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FREQUENTLY ASKED LAW & POLICY QUESTIONS (Natural Res.
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Colorado River: Frequently Asked Law & Policy Questions

November 2011
Version 2.0

Colorado River Governance Initiative
Natural Resource Law Center
University of Colorado - Boulder

This is a working document that will be continually updated as information on the Colorado River evolves and as we respond to additional questions. For the latest version, or questions, comments, and further information, please visit <http://www.waterpolicy.info> or email us at crgi.cu@gmail.com.

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What previous litigation, settlements, agreements and/or legislation have occurred with respect to Colorado River governance?

Colorado River Compact of 1922

The 1922 Colorado River Compact is the foundation for the all-encompassing “Law of the River” and determined broadly how the states were to be divided and the river to be allocated. Negotiated by the seven Basin states and the federal government, the Compact divides the Basin in two divisions (Upper Division – Colorado, Wyoming, Utah, New Mexico and Lower Division – Arizona, Nevada, and California) and helped ease tensions between the two divisions. The Upper Division was concerned the Lower Division states were growing so rapidly that they would, under the Prior Appropriation Doctrine, secure rights to a large portion of the Colorado River. The Lower Division states did not want to limit their current growth and wanted secure, reliable rights that held enough water to satisfy their increasing demands.

Although no specific allocations were made to the individual states in the original Compact, each division was allocated the right to develop and use 7.5 million acre-feet annually, with the Lower Division given another 1 million acre-feet for consumptive use. The Compact, among a few other stipulations, also required the Upper Division not to deplete the flow of the River at Lee Ferry below 75 million acre-feet, on a ten year rolling average (this part of the Compact has sparked much debate, and is addressed below in the “ambiguities” section).

It should be noted that although Mexico and Tribal interests were not involved in the negotiating process, both parties are mentioned in the Compact. Article VII states that the Compact will not affect current obligations the United States has to Indian Tribes. Article III (c) states that should a deal with Mexico be negotiated in the future, the “burden of such deficiency” should be equally shared by both the Upper and Lower Divisions (this equal sharing of deliveries to Mexico is another contentious debate, and is also discussed in the “ambiguities” section).

For further information on the Colorado River Compact of 1922:

<http://www.usbr.gov/lc/region/g1000/pdfiles/crcompct.pdf>

<http://www.usbr.gov/lc/region/g1000/lawofrvr.html>

http://wwa.colorado.edu/colorado_river/law.html

Boulder Canyon Project Act of 1928

The Boulder Canyon Project Act of 1928 served several purposes. Not only did it officially ratify the 1922 Colorado River Compact, but it also authorized the construction of Hoover Dam and related irrigation facilities in the Lower Basin. This act also apportioned the Lower Basins allocation among the three states: Nevada: 300,000 acre-feet, Arizona: 2,800,000 acre-feet, and California: 4,400,000 acre-feet. Finally, the act

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also authorized the Secretary of the Interior to be “water-master” for the Colorado River waters in the Lower Basin.

For further information on the Boulder Canyon Project Act of 1928:

<http://www.usbr.gov/lc/region/g1000/pdfiles/bcpact.pdf>

<http://www.usbr.gov/lc/region/g1000/lawofrvr.html>

http://wwa.colorado.edu/colorado_river/law.html

1944 Water Treaty with Mexico

The 1944 Water Treaty with Mexico allocated annually 1,500,000 acre-feet to be delivered across the international border. The Treaty stipulates that in years of surplus, as determined by the United States, Mexico may receive an additional 200,000 acre-feet. Conversely, in years of ‘extraordinary drought’ or damage to irrigation facilities in the United States, Mexico’s allocation may be reduced in the same proportion as the consumptive uses in the United States. The Treaty, however, does not define ‘extraordinary drought’, which has led to some debate among the Basin states and Mexico. This debate regarding the definition of ‘extraordinary drought’ is discussed below in the ‘Law of the River ambiguities section’.

For further information on the 1944 Water Treaty with Mexico:

<http://www.usbr.gov/lc/region/g1000/pdfiles/mextrety.pdf>

<http://www.usbr.gov/lc/region/g1000/lawofrvr.html>

http://wwa.colorado.edu/colorado_river/law.html

Upper Colorado River Basin Compact of 1948

The Upper Colorado River Basin Compact of 1948 apportioned the Upper Basin’s allocation among Colorado, Wyoming, Utah, New Mexico and Arizona (although Arizona is a Lower Basin state, a small part is actually in the Upper Basin). Differing with the Lower Basin, which allocated exact quantities, the Upper Basin states’ allocations are based on percentages: Colorado – 51.75%, Wyoming – 14%, Utah – 23%, New Mexico – 11.25%, and Arizona – 50,000 acre-feet. The Compact of 1948 also established the Upper Colorado River Commission, which is comprised of one representative commissioner from each Upper Basin state, and one commissioner representing the United States. The Upper Colorado River Commission has responsibility for administering Compact compliance issues, a somewhat similar role to the Secretary of the Interior in the Lower Basin.

For further information on the Upper Colorado River Basin Compact of 1948:

<http://www.usbr.gov/lc/region/g1000/pdfiles/ucbsnact.pdf>

<http://www.usbr.gov/lc/region/g1000/lawofrvr.html>

http://wwa.colorado.edu/colorado_river/law.html

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Colorado River Storage Project of 1956

The Colorado River Storage Project of 1956 was an Upper Basin-wide development plan for the Upper Basin states to better utilize their Colorado River allocations through reclamation, flood control, and hydroelectric power production. The Project authorized the construction of the main Upper Basin dams, reservoirs, hydroelectric facilities, and irrigation projects, including the Curecanti, Navajo, Flaming Gorge, and Glen Canyon dams.

For further information on the Colorado River Storage Project of 1956:

<http://www.usbr.gov/lc/region/g1000/pdfiles/crspuc.pdf>

<http://www.usbr.gov/lc/region/g1000/lawofrvr.html>

http://www.colorado.edu/colorado_river/law.html

1964 *Arizona v. California* (U.S. Supreme Court Decision)

In 1963 the Supreme Court settled an ongoing dispute between Arizona and California that had lasted for 25 years. Arizona wanted to construct the Central Arizona Project (CAP) to utilize their full Colorado River allocation, but California objected arguing that Arizona was already utilizing their allocation through development on the Gila River, a tributary to the Colorado River. The dispute regarding whether or not tributaries in the Lower Basin constitute Colorado River apportionments reached the Supreme Court, where the Supreme Court held in favor of Arizona. The Court held in *Arizona v. California* that Lower Basin states have the right to appropriate and use tributary flows before they reach the main-stem of the Colorado River, without impact on respective Colorado River allocations.

The Supreme Court issued its decree in 1964 regarding this decision. The decree touched on several other issues as well, and instructed the Secretary of the Interior to prepare annual reports documenting water use in the Lower Basin states.

For further information on the Arizona v. California Supreme Court Decision:

<http://www.usbr.gov/lc/region/g1000/pdfiles/supctdec.pdf>

<http://www.usbr.gov/lc/region/g1000/lawofrvr.html>

http://www.colorado.edu/colorado_river/law.html

Colorado River Basin Project Act of 1968

The Colorado River Basin Project Act of 1968 authorized construction of a number of projects in both the Upper and Lower Basin, most notably the Central Arizona Project (CAP) in Arizona. In authorizing the construction of CAP, however, the Act also stipulated that during times of drought or shortages, CAP's priority will be junior to that of California's Colorado River allocations.

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The Act also instructed the Secretary of the Interior to plan and develop long term operating criteria for Colorado River reservoir and storage projects; these operating criteria are to be prepared in consultation with the seven Basin States.

For further information on the Colorado River Basin Project Act of 1968:

<http://www.usbr.gov/lc/region/g1000/pdfiles/crbproj.pdf>

<http://www.usbr.gov/lc/region/g1000/lawofrvr.html>

http://www.colorado.edu/colorado_river/law.html

Minute 242, US-MX International Boundary and Water Commission, 1973

In 1973, the United States and Mexico under the International Boundary and Water Commission (IBWC) agreed to Minute 242, amending the 1944 Treaty to require the United States to take certain actions to reduce salinity levels in the Colorado River at the point of delivery to Mexico, Morelos Dam. The Minute stipulated that the water at Morelos Dam have annual average salinity of no more than 115 parts per million (ppm).

For further information on Minute 242:

www.ibwc.gov/Files/Minutes/Min242.pdf

http://www.ibwc.gov/Treaties_Minutes/Minutes.html

<http://www.usbr.gov/lc/region/g1000/lawofrvr.html>

Colorado River Basin Salinity Control Act of 1974

In response to Minute 242 in 1973, the Colorado River Basin Salinity Control Act of 1974 authorized construction of salinity control and desalinization projects near the international border, including the Yuma Desalting Plant near Yuma, Arizona. The Act is intended to improve Colorado River quality as it flows into Mexico.

For further information on the Colorado River Basin Salinity Control Act:

<http://www.usbr.gov/lc/region/g1000/pdfiles/crbsalct.pdf>

<http://www.usbr.gov/lc/region/g1000/lawofrvr.html>

http://www.usbr.gov/lc/yuma/facilities/ydp/yao_ydp.html

http://www.colorado.edu/colorado_river/law.html

Grand Canyon Protection Act of 1992

This act, passed in response to public concern over threats to species, river dynamics, and archeological sites, directs the Secretary of the Interior to manage Glen Canyon Dam in such a way as to “protect, mitigate adverse impacts to and improve the values for which Grand Canyon National Park and Glen Canyon National Recreation Area were established.” It emphasized the need for scientific data, public participation, and efficiency in natural resource use. After extensive studies were completed, operating

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procedures for Glen Canyon Dam were set forth in the 1996 Environmental Impact Statement (EIS) required by the act. The Adaptive Management Work Group (AMWG), also established by the act, makes recommendations to the Secretary of the Interior regarding these procedures and other management actions.

For further information on the Grand Canyon Protection Act of 1992:

<http://www.usbr.gov/uc/legal/gcpa1992.html>

2003 Quantification Settlement Agreement (QSA)

The QSA's goals are 1) to allow California to live within the state's 4.4 million acre-feet allotment of Colorado River water, 2) commit the state to a restoration path for the Salton Sea, and 3) provide mitigation for water supply programs. The QSA's method for accomplishing these goals is shifting water from agricultural to urban uses and conserving water by lining canals to prevent seepage.

