

**The Colorado River Compact: A  
A Breeding Ground for International,  
National, and Interstate  
Controversies  
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**I. INTRODUCTION**

The Colorado River is one of the most physically developed and controlled rivers in the nation. It is also one of the more water-deficient systems with a service area that extends far beyond its physical drainage area. Despite its relatively meager water supply, a larger percent of water is exported from the Colorado River system than from any other major river system in the United States. Although the water supply of the river is arguably adequate to meet the quantitative needs today and in the immediate future of both the Upper and Lower Basin, severe problems currently exist related to water shortage. Most resource development undertakings require an assured supply of water for at least 40 years in order to justify making the initial investments. Thus, the fact that there is no actual shortage of water today or in the immediate future is of little comfort to those whose future depends upon an assured and adequate supply of water for the next 40 to 50 years. See U.S. Department of Interior,

Westwide Study Report on Critical Water Problems Facing the Eleven Western States 154 (1975). The objective of this presentation is to discuss three areas of law which affect the usable water supply of the Colorado River: the Mexican Treaty of 1944, salinity control measures, and the Federal Endangered Species Act of 1973; and to explore why the Colorado River Basin is a breeding ground for controversy.

A. The Law of the River

The waters of the Colorado River have been divided among the Upper Basin, the Lower Basin, the Republic of Mexico, and among the states of the Upper and Lower Basins by a set of compacts, treaties, statutes, and judicial decisions, collectively referred to as "the law of the river." What follows is a summary of the principal components of the law of the river.

1. The Colorado River Compact of 1922

The Colorado River Compact of 1922 ("1922 Compact") divides the entire Colorado River System, which by definition includes all tributaries of the Colorado River, into an Upper and a Lower Basin. The boundary between the two is at Lee's Ferry, Arizona, which was considered by the compact commissioners to be the natural dividing point between the tributaries of the Upper and

Lower Basin states. The Upper Basin states are Colorado, Utah, and Wyoming; the Lower Basin states are Arizona, California, Nevada, and New Mexico. In essence the 1922 Compact accomplishes the following:

a. Article III(a) apportions for annual beneficial consumptive use 7.5 million acre feet ("m.a.f.") of the flows of the Colorado River System to each Basin. Article III(b) gives the Lower Basin the right to increase its beneficial consumptive use by 1 m.a.f. per year.

b. Article III(c) provides that if the United States thereafter recognizes in the Republic of Mexico any right to use the waters of the Colorado River System, such waters shall be supplied first from any surplus flows above the aggregate of quantities allocated in Articles III(a) and (b); if such surplus is insufficient, then the deficiency shall be borne equally by the Upper and Lower Basins. Whenever necessary the Upper Basin must deliver at Lee's Ferry water to supply one-half of the deficiency.

c. Article III(d) provides that the Upper Basin shall not cause the flow of the river at Lee's Ferry to be depleted below an aggregate of 75 m.a.f. in any consecutive ten-year period.

2. The Boulder Canyon Project Act of 1928

The Boulder Canyon Project Act of 1928, 43 U.S.C. § 617 (1928) ("Boulder Canyon Act"), authorized the construction of the Hoover Dam and Powerplant and the All-American Canal between Imperial Dam on the lower river and the Imperial and Coachella Valleys. It also provided that before the 1922 Compact would become effective, all seven states had to ratify it, or that six states, including California, ratify; and that California enact legislation limiting itself to no more than 4.4 m.a.f. of the 7.5 m.a.f. apportioned to the Lower Basin states by Article III(a), plus not more than one-half of the surplus water unapportioned by the 1922 Compact. The latter was accomplished in the California Limitation Act of 1929.

The Boulder Canyon Act also pre-approved any compact which Arizona, California, and Nevada might enter into apportioning, of the Article III(a) water, 300,000 acre-feet to Nevada, 2.8 m.a.f. to Arizona, and 4.4 m.a.f. or less to California; allowing Arizona exclusive beneficial use of the waters of the Gila River; exempting the Gila River's Arizona tributaries from any obligation to supply water to Mexico under Article III(c); and requiring that any Mexican burden be borne equally by California and

Arizona from mainstream water. Finally, the Boulder Canyon Act authorized the Secretary of the Interior to execute contracts for water made available by Hoover Dam, subject to the terms of the 1922 Compact.

3. The Mexican Treaty of 1944

Article X of the "Treaty...Relating to Waters of the Colorado and Tijuana Rivers and of the Rio Grande" ("Mexican Treaty") guarantees an annual delivery of 1.5 m.a.f. of water to Mexico and an additional amount up to a total of 1.7 m.a.f. if there is a surplus. In the event of extraordinary drought or serious accident to the United States' irrigation system, the Mexican Treaty allows the United States to reduce the delivery below 1.5 m.a.f. in the same proportion as consumptive uses in the United States are reduced.

4. The Upper Colorado River Basin Compact of 1948

The Upper Colorado River Basin Compact of 1948 apportions the water allocated to the Upper Basin by the 1922 Compact as follows: Colorado, 51.75%; Utah, 23%; Wyoming, 14%; and New Mexico, 11.25%. Arizona, whose northeast corner drains into the Upper Basin, was given a flat 50,000 acre feet per year.

