
COLLABORATIVE MANAGEMENT OF GLEN CANYON DAM: THE ELEVATION OF SOCIAL ENGINEERING OVER LAW

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ABSTRACT

The operation of Glen Canyon Dam on the Colorado River affects several downstream resources and water uses including water supply for consumptive uses in Arizona, California, and Nevada, hydroelectric power production, endangered species of native fish, recreational angling for non-native fish, and recreational boating in the Grand Canyon. Decisions about the magnitude and timing of water releases through the dam involve trade-offs between these resources and uses. The numerous laws affecting dam operations create a hierarchy of legal priorities that should govern these decisions. At the top of the hierarchy are mandatory requirements for water storage and delivery and for conservation of endangered species. Other resources and water uses have lower legal priorities.

The Glen Canyon Dam Adaptive Management Program ("AMP") has substituted collaborative decisionmaking among stakeholders for the hierarchy of priorities created by law. The AMP has thereby facilitated non-compliance with the Endangered Species Act by the Bureau of Reclamation, which operates the dam, and has effectively given hydroelectric power production and non-native fisheries higher priorities than they are legally entitled to.

Adaptive management is consistent with the laws governing operation of Glen Canyon Dam, but collaborative decisionmaking is not. Nor is collaborative decisionmaking an essential, or even logical, component of adaptive management. As implemented in the case of Glen Canyon Dam, collaborative decisionmaking has actually stifled adaptive management by making agreement among stakeholders a prerequisite to changes in the operation of the dam. This Article proposes a program for adaptive, but not collaborative, management of Glen Canyon Dam that would better conform to the law and would be more amenable

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the measures necessary to conserve, endangered species of fish and wildlife. The Fish and Wildlife Service, in a Biological Opinion issued in 1994, identified certain modifications in dam operations that it deemed necessary for the survival of the humpback chub, an endangered species of native fish whose largest surviving population is in the Grand Canyon and a tributary canyon (the Little Colorado) below the dam. Fourteen years later, these changes have not been implemented, and the United States Bureau of Reclamation continues to operate the dam in a manner that the Fish and Wildlife Service has determined jeopardizes the continued existence of the chub.

Since 1996, the Bureau has operated the dam under a program of "adaptive management." At the heart of the Adaptive Management Program is a committee of "stakeholders" that makes recommendations to the Secretary of the Interior, who oversees the Bureau, concerning operations of the dam. It is the thesis of this Article that the Adaptive Management Program has facilitated non-compliance with the Endangered Species Act by substituting the search for consensus among stakeholders for the requirements of the Act.

Part II of this Article presents background information on the Colorado River, Glen Canyon Dam, and the dam's effects on the aquatic environment of the Colorado River in the Grand Canyon and the fish therein, especially the endangered humpback chub. Part III explores the legal hierarchy of resources and uses created by the laws affecting management of the dam. Part IV traces the recent history of operations of Glen Canyon Dam, with emphasis on the Bureau's non-compliance with the Endangered Species Act. Part V considers the reasons for the Bureau's non-compliance and concludes that the Adaptive Management Program has been a significant factor facilitating, if not causing, that non-compliance. Part VI identifies the attributes of the Adaptive Management Program that have contributed to non-compliance and argues that one such attribute, collaboration among stakeholders, has been unnecessarily included in the program. Finally, Part VII briefly outlines a proposal for adaptive, but not collaborative, management of Glen Canyon Dam that would be consistent with the Endangered Species Act.

II. BACKGROUND

A. *The Colorado River Compact and Glen Canyon Dam*

The drainage basin of the Colorado River includes portions of seven states: Wyoming, Colorado, Utah, New Mexico, Arizona, Nevada, and California.¹ The Colorado River Compact of 1922 divided the basin into the "Upper Basin" and the "Lower Basin," with the dividing line between the Upper and Lower Basins drawn at Lee Ferry, a point on the river about twenty miles south of the

¹ See Colorado River Compact of 1922; art. II, 70 CONG. REC. 324 (1928), available at <http://www.usbr.gov/lc/region/pao/pdfiles/crcompct.pdf>.

be used to meet the Compact's requirement.

Glen Canyon Dam also produces hydroelectric power. The dam's eight generators can produce a total of 1320 megawatts of power (enough to supply the domestic consumption of about one million homes) at a maximum combined flow rate of 33,200 cubic feet per second ("cfs").¹⁰ Since the average flow through the dam in recent years has been only about 11,000 cfs (eight million acre-feet per year),¹¹ on average the generators have been running at only about one third of their capacity. But the dam's capacity to produce "peaking power" of up to 1320 megawatts is an important asset on the western power grid. Unlike a coal-burning or nuclear power plant, whose output can be changed only slowly, a hydroelectric plant can be turned up or down in a matter of minutes simply by opening or closing valves to draw more or less water into the turbines. Thus, it can respond quickly to peaks in power demand caused by either predictable events, such as the surge in air conditioning use on a summer afternoon, or unpredictable events, such as the failure of a transmission line bringing in power from another source.¹²

B. The Effects of Glen Canyon Dam on the Aquatic Environment of the Grand Canyon

Because Glen Canyon Dam is immediately upstream of the Grand Canyon,¹³ virtually all water flowing in the canyon must first pass through the dam. The existence and operation of the dam has profoundly altered the aquatic environment of the canyon in three respects: flow pattern, sediment content, and temperature.

