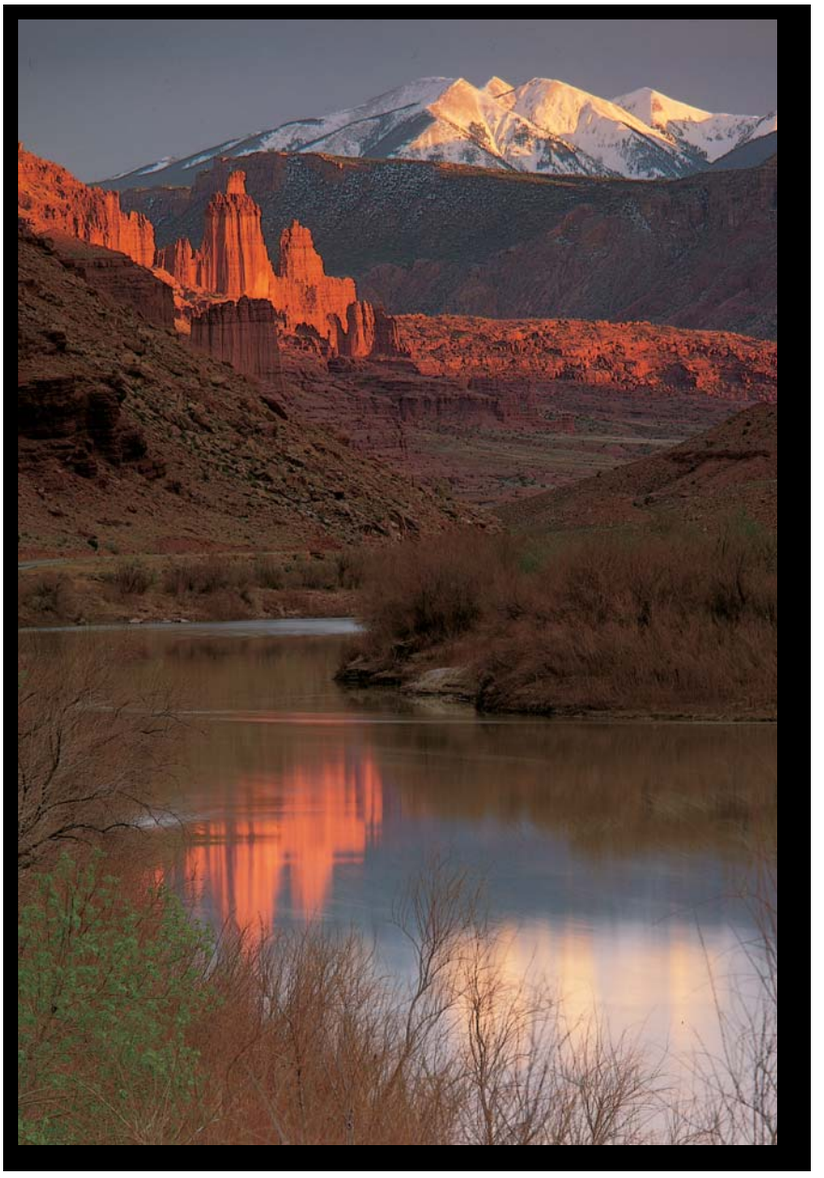
Utah's Perspective

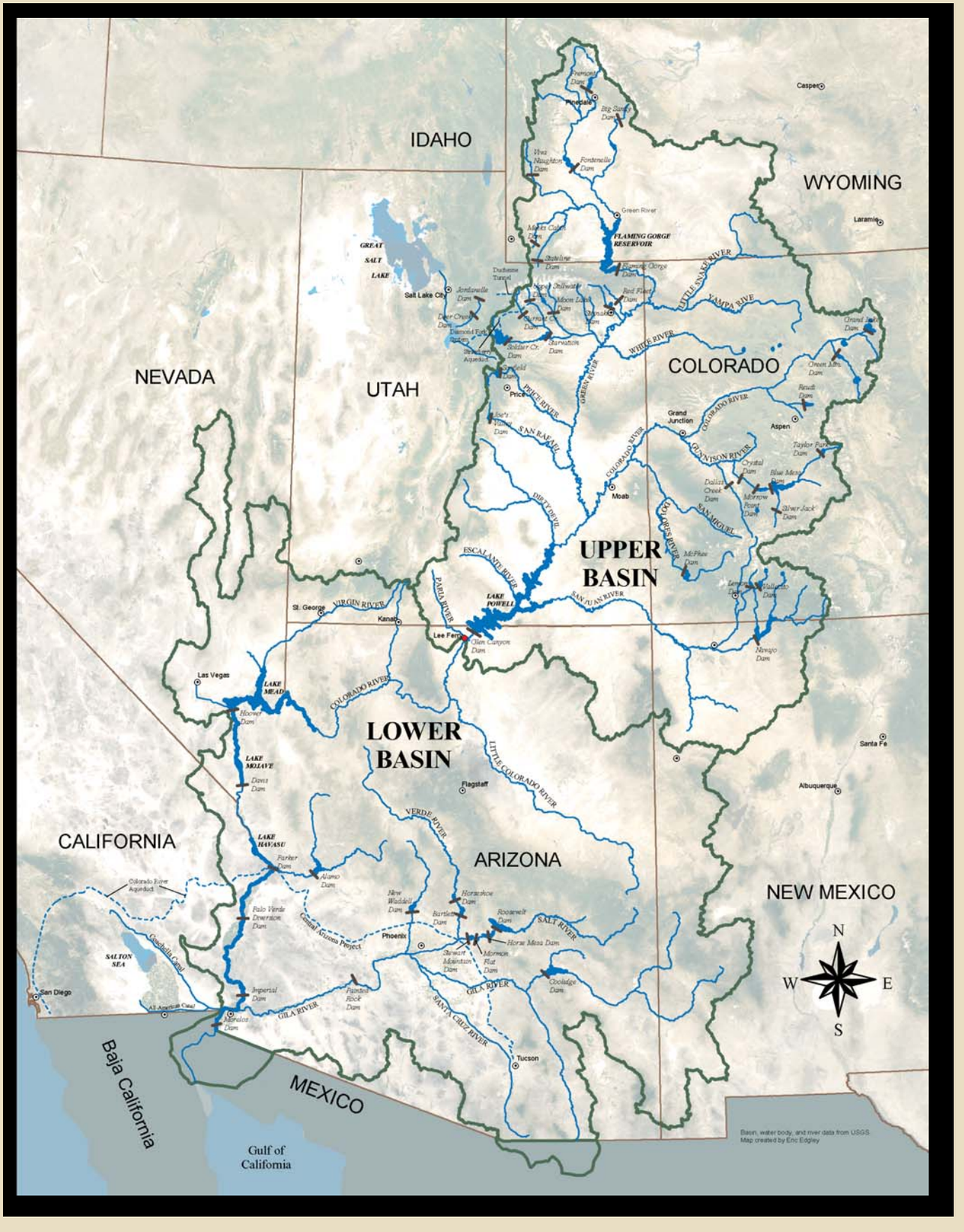
The Colorado River



By D. Larry Anderson

Director, Utah Division of Water Resources

Colorado River Basin



The Colorado River

Rafting Whitewater
Courtesy of the Utah Travel Council, Frank Jensen

Cover Photo:
Fisher Towers, Colorado River
Courtesy Tom Till

The steep and at times turbulent Colorado River falls more than 12,000 feet as it flows from the Rocky Mountains in Colorado and Wyoming to its natural outlet in the Gulf of California. The river has a huge drainage basin that covers over 244,000 square miles; it is 1,440 miles long and passes through parts of seven states and Mexico.

The seven states, Arizona, California, Colorado, Nevada, New Mexico, Utah and Wyoming, are referred to as the Colorado River Basin states. The drainage basin comprises about one-twelfth of the area of the continental United States. Despite the size of its drainage area, the Colorado River ranks only sixth among the nation's rivers in volume of flow with an average annual flow in excess of 17.5 million acre-feet. (15 million acre-feet at Lee Ferry, the Colorado River Compact division point.) In comparison, the Columbia River's drainage area is about the same size, but its flow is about 12 times greater.

