NEW IDEAS FOR OLD DAMS: DEVELOPING SOLUTIONS FOR A SHRINKING COLORADO RIVER

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I. INTRODUCTION

The world is warming, and climate scientists blame human activity. At the December 2007 American Geophysical Union, scientists reported that the earth is getting warmer, the amount of snow accumulating during the winter is decreasing, and the snow is melting earlier in the spring. Climate changes in the West are presenting a serious challenge to water managers and users as well as the ecosystems and species that depend on water. Recent studies of the Colorado River system conducted by the Bureau of Reclamation estimate that drying conditions in the upper Colorado River Basin could cause reservoir levels at Lake Powell to fall too low for power generation 40% of the time.

The Colorado River Basin is North America’s fifth largest, draining about 242,000 square miles and extending throughout seven Western

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2 Id.

states and the country of Mexico. There are more than 100 dams and countless diversions throughout the basin, including eleven mainstem dams on the Colorado and its major tributary, the Green River. This basin once supported an assemblage of native fish that existed nowhere else in the world. Today, four fish species are federally listed as "endangered," with the distribution of one—the razorback sucker—physically diminished to less than 25% of its historical range.

In the West, Colorado River water is life. The "Law of the River" controls every drop of water and is sacred to water managers in the Colorado River Basin. Any attempt to divert the water from management for development and power meets with stiff opposition and legal maneuvering. Some refer to the Law of the River as a river of words that stretches back over a century.

The objective of this article is to discuss the need for a comprehensive and public review of alternative management options for the Colorado River system in the future. Due to the institutional and physical complexity of the basin, this analysis should be accomplished through the use of the National Environmental Policy Act of 1969 ("NEPA") and incorporating the requirements of the Endangered Species Act of 1973 ("ESA"). We believe this review is necessary due to requirements of the ESA, impacts to the Colorado River delta, and increasing concerns related to the changing climate.

II. SYSTEM MANAGEMENT

The Colorado River water and hydroelectric power system encompasses the operations of the major dams and reservoirs and is managed as a coordinated federal program. The Bureau of Reclamation operates the federal dams, while federal and state agencies and local water districts combine to manage the remainder. All operations of federal dams are coordinated in order to meet the legal delivery requirements outlined in the body of laws, treaties, and court agreements.

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6 Id. at 27.
7 Id. at 6, 56.
referred to as the Law of the River.\textsuperscript{11} These federal projects are a major source of power in the region, and they provide for some beneficial flood control, recreation, fish and wildlife, municipal and industrial water supply, and irrigation uses.

The Western Area Power Administration ("WAPA"), an agency of the U.S. Department of Energy, is responsible for marketing and transmitting wholesale electrical power from fifty-six federal hydropower plants and one coal-fired plant.\textsuperscript{12} WAPA sells about 40\% of regional hydropower generated by the Bureau of Reclamation, the U.S. Army Corps of Engineers ("Corps of Engineers"), and the International Boundary and Water Commission in a service area that covers 1.3 million square miles in fifteen states.\textsuperscript{13}

The Fish and Wildlife Service ("FWS") is required by the ESA to assess whether federal actions will jeopardize the continued existence of listed species.\textsuperscript{14} It does this through a process of consultation with the Bureau of Reclamation. Consultation results in FWS issuing a biological opinion, which identifies "reasonable and prudent" alternatives for the Bureau of Reclamation to consider in its operation and management of specific dams.\textsuperscript{15}

Each of the seven Colorado River Basin states—Wyoming, Utah, Colorado, New Mexico, Arizona, California, and Nevada—has an allocation of water from the Colorado River system based on historical distributions and articulated in the cumulative documents defining the Law of the River. Native American tribes and the country of Mexico were not allocated any water under the original 1922 Compact.\textsuperscript{16} In 1944, Mexico was allocated approximately 9\% of the historical amount that flowed to the Colorado River delta.\textsuperscript{17}

The water of the Colorado River supports over thirty million people.\textsuperscript{18} According to the U.S. Census Bureau, three Colorado River Basin states are in the top ten states in respect to growth: Nevada, Arizona, and Utah.\textsuperscript{19} In addition to the water, people in the basin are

\textsuperscript{11} See Nathanson, supra note 4, at 1-29.
\textsuperscript{13} Id.
\textsuperscript{14} 16 U.S.C.A. § 1536(a)(2) (Westlaw 2008).
\textsuperscript{15} Id.
\textsuperscript{16} See Nathanson, supra note 4, at 4.
\textsuperscript{17} See id., at 2, 10.
\textsuperscript{19} U.S. Census Bureau, Equal Change in Resident Population for the 50 States, the District
dependent on the river to supply irrigation water to 3.5 million acres and to generate thirteen billion kilowatt-hours of hydroelectric power annually.

Management of water in the Colorado River Basin is a complex proposition constrained by the natural variability of the hydrology cycle, the basin's physical size, a large number of dams and diversions, and institutional constraints defined in the Law of the River. Each year, a plan is developed to guide the management of the Colorado River Basin reservoirs (Annual Operating Plan or "AOP") under authority of Section 602 of the Colorado River Basin Project Act (Public Law 90-537) and the Criteria for Coordinated Long-Range Operation of Colorado River Reservoirs pursuant to the Colorado River Basin Project Act of September 30, 1968, as amended.

The AOP is developed under the direction of the Secretary of the Interior ("SOI"). As the 2008 AOP explained:

The Operating Criteria and Section 602... mandate consultation with representatives of the Governors of the seven Basin States and such other parties as the Secretary may deem appropriate in preparing the [AOP for] the Colorado River reservoirs... [T]he Grand Canyon Protection Act of 1992 (Title XVIII of Public Law 102-575) requires [additional] consultation to include the general public and others.