1. Flow Pattern

The quantity of water flowing in the Colorado River through the Grand Canyon, before it was changed by Glen Canyon Dam, varied enormously from season to season. The flow peaked in the late spring and early summer as the winter snows melted in the river's Rocky Mountain headwaters. The median peak flow at that time of year was around 85,000 cfs, and flows exceeding

¹⁰ *Id.* at 166.

¹¹ The minimum annual release from Glen Canyon Dam to meet compact requirements and a treaty obligation to Mexico is 8.23 million acre-feet per year. This was also the amount of water actually released from the dam in each of the years 2001 through 2004. *Id.* at 171. One million acre-feet per year equals approximately 1400 cfs.

¹² *See id.* at 166-68.

¹³ Strictly speaking, the first fifteen river miles below the dam are in lower Glen Canyon, followed by about sixty miles of Marble Canyon, and then over 200 miles of the Grand Canyon, ending at Lake Mead. The dividing point between Glen Canyon and Marble Canyon is Lee Ferry; the division between Marble Canyon and the Grand Canyon is the mouth of the Little Colorado River. *See id.* at 3 (map), 11. In this Article, as in the SCORE Report, lower Glen Canyon, Marble Canyon, and the Grand Canyon proper, will be referred to collectively as the Grand Canyon.

summer and mid-winter, when cooling and heating increases electric power use, with lower flows in the fall and spring.²⁴ Overall, the effect of the dam and its operation has been to replace a regime of high seasonal variability and relatively small daily variability with a regime of high daily variability and minimal seasonal variability.

2. Sediment

Before the construction of Glen Canyon Dam, the Colorado River carried an enormous sediment load through the Grand Canyon. The turbid, muddy river was famously characterized as "too thick to drink; too thin to plow." The total amount of sand transported annually by the river through the canyon has been estimated at twenty-five to thirty million tons.²⁵

Because slow-moving water can suspend much less sediment than fast-moving water, a river drops most of its sediment load to the bottom when it enters the standing water of a lake or reservoir. Since the completion of Glen Canyon Dam in 1963, the vast majority of the sediment carried by the Colorado River has been deposited in the upper reaches of Lake Powell. The water passing through the dam is nearly clear.²⁶ Tributaries entering the river below Glen Canyon Dam, primarily the Paria River and the Little Colorado River, still provide some sediment to the Grand Canyon, but the total sand supply is only approximately 16% of the pre-dam supply.²⁷

The drastic reduction in sand supply, along with the change in flow pattern, has changed the physical environment in the Grand Canyon. Beaches and sand bars in the canyon, if they are to be maintained, need to be periodically replenished with fresh sand to offset the constant loss of sand to erosion by wind and water. Before the construction of the dam, these beaches and sand bars were replenished by the deposit of sand from the river during periods of high flows in the spring and summer.²⁸ The construction and operation of the dam have eliminated most of the sand supply as well as the floods necessary to raise that sand onto beaches and sandbars. Now, the relatively clear water of the river erodes sandbars and beaches but does not replenish them. As a result, sandbars and beaches in the canyon are shrinking.²⁹

²⁴ *Id.*

²⁵ *Id.* at 18.

²⁶ *See id.*

²⁷ *Id.*

²⁸ *See id.*

²⁹ *See id.* at 21. There is an offsetting effect. Because the dam has reduced peak floods, it has reduced the erosive power of the river. If this effect reduced erosion more than the loss of sediment reduced deposition, there could conceivably be an increase, rather than a decrease, in the quantity of sediment found in the canyon. But recent empirical studies have revealed that this is not the case. On balance, the changes wrought by the dam have led to a steady loss of sediment from the canyon. *See id.*

for over twenty years.³⁷

The humpback chub, like the other native fish of the Grand Canyon, is considered a "warmwater" fish. Although it can, and did, survive in the canyon's cold water in winter, it requires seasonally warm water in which to spawn and grow. The canyon's warm water in the summer and fall met the chub's needs for reproduction and growth.³⁸

The humpback chub has become the principal focus of controversy and litigation over management of Glen Canyon Dam for two reasons. First, it is the only endangered species of fish that currently resides in the Grand Canyon. Second, unlike the three other species of native fish still found in the canyon (speckled dace, bluehead sucker, and flannelmouth sucker), which have greater populations elsewhere, the humpback chub's largest remaining population is in the Grand Canyon.³⁹ The Grand Canyon population is also the only successfully reproducing population of humpback chub in the lower basin of the Colorado River.⁴⁰ Therefore, the fate of the Grand Canyon population is critical to the survival of the species.

