhancement Project, Pub. L. No. 103-434, ***108 Stat. 4550 (1994).*** [↑](#footnote-ref-168)
168. 168 Id. 1205(a). [↑](#footnote-ref-169)
169. 169 Id. 1206(a), 1208(a). Water filling the increased storage capacity at Cle Elum is not to be regarded as part of the supply available to meet out-of-stream demands but would be used only to benefit the fish. Id. 1205(b). [↑](#footnote-ref-170)
170. 170 Id. 1203(d). [↑](#footnote-ref-171)
171. 171 [*Wash. Rev. Code Ann. 90.38.040*](https://advance.lexis.com/api/document?collection=statutes-legislation&id=urn:contentItem:5BB3-WN41-66P3-214V-00000-00&context=1516831) (West 1992 & Supp. 1995). This program was extended in 1991 to two other basins in the state and, in 1993, statewide. Id. 90.42.010(2). The Washington program is explained at some length in Smarter Approaches, supra note 161, at 41-43. [↑](#footnote-ref-172)
172. 172 Envtl. Defense Fund, Restoring the Yakima ***River***'s Environment: Water Marketing and Instream Flow Enhancement in Washington's Yakima ***River*** Basin (1994). [↑](#footnote-ref-173)
173. 173 1203(j)(4), ***108 Stat. 4550.*** [↑](#footnote-ref-174)
174. 174 See generally [*Restoring the West's Waters, supra*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4W-W4S0-003B-G0DY-00000-00&context=1516831) note 15, vol. 2, ch. 1. [↑](#footnote-ref-175)
175. 175 [*State Dep't of Ecology v. Yakima Reservation Irrigation Dist., 850 P.2d 1306, 1310 (Wash. 1993).*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S3J-VXY0-003F-W2KP-00000-00&context=1516831) [↑](#footnote-ref-176)
176. 176 State Dep't of Ecology v. Acquavella, No. 77-2-01484-5 (Super. Ct. Wash. filed May 12, 1992) (mem.). For a complete list of the court's findings, see [*Restoring the West's Waters, supra*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4W-W4S0-003B-G0DY-00000-00&context=1516831) note 15, vol. 2, at 1-22 to 1-28. [↑](#footnote-ref-177)
177. 177 A good description of the Council's efforts is provided in Yakima Water Users Team Up to Resolve Water Issues, Yields (Farm Credit Services, Spokane, Wash.), Aug. 1995, at 5-7. [↑](#footnote-ref-178)
178. 178 [*43 U.S.C. 1571*](https://advance.lexis.com/api/document?collection=statutes-legislation&id=urn:contentItem:8SDD-0HD2-8T6X-74F4-00000-00&context=1516831)-99 (1988). [↑](#footnote-ref-179)
179. 179 U.S. Dep't of Interior, Progress Report No. 17, Quality of Water ***Colorado*** ***River*** Basin 60-61 (Jan. 1995). [↑](#footnote-ref-180)
180. 180 See, e.g., Gaylord V. Skogerboe, Irrigation Practices and Return Flow Salinity in the Grand Valley (1979). [↑](#footnote-ref-181)
181. 181 Daniel Tyler, The Last Water Hole in the West: The ***Colorado***-Big Thompson Project and the Northern ***Colorado*** Water Conservancy District (1992). [↑](#footnote-ref-182)
182. 182 S. Doc. No. 80, 75th Cong., 1st Sess. 3 (1937). [↑](#footnote-ref-183)
183. 183 Frank Milenski, In Quest of Water: A History of the Southeastern ***Colorado*** Water Conservancy District and the Fryingpan-Arkansas Project (1993). [↑](#footnote-ref-184)
184. 184 During construction of the Grand Valley Project, Reclamation entered into an agreement with OMID to include its lands within the project service area even though they were located on bench lands on the opposite side of the ***Colorado*** ***River***. Consequently, OMID's diversion rights are taken out of the ***river*** at Reclamation's Roller Dam, carried three miles in the main canal, siphoned under the ***river*** to another canal, and moved 3.5 miles to a hydraulic pumping plant where a portion is lifted up by two pipes - one 41 feet long and one 130 feet long, to two canals on Orchard Mesa. Project Data, supra note 18, at 518-19. [↑](#footnote-ref-185)
185. 185 A good explanation of the history and operation of the check is provided in Flow Protection Plan, supra note 43, at 6-7. [↑](#footnote-ref-186)
186. 186 This history is set out in Lawrence J. MacDonnell, The Endangered Species Act and Water Development within the South Platte Basin 30-39 (1985). [↑](#footnote-ref-187)