... The purposes of the AOP are to annually determine or address: (1) the projected operation of the Colorado River reservoirs to satisfy project purposes under varying hydrologic and climatic conditions; (2) the quantity of water considered necessary to be in storage in the Upper Basin reservoirs as of September 30, 2008, pursuant to Section 602(a) of the Colorado River Basin Project Act; (3) water available for delivery pursuant to the 1944 United States-Mexico Water Treaty and Minutes No. 242 and 310 of the International Boundary and Water Commission... ; (4) whether the reasonable consumptive use requirements of mainstream users in the Lower Division States will be

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20 Mark Lellouch et al., Ecosystem Changes and Water Policy Choices: Four Scenarios for the Lower Colorado River Basin to 2050, at v (2007).
met under... the Operating Criteria and as implemented by the Interim Surplus Guidelines; and (5) whether water apportioned to, but unused by one or more Lower Division States exists and can be used to satisfy beneficial consumptive use requests of mainstream users in other Lower Division States as provided in the Consolidated Decree of the Supreme Court of the United States in *Arizona v. California*, 547 U.S. 150 (2006).24

Every five years the Secretary is required to formally review the criteria utilized in the development of the AOP, in consultation with the basin states.25

We believe this process alone is insufficient to meet the future management needs of the Colorado River system and will argue that alternative management options should be explored to meet the system’s changing needs.

III. REGULATING HYDROPOWER DAMS AND RIVER BASINS

Development of the water of the Colorado River system began in August 1869, as Major John Wesley Powell emerged from the Grand Canyon and completed connecting the geographic dots on the Colorado River Basin map.26 By the time Major Powell finished his Report on Arid Lands27 in 1879, settlers were already diverting water from the tributaries of the Colorado.28

The Colorado River stretches over 1400 miles from its headwaters in Colorado to its terminus at the Sea of Cortez in Mexico. Today, 265 dams—each taller than fifteen meters29—remain in the 248,000 square-mile watershed of the Colorado River and the collecting tributaries. Of these dams, forty-six of them are considered to significantly impede the river and “all that it carries,”30 with one third of the river’s average flow diverted out of the basin to Southern California, the Phoenix-Tucson metroplex, Salt Lake Valley, and the Colorado Front Range.31 Of the remaining water in the system, over one million acre-feet evaporate per

26 See ADLER, *supra* note 5, at 104.
30 See ADLER, *supra* note 5, at 34.
31 Id.
year from the reservoirs, with an additional undetermined amount lost to seepage into the porous sandstones, silts, and clays that make up the geology of the watershed.\textsuperscript{32}

Edward Abbey referred to the Colorado River as the "living artery" of the basin.\textsuperscript{33} How did this river that defines the Colorado River Basin become one of the most artificially developed and controlled river systems in the world? Early settlers in the Colorado River Basin realized that the river needed to be controlled and managed before it could be put to beneficial use.\textsuperscript{34} Two things were needed to accomplish that: (1) control of the water and (2) an unlimited checkbook. Congress established the Reclamation Service in 1902 with the express purpose of providing guidance on the development and restoration of water in the West.\textsuperscript{35} The seven Colorado River Basin states did not trust that the federal government would not usurp their authority over their water, but they realized that they needed federal support to acquire the funds necessary to control the river. Thus, the states needed a legal agreement with the U.S. government to protect their water interests.\textsuperscript{36}

After months of discussion and argument, the seven basin states and the federal government signed the Colorado River Compact on November 24, 1922.\textsuperscript{37} The job of basin development shifted to Congress, which had the power to legislate and make appropriations for water control structures. The Department of the Interior and Reclamation Services (later renamed the Bureau of Reclamation) assumed the responsibility for designing a comprehensive plan for development of the water resources of the Colorado River Basin.

In March 1946, Interior published The Colorado River: A Natural Menace Becomes a Natural Resource pursuant to Section 9 of the Reclamation Project Act of 1939 (53 Stat. 1187) and pursuant to Section 15 of the Boulder Canyon Project Act (45 Stat. 1057).\textsuperscript{38} The report served as the Interior Secretary's plumbing system "wish list," including a survey of the basin's resources, its needs and problems, and its present

\textsuperscript{32} See David R. Dawdy, Hydrology of Glen Canyon and the Grand Canyon, in COlORADO RIVER ECOLOGY AND DAM MANAGEMENT: PROCEEDINGS OF A SYMPOSIUM, May 1990, at 40, 45.


\textsuperscript{34} See, e.g., NATHANSON, supra note 4, at 2 (describing early diversions by developers in the Imperial Valley of southern California).


\textsuperscript{36} See NATHANSON, supra note 4, at 2.


and potential development. The report identified 134 potential projects and units, in addition to those projects already existing and authorized. The report was supported by another work entitled The Colorado River: A Comprehensive Report on the Development of the Water Resources of the Colorado River Basin for Irrigation, Power Production, and other Beneficial Uses in Arizona, California, Colorado, Nevada, New Mexico, Utah and Wyoming. This report identified an average flow of 16.22 million acre-feet of water for depletion in the United States. Cumulatively, these two reports provided the basis for a strategic and comprehensive approach to basin-wide development of the water resources. Cooperating interests of other federal entities were identified; however, no specific allocations of water were made to satisfy federal reserved water rights for Native Americans, for environmental purposes, or for Mexico.

Beginning with Laguna Dam (constructed from 1907 to 1909) and continuing with the construction of Ridgeway Dam – Animas La Plata Project (completed in December 2007), the Colorado River watershed has been divided up, fragmented, and controlled. All of the major dams on the Colorado River and the majority of tributary dams and diversions were built prior to the passage of NEPA, ESA, and the majority of the other cultural and environmental laws passed to protect the resources and living systems of the nation. As a consequence, no watershed-level environmental review has taken place to review the cumulative impact of the management of the entire water system.

