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IMPACT OF ENERGY DEVELOPMENT ON THE LAW OF THE COLORADO RIVER

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INTRODUCTION

For several million years the Colorado River flowed free of human constraints. It was viewed as a "natural menace"[1] well into this century. In less than a human lifetime, the river has become comprehensively and commercially developed—dammed, desilted, and diverted—to irrigate crops, produce power, and water distant cities.

Each stage of development has been authorized or supported by laws. Historically, the laws have reflected multiple purposes, but the objective of reclaiming arid and semi-arid land for agricultural use—the reclamation ethic—has been paramount. Property rights to use the water have become legally vested pursuant to those laws. The limited supply of cheap and regulated surface water in the basin is over subscribed in the sense that it has become, variously, covered by vested water rights (or water right applications), contractually committed, officially reserved, unofficially projected for designated potential uses, and progressively degraded in quality.

Profound changes are now occurring in the Colorado River Basin. New societal demands for water are on a collision course with vested legal rights and past commitments. Mammoth economic forces are converging to exploit fossil fuels in the Colorado River Basin and the North Central States Region for energy consumers in the western two-thirds of the nation.

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1. The mission of the Federal Government for many years was to convert the "natural menace" into a "national resource." So said the subtitle to the major report, U.S. Dep't of the Interior, The Colorado River (1946).

In the 1955-1965 decade, thermal electricity passed irrigation as the single most prolific withdrawer of water in the nation.[2] Withdrawal constitutes the total amount diverted or pumped. In a once-through cooling system for a fossil-fueled power plant only about 1½ to 2 percent of the withdrawal is consumptively used. By comparison, a much higher percentage is consumptively used in irrigation. On the average, the coal-fired plants consume 15 acre-feet of water per megawatt per year.[3] Nuclear power plants, which may follow on the heels of the fossil fuel plants, consume approximately 22 acre-feet per megawatt per year under current technology.[4]

In January 1974, the Western Systems Coordinating Council projected an addition of 25,161 megawatts in coal-fired generating capacity during the decade ending in 1983 for the 13 western states and British Columbia.[5] As of July 1974, the six large coal-fired thermal electric power plants which were operational or under construction in the Upper Colorado River Basin involved some 8,450 megawatts of capacity.[6] The total consumptive water use for that capacity will be about 125,000 acre-feet per year.[7] Planned and projected units and plants in the Upper Basin could add another 25,000 megawatts of electricity, consuming approximately 351,000 acre-feet more of water per year.[8] Planned and projected oil shale plants and coal-gasification facilities reportedly could require another 388,000 acre-feet of Upper Basin water each year.[9]

The Bureau of Reclamation recently estimated that something in the order of 874,000 acre-feet more water will be needed annually in the Upper Basin by the turn of the century to supply coal-fired steam plants, coal-gasification facilities, and oil shale development.[10]

Although energy-related development within the Lower Colorado River Basin drainage area, removed as it is from most of the larger significant coal deposits, can be expected to accelerate more slowly than the Upper Basin, several new coal-fired and nuclear plants are projected for the next decade.[11]

2. U.S. Dep't of the Interior, Water Demands for Expanding Energy Development 5-6 (GS Circular 703, 1974).
3. *Id.* at 8 n. 1.
4. *Id.*
5. Western Systems Coordinating Council, Ten Year Coordinated Plan Summary, 1974-1983, at 9, Table 3 (1974).
6. U.S. Dep't of the Interior, Report on Water for Energy in the Upper Colorado River Basin 40, Table 11 (1974).
7. *Id.*
8. *Id.* at 42.
9. *Id.* at 40.
10. *Id.* at 42.
11. *See* Western Systems Coordinating Council, *supra* note 5, at 26-31.

Several words of caution are in order about the current projections of massive water demand for energy development.

First, energy development is only one source, among many, of rising water demand in the Colorado River Basin. Claims for greater shares of the flow are being asserted on behalf of Indians, fish and wildlife, mining interests, recreationists, and environmentalists. Given the multiple-demand picture, it would be an oversimplification to view increased energy demand as the sole variable likely to create pressure points in the law of the river. Any one of several emergent demands could be the critical factor precipitating a particular "crunch" or "crisis" in the future. Obviously, some of the demands are interdependent and all of the demands can act collectively to place strains on the legal framework governing the management of the river. Energy development simply happens to be the most prominent, rapidly changing, nonagricultural variable at this point in the history of water demand in the basin. The kind of impact it will have on the legal system may be illustrative of the kinds of impacts other water demand variables can be expected to cause over time.

Second, large-scale water use for the production of electrical energy may not be a permanent fixture. The water demand associated with coal-fired power plants, which commonly are built with a 35-year amortization and plant-life period in mind, will be terminable. Under some contractual arrangements, the water will automatically revert to nonenergy uses upon the death of the power plant. Many fossil fuel plants could be replaced by nuclear plants, of course, which consume even more cooling water per unit of power produced. Direct conversion of solar to electric energy, or some other means of energy production which needs little water, may preempt or ultimately supplant fossil fuel or nuclear power generation, however. And, because the coal reserves are exhaustible, the gasification and liquefaction of coal will be ephemeral. At some future date, then, the use of water for food and fiber production could become a "higher" economic use than any energy-related use of water.

Finally, projections of future water demand for energy—or for any other use—are highly speculative. Water demand, as well as supply, defies precise prediction. The variables surrounding demand can change and commonly evade prospective quantification. Every generation would probably do well to avoid precipitous and inflexible responses to what are characterized as emergent and inevitable water demands.

With the foregoing qualifications made, the fact remains that

energy-related demands for water are mounting quickly in the Colorado River Basin. Although the rural reclamation ethic has been able to accommodate a measure of municipal–industrial water and power demand in the past,[12] the divergent, water-related demands of urban populations now have grown to a point where accommodation is becoming more difficult. The urban-based "environmentalist" and "recreationist" demands clean water. The urban "voter" demands that limits be put on subsidies for agricultural development (while insisting upon low food prices). The urban "consumer" sustains a high-energy lifestyle which sends the electric utilities to the banks of the Colorado in search of powerplant sites. These often times inconsistent demands add up to an urban assault of major proportions on the rural reclamation ethic.

With this crunch between urban and rural water demand comes the question: Is the "law of the river" flexible enough to moderate these competing forces in the public interest? If so, how will the process work? This article attempts to answer those questions in general terms only. Since water supply is variable and the extent, rate, and location of the future demands for water in the basin are a matter of conjecture, it is impossible to identify all of the possible pressure points which could arise in the laws governing management of the river. We deal here with some of the more obvious problems, hoping that other students of the subject will add to the literature as the pace of new water demand quickens and the trends become more discernible.

PRESENT LEGAL FRAMEWORK

Since the laws governing the Colorado River system have been superbly analyzed in detail elsewhere,[13] only a brief summary of the major legal provisions is offered here. The "law of the river" is actually a composite of many laws–an accumulation of statutes, compacts, court decisions, contracts, regulations, and administrative rulings.

A. Levels of Legal Allocation in the Colorado River Basin

Generally speaking, the flow of the Colorado River is divided among users on the basis of beneficial consumptive use. What is apportioned are rights to consume certain amounts of water for purposes recognized to be beneficial under the law. These rights to

12. *See, e.g.*, 43 U.S.C. § 485h(c) (1971); *see also*, Sax, *Federal Reclamation Law*, in 2 Waters and Water Rights, 246-255 (R. Clark ed. 1967).

13. Meyers, *The Colorado River*, 19 Stan. L. Rev. 1 (1966).

deplete the flow of the system are allotted pursuant to formulae, criteria, and priorities embodied in numerous laws.

The allocation system for the Colorado River and its tributaries operates at four levels: international, interregional, interstate, and intrastate. At the international level, the use of the river has been divided between the United States and Mexico by treaty. On the broadest domestic level, the beneficial utility has been both reserved to an uncertain extent for Indian and federal uses and apportioned between two interstate regions, the Upper Basin and the Lower Basin. The reservation of water occurred in connection with the creation of Indian and federal reservations variously by treaty, executive order and act of Congress. The interregional allocation was accomplished by interstate compact and act of Congress. At the next level of generality, the beneficial utility has been apportioned among the States. This has been achieved by a mix of laws, including an interstate compact in the Upper Basin and interstate litigation in the Lower Basin. The lowest level of generality is that of intrastate allocation, which has resulted from appropriations being made and water rights being perfected under state laws, both within and outside the contractual scheme of federal reclamation projects.

1. International Allocation

A formal division of water between the upstream riparian and downstream riparian nations was accomplished in the Mexican Water Treaty of 1944.[14] Mexico was guaranteed an annual amount of 1.5 million acre-feet (m.a.f.), except in times of extreme shortage.[15] The treaty contained no express provision for water quality,[16] although continued agricultural use of the water in Mexico was clearly contemplated.[17] The issue of water quality came to the fore in 1961 when highly saline groundwater from the Wellton-Mohawk District in Arizona was pumped into the river above the Mexican delivery point. Negotiations resulted in a 1965 joint agreement[18] supplementing the

14. Treaty with Mexico Respecting Utilization of the Colorado and Tijuana Rivers and of the Rio Grande, Feb. 3, 1944, 59 Stat. 1219, T.S. No. 994 (effective Nov. 8, 1945) [hereinafter cited as Water Treaty of 1944].

15. *Id.* art. 10.

16. According to E. Weinberg, "Salt Talks" United States and Mexico Style 48, May 23, 1973 (draft of a case study to appear in a publication of the American Society of International Law tenatively entitled International Responsibility for Environmental Quality):

> It is impossible to escape the conclusion, when examining the record of the negotiations of the 1944 water treaty, that the parties feared that if they had had to deal explicitly with the issue of water quality, the treaty would not have materialized.

17. Water Treaty of 1944, art. 27.

18. Minute No. 218, 4 Int'l Legal Materials 545 (1965), 55 Dep't State Bull. 555 (1965).

treaty and requiring the drainage waters to be periodically bypassed below the Mexican diversion point. This joint agreement was superseded by a new joint agreement in 1972,[19] which called for higher-quality water to be substituted for the drainage water delivered to Mexico. On June 24, 1974, President Nixon signed the Colorado River Basin Salinity Control Act,[20] authorizing the construction of a desalting plant and other works to improve the quality of the water crossing the border. The obligation to Mexico is becoming primarily a matter of Federal responsibility.[21]

2. Interregional Allocation and Management

(a) 1922 Colorado River Compact

Sectional rivalry caused the drainage basin of the Colorado River system to be divided into two allocation areas, the Upper Basin (composed of the "upper division" states of Colorado, New Mexico, Utah and Wyoming, as well as a portion of Arizona) and the Lower Basin (composed of the "lower division" states of Arizona, California and Nevada).

Headwater regions, called "areas of origin," commonly develop more slowly than the fertile lowland valleys. In order to prevent downriver users from acquiring a disproportionate share of the water rights, users in areas of origin have come to insist that rights to some of the water flow be reserved for their future benefit.[22] In essence, that was what the states in the Upper Basin achieved when Congressional approval of the 1922 Colorado River Compact became effective in 1929.[23]

The compact, as adopted by Congress, purported to give each basin a perpetual right to the "exclusive beneficial use of 7,500,000

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19. Minute No. 241, 67 Dep't State Bull. 198 (1972).

20. Pub. L. No. 93-320, 88 Stat. 266 (1974).

21. Congress declared the Mexican treaty terms to be a "national obligation" in 1968. If and when the river is augmented by an adequate supply, the upper and lower division states are to be relieved from any water delivery obligations they assumed in Article III(c) of the 1922 Colorado River Compact. *See* Colorado River Basin Project Act, 43 U.S.C. § 1512 (1971). For an historical review of the salinity problem with Mexico, *see* Brownell, Report of the President's Special Representative For Resolution of the Colorado River Salinity Problem with Mexico, December 28, 1972, in S. Rep. No. 93-906, 93d Cong., 2d Sess. (1974).

22. *See* Weatherford, *Legal Aspects of Interregional Water Diversion*, 15 U.C.L.A. L. Rev. 1299, 1308-1331 (1968).