There have been several legal challenges to the validity of the QSA ever since its creation in 2003. But only recently have legal decisions successfully chipped away at the QSA. The Superior Court of California invalidated portions of the QSA in February 2010 on the grounds that some QSA contracts required the state to pay environmental mitigation fees, which by-passed the state's constitutional finance procedures. As a result of this ruling, 12 of the 35 contracts that comprise the QSA were invalidated. This ruling has been appealed and all QSA agreements remain intact due to a stay of execution granted in March 2011. A ruling from the California 3rd District Appellate Court is expected in late February of 2012.

For further information on the Quantification Settlement Agreement:

<http://www.sdcwa.org/quantification-settlement-agreement>

<http://www.saccourt.ca.gov/coordinated-cases/qa/qa.aspx>

2007 Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lakes Powell and Mead

In response to the ongoing drought in the Southwest and subsequent declines in Colorado River reservoir storage, the Secretary of the Interior instructed the Bureau of Reclamation to develop coordinated strategies for the operation of Colorado River storage reservoirs during periods of drought or shortages. Criteria had been established for coordinated operation during surplus years, but there were no guidelines during shortage years.

In 2005 the Bureau initiated this process with an Environmental Impact Statement (EIS) to determine the impacts of changing the operating criteria, and what criteria would benefit operation of the system while limiting or preventing environmental harm.

In addition to the Bureau and the Basin States, many other stakeholders were included in the discussion for developing each of the proposed alternatives for coordinated operation, including non-governmental organizations, environmental non-profits, Native American

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tribes, federal agencies and the general public. In the end, the Preferred Alternative (PA) included elements submitted by a collection of environmental organizations. The adopted guidelines included operating criteria for Lakes Mead and Powell, basing releases on determined 'trigger levels' in both reservoirs. They also included a schedule of Lower Basin curtailments, and a mechanism for storing and delivering conserved water from Lake Mead called Intentionally Created Surplus (ICS).

A Draft EIS was released in February 2007 and opened to public comment. The Final EIS was published later that year in November and Secretary of the Interior Dirk Kempthorne signed a Record of Decision in December 2007. The interim guidelines have a set time period for implementation and will expire in 2026, the theory being this period will give managers experience with coordinated reservoir operation and operation during periods of drought, and will provide a window for implementing more comprehensive solutions.

For further information on the 2007 Colorado River Interim Guidelines:

<http://www.usbr.gov/lc/region/programs/strategies.html>

<http://www.usbr.gov/lc/region/programs/strategies/FEIS/index.html>

http://www.colorado.edu/IWCS/archive/IWCS_2009_Jan_feature2.pdf

Minute 318, US-MX International Boundary and Water Commission, 2010

In December of 2010 the United States and Mexico negotiated an interim agreement that allows Mexico to store part of its allocation in Lake Mead, while repairs are made to infrastructure damaged during an earthquake in April of 2010. The damage would have prevented Mexico from utilizing up to 260,000 acre-feet of Colorado River water annually. Minute 318 allows Mexico to defer annual delivery of this amount through December 31, 2013, during which the water would be kept in Lake Mead. Starting in 2014, Mexico could begin to recover this deferred allotment, should their infrastructure be adequately repaired and subject to reservoir operations in the U.S.

Although this agreement is short-term, and is the result of a natural disaster, it can be seen as beneficial to both countries in the long-term management of the Colorado River. Water banking has been proposed as a strategy to mitigate risk during periods of drought, and Minute 318 gives both countries circumscribed experience in banking. The successful negotiation of Minute 318 could potentially lead the way to future agreements in which water banking could benefit users in both countries, as well as supporting Colorado River ecosystems, including the Colorado River Delta.

Additionally, a bi-national agreement that is immediately mutually beneficial supports future negotiations and a respectful relationship in Colorado River management.

For further information on Minute 318:

<http://www.doi.gov/news/pressreleases/Salazar-Elvira-Announce-Water-Agreement-to-Support-Response-to-Mexicali-Valley-Earthquake.cfm>

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www.ibwc.gov/Files/Minutes/Min_318.pdf

What are some ambiguities in the Law of the River?

Since the Colorado River Compact of 1922 was written into law, there has continually been debate surrounding some ambiguities in the Compact and related elements of the Law of the River. Some of these debates have been taken to court and resolved there, as was the case with the Lower Basin apportionment scheme (*California v. Arizona*, 1963). Other ambiguities, however, have not been resolved and debate continues. The following section presents brief discussions of some of the most prominent uncertainties, as well as some of the latest thinking of resolutions to these legal issues.

Deliveries to Mexico

Although no negotiation or treaty had yet been developed with Mexico concerning apportioning shares of the Colorado River, the original Colorado River Compact of 1922 did discuss possible future deliveries to Mexico. There are, however, numerous legal ambiguities surrounding this provision in the Compact and the subsequent treaty with Mexico that was signed in 1944. These ambiguities will be discussed below.

The 1922 Compact provides in Article III (c) that:

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

In 1944, Mexico and the United States signed the Utilization of Water of the Colorado and Tijuana Rivers and of the Rio Grande Treaty. Under Article X, the United States agreed to deliver 1.5 million acre-feet per year to Mexico. The United States may deliver an additional 200,000 acre-feet per year if there is surplus water available. In the event of “extraordinary drought or serious accident to the irrigation system making it difficult for the United States to deliver the guaranteed quantity of [1.5 million acre-feet],” the water allocated to Mexico “will be reduced in the same proportion as consumptive uses in the United States are reduced.”

The 1944 Treaty with Mexico can be found here:

<http://www.usbr.gov/lc/region/g1000/pdfiles/mextrety.pdf>

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The Upper Basin's Mexican Treaty Obligation

The dispute about Mexican Treaty delivery obligations is multifaceted, but is primarily centered on the Lower Basin tributaries, which may not be included in the basin allocations. Without the tributaries, the water supply in the Lower Basin available to meet the Treaty obligation drops dramatically and the Upper Basin faces a higher burden in ensuring adequate deliveries.

According to the 1922 Compact, deliveries to Mexico are to be made from surplus water in the “Colorado River System,” “that portion of the Colorado River and its tributaries within the United States of America,” above the aggregate requirements of Article III (a) and (b). When there is no “surplus” water, the Upper Basin is required to bear one half of the deficiency – up to 750,000 acre-feet per year. Without surplus, the Upper Basin has to deliver at least 8.23 million acre-feet per year to Lee Ferry, perhaps more if compensation for transit losses is required. In low flow years, this could result in curtailment of Upper Basin users. The Comptroller General of the United States summarized the dispute in a Report to Congress on May 4, 1979:

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 million acre-feet 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.

This dispute was nearly non-existent until the Supreme Court, in *Arizona v. California*, disregarded the Lower Basin tributaries when determining state allocations in the Lower Basin. The Court declared that under the Congressional scheme established in the Boulder Canyon Project Act, “the tributaries are not included in the waters to be divided...” The Court reasoned that legislative history and the alternative proposals that eventually culminated in the Boulder Canyon Project Act “consistently provided for division of the mainstream only, reserving the tributaries to each State's exclusive use.”

Under the plain language of the Compact, the Lower Basin's apportionment in Articles III (a) and (b) is of Colorado River System water, which includes both main-stem and tributary water. The Compact Commissioners certainly intended to subject the Lower Basin tributaries to future Mexican obligations. Contemporaneous support for the inclusion of the tributaries in the Compact comes from the failure of amendments to the Boulder Canyon Project Act that would have exempted tributaries from the Mexican obligation. Moreover, Arizona's past conduct illustrates that the tributaries were intended to be included in the basin allocations. Arizona opposed ratification of the Colorado River Compact based on the inclusion of the tributaries in the Article III (c) surplus, and argued in *Arizona v. California* (1934) that Article III (b) was intended to

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compensate Arizona for the inclusion of the Gila River and other tributaries in the Compact.

The decision in *Arizona v. California* could be stretched to mean that there may be no “surplus” water available to satisfy the Mexican Treaty obligation. State law governs the tributaries; and since they are not included in the Compact, under this notion, they may not need to be curtailed to meet Mexican delivery obligations. Eliminating the tributaries from the Lower Basin’s apportionment forces the Upper Basin to bear a bigger relative burden than the Lower Basin in ensuring adequate deliveries. In 2004, the Upper Basin’s Governor representatives on Colorado River operations formally stated their position in regarding the existence of “surplus waters” in the system. In a letter to their counter parts in the Lower Basin, the Upper Basin representatives, in discussing whether or not there is a deficiency in surplus, stated, “. . .it has been our consistent position that because no such deficiency has been shown to exist, the Upper Basin has no obligation in this regard.”

Further complicating the Upper Basin’s position is that the Mexican Treaty obligation is one of the top priorities on the River. During significant droughts or low-flow years in which there is not enough in storage to meet demands, the Mexicans would still have right to their allocation, even if that means shortages in both the Upper and Lower Basins.

The Upper Basin’s burden would further increase if it were required to compensate for transit losses occurring between Lee’s Ferry and the Mexican border. The Lower Basin argues that the Upper Basin must deliver an amount of water equal to one half or more of the channel losses. However, the Compact negotiations do not suggest that this was the Commissioners’ intention and the final Compact states that the Upper Basin “shall deliver at Lee Ferry” and not Yuma, as Lower Basin commissioners suggested. Accordingly, this suggests the Upper Basin is not required to compensate for channel losses through the hottest and driest stretch of the River – Lee’s Ferry to Yuma.

As a practical matter, the Upper Basin is not currently using its full apportionment, and so there have not been problems ensuring adequate deliveries to Mexico. However, as the Upper Basin continues to develop its water, and if climate change or drought further reduces flows, the chance for confrontation grows and the resolution of this ambiguity takes on increasing importance.

For further information on the Upper Basin’s Mexican Treaty Obligation:

Arizona v. California, 373 U.S. 546, 559-60 (1963).

Carlson, J. 1989. *The Colorado River Compact: A Breeding Ground for International, National, and Interstate Controversies*, Natural Resources Law Center, University of Colorado School of Law.

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Carlson, J. and Boles, A. 1986. *Contrary Views of the Law of the Colorado River: An Examination of Rivalries Between the Upper and Lower Basins*, Rocky Mtn. Mineral Law Inst. Vol. 32, pp 21-1 to 21-68.

