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# COMPETING DEMANDS FOR THE COLORADO RIVER

DAVID H. GETCHES\*

The Colorado River traverses and collects the water of a vast, arid region. It drains snowmelt from the western slope of the Rockies in Colorado and Wyoming, from the Uintas of Utah, from the San Juans in Colorado and New Mexico, as well as runoff from flashfloods across the Arizona deserts. The River and its major tributaries—the Green, the Yampa, the White, the Gunnison, the San Juan, the Little Colorado, and the Gila—thread country of breathtaking beauty, from glaciers to sand dunes, city streets to wilderness, timber to sagebrush, and the highest mountain range to the deepest canyon. In its 1,400-mile journey from the Continental Divide to the Gulf of California the Colorado drops almost 14,000 vertical feet. The River is the drainage for about one-twelfth of the continental United States but has a virgin flow about equal to the Delaware River with its relatively tiny watershed.<sup>1</sup>

The area served by the Colorado is even larger than the area that contributes to its flows. The River's water is moved far from its watershed to irrigate farm land and quench thirsts in parts of all seven states it touches. Water is carried across the Continental Divide to the Denver metropolitan area, in canals to the population centers of Arizona, and by pipeline to San Diego, Los Angeles, and their suburbs. Once barren deserts have been converted into a cornucopia of year-around cash crops. Throughout the West, industries are animated and homes are lighted, heated, and cooled by energy generated by the River's force. The River and the mountains and valleys where it originates are playgrounds for people from all over the country and the world. The finite and annually fluctuating resources of the Colorado are shared by family-owned ranches, by corporate-owned farm operations, by ski areas, and by mountain towns within its watershed, as well as by homes

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1. *Arizona v. California*, 373 U.S. 546, 552 (1963). The Colorado River drains 247,600 square miles; the Delaware River drains 17,500 square miles. U.S. Water Resources Council, *The Nation's Water Resources* 6-1-4, 6-13-4, 6-14-4 (1968).

and industries in sprawling cities far from the River's natural reach or origins. A natural treasure to some, a capital asset to others, it sustains diverse and sometimes competing uses such as fishing and golf courses, cattle ranching and car washes, kayaking and power plants.

The history of the Colorado is a history of conflict. Competing users vie for the River's water, insisting that they have the highest right by virtue of equity, location, natural right, or economics—whatever best serves their interests. Arizona's attempts to prevent California from monopolizing the River led to a long and bitter feud. The slower developing Upper Basin states have fought to reserve a share of the River for their future. Mexico insisted it deserved to have some water left in the stream to serve farms south of the border. Once Mexico got American agreement on its entitlement to a quantity of water, it demanded that the water be of a quality good enough for irrigation, touching off further conflict. For many years Basin states competed with one another for federal funds for water development, only later finding it more fruitful to cooperate.

The most serious conflicts among sovereigns over the Colorado River have been legally resolved. The River's bounty is now allocated among states and between the United States and Mexico by a set of compacts, statutes and court decisions known as the Law of the River.<sup>2</sup> The Law of the River has moderated conflict and imposed order on chaos. Although interpretive issues may be unavoidable as the mountain states claim their full share of the River and while potentially huge legal rights of Indian tribes to Colorado River water remain uncertain, legal controversies among governments will not be the basis of future tensions over the Colorado.

I believe that conflicts over the Colorado River in the future will focus on which users and what uses will prevail over others, consistent with the established Law of the River. The competitors include agriculture, municipalities, recreationists, power customers, naturalists and Indians. Together they seek more productivity for more people with virtually no deterioration—perhaps even improvement—in the aesthetic and ecological values of the River. Achieving these ends demands interstate cooperation and economically beneficial arrangements among public and private entities with interests in the River. Although innovative and flexible applications of the law and some alteration of state laws will be needed, competing demands can be met without major changes in the Law of the River. The challenge to those whose decisions shape the River's future is how to achieve opti-

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2. The leading authority on the law of the Colorado River is Meyers, *The Colorado River*, 19 STAN. L. REV. 1 (1966).

num benefits from an established allocation system for a society whose needs and values are changing.

The article is in three Sections. The first discusses the historic apportionment of the Colorado River between the Upper and Lower Basins and, ultimately, among the seven Basin states and Mexico. It also addresses possible future legal questions about the interpretation of laws apportioning the River's water. The second Section identifies the most significant uses competing for shares of the water. Agriculture, power production, municipal use, Indians, and instream needs for fish, wildlife and recreation all are competitors for use of the Colorado River. The Section analyzes the nature of future conflicts among those uses and the potential for accommodating some apparently inconsistent purposes. The final Section considers several approaches to maximizing the River's capacity to satisfy future demands. The approaches include storage, efficiency measures, controlling salinity, comprehensive consideration of all available water sources and interstate water marketing. The Section describes some ways in which the approaches may be used to resolve competing demands in the future.

## I. APPORTIONMENT OF THE RIVER

The right to use Colorado River water has been legally apportioned among the seven states through which the River passes by two interstate compacts, congressional legislation, and interpretive Supreme Court decisions. Although a few legal issues persist that could erupt into litigation over aspects of the allocation scheme, it is reasonable to expect the states to avoid major legal disputes in favor of practical, negotiated solutions.

### *A. Interstate Allocations*

In the early years of the twentieth century, Southern California's growing need for federal assistance in building delivery facilities for Colorado River water came into conflict with the desire of states in the Upper Basin to secure the right to develop River water for future needs. Rich farms in California's Imperial Valley were irrigated with water brought from the River by a canal through Mexico. The Imperial Irrigation District sought the security of an "all-American" canal that would not leave the Valley's farmers at the mercy of Mexico. The federal government began investigating the possibilities. At the same time, rapidly expanding Los Angeles was feeling the need for new sources of electric power and anticipating new water needs. Leaders in the Upper Basin states, especially Colorado, objected. They knew that they would eventually need to develop Colorado River water to

meet the needs of growing areas like Denver. They feared that if California were allowed to develop the River's water first, it would perfect a better legal claim. Their fears were justified by contemporary jurisprudence.

In 1922 it was reasonable to assume that the United States Supreme Court would recognize greater legal rights in a state that developed water first than in a state developing later. The Court allocates waters of interstate streams by the principle of "equitable apportionment."<sup>3</sup> The Court applied the doctrine of prior appropriation in a 1922 equitable apportionment between Colorado and Wyoming, both of which use prior appropriation to allocate water within the states.<sup>4</sup> Interstate apportionment of the Colorado River under that approach could have resulted in the Upper Basin states getting very little water.

The 1922 Colorado River Compact<sup>5</sup> was intended to strike an accommodation between the expanding demands of the Lower Basin and the desire to preserve adequate water for future use in the less developed Upper Basin, the source of virtually all the River's water. Compacts had been used to settle or avoid conflicts between states on other issues since the signing of the Constitution, but the Colorado River Compact was the first compact negotiated to resolve claims to an interstate stream.<sup>6</sup> The Compact enabled construction of storage facilities to protect the Lower Basin from floods and allowed the Lower Basin to use water needed for a growing population. The Up-

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3. *Kansas v. Colorado*, 206 U.S. 46 (1907).

4. *Wyoming v. Colorado*, 259 U.S. 419 (1922). Later the Court modified its approach to require consideration of a variety of factors. See *Nebraska v. Wyoming*, 325 U.S. 589 (1945):

Apportionment calls for the exercise of an informed judgment on a consideration of many factors. Priority of appropriation is the guiding principle. But physical and climatic conditions, the consumptive use of water in the several sections of the river, the character and rate of return flows, the extent of established uses, the availability of storage water, the practical effect of wasteful uses on downstream [junior] areas, the damage to upstream areas as compared to the benefits to downstream areas if a limitation is imposed on the former—these are all relevant factors. They are merely an illustrative, not an exhaustive catalogue. They indicate the nature of the problem of apportionment and the delicate adjustment of interests which must be made.

325 U.S. at 618.

5. Congress authorized compact negotiation by the Act of Aug. 19, 1921, ch. 72, 42 Stat. 171. The Compact was approved by Congress in § 13(a) of the Boulder Canyon Project Act of 1928, ch. 42, 43 U.S.C. § 617(l) (1982). It was proclaimed by President Hoover on June 25, 1929, 46 Stat. 3000. See Wilbur & Ely, *The Hoover Dam Documents*, H.R. Doc. No. 717, 80th Cong., 2d Sess. (Washington, D.C.: Government Printing Office, 1948), p. 22. The Constitution provides that "No State shall, without the Consent of Congress . . . enter into any Agreement or Compact with another State . . . ." U.S. CONST. art. I, § 10, cl. 3. A similar clause was included in Article VI of the Articles of Confederation.

6. See J. MUYS, *INTERSTATE WATER COMPACTS: THE INTERSTATE COMPACT AND FEDERAL-INTERSTATE COMPACT*, National Water Commission Legal Study No. 14 (1971).

per Basin states relied on the Compact to prevent River water from being monopolized by California and Arizona through the establishment of legal priorities.

Under the Compact the waters of the Colorado River were apportioned on an essentially equal basis between the Upper Basin states—Colorado, Utah, Wyoming, and New Mexico—and the Lower Basin states—Arizona, California and Nevada. The Compact guaranteed the Lower Basin states a flow of 75,000,000 acre-feet over a progressive series of ten-year periods.<sup>7</sup> The drafters intended that Article III(a) would give each Basin, Upper and Lower, an average of 7,500,000 acre-feet a year. In addition, under Article III(b) the Lower Basin may consume another 1,000,000 acre-feet in years when flows permit. Article III(e) allows the faster developing Lower Basin to use

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7. Article III of the Compact states:

(a) There is hereby apportioned from the Colorado River System in perpetuity to the Upper Basin and to the Lower Basin respectively the exclusive beneficial consumptive use of 7,500,000 acre feet of water per annum, which shall include all water necessary for the supply of any rights which may now exist.

(b) In addition to the apportionment in paragraph (a) the Lower Basin is hereby given the right to increase its beneficial consumptive use of such waters by one million acre per annum.

(c) If, as a matter of international comity, the United States of America shall hereafter recognize in the United States or Mexico any right to the use of any waters of the Colorado River System, such waters shall be supplied first from the waters which are surplus over and above the aggregate of the quantities specified in paragraphs (a) and (b); and if such surplus shall prove insufficient for this purpose, then, the burden of such deficiency shall be equally borne by the Upper Basin and the Lower Basin, and whenever necessary the States of the Upper Division shall deliver at Lee Ferry water to supply one-half of the deficiency so recognized in addition to that provided in paragraph (d).

(d) The States of the Upper Division will not cause the flow of the river at Lee Ferry to be depleted below an aggregate of 75,000,000 acre feet for any period of ten consecutive years reckoned in continuing progressive series beginning with the first day of October next succeeding the ratification of this compact.

(e) The States of the Upper Division shall not withhold water, and the States of the Lower Division shall not require the delivery of water, which cannot reasonably be applied to domestic and agricultural uses.

(f) Further equitable apportionment of the beneficial uses of the waters of the Colorado River System unapportioned by paragraphs (a), (b) and (c) may be made in the manner provided in paragraph (g) at any time after October 1, 1963, if and when either basin shall have reached its total beneficial consumptive use as set out in paragraphs (a) and (b).

(g) In the event of a desire for a further apportionment as provided in paragraph (f) any two signatory States, acting through their Governors, may give joint notice of such desire to the Governors of the other signatory States and to the President of the United States of America, and it shall be the duty of the Governor of the signatory states and of the President of the United States of America forthwith to appoint representatives, whose duty it shall be to divide and apportion equitably between the Upper Basin and Lower Basin the beneficial use of the unapportioned water of the Colorado River System as mentioned in paragraph (f), subject to the Legislative ratification of the signatory States and the Congress of the United States of America.

any water the Upper Basin cannot use. Further, under Article III(c), the two basins are to share equally any burden that might be imposed to deliver water to Mexico, an obligation later set at 1,500,000 acre-feet annually.<sup>8</sup>

The water apportioned to the two basins was later allocated to individual states. In 1949, the Upper Colorado River Basin Compact gave each Upper Basin state a percentage share of that Basin's apportionment.<sup>9</sup> California, Arizona, and Nevada, however, were unable to agree on how to divide the Lower Basin share. After years of intense dispute and litigation, Congress enacted legislation making federal financing of Hoover Dam contingent on a prescribed Lower Basin allocation formula. Later the Supreme Court found that the Act had effectively apportioned the water.<sup>10</sup>

Water from the Colorado was not divided among the seven Basin states based on the amount of water each contributes to the River's flow. Indeed, state portions bear no relation to state contributions.

#### STATE CONTRIBUTIONS TO RIVER FLOW AND APPORTIONMENTS OF RIVER WATER (PERCENTAGES)

	Contribution to Flow <sup>11</sup>	Apportionment of Water <sup>12</sup>
Arizona	1	20.7
California		30.6
Colorado	71	24.3
Nevada		2.1
New Mexico	1	5.5
Utah	15	10.8
Wyoming	11	6.6

8. The obligation to Mexico was quantified in the Treaty with Mexico, T.S. No. 994, 59 Stat. 1219 (1944).

9. Upper Colorado River Basin Compact, ch. 48, 63 Stat. 31, 33 (1949). The states received the following shares: Colorado, 51.75%; Utah, 23%; Wyoming, 14%; New Mexico, 11.25%; Arizona, 50,000 acre-feet.

10. *Arizona v. California*, 373 U.S. 546 (1963). The Court held that allocation of the Lower Basin share is governed by the Boulder Canyon Project Act, 43 U.S.C. §§ 617-617f (1982). The Act gives Arizona 2.8 million acre-feet, California 4.4 million acre-feet, and Nevada 300,000 acre-feet of the first 7.5 million acre-feet. Deliveries in excess of such amounts are apportioned 46 percent to Arizona, 50 percent to California and 4 percent to Nevada.

11. Portion of the total flow at Lee Ferry added from runoff occurring within the state, based on historical information in UPPER COLORADO RIVER BASIN COMPACT COMMISSION, RECORD, vol. 2, Meeting No. 7, 19 (1948). Figures assume no significant runoff is added to the River below Lee Ferry.

12. Calculations assume a total flow that would allow 16 million acre-feet to be divided between the two basins. State shares are determined using allocations found in the Colorado River Compact, U.S. DEPT. OF INTERIOR, I FEDERAL RECLAMATION AND RELATED LAWS ANNOTATED 441-445 (1972), and the Upper Colorado River Basin Compact, ch. 48, 63 Stat. 31 (1949), the Boulder Canyon



The allocation scheme in the 1922 Compact was to give the two basins equitable shares of available water. It is now apparent that the apportionment was made on the incorrect assumption that there would be an average annual flow of at least 16,000,000 acre-feet.<sup>13</sup> Data spanning three centuries, however, reveal an average annual flow of only about 13,500,000 acre-feet.<sup>14</sup> Furthermore, annual flows have been erratic, ranging from 4,400,000 acre-feet to over 22,000,000 acre-feet.<sup>15</sup> The erroneous assumption about average flows resulted in the Lower Basin's being guaranteed substantial minimum deliveries by the Upper Basin, leaving far less water available for Upper Basin use than the negotiators apparently expected.

The Compact contemplates storage facilities to smooth out fluctuating flows and to allow for the average annual usage described in Articles III(a) and III(b). Adequate storage exists on the River to protect Lower Basin Compact entitlements except in the most severe and prolonged drought. Lake Mead, behind Hoover Dam, can hold 27,400,000 acre-feet. Lake Powell has a capacity of 25,000,000 acre-feet. Together, all reservoirs in the Colorado River system have a storage capacity of 62,489,200 acre-feet.<sup>16</sup> With sixty percent of this storage effectively inaccessible to Upper Basin users, however, the burdens of cyclical water shortages fall largely on the Upper Basin. These inherent burdens, as well as practical limits on Upper Basin storage, should inform Compact interpretation. For instance, Article III(e) says that the Upper Basin may not withhold water from Lower Basin

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Project Act of 1928, 43 U.S.C. §§ 617-617t (1982), and *Arizona v. California*, 373 U.S. 546 (1963). For the percentages and amounts, see *supra* notes 9 and 10.

13. Articles III(a) and (b) of the Compact contemplated annual use of up to 16 million acre-feet. That a surplus was contemplated is shown by Article III(c) which allowed for further allocation of river water for Mexico and Articles III(f) and III(g) which provide for later equitable apportionment by further compact of water not otherwise allocated by the Compact. Furthermore, Article I makes it clear that the Compact signatories thought they were only making "an apportionment of the use of *part* of the water of the Colorado River System . . ." (emphasis added) COLO. REV. STAT. § 37-61-101 (1973).

There is some evidence that the negotiators thought the river could supply as much as 21 million acre-feet per year. See S. RIFKIND, REPORT OF THE SPECIAL MASTER, *ARIZONA V. CALIFORNIA* (U.S. 1960) (approved in part, *Arizona v. California*, 373 U.S. 546 (1963)), at 17 n.56. In fact, the progressive ten-year running average peaked about the time the Compact was signed. From 1933 to 1983 there was only one year (1950) in which the ten-year progressive running average flow at Lee Ferry reached 15 million acre-feet. It rose to 15.8 million acre-feet in 1984. Average annual virgin flow for the period since the Compact, 1922 to 1982, has been 14.2 million acre-feet, and since 1930 it has been only 13.8 million acre-feet. UPPER COLORADO RIVER COMMISSION, THIRTY-SIXTH ANNUAL REPORT 21-27 Salt Lake City, Utah, 1984.

14. Weatherford & Jacoby, *Impact of Energy Development on the Law of the Colorado River*, 13 NAT. RESOURCES J. 171, 183-85 (1975). The authors explain a study of tree ring widths and reconstructed virgin flow data to develop estimates going back to 1570.

15. S. RIFKIND, *supra* note 13, at 18.

16. UPPER COLORADO RIVER COMMISSION, *supra* note 13, at 10-11.

uses unless it can "reasonably be applied to domestic and agricultural uses." But the provision should not be read to preclude storage of water to meet future compact delivery requirements under Article III(d) or for reasonably foreseeable Upper Basin needs.

Some scientists predict that climatic changes could alter historic precipitation patterns, and reduce available water supplies. Carbon dioxide loading of the atmosphere caused by fossil-fuel combustion, mostly in coal-burning power plants, threatens a significant climate change. The amount of CO<sub>2</sub> in the atmosphere is increasing rapidly. These concentrations could double in the next sixty-five years causing what is commonly known as the "greenhouse effect."<sup>17</sup> A National Academy of Sciences report estimates that the resulting temperature increase and reduction in precipitation could diminish water supplies by almost forty percent in the Upper Colorado River region.<sup>18</sup> Intensified droughts would exacerbate water problems of the Basin states, especially in the Upper Basin.

The ultimate problem for the Upper Basin is how to build a future on the right to leftovers. The issue has not yet been presented sharply, however, because Upper Basin uses have not approached the legal or natural limits on water supplies.<sup>19</sup> But the Lower Basin states have present uses for a larger share of water than their Compact entitlements. Although the Compact was to allow each basin to develop at its own pace, with a share of water guaranteed when development occurs,<sup>20</sup> some Upper Basin interests fear that the Lower Basin's "temporary" reliance on this water could ripen into necessity and ultimately into recognized rights. Such a result would abrogate the Compact under precisely the circumstances the drafters intended to address—later development of the Upper Basin apportionment, after temporary Lower Basin use. Although the Compact should provide solid legal protection for its future uses, the Upper Basin remains concerned with losing some of its apportionment from adverse Compact interpretations that may be influenced by a growing Lower Basin dependence on the lion's share of the River's water.

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17. COUNCIL ON ENVIRONMENTAL QUALITY AND U.S. DEPARTMENT OF STATE, GLOBAL FUTURE TIME TO ACT: REPORT TO THE PRESIDENT ON GLOBAL RESOURCES, ENVIRONMENT AND POPULATION 137-38 (1981).

18. Revelle & Waggoner, *Effects of a Carbon Dioxide-Induced Climatic Change on Water Supplies in the Western United States*, in CHANGING CLIMATE, REPORT OF THE CARBON DIOXIDE ASSESSMENT COMMITTEE 423 (1983).

19. Total consumptive water use from the Colorado River in the Upper Basin was 3.5 million acre-feet in 1980. UNITED STATES DEPARTMENT OF THE INTERIOR, QUALITY OF WATER, COLORADO RIVER BASIN, PROGRESS REPORT NO. 11, at 10 (1983).

20. See *Arizona v. California*, 373 U.S. 546, 555-59 (1963).

### B. Compact Interpretation

Several issues of Compact construction are unresolved.<sup>21</sup> Some have to do with the nature of the Upper Basin's obligation to participate in fulfilling the United States' obligation to deliver water to Mexico. Another issue, the interpretation of "beneficial consumptive use" in the Compact, bears on how much water can be consumed in the Upper Basin. An historic unanswered question is whether the flow of the Gila River, which is consumed exclusively in Arizona, should be counted against the Lower Basin's apportionment. If so, it could have a dramatic effect on allocation of water. Finally, the Upper Basin states could argue that the Colorado River Compact should be reformed based on a mutual mistake of fact—the assumption that much more water annually flows in the Colorado than historical records can justify.

#### 1. Mexican Treaty Issues

The Mexican Treaty and the related Compact provision lack clarity, leaving them open to a variety of constructions. In 1944, the United States entered into a treaty promising to deliver 1,500,000 acre-feet to Mexico annually.<sup>22</sup> The drafters of the Colorado River Compact anticipated that possibility, and said in Article III(c) that if any Mexican rights could not be adequately supplied from "surplus," the Upper and Lower Basins would be obliged to share the burdens equally. How the words of the two documents are parsed and applied affects the amount of water the Upper Basin ultimately may use.