23. Congress approved the Compact in the Boulder Canyon Project Act, 43 U.S.C. § 617 (*l*) (1971), and provided that it could become effective when California and at least five of the other basin states approved it. The Project Act and Compact became effective by presidential proclamation on June 25, 1929, 46 Stat. 3000.

acre-feet of water per annum . . ."[24] Such an equal division may never occur, however, because the Lower Basin negotiators hedged their bet. Although the river had produced an average flow for the two decades preceding 1922 that would have comfortably accommodated 7.5 m.a.f. in beneficial consumptive uses annually for each half of the basin, the hydrological risk remained that a dryer cycle might someday occur, preventing the river from supporting that level of use throughout the basin. Who should bear such a deficiency? One possibility would be to proration the deficiency evenly between the Upper and Lower Basins. Another approach would be to require one of the basins to assume all or a disproportionate share of the deficiency. The latter approach was adopted, with the Upper Basin assuming the burden.

The Lower Basin was assured that depletions in the Upper Basin would not prevent at least 75 m.a.f. of aggregate flow in each successive ten-year period from reaching the Lower Basin at Lee Ferry.[25] The Lower Basin received a guaranteed ten-year, not annual,[26] minimum flow. The Upper Basin became a guarantor in the sense that its depletions may not reduce the ten-year aggregate flow below the 75 m.a.f. figure.

The 1922 Compact apportionment formula does not apply to those groundwater resources within the basin which are hydrologically unrelated to the Colorado River system.

(b) *Operating Criteria Under 1968 Colorado River Basin Act*

The apportionment of the variable river flow between the Upper and Lower Basins became a challenge in the 1960's, particularly with the construction and filling of new storage reservoirs in the Upper Basin.[27] In the Colorado River Basin Act of 1968[28] Congress in-

24. Colorado River Compact, art. III (a), November 24, 1922, 70 Cong. Rec. 324, 325 (1928).

25. *Id.* art III(d), provides: "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 10 consecutive years reckoned in continuing progressive series beginning with the first day of October next succeeding the ratification of this compact."

26. Use of the modifier, "aggregate," in Article III(d) strongly suggests, of course, that deliveries of less than 7.5 m.a.f. to the Lower Basin during a given year would be permissible as long as the 10-year cumulative flow was 75 m.a.f. Also, extrinsic evidence reveals that the inclusion of specific language guaranteeing a minimum annual flow was considered but finally rejected by the Compact negotiators. An earlier version of Article III(d) contained the phrase, "not below a flow of 4,000,000 acre-feet for any one of such years," which was later deleted by the Compact Commission. *See* Olson, The Colorado River Compact (1926), Appendix II, Exhibit A.

27. Four storage units (Glen Canyon, Flaming Gorge, Curecanti and Navajo) were constructed under authority of the Colorado River Storage Project, 43 U.S.C. § § 620-620 *o* (1971). In the first full-water year after Glen Canyon Dam was closed, 1964, approximately

structed the Secretary of the Interior to develop and adopt "criteria for the coordinated long-range operation" of the federal reservoirs in the Colorado River System.[29] Congress specified the priorities by which water was to be released from Lake Powell above the Lee Ferry accounting point. The treaty obligation to Mexico, the Upper Basin guarantee of 75 m.a.f. per decade, and carryover storage necessary to meet those foregoing obligations, were to be given preference in that order. Guidelines for maintaining parity in the active storage between Lake Mead and Lake Powell were also mandated. The Secretary of the Interior promulgated detailed criteria in 1970.[30] The actual experience under these legal guidelines is described annually in a departmental report.[31]

3. *Interstate and Tribal Allocation*

(a) Statutory Apportionment Among the Lower Division States

Congress, whether it fully appreciated it then or not, apportioned the consumptive use of the river among the lower division states through the Boulder Canyon Project Act of 1928. According to the majority opinion in *Arizona v. California,*

> Congress decided that a fair division of the first 7,500,000 acre-feet of such mainstream waters would give 4,400,000 acre-feet to California, 2,800,000 to Arizona, and 300,000 to Nevada; Arizona and California would each get one-half of any surplus. *** Division of the water did not . . . depend on the States' agreeing to a compact, for Congress gave the Secretary of the Interior adequate authority to accomplish the division. Congress did this by giving the Secretary power to make contracts for the delivery of water and by providing that no person could have water without a contract.[32]

5,663,000 acre-feet was retained, with only 2,414,000 acre-feet released from the dam. The comparable figures for 1965 were 4,931,000 acre-feet and 10,820,000 acre-feet. These estimates were computed from figures appearing in unpublished tables, *Reconstructed Flow Studies, Lake Powell,* provided to the Lake Powell Research Project by staff of Region IV, Bureau of Reclamation, Salt Lake City, on October 16, 1972. The authority of the Secretary of the Interior to reduce Lower Basin deliveries by 10 percent to facilitate the filling of Glen Canyon Dam was upheld in Yuma County Water Users' Association v. Udall, 253 F. Supp. 909 (D.C. 1968). Notwithstanding the low release in 1964, the ten-year period ending in 1973 ended with in excess of 75 m.a.f. delivered at Lee Ferry; 82.9 m.a.f. had been delivered by the end of the 1973 water year. U.S. Dep't of the Interior, Annual Report, 1973 Operation of the Colorado River Basin, 1974 Projected Operations 20 (1974).

28. 43 U.S.C. § 1501 (1971).

29. *Id.* § 1552.

30. See *Criteria for Coordinated Long-Range Operation of Colorado River Reservoirs Pursuant to the Colorado River Basin Project Act of September 30, 1968 (P.L. 90-537),* in Upper Colorado River Comm'n, Twenty-Second Annual Report, Appendix C (1970).

31. *E.g.,* U.S. Dep't of the Interior Annual Report, 1973 Operation of the Colorado River Basin, 1974 Projected Operations (1974).

32. 373 U.S. 546, 565 (1963).

California had sought to have the Court allocate the flow under the doctrine of equitable apportionment, whereby priority could be given to the early appropriations of California users.[33] California regained some lost ground in 1968 when Congress gave the state's water-right holders a priority, to the extent of the 4.4 m.a.f., over the Central Arizona Project in the event of shortage.[34]

(b) Compact Apportionment Among Upper Division States

The upper division states, unlike the lower, avoided litigation and reached agreement on a formula for apportioning rights to the flow in their half of the basin. The Upper Colorado River Basin Compact of 1948 allots to Arizona 50,000 acre-feet per annum and, as to the balance of the annual consumptive use available to to the Upper Basin, apportions to Colorado, 51.75 percent; New Mexico, 11.25 percent; Utah, 23 percent; and Wyoming, 14 percent.[35] The gross amount of annual consumptive use allowable in the Upper Basin, against which these percentages apply, has become less than 7.5 m.a.f. with the downward revision of estimates of average river flow. Water available for Upper Basin consumptive use is now projected to be from 5.25 to 5.8 m.a.f., as discussed below.

(c) Reserved Rights for Indian Tribes

Indian tribes, regarded as quasi-sovereigns under the law, nonetheless were not parties to either the interregional allocation of the 1922 Compact or the interstate allocation of the 1948 Compact. Each of the compacts contains a negative declaration to the effect that Indian rights are outside the reach of the interstate accord.[36]

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33. *Id.* at 563.

34. The decree in *Arizona v. California*

> shall be so administered that in any year in which [the Secretary of the Interior determines] there is insufficient mainstream Colorado River water available for release to satisfy annual consumptive use of seven million five hundred thousand acre-feet in Arizona, California, and Nevada, diversions from the main stream for the Central Arizona Project shall be so limited as to assure the availability of water in quantities sufficient to provide for the aggregate annual consumptive use by holders of present perfected rights, by other users in the State of California served under existing contracts with the United States by diversion works heretofore constructed, and by other existing Federal reservations in that State, of four million four hundred thousand acre-feet of mainstream water, and by users of the same character in Arizona and Nevada.

Colorado River Basin Project Act, 43 U.S.C. § 1521 (b) (1971).

35. Upper Colorado River Basin Compact, October 11, 1948 (approved by Congress April 6, 1949), art. III (a), 63 Stat. 31, 32 (1949).

36. "Nothing in this compact shall be construed as affecting the obligations of the United States of America to Indian tribes." Colorado River Compact, art. VII, 70 Cong.

Tribal water claims are based on the *Winters* doctrine, which holds that the right to use water is reserved as an incident of reservation land.[37] Since, unlike most water rights, the *Winters* right is not lost by non-use, it can persist indefinitely in an unquantified state. Some of the Indian water rights have been quantified (either by adjudication or agreement); some have not. While the apportionment of consumptive use rights to Native Americans throughout the basin defies quantification at this time, some tribal rights have been numerically defined.

The reserved rights of five tribes in the Lower Basin were adjudicated and quantified, totaling some 1 m.a.f. per annum, in the latest *Arizona v. California* litigation.[38]

Tribal rights in the Upper Basin are at various stages of development. The Navajo Tribe agreed to share shortages in the San Juan River system and to accept a right to an average annual diversion of 508,000 acre-feet to irrigate a projected 110,630 acres in the Navajo Indian Irrigation Project.[39] The Navajos also adopted a resolution allowing 34,000 acre-feet of Arizona's 50,000 acre-foot entitlement in the Upper Basin to be used as cooling water for many years at the Navajo Generating Station.[40] An adjudication of Southern Ute and Ute-Mountain Ute rights on several San Juan River tributaries is pending.[41] The Ute Indian Tribe of the Uintah and Ouray Reservation has reserved water rights, some of which allegedly are recognized by contract.[42]

Rec. 325 (1928). The same language appears in the Upper Colorado River Basin Compact, art. XIX (a), 63 Stat. at 42.

37. *See generally,* M. Price, Law and the American Indian, 310-329 (1973); National Water Comm'n, Water Policies for the Future 473-483 (1973); Winters v. United States, 207 U.S. 564 (1908); and Arizona v. California, 373 U.S. 546, 600-01 (1963).

38. Chemehuevi Indian Reservation (the lesser of either 11,340 acre-feet diversion or water to irrigate 1,900 acres); Cocopah Indian Reservation (the lesser of either 2,744 acre-feet diversion or water to irrigate 431 acres); Yuma Indian Reservation (the lesser of either 51,616 acre-feet diversion or water to irrigate 7,743 acres); Colorado River Indian Reservation (the lesser of either 717,148 acre-feet diversion or water to irrigate 107,588 acres); and Fort Mohave Indian Reservation (the lesser of either 122,648 acre-feet diversion or water to irrigate 18,974 acres). Arizona v. California, 376 U.S. 340, 344 (1964) (decree).

39. *See* Act of June 13, 1962, 43 U.S.C. § 615ss (1971); *see also,* Navajo Tribal Council Resolution CD-86-57, December 12, 1957.

40. Navajo Tribal Council Resolution CD-108-68, December 11, 1968.

41. United States v. Akin, Civil No. C-4497 (D. Colo. filed Nov. 14, 1972). The action was dismissed by the District Court on the grounds of abstention and comity, in recognition of similar state-court action. On appeal, however, the Tenth Circuit reversed and remanded, 504 F.2d 115 (10th Cir. 1974).

42. *See,* Brief, Ute Indian Tribe, Amicus Curiae, Sierra Club v. Stamm, Civil No. C-74-9 (D. Utah, filed Jan. 7, 1974); Indian Deferral Agreement of September 20, 1965 (Contract No. 14-06-W-194, Bureau of Reclamation), covering the Upper Duchesne River and Rock Creek; Colorado River Storage Project, 43 U.S.C. § 620a (1971).

Indian water rights are becoming an increasingly important variable in the planning and management of the river system.

4. Intrastate Allocation

The beneficial consumptive use of water has been allocated within each basin state through the creation and recognition of water rights. The water rights have arisen in a number of ways, depending on the time period and jurisdiction involved.[43]

The typical allocation scheme for irrigated agriculture within federal projects involves two levels of contracts plus the perfection of the water right by actual appropriation and beneficial use. The United States enters into a contract with an irrigation district, wherein the former agrees to deliver water and the latter agrees to assume the burden of capital repayment, as well as operation and maintenance costs.[44] The district then contracts with the water user who acquires a water right by putting the water to beneficial use in accordance with state law.[45]

Industrial users increasingly are contracting directly with the Bureau of Reclamation for water, while concurrently applying for water use permits with the appropriate state water agency.

Whatever the source of the water right, or the sequence followed in establishing it, the related consumptive use is charged against the entitlement of the basin state where the use occurs.[46]

B. Influence of National Policies and Controls

The law of the river cannot be viewed simply as a regional water allocation scheme. A more generic class of federal laws which represent broad national policies concerning water resource development and management, are also embodied in the law of the river. The law of the river contains not only the traditional national reclamation laws, for example, but also the new incentives, sanctions and controls of such legislation as the Water Resources Planning Act, National Environmental Policy Act and the Federal Water Pollution Control Act Amendments of 1972, all noted *infra.* The integration of new national laws and policies into the law of the river is an ongoing process in the Colorado River Basin, as it is in other river basins.