5. The Colorado River Storage Project Act of 1956

The Colorado River Storage Project Act of 1956, 43 U.S.C. § 620 (1982), authorized the construction and operation of several long-term carryover reservoir storage units in the Upper Basin, including the initial phase of the Central Utah Project, which assist the Upper Basin to make required deliveries of water to the Lower Basin and also to maximize the consumptive use of its own 1922 Compact-apportioned water. This act also established the Upper Colorado River Basin Fund to which operating revenues are credited and provided a percentage formula to distribute surplus moneys to each Upper Basin state.

6. Arizona v. California

In 1952 Arizona brought a suit under the original jurisdiction of the United States Supreme Court to determine, among other things, its right to divert 1.2 m.a.f. of mainstream water at Lake Havasu for use in the Phoenix and Tucson areas as a part of the Central Arizona Project ("CAP"). Contrary to California's contentions, the Court rejected both the law of prior appropriation and the doctrine of equitable apportionment as a basis for its decision and held that by passing the Boulder

Canyon Act, Congress had created a means of statutorily apportioning the mainstream waters of the Colorado River among California, Arizona, and Nevada. Arizona v. California, 373 U.S. 546 (1963). In the Court's opinion, of the 7.5 m.a.f. of water apportioned to the Lower Basin by the 1922 Compact, the Boulder Canyon Act allocated 2.8 m.a.f. to Arizona, 4.4 m.a.f. to California, and 300,000 acre feet to Nevada, while allowing Arizona and Nevada exclusive use of their tributaries. If there was any surplus water in the mainstream, half of it would go to California and half to Arizona. In the event of a shortage of mainstream water, the Secretary of the Interior was to equitably prorate the deficiency.

7. Colorado River Basin Project Act of 1968

The Colorado River Basin Project Act of 1968, 43 U.S.C. §§ 1501 et seq. (1982) ("Basin Project Act"), authorized the construction of a number of federal projects, including the CAP, but directed the Secretary of the Interior to administer the CAP so that California never receives less than 4.4 m.a.f. Congress further recognized that the Colorado River System contained too little water to satisfy the Mexican Treaty burden and also to accommodate the growing needs of the Upper and Lower Basins. Without augmentation of the water of the

river by 2.5 m.a.f., Congress stated that the Colorado River Basin was in danger of economic stagnation. The Secretary of the Interior was directed to investigate augmentation, primarily by importation from other basins or desalinization. Because of objections of representatives of the Northwest, however, examination of water importation was suspended until at least 1988. The Basin Project Act also declared that satisfaction of the requirements of the Mexican Treaty from the Colorado River constitutes a national obligation and that the seven Basin States would be relieved of the Mexican Treaty obligation as soon as an augmentation plan for an additional 2.5 m.a.f. was implemented.

8. Minute 242

Minute 242 of the International Boundary and Water Commission, signed by the United States and Mexico on August 30, 1973, commits the United States to deliver water to Mexico from the mainstream containing on the average no more than 115 parts per million more than the salt content of the water used by the Imperial Valley. This standard generally limits the salt content to about 1000 parts per million.



9. Colorado River Basin Salinity Control Act  
of 1974

The Colorado River Basin Salinity Control Act of 1974, 43 U.S.C. §§ 1571 et seq. (1982) ("Salinity Control Act"), was enacted in order to implement Minute 242. The Salinity Control Act initially authorized four salinity control projects and has been amended to authorize numerous others, most of which are located in the Upper Basin. The Salinity Control Act also sanctions an array of other methods to control salinity, including canal lining, projects to reduce the return flow of particularly saline irrigation water, and the circumvention or deflection of saline water from natural sources.

The Clean Water Act, 33 U.S.C. §§ 1251 et seq. (1982), also pertains to the salinity problem in the Colorado Basin. It authorizes the United States to fix effluent standards governing the amount of pollutants that can be released from "point sources," such as conduits and ditches, and to control such discharges through a permit system. The Clean Water Act also authorizes the United States to control the general water quality of streams.

10. Colorado River Basin Salinity Control Forum

Although no federal legislation has designated a Basinwide authority to manage salinity control efforts, in 1973 the Basin states organized the Colorado River Basin Salinity Control Forum ("Forum"). In 1975 the Forum established Basinwide salinity standards and developed a plan of salinity control which emphasizes the construction of the federally-funded projects authorized by the Salinity Control Act. The Forum's approach has withstood a court challenge by the Environmental Defense Fund under the Clean Water Act and the National Environmental Policy Act. See Environmental Defense Fund v. Castle, 657 F.2d 275 (D.C.Cir. 1981).

B. General References

1. Carlson and Boles, Contrary Views of the Law of the Colorado River: An Examination of Rivalries Between the Upper and Lower Basins, 21 Rocky Mtn. Mineral Law Institute (1986).
2. U.S. Department of Interior, Quality of Water Colorado River Basin Progress Report No. 13 (January 1987).
3. Miller, Weatherford, and Thorson, The Salty Colorado (1986).