It is not clear what the Compact means by "surplus." The provision arguably requires the Upper Basin to make annual deliveries to Mexico of one-half the total American obligation, or 750,000 acre-feet, but the language states a more limited obligation. Article III(c) says that the first source for supplying Mexico is water which is "surplus over and above the aggregate of the quantities specified in paragraphs (a) and (b)" (i.e., 16,000,000 acre-feet a year). To the extent there is inadequate "surplus" water, "the burden of such deficiency shall be borne equally by the Upper Basin and the Lower Basin." When no water above 16,000,000 acre-feet is available in a particular year, the two basins must meet the shortfall equally from their Compact apportionments regardless of how much water each is actually using that year. This indicates that the Upper Basin need not reduce its present

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21. Several of the interpretive problems regarding interbasin obligations and rights are discussed elsewhere. See Meyers, *supra* note 2, at 12-26; MEYERS, *Conflicts Between the Upper and Lower Basins on the Colorado River*, in RESOURCES DEVELOPMENT: FRONTIERS FOR RESEARCH 113 (1960).

22. See Treaty, *supra* note 8.

uses or even refrain from storage for reasonable domestic and agricultural uses until they total 7,500,000 acre-feet a year. Because the Upper Basin is unlikely to need 7,500,000 acre-feet for its own immediate use in most years, the shared obligation for Mexican deliveries may require the Lower Basin to curtail present uses while the Upper Basin curtails only storage. The Lower Basin is protected by Article III(e), which prohibits the Upper Basin from withholding water which it cannot reasonably apply to domestic and agricultural uses. This provision should allow the Upper Basin to store water out of its 7,500,000 acre-foot share to protect its reasonable domestic and agricultural uses against fluctuations in supplies, but not to hoard huge amounts of water while the Lower Basin curbs present uses. In practice, the Lower Basin could replace the water it delivers to Mexico under Article III(c) at the expense of present uses, with water demanded from the Upper Basin under Article III(e), thus reducing the significance of the issue.

A second question is whether the Mexican Treaty obligation requires annual deliveries from the Upper Basin. The Compact requires an aggregate ten-year flow at Lee Ferry, the dividing point between Upper and Lower Basins, located near the Utah-Arizona border. But the Treaty promises Mexico an annual delivery. In years when more than 7,500,000 acre-feet are delivered at Lee Ferry, the Upper Basin gets credit toward its ten-year, 75,000,000 acre-feet delivery requirement. But does the Upper Basin get credit against its duty to contribute to the Mexican Treaty obligation? A practical solution would be to allow the Upper Basin credit toward future Mexican obligations for excess deliveries at Lee Ferry if the water could physically be stored in the Lower Basin or was actually consumed by the Lower Basin (rather than simply being released by the Upper Basin because of inadequate storage space or to generate power). Water over and above 7,500,000 acre-feet a year delivered to the Lower Basin which can neither be used nor stored (because storage space is unavailable) should not be credited against future Upper Basin obligations to Mexico. The United States gets no credit from Mexico for overdeliveries and neither should the Upper Basin unless the Lower Basin can benefit from it.

A third Mexican Treaty issue is where the Upper Basin must deliver the share of water it owes to Mexico. The Upper Basin says that it is sufficient for it to deliver 750,000 acre-feet (the Upper Basin's one-half share of 1,500,000 acre-feet promised in the Treaty) at Lee Ferry. The Lower Basin states argue that enough water must be delivered by the Upper Basin at Lee Ferry to make an effective delivery of 750,000

acre-feet at the Mexican border. Because there are significant channel losses and evaporation between Lee Ferry and the Mexican border, the difference is great. The Upper Basin can argue persuasively that no water must be delivered at Lee Ferry to compensate for transit losses because availability of the 750,000 acre-feet from Lee Ferry to the Mexican border benefits the Lower Basin by giving it opportunities for reuse and greater hydroelectric power generating capacity. This argument is less apt if the Upper Basin has voluntarily released excess water in a prior year that is stored in the Lower Basin and for which the Upper Basin has received credit against future Mexican Treaty delivery requirements. Under those circumstances, the Upper Basin indirectly benefits from the storage in the Lower Basin and perhaps should deliver additional water to compensate for storage losses due to evaporation and other causes.

## 2. The Meaning of "Beneficial Consumptive Use"

The Compact apportions the "beneficial consumptive use" of amounts of water specified in Article III(a) and (b) but the term is not defined. If the states can salvage and use water naturally lost to the stream without it counting against their apportionments, greater use can be made of the same water. One view is that the phrase means net depletions—the amount by which the natural flow is depleted by human activity. Another is that "beneficial consumptive use" should be the sum of all diversions less any returns to the stream. The latter method counts as beneficially consumed all water that is naturally lost to the system, such as seepage to groundwater, evaporation, and evapotranspiration. The former method, net depletion, would charge the user only for losses that would not have occurred in nature. For instance, if an Upper Basin state diverted 1,000,000 acre-feet and consumed it all, the diversions less return flow formula would charge 1,000,000 acre-feet against the state's Compact entitlement. The net depletion method would charge the state with using only the portion that was not consumed or lost in a state of nature. Thus, if it could be shown that thirty percent of water in the River at the place of diversion historically was consumed by evaporation, evapotranspiration and other natural causes before it reached Lee Ferry, only seventy percent, or 700,000 acre-feet of the 1,000,000 acre-feet consumed would be counted against the state's Compact apportionment.

The Lower Basin states may argue that "diversions less return flows" should be used to measure beneficial consumptive use, fearing that the net depletion approach would result in less water being avail-

able after Upper Basin uses. In *Arizona v. California*,<sup>23</sup> the United States Supreme Court construed consumptive use in the Boulder Canyon Project Act<sup>24</sup> to mean "diversions less returns to the river" in allocating the Lower Basin apportionment among the states.<sup>25</sup> The Court, however, has never interpreted beneficial consumptive use within the meaning of the 1922 Compact apportioning waters between the two basins.

The Upper Basin states can get more benefit from their apportionment if the net depletion formula is used. Water saved by avoiding or eliminating natural causes of losses can be beneficially used without being "consumed," i.e., without diminishing virgin flow. The Upper Basin must be able to maximize use of its apportionment because the Compact requires it to shoulder the burdens of fluctuating natural supplies. The Lower Basin is adequately protected by its entitlement to a certain ten-year aggregate of water deliveries.

The argument that the net depletion formula should apply in the Upper Basin is bolstered by the fact that the Upper Basin Compact divides the Upper Basin's apportionment among Upper Basin states by effectively applying a net depletion formula. Calculation of state shares is by the "inflow-outflow method" which is based on man-made depletions of virgin flow (i.e., not natural losses) at Lee Ferry.<sup>26</sup>

### 3. The Gila River

A lingering issue is whether waters apportioned by the Compact include all tributaries. The Gila River joins the mainstem of the Colorado River in Arizona near the Mexican border. It produces more than 2,000,000 acre-feet of water a year, much of which flows beneath its bed and is extracted by wells. Almost all of its flow is now consumed in Arizona; virtually none reaches the mainstem.<sup>27</sup> If the flow of the Gila were considered in satisfaction of apportionments to the Lower Basin and to Arizona, it could greatly affect rights and obligations among the states. It would not alter the Upper Basin's 1922 Compact obligation to deliver 75,000,000 acre-feet at Lee Ferry each ten years; but use of water from the Gila could be counted against the Lower Basin's allowable annual beneficial consumptive use, and its flows could be considered available to meet the treaty obligation to

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23. 373 U.S. 546 (1963).

24. 43 U.S.C. § 617c(a) (1982).

25. 373 U.S. at 557 n.23. The Court approved the Report of the Special Master which referred to the formula in describing the Compact. Meyers, *supra* note 2, at 19.

26. Upper Colorado River Basin Compact, ch. 48, 63 Stat. 31 (1949).

27. N. HUNDLEY, *WATER AND THE WEST: THE COLORADO RIVER COMPACT AND THE POLITICS OF WATER IN THE AMERICAN WEST* (1975).

Mexico. The 1,000,000 acre-feet allocated to the Lower Basin by Article III(b) of the Compact (in addition to the 7,500,000 in Article III(a)) is not subject to delivery at Lee Ferry and thus should be satisfied by the Gila's flows used in Arizona.

The status of the Gila under the Compact has never been determined. One of Arizona's reasons for its steadfast refusal to ratify the Colorado River Compact was uncertainty over its rights to water from the Gila.<sup>28</sup> The Colorado River System is defined in Article II(a) as "the portion of the Colorado River and its tributaries within the United States of America." Article I of the Compact says that the purpose of the Compact was "to provide for the equitable division and apportionment of the use of the Colorado River System," indicating that the Gila's waters should be included in the apportionment. However, in *Arizona v. California*, California contended unsuccessfully that the water of the Gila should be counted against Arizona's apportionment under the Boulder Canyon Project Act.<sup>29</sup> California sought to benefit from greater "surpluses" which it splits equally with Arizona under the Act. The United States Supreme Court held that the Act allocated mainstem water, not the Gila.<sup>30</sup> The case dealt only with an allocation among Lower Basin states under the Act, and consequently whether the Gila is apportioned under the Colorado River Compact remains an open question.

#### 4. Mutual Mistake

The Upper Basin could assert that its Compact obligation should be avoided or reformed because of a mutual mistake of fact. The apportionment in the Compact was based on an assumed average annual runoff skewed by a few extraordinarily wet years just before 1922.<sup>31</sup> The magnitude of potential effects of the mistake on the Upper Basin is great. Reformation of the Compact under contract law principles<sup>32</sup> to reflect accurate runoff statistics and follow the Compact negotiators' approach of dividing the right to use water essentially equally,

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28. *Id.* at 238-42; Meyers, *supra* note 2, at 41.

29. 43 U.S.C. §§ 617-617f (1982).

30. 373 U.S. at 568.

31. *See supra* notes 13-14 and accompanying text.

32. *See* RESTATEMENT (SECOND) OF CONTRACTS § 152. "Interstate compacts are not only statutes; they are also contracts. This means that the substantive law of contracts is applicable to them." F. ZIMMERMAN & M. WENDELL, *THE LAW AND USE OF INTERSTATE COMPACTS* 2 (1961). *See also* *West Virginia ex rel. Dyer v. Sims*, 341 U.S. 22 (1951), and *Green v. Biddle*, 21 U.S. (8 Wheat.) 1 (1823), where the Supreme Court considered interstate compacts to be "contracts" within the meaning of the Art. I, § 10, cl. 1 prohibition on laws impairing the obligation of contract. *See also* Frankfurter and Landis, *The Compact Clause of the Constitution - A Study in Interstate Adjustments*, 34 *YALE L.J.* 685 (1925).

could reduce the Upper Basin obligation to the Lower Basin by more than 1,000,000 acre-feet a year.

Although each of the legal questions discussed above, and others,<sup>33</sup> bears on the allocation of Colorado River water between the Upper and Lower Basins, neither the Supreme Court nor Congress is likely to upset existing uses and expectations. While Congress could take unilateral action to revise or interpret the Compact<sup>34</sup> the prospects are slight absent demonstrable injustice.<sup>35</sup> The United States Supreme Court could also address whether the Compact departed from the principle of equitable apportionment,<sup>36</sup> but it has already accepted the allocations in the Compact as the backdrop for *Arizona v. California*.<sup>37</sup> Ideally, problems concerning the allocation and management of River resources should be resolved by the mutual agreement of the states. Matters going beyond interpretation of existing law, of course, would require new compacts and the consent of Congress. The affected states can determine better than Congress or the Court how to get the most use and benefits from the Colorado River. It is not in their interest to leave matters of such great importance to the

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33. For example, it is unclear whether the 1922 Compact, or the Upper Colorado River Basin Compact of 1948, apportioned the White River in Colorado.

34. Congress does not surrender or limit its sovereign power by consenting to an interstate compact. *Pennsylvania v. Wheeling & Belmont Bridge*, 59 U.S. (18 How.) 421, 433 (1856). Congress never has modified an "equitable apportionment" made by compact but it has departed from compact language to assert federal interests. The Colorado River Compact states in article IV that the river is no longer navigable and that other uses are to take priority over navigation. Congress later asserted its navigation power in connection with the Boulder Canyon Project Act in *Arizona v. California*, 283 U.S. 423 (1931).

The commerce clause furnishes ample power for Congress to modify a compact. See Frankfurter & Landis, *supra* note 34, at 684, 685. See also Comment, *Congressional Supervision of Interstate Compacts*, 75 YALE L.J. 1416 (1966).

Congressional power to legislate to solve interstate water problems was recognized in *Arizona v. California*, 373 U.S. 546 (1963), and *Sporhase v. Nebraska ex rel. Douglas*, 458 U.S. 941 (1982).

35. The Court has regularly declined to exercise its original jurisdiction in the absence of present or imminent harm. *Arizona v. California*, 283 U.S. 423 (1931); *Kansas v. Colorado*, 206 U.S. 46 (1907).

36. Interstate water compacts are to effectuate the equitable apportionment doctrine, and the Supreme Court has jurisdiction to determine their validity. See *Hinderlider v. La Plata and Cherry Creek Ditch Co.*, 304 U.S. 92, 101-02 (1938).

The Court's original jurisdiction over interstate disputes, U.S. CONST. art. III, § 2, cl. 2, could be invoked to determine whether the Colorado River Compact should be enforced to produce an inequitable result when its assumed "equity" was based on a mutual mistake. See also *Cuyler v. Adams*, 449 U.S. 433 (1981); Comment, *Federal Question Jurisdiction to Interpret Interstate Compacts*, 64 GEO. L.J. 87 (1975). *Contra*, Engdahl, *Characterization of Interstate Agreements: When is a Compact Not a Compact*, 64 MICH. L. REV. 63 (1965); Engdahl, *Construction of Interstate Compacts: A Questionable Federal Question*, 51 VA. L. REV. 987 (1965).

37. The Court discussed the events leading up to the Compact and outlined its provisions as part of the facts of the case. 373 U.S. at 552.



vicissitudes of the national political process or the uncertainties of adjudication among adversary positions.

## II. COMPETING USES

### A. Agriculture vs. Municipal and Industrial Uses

Economic forces call for a switch from agricultural to municipal and industrial uses. The Law of the River bristles with preferences for agriculture.<sup>38</sup> Congress authorized expenditures of billions of dollars for a network of dams and delivery systems which were proposed to assist agriculture.<sup>39</sup> Nevertheless, several water projects, while primarily intended to benefit agriculture, drew essential political support because they would eventually provide for growing urban centers. Southern California's need for water and electric power in the Twenties was a significant factor in the struggle to authorize Hoover Dam.<sup>40</sup> Urban needs have given popularity and political viability to the most recent developments on the River, too, such as the Central Arizona Project which will serve the growing Phoenix and Tucson areas.<sup>41</sup> Nevertheless, the authorizing legislation for the project recites agricultural preferences.<sup>42</sup>

Demographic and economic changes in the Colorado River region alter the nature of demands for water. Thus, the relative importance of agriculture in the Colorado River Basin is declining as agriculture has ceased to expand significantly and urban growth abounds. Urban population growth from 1970-80 in six of the seven Basin states ranged from thirty-three percent to seventy-three percent.<sup>43</sup> The Water Resources Council estimated that agricultural

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38. One of the purposes listed in Article I of the Colorado River Compact is "to secure the expeditious agricultural and industrial development of the Colorado River Basin." Further, the Compact in Article III(e) makes water delivery rights and obligations of the Basin states dependent on whether they can apply the water to "domestic and agricultural uses." Article IV(b) provides that impounding water for power purposes is subservient to the use and consumption of such water for agricultural and domestic purposes. Likewise, Article IV(a) provides that agricultural and power purposes are preferred over uses for the purpose of navigation. *See supra* note 7. The Upper Colorado River Basin Compact provides in Article XV that agricultural and domestic uses are preferred to storage for power generation.

39. In the Boulder Canyon Project Act, 43 U.S.C. § 617 (1982), Congress provided that no charge could be made for water used in the Imperial or Coachella Valleys for irrigation from Hoover Dam. The Colorado River Basin Project Act declares that one of the purposes of the Central Arizona Project and several others is to provide "for the storage and delivery of the waters of the Colorado River for reclamation of lands...." 43 U.S.C. § 1501 (1982). Similar declarations are in the Colorado River Storage Project Act that authorized most of the Upper Basin projects, 43 U.S.C. § 620 (1982), and in the Boulder Canyon Project Act, 43 U.S.C. §§ 617-18 (1982).

40. N. HUNDLEY, *supra* note 27, at 250-52.

41. Sudman, *The Central Arizona Project*, 4 WESTERN WATER (May/June 1985).

42. 43 U.S.C. § 1501 (1982).

43. UNITED STATES DEPARTMENT OF COMMERCE, BUREAU OF THE CENSUS, 1980 CENSUS OF

water consumption nationally can be expected to drop from eighty-three percent to seventy percent of total water usage, although it will increase in absolute terms.<sup>44</sup> It is expected to decrease in both relative and absolute terms in Colorado River Basin states.<sup>45</sup>

Population centers outside the Colorado River Basin, like Los Angeles, San Diego, Denver, Phoenix, Tucson,<sup>46</sup> and Salt Lake City, now draw heavily on the River. More than half of the United States' consumption of Colorado River water is outside the Basin.<sup>47</sup> Municipal and industrial users can afford to pay enough to make it advantageous for farmers and ranchers in the Basin to sell their rights plus pay the cost of transporting the water hundreds of miles over mountainous divides.

Even in rural areas of the Upper Basin, increased water demands are projected for industrial development.<sup>48</sup> Energy-related uses in the West that are directly and indirectly increasing the demand for water in rural areas include mines, oil and gas wells, power plants,<sup>49</sup> coal slurry lines,<sup>50</sup> oil shale projects,<sup>51</sup> and coal gasification plants.<sup>52</sup> Such

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POPULATION, GENERAL POPULATION CHARACTERISTICS 4-7, 6-7, 7-7, 30-7, 33-7, 46-7, 52-7 (1982). California's urban growth was 19 percent.

44. UNITED STATES WATER RESOURCES COUNCIL, I THE NATION'S WATER RESOURCES 1975-2000 at 31 (1978).

45. *Id.*

46. Phoenix and Tucson are technically within the Colorado River drainage. They are in the Gila River watershed which has for many years contributed nothing to the river's flow in the mainstream. Thus these cities can be considered effectively outside the Basin.

47. UNITED STATES GENERAL ACCOUNTING OFFICE, COLORADO RIVER BASIN WATER PROBLEMS: HOW TO REDUCE THEIR IMPACT, GAO Report No. B-122053, LED-79-11, at 9 (1979).

48. Stegner, *The Colorado River is a River No More*, Rocky Mountain News, June 14, 1981, at 87.

49. Electric power generation uses water for cooling in coal-fired power plants. Estimates of consumptive use run as high as 14,400 acre-feet per year for a 1,000 megawatt plant. C. BORIS & J. KRUTILLA, WATER RIGHTS AND ENERGY DEVELOPMENT IN THE YELLOWSTONE RIVER BASIN 104-14 (1980).

50. Coal slurry pipelines, used to transport pulverized coal by mixing it with water, can draw large quantities of water. Energy Transportation Systems, Inc. (ETSI) purchased 50,000 acre-feet per year of water from South Dakota for a proposed pipeline that was to run from a Wyoming mine to load centers in Louisiana and Arkansas. When government approvals of the project were set aside by a federal court, *Missouri v. Andrews*, 586 F. Supp. 1268 (D. Neb. 1984) (appeal pending), the project was dropped. *Denver Post*, Aug. 2, 1984, at E1, col. 1.

51. Oil shale development requires large quantities of water. For a 50,000 barrel per day project it is estimated that 5,000 to 8,000 acre-feet of water per year is needed. Office of the Executive Director, Colorado Department of Natural Resources, *The Availability of Water for Oil Shale and Coal Gasification Development in the Upper Colorado River Basin*, 5-4 (October 1979). See also Lewis, *Oil from Shale: The Potential, the Problem and Plan for Development*, 5 ENERGY 373 (1980), (5500-6400 acre-feet per year for 50,000 barrels per day); OFFICE OF TECHNOLOGY ASSESSMENT, U.S. CONGRESS, AN ASSESSMENT OF OIL SHALE TECHNOLOGIES 364 (Government Printing Office, 1980) (5000-13,000 acre-feet per year for 50,000 barrels per day plant).

52. A coal gasification project could take 6,000 acre-feet per year to produce 250 million cubic feet per day of gas. Coal mining itself consumes some water, perhaps 500 acre-feet per year for a mine that produces 10 million tons per year. C. BORIS & J. KRUTILLA, *supra* note 51, at 98-104.

uses justify far higher prices for water than irrigators now pay. The Western States Water Council reported in 1977 that while most western agriculture is based on water costing under twenty dollars an acre-foot, coal-burning electric power plants can pay between \$1,200 and \$16,300 an acre-foot for cooling water.<sup>53</sup> The prices paid by different enterprises are limited by the value water adds to their products. A 1962 study of the Rio Grande Basin showed that the value added in agriculture was \$44-\$51 per acre-foot; in recreation, \$212-\$307 per acre-foot; in industry, \$3,040-\$3,989 per acre-foot.<sup>54</sup>

Although strong economic forces may influence the shift away from irrigated agriculture, legal and political forces may discourage transactions. Outright transfer restrictions have been repealed by most states, yet transfers remain inhibited by a number of state laws.<sup>55</sup> Most western states now "freely" allow transfers and changes of water rights, but require the applicant to show that no other water user, junior or senior, will be injured by the change. Proof of no injury can require costly experts, imposing a considerable transaction cost.<sup>56</sup> Cumbersome and expensive procedures and substantive requirements deter transfers of rights to valuable, more efficient uses.<sup>57</sup> In addition, federal projects operate under reclamation laws that erect barriers to market transfers of water.<sup>58</sup>

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53. WESTERN STATES WATER COUNCIL, WATER FOR ENERGY DEVELOPMENT, Update 1977 17 (1977). Some charges for irrigation water are actually much lower. The 1983 rate for the Grand Valley Water Users Association in Colorado was \$3.20 an acre-foot. Telephone interview with Bill Klapwyk, Manager-Treasurer, Grand Valley Water Users Association (May 4, 1984). The Yuma County Water Users Association in Arizona charged \$7 an acre-foot in 1982. 1983 Public Rate Notice, Yuma County Water Users Association (November, 1982).