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39 Id. at 3-6.
40 Id.
42 See id. at 13.
43 See id. at iii. In the context of multiple uses, reservoir development was identified as being available for outdoor recreation (i.e., hunting and fishing uses that would benefit from fish and wildlife conservation measures associated with reservoir development) and for supplying water to pre-existing Indian and non-Indian irrigation projects. Id. at 5.
IV. HISTORICAL APPROACH TO AN ENVIRONMENTAL IMPACT STATEMENT FOR THE COMPREHENSIVE REVIEW OF THE COLORADO RIVER BASIN

On March 20, 1954, President Eisenhower issued a signing statement to support the development of the upper Colorado River Basin and the passage of the Colorado River Storage Project (“CRSP”) Act.46 President Eisenhower stated:

This is a comprehensive, well-planned development of a river basin.... The legislation being drafted will authorize a number of projects which will put to use the waters of the Upper Colorado.... I firmly believe development of the Upper Colorado River Basin, in accordance with its provisions, is in the national interest.47

CRSP planning documents, along with the support of administrations and Congresses following passage of the CRSP Act, made it clear that the intent of the CRSP was basin-wide water development of the Colorado River. The CRSP Act “provided a comprehensive, multi-purpose, Basin-wide water resource development plan.”48 Such development was the subject of a 1980 effort to compel the generation of a basin-wide environmental assessment. Understanding the background and result of this effort is necessary to lay the groundwork for present-day needs.

V. ENVIRONMENTAL DEFENSE FUND V. HIGGINSON: ORIGINS OF CEIS DEBATE

Any analysis of whether a basin-wide environmental impact statement (“EIS”) is necessary or appropriate for the Colorado River Basin must recognize an earlier abandoned plan by the Department of the Interior to prepare a comprehensive EIS (“CEIS”) for the basin, litigation by environmental groups seeking to compel preparation of the CEIS, and Congress’s subsequent legislative intervention to ensure that pending water projects in the basin could proceed absent the CEIS, so long as an individual EIS was filed for each such project.49

As reported in the majority and dissenting opinions in

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47 Id.
48 NATHANSON, supra note 4, at 11.
Environmental Defense Fund v. Higginson, during the 1970s, the Interior Department had “recognized the desirability and necessity of completing a CEIS for the entire Colorado River Basin.”\(^{50}\) However, after unsuccessfully seeking funding for such an analysis, and in part based on the Supreme Court’s decision in Kleppe v. Sierra Club,\(^{51}\) the Department revised its position and determined that it would comply with NEPA with respect to the many pending construction projects in the basin through site-specific EISs, each of which would address the cumulative and synergistic effects of that project on the basin.\(^{52}\)

Environmental groups sued for declaratory and injunctive relief to compel the Department to prepare the CEIS and to enjoin construction of the planned water projects in the interim.\(^{53}\) To avoid the requested injunctive relief, Congress passed a rider to the Department of the Interior’s Appropriations Bill providing that construction of any authorized federal water project in the basin for which a site-specific EIS was properly prepared “shall proceed,” notwithstanding the absence of a CEIS.\(^{54}\)

The district court granted the Department’s motion for summary judgment in the case, holding that the Department could “delay” preparation of a CEIS covering all water projects in the basin.\(^{55}\) On appeal, two judges on the D.C. Circuit panel held that the Department’s revised position was subject to the arbitrary-and-capricious standard of review as indicated in Kleppe, but that the plaintiffs had had no opportunity to challenge the new position below.\(^{56}\) Therefore, the court of appeals remanded the case to the district court to develop a record on which that new position could be reviewed.\(^{57}\) Based on the Supreme Court’s guidance in Kleppe, however, Judge Edwards, writing for the panel majority, noted that “[t]here is no doubt that if an agency has adopted a region-wide plan that can be characterized as a major federal action, § 102(2)(C) of NEPA requires the agency to prepare an EIS

\(^{50}\) Id. at 1246.

\(^{51}\) Kleppe v. Sierra Club, 427 U.S. 390 (1976) (holding that the DOI was not required to prepare a programmatic EIS regarding coal leasing and development in the Northern Great Plains Region).

\(^{52}\) Envtl. Def. Fund, 655 F.2d at 1246.

\(^{53}\) Id. at 1245-46.

\(^{54}\) Id. at 1246 & n.3 (citing Pub. L. No. 95-465, § 110(a)-(c), 92 Stat. 1279, 1291 (1978)).

\(^{55}\) Id. at 1245 (citation omitted).

\(^{56}\) Id. at 1245, 1248 (writing for the majority was Judge Harry Edwards, joined by Judge Mikva).

\(^{57}\) Id. at 1248.
covering the entire ‘region.’”

Dissenting, Judge MacKinnon argued that, based both on the Supreme Court’s decision in Kleppe and the subsequent congressional action, no remand was necessary to uphold the Department’s position that a CEIS was not needed. With respect to the first component of Kleppe, Judge MacKinnon wrote that the absence of any evidence of any agency action or proposal of regional scope disposed of any claim that NEPA demanded that the SOI prepare a regional EIS. “It may have been within his power to prepare such a comprehensive EIS, if he had the money, but he was not required by the NEPA to do so.” Regarding the second possible justification for a regional EIS under Kleppe, based on cumulative and synergistic impacts, Judge MacKinnon would have found that the “magnitude and variation of the environmental factors” in the basin, along with the large number of existing and proposed water projects, justified the Department’s decision based on “practical considerations of feasibility” to proceed via a series of individual EISs rather than a CEIS. Finally, Judge MacKinnon read the intervening appropriations rider as essentially precluding a CEIS for the basin rather than simply allowing projects to proceed absent a CEIS, citing statements by some members of Congress “that they strongly doubted that Congress, when it passed NEPA, ever intended to require a comprehensive environmental impact statement for an entire river basin.”

In the end, the plaintiffs declined to challenge the Department’s new position upon remand, and no further decisions were reached in the case. We will next explore reasons why we maintain that a comprehensive EIS is necessary.