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43. *See generally,* I. Hutchins, Water Rights Laws in the Nineteen Western States (1971); R. Dewsnup, D. Jensen, & R. Swenson, A Summary-Digest of State Water Laws (1973).

44. *See generally* Sax, *The Federal Reclamation Law,* in 2 Waters and Water Rights 111 (R. Clark ed. 1967).

45. *See* Ickes v. Fox, 300 U.S. 82 (1937).

46. Arizona v. California 373 U.S. 546, 601 (1963), and the Upper Colorado River Basin Compact, arts. III & VII, 63 Stat. at 32, 35.

HYDROLOGIC PARAMETERS AND PROSPECTS[47]

A. Surface Water Supply in the Basin

The entire Colorado River Basin has an area of 243,000 square miles. It is estimated that the average annual virgin flow of the Colorado River Basin is about the same as that of the Delaware River Basin which is only about 1/20th of the areal size.[48] With the exception of the deserts of the Great Basin, the Colorado River Basin has the greatest water deficiency of any basin in the coterminous United States (water deficiency determined by average precipitation less potential evapotranspiration).[49] Yet, more water is exported from the Colorado River Basin than from any other river basin in the United States.[50]

About 83 percent of the water which flows in the Colorado River Basin comes from the Upper Basin.[51] The Upper Basin area is 109,000 square miles. The average annual precipitation throughout the entire Upper Basin is about 16 inches,[52] providing a renewable input to the Upper Basin averaging about 93,440,000 acre-feet per year. This input, however, only yields about 13,500,000 acre-feet per year of virgin surface-runoff.[53] The remainder is lost by evapotranspiration within the Upper Basin.

During the winter season from October through April the precipitable moisture is brought in mostly by maritime air masses from the Pacific Ocean. During the other months of the year a large part of the precipitable moisture brought to the basin originates in the Gulf

47. The authors recognize that there is a partially integrated surface and ground-water system in the Colorado River Basin. However, the law of the river neglects ground water for the most part. *See* Meyers, *supra* note 13, at 26. Therefore, this discussion is limited to surface-water parameters and prospects. The development of those ground-water resources of the basin which are not hydrologically related to the surface water may relieve some of the pressure on surface-water supplies. On the other hand, the recharge rate of most ground water sources in the basin is relatively slow and extensive use may deplete the ground-water supplies at a nonreplenishable rate.

48. Committee on Water, National Research Council, Water and Choice in the Colorado River Basin 8 (1968).

49. Piper, Has the United States Enough Water? 11 (U.S.G.S. Water-Supply Paper 1797, 1965).

50. Committee on Water, *supra* note 48, at 5.

51. Lower Colorado Region State-Federal Interagency Group for the Pacific Southwest Interagency Committee, Lower Colorado Region Comprehensive Framework Study, Appendix V, at 11-13 (1970).

52. Iorns, Hembree & Oakland, Water Resources of the Upper Colorado River Basin-Technical Report 10 (U.S. G. S. Prof. Paper 441, 1965).

53. This estimate was developed by the Hydrology Subproject of the Lake Powell Research Project which is an NSF-sponsored consortium of universities and institutions studying the impact of man's activities in the Lake Powell region. The estimate is based on research primarily conducted at the Laboratory of Tree-Ring Research in Tucson, Arizona, by Dr. Charles W. Stockton.

of Mexico. The winter precipitation accumulates in the higher mountain regions as a winter snowpack and provides most of the surface runoff in the basin during the spring melt and runoff period. It is this winter precipitation regime that is receiving the most attention in weather modification studies in the Upper Basin.[54] The seeding of some of the winter storms to stimulate greater amounts of precipitation is termed "winter orographic snowpack augmentation." The term "orographic snowpack" refers to the effect of high altitude on precipitation. It has been recently estimated that 0.9 to 1.3 m.a.f. could be added by this method to the natural flow of the river.[55]

The moisture brought up from the Gulf of Mexico generally precipitates as summer storms throughout the basin area. In the Upper Basin, most of the precipitation occurs during the October through April period. In much of the Lower Basin, the summer storms provide the major portion of precipitation.

The evaporation rates vary greatly throughout the entire basin, from approximately 30 inches[56] in the northern, higher portions of the basin to about 86 inches[57] in the extreme southern portions of the basin.

Estimates have been made of the virgin runoff for the Upper Basin going back to 1896. The runoff for the Upper Basin has actually been recorded since January 1923.[58] Table 1 indicates the estimated

TABLE 1

Estimates of Average Virgin Flow for the Upper Colorado River Basin

Period	*Million Acre-Feet Per Year*
1896-1968	14.82
1906-1965	15.09
1914-1965	14.64
1922-1965	13.87
1931-1965	13.09
1931-1968	13.01*

*1966-1968 estimated from graph.

Source: Lower Colorado Region Comprehensive Framework Study, Appendix V, Water Resources, V-12 (1970).

54. Bureau of Reclamation, U.S. Dep't of the Interior, 1972 Project Skywater Annual Report 15-121 (1973).

55. U.S. Dep't of the Interior, *supra* note 6, at 58.

56. Upper Colorado Region State-Federal Interagency Group for the Pacific Southwest Interagency Committee, Upper Colorado Region Comprehensive Framework Study, Appendix V, at 12 (1971).

57. Lower Colorado Region State-Federal Interagency Group, *supra* note 51, at 9.

58. U.S. Geological Survey, Compilation of Records of Surface Waters of the United States through September, 1950, Part 9, Colorado River Basin (Water-Supply Paper 1313, 1954).

average virgin flow for the Upper Colorado River Basin during different time periods. Depending upon the time period selected, the streamflow from the Upper Basin varies from 13.01 to 15.09 m.a.f. per year.

The hydrology studies of the Lake Powell Research Project estimate that the reconstructed virgin runoff from the Upper Colorado River Basin for the past four centuries would have a mean of about 13.5 m.a.f. per year. The flow figures from 1896 to 1922 in Table 1 are based on data from other locations, and these measurements were used to make estimates of what the flow would have been at the 1922 Compact accounting point at Lee Ferry. From 1923 to the present there has been stream gage information from the Colorado River and Paria River that can be summed to provide data for the accounting point. One common factor that produces some uncertainty in all of these figures is the determination of consumptive use within the Upper Basin which must be added back to the early estimated and later gauged data to provide the reconstructed virgin flow at the accounting point.

In the Lake Powell Research Project studies, dendrochronology techniques were used in correlating tree-ring width series from Upper Basin sites with reconstructed virgin outflow data provided by federal agencies. This information was then used to extrapolate virgin runoff from the Upper Basin back to the year 1570.[59] This procedure placed the measured and previously estimated information in a broader historical context and the results indicated that the early decades of the 20th Century were one of the wettest periods in over 400 years. The study showed that since 1930 we probably have been in a more normal precipitation and runoff period in contrast to the abnormally wet period during the early part of this century. The estimate of a reconstructed virgin outflow of 14.9 m.a.f. per year used by the Bureau of Reclamation is based on data for the 1906-1973 interval.[60] The period covered by measured data largely coincides with the more normal precipitation and runoff period. The difference between this figure of 14.9 m.a.f. per year and the Lake Powell Research Project figure of 13.5 m.a.f. per year is significant. However, both of these current estimates of available surface-water supply within the Upper Colorado River Basin are considerably less

59. The Hydrology Subproject of the Lake Powell Research Project is currently preparing a technical bulletin to fully describe the methods, data, and results of its Upper Basin streamflow-trends study based on dendrochronology.

60. Communication with Don Barnett of the Bureau of Reclamation, Upper Colorado Region, Salt Lake City, September 23, 1974.

than those existing at the time the Colorado River Compact was negotiated and some of the early legislation was enacted.

There are distinct uncertainties in the hydrologic data for the basin. Rain and snow gauges in the basin provide an extremely small sample in relation to the total area of the basin. A study of the atmospheric water balance indicated "that the basin precipitation as determined from rain gauges is about 50 percent less than that obtained from the atmospheric water balance."[61] The difference was largely attributed to a lack of high-altitude sampling in the precipitation gauge system. High-altitude sampling is critical in regions such as the Upper Basin where orographic effects strongly influence precipitation distribution.

The most accurate hydrologic measurements for the basin are probably the measured streamflow data. Most of the major U.S. Geological Survey stream gauges in the basin are rated "excellent."[62]

In evaluating the surface-water resources of the basin it is necessary to try to reconstruct what the virgin flow would be without the effects of man's activities, primarily diversions and consumptive uses. The estimation of consumptive uses involves extrapolations and considerable subjective judgment.[63]

Thus it can be seen that there are some uncertainties in the hydrologic estimates of available water supply. Because these uncertainties could be either positive or negative, the figures commonly used represent best current estimates and could be too optimistic just as easily as too pessimistic. Hydrologic variation and uncertainty prevents precise projections of water supply. Legal controls and regulations must take these vagaries into account.

B. Projected Demand Curves

To demonstrate the relationship between estimated supply and projected demand for Colorado River water, Figure 1 depicts the estimated values for water available for consumptive use in the Upper Basin and the projected demand curves. The 5.8 m.a.f. level is used as a conservative guide point by the U.S. Department of the Interior.[64]

61. Rassmussen, *Atmospheric Water Balance and Hydrology of the Upper Colorado River Basin*, 6 Water Resources Research 62, 76 (1970).

62. "Excellent" is defined as a station where the recorded flow is judged by the U.S. Geological Survey to be within five percent of the real flow 95 percent of the time.

63. Upper Colorado Region State-Federal Interagency Group, *supra* note 56, at 11.

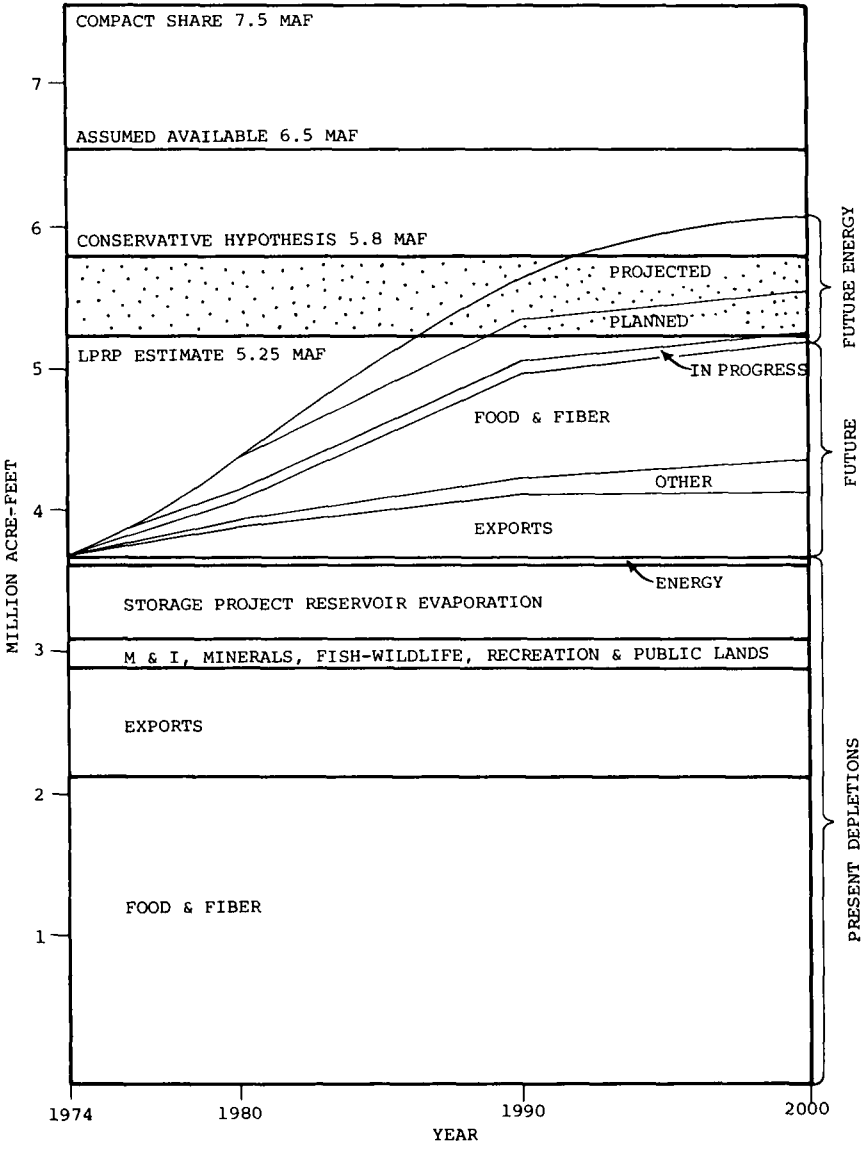
64. U.S. Dep't of the Interior, *supra* note 6, at 4:

> A Bureau of Reclamation hypothesis indicates that 5.8 m.a.f. should be a conservative average amount of water available for consumptive use in the Upper Basin States. Other studies have been made using differing basic assumptions and applying other factors which have suggested both higher and lower annual estimates. Recognizing assumptions upon which the Bureau

FIGURE 1

UPPER COLORADO RIVER BASIN

SURFACE WATER AVAILABLE FOR CONSUMPTIVE USE



Stippled zone represents most likely level of surface-water supply. (Modified after Dept. of Interior, Report on Water for Energy in the Upper Colorado River Basin, 1974)

The 5.25 m.a.f. level is determined by using the 13.5 m.a.f. average virgin flow mentioned earlier and subtracting a figure of 8.25 m.a.f. (7.5 m.a.f. plus one-half of the Mexican obligation, 0.75 m.a.f.) as the legal downstream obligation. If the Federal Government takes action to furnish the requirements of the Mexican Treaty from other sources or through flow augmentation projects, such action will relieve some of the downstream delivery burden from the Upper Basin.[65]

If the virgin flow actually averages 13.5 m.a.f. and the Upper Basin is obligated to deliver downstream an average of 8.25 m.a.f., the total projected demand will exceed the surface water supply in little more than a decade.