The Colorado River Compact Negotiation Transcripts:

http://wwa.colorado.edu/colorado_river/cocmpct_trnscrpts.html

Getches, D. 1985. *Competing Demands for the Colorado River*, U. Colo. L. Rev. Vol. 56, pp. 413.

Hundley, N., 2009. *Water and the West: the Colorado River Compact and the Politics of the American West* (2nd ed.). University of California Press.

USBR. 2004. *Colorado River System: Consumptive Uses and Losses Report, 1996-2000*, Department of Interior.

Meyers, Charles, *The Colorado River*, 19 Stan. L. Rev. 1, 24-25 (1966).

Clyde, Edward W., *Institutional Response to Prolonged Drought*, New Courses for the Colorado River, 117-21 (1986).

Shiffer, W.Patrick et al., *From a Colorado River Compact Challenge to the Next Era of Cooperation Among the Seven Basin States*, 49 Ariz. L. Rev. 217 (2007).

MacDonnell, Lawrence J., *The Disappearing Colorado River*, Vol. 9, No. 2, Western Economics Forum (2010): 2-3.

What is extraordinary drought?

The term “extraordinary drought” is not defined in the 1944 Treaty with Mexico, nor is it defined in any parallel agreement. Article X of the 1944 Treaty provides that:

In the event of extraordinary drought or serious accident to the irrigation system in the United States, thereby making it difficult for the United States to deliver the guaranteed quantity of 1,500,000 acre-feet... a year, the water allotted to Mexico under subparagraph (a) of this Article will be reduced in the same proportion as consumptive uses in the United States are reduced.

One academic interpretation of the clause breaks its terms into three parts: (1) “extraordinary drought” or “serious accident to the irrigation system,” (2) “difficulty” in making deliveries, and (3) reductions in consumptive uses in the United States, and explains that all three conditions must exist to reduce deliveries to Mexico under the clause.

The term “extraordinary drought” is also used in Article V of the 1944 Treaty, which provides for Mexican deliveries on the Rio Grande to users in the United States. There are, however, some differences between the use of extraordinary drought in Article X and Article V. Article X says that deliveries to Mexico will be decreased in proportion to consumptive use decreases in the United States.

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Article V permits Mexico to deliver less water for five years, but requires it to make up delivery deficiencies in the next five-year cycle. (The Treaty with Mexico, *supra*, Art. 5, Art. 10 (1944)).

During a prolonged drought in the 1990s, Mexico claimed extraordinary drought along the Rio Grande and failed to deliver sufficient water to irrigation districts in the United States. Mexico, under Article V, obtained the ability to make up deliveries in the next five-year period. Its invocation of extraordinary drought was controversial, as Texans reliant on the water claimed the basin's growth in Mexico and Mexican storage of Rio Grande water was to blame instead of the drought. Similar disagreements are likely to occur should the U.S. declare extraordinary drought on the Colorado River.

In 2007, the seven basin states developed rules for shortage sharing and included a shortage schedule in the EIS that appealed to neither Mexico nor the United States. The proposed schedule is Appendix Q in the Interim Guidelines.

The Interim Guidelines also hint to the procedures the United States would undertake should a shortage be declared on the Colorado River. If Lake Mead elevations are low enough to trigger shortages in Lower Basin deliveries, then the Secretary of the Interior will consult with the Department of State, the USIWBC, and the Basin States. These agencies would then determine whether and how the United States would reduce deliveries to Mexico consistent with the 1944 Treaty. If the elevation of Lake Mead falls below 1,000 feet, then the Secretary will consult with the Basin states representatives to determine further measures to be taken consistent with federal law.

The United States and Mexico are currently in talks to craft an agreement that develops a schedule of curtailments in times of shortage. These discussions will likely shed more light on the ambiguities in Article III (c), at least to when and how Mexican deliveries may be curtailed under the 1944 Treaty.

For further information on the definition of extraordinary drought:

Adler, R. 2008. Revisiting the Colorado River Compact: Time for a Change? *Journal of Land, Natural Resources, and Environmental Law* Vol. 28.

Getches, D. 1994. The Law of the Colorado River in Coping with Severe Sustained Drought in the Southwestern United States, Phase II Report.

Meyers, Charles J., *The Colorado River: The Treaty with Mexico*, 19 *Stan. L. Rev.* 367 (1967).

Mission 2012: Clean Water. International Cooperation, Massachusetts Institute of Technology:

<http://web.mit.edu/12.000/www/m2012/finalwebsite/problem/international.shtml>

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USBR. 2007. Executive Summary, Final EIS – Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead, Department of the Interior.

U.S. Water News, 2002. Online. Satellite data show Mexico can no longer claim drought, researcher says:

<http://www.uswaternews.com/archives/arcglobal/2satdat10.html>

The Equal Shares Theory

The purpose of the Colorado River Compact is to “provide for the equitable division and apportionment of the Colorado River System.” Controversy remains as to whether this equitable division was intended to guarantee equal shares to both basins, the so-called “equal shares theory.” Articles III (a), (b), (c), (d), (f), and (g) all make some reference to the equitable division of the river system, but the language in Article III(a) is most explicit, stating:

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

The most significant effect of this ambiguity is on shortage sharing. Tree-ring paleo reconstructions of flow for the Colorado River system indicate that 15 million acre-feet is most likely higher than a long-term average, which may be closer to 13.5 MAF. If the Colorado is apportioned into equal shares, each Basin has the same priority over water in times of shortage. If, however, the Colorado was not divided into equal shares, and the Lower Basin has a higher priority, then the Upper Basin would be forced to curtail its uses before the Lower Basin during times of shortages.

Supreme Court decisions have framed the allocation made in the Compact. In *Kansas v. Colorado*, 206 U.S. 46 (1907), the Court announced the doctrine of equitable apportionment. The underlying rule was “equality of right,” not necessarily “equality of amounts apportioned.” (Id. (White, J., and McKenna, J., concurring)). In *Wyoming v. Colorado*, 259 U.S. 419 (1922), the Court held that the rule of prior appropriation applied to interstate stream allocations between two prior appropriation states. Lower Basin diversions have the earliest priority dates. As a result of these decisions, the Upper Basin states were concerned that their right to develop future water supplies would not be protected.

During compact negotiations, Delph Carpenter representing the state of Colorado, perhaps fearing these adverse consequences, offered a proposal based on a fifty-fifty allocation of water between the two basins based on the Colorado River’s flows. At the time of his proposal, the needs of each Basin had been roughly calculated to be equal. This proposal allowed the Upper Basin to develop more slowly without concern that the Lower Basin would acquire rights to the majority of the river, and provided the Lower Basin with ample current supplies. He hoped his formula would establish “a permanent

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and perpetual status” between the two Basins. Opposing this plan was W.S. Norviel from Arizona, who insisted on the Lower Basin receiving 82,000,000 acre-feet every ten years, while the Upper Basin states, led by Carpenter, refused to deliver more than 65,000,000 acre-feet every ten years.

Herbert Hoover, looking to compromise, urged “appropriations... be made in either division with equality of right as between them, up to a total of 7,500,000 acre-feet per annum, for each division.” While this exact language was not used in the final version of the Compact, Hoover’s statements coupled with those of other negotiators indicate that the two Basins intended to share at least base flow equally, and that these equal allocations would have equal priority between them.

Other language in the Compact could be interpreted to further support the concept of equal shares. The inclusion of Article III (b), as the sole exception to the equal division, may emphasize by negative implication that the commissioners intended to equally divide the Colorado River between the Basins. Furthermore, Article III (c) notes that when surplus water proves inadequate to satisfy Mexican delivery obligations, then the burden is to be “equally borne by the Upper Basin and the Lower Basin, and whenever necessary the States of the Upper Division shall deliver...water to supply one-half of the deficiency.”

The Compact, however, uses the term “equitable apportionment,” which is a legally defined term. Article I states the purpose of the Compact is to “provide for the equitable division and apportionment of the waters of the Colorado System.” The Commissioner’s use of this term could indicate that the allocation of the Colorado River is based on equality of right, instead of equality of flow. Similar terms used in Article III (f) and (g) further support the equality of right/equitable apportionment theory. Here the negotiators intended to provide guidance on future appropriations of the Colorado River. The Commissioners used the phrase “further equitable apportionment,” perhaps indicating that other provisions in the Compact were also based on the concept of equality of right. Accordingly, these equitable apportionment provisions are not necessarily inconsistent with the equal shares theory if they are limited to a future apportionment context.

The Compact itself has provisions that could support both theories, while the equal shares theory has its best support from the Compact negotiations. This ambiguity will only become more significant as demands have met, and will increasingly exceed available supplies, increasing the likelihood of shortages in either Basin.

For further information on the equal shares theory:

Carlson, J. and Boles, A. 1986. *Contrary Views of the Law of the Colorado River: An Examination of Rivalries Between the Upper and Lower Basins*, Rocky Mtn. Mineral Law Inst. Vol. 32, pp 21-1 to 21-68.

The Colorado River Compact Negotiation Transcripts

http://wwa.colorado.edu/colorado_river/cocmpct_trnsrpts.html

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Hundley, N., 2009. *Water and the West: the Colorado River Compact and the Politics of the American West* (2nd ed.). University of California Press.

McDonald, J. 1997. *The Upper Basins' Political Conundrum: A Deal is Not a Deal*, Department of the Interior, Report to the Western Water Policy Review Advisory Commission.

Tyler, D. 2003. *Silver Fox of the Rockies: Delphus Carpenter and Western Water Compacts*, University of Oklahoma Press: Norman.

The Interbasin Apportionment

The Colorado River Compact apportioned water between the two Basins, but left the apportionment of that allocation between the several states in each Basin to later agreements. The Boulder Canyon Project Act (1928) apportioned the Lower Basins allocation among the three states: Nevada, 300,000 acre-feet; Arizona, 2,800,000 acre-feet; and California, 4,400,000 acre-feet. These allocations were affirmed by the Supreme Court's interpretation of the Act in *Arizona v. California* (1963). The Upper Colorado River Basin Compact (1948) apportioned the allocation among those states as percentages: Colorado, 51.75%; Wyoming, 14%; Utah, 23%; and New Mexico, 11.25%. The Upper Basin apportionment also includes 50,000 acre-feet for Arizona.