VI. ESA Consultation and Its Role in River Basin Management

The Fish and Wildlife Service (“FWS”) has never evaluated the cumulative environmental effects of the operation of the Colorado River

58 Envil. Def. Fund, 655 F.2d, at 1246 n.6.
59 Id. at 1252-1253 (MacKinnon, J., dissenting).
60 Id. at 1251 (MacKinnon, J., dissenting).
61 Id.
62 Id. at 1252 (MacKinnon, J., dissenting).
63 Id. at 1253 n.5 (MacKinnon, J., dissenting). Of course, post hoc statements by individual members of Congress have little or no weight in explaining the intent of a prior Congress. It should be noted that in NEPA compliance documents completed since the court’s decision, no effort has been made to address the cumulative impacts of incremental river basin development on federally listed species or on the environment overall.
system of dams and diversions. The first Colorado River fish species listed under the Endangered Species Act were the humpback chub (*Gila cypha*) and the Colorado pikeminnow (*Ptychocheilus lucius*), listed in 1964 and 1967, respectively. Additional bird, plant, amphibian, and mollusk species have subsequently been added. Several of these species exist in both the United States and Mexico, and several are endemic to the Colorado River delta region and the Sea of Cortez.

In 2002, the FWS published recovery goals for four endangered fish in the Colorado River Basin. The goals recognize the historical and existing distribution of the species and are the latest effort to resolve the relationship between water development and the survival of these federally listed species. From the 1970s to the present, federal and state control and management of the Colorado River have been at odds with the ESA. The Law of the River has rested on key factors that vary over time, such as our scientific understanding of how much water is likely to be available and what additional demand for that water may arise.

The ESA has established specific requirements for federal agencies with respect to the prevention of impacts to listed species:

Each federal agency shall, in consultation with and with the assistance of the Secretary, insure that any action authorized, funded, or carried out by such agency . . . is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined by the Secretary . . . to be critical. . . . In fulfilling the requirements of this paragraph each agency shall use the best scientific and commercial data available.

The Colorado River dams and diversions are operated by the Bureau of Reclamation. The projects were constructed pursuant to congressional authorizations and mandates beginning in 1928 and extending through the 1970s. The congressional directives specified

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67 See ADLER, supra note 5, at 116.


70 See generally NATHANSON, supra note 4 (describing Congressional approval of dams and diversions on the Colorado River).
that the facilities were to be constructed and operated for multiple uses, including irrigation, water storage, flood control, generation of electrical power, and recreation.\textsuperscript{71} Reclamation is also charged with implementing programs to protect, mitigate, and enhance the biological status of fish and wildlife impacted by the construction of dams.\textsuperscript{72}

\textbf{VII. GLOBAL WARMING AND SCIENTIFIC CONCERNS}

Development of the Colorado River occurred during a period of time when hydrologic and social conditions were much different from those of today. In 1922, when the commissioners of the seven Colorado River Basin states and the Secretary of Commerce negotiated the Colorado River Compact, they made assumptions that included the following:

- An average of 16.5 million acre-feet of water would be available annually for distribution amongst the states;\textsuperscript{73}
- Water for Mexico was not to be considered;
- Water for Indian water rights was not to be considered; and
- Agriculture would remain the primary use of the water.

Today we see that the major assumption that there would be adequate water for distribution among the states was seriously in error. Colorado River hydrology is extremely variable: the annual flow has ranged from approximately 3.8 to 22.2 million acre-feet.\textsuperscript{74} The seven basin states attempted to get around this issue by requiring the upper basin states to deliver to the lower basin seventy-five million acre-feet over a rolling ten-year period.\textsuperscript{75} This requirement was constrained when the Long Range Operating Criteria for management of Lake Powell and Lake Mead were implemented in 1970.\textsuperscript{76} In that agreement, a minimum flow of 8.23 million acre-feet was required to be delivered to the lower basin, if available.\textsuperscript{77} This amount satisfies the Compact requirement and the additional water required to meet the 1944 Treaty with Mexico.\textsuperscript{78}

\textsuperscript{71}See generally id.

\textsuperscript{72}16 U.S.C.A. § 1536(a)(2) (Westlaw 2008).

\textsuperscript{73}See ADLER, supra note 5, at 117.


\textsuperscript{75}See NATHANSON, supra note 4, at 5.


\textsuperscript{77}Id. at art. II(2).

\textsuperscript{78}Id. at art. II(1).
What we have learned over the last several years, however, is that the Colorado River, even with its massive plumbing system, will likely be severely hydrologically constrained in future years. In February 2007, the National Research Council ("NRC") published the report *Colorado River Basin Water Management: Evaluating and Adjusting to Hydrologic Variability*. The Council concluded that the period of record used in the negotiation of the Colorado River Compact was an exceptionally wet one. They stated:

Multicentury, tree-ring based reconstructions of Colorado River flow indicate that extended drought episodes are a recurrent and integral feature of the basin’s climate. Moreover, the range of natural variability present in the stream flow reconstructions reveals greater hydrologic variability than that reflected in the gaged [sic] record, particularly with regard to drought.

Climate change is likely to be a significant factor in the management of the Colorado River system with respect to water quantity, water quality, and the ability to meet water-supply commitments. Recent studies by the NRC and others have identified a high probability that the amount of future runoff available for capture and use in the Colorado River Basin will be diminished.

VIII. SHORTAGE EIS

In December 2007, the Department of the Interior issued its latest response to the threat of reduced flows. With respect to total water flow, "2000 through 2007 was the driest eight-year period in the 100-year historical record of the Colorado River. This drought in the Colorado River Basin has reduced . . . system storage, while demands for . . . water supplies have continued to increase." The Department addressed how water would be managed when there was not enough to meet all water commitments and how to manage the operations of Lake Powell and Lake Mead through 2025. These interim guidelines would

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79 See NAT’L RESEARCH COUNCIL, supra note 23.
80 Id. at 6.
81 Id. at 19.
83 See id. at ES-1.
84 See generally id.
be used by the Secretary of the Interior to (1) determine those circumstances under which the SOI would reduce the annual amount of water available for consumptive use from Lake Mead to the Colorado River Lower Division; (2) define the coordinated operation of Lake Powell and Lake Mead to provide improved operation of the two reservoirs under low reservoir conditions; (3) allow for storage and delivery, pursuant to applicable federal law, of conserved Colorado River system and non-system water in Lake Mead; and (4) determine those conditions under which the SOI may declare the availability of surplus water.85

What is missing in this discussion? The integration of the potential impact of reduced hydrological resources due to climate change on the entire Colorado River watershed, including Mexico.