Demands on the Colorado River are not limited to needs within the basin. In fact, more water is exported from the basin than from any other river in the U.S. The Colorado River provides municipal and industrial water for more than 24 million people living in the major metropolitan areas of Los Angeles, Phoenix, Albuquerque, Las Vegas, Salt Lake City, Denver, San Diego and hundreds of other communities in the seven states. It also provides irrigation water to about 2.0 million acres of land. The river has more than 60 million acre-feet of storage capacity, 4,000 megawatts of hydro-electric generating capacity, and provides more than 20 million annual visitor days of outdoor recreation.

Dividing the River

The Colorado River is often described as the most regulated river in the world. Considering its importance to the Colorado River Basin states, Native American Indian Tribes and Mexico, it is surprising any agreement has been reached to divide the river's water.

In the 1800s and early 1900s, a sizable agricultural development emerged in California's Imperial Valley. Water was delivered to the valley from the Colorado River in a canal that passed through Mexico. Mexico allowed Imperial Valley farmers to use the channel in exchange for a portion of the water. American farmers became unhappy with the Mexican government controlling their water supply from the river, and they began to push for construction of a new canal built entirely within the U.S., an "All-American" canal. Disastrous flooding occurred in 1905 along the Colorado River. The river broke through a temporary diversion in the river bank, and for two years the entire flow of the river poured into the Imperial Valley. The flooding destroyed homes and thousands of acres of agricultural land, filling a natural depression known as the Salton Sink and creating today's Salton Sea.

As additional flooding occurred in 1910 and the Mexican Revolution began, pressure intensified to construct an All-American Canal to bring Colorado River water to the Imperial Valley and build a flood control dam and storage reservoir on the lower mainstem Colorado River. In addition, Los Angeles was interested in developing hydroelectric power to meet needs of its growing population.

California realized construction of the projects would require the federal government's assistance, which would raise legal and political issues. The other six basin states did not oppose structural control of the river, but they were determined to resist a project for California unless they received satisfactory assurance of their future use of the river's water. Such use by California, they feared, would establish appropriative claims to the water (first in time, first in right), and would prejudice the equity of any future apportionment of the Colorado River among the basin states. The solution appeared to be the development of an interstate compact between the basin states to apportion the Colorado River.

Colorado River Compact of 1922

Discussions for a compact between the Colorado River Basin states began on January 26, 1922, and state and federal negotiators came to agreement on the provisions of the Colorado River Compact on November 24, 1922. The compact split the river system into an Upper Basin comprised of Arizona, Colorado, New Mexico, Utah and Wyoming and a Lower Basin comprised of Arizona, California, Nevada, New Mexico and Utah.

It also partitioned the rights to water between lower and upper basins. The dividing line and measuring point was at Lee Ferry, approximately 17 miles below today's Glen Canyon Dam. The compact apportioned in perpetuity to the upper and lower basins the exclusive, beneficial consumptive use of 7.5 million acre-feet of water annually from the Colorado River. In addition, the Lower Basin received the right to increase its annual beneficial use of water by one million acre-feet.

Compact negotiators, however, were unsuccessful in their attempt to divide the river's water between the individual states as originally intended. But the compact reduced the Upper Basin states' concern that the faster-growing Lower Basin states, particularly California, would monopolize use of the water in the Colorado River. The compact set aside the prior appropriation principle of "first in time, first in right" and allowed each basin to develop its apportioned water as needed without fear of losing it through non-use.

The Arizona State Legislature, in contrast with other basin states, refused to ratify the compact because it felt the compact left Arizona unprotected against rapid development in California. Arizona also opposed including tributary water (specifically the Gila River) in the compact's apportionment. Because of Arizona's refusal to sign the compact, the U.S. Congress did not ratify it until the Boulder Canyon Project Act of 1928 allowed the compact to become law with the approval of six states and the enactment by California of a statute limiting its use of Colorado River water. Arizona finally ratified the compact in 1944.