4. Salinity Update. (Special Edition 1986).

5. Pitts, A Proposal: Resolving the Conflict Between the Endangered Species Act and Water Development in the Upper Colorado River Basin, Colorado Water Rights Vol. 5, No. 3 (Summer 1986).

6. Pitts, Update: Endangered Species Recovery Program in the Upper Colorado River Basin, Colorado Water Rights Vol. 8, No. 1 (Winter 1989).

## II. MEXICAN TREATY OF 1944

The drafters of the 1922 Compact anticipated that a resolution of the international controversy between Mexico and the United States concerning the waters of the Colorado River might affect the allocations made in the 1922 Compact. The drafters attempted to protect against this risk by apportioning a lesser quantity of water than they believed was physically present. Thus, the 1922 Compact provides that any commitment of water to Mexico is to be supplied first from waters surplus to the 16 m.a.f. apportioned between the Upper and Lower Basins. The problem is that the river fails to adhere to the commands of man; it generates no surplus water.

### A. The Problem

In 1944 the United States in the Mexican Treaty committed itself to the delivery from the Colorado River

to Mexico of 1.5 m.a.f. annually, subject to the adjustments discussed in Part I.A.3. above. According to the provisions of the 1922 Compact, this water was to be supplied from the waters which are surplus to the aggregate of waters apportioned in Article III(a) and (b), which is 16 m.a.f.; 7.5 m.a.f. to the Upper Basin and 8.5 m.a.f. to the Lower Basin. However, the actual sustained water supply of the river since 1930 has not been sufficient to yield the quantities of water anticipated by the drafters of the 1922 Compact, as well as satisfying the United States' obligation under the Mexican Treaty. The 1922 Compact provides for this contingency by stating that the burden of any deficiency in surplus waters must be borne equally by the Upper and Lower Basins. In other words, to the extent that no surplus waters exist, the Upper and the Lower Basin are each responsible for 750,000 a.f. annually.

Even though at the present time uses in the Upper Basin have not depleted the flow of the river so as to require curtailment of any Upper Basin use for purposes of the 1922 Compact or the Mexican Treaty, what is happening is that a portion of the waters which are apportioned to the Upper Basin but presently unused are being delivered at Lee's Ferry by federal authorities

expressly to furnish one-half of the Lower Basin's Mexican Treaty obligation. Additionally, because federal authorities seek to maximize power generating potential in the Lower Basin, they typically release more than 8.25 m.a.f. (7.5 m.a.f. plus 750,000 a.f.). While this administrative practice is probably consistent with Article IV(c) of the 1922 Compact, which provides that until a need for water in the Upper Basin materializes the Upper Basin may not withhold water from an actual need in the Lower Basin, it affords an opportunity for overdraft on the water apportioned to the Lower Basin. Although this presently may not cause actual shortages in the Upper Basin, as development in the Upper Basin, as well as in the Lower Basin, increases the draft on the river, administration to satisfy the various entitlements to the water is inevitable.

It is generally believed that the United States' obligation under the Mexican Treaty is paramount; it constitutes a first call on the Colorado River and most agree that federal officials will take all necessary steps to satisfy this obligation. The problem created by the lack of sufficient water to satisfy all entitlements raises a number of complex issues not all of which are capable of resolution at this time. They include:

1. Are waters used from the Lower Basin tributaries included in the calculation of allowable beneficial consumptive uses apportioned to the Lower Basin by Article III(a) and (b).
2. If they are, then what contribution to the Mexican Treaty obligation is imposed by Article III(c) on the Lower Basin when
  - (a) beneficial consumptive uses in the Lower Basin exceed 8.5 m.a.f.,
  - (b) the supply in the Lower Basin (by including its tributaries) substantially exceeds 8.5 m.a.f., and
  - (c) the actual demand for water in the Upper Basin exceeds that available after delivery of 75 m.a.f. in successive ten year periods at Lee's Ferry.
3. Must there be more water used in the entire Colorado River System than the 16 m.a.f. apportioned by Article III(a) and (b) before the Upper Basin can invoke curtailment of Lower Basin uses in excess

of 8.5 m.a.f. in aid of any Mexican Treaty obligation.

4. If yes, must the Upper Basin deliver more than 750,000 a.f. at Lee's Ferry in order to absorb "shrink" or transit loss occurring in the river between Lee's Ferry and the Mexican boundary.

This problem has been described by the United States Comptroller General as follows:

A major dispute exists between the Upper and Lower Basins over supplying the 1.5 m.a.f. commitment to Mexico. The Colorado River Compact states that any required delivery of water to Mexico shall be supplied first from water surplus to the basic apportionment from the Colorado River system (7.5 m.a.f. to the Upper Basin, 8.5 m.a.f. to the Lower Basin) and if the surplus is insufficient, the burden of such deficiency shall be borne equally by the two basins.

The Lower Basin States contend that there is no surplus and the Upper Basin's share of the Mexican treaty delivery obligation is therefore one-half of the total obligation of 1.5 m.a.f. plus one-half of the losses incurred in delivering the water from Lee Ferry to the Mexican border. The Upper Basin States believe that surplus water exists in the Lower Basin and therefore they are not required to release any water to meet the Mexican treaty obligation.