IX. DO ALL DAMS MAKE SENSE IN THE FACE OF CHANGING HYDROLOGY?

The system of eleven mainstem and other dams and reservoirs on the Colorado River system is separated into the upper and lower Colorado River Basins for political reasons. The combined storage volume of Powell and Mead reservoirs exceeds 50 million acre-feet—over 80% of the total storage volume in the system.86 Proponents of dam construction on the Colorado River convinced Congress that the Southwest needed water to survive and develop. Dams were the quick and easy solution to providing water for development. Dams and development have dramatically changed the ecological dynamics of the river system. Dams create reservoirs, which are bodies of standing water that increase evaporation. In the case of Glen Canyon Dam and Lake Powell, recent studies indicate that evaporation rates from the reservoir vary from 570,000 to 1 million acre-feet per year.87 Pre-reservoir evaporation from the riparian areas of the now-submerged canyons is estimated to have been 102,000 acre-feet per year.88

Glen Canyon Dam does provide the upper basin states with a sense of water and development security. The twenty-four million acre-feet of storage in Lake Powell represent 73% of the upper basin’s active storage capacity89 and approximately three years of downstream release

85 See id. at ES-2.
86 See Adler, supra note 5, at 5.
87 See Dawdy, supra note 32, at 45.
requirements—when it is full. Over the past eight years (2000 through 2007, inclusive) inflow to Lake Powell has been below average in all but one year (2005). In extensive reviews completed prior to the emerging evidence on climate change impacts, the role of Glen Canyon Dam has been debated.

In February 2007, the Water Science and Technology Board of the NRC concluded that "increasingly costly, controversial, and unavoidable tradeoff choices" would need to be made to accommodate an increasing population and its rising water demand. The NRC examined the prospects of both urban and rural water conservation. The NRC concluded that "[t]echnological and conservation options for augmenting or extending water supplies—although useful and necessary—in the long run will not constitute a panacea for coping with the reality that water supplies in the Colorado River Basin are limited and that demand is inexorably rising." Predicted results of climate change include more rain than snow, increased temperatures, and more extreme precipitation events.

We can conclude the following: dams and reservoirs were constructed for a different hydrologic system, one based on using the winter snowpack as the largest reservoir, to slowly release water for downstream uses; dams are physical structures that require maintenance; dams are becoming liabilities for future generations; dams and reservoirs contribute to climate change from the release of methane, increased evaporation, and trapped sediments; and the ecological impacts from dams are transferred both upstream and downstream of the physical structure.

The imperative question, then, is whether the number of existing dams, with their substantial management requirements, makes sense in the context of the changing hydrology and environmental impacts. Several suggestions have been made that indicate answers to this

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93 See Nat’l Research Council, supra note 23, at 8.

94 See id. at 1-12.

95 See id. at 9.

96 See id. at 3-4.

essential query, including the following:

- Renegotiating the Colorado River Compact,\textsuperscript{98}
- Filling Lake Mead before filling Lake Powell;\textsuperscript{99} and
- Revising the Colorado River Compact.\textsuperscript{100}

X. THE COLORADO RIVER DELTA PROBLEM

The landscape at the end of the Colorado River is a delta that is far from the dynamic ecosystem found by the early explorers and settlers. Located primarily in Mexico, the delta is out of sight of most users of the Colorado River. As a result of being choked and starved for water by frenzied dam building on the upstream portions of the Colorado River, the delta is a mere remnant of what it once was. Decisions made in the United States to harness the water have negatively affected the delta ecosystem, yet the delta in Mexico and its endangered species have no protection under U.S. law.\textsuperscript{101}

Approximately fifty endangered and threatened species inhabit the delta region in Mexico,\textsuperscript{102} with about half of them occurring on both sides of the international boundary. Prior to the upstream dam-building frenzy, the delta covered 1.93 million acres.\textsuperscript{103} Today, it is confined to 150,000 acres—all in Mexico—representing approximately 8% of its former expanse. Even with this small area remaining, the largest area left for restoration and for meeting the needs of the Endangered Species Act rests with the Colorado River Delta. However, the continuing unimpeded use and development of the Colorado River’s increasingly limited resources by upstream politicians and water managers suggests that they view the Delta as beyond repair.

Before upstream dam development, there were five endemic freshwater fishes in the Mexican portion of the delta, of which four have already disappeared: the bonytail chub (\textit{Gila elegans}), woundfin (\textit{Plagopterus argentissimus}), Colorado pikeminnow (\textit{Ptychocheilus


\textsuperscript{100} See generally Gary Bitzer, \textit{The Struggle to Secure Water in the Southwest}, W. WATER, May-June 2007 (arguing that allocation of Colorado River water be subjected to a new regulation scheme).

\textsuperscript{101} See BERGMAN, supra note 8, at 21.

\textsuperscript{102} See id. at 29.

\textsuperscript{103} See id. at 41.
lucius) and razorback sucker (Xyrauchen texanus). The desert pupfish (Cyprinodon macularius) is the only one to survive, and it exists in limited locations in the delta. The totoaba fish and vaquita porpoise are endangered in Mexico and depend upon the Colorado River Delta and flows for their survival.

Water management activities in the United States continue to impact species in the Colorado River Delta. The most recent articulation of federal policy on this is associated with the lining of the All American Canal in California and its impact on listed species in Mexico. The federal government has concluded that nothing in Section 7 of ESA indicates that it applies to transboundary effects. The FWS does not have the authority to protect species that are present in foreign nations; however, Section 8 of ESA does provide the ability for the United States to deal with endangered-species issues beyond the border through assistance, encouragement, and research. Thus, Section 8 presents an opportunity for FWS to compile basin-wide data for use in protecting and preserving downstream endangered species.