The figure of 13.5 m.a.f. virgin flow from the Upper Basin will be used here as a basis for determining the relative pressures within each state concerning surface-water supply and demand. First, the 10-year 75 m.a.f. obligation to the Lower Basin must be subtracted, a requirement that averages 7.5 m.a.f. per year. Next, until federal action contributes to the Upper Basin's half of the Mexican Treaty burden, it will be assumed that an additional 0.75 m.a.f. must be subtracted. The residual of 5.25 m.a.f. is an estimate of the surface water annually available for consumptive use in the Upper Basin.

Using this figure, Table 2 shows the amount of water from the Colorado River system available to each Upper Basin state.

TABLE 2

Amount of Water Available to Each Upper Basin State

	Percent	*Acre-feet Per Year*
Arizona[66]	–	50,000
Colorado	51.75	2,691,000
New Mexico	11.25	585,000
Utah	23.00	1,196,000
Wyoming	14.00	728,000
TOTAL	100.00	5,250,000

Present consumptive use and projected consumptive uses have been compiled and estimated for each state.[67] Graphs have been

hypothesis is based, the 5.8 m.a.f. will be used as a guide point in this report with the recognition that this figure is not supportable by the provisions of the Compacts and the understanding that its use is not intended in any way as an interpretation of the Compacts.

65. *See* 43 U.S.C. § 1512 (1971).

66. Upon the completion of the Navajo Generating Station, Arizona's fixed allocation of 50,000 acre-feet per year for consumptive use of Upper Basin surface water will be essentially depleted. U.S. Dep't of the Interior, *supra* note 6, at 5.

67. *See generally id.*

made of these present and future consumptive uses, showing the supply-demand situation for the four states which receive percentage shares.

Colorado receives the largest share of Upper Basin water and is now using most of its share through extensive development within the basin and transfers of water out of the basin into eastern Colorado. With the flow assumptions discussed above, Figure 2 shows that Colorado may be in a full depletion position before 1985. The future requirement of 326,000[68] acre-feet per year for energy developments in progress, planned or projected, food and fiber production, and increased extrabasin transfers, will push Colorado's use beyond the supply level. Most of the expected energy requirements are related to oil shale development.[69] At the present time, all the streams constituting the Colorado River system in the State of Colorado are "overappropriated in terms of absolute and conditional decrees."[70]

New Mexico, with the smallest allotment of the Upper Basin states, appears to be in a somewhat worse position. Figure 3 shows an earlier convergence of demand with the supply curve and an insufficient supply even with the higher estimated supply levels. There will be heightened competition for water between projected and planned energy development and new food and fiber production.

The State of Utah is allotted almost a quarter of the Upper Basin's share of the water. The development of extensive coal deposits, oil shale, and tar sands for energy production, the implementation of Indian claims, and increased extrabasin transfers will constitute the large increases in use in Utah. In less than two decades, it is likely that Utah's demand for consumptive use will exceed the available supply of surface water, as shown in Figure 4.

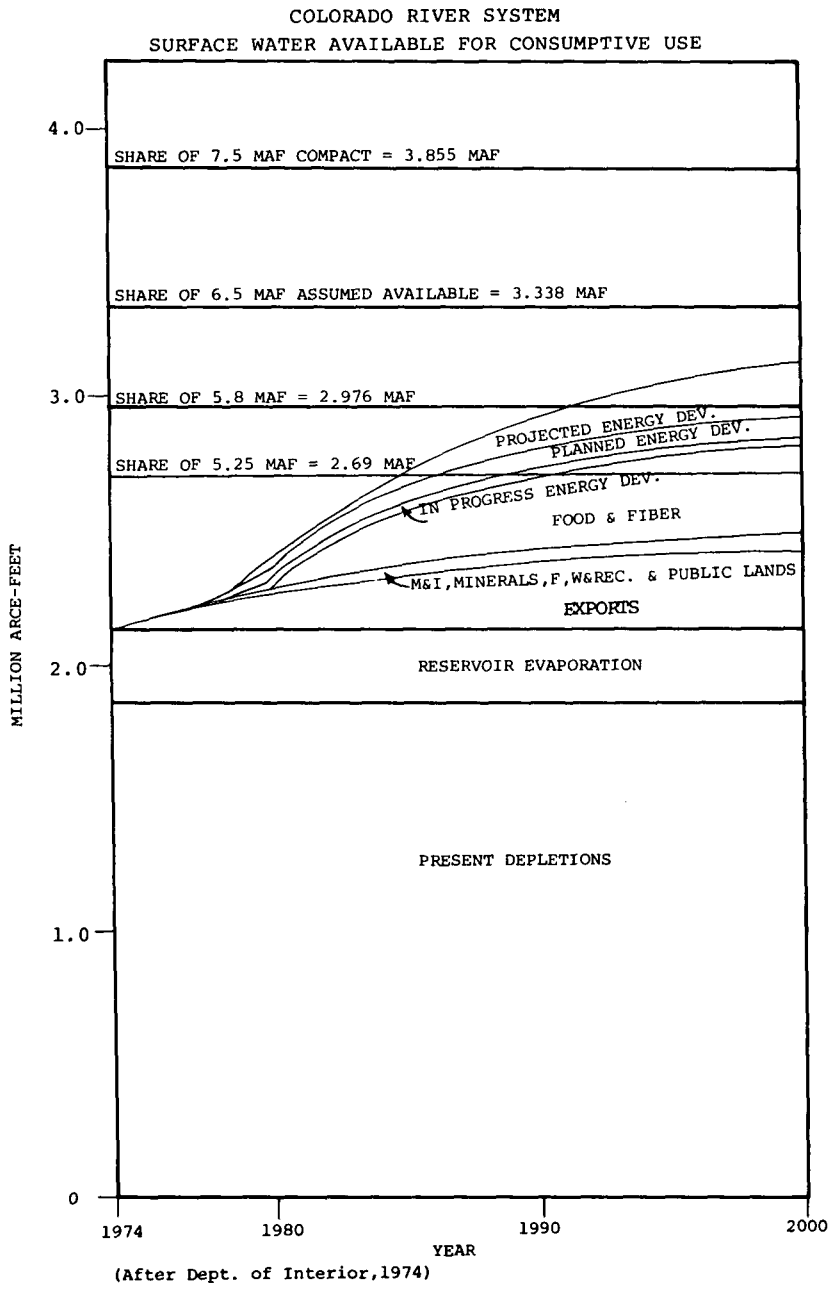
Utah and Colorado together are allocated almost 75 percent of the Upper Basin share. Both states have large water- and energy-consuming urban centers outside the basin. Also, much of the energy to be produced in these states will be transmitted not only outside the basin but outside the respective states. Thus, there will be increasing

68. *Id.* at 41.
69. *Id.*
70. *Id.* at 6:

> [A]lthough a stream may be overappropriated by prior decrees, a party can still obtain a junior adjudicated water right with a current priority date in the anticipation that it might be used when other senior rights are not utilizing the full flow of the stream, or if the senior rights are abandoned, etc. This factor contributes substantially to the fact that most streams in Colorado, including all those in the Colorado River Basin, are overappropriated in terms of absolute and conditional decrees.

FIGURE 2

COLORADO



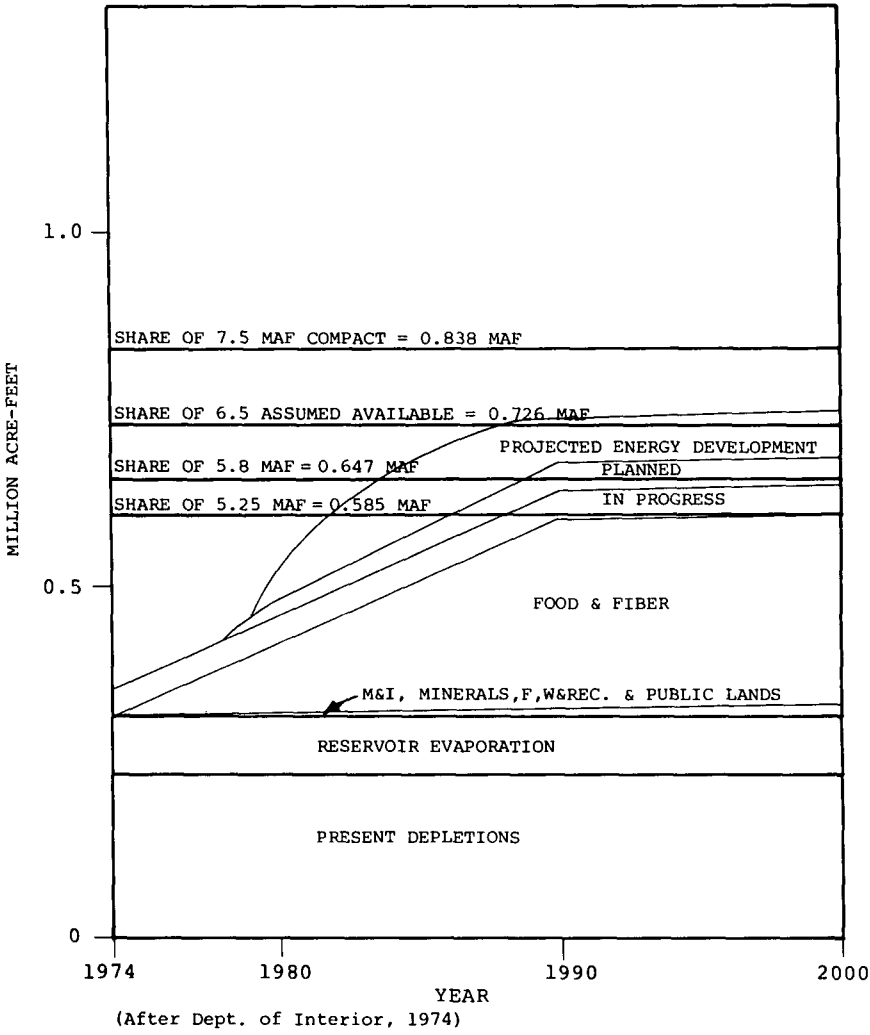
(After Dept. of Interior, 1974)