2. Introduced Fish

For many years, the native fish of the Grand Canyon have been overwhelmed by far greater numbers of exotic (non-native) fish that have been introduced into the canyon either deliberately, for recreational fishing, or accidentally. As with native fish, quantitative data about non-native fish populations are lacking before the 1980s, but it is known that non-native fish have been present in the Grand Canyon since the nineteenth century.⁴¹ As with native fish, the pre-dam aquatic environment in the Grand Canyon was most hospitable to warmwater species of non-native fish, such as catfish, carp, bass, and sunfish. By the time Glen Canyon Dam was built in the mid-twentieth century, one non-native warmwater species, channel catfish, was the most abundant fish in the canyon.⁴²

The cooling and clearing of the canyon's waters brought about by the construction of Glen Canyon Dam made the river less hospitable to warmwater fish, but greatly improved conditions for introduced coldwater fish, particularly

³⁷ U.S. FISH & WILDLIFE SERV., U.S. DEP'T OF THE INTERIOR, FINAL BIOLOGICAL OPINION: OPERATION OF GLEN CANYON DAM 8 (1994), available at http://www.fws.gov/southwest/es/arizona/Documents/Biol_Opin/93167_GlenCanyonOperations.pdf [hereinafter 1994 BIOLOGICAL OPINION].

³⁸ SCORE REPORT, *supra* note 8, at 36.

³⁹ 1994 BIOLOGICAL OPINION, *supra* note 37, at 8.

⁴⁰ Memorandum from Field Supervisor, U.S. Fish & Wildlife Serv., U.S. Dep't of the Interior, to Reg'l Dir., Bureau of Reclamation, Salt Lake City, Utah 9 (Dec. 6, 2002), available at http://www.fws.gov/southwest/es/arizona/Documents/Biol_Opin/03016_Glen_Canyon_Dam.pdf.

⁴¹ SCORE REPORT, *supra* note 8, at 36.

⁴² *Id.*

may have improved.⁵⁰

2. Factors Affecting the Population

The factors adversely affecting the humpback chub population in the Grand Canyon are numerous, complex, and not well understood. Some, but not all, of them are attributable to the construction and operation of Glen Canyon Dam.

Among the factors not entirely attributable to the dam is the presence of large numbers of non-native fish. These non-native fish may negatively affect the humpback chub population by preying on chub eggs and young chub, by competing with chub for food, and by driving chub away from spawning and rearing areas.⁵¹ As noted above, the presence of large numbers of non-native warmwater fish in the Grand Canyon predates the dam, and the cool water released from the dam is actually a detriment to non-native warmwater fish. However, as also noted above, the dam has made the canyon hospitable to coldwater non-native fish—rainbow and brown trout—whose large populations are a threat to the chub. Whether, on balance, the dam has increased or decreased the threat to the chub population from non-native fish is a point of debate.

Another factor negatively affecting the humpback chub population that is not attributable to the dam is the presence of a parasite, the Asian tapeworm. Accidentally introduced into the United States in the 1970s, the Asian tapeworm was discovered in the Little Colorado River, a tributary that is the principal spawning area for humpback chub in the Grand Canyon, in 1990.⁵² By 2004, over 90% of humpback chub were infested.⁵³ Asian tapeworm infestation can be fatal to a chub, but more often it causes reduced growth and poor condition.⁵⁴ Like warmwater fish, the Asian tapeworm cannot complete its life cycle in the relatively cool water that Glen Canyon Dam releases into the Grand Canyon. It is therefore restricted to warmer tributaries such as the Little Colorado.⁵⁵ This limitation on its spread can be seen as a beneficial effect of the dam from the standpoint of the chub.

On the other hand, the changes in the aquatic environment wrought by Glen Canyon Dam are harmful to the chub in several ways. First, as a warmwater fish, the chub cannot spawn in the cool water released from the dam. Since the completion of the dam in 1963, spawning of humpback chub has been largely limited to the Little Colorado River, a tributary whose waters are sub-

⁵⁰ GCMRC – Research – Information on Humpback Chub, August 2006, http://www.gcmrc.gov/research/humpback_chub/20060802.aspx.

⁵¹ See SCORE REPORT, *supra* note 8, at 42.

⁵² *Id.* at 37.

⁵³ *Id.* at 46.

⁵⁴ *Id.* at 37.

⁵⁵ *Id.*

decommissioning Glen Canyon Dam and draining Lake Powell, the only way to restore the sediment supply to the Grand Canyon would be somehow to transport millions of tons of sand each year from the periphery of the lake, around the dam, and into the canyon. While schemes have been envisioned to do this, it would take many years and cost many billions of dollars to construct the transport system, and it would entail numerous, and potentially very serious, collateral environmental impacts.

Raising the temperature of the water in the Grand Canyon to facilitate spawning and growth of humpback chub would be more feasible than restoring the sediment content, but would still be a substantial engineering enterprise involving modification of the dam. A temperature control device would consist of an intake structure on the upstream side of the dam that would draw water from the higher, warmer levels of Lake Powell down into the intakes of the electric generators. Installation of such a device would cost about fifteen million dollars, but would entail substantial risk because it would also make the canyon more hospitable to the several species of non-native warmwater fish that are abundant in the lower part of the Grand Canyon and downstream in Lake Mead.