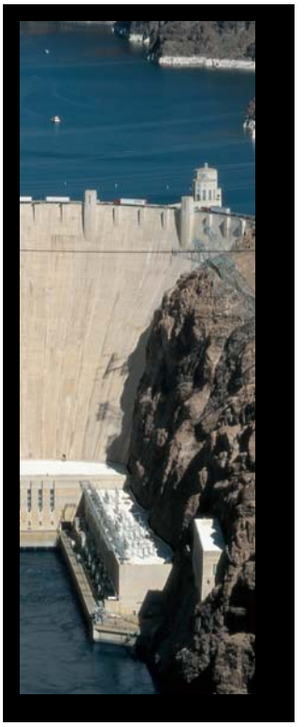
While the Colorado River Compact of 1922 was the first result of a long process of negotiation, legislation and litigation, it was not the last. The collaborative process continues today and has resulted in a body of law known collectively as the "Law of the River."

Law of the River

The Colorado River has been subjected to extensive negotiations and litigation. As a result, a complex set of federal laws, compacts, court decisions, treaties, state laws and other agreements has been developed, known as the "Law of the River". Principal documents forming the Law of the River are:

- Colorado River Compact of 1922*
- Boulder Canyon Project Act of 1928
- Mexican Treaty of 1944
- Upper Colorado River Basin Compact of 1948
- Colorado River Storage Project Act of 1956
- 1963 U.S. Supreme Court decision, *Arizona v. California*
- Colorado River Basin Project Act of 1968
- 1970 Criteria for Coordinated Long-Range Operation of Colorado River Reservoirs
- Minute 242 of the 1973 International Boundary and Water Commission
- Colorado River Basin Salinity Control Act of 1974
- Grand Canyon Protection Act of 1992
- 2001 Colorado River Interim Surplus Guidelines.

*The Colorado River Compact of 1922 says the term "Upper Basin" means those parts of Arizona, Colorado, New Mexico, Utah and Wyoming from which waters naturally drain into the Colorado River system above Lee Ferry. The term "Lower Basin" means those parts of the states of Arizona, California, Nevada, New Mexico and Utah from which waters naturally drain into the Colorado River System below Lee Ferry. It further states the term "the Upper Division" means the states of Colorado, New Mexico, Utah and Wyoming, and term "the Lower Division" means the states of Arizona, Colorado and New Mexico.



Hoover Dam
Courtesy of Southern Nevada Water Authority

Boulder Canyon Project Act

Even though Arizona refused to ratify the Colorado River Compact of 1922 until 1944, the compact became law in 1928 with passage of the Boulder Canyon Project Act. This act authorized construction of the All-American Canal and Hoover Dam and power plant, and gave Arizona, California and Nevada the option of developing a Lower Basin compact to divide their apportionment of the Colorado River. Lower Division states were unable to agree on dividing their water, and the final apportionment was not decided until the Supreme Court ruled in *Arizona v. California* in 1963.

Arizona v. California

In 1963, after 11 years of legal battles, the U.S. Supreme Court, in its decision in *Arizona v. California*, confirmed the Lower Division apportionment of the Colorado River in the Boulder Canyon Project Act of 1928 as follows: California - 4.4 million acre-feet and 50 percent of all surplus, Arizona - 2.8 million acre-feet and 46 percent of all surplus, and Nevada - 300,000 acre-feet and 4 percent of all surplus. The court also held that Arizona's use of the Gila River and its tributaries would not reduce its entitlement of Colorado River water.

The 1908 *Winters v. United States* Supreme Court decision established the doctrine of Indian reserved water rights. The court held that such rights existed whether or not the tribes were using the water. The decision was reaffirmed by the *Arizona v. California* decision that awarded water rights to five Indian reservations in the Lower Basin. The court determined the only feasible way the tribes' reserved water rights could be measured was based on the amount of "practicably irrigated acreage" on the reservations. The court also ruled an Indian tribe's quantified reserved rights must be taken from and charged against the apportionment of water of the state in which the tribe's reservation is located.