Report to Congress of Comptroller General, May 4, 1979.

The problem is often referred to as "the Gila River problem." Substantial quantities of water originate in the tributaries of the Colorado River located in the Lower Basin, principally the Gila River, which discharge into the Colorado River at points below Lee's Ferry. These tributary waters have been estimated to range at quantities between 2 m.a.f. to 3.5 m.a.f. annually. Arizona has reached a very high, if not full, state of development with respect to the Gila River waters. To the extent these tributary waters are included in the accounting of "surplus" waters, it would materially increase the usable water supply in the Upper Basin as the Upper Basin would be freed of a duty to release water at Lee's Ferry for satisfaction of the Mexican Treaty obligation.

It appears from an examination of the 1922 Compact and the Boulder Canyon Project Act of 1928 that the Lower Basin tributaries must be included in the determination of whether a surplus exists. Resolution of 1) whether the Upper Basin has a duty to contribute water toward the Mexican Treaty obligation when the Lower Basin's uses exceed 8.5 m.a.f. and the Lower Basin's uses do not reach 7.5 m.a.f. and 2) if the answer to number one is yes, whether the Upper Basin must also supply additional water



to compensate for channel losses between Lee's Ferry and the Mexican border is less clear although I believe that the equities and the record of the 1922 Compact negotiations clearly support the Upper Basin's positions.

**B. Inclusion of the Lower Basin Tributaries**

The Lower Basin's average annual use of water from its tributaries from 1976-80, including possible groundwater overdrafts in the Gila River system, has been estimated at 4.5 m.a.f. U.S. Department of Interior, Colorado River System Consumptive Uses and Losses Report 1976-80, at 35-39 (Washington, D.C.). If that quantity of water were added to the average virgin flow of the Colorado River at Lee's Ferry from 1922 to 1985, the sum would exceed 16 m.a.f. and would thus yield a surplus sufficient to satisfy the Mexican Treaty obligation without a contribution from the Upper Basin. The Lower Basin, however, contends that its tributaries should not be treated in this manner.

**1. Probable Position of the Lower Basin States**

Relying on the language of Article III(c) of the 1922 Compact and on the United States Supreme Court decision in Arizona v. California, 373 U.S. 546 (1963), the Lower Basin contends that its tributaries are

excluded from the determination of whether surplus water exists. The critical language of Article III(c) is:

If...the United States...shall...recognize... in...Mexico any right to the use of waters of the Colorado River System...such waters shall be supplied first from the waters which are surplus over and above the aggregate of the quantities specified in paragraphs (a) and (b); and if such surplus shall prove insufficient ...then, the burden of such deficiencies shall be equally borne by the Upper Basin and the Lower Basin...

(Emphasis added). The Lower Basin contends that Article III(c) defines surplus water as the excess after the aggregate of uses apportioned by Article III(a) and (b) is reached. Since Article III(a) and (b) apportion a total of 16 m.a.f. the Lower Basin contends that there is a surplus only when the aggregate of uses in the Upper and Lower Basin combined exceed 16 m.a.f. Since a supply of 16 m.a.f. does not now exist, nor will it in the foreseeable future, the Upper Basin and Lower Basin must equally bear the Mexican Treaty obligation.

The Lower Basin can be expected to argue that this literal and technical reading of Article III(c) is consistent with the decision in Arizona v. California 373 U.S. 546 (1963), in which the United States Supreme Court held that Congress, in the Boulder Canyon Act, excluded the Lower Basin tributaries from its statutory apportionment among the Lower Basin states. The Court's decision

occurred in the face of the express language of section 4(a) of the Boulder Canyon Act which required that California limit itself to 4.4 m.a.f. "of the waters apportioned to the lower basin States by paragraph (a) of Article III of the Colorado River Compact, plus not more than one-half of any excess or surplus waters unapportioned by said compact." Article III(a) of the 1922 Compact apportioned water from the "Colorado River System" which is defined in Article II(a) as "that portion of the Colorado River and its tributaries within the United States." (Emphasis added). However, the Supreme Court expressly stated that it was not deciding any issue of interpretation of the 1922 Compact, and that the controversy was to be disposed of solely on the theory that Congress had made a statutory apportionment between the states of the Lower Basin: Arizona, California, and Nevada.

## 2. Reasons for Inclusion

Scrutiny of the Compact, the Boulder Canyon Act, and even Arizona's past conduct leads to the conclusion that the Lower Basin tributaries are to be included in an Article III(a) determination of surplus. First, however, before analyzing these factors, it must also be noted that although the Supreme Court in Arizona

v. California scrupulously avoided a decision with respect to Upper-Lower Basin issues, it did imply in dictum that tributaries of the Colorado River were comprehended by the 1922 Compact's apportionment scheme.

The Court states:

Arizona, because of her particularly strong interest in the Gila, intensely resented the Compact's inclusion of the Colorado River tributaries in its allocation scheme and was bitterly hostile to having Arizona tributaries, again particularly the Gila, forced to contribute to the Mexican burden.