The easiest factor to modify is the flow pattern. The daily fluctuations in river flow through the Grand Canyon are caused by the opening and closing of the valves that regulate the flow of water through the electric generators. While the economic and legal implications of operating the valves so as to reduce or eliminate these fluctuations may (or may not, as will be discussed below) be complex, there are no physical or technological impediments to doing so. Steady flows through the dam have been implemented, for relatively short times, in the past, and could be implemented again, either temporarily or permanently, at any time.

Because there are no technological barriers to modifying the seasonal and daily pattern of water flows through the dam, there is no excuse for failure to comply with the law in determining what the pattern will be. For this reason, the remainder of this Article, which is concerned with the application (or lack thereof) of the law, will focus primarily on the issue of flow pattern.

III. THE LEGAL HIERARCHY OF WATER USES AND RESOURCES AFFECTED BY THE OPERATION OF GLEN CANYON DAM

The operation of Glen Canyon Dam affects numerous resources and water uses, including, but not limited to, water supply for consumptive uses, hydroelectric power production, endangered species of native fish, recreational angling for non-native fish, and recreational boating in the Grand Canyon. Choices about the operation of the dam involve trade-offs between these resources and uses. The trade-off between hydropower production and endangered species protection is the primary focus of this Article.

Under the law, not all resources and uses affected by the dam are equal in

ize the amount of water stored in Lake Powell and in Lake Mead downstream.⁶⁷

The 1968 Act instructed the Bureau of Reclamation to promulgate "criteria" for dam operations to implement these priorities.⁶⁸ In the criteria issued pursuant to this requirement, the Bureau has set the "normal year" release from the dam at 8.23 million acre-feet. This figure was determined by adding the Upper Basin's one-half share (0.75 million acre-feet) of the Mexican treaty obligation to the Compact's requirement of an average flow of 7.5 million acre-feet and then subtracting the average contribution of the Paria River (0.02 million acre-feet), which enters the Colorado below Glen Canyon Dam but just above the division point at Lee Ferry, and thus contributes to the flow from the Upper Basin to the Lower Basin.

Despite these seemingly precise instructions for releases from the dam, significant controversy persists between the Upper Basin and the Lower Basin states regarding required annual releases. The controversy stems from, among other things, ambiguity in the meaning of the word "surplus," which determines when the Upper Basin must contribute to meeting the Mexican treaty obligation, and disagreement over the appropriateness of providing a minimum annual release as opposed to the less demanding decadal average specified in the Compact, which would allow for lesser releases in some years so long as they are compensated by greater releases in preceding or following years.

For purposes of this Article, however, the most salient feature of the statutory provisions governing operation of Glen Canyon Dam is that they govern *only* annual and decadal releases of water from the dam, and they are indifferent to the intra-annual pattern of releases. That is, any pattern of releases from the dam—steady through the year, seasonally fluctuating, daily fluctuating, or a combination—will satisfy the laws governing water storage and supply so long as the correct total amount of water is released from the dam over the course of each year and each decade.

Not only the law, but also water uses in the Lower Basin are indifferent to the intra-annual pattern of releases from Glen Canyon Dam because such releases do not flow directly to Lower Basin water users. Rather, they flow through the Grand Canyon into Lake Mead, behind Hoover Dam. Lake Mead, with a storage capacity roughly equal to that of Lake Powell, acts as a regulating buffer between Glen Canyon Dam and Lower Basin water users. Therefore, hourly, daily, and seasonal fluctuations in releases from Glen Canyon Dam do not affect water uses in the Lower Basin. As far as such uses are concerned, only the total annual water release from the dam matters.⁶⁹

⁶⁷ *Id.* § 1552(a)(3).

⁶⁸ *Id.* § 1552.

⁶⁹ See, e.g., Upper Colorado Region, Bureau of Reclamation, U.S. Dep't of the Interior, *Interior Secretary Kempthorne Launches Grand Canyon High Flow Experiment*, <http://www.usbr.gov/uc/feature/GC-hfe/index.html> (last visited May 20, 2008) [hereinafter *High Flow Experiment*] (explaining that sixty-hour high flow experiment conducted in March 2008, would have no effect on the annual quantity of water flowing to Lake Mead).

The substantive mandate of section 7 is accompanied by a procedural requirement that makes the United States Fish & Wildlife Service the arbiter of whether a proposed agency action is or is not likely to jeopardize the continued existence of a threatened or endangered species. When another federal agency proposes an action that is likely to affect a threatened or endangered species, the Fish and Wildlife Service prepares a "Biological Opinion" evaluating whether the action is likely to jeopardize the species or harm its critical habitat.⁷⁷ If the opinion concludes that jeopardy or adverse modification will occur, in violation of section 7(a)(2), then the opinion can suggest "reasonable and prudent alternatives" that would not violate section 7(a)(2).⁷⁸

2. The Grand Canyon Protection Act

The ESA's broad mandate for protection of endangered species is supplemented by another statute that applies explicitly to the operations of Glen Canyon Dam, the Grand Canyon Protection Act of 1992 ("GCPA").⁷⁹ Section 1802(a) of that Act requires the Secretary of the Interior to

operate Glen Canyon Dam in accordance with the additional criteria and operating plans specified in section 1804 and exercise other authorities under existing law in such a manner 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, including, but not limited to natural and cultural resources and visitor use.⁸⁰

Section 1804, in turn, requires the preparation of an Environmental Impact Statement ("EIS") and an audit of the costs and benefits of dam operations, and

⁷⁷ 16 U.S.C. § 1536(b)(3)(A) (2000).