Upper Colorado River Basin Compact of 1948

Formal negotiations on an Upper Colorado River Basin Compact were initiated on July 31, 1946. They were prompted by the desire of the states to continue water development in the Upper Basin which had been put on hold in 1941 by wartime restrictions. The Upper Basin states wanted to construct a major federal project, but federal funding was contingent on an Upper Basin compact. On October 11, 1948, the Upper Basin states entered into the Upper Colorado River Basin Compact to apportion allowable depletions between the states. The four Upper Division states were uncertain how much water would remain after they met their requirement in the Colorado River Compact of 1922 to deliver the Lower Basin 7.5 million acre-feet per annum and how the Mexican Treaty obligation might affect the available water supply. So they apportioned the remaining water as follows:

Colorado - 51.75% New Mexico - 11.25% Utah - 23.00% Wyoming - 14%
Arizona - 50,000 acre-feet *(Deducted prior to calculating other state shares.)*

The Upper Basin compact gave the states the final protection they needed to develop and use their water gradually without fear of losing it through non-use.

A major incongruity with the Law of the River is the assumed quantity of water in the Colorado River upon which the Colorado River Compact of 1922 was negotiated. The river's average annual flow (1896- 1921) at Lee Ferry was thought to be about 17 million acre-feet. Now the states agree the compact was negotiated during a period of high water supply. Recent estimates

show the river's average annual flow to be 15 million acre-feet. Subtracting the compact and treaty guaranteed annual apportionments to the Lower Basin of 7.5 million acre-feet and Mexico of 1.5 million acre-feet, and recognizing the impacts of sustained drought periods, the Upper Basin is left with an estimated dependable supply of about 6.0 million acre-feet. As a result, Utah's allocated share is reduced from 1.7 million acre-feet to approximately 1.4 million acre- feet.

Colorado River Storage Project Act of 1956 & the Colorado River Basin Project Act of 1968

The 1956 act authorized construction of the Glen Canyon Dam, Flaming Gorge Dam, Navajo Dam and Curecanti Dam for river regulation and several other participating projects in the Upper Basin. It also provided for an Upper Basin water resources development plan. The act authorized the Bureau of Reclamation to construct the Central Utah Project as one of the participating projects. The CUP develops part of Utah's remaining share of Colorado River water for irrigation and municipal uses, hydroelectric power, flood control, recreation, and fish and wildlife benefits in a number of areas of the state. The 1968 act authorized several projects in the upper and lower basins. The Secretary of the Interior was also directed to consult with the basin states in developing long range operating criteria for the Colorado River reservoir system.

Lake Powell
Courtesy Southwest Aerial Photo

Water For Mexico

The last 75 miles of the Colorado River are in Mexico. Mexico's share of the Colorado River is determined under provisions of a treaty signed in 1944. The treaty guarantees Mexico 1.5 million acre-feet to be increased in years of surplus to 1.7 million acre-feet and reduced in years of extraordinary drought in proportion to the reduction of consumptive uses in the U.S. Since 1944, the U.S. has delivered to Mexico at least the amount of water the treaty requires.

The treaty did not mention water quality, but a subsequent agreement between the U.S. and Mexico, called "Minute 242, International Boundary and Water Commission, September 4, 1973," contains a provision guaranteeing Mexico that water delivered at the northern international boundary will have an average annual salinity of no more than 115(± 30) parts per million over the salinity of water that arrives at Imperial Dam. Since 1972, water delivered to Mexico has met the water quality provisions of Minute 242 and over time water quality has improved due to efforts of the federal, state and local governments as well as the irrigation interests on the Colorado River to control salinity.

The Colorado River Basin Salinity Control Act was passed in 1974 authorizing the use of federal funds to help control salinity in the Colorado River. Title I of the act authorized construction of a desalination plant near Yuma, Arizona, to desalt 80,000 acre-feet of return irrigation flows from farmers in the Welton Mohawk Irrigation District prior to the water being delivered to Mexico. The desalting plant was completed in 1992 at a cost in excess of $250 million. With an annual operating cost in excess of $25 million, the plant has not been operated.