54. N. WOLLMAN, THE VALUE OF WATER IN ALTERNATIVE USES 17 (1962).

55. Nebraska imposes severe restraints on transfers of irrigation rights. See Yuetter, *A Legal-Economic Critique of Nebraska Watercourse Law*, 44 NEB. L. REV. 11, 35 (1965). Wyoming's no-change rule (WYO. STAT. § 41-3-101) is still on the books but has been all but swallowed by exceptions. Gould, *Conversion of Agricultural Rights to Industrial Use*, 27B ROCKY MTN. MIN. L. INST. 1791, 1804-05 (1982). Other statutes allow transfers only if water use on the original land becomes impracticable, and then only with administrative approval. E.g., NEV. REV. STAT. §§ 533.040, 533.325 (1984); S.D. COMP. LAWS ANN. §§ 46-5-34 to 46-5-36 (1982).

56. See, e.g., *Farmers Highline Canal & Reservoir Co. v. City of Golden*, 129 Colo. 575, 272 P.2d 629 (1954).

57. See L. HARTMAN & D. SEASTONE, WATER TRANSFERS: ECONOMIC EFFICIENCY AND ALTERNATIVE INSTITUTIONS (1970); A. KNEESE & F. BROWN, SOUTHWEST UNDER STRESS 89-94 (1981); WATER AND AGRICULTURE IN THE WESTERN U.S.: CONSERVATION, REALLOCATION, AND MARKETS 215-23 (G. Weatherford ed. 1982); Comment, *Water Law — Legal Impediments to Transfers of Water Rights*, 7 NAT. RESOURCES J. 433 (1967).

58. Sax, *Selling Reclamation Water Rights: A Case Study in Federal Subsidy Policy*, 64 MICH. L. REV. 13 (1965), points out three such barriers: 1) the prohibition against the sale of reclamation water rights for use on more than a certain number of acres in single ownership, 43 U.S.C. § 431; 2) the requirement that users of such water be bona fide residents of the land, 43 U.S.C. § 431; and 3) the condition that reclamation water be appurtenant to the land, 43 U.S.C. 372. See also Ellis & DuMars, *The Two-Tiered Market in Western Water*, 57 NEB. L. REV. 333 (1978); Pring & Edelman, *Reclama-*

Legal obstacles to changing water use from agricultural to municipal and industrial uses are inspired, at least in part, by a desire to protect farming and ranching interests. Many state laws expressly limit the conversion of water rights from agricultural to industrial uses. While such laws may tend to preserve agriculture, they are contrary to the interests of farmers who want to sell their rights.<sup>59</sup>

There are also noneconomic reasons for political sentiment favoring agricultural preservation.<sup>60</sup> A strong pro-agriculture spirit lives in the breast of western society. The Jeffersonian ideal of a nation of family farmers became a bastion of our culture. In a very real sense our heritage is rooted in rural America. The existence of rural societies and the open expanses they inhabit are valuable for more than agricultural production. Even though the electorate is concentrated in the cities,<sup>61</sup> urban dwellers are willing to bear some burdens of protecting rural areas.<sup>62</sup> Western politicians continue to champion farm preservation while economically more beneficial industrial or municipal uses compete for water.<sup>63</sup>

Agriculture enjoys substantial economic subsidies when using irrigation water from government-financed facilities. Project costs are repaid interest free or at below market rates and amortized over an

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*tion Law Constraints on Energy/Industrial Uses of Western Water*, 8 NAT. RESOURCES LAW. 297 (1975).

59. Gould, *supra* note 55, at 1807-08.

60. "[A]gricultural preservation can be clearly identified as one societal interest which gives purpose to one class of impediments to water transfers." A. KNEESE & F. BROWN, *supra* note 57, at 92. "Although preservation of agriculture is often dismissed as a romantic notion that frustrates the transfer of water to higher economic uses, it is a goal which enjoys wide support on non-economic, social grounds." Comment, *Do State Restrictions on Water Use By Slurry Pipelines Violate the Commerce Clause?* 53 U. COLO. L. REV. 655, 669 (1982). See also Weatherford, *supra* note 57, at 195-96; WESTERN STATES WATER COUNCIL, WATER FOR ENERGY DEVELOPMENT, UPDATE 1977 at 17 (1977).

61. In the Colorado River Basin states, the following percentages of the total state population are located in cities of 10,000 or more: Arizona, 92%; California, 88%; Colorado, 74%; Nevada, 78%; New Mexico, 59%; Utah, 77%; Wyoming, 45%. U.S. DEPARTMENT OF COMMERCE, *supra* note 43.

62. Denver Post, November 4, 1979, at 25, col. 1 & 5:

Why Colorado, a rapidly changing state with a predominantly urban population, should be behaving this way [opposing a project to bring rural water to Denver] is something of a mystery. It has a lot to do with what has been primarily an agricultural state; with the fact of too many past boom and bust periods, making the state value the stabilizing influence of an agricultural economy; and with a perennial desire of Westerners to watch the desert bloom.

63. A journalist recalled a conversation with former Colorado Congressman Wayne Aspinall: I then asked him if it made sense to tie up so much of Colorado's scarce water in some irrigation projects which will contribute virtually nothing to the nation as a whole but which might inhibit future growth in other parts of the state, not to mention their effects on the environment. His answer was essentially that Colorado is first and foremost an agricultural state, and that there would be plenty of water in the future for everyone.

extended period.<sup>64</sup> Hydroelectric power revenues from the projects are applied to defray much of the cost of irrigation water. Also, the value of flood control, navigation, and other public benefits may be overstated, thereby reducing the repayment obligation of irrigators.<sup>65</sup> Environmental costs are often ignored and alternative uses such as industrial, municipal, wildlife, recreation, and aesthetics are rarely considered fully.<sup>66</sup> Under state laws, special districts formed to operate reclamation projects may issue tax exempt bonds and are exempt from property and other taxes.<sup>67</sup>

Economic and social change dictate that much of the heavy Colorado River water use for agriculture will gradually shift to other uses. Legal barriers to market forces and subsidies will slow but not prevent such changes. Some retarding of changes to alternate uses may effectively reflect important values surrounding agriculture which lack adequate protection in the marketplace.<sup>68</sup>

### *B. Power Production*

Hydroelectric power generation was not a primary purpose for constructing most of the dams on the Colorado, but demand for inexpensive power and a drive to secure revenues from the projects have brought their operation into conflict with other uses. Dams constructed and operated by the federal government on the Colorado River generate some 3,700,000 kilowatts a year.<sup>69</sup> The government recovered \$205 million for power sales in 1982,<sup>70</sup> while charging far below the market rate.<sup>71</sup> Irrigators and municipal users believe that the dams should be operated to maximize water storage and ensure deliveries of compact entitlements. Releases of water to maintain maximum power generation can draw down stored water supplies. Recreational users, and businesses serving them, object to dam operations that radically affect periodic flows to produce lucrative peak-load

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64. Comment, *Reclamation Subsidies and Their Present-Day Impact*, 1982 ARIZ. ST. L.J. 497, 518-20.

65. Comment, *Desert Survival: The Evolving Western Irrigation District*, 1982 ARIZ. ST. L.J. 377; Burness, Cummings, Gorman, & Lansford, *United States Reclamation Policy and Indian Water Rights*, 20 NAT. RESOURCES J. 807 (1980); Roberts, *Benefit-Cost Analysis: Its Use (Misuse) in Evaluating Water Resource Projects*, 14 AM. BUS. L.J. 73, 81-83 (1976).

66. Roberts, *supra* note 65, at 74; Jaffe, *Benefit-Cost Analysis and Multi-Objective Evaluation of Federal Water Projects*, 4 HARV. ENV'T'L. L. REV. 58, 60, 61 (1980); R. BERKMAN & W. VISCUSI, *DAMMING THE WEST* 55-62 (1973).

67. Comment, *Desert Survival: The Evolving Western Irrigation District*, 1982 ARIZ. ST. L.J. 377, 388-89.

68. See Weatherford, *supra* note 57, at 194-97.

69. WESTERN AREA POWER ADMINISTRATION, 1983 ANNUAL REPORT 8-9.

70. *Id.* at 31.

71. See *infra* notes 88-89 and accompanying text.

power.<sup>72</sup> There is also a growing movement among fiscal conservatives and in Congress to charge prices for public power that are closer to the market rate. Environmentalists join the cause of raising power prices as a means of reducing demand for power and, hence, for new power plants. As a result of all these pressures, power rates are virtually certain to increase. Perceiving the trend, some western states see increased power revenues as a source of funds for further water project development and a way to keep the benefits of existing water projects in the region.

The Secretary of the Interior claims he has the discretion to manage the Colorado River dam system to maximize the production of electricity, or to maximize the reliability of water supplies, or to satisfy a range of statutory objectives as he sees fit. Indeed, the Colorado River Basin Project Act empowers the Secretary to adopt criteria for the operation of federal dams on the Colorado<sup>73</sup> and broad secretarial discretion has been upheld by the courts.<sup>74</sup> The Act does not, however, purport to supersede the compacts. Furthermore, the 1922 Compact expresses a clear preference for domestic and agricultural uses over power production<sup>75</sup> and that preference is reiterated in the Basin Project Act. After listing several purposes, the Act mentions "the generation and sale of electrical power as an incident of the foregoing purposes."<sup>76</sup> Thus, there would appear to be some limitation on the extent to which the Secretary could manage dams for power generation. Nevertheless, because electrical generation is far more important to the Basin states today than it was when most major projects on the Colorado were authorized, there is less dispute over use for power purposes than one might expect by simply looking at the law.

Limits on federal authority to operate Colorado River dams have

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72. Roberts, *Dam is Killing the Grand Canyon*, 55, NATIONAL PARKS 18 (July/August 1981) (expanded use of Glen Canyon Dam for peaking power could destroy the \$12 million river-running industry in the Grand Canyon as well as endangering fish and wildlife and damaging the physical environment). See also the dispute over Marble and Bridge Canyon Dam which would have been located near Grand Canyon, *infra* note 181 and accompanying text.

73. 43 U.S.C. § 1552 (1982).

74. *Yuma Mesa Irrigation & Drainage Dist. v. Udall*, 253 F. Supp. 909 (D.D.C. 1966); *Yuma County Water Users Ass'n v. Udall*, 231 F. Supp. 548 (D.D.C. 1964) (sustaining Secretary's power to curtail impoundment of water in Glen Canyon Dam in order to provide water sufficient to satisfy power generation contract obligations of Hoover Dam down-stream). See also *Arizona v. California*, 373 U.S. 546, 590 (1963) (affirming the extensive powers of the Secretary in managing the River).

75. Article IV(b) of the Compact states that:

[W]ater of the Colorado River System may be impounded and used for the generation of electrical power, but such impounding and use shall be subservient to the use and consumption of such water for agricultural and domestic purposes and shall not interfere with or prevent use for such dominant purposes.

76. 43 U.S.C. § 1501 (1982).

not been determined. Congress presumably could appropriate the flow of the Colorado for power generation to meet national energy needs. A decision to manage the timing and amount of River flows solely to generate power might be within the ambit of constitutional power over navigable waters. If so, it would not be a taking of property subject to compensation,<sup>77</sup> although it might contradict the Law of the River. If, however, the Secretary exercises his broad power to enter into a contract to sell and deliver water<sup>78</sup> and then the water is used for power generation, the deprived party could assert a breach of contract claim against the United States under the waiver of sovereign immunity in the Tucker Act.<sup>79</sup>

Competition between basins for the ability to use water for hydroelectric power may raise legal questions. Under the Compact the Lower Basin may not demand delivery of water for power generation unless it is also needed for agricultural and domestic uses.<sup>80</sup> But the government may choose to generate power so long as it will not reduce the amount of water available for Upper Basin agricultural and domestic uses. The Lower Basin should not be able to compel releases of "excess" stored waters from the Upper Basin (i.e., over the Compact entitlement) solely for power generation.<sup>81</sup> Invading storage to satisfy Lower Basin power generation needs may diminish the Upper Basin's ability to store water to meet future Compact water delivery obligations. Surely, releases of "excess" water that are made for power generation should be credited to the Upper Basin's Compact delivery

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77. The power of Congress over navigable waters is not limited to what commonly is considered control of navigation. *Arizona v. California*, 283 U.S. 423 (1931). Navigable waters are treated as public property of the United States and thus the government need not pay compensation when it takes the water power of a stream. *United States v. Chandler-Dunbar Water Power Co.*, 229 U.S. 53, 73-74 (1913). But the rule in *Gerlach*, *infra* note 79, could make even a congressional breach of contract compensable.

78. 43 U.S.C. §§ 617d, 617g(b) (1982); *Arizona v. California*, 373 U.S. 546 (1963). *See also supra* note 74.

79. 28 U.S.C. § 1346(a)(2). Damages to water users should be compensable. In *United States v. Gerlach Live Stock Co.*, 339 U.S. 725 (1950), the Supreme Court held that where a water right established under state law pursuant to the prior appropriation doctrine is destroyed by the federal government in the process of building a reclamation project, compensation will be allowed. The decision reasoned that the legislative scheme for water development showed an intention that the navigation servitude ordinarily would not be asserted to take irrigation waters without compensation.

80. Dean Meyers offers the following interpretation of the Compact:

. . . the Upper Basin must supply 75 million acre-feet to the Lower Basin in each progressive ten-year period, although some of the water is used to generate power in the Lower Basin, provided, however, that the Upper Basin may reduce deliveries below that figure to maintain existing agricultural and domestic uses where the water withheld would be used by the Lower Basin to generate electric power.

Meyers, *supra* note 2, at 21.

81. Clyde, *Conflicts Between the Upper and Lower Basins on the Colorado River* in *RESOURCES DEVELOPMENT: FRONTIERS FOR RESEARCH* 113, 119-23 (1960).

requirements during the ten-year window for calculating the obligation.

Income from power generation is the primary source for repayment of costs of building and operating existing and planned federal reservoir projects. This fact dampens potential legal and political objections to operations for power production. The Reclamation Act originally required water users to repay all costs of dams.<sup>82</sup> The Act, however, was amended to remove the requirement,<sup>83</sup> and now the Secretary contracts with irrigators for repayment after considering income from power revenues and the ability of the irrigator to pay.<sup>84</sup> The availability of power revenues is what makes most new water projects economically feasible. Repayment is typically amortized over fifty years at low interest rates—three percent in the case of Hoover Dam.<sup>85</sup> Furthermore, the costs of project features attributable to irrigation are subject to no interest.<sup>86</sup> The Bureau of Reclamation generally credits payments first to the highest interest-bearing components of a project before recouping costs of irrigation features.<sup>87</sup> Once all project costs are recovered, there are provisions for accumulation of separate Upper and Lower Basin funds for further development of each Basin.<sup>88</sup> Projected income from power generation can justify dams to provide Upper Basin storage that otherwise could not be built.

Low-priced federal hydropower is an important benefit to the West. Power prices may not exceed the cost of production plus the cost of repaying capital obligations owed to the government for construction expenditures.<sup>89</sup> Favorable interest rates and repayment schedules keep those obligations low. The result is an inherent public subsidy to power users. Power from Hoover Dam sells for 4.27 mills per kilowatt hour (KWH).<sup>90</sup> By contrast, privately sold energy costs

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82. Comment, *Reclamation Subsidies and Their Present-Day Impact*, 1982 ARIZ. ST. L.J. 497, 508.

83. *Id.* at 519-20. The Reclamation Project Act of 1939, ch. 418, 53 Stat. 1187 (codified in scattered sections of 43 U.S.C.) gave general authority for multipurpose reclamation projects and shifted many project costs to other water users.

84. 43 U.S.C. §§ 485h(d) and (e) (1982).

85. 43 U.S.C. § 618e (1982).

86. Comment, *Reclamation Subsidies and Their Present-Day Impact*, 1982 ARIZ. ST. L.J. 497, 498-99, 518.

87. See U.S. Department of Energy Order No. RA 6120.2 (n.d.).

88. 43 U.S.C. §§ 618(a) and 620d(e) (1982).

89. Regulations for Generation and Sale of Power in Accordance with the Boulder Canyon Project Adjustment Act, § 6, May 20, 1941, Secretary of the Interior, in Wilbur & Ely, *supra* note 5, at A286.

90. Metropolitan Water District of Southern California, chart entitled *Determination of Energy*



upwards of ten times the Hoover Dam price.<sup>91</sup> The availability of cheap power enables municipal water providers in southern California to keep down the cost of pumping large amounts of River water across the mountains to San Diego and the Los Angeles area. Consequently, the Metropolitan Water District (MWD), which uses more of the Lower Basin's share of water than any but the vast combined agricultural interests of the Imperial Valley,<sup>92</sup> is also one of the largest Hoover Dam power consumers.<sup>93</sup>

In 1983, the Department of Energy proposed new criteria for marketing Hoover Dam power after 1987 when present contracts will expire.<sup>94</sup> Nevada and Arizona filed suit contesting the proposed criteria, essentially seeking larger allotments of Hoover's output.<sup>95</sup> In 1984, Congress passed legislation giving more power to Arizona and Nevada,<sup>96</sup> and the states dropped their suits. The 1984 Hoover Dam Act departed from the traditional cost-based pricing of federal power, allowing rates to be increased by 4.5 mills/KWH for Arizona customers and 2.5 mills/KWH for California customers.<sup>97</sup> The proceeds will be used by Arizona to pay for features of the Central Arizona Project, and by California to support salinity control measures.<sup>98</sup>

Some Upper Basin interests have proposed that modest increases in power rates be made to finance further water development.<sup>99</sup> A new revenue source is needed because the willingness of Congress to advance federal funds, to be repaid largely from power revenues, is waning. The 1984 Hoover Dam Act is precedent for "up front" use of

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*Rates, Effective June 1, 1982 (Hoover Dam)*; Telephone conversation with Robert W. Thompson, Engineer, Metropolitan Water District (May 10, 1983).

91. Southern California Edison Co. was paying 53 mills/KWH in 1983. So. Calif. Edison Co. Standard Offer No. 4, Energy Only (1983).

92. Under an agreement of the Southern California water users the first priority to California's entitlement from the river belongs to the major irrigation interests including the Imperial Irrigation District, the Palo Verde Irrigation District and the Coachella Irrigation District. The three districts may take up to 3.85 million acre-feet per year. Metropolitan Water District (MWD) has the next priority, 550,000 acre-feet. Seven-party Water Agreement, August 18, 1931, Art. I, §§ 1-4, in Wilbur & Ely, *supra* note 5, at A480. In fact, MWD has diverted much more than that amount for over 20 years, utilizing a portion of Arizona's share that will not be usable in that state until the Central Arizona Project is complete.

93. MWD is entitled to thirty-five percent of the first energy produced from Hoover Dam. In addition, it has the first right to use any secondary energy produced from the dam. *General Regulations for Generation and Sale of Power in Accordance with the Boulder Canyon Project Adjustment Act* (May 20, 1941) in Wilbur & Ely, *supra* note 5, at A279-A286.

94. 48 Fed. Reg. 20872 (1983).

95. Nevada v. United States, No. 82-441 (D. Nev. filed Aug. 27, 1982).

96. Pub. L. No. 98-381, 98 Stat. 1333 (1984).

97. *Id.*, 98 Stat. at 1333-34.

98. *Id.*; see also 43 U.S.C. §§ 1543(f) and (g).

99. Colorado's Proposal to Use CRSP Power Revenues for Water Project Financing (March 6, 1984); see *infra* text accompanying notes 175-177.

power revenues for water projects. Legislation applying power revenues directly to water projects could also serve to preempt a growing movement to increase power revenues and divert them to federal purposes outside the area where the revenues are produced. An amendment to the Hoover Bill that would have increased power rates to market levels was only narrowly defeated.<sup>100</sup> Critics of low-priced federal power are not only moved by a desire to recover greater income for the federal treasury; they also argue that increased power rates would discourage excessive power and water use.<sup>101</sup> The drive to raise federal revenue by increasing power rates should be tempered by recognition of the historical fact that Congress intended the hydroelectric systems to provide benefits to the regions served, not as proprietary endeavors to extract revenues from those regions.

The Basin states should be able to resolve the tension between the needs of their citizens for reasonably priced power and the temptation to maximize power generation revenues to finance and repay water projects needed in the region. If power prices charged in the region are raised with no direct benefit to the region, the Basin states will be bitterly opposed. At that point, technical arguments about the extent to which the United States can use Colorado River dams for power production versus other uses may be raised. Unless and until power pricing incites the Basin states to action, their efforts will probably be spent in cooperative negotiation with the Secretary of the Interior over details of the operating criteria. It is in the interest of all to help achieve the optimal balance between production of low-cost power for use in the region and other uses that may come into conflict with power production.

### C. *Indian Reserved Rights*

In *Arizona v. California*,<sup>102</sup> the United States Supreme Court allocated about 900,000 acre-feet of the Colorado River annually to the

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100. 130 CONG. REC. H3319-3333, (Daily Ed.) May 3, 1984; House Votes to Retain Cheap Sale of Hoover Dam Power in 3 States, N.Y. Times, May 4, 1984, at 1.