⁷⁸ *Id.*

⁷⁹ Grand Canyon Protection Act of 1992, Pub. L. No. 102-575, 106 Stat. 4600, 4669-73. The Act was Title XVIII of the Reclamation Projects Authorization and Adjustment Act of 1992, Pub. L. 102-575, 106 Stat. 4600.

⁸⁰ *Id.* § 1802(a). Professor Robert Adler, in a very thoughtful article on the Colorado River, has pointed to an "apparent direct contradiction" between the GCPA's mandate for natural resource protection and its simultaneous insistence that it does not modify the requirements of the Colorado River Compact, the Colorado River Storage Project Act of 1956, or other laws governing water supply and storage and hydroelectric power production on the Colorado River. See Robert W. Adler, *Restoring the Environment and Restoring Democracy: Lessons from the Colorado River*, 25 VA. ENVTL. L.J. 55, 86 (2007). However, the apparent contradiction can be at least partially resolved by the recognition, as noted above, *see supra* text accompanying notes 68-69, that compliance with the laws governing water storage and supply depends only on the total annual releases of water through Glen Canyon Dam, and is unaffected by the seasonal and daily patterns or the temperature of those releases. Thus, the Bureau can, and under these laws must, manage the seasonal and daily patterns and the water temperature in a manner to protect resources as required by the GCPA without violating those other laws. As for hydroelectric power production, as noted below, *see infra* text accompanying note 96, the 1956 Act requires maximization of the *quantity* of power produced, but not the *value* of power produced. Therefore, it does not mandate daily fluctuating flows designed to provide peaking power. The Bureau may, and under the GCPA must, reduce or eliminate such fluctuations if and as necessary to protect natural resources.

for Glen Canyon Dam as required by Section 1804 of this title.”⁸⁷

C. The Lack of Conflict Between Water Supply and the Humpback Chub

As a theoretical matter, the question of whether the Endangered Species Act takes precedence over the Colorado River Compact, the Mexican treaty, the Colorado River Basin Project Act, and other laws regulating the use of Colorado River water presents an interesting and difficult legal question.⁸⁸ However, as far as the operation of Glen Canyon Dam is concerned, that question is hypothetical at this time because the measures identified by the Fish and Wildlife Service as necessary for protection of the chub do not conflict with the demands of water supply and storage. These measures—elimination of the daily fluctuations in releases and increasing the temperature of the water released from the dam—would not affect the total amount of water released over the course of a year. And, as noted above, any measure that does not affect the total amount of water released over the course of a year does not affect Lower Basin water users and does not affect compliance with the laws governing water use and storage.

On the other hand, measures to change daily release patterns and water temperature are likely to affect other resources and uses, including non-native sport fisheries and electric power production. However, as will be discussed in the following sections, these other resources and uses enjoy a lower level of legal protection that is inferior to the mandatory requirements of the Endangered Species Act.

D. Hydroelectric Power Production

Although hydroelectric power production is one of the statutory purposes of Glen Canyon Dam, it is lower in legal priority than either water storage and supply or endangered species protection. Section 1 of the Colorado River Storage Project Act of 1956 (“CRSPA”), which authorized the construction of the dam, defined hydroelectric power production as an *incidental* purpose of the dam:

In order to initiate the comprehensive development of the water resources of the Upper Colorado River Basin, for the purposes, among others, of regulating the flow of the Colorado River, storing water for beneficial consumptive use, making it possible for the States of the Upper Basin to utilize, consistently with the provisions of the Colorado River Compact, the apportionments made to and among them in the Colorado River Compact and the Upper Colorado River Basin Compact, respectively, providing for the reclamation of arid and

⁸⁷ Grand Canyon Protection Act § 1809.

⁸⁸ The question would be whether the requirements of these laws are sufficiently mandatory so as to preclude application of the Endangered Species Act or whether they leave some discretion that could be exercised in favor of protection of endangered species. See *Nat'l Ass'n of Home Builders v. Defenders of Wildlife*, 127 S. Ct. 2518 (2007); *supra* text accompanying notes 74-76.

species.

Finally, it is worth noting that the adverse effects of hydroelectric power production on the humpback chub and other native species are related not to the total amount of power produced but rather to the daily fluctuations in flows through the dam.⁹⁵ These fluctuations result from the attempt to maximize the *value* of the dam's power production by concentrating that production at times of peak demand.⁹⁶ But maximizing the *value* of power production is not mandated by the CRSPA, which refers only to producing the greatest practicable *amount* of power, or by any other statute. Therefore, any such value maximization is permissible, if at all, only if, and to the extent that, it does not jeopardize the existence of the humpback chub or any other threatened or endangered species.