Interest has been renewed in recent years to protect and restore the Colorado River delta in Mexico. Before Hoover and Glen Canyon dams were constructed on the Colorado River, from 10 to 20 million acre-feet of water per year passed through the delta. Approximately two million acres of riparian habitat and wetlands existed there. Riparian habitat in the Colorado River delta in Mexico now totals about 180,000 acres. Environmental groups, basin states, federal agencies and the government of Mexico are studying ways to preserve the remaining riparian habitat.

Colorado River Basin Salinity Control Program

The Colorado River Basin Salinity Control Program, as authorized by Section 202(c) of Title II of the Colorado River Basin Salinity Control Act of 1974, as amended, authorizes federal agencies to cost share with state and local organizations for the construction of projects, mostly in the Upper Basin, to control salinity in the Colorado River by decreasing the amount of salt entering the river. Salinity control projects have been installed in Utah, Colorado, Wyoming, New Mexico and Nevada. The majority of the projects have involved improvements in irrigation system efficiency.

Federal financial and technical assistance is delivered under the program through the U.S. Department of Interior, Bureau of Reclamation, and the U.S. Department of Agriculture, Natural Resources Conservation Service. The program provides assistance in identifying salt source areas in the Colorado River Basin, including privately owned lands, Indian tribal lands, irrigation company lands, and state and federal lands. The program also includes the installation of conservation practices to improve irrigation efficiency such as conversion from surface to sprinkler irrigation, lining or piping irrigation conveyance systems, education of water users, and monitoring and evaluation of salinity activities.

In Utah, over 100,000 acres of salinity control efficiency improvements have been installed in the Uintah Basin and an additional 40,000 acres are being installed in the Price/San Rafael rivers area.

The great benefit of this program in Utah is the increased irrigation efficiencies with attendant agricultural production increase at a reasonable cost for the agricultural producer. Since the downstream states of Arizona, California and Nevada and the federal government are the benefactors of improved water quality, they provide up to 70 percent of the funds needed for the program.

Upper Colorado River Endangered Fishes Recovery Program

The Upper Colorado River Endangered Fishes Recovery Program is an interagency partnership created to recover the endangered Colorado pikeminnow, razorback sucker, humpback chub and bonytail fishes. This program assures compliance with environmental laws for water use from the Colorado River in the Upper Basin. Utah is one of the original program partners with the Governor of Utah signing a cooperative agreement in 1988 along with the governors of Wyoming and Colorado, the Secretary of the Interior, and the Administrator of the Western Area Power Administration. This cooperative agreement was extended in 2001 to coincide with Public Law 106-392 to provide total long term funding authorization of $100 million for the capital construction projects called for in the endangered fishes recovery program. The cooperating states of Utah, Wyoming, Colorado and New Mexico agreed to provide $17 million, and power users agreed to provide another $17 million. The federal government provides the remaining amount. Utah's share is $3.4 million to be paid by the year 2005.

The program has been successful in meeting the Endangered Species Act requirements by providing the elements necessary to be the reasonable and prudent alternatives for successful section 7 consultations with the U.S. Fish and Wildlife Service for federal and local water projects. The success of this program has allowed construction of water development projects in Utah; for example, the Central Utah Project.

2001 Colorado River Interim Surplus Guidelines

The interim surplus guidelines allow the Secretary of the Interior to provide water to meet municipal and industrial uses in the Lower Basin, particularly California, during an interim period between the years 2001 and 2016 when Colorado River reservoirs are projected to be relatively full. Approximately 5.2 million acre-feet of Colorado River water has been used annually by California over the past 20 years, which is 800,000 acre-feet more than the state's compact allocation. The guidelines allow California 15 years to implement water conservation programs to reduce demand for Colorado River water to its compact allotment of 4.4 million acre-feet. During the 15 years, the six other Colorado River Basin states have agreed on criteria to assure California will be able to meet its municipal and industrial water needs. The criteria, however, also protect the other basin states against potential impacts of drought during the 15-year period by reducing the allowable California municipal and industrial water demands that can be met by surpluses as reservoirs are lowered during droughts.