FIGURE 3

NEW MEXICO

COLORADO RIVER SYSTEM

SURFACE WATER AVAILABLE FOR CONSUMPTIVE USE

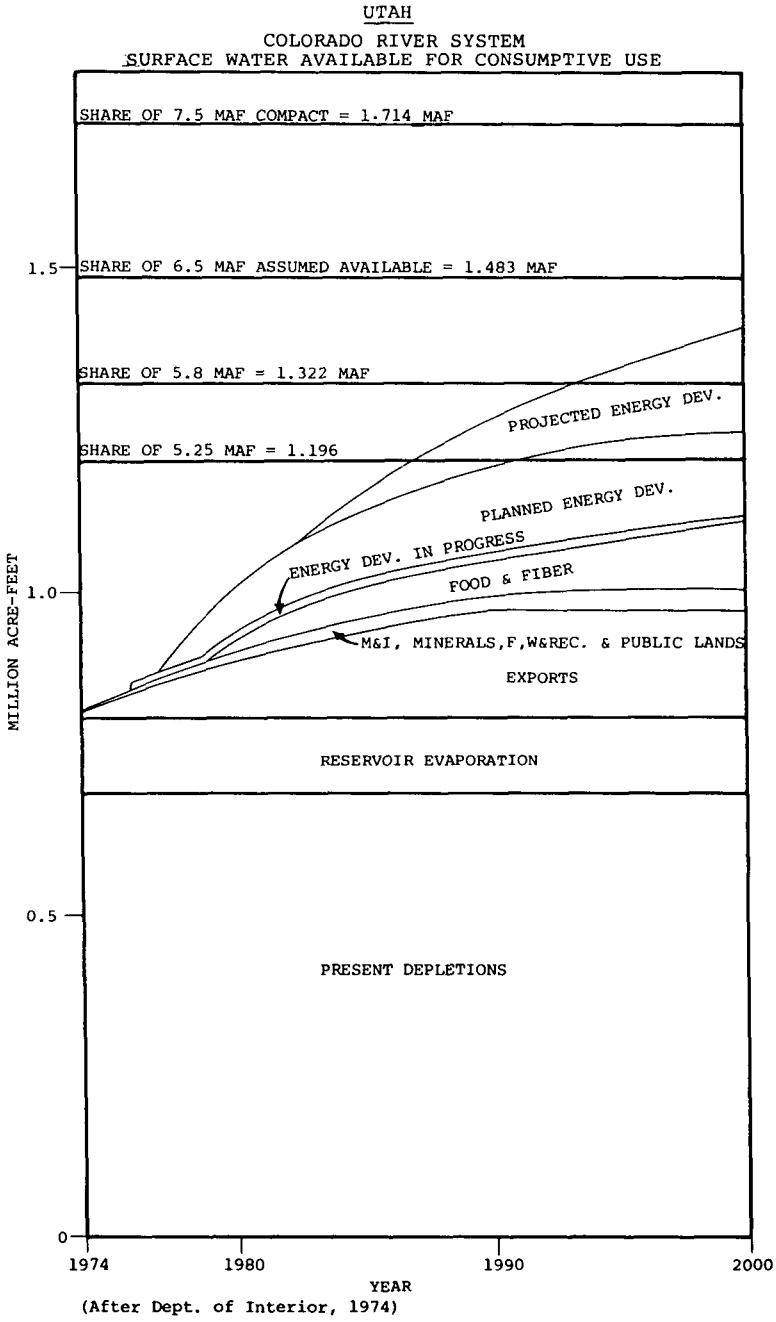


(After Dept. of Interior, 1974)

pressure on the limited water supply of the Upper Basin to provide water for both export and the production of exportable energy.

Wyoming appears to be under the least stress as far as its allotment of Upper Basin water is concerned. Even with the level of virgin runoff estimated by the Lake Powell Research Project and projected

FIGURE 4



(After Dept. of Interior, 1974)

increases in consumptive use, Figure 5 indicates that there should be water available for most purposes.

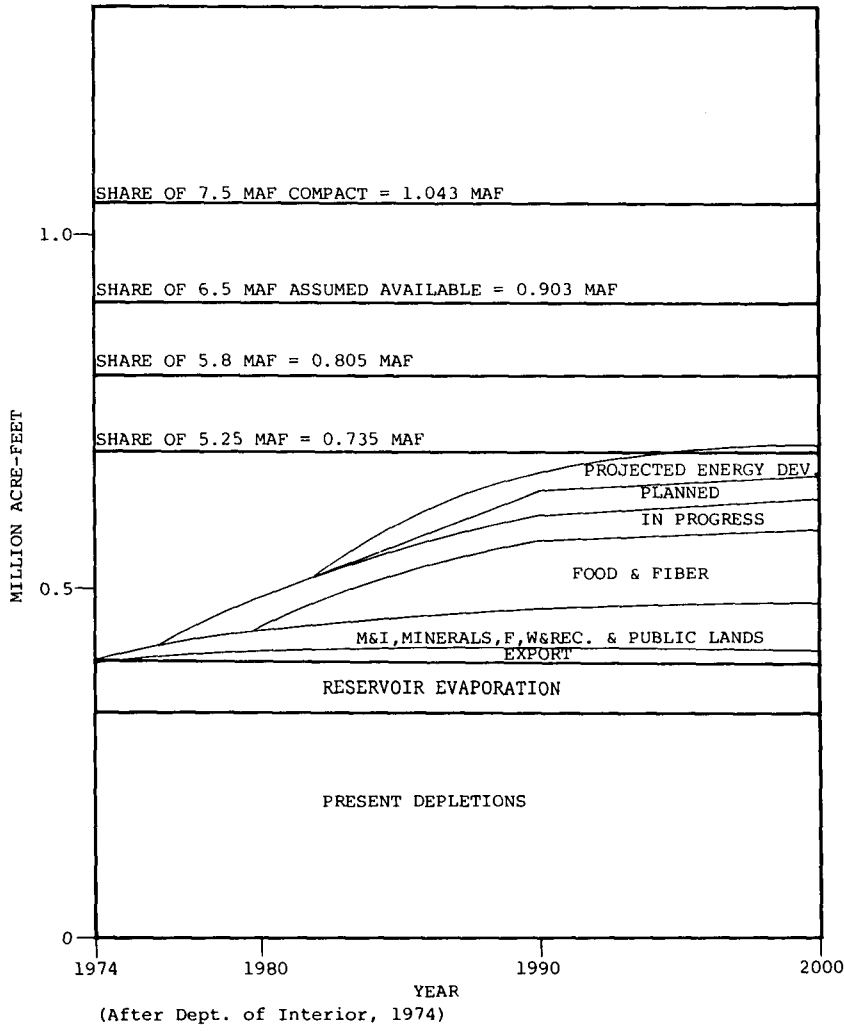
As noted above, the Lower Colorado Basin receives a guaranteed minimum amount of water from the Upper Basin. This amount is 75 m.a.f. per decade and is divided between the Lower Basin states as

FIGURE 5

WYOMING

COLORADO RIVER SYSTEM

SURFACE WATER AVAILABLE FOR CONSUMPTIVE USE



(After Dept. of Interior, 1974)

follows: Arizona 2.8 m.a.f. per year, California 4.4 m.a.f. per year, and Nevada 0.3 m.a.f. per year.[71] Although in the past more water flowed into the Lower Basin than was required to meet the legal commitment, as consumptive use and storage expands in the Upper Basin, it is likely that the flow will be reduced to the legal minimum.

In Arizona a large amount of current development is based on the mining of ground water. It is estimated that the annual overdraft of ground water in the Lower Colorado Region is about 2.5 m.a.f. per year.[72] Most of the overdraft occurs in central Arizona in the Gila River Basin, a tributary to the Colorado River.[73] The Central Arizona Project water will alleviate some of the stress on ground-water supplies in the area, but will be inadequate to provide an annual supply large enough to maintain even the current level of consumptive use.[74] Therefore, Arizona is already in a water-deficit position and only continued mining of ground water will sustain the current level of use even when the state's full allotment of Colorado River water is used.

The State of California has been using more than its 4.4 m.a.f. apportionment[75] and will have to reduce the diversions to that level as other users exercise their rights.

Nevada's allocation is a lesser factor in the Lower Basin water supply situation, and it can be assumed that the state will use its full allotment for consumptive use.

The conclusion is that the Lower Basin states are already using or are constructing facilities to exhaust their legal share of Colorado River water. With the flow control and storage capabilities of the Upper Basin now enlarged, that region can be expected to deplete flows as far as legal requirements will permit.

LEGAL PRESSURE POINTS AMONG THE ALTERNATIVE FUTURES

As demand for Colorado River water approaches the limit of available supply, pressures on the existing legal system of allocation and control can be expected to intensify, and new strains undoubtedly will develop. Legal problems on the river are partially the function of changes in the ratio of water supply to water demand, and a rising

71. Lower Colorado Region State-Federal Interagency Group for the Southwest Interagency Committee, *supra* note 51, at 27.

72. *Id.* at V-99.

73. *Id.*

74. *Id.* at V-101.

75. Some 5.1 m.a.f. were used in California during the 1971 water year according to Colorado River Board of California, 1971 Annual Report 15-16 (1972).

water demand curve, although neither absolutely inevitable nor necessarily desirable, is probable. The consequences of increased pressures on the legal system will depend, in part, on the nature and magnitude of the collective responses of the basin states and allied interests. One response might be for each basin state (possibly pursuant to federal incentives) to adopt and pursue a strategy of maximizing the utility and economic benefits of available supplies. An alternative response might be for the basin states to seek both the augmentation of the river and concomitant substantive alterations in the legal system of allocation. Although those possible responses are not mutually exclusive, it should be instructive here to abstract them separately into two broad "alternative futures," one with and one without augmentation of flow, in an attempt to identify some of the legal pressure points.

A. A Future Without Augmented Flow

This alternative future assumes that there will be no augmentation of flow by importation or weather modification.

Certain general conclusions follow from the hydrological boundary conditions, discussed *supra.* New uses in many sectors of the basin can be accommodated only by (1) diminishing or terminating the flow going to existing uses and (2) salvaging and conserving water, through improved irrigation practices, reduction in losses from evaporation and bank storage, or other means. To maintain existing uses without a reduction in economic production, while at the same time instituting new uses, slack would have to be found and exploited in the system. Water would have to be conserved where it has not been before. The amount of salvage which could be practicably converted into usable flow determines how much new use could be accommodated without reducing the net productivity of existing uses. If salvage practices were not exploited or were exhausted, the new uses could be instituted only by reducing, terminating, or improving the efficiency of the existing uses.

To the extent that the existing uses are covered by water rights which are valid as against the new uses, the disturbance of those existing uses can require the payment of compensation to the existing user. The existing user would be paid if the water rights were involuntarily lost or diminished by eminent domain, or voluntarily sold or leased.

Now let us consider some of the provisions of the law of the river which would affect or be affected by the above variations on the theme of scarcity.

1. The Guaranteed Aggregate Flow Formula

The Upper Basin's obligation to deliver 75 m.a.f. to the Lower Basin[76] (hereafter "G.A.F." for "guaranteed aggregate flow") is very much alive today. Although other provisions of the 1922 Compact were never implemented or have been abrogated by federal statutory and decisional law, the U.S. Supreme Court in its 1963 pronouncement on the subject said it would look to the Compact "to resolve disputes between the Upper and the Lower Basins. . . ."[77]

The G.A.F. provision is the source of considerable dissatisfaction in the Upper Basin. It has caused projections for Upper Basin per annum beneficial consumptive uses to be limited to 5.8 m.a.f. and less, as noted earlier. Add to this the fact that the G.A.F. actually provides the Lower Basin with the opportunity to consume more than 7.5 m.a.f. per annum from the hydrologic regime of the river. All of the 7.5 m.a.f. apportioned to the Lower Basin states pursuant to the Boulder Canyon Project Act of 1928 (as construed in the 1963 *Arizona v. California* court decision)[78] originate in the Upper Basin. The exclusive use of the tributaries in the Lower Basin has been reserved to each respective state of origin in the Lower Basin. This means that the Lower Basin experiences some 3 million acre-feet[79] of annual runoff from the hydrologic system of the Colorado River in addition to the water delivered to it at Lee Ferry under the compact.

An exhaustion of supply for Upper Basin development in the future could heighten the Upper Basin's dissatisfaction with the G.A.F. provision of the Compact. Such an exhaustion could result from either an increase in depletions through greater development or a marked reduction in natural supply caused by a dry cycle. The projected rise in the consumptive use of water for coal-fired power plants in the Upper Basin, producing electricity in part for the Lower Basin, will deepen interest in having the G.A.F. formula overhauled. Even though the Upper Basin will receive some economic benefits from the construction and operation of the power plants, Upper Basin interests most likely will argue: Why should we guarantee a minimum flow to the Lower Basin while permitting part of the Upper Basin allotment to be translated into electricity which also goes to the Lower Basin?

Some of the emerging water demand in the Upper Basin, partic-

76. *See* Colorado River Compact, 70 Cong. Rec. 324 (1928).
77. Arizona v. California, 373 U.S. 546, 567 (1963).
78. *Id.* at 567-575.
79. Lower Colorado Region State-Federal Interagency Group, *supra* note 51, at V-13.

ularly that associated with the development of coal-fired power plants and the mining of oil shale, conceivably could be supplied by undeveloped ground water. There is an intriguing possibility that sizeable ground-water reserves underlie the coal seams in many of the structural basins.[80] The amount available, its recoverability, and its quality are matters of conjecture at this point, but several million acre-feet could be involved.[81] Proposals to use this gradually-replenishable Upper Basin resource, which in most cases is not part of the "Colorado River system" under the law, to produce power to further the economic growth of the Lower Basin may further prompt Upper Basin interests to consider the possibility of obtaining, in exchange, a greater or more reliable share of the annually replenished surface waters of the Colorado River system.