The Upper Basin Delivery Obligation

One of the prominent ambiguities in the Compact that has been continually debated is whether the Upper Basin has an obligation to deliver the Lower Basins allocation or whether the Upper Basin simply has an obligation not to deplete the flow of the Colorado below the Lower Basins allocation. The original language, and source of confusion, in the Compact is as follows:

Article III (d) – The States of the Upper Division will not cause the flow of the river at Lee Ferry to be depleted below an aggregate of 75,000,000 acre-feet for any period of ten consecutive years reckoned progressive series...

From the language of the Compact and other Law of the River documents, most commentators have adopted the working assumption that Article III (d) operates as a delivery requirement in favor of the Lower Basin states, not just a division of available water or obligation not to deplete. In practical terms, the Compact functions to ensure the Lower Basin receives at least 7.5 million acre-feet per year, suggesting that the rights of the Lower Basin states have a higher priority (seniority) than the rights of the Upper Basin states. While the Compact does not explicitly discuss water rights seniority, the delivery requirement in Article III (d) couple with Article (c)'s provision that the Upper Basin States also may not withhold water that cannot be reasonably used for agriculture or domestic uses from delivery to the Lower Basin suggests that the Lower Division's rights are senior.

Later Federal legislation also supports a delivery obligation. Under the Colorado River Basin Project Act (1968), the Secretary of the Interior ensures adequate deliveries to the Lower Basin through operation of Glen Canyon and Hoover Dams.

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Under section 602(a) the first and second operating priorities of the Upper Basin reservoirs are: [1] releases to satisfy the Upper Basin's delivery obligations to Mexico pursuant to Art. III(c) of the Compact, and [2] releases required for the Upper Basin to comply with Art. III(d) of the Compact. Under this Act and the Long Range Operating Criteria, the Secretary consistently has directed releases of at least 8.23 million acre-feet of water from Lake Powell to ensure the Upper Basin meets its delivery requirement. The operating criteria also established that under shortage conditions, the Secretary has the discretion to release less than 7.5 million acre-feet. This discretionary ability means that the Secretary could choose to satisfy Lower Basin rights up to 7.5 million acre-feet before satisfying consumptive uses in the Upper Basin. Water that could have been used in the Upper Basin would be used instead for storage or satisfaction of 7.5 million acre-feet in the Lower Basin in a time of drought. This discretion can be interpreted that drought conditions and decreased river flows exact a harsher burden on Upper Basin states than Lower Basin states, as reduced flows would reduce the practical availability of water for the Upper Basin.

Disagreement about this consistent release of 8.23 million acre-feet by the Secretary and the Upper Basin's delivery obligation resurfaced during the Seven Basin States negotiations in 2005. The interim guidelines emerging out of these negotiations upheld the Upper Basin's delivery requirement, but permitted the Upper Basin to release less than 8.23 million acre-feet in certain circumstances based upon the relative elevations of Lakes Powell and Mead.

Some prominent academic Colorado River scholars, such as David Wegner and former University of Colorado Law School Dean David Getches, also emphasize this delivery requirement, arguing that during times of drought or shortages the Upper Basin cannot begin fulfilling post 1922 demands until the full Lower Basin delivery obligations have been met. The delivery requirement highlights a tradeoff made in the Compact by each basin. The Lower Basin states gained assurances of a reliable water supply even though that security would limit long-term withdrawals. The Upper Basin states gained assurance that the Lower Basin had limits to their withdrawals, even though it meant the Upper Basin assumed almost the entire risk of shortages during times of drought or low-flows.

Others argue, however, that there is only an obligation for the Upper Basin states not to deplete the flow of the Colorado River by man-made diversions. More specifically, Eric Kuhn of the Colorado River District argues that nature's ability to cause the flow of the river to drop below 75 million acre-feet over 10 year averages means that the Upper Basin simply has an obligation not to deplete the flow through additional apportionments beyond 1922 levels. Thus, as long as the Upper Basin is not consuming more than 75 million acre-feet over 10 year running averages, deliveries at Lee's Ferry could be reduced should severe drought reduced supply. A similar argument is that the Compact was meant to equally divide the river between the two divisions, regardless of flow volume (see above section on the Equal Shares Theory).

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The “obligation not to deplete” interpretation does not enjoy the same level of institutional support as the “delivery obligation” interpretation. Furthermore, shifting management in compliance with an “obligation not to deplete” interpretation poses problems for users in the Lower Basin who have developed a reliance in guaranteed deliveries of 7.5 million acre-feet from the Upper Basin. Nonetheless, the Upper Basin delivery obligation remains a prominent legal issue that will only become more important to resolve as demands continue to grow and supplies are threatened.

For further information on the Upper Basin delivery obligation:

- MacDonnell et al. 1994. The Law of the Colorado River: Coping with Severe Sustained Drought in Coping with Severe Sustained Drought in the Southwestern United States, Phase II Report.
- Clyde, 1960. Conflicts Between the Upper and Lower Basins on the Colorado River, in Resources Development: Frontiers for Research, Western Resources Conference.
- USBR, 2007. Interim Guidelines for the Operation of Lake Powell and Lake Mead, Record of Decision, Department of Interior.
- Lord, W. et al. 1994. Managing the Colorado River in a Severe Sustained Drought: An Evaluation of Institutional Options Using Simulation and Gaming in Coping with Severe Sustained Drought in the Southwestern United States, Phase II Report.
- Kuhn, E. 2007. The Colorado River: The Story of a Quest for Certainty on a Diminishing River (Roundtable Edition), Colorado River Water Conservation Board.
- Grant, D. 2003. Interstate Water Allocation: When the Virtue of Permanence Becomes the Vice of Inflexibility, U. Colo. L. Rev. Vol. 74, pp. 105-180.
- Saunders, G. 1998. Reflections on Sixty Years of Water Law Practice, U. Den. Water L. Rev. Vol. 2, pp. 1.
- Carlson, J. and Boles, A. 1986. Contrary Views of the Law of the Colorado River: An Examination of Rivalries Between the Upper and Lower Basins, Rocky Mtn. Mineral Law Inst. Vol. 32, pp 21-1 to 21-68.

Administration of Compact Calls

Under the prior appropriation system, when flows in a river are insufficient to satisfy all rights on the river, a senior appropriator will place a “call” on the river. This forces junior appropriators to stop diverting until the senior’s water right is satisfied. There are two possible types of interstate calls on the Colorado River, neither of which has ever happened: a Lower Basin call against the Upper Basin, and an intra-Upper Basin call amongst two or more Upper Basin states. A Lower Basin call would only occur when, due to nearly empty reservoirs and severe low flows in the Colorado River, the Upper Basin fails to meet either its Article III(d) flow requirements or its Article III(c) deliveries

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to Mexico. In an Upper Basin call, one Upper Basin state would make a call on another Upper Basin state, perhaps as part of efforts to comply with a Lower Basin call.

It is generally surmised that administration of a basin-wide call would entail at least three contentious and phased efforts. First, a call between the Upper and Lower Basin would require an assessment of the magnitude and timing of downstream deliveries required to bring the Upper Basin back in compliance with the Compact. Second, a system of reservoir releases and user curtailments would need to be allocated among the Upper Basin states, presumably using the rules featured in the Upper Colorado River Basin Compact, as overseen by the Upper Colorado River Commission. And third, state water officials would need to devise and enforce curtailments within each state.

Every stage could be problematic and contentious. Determining whether or not the Upper Basin is out of compliance with the Compact is perhaps the most salient of the issues, as it could require resolution of several of the legal omissions and ambiguities already discussed. If there is any doubt among Upper Basin interests as to the validity of whether or not a Compact violation exists, Upper Basin water officials would likely be hesitant to implement a call.

Should Upper Basin interests concede that an inter-basin call is warranted, interpreting the language in the Upper Colorado River Basin Compact then becomes a central issue. The most common interpretation is that any of the states that used, in the ten years prior to curtailment, more water than they were entitled to use under Article III of the Colorado River Compact must supply the quantity of such an overdraft to Lee's Ferry before any other state faces curtailment. If there is no overdraft, then all states must deliver to Lee's Ferry an amount of water proportional to their consumptive use in the preceding water year over total consumptive use in the Upper Basin ("provided, that in determining such relation the uses of water under rights perfected prior to November 24, 1922, shall be excluded"). The alternate approach is to quantify curtailments based on apportionments. Under this interpretation, each state would curtail its use based on its percentage allocation in the Upper Basin Compact, not its consumptive use in the prior water year. The Commission has yet to formally endorse either interpretation, but is reviewing and establishing detailed procedures and policy for implementing a call. Regardless of the approach used, the magnitude of curtailments for each Upper Basin state must be sufficient to result in the required delivery to Lee's Ferry. Once this step is completed, it is up to individual states to administer curtailments. In recent years, each Upper Basin state has been working to promulgate curtailment rules.

For further information on administration of Compact calls:

Hobbs, G. 2009. Upper Colorado River Basin Compact: Sharing the Shortage, Wyoming Lawyer Vol. 32, available at http://wyomingbar.org/pdf/barjournal/barjournal/articles/Colorado_River.pdf

MacDonnell, L., D.H. Getches, and W.C. Hugenberg Jr. The Law of the Colorado River: Coping with Severe Sustained Drought. Water Resources Bulletin, 31:5(825-836) (1995).

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Tyrrell, P. 2008. Colorado River Compact Administration Program: Consumptive Use Determination Plan, Wyoming State Engineer's Office at http://seo.state.wy.us/PDF/CU_Plan_Final.pdf

Myers, Charles, *The Colorado River*, Stan. L. Rev. 1, 32-33 (1966).

Clyde, Edward W., *Institutional Response to Prolonged Drought*, New Courses of the Colorado River: Major Issues for the Next Century, 125-27 (1986).

Quantity of Upper Basin Present Perfected Rights

Present Perfected Rights (PPRs) are the most senior water rights in the Colorado River Basin, and are not subject to curtailment during a Compact call. These rights are defined in Article VIII of the Compact, which states “Present perfected rights to the beneficial use of waters of the Colorado River System are unimpaired by this compact.” Lower Basin PPRs have been quantified, primarily in *Arizona v. California*(1963); however, there remains some debate as the quantity of Upper Basin PPRs. Part of the problem is the inadequacy of consumption records from the 1920s. However, there is also a legal question of are PPRs those with a priority date prior to the signing of the Colorado River Compact (November 24, 1922), or prior to the effective date of its ratification in the Boulder Canyon Project Act (June 25, 1929)? The Upper Colorado Basin Compact (1948) states that rights in the Upper Basin must have been perfected prior to November 24, 1922 (Upper Colorado Basin Compact, CRS 37-62-101(Art. IV)(c)). However, the Supreme Court in *Arizona v. California*, held that the PPRs in the Lower Basin include water appropriated prior to the adoption of the Boulder Canyon Project Act on June 25, 1929 (*Arizona v. California*, 547 U.S. 150, 154 (2006)). Two Upper Basin states, New Mexico and Utah, share Lower Basin tributaries, and were thus involved in the *Arizona v. California* litigation. For those states, it is unclear if their PPRs are determined by the 1922 or the 1929 dates. Most estimates place Upper Basin PPRs in the range of 2.1 to 2.3 million acre-feet (million acre-feet).