187. 187 U.S. Fish & Wildlife Serv., U.S. Dep't. of Interior, Recovery Implementation Program for Endangered Fish Species in the Upper ***Colorado*** ***River*** Basin (1993). [↑](#footnote-ref-188)
188. 188 Id. at 17. [↑](#footnote-ref-189)
189. 189 U.S. Bureau of Reclamation, Study of Alternative Water Supplies for Endangered Fishes in the 15-Mile Reach of the ***Colorado*** ***River*** (1992). [↑](#footnote-ref-190)
190. 190 Id. [↑](#footnote-ref-191)
191. 191 Id. at 77-78. [↑](#footnote-ref-192)
192. 192 See, e.g., Flow Protection Plan, supra note 43. [↑](#footnote-ref-193)
193. 193 This issue is discussed at length in [*Restoring the West's Waters, supra*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4W-W4S0-003B-G0DY-00000-00&context=1516831) note 15, vol. 2, at 5-33 to 5-37. [↑](#footnote-ref-194)
194. 194 See David H. Getches et al., Controlling Water Use: The Unfinished Business of Water Quality Protection (1991). [↑](#footnote-ref-195)
195. 195 The significance of the Endangered Species Act is reflected in its central role in promoting change in the three case examples presented in this article. [↑](#footnote-ref-196)
196. 196 [*Restoring the West's Waters, supra*](https://advance.lexis.com/api/document?collection=cases&id=urn:contentItem:3S4W-W4S0-003B-G0DY-00000-00&context=1516831) note 15, vol. 1, 2, at 5-5. [↑](#footnote-ref-197)
197. 197 Id. at 15-14. [↑](#footnote-ref-198)
198. 198 Id. at 15-9. [↑](#footnote-ref-199)
199. 199 Kenneth Boulding, The Economics of the Coming Spaceship Earth 9 (Henry Jarrett ed., 1966). [↑](#footnote-ref-200)
200. 200 See, e.g., Gregory J. Hobbs, Jr. & Bennett W. Raley, Water Rights Protection in Water Quality Law, 60 U. ***Colo.*** L. Rev. 841, 883-87 (1989). [↑](#footnote-ref-201)
201. 201 National Research Council, A New Era for Irrigation (1996) [hereinafter New Era]. [↑](#footnote-ref-202)
202. 202 Richard W. Wahl, Markets for Federal Water: Subsidies, Property Rights, and the Bureau of Reclamation 33-39 (1989). [↑](#footnote-ref-203)
203. 203 For a more complete discussion, see Smarter Approaches, supra 161, at 41-44, 52. [↑](#footnote-ref-204)
204. 204 Specific recommendations are set out in Facilitating Reclamation Transfers I, supra note 87, at 54-58. [↑](#footnote-ref-205)
205. 205 See, e.g., Lawrence J. MacDonnell, Water Banks: Untangling the Gordian Knot of Western Water, 41 Rocky Mt. Min. L. Inst. 22-1 (1995). [↑](#footnote-ref-206)
206. 206 For example, improvements in fisheries might be viewed as a benefit if the irrigator is also a fisherman. Water-quality improvements (such as reduced salinity or other contaminants) might be demonstrated to provide some incremental benefits to an irrigator. [↑](#footnote-ref-207)
207. 207 [*33 U.S.C.A. 1342*](https://advance.lexis.com/api/document?collection=statutes-legislation&id=urn:contentItem:8TXW-33X2-D6RV-H4D3-00000-00&context=1516831)(l) (Supp. 1994). [↑](#footnote-ref-208)
208. 208 For a discussion of the tension between irrigation as a business and as a culture, see New Era, supra note 201. [↑](#footnote-ref-209)
209. 209 The experience of the Broadview Water District in the Central Valley of California illustrates the kinds of gains that can be made through active programs of water-use efficiency. See, e.g., Dennis Wichelns & David Cone, Water Agency Programs Improve Water Management, in 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 315-26 (1993). [↑](#footnote-ref-210)
210. 210 A good example is provided by transactions in recent years involving Metropolitan Water District of Southern California and irrigation districts in which Metropolitan Water District has provided substantial sums of money to obtain use of saved water (in the case of the Imperial Irrigation District) and water obtained from temporary fallowing of irrigated lands (Palo Verde Irrigation District). Smarter Approaches, supra note 161 at 49-52. [↑](#footnote-ref-211)