2. The Lee Ferry Accounting Point

During the recent Rainbow Bridge litigation,[82] which threatened to reduce significantly the storage capacity behind Glen Canyon Dam, there was unofficial speculation as to the feasibility of moving the interbasin accounting point downstream from Lee Ferry to the gates of Hoover Dam in order to provide added holdover storage within the Upper Basin. The capability of the Upper Basin to meet the G.A.F. obligation accordingly would be enhanced, reducing the risk of water shortage for consumptive uses in the Upper Basin.

Moving the accounting point could affect a number of existing arrangements and regimes, however, including the power generation contracts and schedules at Hoover Dam and Glen Canyon Dam; the operation of the Lower and Upper Basin development funds;[83] the crediting of tributary inflows between Lee Ferry and Hoover Dam; the allocation of Lake Mead evaporation losses; and the recreation and fishery programs at Lake Mead. Such adjustments probably could be accomplished technically and legally (through federal legislation) if the political impetus for change existed.

80. Navajo sandstone, which has a high water-holding capacity, deeply underlies much of the coal-bearing strata in the basin. *See, e.g.*, Goode, *Sources of Water to Supply Coal-Fired Electric Power Plants in Kane County, Utah*, 19 Guidebook to the Geology of Utah 144 (Goode & Robinson eds. 1965).

81. *See* Water Supply Work Group, Southwest Energy Study, Water Supply, Appendix B, at III-11 (February 1972 draft):

> Estimated storage of ground water in the Upper Colorado River Basin above a depth of 100 feet of saturated thickness of aquifers ranges from 50 to 116 million acre-feet. A portion of this is recoverable using available equipment and methods but without regard to economic, physical, legal, or environmental factors.

82. Friends of the Earth v. Armstrong, 485 F.2d 1 (10th Cir. 1973), *cert. denied*, 414 U.S. 1171 (1974).

83. *See* 43 U.S.C. § § 617a, 620d (1971).

3. Lower Basin Domestic and Irrigation Uses Vs. Upper Basin Power Production

Hydropower production and irrigated agriculture have been closely linked in federal reclamation policy. Public power has subsidized irrigation works throughout the Colorado River Basin. Even so, however, a degree of competition for water between agricultural and power interests has always existed. The "food vs. energy" debate has heightened considerably, of course, in recent months.

Electric power was no match for agriculture in the 1922 Compact negotiations. Power was subordinated to agriculture, reasoned Herbert Hoover, chairman of the commission which drafted the Compact:

> Because the cultivation of land naturally outranks in importance the generation of power, since it is the most important of human activities, the foundation upon which all other industries finally rest.[84]

There appears to have been an underlying assumption that hydroelectric generation was the only form of power production which would use water in the basin.

The 1922 Compact[85] exhibits a strong bias in favor of domestic and agricultural water uses. Article II defines "domestic use" to "exclude the generation of electrical power." Article III(e) provides:

> 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.

Article IV(b) reads, in part, that "water 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." Although a purpose of the Compact as recited in Article I was "to secure the expeditious, agricultural and industrial development of the Colorado River Basin," the electrical power side of industrialization was of secondary concern.

These Compact provisions raise the issue whether a Lower Basin agricultural use has preference over an Upper Basin power use. For example, if and when California is actually limited to 4.4 m.a.f., could a California agricultural user, who could not be served within the 4.4 m.a.f. limit, successfully enjoin the use of water by one or

84. 64 Cong. Rec. 2712 (1923) (statement of Herbert Hoover).
85. Colorado River Compact, 70 Cong. Rec. 324 (1928).

more of the Upper Basin power plants? One commentator has argued that water can be withheld in the Upper Basin for power use as long as the G.A.F. obligation is met,[86] but the issue has not been judicially resolved. The Secretary of the Interior did impose a 10 percent reduction in Lower Basin water deliveries in 1964 to facilitate the filling of the reservoir behind Glen Canyon Dam.[87] Provision was made for protecting Hoover Dam power contracts and the reduction in flow was offset by subsequent deliveries to assure compliance with the G.A.F.

If and when another actual conflict arises over the issue, it could pit Lower Basin agricultural interests against Lower Basin electric power interests, since the latter are developing and exporting much of the electricity generated by coal-fired plants located in the Upper Basin. Unless the matter were to be legislatively clarified in advance, the Secretary of the Interior most likely would decide the question, perhaps precipitating a court test.

4. Restraints on the Transferability of Water Rights

As demand outstrips supply, the pressure for reallocating the supply by replacing old uses with new uses will increase. The tendency to date has not been to disturb preexisting uses every time a new demand comes along. Instead, the response has been to find "physical solutions"—to develop new facilities or supplies for the new uses.

Many resource economists have expressed the opinion that a freer market in water rights would produce a more efficient mode of allocating water[88] than the approach of developing new supplies that has been traditionally followed in the West. Legal restrictions and transaction costs have discouraged water-right transfers, however, not only in the Colorado River Basin but throughout the West.[89] If the river system is not augmented, a strong impetus will exist for removing these restraints on alienation.

(a) Federal

Water rights which appertain to land within a federal reclamation project apparently cannot be transferred without the consent of the

86. Clyde, *Conflicts Between the Upper and Lower Basins on the Colorado River,* in Resources Development: Frontiers for Research 113, 126-27 (Western Resources Conference 1960).

87. *See* Yuma County Water Users' Ass'n v. Udall, 231 F.Supp. 548 (D.D.C. 1964); Yuma Mesa Irr. & Drainage Dist. v. Udall, 253 F.Supp. 909 (D.D.C. 1966).

88. *See generally* Hirshleifer, DeHaven & Milliman, Water Supply (1960); Meyers & Posner, Toward An Improved Market In Water Resources (National Water Comm'n, 1971).

89. *See* National Water Comm'n, Water Policies for the Future 260-70 (1973).

Bureau of Reclamation, yet no specific guidelines or incentives exist for obtaining consent.[90] The stated reason for the restraint lies in the government's continuing interest in projects while the users are repaying construction or rehabilitation loans and, even later, while the users are paying operation and maintenance charges for the dams and other government-owned facilities.[91] Meyers and Posner have argued the need for legal reform:

> Transfers of water from Bureau of Reclamation projects should be freely permissible, whether or not the transfer is to a different use or a use outside of the project, subject only to the conditions that the purchaser assume so much of the construction loan as is fairly allocable to the quantity of water transferred and that he assume a portion of O & M charges if the transfer diminishes the ability of the seller to continue to pay all of them. The Bureau would be empowered to intervene in any transfer proceeding to protect its interests.[92]

The uncertain state of affairs at the federal level increases the transaction costs associated with purchasing an irrigation water right.

(b) Interregional and Interstate

The existing allocation scheme for the Colorado River discourages interbasin and interstate water right transfers. Both before and after the beneficial consumptive use was allocated first to the Upper and Lower Basins and later to the respective states, private water rights appertaining to specific locations and uses became recognized under state law. The extent to which the transfer of such rights would be given extrajurisdictional effect is problematic. Assume, for example, that an agricultural user holds a valid water right in State X which he wants to sell to a power user in State Y. Would that water right be recognized and enforceable in State Y? Against which state's entitlement would the use be charged?

Unreasonable state law restraints on interstate commerce in water are unconstitutional under the Commerce Clause.[93] But does the Constitution compel that one state or region recognize the transfer, change of use and change in point of diversion, of a water right

90. *See* Sax, *Selling Reclamation Water Rights: A Case Study in Federal Subsidy Policy*, 64 Mich. L.Rev. 13 (1965); Meyers & Posner, *supra* note 88, at 18-25.

91. Meyers & Posner, *supra* note 88, at 22.

92. *Id.* at 47. 43 U.S.C. § § 485h(c) & 521 (1971) provide some authority for transfers. *See* El Paso County Water Improvement Dist. No. 1 v. City of El Paso, 133 F.Supp. 894, 920-21 (W.D. Tex. 1955), *aff'd as reformed*, 243 F.2d 927 (5th Cir. 1957), *cert. denied*, 355 U.S. 820 (1957).

93. *See* City of Altus v. Carr, 255 F.Supp. 828 (W.D. Tex. 1966), *aff'd mem.*, 385 U.S. 35 (1966).

which is otherwise valid in another state? Arguably not, unless some federal program for legitimating and regulating such exchanges is established. Since water uses are charged against the entitlement of the state and basin in which the use occurs, a transfer of use from one state to another, or one basin to another, could affect the balance of "political equities" between the states. Adjustments in the state entitlements, a system of credits or some other means might have to be devised to deal with the problem.

(c) Intrastate

Legal requirements and uncertainties in the laws of some of the basin states discourage the intrastate transfer of water and water rights.[94] Many of the legal constraints against transfers stem from the historic notion that a water right is appurtenant to the land on which the water is originally used. Changes in use and in points of diversion are commonly allowed in most western states. Perhaps the next development will be a uniform rule among the states that water rights can be severed from the land, and exercised and recognized elsewhere.[95] The pressure which has been building to change the state laws restricting transfer could be expected to increase appreciably under a future of unaugmented flow.

5. Federal and Indian Water Rights Quantified and Exercised

Federal and Indian water rights will be particularly important variables in the management of unaugmented flow. New energy uses in the Upper Basin are occurring against the backdrop of unquantified federal and Indian water rights which, when quantified and exercised, could displace existing lower-priority uses in times of scarcity.[96]

Energy-related developmental interests, demanding a reliable water supply for billion-dollar investments, can be expected to seek the consent of Indian tribes to shortage-sharing arrangements wherein the tribes would surrender, for a period of years or permanently, their early priority dates and agree to share water in time of scarcity in return for some form of consideration.[97] Interest will also be

94. *See, e.g.*, Meyers & Posner, *supra* note 88, at Appendix I.

95. Meyers & Posner, *supra* note 88, at 47-49, listed the major elements for a "Model State Transfer of Water Rights Act."

96. At this writing serious consideration is being given to the introduction of legislative proposals in Congress which would adjudicate or otherwise quantify reserved water rights. *See* recommendation for a "National Water Rights Procedures Act" and Indian water rights act in National Water Comm'n, *supra* note 89, at 463-67 and 477-83.

97. Such a trade-off marked the development of the San Juan-Chama Project. *See* 43 U.S.C. § 615ss (1971).

displayed in leasing or acquiring Indian water rights, posing the legal issues, yet unresolved, whether the Indian right can be leased or transferred for off-reservation use.[98] By executing waivers of rights for a period of years, the tribal holders of unquantified water rights can obtain some interim financial return, but only at the considerable risk of allowing additional Anglo uses to accumulate and develop patterns of economic reliance which subsequently are difficult to disturb.

While Indian water rights may be periodically waived for value in direct bargaining between the tribes and Anglo users, the Federal Government, as trustee of the tribal resources, cannot legitimately permit Indian water rights to be compromised, whether in a spirit of accommodation or otherwise. The basin is not simply a mixing bowl in which all interests are equally mitigated and compromised. Some rights and obligations are intended to be fully satisfied without regard to the claims of competing interests. Indian water rights are not subject to being prorationed downward through some kind of "judgment call."[99]

Several legal issues could arise under competitive conditions. Is a certain minimum water quality standard to be implied in the Indian water right? Is the formula for dividing water between the basins a limit on Indian water rights? Are the various ceilings on the entitlements of the respective states also effective ceilings on the water rights of Indian tribes located in those states?

As already noted, neither the 1922 Compact, nor the 1948 Compact, purports to affect Indian water rights.[100] Indian water uses within each basin state are charged against that state's entitlement, according to *Arizona v. California*[101] (as to the Lower Basin) and the 1948 Compact[102] (as to the Upper Basin), but this does not resolve the question whether Indian uses or rights are limited by those state entitlements. To take a remote example, assume that State X is entitled by Compact to 10 units of water. Anglo user A has a year 1900 priority right to the first 5 units. Tribal user B has the next priority right (year 1905) which, measured in terms of the purposes for which the reservation was created, amounts to 6 units. Can Tribe B use the full 6 units, to the detriment of a junior user (year 1910) in downstream State Y? There is an administrative

98. *See* Comment, *Sale and Lease of Indian Water Rights,* 33 Mont.L.Rev. 266 (1972).