101. Editorial, *Power to Some of the People*, N.Y. Times, May 2, 1984; *Why Hoover Dam's 'Dirt-Cheap' Power May Stay in the Hands of a Few*, BUS. WK., Apr. 16, 1984, at 124; Graff and Marcus, *The Revenue Runoff From Hoover Dam*, WALL ST. J., Mar. 30, 1984, at 28. The President's Fiscal Year 1986 budget proposes to change the method of repayment of existing obligations for federal hydropower projects, so that current interest rates would apply and principal would be recovered on not less than a straight line amortization. U.S. OFFICE OF MANAGEMENT AND BUDGET, BUDGET FOR FISCAL YEAR 1986, Appendix I-J19 through I-J31 (1985). This would have a substantial effect on power rates and revenues. It would raise Colorado River Storage Project (Upper Basin) power rates by 8.10 mills/KWH, nearly doubling current rates. WESTERN AREA POWER ADMINISTRATION, FEDERAL POWER MARKETING REFORM (Feb. 1985).

102. 373 U.S. 546 (1963).

five Indian tribes located along the mainstem,<sup>103</sup> and 79,000 acre-feet per year for use on federal lands in the vicinity.<sup>104</sup> The allocation was not based on prior use, but upon the doctrine of reserved rights. The doctrine teaches that when federal or Indian lands are reserved, rights to water sufficient to fulfill the purposes of the reservation are also reserved.<sup>105</sup> Under the doctrine, later Indian uses can displace non-Indians who commenced their uses after the land reservations were established.<sup>106</sup>

The Court said the purpose of the five Colorado River Indian reservations was to sustain agriculture and, accordingly, it fixed the tribes' entitlement at an amount sufficient to irrigate all "practicably irrigable acreage" on the reservations.<sup>107</sup> This standard enabled quantification of reserved rights, and facilitated planning by the tribes and other River water users.<sup>108</sup> Yet some uncertainties remained and the Court retained continuing jurisdiction.<sup>109</sup>

In 1979, the tribes, which had been represented in the earlier suit by the United States, intervened on their own behalf and sought to reopen the case to rectify what they perceived to be errors in calculating practicably irrigable acreage and to consider changed circum-

103. *Id.* at 600. The tribes whose claims were decided were the Chemehuevi Tribe, Cocopah Tribe, Colorado River Tribe, Fort Mojave Tribe, and Quechan Tribe. *Id.* at 595 n.97.

104. *Id.* at 601. The Court allocated to the Havasu Lake National Wildlife Refuge a right to divert 41,839 acre-feet per year or to consume 37,339 acre-feet; to the Imperial National Wildlife Refuge a right to divert 28,000 acre-feet per year or to consume 3,000; and the Lake Mead National Recreation Area was decreed sufficient quantities of water to satisfy its purposes.

105. In *Winters v. United States*, 207 U.S. 564 (1908), the United States Supreme Court upheld the right of Indians on the Fort Belknap Indian Reservation in Montana to take water needed by and already being used by non-Indian settlers. The non-Indians relied on Montana law which accorded water rights to the first to appropriate it. The Supreme Court upheld the Indians' later assertion of water rights dating back to the establishment of the reservation. Although the agreement setting aside the reservation was silent on water rights, the Court read the cession of large land areas in return for the smaller reservation bounded by a river to imply a reservation of sufficient water to make the reserved lands useful. Because the purpose of the reservation was "to train, encourage and accustom [the Indians] to habits of industry and to promote their civilization and improvement," their efforts at irrigation were to be protected. 207 U.S. at 566-67. See generally Ranquist, *The Winters Doctrine and How It Grew: Federal Reservation of Rights to the Use of Water*, 1975 B.Y.U. L. REV. 639.

106. *Arizona v. California*, 373 U.S. 546, 600 (1963); *Winters v. United States*, 207 U.S. 564, 576 (1908); *Conrad Investment Co. v. United States*, 161 F. 829, 831 (9th Cir. 1908); *United States v. Ahtanum Irrigation Dist.*, 236 F.2d 321, 327 (9th Cir. 1956), *cert. denied*, 352 U.S. 988 (1957).

107. 373 U.S. at 600-01. The Court approved the report of the Special Master who had found: "The reservations of water were made for the purpose of enabling the Indians to develop a viable agricultural economy ..." S. RIFKIND, REPORT OF SPECIAL MASTER, *ARIZONA V. CALIFORNIA*, 373 U.S. 546 (1963).

108. The Public Land Law Review Commission concluded that "the uncertainty generated by the [reserved rights] doctrine is an impediment to sound coordinated planning for future water resources development." PUBLIC LAND LAW REVIEW COMMISSION, ONE THIRD OF THE NATION'S LAND 144 (1970).

109. *Arizona v. California*, 376 U.S. 340, 345 (1964).

stances. They requested an expanded allocation of water rights.<sup>110</sup> A Court-appointed special master recommended that the Indians' annual entitlement be increased by about 317,000 acre-feet because the United States had not claimed all of the tribes' irrigable acreage.<sup>111</sup> The Master applied standards of economic feasibility to determine what land was "practicably irrigable."<sup>112</sup> He rejected state claims that the benefit from Indian water use must exceed the cost of water by a particular margin to be feasible, and claims that "practicability" should be determined by nineteenth century standards rather than by standards of current technology.<sup>113</sup>

On review of the special master's report, the Supreme Court refused to allow the tribes to expand their entitlement based on the government's failure in the earlier litigation to claim certain lands as "practicably irrigable." The Court stated there is a "strong interest in finality" where "certainty . . . with respect to water rights in the Western United States" is at stake.<sup>114</sup> This indicates that once Indian reserved water rights have been quantified, affected water users can rely on the quantification, without fear that it will be changed in the future.

### 1. Magnitude of Indian Rights

The Indians' rights have not been fully utilized. One tribe, Fort Mojave, has diverted an average of seventy-seven percent of its entitlement. Another, Chemehuevi, has diverted none.<sup>115</sup> This is partly due to a lack of diversion and distribution facilities. Federal assistance in developing the means to irrigate Indian land has been lacking, even as the government has provided copious aid to the tribes' competitors for water from the same sources.<sup>116</sup>

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110. *Arizona v. California*, 439 U.S. 419 (1979).

111. S. TUTTLE, REPORT OF THE SPECIAL MASTER, *ARIZONA V. CALIFORNIA* 281-83 (1982).

112. *Id.* at 96. The standards were more rigorous than those applied in evaluating Bureau of Reclamation projects. See Burness, Cummings, Gorman & Lansford, *United States Reclamation Policy and Indian Water Rights*, 20 NAT. RESOURCES J. 807 (1980).

113. S. TUTTLE, *supra* note 111, at 93-100.

114. *Arizona v. California*, 460 U.S. 605, 620 (1983). The Court did allow for enlarged entitlements if and when boundary disputes left open in the 1964 decree are judicially decided, effectively continuing uncertainty as to water rights on several thousand acres. 460 U.S. at 629-36. See S. TUTTLE, *supra* note 111, at 106-11 for a summary of the claims to additional irrigable acreage.

115. *Arizona v. California*, 460 U.S. 605, 618 n.8 (1983).

116. With the encouragement, or at least the cooperation, of the Secretary of Interior—the very office entrusted with protection of all Indian rights—many large irrigation projects were constructed on streams that flowed through or bordered Indian Reservations, sometimes above and more often below the Reservations. With few exceptions the projects were planned and built by the Federal Government without any attempt to define, let alone protect, prior rights that Indian tribes might have had in the waters used for the projects. . . . In the history of the United States Government's treatment of Indian tribes, its failure to protect

As Indian use expands, it could cut into the ability of the states to develop Colorado River water. Although many of the lands considered "practicably irrigable" in *Arizona v. California* do not justify substantial investment,<sup>117</sup> tribes have begun to develop more productive uses including leases of water for nonagricultural enterprises.<sup>118</sup> While the quantity of water allocated to the tribes is measured by potential agricultural uses, the tribes are not limited to making agricultural applications.<sup>119</sup>

Tribes other than the five that were represented in *Arizona v. California* may claim extensive reserved rights to Colorado River Basin waters. Reserved rights of the huge Navajo Reservation and others such as the Ute, Gila River, and Papago could significantly impact the economies of the states where they are located. One estimate of what a court would award the Navajos based on an irrigable acreage formula is 2,000,000 acre-feet per year while Arizona's entire compact share is only 2,800,000 acre-feet.<sup>120</sup> If the "practicably irrigable acreage" standard that evolved in *Arizona v. California* is strictly applied, however, Navajo rights probably would be more limited, though still large. The high cost of delivering water to lands at elevations and distances far from the water's source and the marginal quality of soils severely reduce economic feasibility, and hence "practicability," of irrigation. Yet, as Arizona approaches the limits of its allocation, and California has already consumed its allocation, any significant reduction in water available to them could be devastating.

## 2. Quantifying Reserved Rights

The essential problem with reserved rights is not their existence, but their uncertain quantity, leading some to call for congressional quantification.<sup>121</sup> Commentators have warned that congressional

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Indian water rights for use on the Reservations it set aside for them is one of the sorrier chapters.

NATIONAL WATER COMMISSION, WATER POLICIES FOR THE FUTURE — FINAL REPORT TO THE PRESIDENT AND TO THE CONGRESS OF THE UNITED STATES 474-75 (1973).

117. S. TUTTLE, *supra* note 111, at 192 *et seq.*

118. *E.g.*, Memorandum of the Solicitor, U.S. Department of the Interior, Feb. 1, 1964 (approving of use of water by lessee of Colorado River Indian Tribe for recreational and housing development).

119. *See Arizona v. California*, 439 U.S. 419, 422 (1979) (Indian water rights that were quantified based on irrigable acreage need not be confined to agricultural uses); S. RIFKIND *supra* note 107, at 265-66. *See also infra* notes 129, 130, and accompanying text.

120. Back & Taylor, *Navajo Water Rights: Pulling the Plug on the Colorado Rivers*, 20 NAT. RESOURCES J. 71, 74 and 74 n.12 (1980). Indian water rights are charged against the allocations made to the states where the reservations are located. *Arizona v. California*, 373 U.S. 546; *United States v. California*, 438 U.S. 645 (1978).

121. *See Clyde, Special Considerations Involving Indian Rights*, 8 NAT. RESOURCES LAW. 237 (1975). Note, *A Proposal for the Quantification of Reserved Indian Water Rights*, 74 COLUM. L. REV.

quantification is doomed to failure unless the interests of all parties are represented, a difficult objective when politically powerful interests are pitted against Indian tribes.<sup>122</sup> In view of the wide differences among tribes in the cultural and economic importance of water, varied climates and competing non-Indian demands, a generic solution to all tribes' reserved water rights claims seems inappropriate.

Litigation of reserved rights claims case by case is an expensive and time-consuming process. Wyoming has spent \$7.2 million to litigate federal and Indian claims, yet many questions still persist.<sup>123</sup> Dozens of Indian reserved rights cases are currently before the courts<sup>124</sup> with little prospect of early or complete resolution.

A promising way of resolving the haunting uncertainties of Indian reserved rights is through agreements between tribes and other users. As the following examples demonstrate, attempts to negotiate Indian water claims in the Basin states have produced mixed results.

The Bureau of Reclamation and the Central Utah Water Conservancy District sought the agreement of the Utes of the Uintah and Ouray Reservation that they would defer development of some 15,000 acres of land to ensure that there would be enough water to justify building the Central Utah Project (CUP). The tribe received vague promises that substitute water would be developed for its benefit before 2005 when a final unit of the CUP was planned to be completed.<sup>125</sup> The Indians later challenged the agreement as unlawful, charging that there was little or no consideration in exchange for the tribe's promise to forego using water. Further, the agreement was never authorized by Congress, as required by law.<sup>126</sup> In 1980, a com-

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1299, 1301 (1974). See GENERAL ACCOUNTING OFFICE, RESERVED WATER RIGHTS FOR FEDERAL AND INDIAN RESERVATIONS: A GROWING CONTROVERSY IN NEED OF RESOLUTION 58 (1978). The Western Regional Council representing resource development and financial interests put forward one proposal following a comprehensive study of Indian needs. Another was suggested by the Western Conference of the Council of State Governments that would have extinguished all Indian rights not actually used or deemed by the Secretary of Interior to be exercisable prior to or within an eight-year period following the bill's enactment. J. FOLK-WILLIAMS, WHAT INDIAN WATER MEANS TO THE WEST 15-17, 139-43 (1982). A similar bill failed in the Ninety-eighth Congress. H.R. 3995, 98th Cong., 1st Sess.

122. See DuMars & Ingram, *Congressional Quantification of Indian Reserved Water Rights: A Definitive Solution or a Mirage?* 20 NAT. RESOURCES J. 17 (1980).

123. WESTERN STATES WATER COUNCIL, INDIAN WATER RIGHTS IN THE WEST 98 (1984).

124. *Id.* at 100-11.

125. Ute Indian Deferral Agreement of September 20, 1965 (Bureau of Reclamation Contract No. 14-06-W-194); see Clyde, *supra* note 121. The deferral agreement is also discussed in J. FOLK-WILLIAMS, *supra* note 121, at 88-90.

126. Interests in Indian real property cannot be transferred without congressional consent. F. COHEN, HANDBOOK OF FEDERAL INDIAN LAW 510-22 (1982). A contract to defer use of water rights effectively "leases" rights to others and should come within the restriction on alienation. See *New Mexico v. Aamodt*, 537 F.2d 1102, 1110 (10th Cir. 1976), *cert. denied*, 429 U.S. 1121 (1977); *United*

compact was negotiated between the Utes and the state of Utah to validate the deferral agreement and quantify the tribe's reserved water rights. The agreement requires the state to give additional security for furnishing substitute water and the tribe to yield some jurisdiction over water rights. The state has ratified the Compact but the tribe has not.<sup>127</sup>

In 1968, the Navajos consented to limiting the use of water on more than one-half of the Upper Basin portion of their huge reservation to facilitate construction of a coal-burning power plant at Page, Arizona.<sup>128</sup> Induced by promises of jobs for Navajos and increased tribal revenues, the Navajos agreed to confine their claims to the amount of Arizona's Upper Basin share of water under the Upper Basin Compact—50,000 acre-feet a year—for the life of the plant or for fifty years, whichever was earlier. They also consented to the use of 34,100 acre-feet of that water by the power plant.<sup>129</sup>

By another agreement made in 1957, the Navajos waived their 1868 priority date on the San Juan River in exchange for congressional approval of the Navajo Indian Irrigation Project which was in conflict with the San Juan-Chama Project sought by non-Indian interests. Both projects would draw on the San Juan River. Congress insisted that the conflicts between Indian rights and non-Indian uses be resolved before it approved the projects, so the tribe agreed to share shortages with non-Indian beneficiaries.<sup>130</sup>

The wisdom of both Navajo agreements has been cast into doubt.<sup>131</sup> Neither the number of jobs nor the revenues from the Page power plant approached the expectations voiced in negotiations. Dissatisfaction with the arrangement has increased and the validity of the tribe's approval has been challenged.<sup>132</sup> In the 1957 deal, it has been suggested that the tribe compromised valuable water rights in ex-

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*States v. Ahtanum Irrigation Dist.*, 236 F.2d 321, 334 (9th Cir. 1956), *cert. denied*, 352 U.S. 988 (1957). Indian water rights may be leased in conjunction with leases of Indian land, but "no general federal statutes ... authorize the sale or lease of Indian water rights separate and apart from the land." F. COHEN, *supra*, at 593. To the extent that the agreement purports to grant jurisdiction to the state it also requires congressional consent. See *Kennerly v. District Court*, 400 U.S. 423 (1971).

127. The proposed compact is discussed and reprinted in J. FOLK-WILLIAMS, *supra* note 121, at 90-91, 132-38. The compact does not call for consent of Congress, which would be required before it could be enforced against the tribe.

128. The tribe's agreement was required by the Act authorizing use of federal funds for construction. See Act of Sept. 30, 1968, Pub. L. No. 90-537, title III, § 303, 82 Stat. 889, *as amended*, 43 U.S.C. § 1523 (1982).

129. See Price & Weatherford, *Indian Water Rights in Theory and Practice: Navajo Experience in the Colorado River Basin*, LAW & CONTEMP. PROBS. 97, 109-14 (1976).

130. *Id.* at 119-25.

131. *Id.* at 114-19; 125-30.

132. Back & Taylor, *supra* note 120, at 71, 87-88.

change for an irrigation project plagued with economic problems and mismanagement.<sup>133</sup> The Navajo Indian Irrigation Project changed in character from a project to benefit family farms to one best suited for larger farms which the Navajos were not equipped to develop or operate, and its construction was delayed for many years.

Congress has approved two settlements of recent Arizona water disputes. The Ak-Chin Indian Community agreed to forego substantial water claims it had raised against non-Indians in return for a promise of 85,000 acre-feet of irrigation water to be furnished by the Secretary of the Interior from a federal project.<sup>134</sup> The Papago Indian Tribe compromised its claims against groundwater users in the Tucson area.<sup>135</sup> The first Act approving the Papago settlement was vetoed by the President because the federal government had not been significantly involved in the negotiating process. In the view of the President the government was being called upon to fund "a multi-million dollar bailout . . . of the mining companies and local water users" who would be relieved of the Indian claims.<sup>136</sup> A second Act was approved.<sup>137</sup> Like the Ak-Chin settlement, the Papago negotiations were ultimately successful. In both, the tribes received fair consideration for their rights, including credible promises of delivered water. The two Navajo examples and the Ute example encountered more difficulties because the tribes' interests were not adequately secured, leading to results that could be questioned.

### 3. Non-Indian Use of Indian Water Rights

Agreements with the Colorado River tribes could help solve southern California's expected shortfall in available water supplies. Leases and other transfers of Indian water rights could be made for an appropriate sum, or for other consideration, such as a trade for irrigable land elsewhere, construction of irrigation facilities to serve part of the reservation, a share of electric power produced, or an interest in a business.

A basic question is whether Indian reserved rights should be alienable.<sup>138</sup> Reserved water rights were created to fulfill the purposes of Indian reservations. The overall purpose of every Indian reservation is to provide a permanent homeland where the tribe can be eco-

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133. DuMars & Ingram, *supra* note 122.

134. Act of July 28, 1978, Pub. L. No. 95-328, 92 Stat. 409.

135. Act of Oct. 12, 1982, Pub. L. No. 97-293, 96 Stat. 1261.

136. R. REAGAN, WEEKLY COMPILATION OF PRESIDENTIAL DOCUMENTS 732-33 (1982).

137. Act of Oct. 12, 1982, Pub. L. No. 97-293, 96 Stat. 1261.

138. See Palma, *Considerations and Conclusions Concerning the Transferability of Indian Water Rights*, 20 NAT. RESOURCES J. 90 (1980).



nomically self-sufficient and govern itself.<sup>139</sup> Thus, reservation purposes conceivably could be fulfilled by selling or leasing water to others for use off the reservation.<sup>140</sup> But Indian reservation purposes arguably do not include off-reservation use of water unrelated to reservation resources.<sup>141</sup> The National Water Commission has recommended the enactment of general legislation enabling leasing of Indian water rights as a way of dealing with the uncertainties that beset both Indians who want to preserve their rights for the future and non-Indians who want to secure a dependable water supply.<sup>142</sup>

Policy considerations must be weighed in authorizing the transfer of Indian water rights. Tribes may be better off receiving payments instead of water, and others may be quite willing to pay for the assurance of a supply not subject to interruption by the exercise of reserved rights. But even if other users of the River have formally acknowledged Indian rights, will the water ever be available to the tribes for their own uses should they need it? And what are the tradeoffs in terms of coherent social structure and community life? A community could be built on a developed agricultural use of water but probably could not be founded on a common interest in collection and distribution of periodic payments to forego such uses. As in other Indian policy debates, the ultimate question is to what extent should Indians be assimilated into the larger society? Because Congress must consider and approve alienation of Indian water rights, the issues surely will be aired in any transaction.

While Indians and the federal government may want to consider carefully the policy implications of schemes for marketing Indian water, the idea holds great promise for non-Indian water users whose rights are now plagued with uncertainty. Quantification of reserved rights alone does not solve the problem of non-Indians who need the water that is subject to those rights. They need assurance that the water will be available. The assurance can come from a contract ratified by Congress. Some non-Indian water users may resist paying for

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139. *McClanahan v. Arizona State Tax Comm'n*, 411 U.S. 164 (1973); *Warren Trading Post Co. v. Arizona Tax Comm'n*, 380 U.S. 685, 686 (1965); *United States v. Shoshone Tribe*, 304 U.S. 111, 117-18 (1938); *United States v. McGowan*, 302 U.S. 535, 537 (1938); *Alaska Pacific Fisheries v. United States*, 248 U.S. 78, 88-89 (1918). The Court in *United States v. New Mexico*, 438 U.S. 696, 700 n.4 (1978), acknowledged that Indian reserved water rights are implied from these broad purposes. *Winters* spoke of encouraging "habits of industry" and "advancing the civilization and improvement of the Indians." 207 U.S. at 567.

140. See *DuMars & Ingram*, *supra* note 122, at 31.

141. F. COHEN, *supra* note 125, at 589 n.85. *But see* Palma, *supra* note 138, at 91.

142. U.S. NATIONAL WATER COMMISSION, *WATER POLICIES FOR THE FUTURE—FINAL REPORT TO THE PRESIDENT AND TO THE CONGRESS OF THE UNITED STATES* 480-81 (1973). Congress has authorized leases of Indian lands. 25 U.S.C. § 415 (1983). Lessees can make use of Indian water rights. *Skeem v. United States*, 273 F. 93 (9th Cir. 1921).

water that now is available for free. But guaranteed availability has great value where there is a threat of losing supplies to Indian water development. Of course, non-Indians would not agree to purchase Indian water unless it was already being used by the Indians or there was a reasonable prospect of its development. Only competition for use of the water (by Indians and non-Indians), not simply the existence of rights, will give economic value to Indian reserved rights. Allowing the market to operate in the realm of Indian reserved rights, then, would be salutary.