XI. THE CASE FOR A COLORADO RIVER BASIN-WIDE EIS

Multiple and independent mitigation (i.e., NEPA-related) and conservation (i.e., ESA-related) programs have been established in the Colorado River Basin in response to negative impacts associated with water projects. The Bureau of Reclamation has taken the route of addressing consultation requirements on individual projects—a piecemeal approach to addressing impacts of dam operations. Examples of the project-based approach include the Flaming Gorge EIS, Upper Basin Recovery Implementation Plan (“RIP”), San Juan RIP, Glen

104 See id. at 86.
105 See id. at 85-89.
106 See id. at 100.
108 Id.
Canyon Dam EIS,113 and Lower Basin Multi-Species Conservation Program.114

These programs, insofar as they are funded and carried out by the agencies charged with operating the dams and reservoirs of the Colorado River Basin (Bureau of Reclamation) and with power marketing (Western Area Power Administration), form part of the collective actions upon which the federal agencies must consult. Each of the dams of the Colorado River system has undergone NEPA and ESA compliance processes, most often associated with operational changes related to power contracts and construction activities.

There are separate and independent forums and mechanisms in the Colorado River Basin for addressing particular issues. These include the Colorado River Basin Salinity Control Forum, the various recovery and endangered species management programs, the Annual Operating Plan discussions, and the International Boundary and Water Commission. However, there is no single entity or framework that serves as a forum for integrating and addressing the many difficult and often overlapping issues in the Colorado River Basin. These issues, particularly in the face of reduced runoff and a changing climate, require cooperation, consensus, and political action if they are to be resolved.

A vision for the Colorado River Basin in 2025 was published under the auspices of the Western Water Policy Review Act of 1992115 for the Western Water Policy Review Advisory Commission.116 This report recommended the development of an integrated management approach.117 This is not a new idea; others, including Colorado River scholars David Geches, Gary Weatherford, Lawrence MacDonald, and Dale Pontius,118 have recommended the development of a river basin commission to coordinate the management of all federal facilities,

117 Id. at 118.
including delivery of water to Mexico. This commission would be funded through hydropower revenues and water delivery charges.\(^{119}\)

Pursuant to congressional enactments since 1902, all of which followed extensive studies, the government has constructed and is currently operating in the Colorado River Basin sixty-five or more storage or diversion dams, hundreds of miles of aqueducts and canals, power plant units, thousands of miles of electric transmission lines, and numerous related structures and facilities. These are located in widespread areas with highly variable environmental characteristics.

Although this degree of complexity poses obvious challenges for a basin-wide EIS or analysis of any kind, the opportunity—if not necessity—of preparing such an analysis to make sense of the interlocking features of Colorado River water development suggests a compelling argument for a CEIS. Of course, as found by the Supreme Court in Kleppe, the initial professional judgment about the wisdom of those competing factors lies first with the agency, subject to a deferential standard of judicial review.\(^{120}\)

XII. WHAT CONSTITUTES A DISCRETIONARY AGENCY ACTION?

A federal agency is required to consult with the FWS only with respect to activities for which the agency has discretionary involvement or control.\(^{121}\) The Bureau of Reclamation has concluded that the operations and maintenance activities defined through the Law of the River largely dictate its actions and limit discretionary involvement and control.\(^{122}\) As a result, certain of the agency’s actions on the Colorado River system are nondiscretionary and therefore not subject to Section 7 consultation.\(^{123}\)

Historically, the courts have given the Bureau of Reclamation the benefit of the doubt when it comes to viewing activities as discretionary.\(^{124}\) The agency has claimed that it has very limited discretion over how it manages the Colorado River system of dams and

\(^{119}\) Id. at 95.

\(^{120}\) See Kleppe v. Sierra Club, 427 U.S. 390, 412 (1976).

\(^{121}\) See 50 C.F.R. § 402.03 (2001).


reservoirs because of the constraints imposed by the Law of the River.\textsuperscript{125} The most recent case involves a decision by the courts regarding the protection of southwestern willow flycatcher habitat at Lake Mead.\textsuperscript{126} The court ruled that the management of the reservoir levels was a non-discretionary action.\textsuperscript{127}

The Lower Colorado River Multi-Species Conservation Program Final Biological Assessment concluded that non-discretionary federal water management actions are triggered by a state or other non-federal action,\textsuperscript{128} making it unclear which parties have the responsibility under ESA to address Section 9 “take” issues. The FWS handled this by approving “incidental take” for nearly all of the species considered.\textsuperscript{129}

The question is whether water management decisions made under the body of Colorado River water law are really non-discretionary. The recently completed Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead identified management options regarding the storage and release of water from the two largest reservoirs.\textsuperscript{130} Completions of EISs for Flaming Gorge, Glen Canyon, Navajo Dam, and other Bureau of Reclamation facilities all included ESA compliance documents, but they did not address the cumulative effects and relationships between the dams.

Historically, the courts have held that water contracts between the Bureau of Reclamation and water users are also discretionary actions subject to ESA compliance.\textsuperscript{131} Similarly, power contracts and the criteria established to allocate capacity and energy supplied by Bureau of Reclamation hydropower dams and negotiated between WAPA and private entities must also comply with NEPA and ESA requirements.\textsuperscript{132}

\textsuperscript{125} See generally Sw. Ctr. for Biological Diversity v. U.S. Bureau of Reclamation, 143 F.3d 515 (9th Cir. 1998) (discussing the Bureau’s discretionary authority under the Endangered Species Act).

\textsuperscript{126} Id.

\textsuperscript{127} Id. at 523.

\textsuperscript{128} See U.S. BUREAU OF RECLAMATION, supra note 122, at ch. 1, pt. II(B) (differentiating discretionary and non-discretionary actions). “Take” means “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect [a protected species], or to attempt to engage in any such conduct.” 16 U.S.C.A. § 1532(19) (Westlaw 2008).


\textsuperscript{130} See U.S. BUREAU OF RECLAMATION, supra note 82, at ES-1.

\textsuperscript{131} See Natural Res. Def. Council v. Houston, 146 F.3d 1118, 1126 (9th Cir. 1998).