99. *See* Pyramid Lake Paiute Tribe of Indians v. Morton, 354 F.Supp. 252, 259 (D.D.C. 1973).

100. *See* note 36, *supra.*

101. 373 U.S. 546, 601 (1963).

102. Upper Colorado River Basin Compact, art. VII, 63 Stat. 31, 35 (1949).

ruling, which has not been judicially confirmed, to the effect that the Navajo Tribe is limited by the 50,000 acre-feet Upper Basin entitlement of the State of Arizona, notwithstanding the fact that the Upper Colorado River Basin Compact disclaims any effect on Indian rights.[103] The claims recognized on behalf of the lower Colorado River tribes in *Arizona v. California*[104] did not exceed the entitlements of the affected states, therefore these issues were not treated.

Since new energy demands predictably will impinge upon some historic, but unexercised, federal and Indian water claims, pressures will mount to resolve some of the foregoing issues.

6. Impact of Water Quality Standards

An unthinking assumption is sometimes made that man has only worsened, never improved, the water quality of the Colorado River. In fact, of course, human activities variously have upgraded and degraded the quality of the surface flow. The river has always been heavily laden with silt. Even now, more than half of the total load of dissolved solids in the river originate from salt springs and diffuse runoff.[105] Although evaporation from reservoirs can concentrate salt, dams and desilting facilities have improved in many ways the quality of the water for numerous consumptive uses. But consumptive uses, in turn, have deteriorated the artificially-achieved water quality. Depletions without return flows have reduced the dilutive capacity of the downstream flow. Depletions with return flows have contributed concentrated dissolved solids to the downstream flow.

The utility of the river has been exploited with very little regard to

103. Sol.Op. M-36799, 76 Interior Dec. 357 (December 10, 1969). The opinion is based, in part, on the disputable premise that the Upper Colorado River Basin Compact "flatly precludes total use [including Indian use] of Upper Basin water in Arizona in excess of 50,000 acre-feet a year." *Id.* at 358. Another interpretation of the Compact, however, is that it left Indian water rights wholly unaffected. *See, e.g.*, Upper Colorado River Comm'n, Official Record of Meeting No. 7 at 13 (mimeo, July 7, 1948) (comments of Commissioner Stone). If so, then it would be quite possible that an Indian water right, when exercised, could be chargeable against a state's entitlement but not limited by that entitlement. The issue has been posed as follows by Muys, Interstate Water Compacts: The Interstate Compact and Federal-Interstate Compact 285 (National Water Comm'n 1971):

> What is the effect of the Indian rights disclaimer if a compact apportionment is inadequate to satisfy all Indian water rights? Does the preservation of the obligation of the United States to the Indian tribes mean that the compact apportionment is controlling but the United States owes an obligation to make the Indian tribes whole if their rights are curtailed by the compact ceilings? Or does it mean that the actual uses are to be unimpaired by the compact apportionments?

104. 376 U.S. 340 (1964).

105. U.S. Environmental Protection Agency, The Mineral Quality Problem in the Colorado River Basin—Summary Report 18 (1971). Of course, man's activities have aggravated the pollution from diffuse runoff in many areas.

the progressive deterioration of water quality. Rights to use the water have been perfected or reserved, but no minimum flow for purposes of water quality has been preserved. Concern for water quality has been voiced from time to time by opponents of particular development projects,[106] but it has not prevented, nor even significantly impaired, development.

The issue of salinity was tacitly avoided in the negotiations behind the Mexican Water Treaty of 1944.[107] A national obligation to improve the quality of the water flowing to Mexico has been recognized and will be pursued through the new Colorado River Salinity Control Act of 1974[108] by desalting irrigation return flows and controlling natural and man-caused salt sources. The salinity-control projects authorized and envisioned by the 1974 Act should reduce the proportion of dissolved solids in the water used in the Lower Basin, but whether these planned physical solutions can improve water quality to a point where expected numerical salinity standards can be met remains to be seen.

The adoption of receiving-water standards for interstate streams was required by the Federal Water Quality Act of 1965.[109] The basin states' failure to promulgate salinity standards in a timely fashion gave rise to an enforcement conference, conducted by the Environmental Protection Agency in 1972,[110] which produced a memorandum of understanding that supported the construction of salt-control projects.[111]

In October of 1972, however, Congress enacted the more stringent Federal Water Pollution Control Act Amendments[112] which, among other things, adopt the "national goal that the discharge of pollutants into the navigable waters be eliminated by 1985."[113] Since the Act is directed primarily at limiting effluents from point sources,[114] most non-point return flows will probably escape its permit pro-

106. For example, California interests invoked water quality arguments in opposing authorization of the Colorado River Storage Project. *See Hearings on H.R. 270, H.R. 2836, H.R. 3383, H.R. 3384, and H.R. 4488 before the Subcomm. on Irrigation & Reclamation of the House Comm. on Interior & Insular Affairs,* 84th Cong., 1st Sess. 911 (1955).

107. *See* note 16 *supra.*

108. Pub. L. No. 93-320, 88 Stat. 266 (1974).

109. Pub. L. No. 89-234, 79 Stat. 903 (1965), amending 33 U.S.C. § § 1151-1174 (1964).

110. U.S. Environmental Protection Agency, Seventh Enforcement Conference in the Matter of Pollution of the Interstate Waters of the Colorado River and Its Tributaries (Las Vegas, February 15-17, 1972 and Denver, April 26-27, 1972).

111. *See* Transcript of Conference, *id.* at 169-173 (April 27, 1972); also, U.S. Dep't of the Interior, Colorado River Water Quality Improvement Program (1972).

112. 33 U.S.C. § 1251 (1971).

113. *Id.* § 2.

114. *Id.*

cedures. Irrigation return flows from more than 3,000 contiguous acres are being treated as point sources, however.[115] The Act requires the adoption of adequate receiving-water standards and implementation plans, which will also have an effect on the Colorado River.

The EPA has set up a schedule which requires the basin states, by October of 1975, to adopt numerical salinity standards for the Colorado River and a plan for implementing the standards by July of 1983.[116] It is expected that the Colorado River Salinity Control Forum, composed of representatives of the basin states, will propose a numerical standard and plan by February of 1975.[117]

The imposition of water quality standards on an unaugmented flow can be expected to highlight the manmade sources of pollution, such as irrigated agriculture. If the projects under the 1974 Salinity Control Act do not bring the river into conformance, further remedial action will be required. It is not likely that any single state, or the states in concert, will act to impose restrictions on water use absent the federal carrot or stick. The carrot has been—and probably will continue for some time to be—favored over the stick.[118] Future federal funding on the river can be expected to be conditioned on the adoption of improved water-use practices by the beneficiaries.

Each of the basin states might attempt to impose restrictions on the exercise of water rights which would encourage wiser irrigation practices. The states ought to redefine the standard of "beneficial use" to require adoption of available technical methods of reducing effluent in return flows.[119] If such regulation exceeds the police power of the state, the power of eminent domain could be exercised to reduce significant sources of return-flow effluent.

B. A Future With Augmented Flow

Weather modification[120] and transbasin water importation are

115. 40 C.F.R. § 124.11(h)(4)(1974).

116. *See, e.g.*, letter from John A. Green, Regional Administrator, U.S. Environmental Protection Agency, Region VIII, to Hon. John A. Love, Governor of Colorado, January 18, 1973.

117. Interview with Robert H. Hagen, Chief, Land Planning Section, Environmental Protection Agency, Region VIII, in Denver, Colorado, September 4, 1974.

118. The "distributive" mode of water policy concerning the Colorado River is discussed by Mann, *The Politics of Water Resource Development in the Upper Colorado River Basin*, in D. Mann, G. Weatherford & Nichols, Legal-Political History of Water Resource Development in the Upper Colorado River Basin (Lake Powell Research Project, 1974).

119. Colorado recently redefined "beneficial use" to include the appropriation "of such minimum flows . . . as are required to preserve the natural environment to a reasonable degree." Laws of Colo. 1973, ch. 442, § 1.

120. *See generally* Fleagle, Crutchfield, Johnson & Abdo, Weather Modification in the Public Interest (1974).

means by which the flow of the Colorado River could be augmented. The Bureau of Reclamation has reported that weather modification over the western slopes of the Rocky Mountains could generate approximately 0.9 to 1.3 m.a.f. of additional flow annually for the system.[121] With the 1978 end of the 10-year moratorium on reconnaissance studies for the transbasin augmentation of water,[122] interest may be revived in schemes to import water into the basin from the Pacific Northwest, British Columbia, or Alaska.[123]

1. Effect of Existing Law Upon Augmentation Plans

It is almost certain that the allocation of such additional flow, whatever its source, would be determined—at least in broad terms—by the federal legislation authorizing the expenditure of funds for the particular augmentation program. Predictably, the preexisting law of the river would be reviewed, tested and modified in the legislative process leading up to such an enactment.

(a) National Environmental Policy Act

Without question, any plan to augment appreciably the flow of the river would constitute a "major federal action significantly affecting the quality of the human environment" within the meaning of the National Environmental Policy Act of 1969 (NEPA).[124] One or more environmental impact statements would have to be prepared, identifying among other things adverse impacts and program alternatives.

(b) Federal Water Pollution Control Act

The requirements of the Federal Water Pollution Control Act Amendments of 1972,[125] discussed *supra,* could influence the apportionment of the augmented flow. If the unaugmented flow violates numerical water quality standards at the time augmentation is planned, the Environmental Protection Agency might be expected to suggest to Congress that a portion of the new flow be apportioned to raising the minimum dilutive flow of the river to effect compliance with the standards.

121. U.S. Dep't of the Interior, *supra* note 6, at 58.
122. *See* 43 U.S.C. § 1511 (1971).
123. *See* D. Mann, Interbasin Water Transfers: A Political and Institutional Analysis (Nat'l Technical Information Serv., Acc. No. PB208303, 1972).
124. 42 U.S.C. § 4332(2)(c) (1971).
125. 33 U.S.C. § 1251 (1971).

(c) Colorado River Project Act of 1968

Deficit apportionment in anticipation of augmented flow has already occurred. Statutory and contractual preferences have already been established for a part of any future augmented flow. Section 202 of the Colorado River Basin Project Act of 1968[126] declares that "the satisfaction of the requirements of the Mexican Water Treaty from the Colorado River constitutes a national obligation which shall be the first obligation of any water augmentation project" built pursuant to a general water-supply and water-demand plan for the Western United States.

Once certain levels of augmented flow are reached, however, some existing limitations and priorities will be lifted. The obligation to meet the Mexican Treaty obligation from the unaugmented flow of the Colorado River will cease with the development of 2.5 m.a.f. of annual augmented flow.[127] And the priority which certain existing Lower Basin uses have over the Central Arizona Project

> shall not apply so long as the Secretary [of the Interior] shall determine and proclaim that means are available and in operation which augment the water supply of the Colorado River system in such quantity as to make sufficient mainstream water available for release to satisfy annual consumptive use of seven million five hundred thousand acre-feet in Arizona, California, and Nevada.[128]

With specific reference to any transbasin importation scheme, the 1968 Colorado River Basin Project Act requires that the exporting region be protected by federal funds and by recognition of a perpetual right to first call on the exported water.[129]

(d) 1922 Compact and 1928 Boulder Canyon Project Act

The issue may arise whether certain provisions of the 1922 Compact, unless otherwise modified or superseded by subsequent laws, would govern the apportionment of augmented flow.

Article III(b), for example, purports to give the Lower Basin the right "to increase its beneficial consumptive use" of the waters of the Colorado River system "by 1,000,000 acre-feet per annum," over and above the 7.5 m.a.f. recognized in Article III(a). The "Colorado River System" is defined in Article II(a) as "that portion of the Colorado River and its tributaries within the United States of America." Water imported from another basin would not be part of the system as it exists in a state of nature. Artificially generated

126. 43 U.S.C. § 1501 (1971).
127. *Id.* § 202.
128. *Id.* § 301.
129. *Id.* § 203.

precipitation, which drains naturally into the river and tributaries, presents a closer case, but it too probably does not come within the legal definition of the system.

The Upper Basin might argue that any annual augmentation ought to inure exclusively or predominantly to its benefit to balance out the inequities created by the combined workings of low historic flow and the G.A.F. formula, referred to earlier. The augmented flow would permit the Upper Basin to enjoy a fuller portion of "the exclusive beneficial consumptive use of 7,500,000 acre-feet of water per annum" perpetually apportioned to it in Article III(a) of the 1922 Compact.