For further information on Upper Basin PPRs:

Kuhn, E. 2007. *The Colorado River: The Story of a Quest for Certainty on a Diminishing River* (Roundtable Edition), Colorado River Water Conservation Board.

Compact Rescission or Reformation

Perhaps the most disconcerting of the potential legal conflicts are those that could result in Compact rescission or reformation. This line of thinking begins with the observation that the Colorado River Compact apportioned water to the Upper and Lower Basins based on data from 1899 to 1920—an unusually wet period. This data prompted negotiators to believe the river featured an average virgin flow of (at least) 16.4 million acre-feet per year. The Compact negotiation transcripts seem to indicate that the Commissioners realized there could be periods of low flows, but that storage reservoirs would buffer the basin states during these periods. However, both measured flows and tree-ring data now suggest the actual average flow of the Colorado River is considerably less—probably closer to 13.5 million acre-feet—and is likely to drop further due to

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climate change. Reduced flows can very quickly reduce available storage, as was seen in the early 2000's drought on Lake Powell levels. As a result, the Colorado River is significantly over-allocated, a problem made worse by later commitments to apportion additional water in the Treaty with Mexico. These inaccurate flow assumptions not only have serious consequences, but as the legal ambiguities discussed above seem to indicate, suggests that much of the burden of those consequences is placed on the Upper Basin.

While interstate Compacts are both statutes and contracts, courts have normally applied contract doctrine to resolve compact issues. Accordingly, there are two contract remedies available to the Upper Basin states: rescission (i.e., voiding) or reformation (i.e., altering) of the Compact based on mutual mistake.

Rescission is possible only if the Upper Basin did not knowingly accept the risk of factual mistake; if they did, honoring the Compact would still be required. This determination may hinge on the interpretation of Article III(d) of the Compact (discussed above). If there is, in fact, a delivery requirement, then it seems to allocate the risk to the Upper Basin. However, if it is an obligation not to deplete or is an expression of the equal shares theory, then perhaps it is less likely that this article expressly allocates the risk of mistake to the Upper Basin, and thus rescission may be possible.

A second possibility that the Upper Basin bears the risk of the mistake is that it was aware that it had only limited facts at the time the Compact was made, but treated those facts as sufficient. The Compact negotiation transcripts and subsequent congressional testimony illustrate that nearly all representatives believed that they had sufficient information to apportion the river, and furthermore, believed that the Colorado River had more than 15 million acre-feet of flow. While the Upper Basin negotiators treated their knowledge as sufficient, the fact that they were unaware that it was so adverse to their interests brings into question if they knowingly accepted the risk of mistake in apportioning the Colorado River's flow in the Compact. Given these facts, there is a potential argument for Compact rescission based on mutual mistake; however, it is unlikely that the remedy would provide any real benefit to the Upper Basin. Since the Lower Basin uses more water and has older water rights than the Upper Basin, voiding the Compact and equitably apportioning the Colorado River may be unlikely to benefit the Upper Basin more than the current Compact.

Reformation of the Compact could occur through judicial means if the Upper Basin is able to successfully argue that reformation should follow the Compact's approach of dividing the right to use water equally. Reformation due to mistake is only permitted when the mistake reflects a reduction in writing or where the parties are mistaken as to the legal effect of the language used. There could be an argument that parties were mistaken as to the legal effect of some of the terms used—"equitable division" being an example. More problematic is the prohibition against reformation when third parties have relied on the contract in acquiring property interests. Since 1922, numerous water users in the Upper and Lower Basins have relied on the provisions in the Compact. This includes individual irrigators, municipalities, water supply companies, power companies, and recreational users, among others. Reformation to ensure equal shares would likely affect

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Lower Basin users more severely than Upper Basin users, and could unfairly affect the rights of third parties acting in reliance on the Compact's provisions.

Reformation of the Compact is also possible using a congressional pathway. When Congress consents to an interstate compact, it presumably retains the right to revise or interpret the agreement. However, it is unlikely to do this in the absence of demonstrable injustice, and as the Upper Basin states are well aware, it is the Lower Basin that holds the political advantages associated with high populations, large economies, and vast congressional representation. Alternatively, the Supreme Court could address, under original jurisdiction, whether the Compact should be enforced when it produces such an unintended and inequitable result. Since the Court accepted the Compact's allocation between the Upper and Lower Basins as law in *Arizona v. California*, it would likely be very hesitant to modify the Compact, especially considering the history of both Basins following the Compact apportionment. Still, the fact remains that the Colorado River Compact was a contract based on a factual error (about average flow volumes), an expectation (at least among some parties) of equal sharing, and an ignorance of climate change. The combined effect of these deficiencies, especially on the Upper Basin apportionment, may be too extreme to ignore. Additionally, a precedent for this type of action already exists: in *Texas v. New Mexico* (467 U.S. 1238 (1984)), the Supreme Court used contract law to change the flawed allocation formula in the Pecos River Compact.

For further information on Compact rescission or reformation:

- Adler, R. 2008. Revisiting the Colorado River Compact: Time for a Change? *Journal of Land, Natural Resources, and Environmental Law* Vol. 28.
- Carlson, J. and Boles, A. 1986. Contrary Views of the Law of the Colorado River: An Examination of Rivalries Between the Upper and Lower Basins, *Rocky Mtn. Mineral Law Inst.* Vol. 32, pp 21-1 to 21-68.
- Getches, D. 1985. Competing Demands for the Colorado River, *U. Colo. L. Rev.* Vol. 56, pp. 413.
- Grant, D. 2003. Interstate Water Allocation: When the Virtue of Permanence Becomes the Vice of Inflexibility, *U. Colo. L. Rev.* Vol. 74, pp. 105-180.

What is the latest with tribal negotiations?

Article VII of the Colorado River Compact states that "...nothing in this compact shall be construed as affecting the obligations of the United States of America to Indian tribes", which is the only mention of Indian water rights in that document. Those obligations are conceptually spelled out by the "*Winters doctrine*" from a 1908 Supreme Court decision which dictates that Indian reserved rights are 1) not dependent on state law; 2) are implied through the creation or expansion of an Indian reservation; 3) determined by the date of creation of the Indian reservation and not the date upon which the water was put to beneficial use; 4) cannot be lost due to non-use; and 5) the amount of water reserved is the amount needed "to satisfy the future as well as the present needs of the Indian Reservations." The *Arizona v. California* (1963) decision determined the standard for determining the quantity of

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Indian water rights: “enough water...to irrigate all the practicably irrigable acreage on the reservation” and applied specifically to the reserved water rights of the five Indian reservations on the lower reaches of the mainstream of the Colorado River: the Fort Mojave Indian Tribe, the Chemehuevi Indian Tribe, the Colorado River Indian Tribes, the Quechan Indian Tribe of the Fort Yuma Reservation and the Cocopah Indian Community.

Ten Indian tribes that have established water rights in the Colorado Basin formed the Colorado River Basin Ten Tribes Partnership in 1992. This Partnership’s goal is to seek to protect and develop tribal water resources, advance tribal influence over the numerous aspects of river management that affect tribal interests and stimulate dialogue with states, federal agencies, and non-Indian water users on matters of concern to tribes. The tribes in the partnership are the Chemehuevi, Fort Mohave, Colorado River, Quechan, Cocopa, Southern Ute, Northern Ute, Jicarilla, and the Navajo Nation. Around the same time the Partnership was formed, the Seven Colorado River Basin States and the Partnership formed the “7/10 Process,” a forum where officials from both parties can discuss water management.

Because Indian rights have largely based on federal court decisions, there has been some difficulty in integrating these federally reserved rights with appropriative rights under state law. This has led to disputes between the tribes and state public and private parties. If local parties are able to devise a settlement, then an act of Congress is usually required to ratify the agreement, authorize federal appropriations, and sometimes stipulate a state contribution. To finalize the agreement, parties also can seek the approval of the court. More recently, Indian rights have been dealt with through settlements with specific tribes or groups of tribes, as discussed later in this section.

Below are several examples of recent tribal settlements:

Arizona Water Settlements Act (2004)

This act was the largest Indian water settlement in the history of the United States and settled a dispute with the Gila River Indian Community that had been ongoing for a hundred years. It resolved a disagreement between the federal government and Arizona; provided a framework for future Arizona Indian water settlements through the Lower Colorado River Basin Development Fund; and confirmed the legitimacy of the Gila River Indian Community’s (GRIC) and the Tohono O’odham Nation’s (TON) water rights. Between the two tribes it allocated almost ten percent of Arizona’s total water supply.

For more information on the Arizona Water Settlements Act:

http://www.azwater.gov/azdwr/SurfaceWater/Adjudications/documents/Cong_Record_S437-108-360.pdf

<http://www.springerlink.com/content/4728wx7u198085n1/fulltext.pdf>

San Juan Navajo Water Rights Settlement (2010)

The San Juan River is an upper basin tributary of the Colorado River. The Navajo Nation declared that it had a claim to its water under the *Winters* doctrine. In 2005, the State of

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New Mexico and the Navajo Nation signed the San Juan Navajo Water Rights settlement. In December 2010, Secretary of the Interior Ken Salazar and former Navajo Nation President Joe Shirley, Jr. also signed the settlement, which has yet to be approved by the 11th Judicial District Court in Aztec. The court has set a Sept. 16 deadline for notification and an Oct. 3 hearing for participants and their attorneys. After that, participants will file written statements for or against the settlement.

This settlement allocates 600,000 acre-feet of diversions and 325,670 acre-feet of depletions from the San Juan River to the Navajo Nation. This agreement also included the construction of the Navajo-Gallup Water Supply Project to convey water from the San Juan River in northern New Mexico to the eastern section of the Navajo Nation, the southwestern part of the Jicarilla Apache Nation, and the city of Gallup.