E. Non-Native Fish

While the non-native sport fishery for rainbow trout at Lee Ferry is a significant tourist attraction and a source of local income,⁹⁷ it ranks low in the legal hierarchy of protected resources. Rainbow trout (*Oncorhynchus mykiss*), which are native to the West Coast but not to the Colorado River, are a very common species and are not listed as threatened or endangered. Because the population at Lee Ferry was developed after the completion of Glen Canyon Dam in 1963, it would be difficult to argue that it is among "the values for which Grand Canyon National Park [was] established" within the meaning of the Grand Canyon Protection Act since Grand Canyon National Park was established in 1919. Moreover, the National Park Service ("NPS") has generally interpreted its statutory mandate to protect wildlife in the National Parks⁹⁸ as referring to native, not introduced species, and current NPS policy disfavors the maintenance of populations of non-native species within the parks, especially where non-native species may pose a threat to native species, as rainbow trout do to humpback chub.⁹⁹

Recreational fishing for rainbow trout fits more plausibly within one of the purposes for which Glen Canyon National Recreation Area was established in 1972, namely, "public outdoor recreation use and enjoyment of Lake Powell and lands adjacent thereto." But the GCPA's broad instruction to "protect, mitigate adverse impacts to, and improve" an assortment of values that includes public outdoor recreation is not the kind of specific instruction for protection of rainbow trout that can compete with the Endangered Species Act's specific mandate to avoid jeopardy to the humpback chub, or the Colorado River Compact's allocation of water between the Upper Basin and the Lower Basin. If

⁹⁵ See *supra* text accompanying note 61.

⁹⁶ See *supra* text accompanying note 23.

⁹⁷ See *supra* text accompanying note 45.

⁹⁸ 16 U.S.C. § 1 (2000).

⁹⁹ See *supra* text accompanying note 51.

1. Alternative Flow Regimes

The principal difference distinguishing the alternatives in the EIS from each other was in the degree of daily fluctuation in water flows to be permitted. Permitting large fluctuations would take maximum advantage of the dam's ability to supply peaking power,¹⁰⁸ but would be harmful to fish and other resources in the Grand Canyon. Thus, the different alternatives analyzed in the EIS represented different potential levels of trade-off between power production and resource protection. The alternatives analyzed varied from the "No Action" alternative,¹⁰⁹ which would have perpetuated the 1963-1991 operations under which flows often varied by more than 25,000 cfs each day, to the "Year-Round Steady Flow" alternative, which, as its name suggests, would have required a steady flow of water through the dam throughout the year.¹¹⁰ Intermediate alternatives included several that would have allowed some daily fluctuation but restricted the magnitude of the fluctuation,¹¹¹ and a "Seasonally Adjusted Steady Flow" ("SASF") alternative that would have eliminated daily fluctuations but allowed flow through the dam to vary seasonally, with the highest flows (18,000 cfs) in May and June and the lowest flows (8000 cfs) in October, November, and December.¹¹² This alternative, which was designed to protect and enhance native fish populations, would have mimicked, to a limited degree, the natural seasonal flow pattern that prevailed before the dam was built.

The 1995 EIS identified as the Bureau's preferred alternative the "Modified Low Fluctuating Flow" ("MLFF") alternative, which was similar to the interim operating criteria under which the dam had been operating since 1991.¹¹³ Under this alternative, two important constraints would be placed on the degree of daily fluctuation in flows through the dam. First, the flow would not be permitted to drop below 5000 cfs at night or below 8000 cfs during the day, nor to exceed 25,000 cfs (about 25% below the power plant capacity of 33,000 cfs) at any time.¹¹⁴ Second, and most important, the difference between the maximum and minimum flow in any one day would not be permitted to exceed 5,000-8,000 cfs, the exact limit depending on the total monthly release volume from the dam.¹¹⁵ This constraint, which was essentially the same as that imposed by the interim operating criteria, was a substantial reduction in fluctuation compared to the 25,000+ cfs variation permitted before 1991 and analyzed

¹⁰⁸ See *supra* text accompanying notes 10-12, 22-23.

¹⁰⁹ GLEN CANYON DAM EIS, *supra* note 104, at 19-23.

¹¹⁰ *Id.* at 33.

¹¹¹ *Id.* at 24-30.

¹¹² *Id.* at 32-33.

¹¹³ *Id.* at 27-29.

¹¹⁴ *Id.* at 28. An exception was made to the 25,000 cfs limit for emergencies and for "high inflow and storage conditions," i.e., when Lake Powell is full and high releases are required to avoid overtopping the dam. *Id.*

¹¹⁵ *Id.*

it would adversely modify or destroy critical habitat, of both the razorback sucker and the humpback chub.¹²²

In finding that the MLFF alternative would jeopardize the razorback sucker and the humpback chub, the BO noted that much was still unknown about the effects of dam operations on native fish, but it discussed numerous ways, some beneficial and some harmful, in which dam operations under that alternative would likely affect these fish. On the positive side, as compared to the No Action alternative, the BO found that the MLFF alternative would benefit the chub and the razorback sucker by increasing minimum flows, decreasing maximum flows, and reducing the magnitude of daily flow fluctuations. However, according to the BO, the MLFF alternative did not go far enough in the direction of steadying flows. The three-foot daily fluctuation in river level permitted by the MLFF alternative would still be enough to eliminate most of the backwater habitat needed by the chub.¹²³ Moreover, the MLFF alternative would do nothing to alleviate two other effects of the dam, namely, the year-round maintenance of water temperatures too cold for spawning and for healthy growth and development of young fish, and the loss of the sediment needed to maintain beaches and sandbars.