...  
Inclusion of the tributaries in the Compact was natural in view of the upper States' strong feeling that the Lower Basin tributaries should be made to share the burden of any obligation to deliver water to Mexico which a future treaty might impose.

Arizona v. California, 373 U.S. at 558, 568. This language indicates that the Supreme Court was aware of the equities and concerns of the Upper Basin. Nonetheless, it must be remembered that this language is dictum and does not dispose of the technical argument discussed above.

a. 1922 Compact Language and Negotiations

The most persuasive proof that tributaries are included under Article III(c) lies in the language of the 1922 Compact itself which includes tributaries within the definition of the waters apportioned. Article

II(a) defines the "Colorado River System" as "that portion of the Colorado River and its tributaries within the United States." The record of the negotiations of the 1922 Compact affirms this interpretation. The definition of the Colorado River System was approved by all the compact commissioners. Further, a review of the record demonstrates that the commissioners understood that the Lower Basin tributaries were subject to Article III and to the Mexican Treaty obligation.

b. Boulder Canyon Act

Congress' intent in approving the 1922 Compact through the Boulder Canyon Act was clearly to subject the Lower Basin tributaries to the demands of Article III. During floor debate various senators expressed the understanding that in the 1922 Compact the Colorado River Basin embraces the tributaries as well as the mainstream of the Colorado River. Senator Hayden twice offered amendments to the pending statute to exempt the Gila, except such return flows as might reach the mainstream, from any obligation under the Mexican Treaty and to allow Arizona exclusive beneficial use of the Gila within the state. Both amendments were defeated.

c. Arizona's Past Conduct

Arizona initially opposed ratification of the 1922 Compact for the primary reason that it included Lower Basin tributaries for the purpose of determining an Article III(c) surplus. At the Denver Governor's Conference in 1927, called by the Upper Basin states to try to settle differences between California and Arizona, Arizona attempted to attach a condition that the tributaries in Arizona be relieved from any burden which might be impressed upon them by virtue of any treaty. This condition was not adopted. Further, in the second Arizona v. California, 292 U.S. 341 (1934), Arizona argued before the United States Supreme Court that the compact commissioners had agreed that the Colorado River System included the Gila River and its tributaries and that Article III(b), which gives the Lower Basin the right to increase its beneficial consumptive use by 1 m.a.f. annually, was intended to go to Arizona to compensate it for the waters of the Gila River and its tributaries. All of these factors together conclusively demonstrate that the tributaries of the Colorado River are to be included in an Article III(c) determination of surplus.

C. Lower Basin Uses in Excess of Its Apportionment

The Lower Basin's use of water from the Colorado River System was estimated at approximately 10.6 m.a.f. in 1980. This is far in excess of its Article III(a) and (b) apportionment of 8.5 m.a.f. The Upper Basin contends that under the terms of Article III(c) this excess use constitutes surplus and that accordingly, the Upper Basin's duty to supply a portion of the Mexican Treaty obligation should be diminished to the extent of the excess use. Thus, in a year such as 1980, the Upper Basin would have no duty to supply any water under Article III(c). Since the common belief at the time the 1922 Compact was negotiated was that the flow of the Colorado River was adequate to satisfy all needs, there is virtually nothing in the record of the compact meetings or elsewhere that either confirms or refutes the Upper Basin's contention. The Upper Basin's position would seem to be contrary to the technical reading of Article III(c). However, its underlying rationale conforms to the intent of the compact commissioners to equalize the Article III(a) apportionments to each basin and to match the Upper Basin's delivery obligation specified in Article III(d) to the amount of those apportionments.

#### D. Channel Losses

The Lower Basin also charges that in addition to one-half of the 1.5 m.a.f. required by the Mexican Treaty, the Upper Basin must also deliver one-half of the channel losses occurring to the water between Lee's Ferry and Mexico. This issue was raised just twice during the compact negotiations. The commissioners discussed designating Yuma, Arizona, as the delivery point for water due Mexico. Delph Carpenter, commissioner for the State of Colorado, commented that such a designation would have the effect of imposing an additional burden on the Upper Basin. The notion of locating the delivery point at Yuma was subsequently abandoned.

Article III(c) states that the Upper Basin "shall deliver at Lee Ferry water to supply one-half of the deficiency." (Emphasis added). By specifically designating Lee's Ferry as the point of delivery, the 1922 Compact expressly relieves the Upper Basin of any duty to compensate for channel losses occurring below that point. So far as the Upper Basin is concerned, Lee's Ferry is where the delivery of water in satisfaction of any Mexican Treaty obligation is to be made; the fate of the water below that point is not its responsibility.



### III. Salinity

A major concern both in the United States and in Mexico is the threat of salinity. The impact of the ever increasing levels of salinity in the waters of the Colorado River is felt to a varying degree by all users - agricultural, municipal, and industrial. It is generally assumed that a relatively high salinity level lowers crop yields, intensifies the need for special on-farm drainage facilities, increases water treatment costs, damages plumbing and fixtures, and increases maintenance on pumps and distribution systems. The federal government has invested millions of dollars in salinity control although the exact magnitude of the benefits of this effort is uncertain, raising policy questions for lawmakers, water managers, and basin residents.