There are some concerns about this settlement due to the possibility of an insufficient water supply to carry out the allocations. This settlement will also have to be incorporated into the ongoing San Juan Adjudication and thus far the Court has ordered the U.S. and the Navajo Nation to complete a hydrological survey.

For further information on the San Juan Navajo Water Rights Settlement:

<http://www.ose.state.nm.us/water-info/NavajoSettlement/NavajoSettlement.pdf>

<http://www.doi.gov/news/pressreleases/Salazar-Signs-San-Juan-Navajo-Water-Rights-Settlement-at-Colorado-River-Water-Users-Association-Conference.cfm>

<http://www.usbr.gov/uc/rm/navajo/nav-gallup/summary.html>

<http://navajotimes.com/news/2011/0711/070211water.php>

White Mountain Apache Settlement (2010)

Since 2004, water users in the Salt River basin have been negotiating their tribal water rights. Finally in November 2010, the U.S. Senate approved this settlement, which sets aside 52,000 acre-feet of water per year for the White Mountain Apache Tribe in Arizona. Half of the water will come from the Salt and Little Colorado River watersheds and the other half will come from Arizona's share of the Colorado River.

For further information on the White Mountain Apache Settlement:

<http://www.usbr.gov/newsroom/testimony/detail.cfm?RecordID=1326>

<http://www.opencongress.org/bill/111-h4783/text>

Northeastern Arizona Indian Water Rights Settlement (2011)

This agreement gives the Navajo Nation and the Hopi Tribe the right to use 31,000 acre-feet per year from the Colorado River, 160,000 acre-feet per year from the Little Colorado River, and rights to groundwater from the C-Aquifer and N-Aquifer. In May 2011, the draft of the settlement was deemed too expensive (with a cost of \$800 million) by Arizona Senator Jon Kyl. Since being advised that the proposed settlement is too

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expensive, the negotiating parties have been meeting to revise the terms and make it less costly.

For further information on the Northeaster Arizona Indian Water Rights Settlement:

<http://nnwrc.org/naiwrs/>

What is the latest with Mexico negotiations?

Under the 1944 Water Treaty with Mexico, the United States agreed to deliver 1.5 million acre-feet annually to Mexico. Subsequent acts (Colorado River Basin Salinity Control Act of 1974) and treaty amendments have specified the quality of the water necessary before crossing the border (Minute 242). Several other issues have been added by Minutes, including several focused on environmental protection: Minute 316 protects Cienega de Santa Clara, a wetland in Mexico, from the Yuma Desalting Plant. Minute 317 sets up framework for collaboration on water conservation, new water resources, system operations, and the environment. Finally, Minute 318 (discussed earlier) deals with reservoir operations during the repair of earthquake-damaged infrastructure. Current negotiations are primarily focused on long-term management of quantity, especially during periods of drought. Specifically, there is debate on whether and/or how deliveries to Mexico should be curtailed during times of shortage, and how do those curtailments influence the existing debate about the respective roles of the Upper and Lower Basin in providing Mexican deliveries.

For further information on Mexico negotiations:

<http://www.ibwc.gov/home.html>

How will energy development and production in the Basin affect the Colorado River?

Water and energy are closely interlinked: for example, thermoelectric power generation uses large quantities of water for cooling, while the water sector uses great amounts of energy for pumping, water/wastewater treatment, and in end uses. One particularly sensitive sector is hydroelectric generation, an important feature in the Colorado River Basin. According to a 2009 report by the U.S. Global Change Research Program, every 1 percent decrease in precipitation results in a 2-3 percent drop in stream flow and every 1 percent decrease in stream flow in the Colorado River Basin results in a 3 percent drop in power generation. The Energy Policy Act of 2005 has focused greater federal attention on the water-energy nexus, including an emphasis on power-plant water efficiency and new hydroelectric generation.

For further information on energy development and production in the Colorado River:

http://www.watereducation.org/userfiles/RiverReport_Summer09_WEB.pdf

<http://www.westernresourceadvocates.org/water/energy.php>

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How much Colorado River water is available for the states to develop?

Determining how much, if any, Colorado River water is left for development is a difficult technical and political question. The latest effort to address this question is the ongoing Basin Study. That study's interim report (June 2011) confirms that demands and historical supplies on the river average around 15 million acre-feet, but with demands projected to increase further while supplies will most likely decline due to climate change, the balance is precarious. In 2011, a USGS report noted that the latest scientific studies suggest that by mid-century flows on the Colorado could be reduced between 5 and 20 percent (for further information on climate change impacts, see below). Not only does a reduction in supply make determining water availability difficult, but the range in uncertainty of this reduction also adds extreme complication.

For further information on the water available for the Basin States to develop:

Bureau of Reclamation Colorado River Basin Water Supply & Demand Study:
<http://www.usbr.gov/lc/region/programs/crbstudy.html>

Colorado Water Conservation Board Colorado River Water Availability Study:
<http://cwcb.state.co.us/technical-resources/colorado-river-water-availability-study/Pages/main.aspx>

Colorado River Governance Initiative Preliminary Report:
<http://www.waterpolicy.info/projects/CRGI/materials/Colorado%20River%20FA>

United States Geological Survey. 2011. "Effects of Climate Change and Land use on Water Resources in the Upper Colorado River Basin." US Department of the Interior, Fact Sheet 2010-3123.

Impacts of Dust on Snow

A 2010 study by UCLA/NASA shows that dust emissions have increased by five times since the mid-19th century. While normally 80 percent of sunlight on fresh snow is reflected back into space, dust absorbs more sunlight melting the snowpack sooner and shortening the duration of snow cover by three to four weeks. This accelerated melting allows vegetation and growing plants to take water out of the soil earlier in the year. It effectively increases the amount of evapotranspiration (ET), which removes more water from the Colorado River Basin via the hydrologic cycle. The study concluded that this earlier snowmelt results in an approximately 5% decrease in overall runoff (roughly two and one-half times the total apportionment of Nevada).

There is hope that the effects of dust can be mitigated. Potential solutions would likely focus on improved grazing management; dust falling on the Rocky Mountains dropped by a quarter following passage of the Taylor Grazing Act of 1934. Improved management/regulation of other soil disrupting activities, such as the use of ATVs, may also be considered.

For further information on dust issues:

<http://www.nasa.gov/topics/earth/features/colorado20100920.html>

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<http://cires.colorado.edu/news/press/2010/dustonsnow.html>

<http://www.enn.com/ecosystems/article/41806>

What are the current federal and state studies investigating climate change impacts on the Colorado River Basin? What have they found?

Federal Climate Change Programs and Studies

Reclamation's 2011 SECURE Water Act Report describes the following effects of climate change on the Colorado River Basin: temperature is projected to increase by 5-6°F during the 21st century; precipitation is projected to increase by 2.1% in the upper basin while declining by 1.6% in the lower basin by 2050; *mean annual runoff is projected to decrease by 8.5% by 2050* (a conservative estimate, relative to other similar studies); and warmer conditions will likely produce more rainfall in December- March and less run-off in April-July.

In January of 2011, the USGS published a report entitled *Effects of Climate Change and Land Use on Water Resources in the Upper Colorado River Basin*. This report analyzed the latest scientific research into climate change impacts on the Colorado, and found that the "... most accurate models show the range of likely flows by 2050 are 5 to 20 percent less than current flows."

In addition, the Bureau of Reclamation has commissioned a federal Basin Study program to examine the supply and demand on the Colorado River and to what extent these will be affected by climate change. The Bureau issued an interim report in June of 2011 outlining the current findings and goals for the project, designed to be a snapshot in time of the river's conditions. In this interim report, the Bureau noted that their water supply assessment modeling indicates a reduction in Colorado River flows of approximately 9 percent in the next 50 years. Western Water Assessment (WWA) has also compiled a list of technical resources and studies regarding the future of the Colorado River, including research into reconciling the large differences in potential flow reductions.

For further information on the Federal Climate Change Programs and Studies:

The SECURE Water Act:

<http://www.gpo.gov/fdsys/pkg/PLAW-111publ11/pdf/PLAW-111publ11.pdf>

Reclamation's SECURE Water Act Report:

<http://www.usbr.gov/climate/SECURE/factsheets/colorado.html>

<http://www.usbr.gov/climate/SECURE/docs/SECUREWaterReport.pdf>

USGS Effects of Climate Change Report:

<http://pubs.usgs.gov/fs/2010/3123/>

Reclamation's Colorado River Basin Study:

<http://www.usbr.gov/lc/region/programs/crbstudy.html>

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Western Water Assessment Information:

http://wwa.colorado.edu/current_projects/CO_River.html

Colorado Study on Climate Change Impacts

A study by the Colorado Water Conservation Board found that Colorado will warm 2.5°F by 2025 and 4°F by 2050. The models project that summer monthly temperatures will typically increase by +5°F, while winter temperatures will increase slightly less (+3°F). Projections regarding precipitation do not agree whether annual mean precipitation will increase or decrease in Colorado by 2050. However, all models project declining runoff in most of the state's river basins.

For further information on the Colorado Study on Climate Change Impacts:

<http://cwcb.state.co.us/public-information/publications/Documents/ReportsStudies/ClimateChangeReportFull.pdf>

What are the current environmental concerns?

As the primary surface water resource of the southwestern United States, the Colorado River has tremendous environmental values. The following sections highlight a few of the more notable environmental issues.

Colorado River Delta

Historically, the U.S. has viewed the protection and restoration of the Colorado River Delta as Mexico's responsibility, because the majority of the Delta's area is across the border. However, the U.S.'s activities upstream have profoundly affected the Delta's ecology. Before the upstream dams were constructed, the Colorado River Delta was two million acres of lush wetlands fed by 10 to 20 million acre-feet of Colorado River water. Today the Delta is a mere 150,000 acres, there are fifty endangered species in the area, and the water and soil chemistry changes could have long-term evolutionary effects. Only 10% of Colorado River water crosses the border between the U.S. and Mexico with nearly all of Mexico's allocation immediately diverted to agriculture and cities. With the exception of some agricultural drainage, the river has not reached its delta in the Pacific Ocean with any regularity since the 1960s. There are no in-stream assurances in the Law of the River that guarantee water flows to the Delta. Instead, it has survived by cycles of high flows and discharges of agricultural wastewater.