According to the BO, as a result of these three factors—continuing (though reduced) daily flow fluctuations, continued lack of sediment, and continued cold water in the mainstem of the Colorado—spawning and recruitment of young humpback chub would continue to be largely precluded in the mainstem and confined to the warmer, more sediment-laden tributary waters of the Little Colorado River. And with the chub population so dependent on a single, relatively small stream, it is unacceptably vulnerable to decimation by water pollution, a chemical spill, or some other catastrophic event or chronic condition.¹²⁴ Therefore, the BO concluded, operation of Glen Canyon Dam under the Bureau's preferred alternative, MLFF, would jeopardize the continued existence of the humpback chub, as well as the razorback sucker, in violation of section 7 of the Endangered Species Act.¹²⁵

2. Reasonable and Prudent Alternative

Pursuant to section 7(b)(3)(A) of the Endangered Species Act,¹²⁶ the BO described a "reasonable and prudent alternative" ("RPA") under which, in the judgment of the Fish & Wildlife Service, Glen Canyon Dam could be operated without jeopardy to the humpback chub or the razorback sucker.¹²⁷ The RPA's prescription for dam operations differed from the MLFF alternative in two sig-

¹²² *Id.* at 3.

¹²³ *Id.* at 23-24.

¹²⁴ *Id.* at 20, 21, 32.

¹²⁵ *Id.* at 3.

¹²⁶ 43 U.S.C. § 1536(b)(3)(A) (2000); *see supra* text accompanying note 78.

¹²⁷ 1994 BIOLOGICAL OPINION, *supra* note 37, at 33-39.

D. The Bureau of Reclamation's Response to the 1994 Biological Opinion

On April 6, 1995, the Bureau of Reclamation sent a memorandum to the Fish & Wildlife Service responding to the Service's 1994 Biological Opinion, including the RPA.¹³⁶ The memorandum expressed a mix of grudging submission, skepticism, and defiance. The memorandum began by stating that "[i]t is our intent to implement the elements of the Reasonable and Prudent Alternative (RPA)"¹³⁷ but then went on to challenge the legal basis for the Service's determination that the Bureau's preferred MLFF alternative would jeopardize the continued existence of the humpback chub.¹³⁸ Of course, the *raison d'être* for the RPA was the Service's determination that the MLFF alternative would jeopardize the chub and adversely modify its critical habitat.¹³⁹ Absent the jeopardy and adverse modification determinations, the Bureau would be under no legal compunction to follow the RPA. But the Bureau's memorandum indicated that the Bureau, in recognition of its broader responsibility to utilize its resources in furtherance of the purposes of the ESA,¹⁴⁰ would implement the RPA despite its view that the Service's jeopardy determination was unjustified.¹⁴¹

However, in its discussion of the several specific elements of the RPA, the Bureau strongly hinted that it did not intend to implement the RPA's requirement for steady flows in the prompt manner that the RPA required and that it might not implement that requirement at all. The memorandum implied that the RPA did not describe the steady flow requirement with sufficient specificity and expressed doubt as to whether this requirement met the regulatory definition of an RPA.¹⁴² It also treated steady flows as a risky experiment that should not be undertaken without great caution and thorough preparation.¹⁴³ (This rhetoric, which turned reality on its head by implying that turning the river up and down on a daily basis to enhance power revenues was the safe, conservative course of action, was a tactic that the Bureau would employ repeatedly as it resisted implementation of steady flows over the next decade.) It concluded that "it will be difficult at best to implement the flows within the period of time

GLEN CANYON DAM MODIFICATIONS TO CONTROL DOWNSTREAM TEMPERATURES: PLAN AND DRAFT ENVIRONMENTAL ASSESSMENT (1999), available at <http://www.usbr.gov/uc/envprog/environment/pdfs/gcdtc.pdf>.

¹³⁶ Memorandum from Charles A. Calhoun, Reg'l Dir., Upper Colo. Reg'l Office, U.S. Bureau of Reclamation, U.S. Dept of the Interior, to Reg'l Dir., Region 2, U.S. Fish & Wildlife Serv., U.S. Dept of the Interior (Apr. 6, 1995) (on file with author) [hereinafter BuRec Response to RPA].

¹³⁷ *Id.* at 1.

¹³⁸ *Id.* at 1-3.

¹³⁹ See *supra* text accompanying notes 77-78 (setting forth ESA's connection between jeopardy determinations and RPAs).

¹⁴⁰ BuRec Response to RPA, *supra* note 136, at 3; see 16 U.S.C. § 1536(a)(1) (2000).

¹⁴¹ BuRec Response to RPA, *supra* note 136, at 3, 8.

¹⁴² *Id.* at 4; see 50 C.F.R. § 402.02 (2006) (defining "reasonable and prudent alternatives").