\textsuperscript{132} See DEP’T OF THE INTERIOR, supra note 113, at 1-12.
XIII. DOES CLIMATE CHANGE REQUIRE FEDERAL AGENCIES TO REVIEW THEIR ACTIONS?

On April 2, 2007, the Supreme Court released a ruling that required EPA to assert its authority to regulate greenhouse gas emissions and identified the responsibility of the government to address climate change.\(^{133}\) With reservoirs identified as sources of methane emissions,\(^{134}\) water management actions affecting evaporation levels, and the likelihood of a vastly different hydrologic future in the Colorado River Basin, is it likely that government water management actions will need to be modified?

Global warming is challenging all agencies and groups to evaluate their historical management paradigms—especially those related to water. Global warming will impact the amount of water available for use in the Colorado River Basin, particularly because of warmer summers and smaller winter snow packs. In May 2007, the journal *Science* predicted the Southwest’s gradual descent into persistent dust-bowl conditions by mid-century.\(^{135}\) Utilizing models to predict the Colorado River’s flow conditions, climate researchers have concluded that, “given current consumptive water use in the [Upper Colorado River Basin], 1°C to 2°C increases in temperature . . . would create increased water-supply problems in the basin.”\(^{136}\)

On a state level, Colorado completed the Statewide Water Supply Initiative report in 2003, which predicted that current and planned water projects could handle only 80% of the new urban growth by 2030.\(^{137}\) That means that 20% of future demand will not be satisfied. The report further concluded that many Colorado cities are counting on farmers to sell their water rights.\(^{138}\) This example is one of many that demonstrate increasing concern that there simply will not be enough water in the Colorado River Basin to support all of the future demands. There will

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138 Id.
have to be tradeoffs if future growth in the Colorado River Basin is to be accommodated. These tradeoffs include a loss of farmland and less water in the rivers for fish, recreation, and scenic beauty.

The prospect of such a shortfall suggests a need to evaluate and implement an alternative management system that is better equipped to address future basin-wide water demand.

XIV. COMPARATIVE REVIEWS OF THE COLUMBIA AND MISSOURI RIVER SYSTEMS

The Colorado River system is unique in the Western United States and managed in such a way that makes wading into any discussion of it like stepping into a minefield. It is interesting, however, that two other major river systems of the West, the Columbia-Snake and Missouri River systems, are managed in a fashion that allows for more integrated evaluation of the environmental impacts of dam operations.

A. COLUMBIA RIVER BASIN

The Columbia River Basin is North America’s fourth largest, draining about 250,000 square miles and extending throughout the Pacific Northwest and into Canada. There are more than 250 reservoirs and about 150 hydroelectric projects in the basin, including eighteen mainstem dams on the Columbia and its major tributary, the Snake River. This basin once supported the world’s largest runs of Pacific salmon and steelhead, but some populations are now extinct and others are severely depleted. The National Oceanic and Atmospheric Administration (“NOAA”) Fisheries Service (formerly National Marine Fisheries Service) has listed thirteen anadromous fish runs in the basin for ESA protection.

The Federal Columbia River Power System (“FCRPS”) encompasses the coordinated operations of fourteen major dams and reservoirs on the Columbia and Snake rivers. The Columbia River’s headwaters are in Canada, and the United States coordinates with Canada to manage the river’s water. The Corps of Engineers operates nine of the

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140 Id.
142 Id.
ten major federal projects on the Columbia and Snake rivers, and the Dworshak, Libby, and Albeni Falls dams. The Bureau of Reclamation operates Grand Coulee and Hungry Horse dams. These federal projects are a major regional power source and further provide beneficial flood control, navigation, recreation, fish and wildlife, municipal and industrial water supply, and irrigation.

As is the case for the Colorado River Basin, the ESA requires the operators of the FCRPS and the upper Snake River projects to insure that their actions are not likely to jeopardize the continued existence of listed species or to result in the destruction or modification of habitat designated as critical to their conservation. Under ESA, the Corps of Engineers and the Bureau of Reclamation must consult with NOAA Fisheries and the FWS on actions they intend to undertake that may affect listed threatened and endangered species or their critical habitats. However, federal courts have interpreted this “jeopardy standard” differently in the case of the Columbia River Basin.

In recent decisions regarding the 2004 FCRPS Biological Opinion, both the U.S. District Court in Oregon and the Court of Appeals for the Ninth Circuit held that the jeopardy standard required NOAA Fisheries to consider whether the species would survive and how the proposed water management actions might affect the species’ recovery prospects. The water management actions NOAA evaluated in the 2007 FCRPS Biological Opinion are essentially a ten-year operation and configuration plan for the FCRPS facilities as well as for various other hydro projects on the Columbia River tributaries operated for irrigation purposes. The ongoing Biological Opinion development is based on biological assessments completed by the three federal agencies that operate projects on the Columbia and Snake rivers: the Corps of Engineers, Bonneville Power Administration, and the Bureau of Reclamation. The Biological Assessments addressed the ongoing management and operation of the dams and reservoirs and the integration of these systems in the form of a Comprehensive Analysis.

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143 Id.
144 Id.
145 Id.
146 Id.
147 See NAT’L OCEANIC & ATMOSPHERIC ADMIN., supra note 141.
149 See generally NAT’L OCEANIC & ATMOSPHERIC ADMIN., supra note 141.
150 See NAT’L OCEANIC & ATMOSPHERIC ADMIN., supra note 141, at 6.
B. MISSOURI RIVER

The Missouri River is managed by the Corps of Engineers through the operation of six dams and reservoirs. The watershed encompasses 529,000 square miles and stretches 2565 miles from its headwaters to its confluence with the Mississippi River. The ESA protects three species—the pallid sturgeon, least tern, and piping plover—whose habitats are impacted by the operation and management of the Missouri River dams.