In 2000, Mexico and the U.S. signed Minute 306 establishing a framework for cooperation in "...joint studies that include possible approaches to ensure use of water for ecological purposes" but stopped short of requiring any minimal flows for the Delta's ecological needs. As a result, the two countries released a report in 2005: *Conservation Priorities in the Colorado River, Mexico and the United States*. In Minute 317 of 2010, both countries renewed their focus on ecological projects in the Delta and identifying water for environmental purposes. While the U.S. has concluded that nothing in Section 7

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of the Endangered Species Act (ESA) applies across national boundaries, Section 8 of the ESA does provide that the U.S. can support protection with trans-boundary endangered species issues through assistance, encouragement, and research.

According to the 2005 report, *Conservation Priorities in the Colorado River, Mexico, and the United States*, there are at least three potential sources from which the IBWC could potentially find water to supplement the Delta: Mexico, the U.S. Federal Government, and private water rights. A conservation strategy for the Delta would likely need to entail an international agreement, legal action, funding allocations, and increased public participation. In Mexico, marginal farmlands could be purchased, retired, and the previously consumed water would flow into the Delta. Another option would be to improve Mexican agricultural water efficiency or to more directly supplement the water flow to the Delta with agricultural wastewater. However, there is the view that Mexico should not have to shoulder the burden alone of correcting the problem caused by the U.S.'s use upstream, especially because the U.S. controls nearly all of Colorado River storage operations. An ideal situation would be the participation of both governments in setting aside some of their water allocation for Delta restoration.

For further information on the Colorado River Delta:

Francisco Zamora-Arroyo et. al., "Conservation Priorities in the Colorado River Delta, Mexico and the United States," Sonoran Institute, Environmental Defense, University of Arizona, Pronatura Noroeste Direccion de Conservacion Sonora, Centro de Investigacion en Alimentacion y Desarrollo, and World Wildlife Fund, 103 (2005).

David Parrish, "Where Has All the Water Gone? Water Marketing and the Colorado River Delta," 13 *Transnat'l L. & Contemp. Probs.* 369 (2003).

Jennifer Pitt et. al., "Two Nations, One River: Managing Ecosystem Conservation in the Colorado River Delta," 40 *Natural Resources Journal* 819 (2000).

Grand Canyon ecosystems

Before 1963, the volume and temperature of the Colorado River was seasonably variable. Today, however, the flow of the river has less seasonal variation and instead changes according to the power demand at Glen Canyon Dam. Such changes have created an altogether different river. Because the sediment settles in Lake Powell (approximately 90% of what once entered the Grand Canyon), the water released from the dam is clear and cool. This clear water favors non-native fish species; vegetation now grows closer to the riverbanks, and beaches are no longer replenished by the sedimentation brought by spring floods.

Glen Canyon Dam was built before the passage of the National Environmental Protection Act (NEPA) so no Environmental Impact Statement was conducted prior to its construction. In 1994 after the Grand Canyon Protection Act was passed and the Adaptive Management Working Group (AMWG) was created, the first Environmental Impact study was finally conducted. The AMWG has conducted experimentation regarding various levels of flows at Glen Canyon. In 2009, the Secretary of the Interior

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required the development of a protocol for conducting additional high flow experimental releases to determine whether such releases could occur under certain sediment conditions. In July 2011, the ADWG released a *Draft Environmental Assessment Development and Implementation of a Protocol for High-flow Experimental Releases from Glen Canyon Dam, Arizona 2011-2020*.

For further information on the environmental issues of the Grand Canyon:

<http://www.nps.gov/grca/naturescience/environmentalfactors.htm>

<http://www.usbr.gov/uc/envdocs/ea/gc/HFEProtocol/index.html>

Gloss, S.P., et al. "The state of the Colorado River ecosystem in Grand Canyon." U.S. Geological Survey Circular 1282. 2005.

Salton Sea

The Salton Sea is California's largest lake and has a salinity of 48 g/L, which is 37% saltier than the Pacific Ocean and 67 times saltier than the Colorado River at Imperial Dam. Until recently, the water entering the Sea helped balance the amount of water evaporation stabilizing its salinity. Today in order to maintain this stabilization four million tons of salt would need to be removed from the sea each year each year and this number will greatly increase as flows to the Sea decline.

It is projected that by 2018 the rate of change in the salinity of the Sea will increase dramatically as inflows decrease. The major environmental issues this could cause are fish and wildlife declines, nutrient impacts, selenium problems, and air quality impacts. . In 1929, the California Department of Fish and Game introduced more than 30 marine fish species to the Sea and as a result the local economy and fish-eating birds have become dependent on its fish populations. In addition, it has become an important habitat for both waterfowl and other birds. While selenium is a necessary metabolic nutrient, too high of a concentration can lead to hair/feather loss, reproductive impairment, and death in wildlife populations. The winds in the Salton Sea basin create large dust storms and these will only worsen should the lakes supply further decline.

While the need for restoration has been recognized since the 1960s, no legislation was passed until the Salton Sea Reclamation Act of 1998. This Act directed the Secretary of the Interior to study the options for restoration and in 2003 a report was published by Reclamation. Additional legislation was passed directing the State of California to become involved in the efforts. In 2008 Reclamation released its report on the feasibility of various restoration alternatives. Proposed alternatives include the creation of saline habitat complexes (SHCs) or controlled salinity pools, air quality mitigation projects (AQMs) such as salt-crust and vegetation planting programs, and the construction of various dams, dikes, and concentric lakes to control the overall salinity of the Sea.

For further information on the Salton Sea:

<http://www.worldwater.org/data20082009/WB02.pdf>

<http://www.usbr.gov/lc/region/programs/saltonsea.html>

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Water Quality

Salinity

The Colorado River has carried an average annual salt load of approximately nine million tons past Hoover Dam. This level of salinity continues to increase as the water moves downstream. A high concentration of salt in the system is naturally occurring, because the Colorado River Basin was prehistorically a marine environment; however, a 1971 EPA study found that approximately 53 percent of the salinity at Hoover Dam was the result of human activity and required the establishment of basin wide water quality standards for salinity.

In order to comply with Section 303(a) and (b) of the Clean Water Act, the Basin states established the Colorado River Salinity Forum in 1973. The Colorado River Basin Salinity Control Act of 1974 authorized the construction, operation, and maintenance of salinity control technology. The goal of this Forum and the Act was to maintain the average annual salinity concentrations at or below the 1972 levels while the Basin states continued to develop their water apportionment. The ideal levels at the three measuring stations are 723 mg/L below Hoover Dam, 747 mg/L below Parker Dam, and 879 mg/L at Imperial Dam.

For further information on salinity issues:

<http://www.crb.ca.gov/Salinity/2011/2011%20REVIEW-June%20Draft.pdf>

<http://www.usbr.gov/lc/region/g1000/pdfiles/crbsalct.pdf>

<http://www.pacinst.org/reports/saltonsea/report.pdf>

Uranium Mining

Uranium is a chemical present in the Earth's crust that is often found in small concentrations in river water and groundwater, but because of its radioactive nature, there are concerns about its health impacts, environmental damage, and clean-up costs. One often-cited example of such impacts is the Atlas Mill mining site in Moab, UT, where clean-up costs are expected to total \$1 billion.

Nevertheless, since 2003 the price for uranium ore has increased from \$12/lb to \$43/lb in 2010, which has consequently increased mining interest in the Colorado River basin.

In 2009, the Secretary of the Interior called for a two-year temporary withdrawal of nearly 1 million federal acres from exploration and new mining claims in the Grand Canyon region in response to concerns about the impacts of uranium mining. This moratorium was due to expire in July 2011, but Secretary Ken Salazar extended the moratorium for six months in June. The BLM released a draft Environmental Impact Statement in February 2011 which sets forth four alternatives, ranging from removing the moratorium completely to extending the moratorium for 20 years. The Lower Colorado River Water Partnership (the Central Arizona Project, Metropolitan water District of Southern California, and

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Southern Nevada Water Authority) has expressed concern that the plan does not address worst-case scenarios.

However, a study by the Arizona Geological Survey study, “Breccia-pipe Uranium Mining in the Grand Canyon Region and Implications for Uranium levels in Colorado River Water,” concluded that uranium mining does not threaten the Colorado River drinking water supply. They found that the uranium concentration in the river is about 4 ppb which is consistently below the EPA Maximum Contaminant Level (MCL) of 30 ppb for drinking water. The study also found that even under an unlikely worst-case scenario, such as a spill, would only release increase the MCL by 0.02 ppb which is trivial against the historical variability of uranium levels in the water.

For further information on uranium mining in the Colorado River Basin:

http://static.ewg.org/pdf/grand_canyon_water_providers_letter_2011.pdf

<http://www.blm.gov/az/st/en/prog/mining/timeout.html>

<http://pubs.usgs.gov/sir/2010/5025/>

Species Health

Endangered Species

The development of several federal statutes, including the Endangered Species Act (ESA), the Grand Canyon Protection Act, the National Environmental Policy Act (NEPA), and the Clean Water Act, have encouraged action on protection the Colorado River’s species.

Of the 35 native fish species in the Colorado, 20 are endemic. The USFWS listed four of these endemic species as endangered under the ESA: Colorado pikeminnow, razorback sucker, bonytail chub, and humpback chub. Some of these species have persisted for more than 20 million years. Most have the evolutionary characteristics indicative of a harsh habitat, such as large and streamlined bodies, expansive fins, and thick, leathery skin.

These species have declined due to the proliferation of nonnative fish species such as northern pike, channel catfish, and smallmouth bass, the ecological changes associated with the construction of dams and reservoirs, and the effects of climate change. Four programs are working to reduce threats to these species and improve their status: 1) the Upper Colorado River Endangered Fish Recovery Program, 2) San Juan River Basin Recovery Implementation Program, 3) Glen Canyon Dam Adaptive Management Program, and 4) the Lower Colorado River Multi-species Conservation Program.

For further information on endangered species:

<http://pubs.usgs.gov/sir/2010/5135/>

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<http://www.coloradoriverrecovery.org/general-information/general-information.html>

http://www.npca.org/cpr/colorado_river_basin/Colorado-River-Report.pdf

Invasive Species

In addition to nonnative fish species, quagga mussels and tamarisk have presented significant invasive species challenges in the Colorado River basin. In May 2011, the mussel which invaded Lake Mead in 2011 was found in two reservoirs in northern Nevada. These mussels are no bigger than a thumbnail but they have caused billions of dollars in damages and prevention elsewhere in the U.S. They can clog pipelines, cooling systems, and corrode underwater infrastructure. This troublesome species usually spreads by attaching to cars, boats, or clothing. The Bureau of Reclamation spent more than \$12 million dollars for quagga mussel research, control, and education from 2008 to 2010.