#### *D. Fish, Wildlife, and Recreation*

The waters of the Colorado are as intensely and thoroughly used and reused as those of any river in the world. For a century, many have devoted their lives and talents to harnessing the wild Colorado River to provide the raw materials of a burgeoning civilization. Bustling economies have been built, mostly outside the watershed of the River. Ironically, those who first surveyed the Colorado Basin found it to be "valueless," exclaiming that they "cannot conceive of a more worthless and impracticable region than the area we now find ourselves in." Other early visitors said "ours has been the first, and undoubtedly will be the last, party of whites to visit the locality. It seems intended by nature that the Colorado River, along the greater portion of its lonely and majestic way, shall be forever unvisited and undisturbed."<sup>143</sup>

While most of the benefits of the Colorado River have been reaped far from its banks, its enchantment as a natural phenomenon has drawn millions to it. Even as it has been changed by man's hand, people have realized that the River is valuable in its natural state.<sup>144</sup> The River has carved spectacular canyons that expose visitors to a cross-section of geology telling the story of the earth's formation. Peaceful beaches and crashing rapids enthrall boaters, hikers, and campers. Views are incomparable. The unreal colors of the Grand Canyon are famous throughout the world.

The complex of dams and reservoirs are properly blamed for obstructing use of the River for rafting and kayaking, blocking passage by native fish, changing the River's regime, causing erosion of beaches, creating irregular flows, altering water temperatures needed for fish, and changing indigenous vegetation. Yet River development has also brought new forms of recreation and opened the River to millions of

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143. P. FRADKIN, *A RIVER NO MORE* 181-82 (1981).

144. See Wilkinson, *Western Water Law in Transition*, 56 U. COLO. L. REV. 317 (1985) (discussing the growing consensus that leaving water in a stream may be a valid use).

visitors. Gigantic lakes—Lake Mead behind Hoover Dam, Lake Powell behind Glen Canyon Dam, and many others—offer flat water recreation to millions each year. Houseboaters, water skiers, jet boaters, fishermen, recreational vehicle campers, four-wheelers, swimmers, and tourists in waterfront resorts and casinos flock to the Colorado River. Today, campgrounds along the Colorado are jammed, and there are waiting lists for expensive river trips. River-running permits are sought years in advance, and air pollution from the endless stream of automobiles threatens the Grand Canyon.

Tourism and recreation have contributed handsomely to the economies of the Basin states; probably the single greatest economic contribution the River makes to the communities *within* the Basin. Of course, the River has the greatest economic importance to the portions of the Basin states outside the Basin itself. Like a microcosm of the West within the United States, the River is exploited largely for the benefit of those elsewhere. At least the tourist economy leaves much of the wealth that is produced in local areas.

The tremendous economic importance of recreation and tourism has contributed to an awareness that enjoyment of the River in its natural environment is not simply an amenity by-product. The difficulty lies in attaching a price tag to uses of water in the stream. A willingness to pay for aesthetics is shown when people pay for dams, canals, pipelines, pumps, and electricity to bring water a thousand miles to make a golf course green, to water flowers, or to fill a fountain. But what is a river worth in its natural state? The multi-million dollar contribution of the river-running industry in the Colorado River Basin is one indicator. In addition, tourists (river runners and others) contribute much more for travel, meals, lodging, equipment, and incidentals. Independent of recreation use values, a recent Colorado study concluded that the public is willing to pay substantial amounts of money for preservation of many rivers in their wild condition.<sup>145</sup> They would pay for the assurance that rivers would remain available for possible future use and for the knowledge that they are being preserved.

Congress passed the federal Wild and Scenic Rivers Act to preserve in a free-flowing condition rivers that have outstanding "scenic, recreational, geologic, fish and wildlife, historic, cultural, and other similar values."<sup>146</sup> Portions of seven tributaries and a portion of the mainstem of the Colorado have been studied for designation as wild

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145. R. WALSH, L. SANDERS & J. LOOMIS, *WILD AND SCENIC RIVER ECONOMICS: RECREATION USE AND PRESENTATION VALUES* 71-73 (1985).

146. Wild & Scenic Rivers Act, 16 U.S.C. §§ 1271-1287 (1982).

and scenic rivers.<sup>147</sup> Remarkably, none yet has been protected. The Act prevents development that would interfere with a river's flows. The possibility of future development of the River may therefore have stalled designation. Until the relative importance of recreation and natural preservation can be balanced against the value of water development, there is an understandable reluctance to preclude development.

Hundreds of species of fish and wild animals inhabit the ecosystems that are supported by the Colorado. Development and the presence of humans have reduced populations of some species. The greatest changes have been to native fish species. Dams have altered the River's ecology. Flow regimes are different; some canyons are now filled with deep, still water rather than rapids. Consequently, sediment settles out of the water and temperatures are varied. The unique conditions of the River that allowed indigenous fish species to evolve have changed. Now some of those species are threatened with extinction. At the same time many exotic fish species such as rainbow, brown and brook trout, perch, sunfish, and carp have been introduced, creating new and popular sport fisheries in the waters released from, and stored in, large reservoirs. But the introduction of some such non-native fish has caused competition with native species, further reducing their numbers.<sup>148</sup>

Today the effects of water project development on fish and wildlife are usually considered before a project proceeds. The Fish and Wildlife Coordination Act<sup>149</sup> demands that the effects of federal water projects on fish habitats be considered before construction begins.<sup>150</sup> This can lead to conditions requiring mitigation or prevention of harm to fish and wildlife. The federal Endangered Species Act,<sup>151</sup> the nation's most rigorous and demanding environmental law, provides nearly absolute protection for animal and plant species which are designated "endangered" or "threatened" by the Secretary of the Interior.<sup>152</sup>

A few of the indigenous fish species of the Upper Colorado River,

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147. 16 U.S.C. §§ 1276(a)(34), (36), (38), (39), (43), (47), (55), and (56) (1982).

148. R. BEHNKE & D. BENSON, *ENDANGERED AND THREATENED FISHES OF THE UPPER COLORADO RIVER BASIN* 7-8 (1980).

149. 16 U.S.C. §§ 661-666c (1982).

150. Federal agencies must consult with the Fish and Wildlife Service and take mitigation measures to alleviate any adverse effects of water resources projects. *E.g.*, *Akers v. Resor*, 339 F. Supp. 1375 (W.D. Tenn. 1972). The Corps of Engineers must consult with the Fish and Wildlife Service even before issuing a dredge and fill permit to a private party. *United States v. Stoeco Homes*, 498 F.2d 597 (3rd Cir.), *cert. denied*, 420 U.S. 927 (1974).

151. 16 U.S.C. §§ 1531-1543 (1982).

152. 16 U.S.C. § 1532 (1982).

including the squawfish, the humpback chub, and the bonytail chub, are listed as endangered.<sup>153</sup> The Endangered Species Act requires the federal proponent of any project that might affect the habitat of an endangered species, as well as federal agencies acting on permits needed by a private project, to consult with the Secretary of the Interior. The Secretary is responsible for ensuring that the action will not "jeopardize the continued existence of such endangered species and threatened species or result in the destruction or modification of habitat of such species."<sup>154</sup>

The United States Fish and Wildlife Service in 1983 issued a draft recovery plan that would require any water project proponent in the Upper Colorado River to ensure substantial minimum streamflows.<sup>155</sup> Many criticized the plan because it portended dramatic effects on future water use in the Colorado, alleging that it was not soundly based on, or compelled by, scientific data. The agency finally agreed to convene a coordinating committee to consider the views of all interested parties, including the Upper Basin states, water developers, and environmentalists, and to reconsider the draft plan.<sup>156</sup>

Congress created the Endangered Species Act to curtail an accelerating extinction of species by human activities. Sensitive species may serve the same function as the canary historically carried into coal mines to detect deadly gas—a bellwether that human existence may be less secure as a result of human effects on the environment. Conceivably, the fate of the squawfish and the humpback chub in the Colorado River is a bellwether; but it is more likely that the issue of how to protect endangered species on the Colorado River turns instead on how to administer an important federal statute in the face of inadequate data. The Act could be invoked to block water development as it was when the snail darter was discovered at the site of Tennessee's Tellico Dam.<sup>157</sup> But its noble purposes notwithstanding, the Act is a crude device for determining how much development is enough and how much of a river should be preserved. The endan-

153. R. BEHNKE & D. BENSON, *supra* note 148, at 9.

154. 16 U.S.C. § 1536 (1982).

155. U.S. DEPARTMENT OF THE INTERIOR, (DRAFT) RECOVERY OF ENDANGERED FISHES OF THE UPPER COLORADO RIVER BASIN (1983).

156. Memorandum of Understanding Between U.S. Fish and Wildlife Service, U.S. Bureau of Reclamation, State of Colorado, State of Utah, and State of Wyoming, August 1984.

157. Tennessee Valley Authority v. Hill, 437 U.S. 153 (1978). *See also* Riverside Irrigation Dist. v. Andrews, — F.2d — (10th Cir. 1985) (Corps of Engineers can consider indirect downstream effects on habitat from changes in water quantity as well as changes in water quality in issuing dredge and fill permits under § 404 of the Clean Water Act). The federal government must strive to accommodate its requirements to the state's interest in allocating water. *Id.*; National Wildlife Federation v. Gorsuch, 693 F.2d 156, 178 (D.C. Cir. 1982); Tarlock, *The Endangered Species Act and Western Water Rights*, 20 LAND & WATER L. REV. 1 (1985).

gered fish of the Colorado may be perpetuated through a program of public and private measures. The possibilities include water releases from federal dams, purchases and appropriations of instream flows, a hatchery and propagation program, and fish passage facilities at dams. Such a program could make water development and some new dams compatible with survival of fish. But the question of what further development is appropriate must be answered by considering issues much broader than the effects of development on endangered fish.

Determining what balance to strike among important values arising from the presence or use of the River belongs in the first instance to the individual states.<sup>158</sup> Most states consider a number of public interest factors before permitting water to be used.<sup>159</sup> These factors are generally extensive enough to allow recreation, aesthetics, economics, and fish and wildlife values to be weighed. The relative weights attributed to each concern may turn on political judgments. Some states, however, narrowly circumscribe considerations for granting a permit to appropriate water and in Colorado there are no requirements beyond a judicial finding that rights of prior appropriators are protected.<sup>160</sup> If rights can be freely traded, the marketplace provides a test of whether society's economic interests are served. But the interests of future generations and of broad segments of the public are rarely fully represented in water rights transactions. Thus, the Basin states should make a deliberate effort to confront the consequences of water development and preservation decisions in a comprehensive, open planning process.

### III. MAXIMIZING THE RIVER'S POTENTIAL

#### A. Storage

The traditional response to problems on the Colorado—and to water supply issues generally—has been to construct water storage facilities. That response becomes less apt in much of the Colorado River Basin as storage opportunities reach their practical and economic limits. Future responses necessarily will emphasize administration and management over physical solutions. Large, federally-funded water projects have been and are essential elements in the River's history and in the economies of Basin states. But the government is unlikely to support much new project construction. For the Upper Basin this change seems inequitable because the faster developing Lower Basin has garnered the bulk of federal water project subsidies.

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158. *California v. United States*, 438 U.S. 645 (1978).

159. See authorities summarized in D. GETCHES, *WATER LAW IN A NUTSHELL* 147-52 (1984).

160. *Id.* at 156-59.

Hoover Dam became the foundation for tremendous economic growth in California by regulating destructive floods, storing irrigation water for fertile desert lands, and supporting the expanding population centers of southern California with water and cheap electric power. A number of smaller dams, most importantly Parker and Davis, were added on the lower mainstem to store and regulate water supplies and generate power. Two large reservoirs in the Upper Basin—Flaming Gorge and Glen Canyon (Lake Powell)—together hold 30,800,000 acre-feet,<sup>161</sup> to protect future Compact deliveries to the Lower Basin. However, in over thirty years since Flaming Gorge was built, and almost as long since Glen Canyon was completed, the only benefits produced have been electric power generation and some flood control. The dams are primarily an insurance policy against future water shortages.

The Lower Basin states are at or near the limits of their Compact entitlements. California has been using in excess of its 4,400,000 acre-feet; Arizona has been impeded in taking its 2,800,000 acre-feet,<sup>162</sup> though not by lack of demand. The completion of Arizona's gargantuan delivery system, the Central Arizona Project (CAP), will soon expose the River to the thirst of the growing Phoenix and Tucson areas—a thirst greater than the state's entire Compact apportionment.

As anticipated by the Compact negotiators, the Upper Basin states have developed much more slowly and their demand for water has not yet approached the copious available supplies. New Mexico alone among the Upper Basin states is in a position to use its entitlement. Utah is building the Central Utah Project (CUP) which, like the CAP, features an aqueduct system to serve areas distant from the River.<sup>163</sup>

Colorado and Wyoming have made the least progress in securing the means to put their Compact waters to use. Eventually it is expected that each state will consume its full share of water. In anticipation of these future needs, Colorado's influential twelve-term congressman, the late Wayne Aspinall, exacted a promise from Congress to build five projects as the price of his support for building the CAP. The 1968 Colorado River Basin Project Act authorizing the CAP stated:

the Secretary is directed to proceed as nearly as practicable

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161. U.S. DEPARTMENT OF THE INTERIOR, 27TH ANNUAL REPORT, COLORADO RIVER STORAGE PROJECT AND PARTICIPATING PROJECTS, FISCAL YEAR 1983 at 11 (1984).

162. U.S. DEPARTMENT OF THE INTERIOR, COLORADO RIVER SYSTEM CONSUMPTIVE USES AND LOSSES REPORT 1976-80 at 34.

163. UTAH DEPARTMENT OF NATURAL RESOURCES, STATE REVIEW, BONNEVILLE UNIT, CENTRAL UTAH PROJECT (Dec. 1984).

with the construction of the [five Colorado] participating Federal reclamation projects concurrently with the construction of the Central Arizona Project to the end that such projects shall be completed not later than the date of the first delivery of water from said Central Arizona Project.<sup>164</sup>

The CAP is nearing completion, but after seventeen years only two of the five Colorado projects are under construction (Dolores and Dallas Creek), two appear to be dead (San Miguel and West Divide), and one has only a remote hope of being constructed (Animas-La Plata). The only viable means for enforcing the commitment is political, yet that avenue has been unsuccessful notwithstanding many years of effort. Judicial enforcement of the commitment, ordering Congress to appropriate funds for an authorized project, would confront separation of powers problems under the Constitution.<sup>165</sup>

### 1. Decline in Federal Funding

Prospects are dim for federal funding of major new water projects in the Basin, whether they have been authorized by Congress or not. The federal government has been generous in its largess for water projects for over seventy years and the Colorado River Basin has been the centerpiece of the Reclamation program.<sup>166</sup> There once was a consensus that Colorado River water development was a national need to be satisfied by national expenditures repayable with project revenues. Now, a strong bipartisan sentiment, based largely on fiscal conservatism coupled with a genuine need to curb government spending, favors curtailing further federal investments in water projects. No new construction on federal water projects has begun in almost ten years.

The federally authorized projects that remain to be built—mainly Upper Basin storage facilities—are difficult to justify economically and would not directly benefit large numbers of people. For instance, Colorado's congressionally-authorized but never-funded Fruitland Mesa Project would benefit only sixty-nine ranchers at a cost of \$82.8 million. Another authorized but unfunded project, Savery-Pot Hook in

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164. 43 U.S.C. § 620 a-1 (1982).

165. Under the spending clause of the United States Constitution, U.S. CONST. art. I, § 9, cl. 7, only Congress can appropriate money. Congress has specified that the enactment of an appropriation act is required before any money can be spent. 31 U.S.C. § 1301(d) (1982). This is so notwithstanding the fact that an expenditure has been authorized, as Congress need not fund the authorization. See *State of Connecticut v. Schweiker*, 684 F.2d 979, 989-90 (D.C. Cir. 1982), *cert. denied*, 459 U.S. 1207 (1983); *Haskins Bros. & Co. v. Morgenthau*, 85 F.2d 677 (D.C. Cir.), *cert. denied*, 299 U.S. 588 (1936).

166. Federal expenditures for construction of water projects in the Colorado River Basin for the period 1903-1980 exceeded 3.66 billion dollars—more than one-half the national total. The full Reclamation budget for the Basin during the same period was 4.92 billion dollars. U.S. BUREAU OF RECLAMATION, 1980 ANNUAL REPORT (Government Printing Office, 1981), appendix 2.



Colorado and Wyoming, would irrigate only 14,650 acres, but would curtail grazing on 21,750 acres and would cost an average of \$700,000 for each ranch served.<sup>167</sup> Some federally authorized projects have more favorable economics. The Animas-La Plata Project shows a 1.6:1 benefit-cost ratio,<sup>168</sup> but has failed to attract enough political support because of its great cost.

In 1977, President Carter deleted eight major water projects from the federal budget for fiscal 1978. All previously authorized projects and all new projects were to be reviewed by the Water Resources Council after a study that considered environmental factors and non-structural alternatives pursuant to principles and standards that had been in effect for several years.<sup>169</sup> President Carter aroused western ire when he announced that approval was to be contingent upon a number of things, including a showing that the benefit-cost ratio of a project was greater than one to one.<sup>170</sup> The Reagan Administration adopted an ostensibly more flexible set of "Principles and Guidelines" for evaluation of projects that allows consideration of a variety of national and regional benefits from economic development.<sup>171</sup> The new approach, however, has not enabled construction of any new projects or funding of long-authorized water development.

Reagan Administration policy requires that the states bear a portion of the initial costs of any water project to be funded by the United States.<sup>172</sup> This not only reduces the federal obligation, but is a measure of a project's importance to the state. The objection of some congressional leaders to the concept, however, has blocked proposals that included provisions for cost-sharing.<sup>173</sup>

The near demise of federal funding, and rigid conditions of feasibility and state cost-sharing shift the onus of water project financing to state and private sources. A state may decide to finance a project with little immediate utility in order to protect future access to supplies or

167. P. FRADKIN, *supra* note 143, 11-12.

168. U.S. BUREAU OF RECLAMATION, WESTERN COLORADO PROJECTS REVIEW 83 (1983). The benefit-cost ratio was calculated by discounting annual benefits over a one-hundred year period at a rate of 3.25 percent and amortizing project costs over 100 years at 3.25 percent simple interest. U.S. Bureau of Reclamation, *Animas-La Plata Project, Colorado-New Mexico, Definite Plan Report* 140, 144 (1979).

169. Principles and Standards for Planning Water and Related Land Resources, 38 Fed. Reg. 24, 778 (1973) (formerly codified at 18 C.F.R. §§ 711, 713, 714 and 716).

170. R. LAMM & M. MCCARTHY, *THE ANGRY WEST* 186 (1982).

171. Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies, 48 Fed. Reg. 10, 259 (1983). The Missouri Department of Conservation and an environmental group has challenged the legality of replacing the principles and standards with the new principles and standards. *National Wildlife Federation v. Clark*, No. 84-2272 (D.D.C. filed July 24, 1984).

172. See Letter from Ronald Reagan to Paul Laxalt (Jan. 24, 1984).

173. Interstate Conference on Water Problems, 3 WASHINGTON REPORT 2-5 (Nov. 1984).

to support an important industry, like agriculture, that has difficulty paying its own way. But staggering costs are likely to thwart most projects. State finances in the Upper Basin have suffered considerably in recent years.<sup>174</sup> Tax bases are growing but state legislatures are under pressure to keep taxes down, to assume functions now being abdicated to state and local governments by the federal government, and to meet growing infrastructure needs. This will compel scrutiny of the economics of any water project proposed for state funding. State financial assistance is likely to depend on a comparison of the expected benefits from several competing projects and a showing that the project is not one that private enterprise or local governments could finance and build. States also must weigh competing needs for rehabilitation and repairs of existing facilities. A dam that is in poor repair and must be operated at less than its full capacity for safety reasons can impair existing water uses. Repairs have immediate effects and may be more cost effective than building new storage facilities.

An innovative approach to publicly-supported water project finance has been proposed by Colorado Governor Richard D. Lamm. He has urged that rates for hydroelectric power generated by federal dams in the Upper Basin be raised from their present below-market levels<sup>175</sup> to produce enough revenue to construct water projects needed by Upper Basin states.<sup>176</sup> A federal enactment would be required to reflect current construction costs of new projects in the Colorado River Storage Project rate base.<sup>177</sup> Funds available to a state would be limited to a sum sufficient to reach a level of water development anticipated by the water projects Congress has already authorized for the state. Thus, states would still have to consider the relative economic and other benefits of projects, forcing them to choose only the most important projects to be built. They would not need to build the authorized projects but could build smaller projects, repair and rehabilitate existing facilities, and make existing water uses more efficient.

Whatever sources of capital are used for future water projects, public or private, financing will be more difficult. Capital markets are

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174. Stanfield, *Governors, Mayors Turn from Seeking More Power to Fending Off Aid Cuts*, National Journal, January 22, 1983 at 166. The States' Red-Ink Blues, Newsweek Feb. 28, 1983, at 19; Chart, *Fiscal Condition of the 50 States*, National Journal, February 5, 1983, at 295.

175. See *supra* notes 89-91, and accompanying text.

176. See *supra* note 99.

177. The Colorado River Storage Project as amended limits rates to an amount necessary to repay the costs of authorized facilities within the project, costs of operation, maintenance, replacement and salinity control. 43 U.S.C. § 620d (1982). See *supra* notes 89-99 and accompanying text.

now and will, for the foreseeable future, be dominated by massive federal borrowing to finance deficit spending and to service the national debt. All borrowers, whether governmental or private, will encounter stiff competition and high interest rates. The limited availability and high cost of money surely will limit construction of water projects to those that are the most needed.