#### A. Historical Information

The Colorado River, like many of the rivers of the west, had a relatively high salinity content due to natural sources even prior to any use of the waters by man. The Colorado River Basin is a former sea bed. When the sea dried up, the salt deposits remained; as a result, much of the basin is underlain by highly saline shales. High salinity concentrations in the water result from two general processes: salt loading, or the

addition of soluble salts to the river, and salt concentration, caused by a reduction in the volume of river water as a result of evaporation, transpiration, or withdrawals of water. Almost one-half of the river's salt loading is estimated to come from interaction of the river with the basin's naturally saline soil and rocks. In addition to precipitation percolating through the soil and dissolving salts, the three million acres of irrigated farmland in the region add more soluble minerals to the river as irrigation water leaches minerals from cultivated soils. Salt concentrations in the river are further increased by transpiration by plants and evaporation of water from reservoirs. Exports of over five million acre feet from the basin reduce the potential for dilution downstream.

Salinity levels vary throughout the basin. Generally, the Colorado River, at its headwaters in north-central Colorado, has a salinity concentration of about 50 mg/L (milligrams per litre). The salinity concentration progressively increases as the river flows downstream. Recent record high flows have flushed and filled the major reservoirs, resulting in significantly lower salinity levels at Imperial Dam - from an annual average of 826 mg/L in 1982 to 608 mg/L in 1985. Without

control measures, however, the salinity level is projected to increase, possibly reaching a level of 1005 mg/L at Imperial Dam by about 2010.

Average salinity levels fail to give an accurate picture of salinity levels prior to development in the basin. Before the construction of Hoover Dam, salinity levels in the Lower Basin fluctuated wildly during a given year in inverse relation to the flow: during periods of high runoff, the salinity level was extremely low; when the flow diminished, the salinity level increased dramatically. Construction of Hoover Dam, in addition to preventing destructive flooding and providing a reliable, year-round source of supply, provided the Lower Basin with water supply relatively uniform in salinity content. As a result, California and Arizona were able to develop a year-round agricultural base, the principal crops of which were dependent upon water fairly low in salinity. As significant development in the Upper Basin began in the 1950s and 1960s, the average salinity level of the Colorado River began to rise. In the late 1960s and early 1970s leaders at the regional and national levels began to recognize the problem and to seek solutions.

**B. Selected Legislation Pertaining to Salinity Control**

It was actually a Lower Basin project that first made salinity a major issue. In the 1930s and 1940s salt buildup in the groundwater of southern Arizona had led to a reduction of farming in the Wellton-Mohawk area. This prompted the importation of cleaner Colorado River water in the mid-1950s under a federal project. Importation of this new water, however, resulted in a rise in the salt-laden groundwater table which prompted an additional federal project to pump the saline groundwater and discharge it out of the area to the Colorado River just north of the Mexican border. The effects of this salt loading were exacerbated when the filling of Lake Powell behind the Glen Canyon Dam reduced flows in the Lower Basin. By 1961 saline concentrations of about 6000 mg/L in the drainage water of this area caused the Colorado River water flowing to Mexico to reach 2700 mg/L. Mexico claimed this water was ruining its crops and also that the Mexico Treaty was being violated.

Although the Mexican Treaty contains no express water-quality guarantee, after extended negotiations and two interim agreements, on August 30, 1973, the United States and Mexico reached an accord. Under Minute 242

of the International Boundary and Water Commission, the United States agreed that about 1.36 m.a.f. of the water delivered to Mexico above the Morelos Dam would maintain an average annual salinity of not more than 115 parts per million, plus or minus 30 parts per million, over the average annual salinity at Imperial Dam. Under this standard, the salt content of the Mexican water would generally be limited to about 1000 parts per million.

In 1974 Congress enacted the Salinity Control Act not only to implement this international accord, but also to undertake a basin-wide program to control salinity in the Colorado River. The Salinity Control Act initially authorized the construction of four salinity control projects and has been amended to authorize numerous others. The largest project is a desalinization plant at Yuma, Arizona, which has cost at least \$500 million to construct thus far. The Act also sanctions an array of other methods to control salinity, including canal lining, projects to reduce the flow of particularly saline irrigation water, and the circumvention or deflection of saline water from natural sources. The projects are to be financed by the federal government, but repaid in part from money in the Upper Colorado River

Basin Fund and the Lower Colorado River Basin Development Fund.

In 1972 Congress enacted amendments to the Federal Water Pollution Control Act, commonly known as the Clean Water Act. This Act sets forth a public policy embracing the restoration and maintenance of water quality, pollution effluent discharge limitations, and eventual zero pollution discharge. The Act was interpreted by the Environmental Protection Agency (EPA) as requiring for the Colorado River water quality standards, numeric salinity criteria, and a plan of implementation. The basin states organized themselves in 1973 into the Colorado River Basin Salinity Control Forum (Forum). The Forum, made up of representatives from the seven Basin states, established numeric criteria at three stations and a plan of implementation that described actions to be taken to achieve the numeric criteria.