The 1922 Compact contains a mechanism for the "equitable apportionment" of beneficial uses left unapportioned by the document. According to subparagraphs (f) and (g) of Article III, "at any time after October 1, 1963, if and when either basin shall have reached its total beneficial consumptive use" [7.5 m.a.f. in Upper, 8.5 m.a.f. in Lower Basin], any two signatory states can cause the President of the United States and the governors of all of the signatory states to appoint representatives "whose duty it shall be to divide and apportion equitably between the upper basin and the lower basin the beneficial use of the unapportioned water," subject to state and federal legislative ratification. It is doubtful that this provision would govern any attempt at apportioning augmented flow.

First, there is the bootstrap problem. Barring a lengthy and extraordinary wet water cycle, it is not likely that either basin could reach the compact limits on beneficial consumptive use. Second, as already noted, it is doubtful whether the augmented flow would be part of the "system" for which such further equitable apportionment would be intended.

Whatever the proper interpretation of Article III(f) and (g), nothing would prohibit the basin states, with congressional consent, from convening a round of negotiations looking toward a new interstate agreement.

2. Conflicts Over Measuring Use and Charging Losses

Augmentation might give rise to a conflict between the Upper and Lower Basins stemming from the legal uncertainty surrounding the definition of "beneficial consumptive use."[130] The Upper Basin and Lower Basin measure beneficial consumptive use differently. The Upper Basin Compact adopts the "inflow-outflow" method with its

130. Colorado River Compact, 70 Cong. Rec. 324 (1928).

"net depletion" formula which "does not charge users for water they apply to beneficial use if the water would have been lost anyway in a state of nature."[131] The Lower Basin is governed by a formula which regards beneficial consumptive use as the difference between diversions and return flows.[132] If and when Upper Basin consumptive use ever reached 7.5 m.a.f. under the Lower Basin method of measurement, the Lower Basin might be heard to complain if there were an increase in the use pursuant to the "inflow-outflow" formula.

3. Indian and Federal Reserved Rights

Although reserved water rights are commonly regarded as attaching to flow from runoff within the watershed of use, rather than to artificially augmented flow, the distinction might not be meaningful in the practical context within which augmentation plans could be expected to evolve. If, for example, the assertion of reserved water rights threatened to deprive existing Anglo users of water, augmented water supplies most likely would be viewed as a means of mitigating the competition.

An interesting point-counterpoint between law and politics could arise in such circumstances. On the one hand, the national obligation to the Indian tribes would provide the basin states an appealing touchstone with which to seek broad political support for a largely nonreimburseable river augmentation project. On the other hand, if the Indian tribes accepted rights in the augmented flow, in lieu of reserved rights, they could be giving up the early priority dates of their water rights. Arguably, then, the lower priority users of the unaugmented flow ought to be the ones subordinated to the priorities of the exporting region (in the case of water importation) or to the fortuities of governmental rainmaking (in the case of weather modification).

LEGAL-INSTITUTIONAL CHANGE: PROSPECTS AND PATTERNS

A. The Legal-Political Environment for Change

1. The Federal Presence

The adaptability of the law of the river lies in the paramount fact of federal control. The strongest legal influence on the river is the United States Constitution, granting the President the power to make treaties[133] and empowering Congress to regulate interstate and

131. Meyers, *supra* note 13, at 19.
132. Arizona v. California, 376 U.S. 340 (1964).
133. U.S. Const. art. II, § 2.

foreign commerce,[134] administer public lands,[135] protect the Native American,[136] and provide for the general welfare.[137] The basin states sought unsuccessfully to put the river system outside the reach of the commerce clause by declaring the river to be nonnavigable.[138] Congress and the United States Supreme Court have insisted on the Colorado River's navigability[139] in order to preserve federal control over its development.

The construction, subsidization, and operation of the dams and associated works unquestionably has given the Federal Government administrative control of the river. The Secretary of the Interior currently is the regent of the water resources—and a major portion of the land and mineral resources[140]—of the Colorado River Basin. The Secretary acts amidst many restraints, however, and the authority he wields is delegated by Congress. The pressures for institutional change may originate elsewhere, but little significant institutional change is likely to occur without authorization from Congress.

Federal powers are sufficient to promote and oversee needed changes in the water allocation and management system. Water quality improvement is becoming federally regulated and subsidized. Federal and state restraints on water right transfers could be modified, with water allocation becoming a matter of interstate commerce within the basin.

The central issue becomes, then, not whether the legal framework of the river is flexible enough to facilitate change, but rather how the change will be accomplished. Put another way, the question is not whether federal authority is sufficient to manage change, but rather how that authority will be exercised and who will pay the costs and enjoy the benefits of the resultant change.

2. *The Role of the States*

Although the Federal Government enjoys supremacy over the basin states in most areas of sovereignty and political power under the Constitution, federal powers over water and other natural resources in the West generally are exercised on behalf of articulated

134. *Id.* art. I, § 8.
135. *Id.* art. IV, § 3.
136. *Id.* art. I, § 8.
137. *Id.*
138. *See* Colorado River Compact, art. IV(a), 70 Cong. Rec. at 325.
139. *See, e.g.*, 43 U.S.C. §§ 617, 617e (1971); Arizona v. California, 283 U.S. 423, 453-55 (1931).
140. *See* Lower Colorado Region State-Federal Interagency Group, *supra* note 51, at Appendix VI-49, and Upper Colorado Region State-Federal Interagency Group, *supra* note 56, at Appendix VI-14.

state interests. The final political action may be federal, but, in any given case, the impetus for taking the action can originate with the states, or at least with a coalition of interests in which the states play a major role. The states will be principal participants in any significant institutional changes which occur.

3. The Changing Missions and Constituencies of the Federal and State Agencies

Changes in water use patterns will mean changes in the complexion of the user-beneficiaries served by federal and state water management agencies. The missions and actions of those agencies will be influenced over time by the expectations and demands of newly defined constituencies.

Federal and state water agencies have found it necessary in recent years to make changes in program goals and procedures. For example, rising environmental concern, represented by the 1969 enactment and ongoing implementation of the National Environmental Policy Act, has imposed the values of environmental interest groups upon all federal agencies engaged in resource management, including the Bureau of Reclamation. Counterpart state legislation has had similar effect on the water agencies of some of the basin states. Environmental analysts have been added to agency staffs and environmental analysis has been added as a step in project planning.

Alliances within the new sectors of water consumers can be expected to develop. Electric power producers will cooperate to attain a stronger and more unified voice in water management affairs in the basin. The Indian tribes will likely find advantage in establishing a region-wide tribal water commission or in obtaining threshold or expanded representation in Anglo-dominated water resource planning efforts. State boards and commissions gradually will be restructured to allow new water users to be represented.

B. The Quest for Regional Management

1. The Persistent Pluralism

The competition surrounding the exploitation and conservation of the natural resources, including the water, of the Colorado River Basin is too intense to allow prompt and easy systematic changes in the water management system. The diversity of values, interests, and jurisdictions operating in the basin hamper the establishment of some form of regional government to comprehensively plan and manage the publicly-owned, and regulate the privately-owned, natural re-

sources.[141] Conceivably, however, the advent of large-scale mineral and energy development may put enough of a competitive strain on the use of basin land, water, and air to create a favorable climate for certain kinds of institutional change.

2. Expanded Regulatory Mechanisms for Resolving Conflict and Mitigating Competition

Multiple-use management involves the continuous balancing of competing interests. As the pressure on the natural resources of the basin increases, the situations in which competitors take nonnegotiable positions and refuse to accede to agency attempts at compromise solutions will increase.

In the short term this will mean that dissatisfied interests will engage in more contests at the administrative hearing level, and will seek judicial review of agency decisions and judicial restraint of agency actions. It is unclear whether this change will simply involve the greater use of existing agency machinery or will prompt the creation of new regulatory agencies or procedures. There currently is pending, for example, the issue whether the Federal Power Commission has jurisdiction over power plants which use Colorado River water for cooling purposes.[142]

3. Institutional Arrangements for Regional Planning

If the comprehensive and coordinated management of the natural resources and environment of the Basin is a distant prospect, new ventures into basin-wide planning[143] could be made in the near future. Either land planning or water-resource planning could provide the needed focus or impetus. Political realities counsel that significant steps toward such basin-wide planning will not be taken without the cooperation of all of the involved states and that the states will cooperate only if there are economic and political incentives to do so.

Some sources of legal authority may already exist for providing such incentives. The Federal Water Pollution Control Amendments of 1972 authorize the creation of interstate waste treatment management planning areas, sanction planning administration grants to the

141. *See* Weatherford, *Basin-Wide Planning and the Problem of Multiple Jurisdictions in the Colorado River Basin*, in Colorado River Basin Environmental Management (D. Peterson & B. Crawford eds., publication pending).

142. Chemehuevi Tribe v. FPC, 489 F.2d 1207 (D.C. Cir. 1973), *cert. granted*, 417 U.S. 944 (1974).

143. The closest approximation to basinwide multiple-resource planning seen to date are the Type I framework studies, notes 51 & 56 *supra*.

states, encourage uniformity of state laws, and consent to interstate water quality compacts.[144] The Water Resources Planning Act of 1965[145] authorizes the creation of river basin (and related land resources) commissions, but requires concurrence by "at least three of the four states Colorado, New Mexico, Utah and Wyoming," for the creation of such a commission in the Upper Colorado River Basin.[146]

Generally speaking, three institutional models exist for interstate water planning: (1) river basin coordinating committees or commissions, (2) interstate and federal-interstate compact commissions and (3) regional government corporations.[147] A critical review of how such arrangements have operated elsewhere ought to be undertaken with a view toward identifying workable institutional alternatives available to the Colorado River Basin.

4. Regional Water Development and Exchange Account

Consideration might be given to including some type of regional water rights exchange mechanism within future institutional arrangements. As already noted, there currently are restrictions on the intrastate and interstate transfer of water rights. The political equity of each state in the Colorado River Basin is secured by a certain share of the usable flow. The right to the water is a necessary condition precedent to economic development. The apportionment of the beneficial use of the Colorado River to the states was an allocation of an economic growth factor which the states vigorously protect for their citizenry.

Could the political and economic interest of a basin state in its water apportionment be protected, on the one hand, and the interstate transfer of the right to use water be permitted, on the other? Obvious problems exist. Even if the right to use water could be leased between users in different states for a period of years, providing income to the lessor while allowing the underlying water right to remain within the original state's apportionment, the state of origin might not enjoy indirectly the same multiplier effect from the lease income that it would enjoy from the productive water-use activity itself.

One approach might be to set up a regional accounting mechanism which would allow a state's interest in water of the Colorado River

144. 33 U.S.C. § 1252 (1971).
145. 42 U.S.C. § 1962 (1971).
146. *Id.* § 1962b(a).
147. *See* description of existing river basin institutions in National Water Comm'n, *supra* note 89, at 414-33.

system to be translated into economic development credits or funds; that is, in return for the permanent or periodic relinquishment of a water right, a state could receive other benefits, such as economic development moneys, to offset the loss of economic activity arising from the water use. Such an idea requires the attention first and foremost of economists, not lawyers and hydrologists, so it will not be pursued further here.

CONCLUSION

The "law of the river" is neither static nor seamless; rather, it is a changing patchwork of provisions born of a series of events and experiences. While it protects a number of historical and vested interests, it is not dependent upon any one of them for ultimate survival. Vestigial legal priorities and provisions can be sloughed off, at a price, as new ones are taken on. The entire legal framework need not be—nor is it likely to be—scrapped simply because new demands for water are being articulated by strong economic forces.

The scale of dislocation and change expected over the coming decades can be handled by the legal system through water conservation and the acquisition or condemnation of water rights. It will not be an easy road. Legal priorities will need to shift over time to accommodate the competing demands. Vested rights will be subject to increased regulation, and in some instances to condemnation, to effect the needed changes.

The Colorado River will continue to be subject to the ephemeral preferences and programs of a pluralistic society. As long as capital investment requires security, some proprietary or contractual assurance of long-term water supply will be necessary. As long as the flow of the river is variable, a legal formula for allocating hydrological risk will be required. As long as the quality of the river significantly limits economic development, legally enforceable standards for water use practices will be needed.

In broad terms, the problem of managing the Colorado River is the problem of allocating a flow resource in such a way as to satisfy legally preferred current demands without foreclosing the satisfaction of a different set or configuration of demands in the future. When so viewed, it is clear that there will be no single and final solution to the problems of allocation and management in the Colorado River Basin. The time for seriously addressing the emerging generation of problems, however, is now.