## 2. Environmental Limitations

The limited number of feasible sites is a significant restraint on construction of major new storage facilities. Reservoirs already have been built at the sites best located and configured for water storage. Many remaining sites are unacceptable for environmental reasons. Dam building can be unacceptable to the public because it harms natural assets. In the 1950s, plans for the Echo Park Dam on the Yampa River were dropped when the project encountered strong opposition because it would have flooded a significant portion of Dinosaur National Monument. The Colorado River Storage Project Act would not have passed without the Echo Park. The Act was needed to fund projects so the Upper Basin states could use their Compact share and satisfy Compact obligations to the Lower Basin.<sup>178</sup> A similar battle was fought over congressional authorization of the Marble Canyon and Bridge Canyon Dams that were proposed to be located above and below Grand Canyon, and which would have altered the River's flow through the Grand Canyon National Monument. Deletion of the proposal allowed the passage of the Colorado River Basin Project Act which authorized the Central Arizona Project.<sup>179</sup> Environmentalists were unsuccessful, however, in their efforts to prevent Lake Powell (behind Glen Canyon Dam) from being completely filled; they argued that it would impair the scenic beauty and jeopardize the integrity of Rainbow Bridge National Monument.<sup>180</sup>

Because of the high level of existing development, the efficacy of new water projects for the Basin as a whole is questionable. Some studies show that because of huge evaporative losses—now approaching 2,000,000 acre-feet a year from Colorado River reservoirs<sup>181</sup>—the

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178. Mann, *Conflict and Coalition: Political Variables Underlying Water Resource Development in the Upper Colorado River Basin*, 15 NAT. RESOURCES J. 141, 154-56 (1975).

179. *Id.* at 158-61.

180. *Friends of the Earth v. Armstrong*, 485 F.2d 1 (10th Cir. 1973), *cert. denied*, 414 U.S. 1171 (1974). See also *Badoni v. Higginson*, 638 F.2d 172 (10th Cir. 1980), *cert. denied*, 452 U.S. 954 (1981) (rejecting claims of Navajo Indians that the filling of Lake Powell and Park Service access policies would interfere with religious practices centering around Rainbow Bridge, a traditionally sacred area).

181. Under current operating conditions evaporation is estimated at 599,000 acre-feet from Upper Basin reservoirs and 1,120,000 acre-feet from Lower Basin reservoirs. U.S. DEPARTMENT OF THE INTERIOR, *supra* note 162, at 24, 32.

useful limits of storage as drought protection have been reached.<sup>182</sup> Nevertheless, new storage still may be needed to meet local or regional needs.

More than ever before, there is a solid front of political opposition to further large project development on the River. Zeal for total exploitation has been tempered as threats to the River's native elegance increase. Citizens' groups have become increasingly vocal, insisting that some of the West's natural amenities be saved from subjugation to human enterprise. The enchantment of the early explorers has been rekindled in those who believe that some of the River belongs to wild-life, or that stretches must be preserved so that unborn generations can have glimpses of what enthralled John Wesley Powell in his epic, 1869 scientific exploration-turned-adventure.<sup>183</sup>

Today, opponents of dam development rely on more than aesthetic preferences and appeals based on the importance of protecting our natural heritage. They cite the economic value of recreation and tourism.<sup>184</sup> Further, they have strong allies in fiscal conservatives; together they insist on the necessity to restrain government spending for water projects. States must carefully rethink the importance of long-planned water projects and must study new financing mechanisms for projects that are needed.<sup>185</sup> As cost-effectiveness becomes a paramount consideration, expenditures of limited funds are likely to be for small regional projects, water conservation measures, and rehabilitation of existing facilities.

### *B. Efficient Agricultural Use*

Federal and state studies of agricultural water use have universally urged better conservation efforts.<sup>186</sup> Increased efficiency could alleviate shortages and extend supplies. Just as the United States "found" a significant supply of oil through conservation during the energy crisis of the 1970's,<sup>187</sup> water could be found through water con-

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182. Hardison, *Potential United States Water-Supply Development*, J. Irrigation and Drainage Division, 1972 Proc. Am. Soc'y Civ. Engineers 479 (Sept. 1972); Langbein, *Water Yield and Reservoir Storage in the United States*, U.S. GEOLOGICAL SURVEY CIR. 409 (1959).

183. J. POWELL, *THE EXPLORATIONS OF THE COLORADO RIVER AND ITS CANYONS* (1961).

184. See *supra* notes 144-45 and accompanying text.

185. E.g., R. SMITH, *TROUBLED WATERS: FINANCING WATER IN THE WEST* (1985).

186. E.g., NATIONAL WATER COMMISSION, *WATER POLICIES FOR THE FUTURE* 227-30 (1973); U.S. DEPARTMENT OF THE INTERIOR, *CRITICAL WATER PROBLEMS FACING THE ELEVEN WESTERN STATES* (1975); U.S. WATER RESOURCES COUNCIL, *THE NATION'S WATER RESOURCES 1975-2000*; STATE OF CALIFORNIA, *FINAL REPORT, GOVERNOR'S COMMISSION TO REVIEW CALIFORNIA WATER RIGHTS LAW 71-72* (1978) (list of measures recommended to increase efficiency of water use).

187. For example, in 1983 gasoline consumption in the United States dropped to 6.1 million barrels per day, far less than the peak of 7.6 million barrels per day in 1978; less even than the 6.4 million barrels per day used in 1972. U.S. News and World Report, Feb. 21, 1983, at 65.

ervation measures. There are tremendous opportunities for conservation of water in agriculture.<sup>188</sup> One report estimates that irrigation water waste annually amounts to some 24,000,000 acre-feet.<sup>189</sup> Because most water use in the Colorado River Basin is for agriculture,<sup>190</sup> irrigation efficiency is of particular concern.

There are promising technologies for conserving agricultural water including: new drip irrigation systems instead of flooding fields; gated pipes to reduce seepage, evaporation, and evapotranspiration instead of open ditches; laser leveling of fields to reduce runoff; electronic sensors to indicate with precision how much water is needed; computers to schedule irrigation; and a variety of other approaches.<sup>191</sup> But technologies are costly and may not be economically justified or accommodated by present state laws.

### 1. Legal Doctrine and Conservation

One has never had a right to waste water under the prior appropriation system; the right is only to put water to a "beneficial use."<sup>192</sup> If a use is within the state law definition of beneficial use, i.e., an agricultural use, a municipal use, etc., there are few opportunities to ask whether all the water used is necessary for the beneficial use or whether the use is relatively less beneficial than other possible uses. Thus, senior irrigators may hold rights to, and may actually divert and consume, far more water than they need. Some believe full use of water rights is necessary to maintain the quantity of their rights, although the trend in state law is to discourage such practices.

The concept of beneficial use is maturing. Courts are increasingly demanding more than simply putting water to some use that is nominally "beneficial." The Colorado Supreme Court has interpreted beneficial use to require the use to be consistent with maximum utilization of the water. Thus "it is implicit in these constitutional provisions [stating that 'the right to divert unappropriated waters of any natural

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188. *E.g.*, U.S. COMPTROLLER GENERAL, MORE AND BETTER USES COULD BE MADE OF BILLIONS OF GALLONS OF WATER BY IMPROVING IRRIGATION DELIVERY SYSTEMS GAO CED-77-117 (1977); U.S. GENERAL ACCOUNTING OFFICE, BETTER WATER MANAGEMENT POSSIBLE — BUT CONSTRAINTS NEED TO BE OVERCOME GAO CED-79-1 (1978).

189. U.S. Soil Conservation Service, *Crop Consumptive Irrigation Requirements and Irrigation Efficiency Coefficients for the United States*, appendix to NATIONAL ANALYSIS, SECOND NATIONAL WATER ASSESSMENT (1976). *See generally*, Pring & Tomb, *License to Waste: Legal Barriers to Conservation and Efficient Use of Water in the West*, 25 ROCKY MTN. MIN. L. INST. 25-1 (1979).

190. Gardner & Stewart, *Agriculture and Salinity Control in the Colorado River Basin*, 15 NAT. RESOURCES J. 63, 64 (1975).

191. *See generally* U.S. OFFICE OF TECHNOLOGY ASSISTANCE, WATER-RELATED TECHNOLOGIES FOR SUSTAINABLE AGRICULTURE IN U.S. ARID/SEMIARID LANDS (1983).

192. *See Note*, *Water Waste — Ascertainment and Abatement*, 1973 UTAH L. REV. 449 (1973).

stream to beneficial uses shall never be denied'] that, along with vested rights, there shall be maximum utilization of the water of this state." The Court said that this followed from the "principle that the right to water does not give the right to waste it."<sup>193</sup> Similar approaches have been taken in other states.<sup>194</sup>

The most notable legal restriction is that one may only transfer to another the right to use the quantity of water that has historically been consumed for a beneficial use.<sup>195</sup> This may be an amount other than simply the difference between the amount diverted and the amount returned to the stream. In quantifying historical use, Colorado courts will determine the amount of water required for the particular purposes to which it has been applied. Evidence may include soil conditions, proximity to the stream, crop requirements, average precipitation, and the efficiency of irrigation.<sup>196</sup>

Courts generally hold that the means of diversion must be reasonably efficient. They differ on the time when reasonableness is determined and on the consequences of finding that the means are unreasonable. In one case, the Montana Supreme court found that an earth and debris wing dam was "reasonable" by contemporary standards when it was built and therefore would be protected against upstream diversions that rendered it useless.<sup>197</sup> But the Oregon Supreme Court said that while crude and inefficient diversion means may be adequate to establish a right by appropriation, more efficient, modern methods must be adopted when available.<sup>198</sup> The United States Supreme Court has suggested, too, that an unreasonable and inefficient means of diversion cannot be maintained where it interferes with the reasonable use of water by others.<sup>199</sup>

The Colorado Supreme Court has held that a groundwater pumper must have a "reasonable means of diversion" in order to be protected against aquifer depletions by other pumpers who render the pumper's well useless.<sup>200</sup> The principle has not been fully extended to

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193. *E.g.*, *Fellhauer v. People*, 167 Colo. 320, 336, 447 P.2d 986, 994 (1968).

194. *E.g.*, *Erickson v. Queen Valley Ranch Co.*, 22 Cal. App. 3d 578, 99 Cal. Rptr. 446 (1971); *Glenn Dale Ranches, Inc. v. Shaub*, 94 Idaho 585, 494 P.2d 1029 (1972); *Kaiser Steel v. W. S. Ranch Co.*, 81 N.M. 414, 467 P.2d 986 (1970); *Warner Valley Stock Co. v. Lynch*, 215 Ore. 523, 336 P.2d 884 (1959); *Lower Colorado River Auth. v. Texas Dept. of Water Resources*, 638 S.W.2d 557 (Tex. Ct. App. 1982); *In re Waters Rights of Escalante Valley Drainage Area*, 10 Utah 2d 77, 348 P.2d 679 (1960); *Basin Elec. Power Coop. v. State Bd. of Control*, 578 P.2d 557 (Wyo. 1978).

195. *City of Westminster v. Church*, 167 Colo. 1, 445 P.2d 52 (1968).

196. *E.g.*, *Green v. Chaffee Ditch Co.*, 150 Colo. 91, 371 P.2d 775 (1962).

197. *State ex rel Crowley v. District Court*, 108 Mont. 89, 88 P.2d 23 (1939).

198. *In re Willow Creek*, 74 Ore. 592, 144 P. 505 (1914). *Cf. In re Water Rights in Silvies River*, 115 Ore. 27, 237 P. 322 (1925).

199. *Schodde v. Twin Falls Land & Water Co.*, 224 U.S. 107, 113 (1912).

200. *City of Colorado Springs v. Bender*, 148 Colo. 458, 366 P.2d 552 (1961).

the use of surface water, but the Colorado court has suggested that we may be entering an era when irrigation ditch lining can be required.<sup>201</sup> Recent cases judge reasonableness of a diversion in light of today's technology and conditions. A leaky, unlined irrigation ditch that was the state of the art seventy-five years ago may be found wasteful today and lose legal protection as against others whose water use would be limited by protecting the inefficient diversion. A simpler, more severe method is to count all water lost by a ditch or other delivery system as delivered in satisfaction of one's water right.<sup>202</sup>

Requirements for efficient diversion methods and historical use limitations can be applied in a variety of ways. Some states demand a forfeiture of water rights that are used wastefully.<sup>203</sup> Traditionally forfeiture has been applied to terminate water rights not used at all for a statutory period. As the definition of beneficial use evolves to require efficiency, enforcement of the forfeiture laws can be an especially powerful tool to eliminate waste. A forfeiture proceeding need not await a proposed change in use but can be initiated at any time and, in some states, by anyone.

Basinwide management is an especially important means of water conservation. Water users depending on the same stream or portion of a stream system can cooperate to make the resource go farther. The prior appropriation doctrine allows senior users to use their full legal rights, even when it means applying water in larger amounts than is necessary, and to store water, even as junior users get none. There is no requirement that shortages be shared. But water users are learning to share storage facilities and to trade or lease water in times of shortage to stretch supplies and maximize overall benefits. Payments to those with senior rights recognize their rights while holders of junior rights can use water when they would not otherwise be able to do so. Basinwide management depends on the availability of data concerning existing supplies and legal rights; an ability to make reliable projections about future water needs and natural supplies; and the means to exchange information among water users. Computer technology and aggressive state programs to encourage cooperative efforts can lead to successful basinwide management.

The Law of the River should not be viewed as a disincentive to

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201. *A-B Cattle Co. v. United States*, 196 Colo. 539, 589 P.2d 57 (1978).

202. *Glenn Dale Ranches v. Shaub*, 94 Idaho 585, 494 P.2d 1029 (1972).

203. *E.g.*, *State v. McLean* 62 N.M. 264, 308 P.2d 983, 988-89 (1957). *See generally* Shupe, *Waste in Western Water Law: A Blueprint for Change*, 61 OR. L. REV. 483 (1982). Abandonment of water rights, as opposed to forfeiture, requires a showing of intent to abandon as well as non-use. To further the policy of extinguishing unused rights, some courts have adopted a rebuttable presumption of an intent to abandon. *E.g.*, *Rand v. Pitsch*, 666 P.2d 215 (Mont. 1983).

conservation. It might be argued that it is in the interest of the Upper Basin states *not* to use water efficiently so long as their full Compact entitlements are unused. The argument rests on a misconception that the Compact requires a state to "use it or lose it." Compact negotiations were, of course, animated by the Upper Basin's desire to protect a share of water so that it could develop later than the Lower Basin, at its own pace. The result reflects that purpose. It could only be changed if the Compact were renegotiated or the Lower Basin states succeeded in getting the United States Supreme Court to review the matter under equitable apportionment principles.<sup>204</sup> In the unlikely event that judicial or legislative scrutiny were focused on the "equity" of an allocation of uses between the Upper and Lower Basins, a full, but wasteful, early Upper Basin use would not "protect" Upper Basin Compact apportionments. The Supreme Court has held in a recent equitable apportionment case, that a prior, established New Mexico water use could not be sustained against a new Colorado use where the older use was wasteful and the newer use efficient.<sup>205</sup> The decision suggests that the Court would look carefully at the relative efficiencies of competing uses in the two basins and that prior but inefficient Upper Basin uses would provide little protection.

## 2. Conservation and Economics

The most effective boon to efficient water use is pricing. There is broad agreement that water conservation would be promoted if water were priced to reflect the direct and indirect costs of development, storage, transportation, quality protection, and delivery.<sup>206</sup> Agricultural water use is especially sensitive to price increases.<sup>207</sup> Subsidies have made users' costs artificially low, creating an incentive for irrigators to apply water with little consideration for the overall costs to society. As water is attracted to new and more profitable uses, its price to all users will rise, reflecting more closely its real value to society. Therefore, if agricultural users are to survive, their water use practices must change.

For many, farming is marginally profitable, at best. Although some improvements in water efficiency can be costly, because improve-

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204. See *supra* notes 34 and 36, and accompanying text.

205. *Colorado v. New Mexico*, 103 S. Ct. 539 (1982). In later considering the case the Court upheld New Mexico's claim because Colorado could not yet show concrete plans to demonstrate the new, efficient uses it intended. *New Mexico v. Colorado*, 104 S. Ct. 2433, 2442 (1984).

206. Meyers & Posner, *Toward an Improved Market in Water Resources*, in NATIONAL WATER COMMISSION, LEGAL STUDY NO. 4 (1971).

207. L. GISSER, R. MYERS & R. RESTA, *WATER DEMAND AND SUPPLY IN THE ALBUQUERQUE URBAN AREA 1975-2030* at 24-27 (1977).



ments in conveyancing and storage systems to eliminate seepage, evaporation, and evapotranspiration require expensive construction, other efficiency enhancing measures are not. Ceasing application of water in excess of crop needs, lining ditches with cheap plastic film, and removing water-sucking phreatophytes along ditches and streams are all relatively inexpensive and improve efficiency greatly.

Because irrigation water is usually applied at times and in amounts dictated by the extent of one's water rights and by custom rather than by need, water usage could be reduced without negative economic effects by seeking to optimize crop yield, rather than maximizing it.<sup>208</sup> Ideally, farmers should apply less water per acre as water costs increase faster than the relative increase in crop prices. Somewhat less may be produced per acre, but the cost of production (specifically the cost of water) can be reduced dramatically. Thus, lower yields may be as profitable, even more profitable, if water saving techniques are used. Conversion to new techniques may be induced by rising water costs.

As water cost rises, farmers may shift to higher valued crops (e.g., vegetables, citrus, and nuts). The farmer's return from the same land can increase while using less water. But a shift is risky and may require a high initial investment and greater production costs. If too many farmers shift crops, the market can become saturated, driving down prices and profits. The extent of demand for certain new crops (e.g., guayule, jojoba, crambe, buffalo gourd) that require less water or that can be produced with saline water, is unknown. In addition, knowledge of the means of production and processing and marketing facilities are limited. Extensive research in this area is warranted. Other inexpensive and immediately available measures for reducing water use while increasing yields include innovative cropping practices such as rotating crops, multiple cropping, and leaving crop residues (minimizing tillage).<sup>209</sup>

Although market pricing of water is inhibited by political resistance (especially where it could cause difficulties for farmers and ranchers),<sup>210</sup> the surviving agricultural enterprises might enjoy a strong, profitable business if prices for their products reflected the increased costs. This depends in part on whether they could, or would, need to

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208. See Lacewell & Collins, *Implications and Management Alternatives for Western Irrigated Agriculture*, Technical Article 17807 of the Texas Agricultural Experiment Station (n.d.).

209. *Id.*

210. A. KNEESE & F. BROWN, *supra* note 60, at 73, 92. "It is the human institutions that prevent . . . the transfer of water from agricultural uses into other, more highly valued uses."

compete with similar products from other regions.<sup>211</sup>

If agriculturalists are induced to sell their water rights, they should be compensated for their reasonable expectations of economic gain from farming, not forced to accept a distress price. A healthy market should be fair to those who sell rights, while moving water use to the highest valued, most efficient purposes. Of course, the market ignores personal preferences for farming over a cash payoff, and may disregard the intangible value of maintaining a viable pastoral society.

Virtually all Colorado River Basin states allow transfers of water rights. Markets in water are inhibited, however, by steep transaction costs including fees for lawyers and experts. Most change of use procedures are designed to protect all existing uses regardless of their value relative to the new use. In applying the rule, it may be appropriate to demand that an existing use be reasonably efficient before it could prevent a change in use.

A significant impediment to market transactions in water is the rule that prohibits reuse or successive uses of water on land other than the land for which the water was originally appropriated.<sup>212</sup> If a water user invests money and labor to conserve water that once was consumed, the law does not ordinarily allow the water saved to be used on other land or to be sold to another. California, however, has recently enacted legislation giving the benefit of conservation efforts to the salvager.<sup>213</sup> Such laws allow agricultural users to finance water conservation with sales of water saved. Municipal and industrial growth may be sustained on savings in agricultural consumption and farms that might otherwise have been dried up can survive on less water.

Water interests in southern California are discussing perhaps the grandest agricultural water conservation scheme ever. The Metropolitan Water District of southern California (MWD) has sought additional supplies to meet anticipated shortfalls when Arizona begins using its full Compact apportionment. The Imperial Irrigation District (IID) is the largest of a few agricultural users that consume most of California's apportionment of Colorado River water, and which have top priority for that water. Following a State Water Resources Control Board decision that found that the IID was misusing vast amounts of River water,<sup>214</sup> the IID moved to accept an Environmental

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211. Lacey & Collins, *supra* note 208, conclude that the impacts of water prices in the Colorado River Basin are unlikely to reach beyond the region.

212. *E.g.*, Salt River Valley Water Users' Ass'n. v. Kovacovich, 3 Ariz. App. 28, 411 P.2d 201 (1966).

213. CAL. WATER CODE §§ 380-386, 1009-1011 (1984).

214. *In Re Alleged Waste and Unreasonable Use of Water by Imperial Irrigation District*, California State Water Resources Control Board, Decision No. 1600 (June 21, 1984); *see also* Elmore v.

Defense Fund suggestion that municipal users pay the cost of pipes and lined canals for IID in return for a share of IID's reduction in water consumption. The proposal could result in IID saving up to 400,000 acre-feet of water yearly which would then be available to MWD.<sup>215</sup>

Conceivably, Lower Basin interests could pay for all or part of the cost of water-saving measures to control Upper Basin agricultural consumption and thereby to maximize the amount of deliverable surpluses over the guaranteed Compact deliveries, without reducing Compact entitlements needed for Upper Basin users. Some studies show that the marginal value of water used in the Lower Basin far exceeds that of water used in the Upper Basin.<sup>216</sup> Consequently, although investments in water conserving technologies in the Upper Basin may not seem justified to Upper Basin users, the Lower Basin may be interested in contributing to the effort.

More efficient agricultural use could make more water available for growth in all of the Colorado River Basin states, most immediately in the water-short Lower Basin. It also could ease competition between agriculture and other users as the Upper Basin grows. To the extent more water were kept in streams it would address the needs of wildlife and recreationists. In a time of limited funds for water projects, investments in water efficiency may be especially wise. Like storage projects, conservation through more efficient use can help Upper Basin states to make guaranteed Compact deliveries to the Lower Basin in dry periods. Indeed, increased efficiency can provide a substantial cushion against the vicissitudes of nature at lower cost than large storage facilities. Where necessary, state laws must be changed to allow those who invest in water efficiency to be able to reap the benefits.