Tamarisk or salt cedar was introduced in the West from Eurasia in the early nineteenth century. These plants have extensive root systems that are able to draw more groundwater than native vegetation in addition to increasing soil salinity and wildfire risk. One mature tree can produce up to 500,000 seeds in a year, so they spread very quickly. In the late 1990s, the USDA's Animal and Plant Inspection Service (APHIS) began importing the salt cedar leaf beetle from Kazakhstan to kill tamarisks, but these beetles have spread further and faster than anticipated. Now biologists are concerned that they will be too successful at killing tamarisk and species that have adapted to it, such as the endangered flycatcher, will suffer. There are also concerns that other invasive weeds will simply fill the gaps.

For further information on invasive species:

<http://www.usbr.gov/lc/region/programs/quagga.html>

<http://www.tamariskcoalition.org>

<http://news.nationalgeographic.com/news/2011/04/110421-national-parks-grand-canyon-water-tamarisk-flycatcher/>

What is the latest information on the status and operations of Lakes Mead and Powell?

In August 2010, a 24-Month Study was used to project the January 2010 elevations of Lake Powell and Lake Mead. These projected conditions for the end of the year determine how the Interim Guidelines will be implemented in the Annual Operating Plan (AOP). There are several operating tiers: 1) the Equalization tier, which applies when Lake Powell's projected January 1 elevation is above the elevation in the elevation table and results in releases of more than 8.23 million acre-feet until the lakes equalize; 2) the Upper Elevation Balancing Tier, which applies when Lake Powell's protected elevation is below the elevation in the equalization table but above 3575 feet and requires varying releases from 7 to 9 million acre-feet; 3) The Mid-Elevation Balancing Tier, which applies when Lake Powell's projected

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elevation is below the 3575 foot level and results in releases of either 7.48 or 8.23 million acre-feet depending on the projected elevation of Lake Mead; and 4) the Lower-Elevation Balancing Tier, which applies when Powell's projected elevation is below 3525 feet which results in attempting to balance the two reservoirs with releases in the range of 7 to 9.5 million acre-feet.

In April 2011 the Bureau of Reclamation set this year's release at 11.56 million acre-feet, but in mid-May that number was increased to 12.46 million acre-feet, which is the largest release since 1998. Accordingly, the Equalization tier of the Interim Guidelines governs the operations of Lake Powell for the remainder of the water year. Snowpack above Lake Powell has been above average since late December 2010 with temperatures below average. As of May 2011, only 30% of the snowpack above Lake Powell had melted compared to the average 60% at this time of year. The June supply forecast is 181% above average and July's forecast is 173% above average. At the end of November 2011, the elevation of Lake Mead is 1125.82 feet and Lake Powell is 3645.5 feet.

For further information on the latest status of Lake Mead and Lake Powell:

Bureau of Reclamation Current Status for Lower Colorado River Operations:
<http://www.usbr.gov/lc/riverops.html>

Bureau of Reclamation 2011 Annual Operating Plan, January 2011:
http://www.usbr.gov/uc/water/rsvrs/ops/aop/AOP11_final.pdf

Bureau of Reclamation Current Status for Lake Powell:
<http://www.usbr.gov/uc/water/crsp/cs/gcd.html>

Bureau of Reclamation Current and Projected Lake Powell Elevations:
<http://www.usbr.gov/uc/water/crsp/studies/lppwse.html>

How has the media been covering Colorado River issues?

For the past several decades there has been ongoing coverage of the various problems and threats to the Colorado River. Often this coverage has focused on individual threats, and has been lacking in national, mainstream media outlets. More recently, however, media coverage has increased and begun to look at the entire picture of threats to the Colorado River. This is most likely due, at least in part, to an improved understanding of various social, environmental, and climate related threats, such as the ongoing drought that has affected the entire Southwest since about 2000. Also, in the last ten years or so, more scientific research has been conducted into the potential impacts of a changing climate and warming Colorado River Basin on future river flows. Scientific tree-ring analyses have been conducted in recent years as well, which can reconstruct long-term flows for the Colorado. These studies indicate that the actual long-term average river flow may be below the 20th Century average. Because of these issues, and including a few others such as continual population growth and energy development, some national news outlets have devoted serious attention to the Colorado River.

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Some examples of mainstream and broad media coverage of prominent issues facing the Colorado River include:

New York Times, *The Future is Drying Up* by Jon Gertner, October 2007

http://www.nytimes.com/2007/10/21/magazine/21water-t.html?_r=1

National Geographic, *The Drying of the West* by Robert Kunzig, February 2008

<http://ngm.nationalgeographic.com/2008/02/drying-west/kunzig-text>

The Economist, *The drying of the West: The Colorado River and the civilization it waters are in crisis* January 2011

http://www.economist.com/research/articlesBySubject/displayStory.cfm?story_id=18013810&subjectID=348924

The above articles are examples of in-depth and extensive coverage of many issues facing the Colorado River. Other media coverage, however, does focus on individual issues in more local, everyday media outlets. Below are some examples of Colorado River issues and coverage of those issues through newspapers, magazines, blogs, radio shows, and other sources of media.

Lake Mead storage and pool elevation levels

Many news agencies have paid attention to the fact that Lake Mead's pool elevation levels have been steadily declining since the turn of the 21st Century. The media attention was elevated in 2010, when Lake Mead's surface level dropped to an elevation not seen since the reservoir began filling in 1930's. Because many municipalities rely on Lake Mead for drinking water, several media outlets throughout the Basin covered the dramatic decreases in elevation levels and subsequent possibility of shortages.

Some examples of media coverage regarding Lake Mead storage and pool elevation levels include:

Las Vegas Review Journal, *Wet year to boost level of Lake Mead* by Henry Brean, April 2011.

<http://www.lvrj.com/news/wet-year-to-boost-level-of-lake-mead-119667594.html?ref=594>

Wall Street Journal, *Wet Winter Can't Slake West's Thirst* by Jim Carlton, March 2011.

<http://online.wsj.com/article/SB10001424052748703739204576228823641659148.html>

The Arizona Republic, *Lake Mead at 54-year low, stirring rationing fear* by Shaun McKinnon, August 2010.

<http://www.azcentral.com/arizonarepublic/news/articles/2010/08/12/20100812lake-mead-low-water-level.html>

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North County Times, *Hoover Dam could stop generating electricity as soon as 2013, officials fear* by Eric Wolff, September 2010.

http://www.nctimes.com/business/article_b7e44e9e-087d-53b2-9c49-7ea32262c9a9.html

New York Times, *Water Use in Southwest Heads for a Day of Reckoning* by Felicity Barringer, September 2010.

<http://www.nytimes.com/2010/09/28/us/28mead.html?hpw>

Proposed diversion and/or augmentation projects

Because of the controversial nature of diversion projects, they often gain media attention before any construction begins. Such projects, especially in the Colorado River Basin, often have stakeholders on both sides that vehemently defend their positions. Municipalities turn to such projects to ensure reliable water supplies for their constituents, which can benefit local communities. But there are those who oppose such projects, arguing they will damage other communities, degrade ecosystems, and are only a temporary fix to the over-arching problem. Due to these controversies, there is often substantial news coverage of diversion and/or augmentation projects.

Some examples of media coverage regarding proposed diversion and/or augmentation projects include:

Salt Lake Tribune, *Pipeline controversy: Tapping the Green River* by Brett Prettyman, September 2010.

<http://www.sltrib.com/sltrib/outdoors/50260217-117/river-green-gorge-pipeline.html.csp>

Denver Westword, *There's a water war on the Colorado-Wyoming border, and Aaron Million is quick on the draw* by Joel Warner, November 2009.

<http://www.westword.com/2009-11-26/news/there-s-a-water-war-on-the-colorado-wyoming-border-and-aaron-million-is-quick-on-the-draw/1/>

Salt Lake Tribune, *Utah governor skeptical of Lake Powell pipeline financing plan*, by Brandon Loomis, November 2011.

<http://www.sltrib.com/sltrib/politics/52940353-90/earmark-fund-gov-growth.html.csp>

Salt Lake Tribune, *Wharton: Water projects can't be justified*, by Tom Wharton, October 2011.

<http://www.sltrib.com/sltrib/outdoors/52642746-117/lake-pipeline-powell-utah.html.csp>

Deseret News, *County needs Lake Powell pipeline by 2020, official says* by Nancy Perkins, February 2007.

<http://www.deseretnews.com/article/660194053/County-needs-Lake-Powell-pipeline-by-2020-official-says.html>

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Drought and/or climate change

The ongoing drought in the Colorado River Basin has brought to the media's attention the issue of drought and its impacts on water supplies in the West. Not only have reservoir levels dramatically decreased (due at least in part to drought), which have allowed for the iconic 'bath-tub ring' images of Lakes Mead and Powell, but water shortages and municipalities needing to reduce consumptive uses have occurred in the Basin. Couple the issue of drought with increased scientific research into climate change impacts on supply, and there is cause for concern, as the media has shown. Although a somewhat contentious issue, climate change negatively impacting Colorado River flows has been covered by numerous media outlets.

Some examples of media coverage regarding drought and/or climate change include:

Voice of San Diego, *The Colorado River's (Nonexistent) Emergency Plan*, by Rob Davis, May 2011.

http://www.voiceofsandiego.org/environment/muck/article_75096332-866a-11e0-8ba8-001cc4c03286.html

Climate Central, *Running Toward Empty? Part I and II* by Tom Yulsman and Brendon Bosworth, January 2011.

<http://www.climatecentral.org/news/running-toward-empty/>

CNBC, *Water Crisis Hits Western Cities and States* by Molly Mazilu, September 2010.

<http://www.cnn.com/id/39397641>

The Huffington Post, *More Water Shortages Coming to the West* by Mike Stark, December 2008.

http://www.huffingtonpost.com/2008/12/05/more-water-shortages-comi_n_148670.html

New York Times, *An Arid West No Longer Waits for Rain* by Randal C. Archibold and Kirk Johnson, April 2007

<http://www.nytimes.com/2007/04/04/us/04drought.html>

National Public Radio, *Colorado River's Low Water Has Far-Reaching Effect* by Elizabeth Shogren, February 2007.

<http://www.npr.org/templates/story/story.php?storyId=7532249>