The criteria, set in terms of milligrams per liter of total dissolved solids, are:

| <u>Location</u>  | <u>Annual Flow-Weighted<br/>Average TDS (Mg/L)</u> |
|------------------|----------------------------------------------------|
| Below Hoover Dam | 723                                                |
| Below Parker Dam | 747                                                |
| At Imperial DAM  | 879                                                |

These standards reflect the river's salinity levels in 1972. It must be realized that they are relatively arbitrary and were selected more as a political expedient than as a result of any technical environmental or economic analysis. A careful reevaluation of these standards could result in their either being relaxed or tightened. A relaxation could enhance damages from salinity and complicate the United States' relationship with Mexico. On the other hand, tightening the standard could increase substantially the costs of salinity control and very possibly reduce or eliminate opportunities for further development in the Upper Basin.

#### C. Choices to be Made

Salinity is one of the major obstacles to further development of the waters of the Colorado River. Three principal factors determine the salinity level of the water: development, mostly in the Upper Basin; runoff; and land and water management practices affecting the natural and human-caused sources of salt. Although two of these factors - development and salinity control measures - can be controlled, runoff, while it might be altered, remains a function largely beyond human control. While many choices have already been made concerning salinity control, these choices must be reviewed and

reevaluated periodically. Also, limits on the choices exist which constrain action.

A principal constraint is uncertainty about how salt loading and transport actually works. Although the costs of monitoring and studying that process may be prohibitively high since much of it occurs underground and out of sight, additional research in this area could yield information that ultimately would save money in the selection and implementation of salinity control measures. Additionally, past choices constrain future ones. Early development proceeded with little attention paid to the effects downstream. To now come in and upset the status quo by requiring water users to shut down or pay for their salt-producing operations is unacceptable to many; but if new rules were to apply only to prospective users, this would seem unfair to them. Heavy past irrigation in salt loading areas would make it difficult to retire that farmland, even assuming that this would be a desirable choice, regardless of whether selective retirement would be the most economical approach to salt control.

Political constraints also exist. The wisdom of federal control over private land use is highly debatable. Local governments in rural areas generally



do not favor land use regulations to prescribe on-farm practices. The traditional method is voluntary, publicly-assisted cost-sharing programs of soil and water conservation.

Three basic issues must be decided:

1. What are the acceptable levels of salinity along the Colorado River?
2. How should those levels be achieved and maintained?
3. Who should pay for the costs of salinity control programs, and how?

#### **IV. EFFECT OF THE ENDANGERED SPECIES ACT ON WATER DEVELOPMENT IN THE UPPER COLORADO RIVER BASIN**

The Endangered Species Act, 16 U.S.C. §§ 1531 et seq (1985), was enacted by Congress in 1973 to provide a means to conserve the ecosystems upon which endangered and threatened species depend. The Act has had the effect of forestalling water development projects in the Upper Basin and denying persons of their legal right to divert water according to state water law. The terms of the Act and actions taken pursuant to it must be examined to understand how this has occurred.

**A. The Endangered Species Act**

The Act expressly declares that federal agencies are to cooperate with state and local agencies to resolve water resources issues in concert with the conservation of endangered species. Id. § 1531(c)(2). Section 1536(a)(2) provides that each federal agency shall insure that any action authorized, funded, or carried out by the agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of habitat of such species which is determined to be critical by the Secretary of the Interior, unless the agency has been granted an exemption for the action. "Action" includes the construction or funding of projects and the issuance of 404 or right-of-way permits.

An exemption may be obtained if the Endangered Species Committee determines that: 1) there are no reasonable and prudent alternatives to the agency action; 2) the benefits of the action clearly outweigh the benefits of alternative courses of action consistent with conserving the species or its critical habitat, and such action is in the public interest; 3) the action is of regional or national significance; and 4) neither the agency nor the applicant made any irreversible or

irretrievable commitment of resources which has the effect of foreclosing the formulation or implementation of any reasonable and prudent alternative measures. The Endangered Species Committee must also establish reasonable mitigation and enhancement measures, such as live propagation, transplantation, and habitat acquisition and improvement, as are necessary and appropriate to minimize the adverse effects of the agency action upon the particular endangered species, threatened species, or critical habitat concerned.

Following passage of the Act, three native fishes in the Upper Colorado River Basin were listed as endangered species: the Colorado squawfish, the bonytail chub, and the humpback chub. In 1981, the Windy Gap Project was subjected to consultation under section 1536 by the United States Fish and Wildlife Service ("Service"). Its sponsor, the Northern Colorado Water Conservancy District, ultimately negotiated a settlement in which it agreed to fund conservation measures to offset any potential adverse effects the project depletions may have on the endangered species' habitat. This approach was subsequently used in over 40 consultations with the Service. The approach served two purposes: it provided a means for generating the funding

necessary to conduct studies to define the needs of endangered or threatened species, and also allowed water development projects to proceed.