### *C. Salinity Control*

The consumable limits of the Colorado River may be felt first not in the quantity of water it produces but in the quality of the water. Salinity is the main quality problem of the River—increased concentration of dissolved solids.<sup>217</sup> The problem has many natural causes,

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Imperial Irrigation Dist., 159 Cal. App. 3d 185 (1985) (district has duty to avoid wasting water and causing excessive drainage). Measures to conserve water had been urged by environmentalists. Environmental Defense Fund Letter, June 1983.

215. Holburt, *Agreements Could Stretch Colorado's Supply*, 18 Colorado River Association News Letter 3 1983.

216. B. Harding, *Possibilities for Unified Operation in a Divided Basin* (May, 1984) (unpublished manuscript).

217. A. KNEESE & F. BROWN, *THE SOUTHWEST UNDER STRESS* 46-47 (1981). See U.S. ENVI-

but is exacerbated by human activity. Highly saline water from salt springs, and runoff picking up salts from underlying soils is made worse by the evaporation of water in reservoirs which expose large water surfaces to the air for a long time, and by the addition of agricultural return flows that increase in salt concentrations as water leaches salts from cultivated fields during successive reuse.

### 1. The Need To Reduce Salinity

The impetus to control salinity of the Colorado River comes from two sources. The federal government has assumed a legal obligation to deliver water to Mexico having a maximum salt content. Although the Mexican obligation was the primary reason for a salinity control program, the driving force of salinity control efforts now is a desire to protect the Lower Basin economies. A multi-faceted federal program of salinity control and reduction includes improvements in the transportation and application of agricultural water, interception of natural salt sources, and grandiose schemes to remove salts from the River's water once it reaches the Lower Basin.<sup>218</sup>

A major international controversy with Mexico was touched off when salinity levels in water reaching Mexico at the foot of the River rose dramatically to 2,700 parts per million (ppm) in 1961, making it useless for irrigation. The Welton-Mohawk Irrigation and Drainage District in Southern Arizona had begun dumping saline wastes in the River. These wastes were pumped from over a hundred wells drilled by the Bureau of Reclamation to remove saline groundwater. The water table was rising because of excessive application of irrigation water imported to the district from the Colorado, and was killing crops. The saline waste water was inadequately diluted in the River because of heavy United States consumption and because the Glen Canyon Dam was being filled.<sup>219</sup>

The 1944 Treaty entitling Mexico to 1,500,000 acre-feet a year of Colorado River water did not address water quality.<sup>220</sup> But negotia-

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RONMENTAL PROTECTION AGENCY, THE MINERAL QUALITY PROBLEM IN THE COLORADO RIVER BASIN — SUMMARY REPORT (1971); U.S. DEPARTMENT OF THE INTERIOR, QUALITY OF WATER IN COLORADO RIVER BASIN, PROGRESS REPORT NO. 12 at 12-14 (1984) [hereinafter cited as QUALITY OF WATER]. The history of the Colorado River salinity problem and the legal issues are covered in the several articles in the *International Symposium on the Salinity of the Colorado River*, 15 NAT. RESOURCES J. 1-239 (1975) [hereinafter cited as *International Symposium*].

218. *International Symposium*, *supra* note 217.

219. Bulson, *Colorado River Salinity Problem: Has a Solution Been Found?*, 9 INT'L. LAW. 283, 285 (1975); Brownell & Eaton, *The Colorado River Salinity Problem with Mexico*, 69 AM. J. INT'L. L. 255, 256 (1975).

220. Treaty with Mexico, Feb. 3, 1944, T.S. No. 994, 59 Stat. 1219. See Meyers & Noble, *The Colorado River: The Treaty with Mexico*, 19 STAN. L. REV. 367 (1966-67).

tions produced assurances that water deliveries would be of a certain quality. In 1965 an agreement was reached by the International Boundary and Water Commission requiring Welton-Mohawk drainage water to be returned to the River below the Morelos Dam, the Mexican diversion point.<sup>221</sup> This led to the construction of elaborate drainage works. After some remedial measures were taken, the concentration of dissolved solids in 1968 was 1,269 ppm while about twenty miles upstream at the Imperial Dam in the United States the concentration was 811 ppm.<sup>222</sup> Mexico remained dissatisfied. In 1972, the United States agreed to substitute higher quality water for the drainage water sent south of the border.<sup>223</sup> Then, in 1973, the United States promised to construct a desalination plant above Morelos Dam.<sup>224</sup> The agreement was implemented by the Colorado River Basin Salinity Control Act which authorized the plant and associated works.<sup>225</sup>

## 2. The Salinity Control Program

The desalination plant being constructed at Yuma, Arizona, will cost nearly half a billion dollars,<sup>226</sup> some five times the original estimates, and is scheduled for completion in 1989.<sup>227</sup> The United States could have eliminated the need for the plant by buying the farms in all or a portion of the Welton-Mohawk project, many of which were not productive or profitable enough to justify their use of huge quantities of water. Though it would have been a cheaper solution to the problem, it was politically infeasible.

A package of controls was included in the 1974 Colorado River Basin Salinity Control Act.<sup>228</sup> The measures include construction of projects to avoid returns of highly saline irrigation water, canal lining, interception of natural sources of salinity, and wells to develop supplemental water. Possible measures to reduce water use through economic incentives or charges, or requiring improved irrigation

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221. Minute 218, 4 INT'L LEGAL MATERIALS 545 (1965); 55 *Department of State Bulletin* 555 (1965).

222. See Martin, *Economic Magnitudes and Economic Alternatives in Lower Basin Use of Colorado River Water*, 15 NAT. RESOURCES J. 229 (1975).

223. Minute 241, 67 *Department of State Bulletin* 198 (1972).

224. Minute 242, 12 INT'L LEGAL MATERIALS 1105 (1973); 69 DEP'T ST. BULL. 395 (1973).

225. Act of June 24, 1974, Pub. L. No. 93-320, 88 Stat. 266 (codified at 43 U.S.C. § 1591).

226. Telephone interview with Glen Billings, U.S. Bureau of Reclamation, Yuma, Arizona (March 1, 1985).

227. U.S. DEPARTMENT OF THE INTERIOR, 2 BUDGET JUSTIFICATIONS, F.Y. 1984, BUREAU OF RECLAMATION, pp. BR-282, BR-287 (1982).

228. 43 U.S.C. § 1591.

efficiency<sup>229</sup> are not parts of the program, although it had been suggested that these methods would be cost effective.<sup>230</sup>

The Bureau of Reclamation estimates the future damage to Lower Basin users from each milligram per liter (mg/l) of total dissolved solids (salts) to be \$561,000.<sup>231</sup> Seven salinity control projects have been completed or are under construction. Only two are in the Lower Basin. Four involve improvements to agricultural irrigation systems or on individual farms (Coachella Valley, California; Lower Gunnison, Colorado; Grand Valley, Colorado; McElmo Creek, Colorado).<sup>232</sup> One (Las Vegas Wash, Nevada) is designed to control seepage of wastewater from manmade sources in a natural drainage channel. Two control natural sources of salt (Meeker Dome, Colorado, and Paradox Valley, Colorado). And another dozen projects are being studied.<sup>233</sup>

The Federal Water Pollution Control Act (now the Clean Water Act),<sup>234</sup> as well as the 1974 Salinity Control Act, apply to salinity control. The Clean Water Act regulates water quality, requiring limitations on salt concentrations. The government sets effluent standards restricting the amounts of various pollutants that can be discharged from "point sources" such as pipes and ditches.<sup>235</sup> Discharges are subject to permits under a "National Pollutant Discharge Elimination System" (NPDES). Irrigation return flows outside the definition of "point sources,"<sup>236</sup> although they may contain agricultural chemicals (as well as dissolved solids) that can cause serious pollution problems.<sup>237</sup> The Clean Water Act also provides federal authority to

229. See Mann, *Politics in the United States and the Salinity Problem of the Colorado River*, 15 NAT. RESOURCES J. 113, 126-27 (1975).

230. Martin, *supra* note 225; S. WEATHERFORD, WATER AND AGRICULTURE IN THE WESTERN U.S.: CONSERVATION, REALLOCATION AND MARKETS 29 (1982).

231. J. KLEINMAN & N. BROWN, COLORADO RIVER SALINITY, ECONOMIC IMPACTS ON AGRICULTURAL, MUNICIPAL, AND INDUSTRIAL USERS (1980); QUALITY OF WATER, *supra* note 218, at 15. The damage estimate is in 1984 dollars, based on concentrations of dissolved solids at Imperial Dam.

232. QUALITY OF WATER, *supra* note 218, at 65-77.

233. *Id.* at 77-90 (1982).

234. 33 U.S.C. § 1251.

235. 33 U.S.C. § 1342.

236. A point source is defined as:

any discernable, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture.

33 U.S.C. § 1362(14) (1982). The last sentence of the definition was added in 1977 after an administrative exemption was overturned. *NRDC v. Costle*, 568 F.2d 1369 (D.C. Cir. 1977). For legislative history see 1977 U.S. CODE CONG. & AD. NEWS 4326. It is possible, though unlikely, that Congress will close the gap in coverage of the Act left by exemption of agricultural irrigation. See Lazarus, *Nonpoint Source Pollution*, 2 HARV. ENV'T'L L. REV. 176 (1977).

237. NATIONAL WATER COMMISSION, *supra* note 186, at 66-67.

control the overall water quality of streams. The job of issuing NPDES permits is usually assigned to the states,<sup>238</sup> but if they do not take sufficient action to preserve water quality, the United States may intercede.<sup>239</sup>

Congress failed to create any Basinwide entity or management system to deal with salinity control. In 1973, however, the Basin states formed the Colorado River Basin Salinity Control Forum because of mutual concerns about federal programs under the Clean Water Act and the Salinity Control Act. The governors of each state appointed representatives to the Forum. In 1975, the Forum set Clean Water Act water quality standards for salinity and developed an implementation plan for controlling salinity levels. Numeric salinity standards reflected average concentrations at three points in the Lower River. The plan relied largely on federally-funded construction of salinity control projects authorized by the Colorado River Salinity Control Act. The Forum and its member states have actively advocated funding and construction of the projects, recognizing full use of Compact-apportioned waters of the River may be impossible if the standards cannot be met. The Forum has become a model for interstate cooperation.

A number of proposed salinity control projects will not be built because they are infeasible, uneconomic, or have been subject to local opposition. Further, there is no assurance that the projects, once built, will be as effective as planned. Consequently, the Forum has developed policies which encourage industrial use of brackish and saline water and which urge NPDES permitting by the Basin states that will limit point source discharges of salts.<sup>240</sup>

The Basinwide approach to water quality, without salinity standards or monitoring within, or at, the borders of each state, has been

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238. 33 U.S.C. § 1251(b) (1982). Congress decided to give the states primary authority to set standards for the quality of waters within their boundaries. It was concerned that centralizing the function would upset the delicate balance of federalism concerns in the Clean Water Act. See H.R. REP. NO. 215, 89th Cong., 1st Sess., reprinted in 1965 U.S. CODE CONG. & AD. NEWS 3313, 3320-23.

239. State plans and standards for water quality maintenance and control are to be submitted to the Administrator of the Environmental Protection Agency. 33 U.S.C. § 1313(c)(2) (1982). They then must be reviewed and revised every three years. 33 U.S.C. § 1313(c)(1) (1982). The Administrator determines whether the standards are consistent with the Act's requirements. If not, the Administrator adopts criteria and standards for water quality. 33 U.S.C. § 1313(c)(3), (c)(4)(B) (1982). The Agency has authority to override water quality standards by changing effluent limitations set out in a point source discharge permit if the Administrator believes the permitted discharge would interfere with water quality. 33 U.S.C. § 1312 (1982). It also sets the scientific criteria by which states are to establish their standards. 33 U.S.C. § 1314(a)(1) (1982). Broad supervisory authority over water quality standards, including discretion in the Administrator to promulgate substitute standards, has been sustained. *E.g.*, *Mississippi Comm'n on Natural Resources v. Costle*, 625 F.2d 1269 (5th Cir. 1980).

240. QUALITY OF WATER, *supra* note 217, at 97-98.

judicially sustained over challenges by the Environmental Defense Fund that it violated the Clean Water Act.<sup>241</sup> Had the Court forced the states or the Environmental Protection Agency to set more rigorous salinity standards, the standards could only be carried out through NPDES permitting. Because most salinity is contributed by irrigation returns and natural sources which are not point sources subject to permits, reductions in salinity would have been minimal.

Future water development will have additional impact on salinity. Evaporation from new reservoirs and added salt pick up from expanded irrigation uses can increase salt loading. Thus, the federal government may be reluctant to assist new projects. Exports from the Basin can reduce total salts in the River, but if diversions of relatively unsalty water are made, the present benefit of dilution is lost, so the effect of particular projects must be examined. The type and timing of new depletions and water projects will determine whether standards actually will be met. Considering current plans, the Bureau of Reclamation estimates that current salinity standards can be met until 1993.<sup>242</sup>

Salinity control projects are financed by the federal government which requires repayment of a portion of project costs from the revenues recovered by the Upper and Lower Basin hydroelectric facilities.<sup>243</sup> Legislation passed in 1984 amended the ten-year-old Salinity Control Act to express a preference among proposed salinity control projects for the most cost-effective measures. The amendments also increased the share of costs repayable from Basin hydroelectric power revenues for newly authorized projects from twenty-five to thirty percent, and imposed market interest rates on the amounts that are to be repaid.<sup>244</sup> Further, the amendments broadened the scope of Bureau authority to build salinity control projects, so that if all projects are funded and built, numeric salinity criteria can be met through 2005.<sup>245</sup> Mounting federal deficits, however, may cause a rethinking of the federal role in salinity control. Federal spending for the least cost-effective authorized projects,<sup>246</sup> as well as for additional measures to satisfy criteria beyond 2005, may be curtailed, casting greater burdens on the Basin states and water users.

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241. *Environmental Defense Fund v. Costle*, 657 F.2d 275 (D.C. Cir. 1981).

242. *QUALITY OF WATER*, *supra* note 217, at 57-60, 101-02. Estimates assume average flows, construction of salinity control projects now authorized or built, and reasonable estimates of water development.

243. 43 U.S.C. §§ 620d(d)(5), 1543(f) (1982).

244. Pub. L. No. 98-569, — Stat. —.

245. *QUALITY OF WATER*, *supra* note 217, Salinity Update (Jan. 1985).

246. The most cost effective projects now in the planning stage will result in only small salinity reductions. See *QUALITY OF WATER*, *supra* note 217, at 63.



The Colorado River Salinity Control Forum must lead the quest for additional effective salinity control measures as the practical limits of structural solutions are reached. Possibilities include: dilution by augmented river flows through cloudseeding and other measures; further on-farm improvements in areas of high salt leaching; land use controls; conversion from irrigation to other uses; and reduction in consumption by imposing charges on reclamation project water, retirement of agricultural lands, limitations on water project development, and conservation measures. Alternatively, the salinity standards could be relaxed. Lower Basin agricultural users could adapt to higher salinity levels by planting salt-resistant crops and municipal and industrial users could treat or dilute saltier water.

Economic arrangements among Basin states can help reduce salinity and place costs of improving water quality on those who benefit. Once federal willingness to support salinity control measures has been exhausted, the Lower Basin states as the primary beneficiaries, may have to pay the costs of salinity control. Lower Basin users could gain from improvements in the Upper Basin that reduce salt pickup and from retirement of Upper Basin agricultural land. Upper Basin states cannot be expected to share appreciably in the cost of such controls that benefit only Lower Basin economies. Nor should water consumed by salinity control measures be charged against waters apportioned to the Upper Basin states.

The Colorado River Salinity Control Forum has been a remarkably effective vehicle for interstate cooperation; it is a paradigm for consensus problem solving in the Colorado River Basin. The Forum should be capable of addressing the difficult future salinity problems in a way that will induce the member states to make wise economic decisions and exercise their sovereignty to regulate salt-loading. New roles, like brokering innovative economic arrangements, should be within the Forum's ability. The most difficult decisions for the Forum lie ahead, however, as choices must be made and responsibility allocated for further salinity control efforts. A failure to confront those choices will, however, lead to congressional intervention and solutions in which the states will have less authority.

#### *D. Management of Interdependent Supplies*

The greatest usage of Colorado River water is outside the Basin, though within the seven Basin states. Uses of all water sources available to the Basin states, such as streams in other watersheds and groundwater, are necessarily related. Furthermore, other basins, even

those far from the Basin states, can be considered sources for augmenting Basin supplies.

Extra-Basin use of Colorado River water creates an interdependence with many other watersheds in the West. California has water delivery contracts with the Secretary of the Interior for 5,362,000 acre-feet per year of Colorado River water, well in excess of its Compact entitlement of 4,400,000 acre-feet.<sup>247</sup> The state will have to curtail its water use as the Central Arizona Project begins to operate (about 1986). To the extent the River's water is inadequate for southern California, water must be drawn from the California State Water Project which is supplied by river systems hundreds of miles to the north.

There have been proposals to augment supplies in the Basin states with imported water. Exxon eyed imports from the Missouri River Basin at one point in its planning for oil shale development in western Colorado.<sup>248</sup> From time to time, the Southwest has focused on the far North as a potential source of water. Projects to move water from distant basins such as the Snake, the Columbia, the MacKenzie, and the Yukon have been discussed.<sup>249</sup> Protectionist sentiment in the Columbia River Basin led the late Senator Henry Jackson to press for and obtain a twenty-year moratorium on further research or planning for transbasin diversions from that area.<sup>250</sup>

A variety of ideas to augment Colorado River water supplies from sources other than imports also are being discussed by the states. One possibility is massive cloudseeding. Extensive testing is needed to determine whether sufficient additional water could be produced to

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247. STATE OF CALIFORNIA, THE CALIFORNIA WATER ATLAS 45 (W. L. Kahrl ed. 1979) [hereinafter cited as WATER ATLAS].

248. The Role of Synthetic Fuels in the United States' Energy Future, Rocky Mountain News, Dec. 6, 1980, at 10.

249. Some of the ambitious plans that have been suggested include:

*Pacific Southwest Water Plan:* The wild rivers of California's North Coast would be dammed and their waters distributed as far south as Arizona at a cost of \$2.4 billion.

*Snake-Colorado Project:* Five million acre-feet of water would be brought south through eastern Oregon to the lower Colorado at a cost of \$3.2 billion.

*Western Water Plan:* Fifteen million acre-feet would be brought through an elaborate system of pumping stations and reservoirs from the Columbia River to Lake Mead on the Colorado at an estimated cost of \$11 billion.

*NESCO Plan:* A \$20 billion fiberglass pipeline would follow the continental shelf of California, carrying four million acre-feet of north coast river water to serve population centers along the coast.

*North American Water and Power Alliance:* Water supplies would move from as far north as the Yukon River through Canada, connecting with major rivers there and then linking waterways from coast to coast to augment supplies at a cost of some \$200 billion.

WATER ATLAS, *supra* note 247, at 107.

250. 43 U.S.C. § 1511 (1982) (as amended by the Reclamation Safety of Dams Act, Pub. L. No. 95-578, § 10, 92 Stat. 2471 (1978)).

justify a regular weather modification program and to determine the effects that would be felt by the states where greater snowfall or rain may be experienced. Another proposal is to clear-cut patches of timber in Upper Basin forests to increase snowpack and, hence, runoff. It is not yet clear how much water could be added to the River system from such programs.

Colorado River Basin states have not addressed the question of how much water they will allow to be diverted out of the Basin. Any water project imposes costs and burdens on people besides those who will use the water. This is especially true of transbasin diversions. Massive water exports can affect the economy, ecology, lifestyle, and potential for future growth of an area.<sup>251</sup> Colorado insists that conservancy districts which move water out of the Colorado River Basin satisfy requirements for "compensatory storage" of water for future in-Basin needs.<sup>252</sup> California law gives the area of origin an absolute priority over exporters to appropriate water if and when it is needed.<sup>253</sup>

Area of origin protections tend to inhibit efficient transfers of water, but may be socially justified. Large "compensatory storage" projects can be wasteful. Unless the project is in a location and of a kind that will meet foreseeable needs, the requirement is merely a way of deterring exports with little benefit accruing to the area of origin. The facility may remain unused for many years. Protection to areas of origin can assist in preserving agriculture, which has difficulty competing with municipal and industrial uses. Although individual farmers may be adequately compensated when they sell their water rights, there may be other societal values in farmland preservation that are not adequately represented in the marketplace.

Open space, bucolic vistas, and stable small-town cultures may be worth preserving. If lands are to be preserved as open space for the good of all, exporters might be required to pay for conservation easements on lands taken out of agriculture by water diversions. A state might create a fund from export charges or taxes to be used for future water project development and related needs in the area of origin. For instance, the fund could be used to pay for upgrading municipal water systems and other infrastructure needs as area of origin towns grow,

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251. For a thorough analysis of the issues regarding interbasin transfers and protection of the area of origin, see Weatherford, *Legal Aspects of Interregional Water Diversion*, 15 UCLA L. REV. 1299 (1968).

252. COLO. REV. STAT. § 37-45-118(b)IV (1973).

253. CAL. WATER CODE §§ 11460-11463 (West 1971); see also CAL. WATER CODE § 10505 (West 1971) ("county of origin" protection); Robie & Kletzing, *Area of Origin Statutes—The California Experience*, 15 IDAHO L. REV. 419 (1979).

perhaps as a result of farmers selling their water rights, giving up their land, and moving to the cities. The fund also could be spent for improving water efficiency to maximize supplies and to secure instream flows needed for protecting the area's capacity for recreational uses and tourism. Like severance tax funds, which are used to compensate for the impacts of energy development, the fund could help mitigate a variety of social and economic effects of exporting water.