Annual Operating Plan Process

The Secretary of the Interior is charged with developing an Annual Operating Plan for Lower Basin reservoirs, taking into account the available water supply, operational needs, water supply requests, and limitations and requirements of the Law of the River. In consultation with the Colorado River Basin states and other interested entities, the Secretary determines the quantity of water that will be made available for use in the coming calendar year and declares whether it is a normal, surplus or shortage year. This declaration will govern water use in the Lower Basin for the next calendar year.

Utah's Current Uses of Colorado River Water

Portions of Utah lie in both the upper and lower basins. Most of the eastern half of the state is in the Upper Basin, while the Virgin River and Kanab Creek drainages, located in Washington and Kane counties in the southwestern part of the state, are in the Lower Basin.

In the Upper Basin, the Colorado River enters Utah west of Grand Junction, Colorado, but few diversions in Utah are made directly from the river in this area. The largest use of Colorado River water is from the Duchesne River system in the Uintah Basin. Lesser amounts of water are diverted from the Price, San Rafael, Dirty Devil, Escalante and San Juan river systems. Water is also exported from the Uintah Basin to the Wasatch Front by the Central Utah Project, Provo River Project, Strawberry Project and several smaller diversions.

Most of Utah's water use in the Lower Basin is from the Virgin River and tributaries. The Virgin River is a non-compact interstate stream originating in Utah that passes through Arizona and Nevada before entering the mainstream Colorado River at Lake Mead. According to the court decree in *Arizona v. California*, the Boulder Canyon Project left tributaries, including Kanab Creek and the Virgin River in Utah, to the exclusive use of the state in which they arise. The state of Utah believes it has the right to develop and use flows of Kanab Creek and the Virgin River. Agriculture is currently the biggest user of water from Kanab Creek and the Virgin River drainages in Utah. But municipal and industrial uses are expected to increase three fold in the next 50 years, exceeding agricultural uses.

Colorado River in Canyonlands National Park
Courtesy Tom Till

Utah's Projected Uses of Colorado River Water

According to projections in the year 2020, Utah will have about 200,000 acre-feet of undeveloped Colorado River water available for future use. During the energy crisis in the 1970s, oil shale development in the Uintah Basin seemed imminent, and many observers believed such development would use much of the state's remaining Colorado River water. By the early 1980s it became apparent that such development was not economically feasible.

The Central Utah Project will probably be the last major water development project in Utah to be funded by the federal government. Additional private development of thermal power will likely occur at existing plants in Emery and Uintah counties. Additional municipal, industrial and agricultural water development will occur as growth continues. In the Lower Basin, water diversions from the Kanab Creek and Virgin River drainages will increase approximately 58,000 acre-feet per year by the year 2050, increasing depletions by about 36,000 acre-feet. The population of the Lower Basin, one the fastest growing areas in Utah, is expected to grow at an average annual rate of 2.96 percent over the next 20 years. Utah's predicted average annual rate of growth for that same period is 1.74 percent.

Utah's Upper Colorado River Basin Projected Depletions

(Units of 1,000 acre-feet per year)

	2000	2020	2050
Agriculture/Stock	591	650	632
Municipal/Domestic	23	38	62
Power/Industrial/Energy	46	55	75
Indian Settlements	-	58	124
Exports/Imports	154	235	295
Reservoir Evaporation	19	19	19
Total Depletions	833	1,055	1,207
Evaporation Storage Units	120	120	120
Total	**953**	**1,175**	**1,327**
Utah's share of the Upper Colo. River	1,369	1,369	1,369
Remaining water available	416	194	42

Source: Utah Division of Water Resources

Utah's Lower Colorado River Basin Projected Depletions

(Units in acre-feet per year)