Pursuant to the Flood Control Act of 1944, the Corps adopted a Master Water Control Manual in 1979 for the systematic operation of the mainstem Missouri River reservoirs. The Corps revised the 1979 Master Manual in 2004 and concurrently initiated NEPA compliance. The final EIS was produced after fourteen years of study and public input. In 2002, the Corps and FWS entered into informal consultation to address environmental issues related to ongoing operations of the Missouri River system. That same year, the National Research Council completed a review of the management of the Missouri River ecosystem and issued a series of recommendations. Several of the NRC recommendations are not being addressed by the Missouri River Recovery and Implementation Committee (“MRRIC”).

Of significance to the argument being presented in this article, the MRRIC is developing recommendations and guidance to the Corps of Engineers, affected governmental entities, and tribes regarding mitigation, recovery, and restoration activities on the Missouri River and its tributaries. Proper recommendations and guidance will (1) ensure

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152 Cf. id.
153 See David P. Smith, Deputy Assistant Sec’y for Fish, Wildlife, and Parks, Dep’t of the Interior, Testimony Before the Senate Energy and Natural Resource Committee, Water and Power Subcommittee, Regarding Missouri River Operation and Management Issues (July 10, 2002).
155 David P. Smith, Deputy Assistant Sec’y for Fish, Wildlife, and Parks, Dep’t of the Interior, Testimony Before the Senate Energy and Natural Resource Committee, Water and Power Subcommittee, Regarding Missouri River Operation and Management Issues (July 10, 2002).
158 See generally id.
that local stakeholders' economic, social, historical, and cultural issues are recognized; (2) identify impacts to stakeholders; (3) identify actions that will benefit multiple users of the river; and (4) avoid, minimize, and/or mitigate adverse impacts. \^{159}

XV. AN OUTLINE FOR ACTION ON THE COLORADO

In 1998, the Western Water Policy Review Advisory Commission, at the direction of Congress, published Water in the West: Challenge for the Next Century. \^{160} This report identified issues that need to be considered for future water planning in the West, including the following: staggering growth projections, unhealthy trends in aquatic ecosystems and water quality, water supply problems, unfulfilled American Indian water claims, an agricultural economy suffering the stress of transition, rapid conversion of open space to urban development, and rising drought and flood damage that are likely to be exacerbated by climate change. \^{161}

The impetus for the formation of the Commission was Congress's finding that current federal water policy suffers from unclear and conflicting goals implemented by a maze of agencies and programs. The Commission concluded that these problems cannot be resolved piecemeal and that the geographic, hydrologic, ecologic, social, and economic diversity of the West requires regionally and locally tailored solutions. \^{162} A basin-wide EIS would meet the Commission's recommendations and ensure an integrative planning process for the Colorado River Basin.

The principal goals of the EIS would be to:

- Improve decisionmaking and management at the river-basin level by bringing the all key political and agency decisionmakers into a basin-wide forum.
- Clarify Colorado River Basin management goals by developing measurable water and environmental objectives.
- Improve the efficiency of federal and state water management activities within the Colorado River Basin by requiring integrated and coordinated programs and budgets.
- Expand technical coordination and financial support from

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\^{159} See generally id.


\^{161} Id. at xiii.

\^{162} See id. at xv-xvii.
agencies for the activities of watershed groups.

- Integrate and prioritize environmental recovery and restoration activities for listed species.
- Address Native American and Mexican environmental and water concerns.

XVI. CONCLUSION

Prior to his untimely death in 1999, Marc Reisner, the author of *Cadillac Desert*, identified a major crisis facing water management: the lack of leadership willing to take this country away from where entrenched power, money, and habit insist that it stay.\(^{163}\) In December 2007, the Delta Vision Blue Ribbon Task Force, appointed by California Governor Arnold Schwarzenegger, released its recommendations on what is necessary to address the environmental and water crisis that currently exists in California’s Sacramento-San Joaquin Delta.\(^{164}\) The Delta provides critical water supplies to California residents and farms while supporting a globally unique ecosystem. The report identifies seven vital, near-term protections: better land management, appropriate levels of guidance, standards for protection of populated areas, appropriate emergency management actions and planning, analysis of climate change impacts, ecosystem revitalization, and water conveyance and groundwater storage systems.\(^{165}\) A similarly comprehensive approach is essential to solve problems in the Colorado River Basin.

As stated by Patricia Mulroy, Director of the Southern Nevada Water Authority, "We are in the midst of a fundamental metamorphosis . . . in how we who rely upon the Colorado River view both the resource and one another."\(^{166}\) The dam construction that began in the Colorado River Basin in the 1930s has brought on significant social and environmental changes. The need to address drought and climate change in relation to the recovery of listed endangered species demands a comprehensive evaluation of alternatives to the current operation of the Colorado River system.

The Bureau of Reclamation finds itself at the center of a struggle between competing interests: those who benefit from the status quo and

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\(^{163}\) See Daniel Tyler, *supra* note 37, at 295.


\(^{166}\) Patricia Mulroy, *A Fork in the River: Coping with Change on the Colorado* 9, COLO. PLATEAU ADVOCATE, Summer-Fall 2007.
will resist a system-wide NEPA evaluation that could change current operations, and other stakeholders who call for such inquiry and for a reallocation of benefits.

Unresolved issues related to the management of water, as defined by the Law of the River, should be addressed in the context of the mitigation objectives of NEPA, the protection and recovery objectives of the ESA, and our national obligations to the Native American tribes and the country of Mexico. We have the technology and ability to develop a comprehensive and scientifically sound framework for future management of all resources dependent on the Colorado River.

Existing laws provide considerable flexibility to meet the needs of the people of the Colorado River Basin, including Mexico and the Colorado River Delta. We believe that a basin-wide approach best meets the intent and purpose of the Colorado River body of law and the Department of the Interior’s adaptive management objectives.¹⁶⁷ It is time to revisit the legal foundation on which the management of the Colorado River rests in order to account for new scientific understanding and current economic, political, and environmental realities. Potential impacts associated with climate change and proposed development demand that a scientifically rigorous approach be integrated into a basin-wide evaluation. Now is the time to begin such a review, with leadership and vision to learn from our past efforts and to guide us into the future.