Even with mitigation, however, there are reasons for limiting the total amount of water that can be exported from an area. Maintaining streamflow is essential to preserve fish and wildlife habitat, to support water-based recreation, and to satisfy aesthetic preferences that may be the basis of local economies and lifestyles. Instream flow rights may be necessary to sustain stretches of the Colorado or its tributaries as a "live" stream. But instream values may be overlooked or treated as unimportant when compared to many extrabasin uses. Only recently has western water law recognized the value of instream flows. Now a number of states allow appropriations of streamflows for preservation of fish and wildlife habitat and for recreational needs.<sup>254</sup> Incorporating appropriations for instream flows into the priority system gives other users, including exporters, notice of the claims that affect the stream and sets limits on how much water ultimately can be diverted.

There is a legitimate interest throughout the area served by the Colorado River in how all available water supplies are used. To the extent water is conserved in Salt Lake City, more will be available in Tucson. If Denver limits lawn watering, tourism may be able to flourish in Glenwood Springs. Thus, limits might be placed on exports by insisting on conservation efforts in the importing region.

Just as there is an interrelationship between Basin and non-Basin water sources, groundwater use is related to the use of River water. Groundwater pumping with a direct hydrologic effect on the River surely is included in the management regime established by the Law of the River. While it went unmentioned in the 1922 Compact, the Supreme Court interpreted related groundwater to be within the scope of management authority in the Boulder Canyon Project Act.<sup>255</sup> A now common understanding of the fundamentals of hydrology demands that groundwater be regulated along with the river flow it af-

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254. See, e.g., COLO. REV. STAT. § 37-92-103(4) (1973). See generally Tarlock, *The Recognition of Instream Flow Rights: "New" Public Western Water Rights*, 25 ROCKY MTN. MIN. L. INST. 24-1 (1979); J. BAGLEY, D. LARSON, & L. KAPALOSKI, *ADAPTING APPROPRIATION WATER LAW TO ACCOMMODATE EQUITABLE CONSIDERATIONS OF INSTREAM FLOW USES* (1983) (Utah Water Research Laboratory, Utah State University, Water Resources Planning Series No. UWRL/P-83/06).

255. *Arizona v. California*, 376 U.S. 340, 347-50 (1964).

fects.<sup>256</sup> Colorado and New Mexico allocate "tributary" groundwater as a part of the surface system to which it is connected.<sup>257</sup>

The use of groundwater by Basin states is important for River management even if the groundwater source is not connected with the River. Groundwater resources can be used to cushion the effects of fluctuations in River flows on all water users, and careful development and distribution of River water can prolong the life of nonrenewable groundwater. As aquifers are depleted, greater burdens fall on the Colorado River. Congress was aware of this prospect and in the 1968 Colorado River Basin Project Act<sup>258</sup> it required conservation in groundwater development.<sup>259</sup> Before funds were appropriated to complete the long-awaited Central Arizona Project, Arizona had to show that it was making significant efforts to conserve all its water resources.<sup>260</sup> The state responded in 1980 by enacting one of the nation's strictest groundwater conservation laws.<sup>261</sup> It gives strong preference to municipal and industrial uses and aims at phasing out agricultural uses.<sup>262</sup>

As demands on the River become more intense, Congress may perceive a national interest in ensuring that all the waters of the Basin states are wisely used. Federal legislation conceivably could invade prerogatives traditionally reserved to the states by regulating groundwater allocation and use. That possibility was foreshadowed by a 1982 Supreme Court decision<sup>263</sup> in which the Court stated "ground water overdraft is a national problem and Congress has the power to deal with it on that scale."<sup>264</sup>

It is becoming increasingly clear that each of the Basin states has a legitimate concern with how the others manage all their available water. Planning and water management within each state is, of

256. NATIONAL WATER COMMISSION, WATER POLICIES FOR THE FUTURE—FINAL REPORT TO THE PRESIDENT AND TO THE CONGRESS OF THE UNITED STATES 232-35 (1973).

257. *E.g.*, *Safranek v. Town of Limon*, 123 Colo. 330, 228 P.2d 975 (1951); *Templeton v. Pecos Valley Artesian Conservancy Dist.*, 65 N.M. 59, 332 P.2d 465 (1958); *Trelease, Conjunctive Use of Groundwater and Surface Water*, 27B ROCKY MTN. MIN. L. INST. 1853, 1856-63 (1981).

258. 43 U.S.C. §§ 1501-1556 (1982).

259. 43 U.S.C. § 1524c (1982). *See* H.R. REP. No. 1312, 90th Cong., 2d Sess., *reprinted in* 1968 U.S. CODE CONG. & AD. NEWS 3666-87.

260. Connall, *A History of the Arizona Groundwater Management Act*, 1982 ARIZ. ST. L.J. 313, 315, 329-30; Johnson, *The 1980 Arizona Groundwater Management Act and Trends in Western States Groundwater Administration and Management: A Minerals Industry Perspective*, 26 ROCKY MTN. MIN. L. INST. 1031, 1059-60 (1980); Weatherford, *supra* note 57, at 153, 158.

261. ARIZ. REV. STAT. ANN. §§ 45-401 to -637 (Supp. 1984).

262. *Id.* § 45-147. The Act states a preference as between competing applications for water from the same source for domestic uses over irrigation and stock-watering. *See also* Connall, *supra* note 260, at 322.

263. *Sporhase v. Nebraska ex rel. Douglas*, 458 U.S. 941 (1982).

264. 458 U.S. at 954.

course, the sovereign right of the individual state, but if it is not exercised responsibly, the other states are affected. In order to maximize supplies that are available to each state, and to have the benefit of reciprocal concern by other states to the same end, it would serve the seven Basin states well to cooperate extensively with one another in formulating state plans and in carrying out management schemes, perhaps through a Basin-wide entity voluntarily formed by them. Failure to do so may lead to federal intervention. Most basically, it is essential for the states to undertake long-range planning. Only then will realistic projections of water needs and means for meeting them be identified. Each state depends on the others to plan and manage effectively, and should be able to build their own plans on assumptions and projections made by their neighbor states. How a Basin state plans to allocate its groundwater resources, its transbasin export restrictions and area of origin protections, its plans for new water sources, and the extent of instream flows it preserves all are important to other Basin states. The states should regularly exchange information and solicit other states' input in their planning. A cooperative effort should be made in seeking ways to augment overall supplies as it becomes necessary to do so.

#### *E. Interstate Markets*

Markets can move natural resources to uses most valued by society, and the interdependence of all water sources in the Basin states suggests that the West could be considered a single water "market." Nevertheless, interstate transactions in Colorado River water face a variety of legal and policy obstacles. Upper Basin states are concerned that even "temporary" transactions could place today's excess water beyond their future reach. The concern should be ameliorated by the fact that the Law of the River contemplates temporary use by faster growing states; the vitality of the law to terminate such temporary use, even though another area may grow dependent on it, is being proven as Arizona recaptures the share of its water which has been used for years by California. Lower Basin states are concerned that if additional water were made available to any state or user, in amounts different from those provided by Compact, it would upset the scheme for sharing water set by the Law of the River. If no states are unduly harmed by a contractual arrangement, however, no objection should be raised.

Several Basin states have enacted laws curtailing interstate ex-

ports of water.<sup>265</sup> To the extent such laws prevent water from going to non-Basin states, they could reduce the potential demands on the River and thereby benefit other Basin states. But the range of permissible embargo statutes is narrow. The United States Supreme Court held in *Sporhase v. Nebraska* that laws regulating water export must pass constitutional muster under the commerce clause, which implies a bar on state legislation that interferes with interstate commerce.<sup>266</sup> Export restrictions are permitted only when the state strictly regulates water use within its own borders. Thus, only a state's even-handed measures demanded by shortages to protect "the health of its citizens—and not simply the health of its economy," will be given deference.<sup>267</sup>

Anti-export legislation needed to facilitate compliance with interstate compacts and federal legislation may not be subject to the same limitations as other state statutes. The Constitution allows Congress to restrain or regulate interstate commerce as it sees fit, or to authorize the states to do so. Because Congress has allocated the interstate waters of the Colorado through legislation and compact approval, state restrictions carrying out Congress's allocation scheme should not be subject to usual commerce clause restraints. One court has held that congressional consent to a compact effectively immunizes it from attack as an interference with interstate commerce.<sup>268</sup> Congressional approval of the 1922 Compact, and passage of the Boulder Canyon Project Act and the Colorado River Basin Storage Project Act, create a complex scheme that may require state action to implement it. Because all water use in the Basin states is interrelated, laws restricting exports arguably could be related to the intricate scheme for River management and water allocation. But the Supreme Court has suggested that congressional specificity about the need for state action may be required to avoid the negative implications of the commerce clause.<sup>269</sup>

Restrictions that relate restraints on exports to compliance with compacts, legislation, and court decisions apportioning interstate waters bear a close relationship to the Law of the River. Colorado's stat-

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265. Barnett, *Mixing Water and the Commerce Clause: The Problems of Practice, Precedent and Policy in Sporhase v. Nebraska*, 24 NAT. RESOURCES J. 161 (1984).

266. *Sporhase*, 458 U.S. at 945-54.

267. *Id.* at 956.

268. *Intake Water Co. v. Yellowstone River Compact Comm'n*, 590 F. Supp. 293, 297 (D. Mont. 1983).

269. *Sporhase*, 458 U.S. at 960. Legislation introduced in the Ninety-ninth Congress would authorize states to regulate interstate transfers of water. H.R. 1510, 99th Cong., 2d Sess., 131 CONG. REC. 1171 (1985).

ute,<sup>270</sup> revised in 1984 to comply with the *Sporhase* decision, requires at least one of three findings by the water court. An export must be specifically authorized by compact, result in a credit of exported water as a delivery under a compact, or not impair the state's ability to comply with interstate apportionments. The law also requires a finding that the export will not deprive Colorado citizens of beneficial uses of waters allocated to the state by compact or decree.<sup>271</sup> If tested, the constitutionality of the Colorado statute will turn on a judicial determination that the state action in the particular case is authorized by or necessary to carry out the complex arrangement of interstate rights and obligations. An essential purpose for the compacts was to protect a share of water for later development in the Upper Basin states. This provides an added justification for a state to control exports which could frustrate that end.

In the summer of 1984, a private corporation called the Galloway Group proposed to develop water on the Yampa River, a Colorado River tributary in Western Colorado, and to sell the water to the San Diego County Water Authority (San Diego). San Diego is almost entirely dependent on River water delivered by the Metropolitan Water District of southern California (MWD). San Diego lacks any significant undeveloped water sources and expects a cutback in available MWD water when the Central Arizona Project enables Arizona to make full use of its apportionment. San Diego paid \$10,000 to buy an option from Galloway which entitles it to enter into a water service agreement. Under the agreement, Galloway would deliver 300,000-500,000 acre-feet of water each year.<sup>272</sup> The Galloway proposal illustrates some of the difficulties of an interstate export scheme.

The Galloway contract would privately bargain away some ten percent of Colorado's total Compact allocation for at least forty years—a term set without state or other public participation—perhaps jeopardizing the purpose of the 1922 compact. Galloway asserts that it need not comply with the export statute because it will use the water it appropriates within Colorado for hydroelectric generation. But Colorado law provides that unauthorized actions leading to water export may be enjoined.<sup>273</sup>

Galloway also could have trouble showing that the proposal does not impair the state's ability to comply with interstate apportionments.

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270. COLO. REV. STAT. §§ 37-81-101 to -103 (Supp. 1984).

271. COLO. REV. STAT. § 37-81-101(3)(c) (Supp. 1984).

272. Option Agreement and *Exhibit A* thereto between the Galloway Group, Ltd. and San Diego County Water Authority (Aug. 1984); *Controversial Plan to Buy Colorado Water*, L.A. Times, Aug. 30, 1984, at Part IIcc, p.1.

273. COLO. REV. STAT. § 37-81-102 (Supp. 1984).



It is proposed that the water to be sent to San Diego will be charged against Colorado's apportionment, and not credited as a delivery to California (and the Lower Basin) in satisfaction of the Compact requirement. Thus, water otherwise available for Compact deliveries would be sold purely for private gain.

There is no absolute legal prohibition of interstate exports in the Colorado River Compact or the Upper Basin Compact. Yet it seems clear that neither the Compact drafters nor Congress contemplated exports. References to "use" in the Colorado River Compact<sup>274</sup> imply that the apportioned water will be used in the basin to which it is apportioned.<sup>275</sup> Further, the guaranteed Upper Basin delivery of 75,000,000 acre-feet every ten years at Lee Ferry is framed as a prohibition against depletion of flows below that amount,<sup>276</sup> suggesting that water apportioned to the Upper Basin should be used in the Upper Basin.<sup>277</sup> Finally, Article III(e) prevents withholding the Upper Basin's share of water from the Lower Basin if it cannot be used by the Upper Basin for agricultural or domestic purposes; thus, there is little reason for a Lower Basin state to purchase some of an Upper Basin state's apportionment that cannot be used in the Upper Basin because Article III(e) would require its release anyway.<sup>278</sup>

The law relating to the Lower Basin poses direct and formidable obstacles to the use of one state's apportionment within another. *Arizona v. California*<sup>279</sup> seems to preclude purchase by a Lower Basin state of water to be charged against any other Basin state's apportionment. The Court said, "any mainstream water consumptively used within a state shall be charged to its apportionment, regardless of the purpose for which it was released."<sup>280</sup> The Court also decreed that "[m]ainstream water shall be released or delivered to water users . . . only pursuant to valid contracts made with such users by the Secretary

274. Article I; Article III(a) and (b).

275. A state could provide for an out-of-state use to be a "use" under its own laws, however. *E.g.*, COLO. REV. STAT. § 37-81-101(4) (Supp. 1984) sets conditions on exports in order for them to "be recognized as a beneficial use for purposes of perfecting a water right."

276. Article III(d).

277. As a practical matter, it would be possible to account for exports in addition to the guaranteed annual deliveries.

278. The Upper Basin should have the right to withhold reasonable amounts of water to store for future uses. See *supra* notes 14-19 and accompanying text. The Upper Basin could also agree not to develop uses but to allow water to be delivered to the Lower Basin.

279. 373 U.S. 546 (1963); 376 U.S. 340 (1964).

280. 376 U.S. at 343. This declaration was made in the context of allocations of the Lower Basin's share of water among Lower Basin states, not of Upper Basin water to Lower Basin states. Yet the Lower Basin states have a stake in how "surplus" Upper Basin water is allocated among them. If it is surplus, it is shared equally; if it is considered water "used" by the Upper Basin (though under contract with a particular Lower Basin user), it is not shared.

of the Interior.”<sup>281</sup> Deliveries of water through Hoover Dam or other federal dams must be with the cooperation of the Secretary. Consent is unlikely if a proposal would disrupt the established regime for regulating the River or interfere with federal statutory goals like flood control, power generation, or fish and wildlife protection. The Secretary operates reservoirs in the Basin under operating criteria adopted by regulation pursuant to law,<sup>282</sup> which must conform to the Law of the River.

The Galloway proposal raises problems because it is a contract between private parties that attempts to reallocate waters that are subject to interstate compacts. Sound public policy, as well as considerations of integrity for the compacts, dictates that the states be parties to any interstate allocation. Leases and other agreements that allow one state to use water allocated to another may be, but probably are not, interstate compacts requiring congressional approval.<sup>283</sup>

Although the Galloway proposal faces great legal obstacles, other market transactions between states involving use of compacted waters in the Colorado River Basin may be possible. Transactions that may raise fewer legal issues include sales among Upper Basin states and exports to non-Colorado River Basin states. Surely Upper Basin agreements (like agreements of Indian tribes discussed earlier) are possible that would delay development, forego present uses, or employ water conservation to reduce consumption. Still, it is unlikely that Lower Basin interests would pay a state to delay or forego water use unless the state were using or could present credible plans for using the water. In such a case, Lower Basin users may pay for “insurance” that an Upper Basin state will not develop the water for a specified time.

The relationship among the Colorado River Basin states rests on a delicate and carefully crafted foundation. The states view proposals that threaten the integrity of their working relationship with suspicion. Basin states may look favorably upon transactions offering benefits for all concerned, but they will surely resist any departures from the Law

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281. *Id.*

282. The Colorado River Basin Project Act requires the Secretary to adopt operating criteria to regulate reservoir operations in the Basin. 43 U.S.C. § 1552 (1982). See Criteria for Coordinated, Long-Range Operation of Colorado River Reservoirs, 35 Fed. Reg. 8951 (1970). The Secretary has great discretion over the criteria. See *supra* notes 74 and 78.

283. Read literally, Art. I, § 10, cl. 3 could require the consent of Congress for every agreement entered into between two states, even if the agreement were of no concern to the United States. But in *Virginia v. Tennessee*, 148 U.S. 503 (1893), the Court held that congressional consent was only required if the agreement would encroach upon or interfere with the just supremacy of the United States. Arguably, a lease would not require consent unless it affected Congress's right to regulate commerce. See generally Dunbar, *Interstate Compacts and Congressional Consent*, 36 VA. L. REV. 753 (1950).

of the River and the practices that have grown up under it unless they expect substantial mutual gains. A Lower Basin agreement to pay for water apportioned to an Upper Basin state would be a tacit recognition of the validity of the Compact apportionment. But the established working relationship among all the states is sufficiently valuable that no contractual arrangement for interstate water sales is likely without the consent of all Basin states.

#### IV. CONCLUSION

Competition among traditional rivals for the Colorado River's copious benefits will continue, but practical arrangements, suited to the diverse needs of the Basin states, must supplant neat legal arguments and political rhetoric. The Upper and Lower Basin states may be pitted against one another anew as the slower growing mountain states consume more of their apportioned share of River water, curtailing the surplus that has helped California and Arizona to build their economies. Several interpretive questions may arise under the Law of the River but their resolution may well turn on the nature of the uses that depend on the water in question. The relative values of competing water uses in the region's economy will move water to new uses through consensual transactions and cooperation among the states and with Indian tribes and water users within individual states. Capital will move to states, Indian tribes and individuals with potential for using their water productively; some states or water users will pay other states or tribes to delay or avoid development. The negotiating table and the marketplace are already replacing the courtroom as the forums of choice in allocating River resources.

The nature of water uses in the Basin is evolving in response to changing demographics and economics. Agriculture historically has been the major consumer of Colorado River water. Marginal agriculture has difficulty remaining viable in the Basin as growing cities and industries can produce greater returns from water now used in farming and ranching. Consequently, only municipal and industrial uses and the highest-valued agricultural uses will be sustained. Another change is that consumptive uses of the Colorado River are coming into conflict with nonconsumptive uses. The newly-realized economic importance of recreation and of healthy fish and wildlife resources has bolstered growing demands for a quality of life in the West that depends on protecting the natural environment. Leaving water in stretches of the River will be increasingly understood to be an important use.

The importance of hydroelectric power generation by Colorado

River facilities has grown with the price of power from other sources. Great water projects on the River were originally built to aid agriculture by allowing repayment of costs to be made over long periods at low interest rates. However, their costs are largely justified today, and repaid to the federal treasury by revenues from their production of electric power. Because power generation can conflict with a variety of other uses—flood control, recreation, fish and wildlife, as well as storage for irrigation and domestic supply—the federal government as operator of the hydroelectric dams, should respond to state concerns about these other uses. The Secretary of the Interior can respond by broadening the state role in setting operating criteria for the Colorado River reservoir system and Congress can respond by giving the states a greater financial stake in power production.

The practical solutions to problems of allocating Colorado River water are changing as demands change and increase. Construction of facilities to store water for future use will remain important, but major new projects are neither likely nor necessary. Irrigated agriculture is a declining industry and cannot repay debts for publicly subsidized project costs, let alone sustain the burdens of privately financing new projects. Municipal and industrial users can pay for projects but will seek less costly approaches first. Future solutions will emphasize greater sophistication in management and administration. Measures to increase water efficiency, especially in agriculture, can make more water available for new purposes, while sustaining existing uses and the economies built on them. Capital will be attracted to the most cost-effective development projects such as certain new Upper Basin projects, repair of existing dams for safety and to maintain maximum storage capacities, and measures to protect water quality and reduce consumptive waste. Aggressive programs to reduce salinity in the River are underway. Protecting water quality is especially important to the Lower Basin where salt concentrations threaten to restrict the usefulness of River water.

Two phenomena will be increasingly significant in allocating Colorado River water according to changing demands: greater application of market forces and Basin-wide cooperation. Economics will play a larger role in distributing Colorado River water among competing users within states and across state lines. Transactions among users can help to maximize the River's utility. As the value of water increases, more efficient uses will be made, and investments in efficiency will be rewarded. Ultimately, Lower Basin users should be willing to pay for further salinity reductions according to the increase in value they will enjoy from the higher quality water. Marketing

water across state lines could also help distribute it to the highest economic uses. However, significant legal obstacles to interstate arrangements will fall only if the benefits and burdens are distributed fairly among the affected states and the states can integrate export of water into their planning efforts. Water marketing must be tempered by public policy considerations for noneconomic values such as preservation of rural communities and aesthetics. States must make tradeoffs, realizing that protecting noneconomic values entails economic costs.

Decisionmaking on the River has moved away from the courts and Congress and toward more interstate cooperation. The Colorado River Salinity Control Forum illustrates the efficacy of Basin state cooperation in solving River problems. Disputes over legal interpretations and allocation issues can be resolved rather than heightened, and River resources can be used for the greatest overall benefit through negotiated agreements following the Salinity Control Forum model. There should be a regular mechanism, perhaps a single seven-state committee or forum, for interstate discussion of a variety of new proposals and long-standing issues. The difficulties in establishing such a group are surely preferable to abdicating solutions to the federal courts or to Congress.

Interstate arrangements must respect the interests and needs of individual Basin states. For individual states to understand clearly their own interests, they should develop their positions and plans with the broadest possible public representation and participation. Free operation of markets and consideration of the public interest in state water allocation decisions are both prerequisites if a state's overall interests are to be clearly articulated and protected in interstate dealings.