	2000	2020	2050
Municipal/Industrial	13,000	22,000	39,000
Secondary (lawn and garden)	6,000	10,000	17,800
Agriculture/Stock	50,000	45,000	38,000
Exports (to New Castle area)	2,600	2,600	2,600
Reservoir Evaporation	5,300	10,600	11,700
Shivwits Paiute Indian Band	300	2,000	4,000
Total Depletion	**77,200**	**92,200**	**113,100**

Source: Utah Division of Water Resources

Unresolved Issues

The Colorado River Basin states and the federal government began dividing up the water in the Colorado River about 80 years ago. Even though states and federal agencies have been able to cooperate to resolve many difficult problems, emerging issues continue to surface.

Since the signing of the Colorado River Compact in 1922, major issues on the river have been discussed and resolved among the states without a formal organization. This informal process has allowed flexibility and encouraged innovation. The informal process requires the seven Colorado River Basin states to reach a consensus. As part of this process, participants must develop an understanding of all sides of issues and be willing to achieve solutions in which needs of all states are met without unduly jeopardizing any single state's position. The process is slow and difficult, but the solutions have the support of all the states, which makes implementation easier and more efficient.

Unresolved Issues in Utah

1. How will Utah use its remaining Colorado River Compact allocation?
2. How will future needs for water in the Virgin River Basin be met?
3. How will the reserved water rights claims of the Ute and Navajo Indian tribes be resolved and how will this impact existing uses?

Unresolved Basin-wide Issues

1. Can Colorado River reservoirs be managed for environmental and recreational uses and still meet increasing consumptive use demands?
2. How will the Endangered Species Act and other federal legislation affect current and projected uses of Colorado River water?
3. How will the Bureau of Reclamation continue to meet federally approved water quality requirements for Colorado River water delivered to Mexico?
4. How will environmental concerns in the Mexico delta of the Colorado River be resolved.

Red Canyon, Flaming Gorge National Recreation Area
Courtesy of the Utah Travel Council, Tom Till

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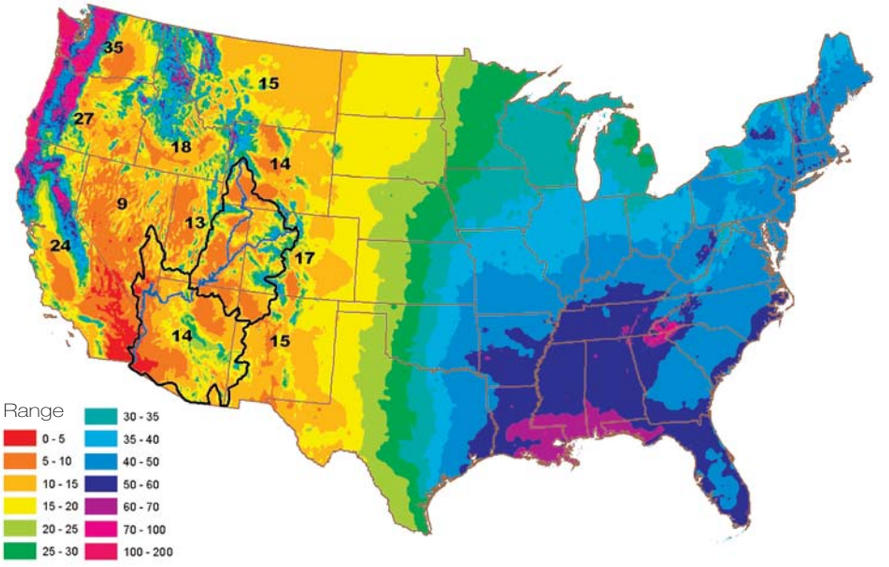
The Colorado River

Water is the lifeblood of Utah. The Colorado River drainage receives substantially less than 20 inches of precipitation (basin-wide average of about 14 inches) and can truly be called the "Great American Desert." Utah has the dubious honor of being the second-driest state in the nation. Utah's precipitation varies from 5 to 60 inches with a statewide annual average of only 13 inches.

Average Annual Precipitation 1961-1990



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Source: USDA - NRCS

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