In 1983, the Service defined minimum flows on the Colorado River, Green River, Yampa River, White River, and Gunnison River as being necessary to maintain the habitats of endangered species. Any project that would cause depletions below those minimum flow levels would receive a jeopardy opinion from the Service. In response to this action, the Colorado Water Congress, at the request of several water users on the Colorado, South Platte, and Arkansas Rivers, sponsored a project seeking a way to continue water development projects in the Upper Basin without violating the provisions of the Endangered Species Act. In March 1984 the Service organized a federal/state coordinating committee to resolve the conflict between section 1536 consultations and future Upper Basin water development. After two years of extensive fact finding and intensive negotiations, a proposal was developed which provided a means of protecting the habitat of endangered species under state water law while at the same time allowing water development projects to proceed in the Upper Basin in accordance with state water law and interstate compacts. The

proposal also called for the full recovery and delisting of endangered native fishes in the Upper Basin within a 15-year time frame.

The proposal was based upon four fundamental principles:

1. Provision and maintenance of instream flows at certain times, locations, and in certain quantities is necessary to protect and recover endangered fish species and habitat in the Upper Colorado River Basin.
2. Water for instream flows will be provided as part of a comprehensive recovery program that addresses the Upper Basin and fish species habitat needs as a system.
3. Recovery and protection of rare species is to be a shared responsibility of the Federal government, the States, water and power users, and environmental organizations. This means, among other things, that the cost of providing instream flows and other recovery activities will be shared by these parties.
4. Water rights for instream flows established under this process will be appropriated, acquired, and administered pursuant to State law and will therefore be legally protected as any water right under State laws. Where water rights for instream flows cannot be obtained, they will be protected through contracts or administrative agreements with holders of appropriate

water rights. In no case shall the Federal government condemn water rights for the purpose of protecting endangered species.

Pitts, A Proposal: Resolving the Conflict Between the Endangered Species Act and Water Development in the Upper Colorado River Basin, Colorado Water Rights, Vol. 5, No. 3 (Summer 1986). On January 21 and 22, 1988, the Secretary of the Interior, the Administrator of the Western Area Power Administration, and the Governors of Colorado, Utah, and Wyoming signed the "Cooperative Agreement for Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin" ("Recovery Program"), thus implementing the proposal developed two years earlier.

**B. Recovery Program**

Under the Recovery Program, obtaining, administering, and protecting instream minimum flows are part of an overall recovery program, not the responsibility of any particular water project sponsor as it was under the former "Windy Gap" approach. Because the Recovery Program provides a mechanism to assure that instream flows are acquired and protected according to state water law, the Service will consider this, under any section 1536 consultation for a water project, as

offsetting project depletion impacts. Thus, project related depletion impacts on all river reaches will not jeopardize endangered species. Water project sponsors are required to make a one-time financial contribution of ten dollars per acre foot of average annual depletion to support the Recovery Program. For water projects causing direct impacts in occupied habitat, such as obstruction to migration routes or adverse physical alteration of occupied habitat, the Recovery Program directs the Secretary of the Interior to suggest reasonable and prudent alternatives to offset those impacts and avoid a jeopardy situation. Projects causing only depletion impacts in nonoccupied habitat are to receive non-jeopardy opinions pending the project's financial support of the Recovery Program.

Because of the Recovery Program, water project sponsors will receive "no jeopardy" opinions regarding impacts to endangered species. This is the principal mechanism by which conflicts between future water development and endangered species protection have been resolved. Environmentalists have objected to this feature of the Recovery Program because to date specific water rights have not been put in place for endangered fish species habitat. The Service is also concerned

about issuing "no jeopardy" opinions based on the premise that flows are available to offset project impacts when those flows are not yet available. To address this concern, the Service has proposed to issue preliminary "no jeopardy" opinions under the Recovery Program and to simultaneously monitor progress made toward obtaining flows for endangered fish species. The "no jeopardy" opinion would then be reviewed prior to any irretrievable commitments of resources by the project sponsors. If the Service determines that insufficient progress has been made, it will identify other conservation measures to offset the proposed project's impact.

The Recovery program specifies the procedures by which the flow needs of endangered species are to be determined. To date the Service has made preliminary recommendations for the flow needs on the Yampa River and the 15-mile stretch of the Colorado River between the Grand Valley Diversion and the Gunnison River. An initial review of these recommendations, however, indicated that they were lacking in scientific justification and the Service is in the process of revising them. Water users generally believe that flow recommendations should be related to the needs of the endangered species



and scientifically justified. They should also take into account the historic availability of water.

The problem with defining flow needs for endangered species is the considerable degree of uncertainty associated with the use of biological data to complete this task. Additionally, such data is very difficult to collect on large river systems, such as the Colorado River. Additional work needs to be done in this area.

#### V. CONCLUSION

The 1922 Compact, the cornerstone of the law of the river, materialized principally as a result of a fear of a recurrence of floods that devastated part of the lower Colorado River in 1905-07 and again in 1916. Ironically, the conditions which has most troubled the law of the river since its inception has been the contrary: an insufficient supply of water to satisfy all entitlements. The super-imposing of international and national obligations and environmental policies upon the law of the river, which essentially is a series of "contracts" to share a common supply of water, is propelling those dependent upon this water towards an eventual show-down.