¹⁴³ BuRec Response to RPA, *supra* note 136, at 4.

the AMWG comprises representatives of federal agencies, each of the Colorado River Basin states, environmental groups, recreational interests, and the electric power industry. The AMWG's responsibilities include "[p]rovid[ing] the framework for AMP policy, goals, and direction," making recommendations to the Secretary regarding possible decisions to modify dam operations, and ensuring that any such decisions are incorporated into operating plans and ongoing activities.¹⁴⁸

According to the ROD, the Bureau intended to rely heavily on the AMWG to ensure that future dam operations protected downstream resources as required by the Endangered Species Act, the Grand Canyon Protection Act, and other laws. The ROD stated that, should the impacts of the flows and fluctuations permitted by the selected MLFF alternative differ from the predictions of the EIS, the AMWG would make recommendations to the Secretary to modify those parameters.¹⁴⁹ It also assigned to the AMWG the responsibility to recommend the timing, duration, and magnitude of the Beach/Habitat-Building Flows designed to rebuild beaches and sandbars and restore backwater habitats.¹⁵⁰

3. The ROD's Treatment of the Fish & Wildlife Service's Biological Opinion

Despite the Bureau's having informed the Fish & Wildlife Service that it intended to implement the RPA prescribed in the Service's 1994 Biological Opinion, the ROD barely mentioned the BO. The ROD did not reveal that the Fish and Wildlife Service had determined that the alternative the Bureau was adopting (MLFF) would violate the Endangered Species Act. Nor did the ROD describe, let alone adopt, the RPA, with its requirement for a program of steady high flows in the spring and steady low flows in the summer and fall in low-water years.

The ROD's lone mention of the BO was in a section in which the Bureau responded to public comments that it received after publication of the final EIS:

COMMENT: Endorse the Fish & Wildlife Service's Biological Opinion and implement experimental steady flows to benefit native fishes, subject to the results of a risk/benefit analysis now in progress.

RESPONSE: The preferred alternative provides for experimental steady flows through the Adaptive Management Program for the reasons put forth in the Biological Opinion.¹⁵¹

This response, which does not claim that the Bureau will actually follow the prescription of the RPA, is confusing and somewhat misleading. The only arguably "steady" flows that the preferred alternative (MLFF) provided for

¹⁴⁸ *Id.* at 36.

¹⁴⁹ 1996 RECORD OF DECISION, *supra* note 145, at 3, 4.

¹⁵⁰ *Id.* at 10; *see supra* Part IV.B.2.

¹⁵¹ 1996 RECORD OF DECISION, *supra* note 145, at 8-9.

habitat maintenance flow (a high flow within the power plant capacity of 33,000 cfs¹⁵⁹) for two days in November 1997.¹⁶⁰

The Bureau, in memoranda to the Fish & Wildlife Service, cited these high flows as evidence of partial compliance with the RPA's requirement¹⁶¹ for "high steady flows in the spring and low steady flows in summer and fall during low water years" to enhance and maintain fish habitat.¹⁶² The Fish & Wildlife Service, however, concluded that the Bureau was not making sufficient progress to comply with the RPA:

This element [steady flows] has not seen sufficient progress. Other than the controlled BHBF in 1996, there have been minimum efforts to develop experimental flows for native fishes. The 1997 Fall Maintenance Flow and canceled 1998 BHBF were designed to protect sediment resources. Although there was some expectation that backwaters and other nearshore habitats could be rejuvenated by these flows, this was not the purpose of the flows.¹⁶³

Moreover, in an earlier memorandum the Fish & Wildlife Service had emphasized that BHBFs and habitat maintenance flows alone could never satisfy the requirements of the RPA because the RPA required not only periods of high steady flows but also periods of *low* steady flows in the summer and fall to provide conditions for rearing and growth of young chub:

The December 1994 Biological Opinion called for a program of experimental flows to include high steady flows in the spring and low steady flows in summer and fall. . . . Although the Service supported the beach/habitat maintenance flow as a means of reforming backwater channel habitats which could be used by native fishes, the dismissal of the low steady flows in summer and fall indicates only partial progress toward meeting the intent of this element of the RPA. . . . The Service is not aware of progress towards designing a program of experimental flows which will include high steady flows in the spring and low steady flows in the summer and fall.¹⁶⁴

Subsequently, in 2000, the Bureau conducted two additional four-day habitat maintenance flows and a single period of low (8000 cfs) steady flow for

B8.

¹⁵⁹ See *supra* text accompanying note 119.

¹⁶⁰ SCORE REPORT, *supra* note 8, at 8, 14.

¹⁶¹ See *supra* text accompanying note 128.

¹⁶² Memoranda from Charles A. Calhoun, Reg'l Dir., Upper Colo. Reg'l Office, U.S. Bureau of Reclamation, U.S. Dep't of the Interior, to Field Supervisor, U.S. Fish & Wildlife Serv., Phoenix, Ariz. (Nov. 27, 1996, and Dec. 12, 1997) (on file with author). The term "sufficient progress" was apparently taken from the RPA itself, which required that the Bureau implement Seasonally Adjusted Steady Flows "[i]f the Service believes there is not sufficient progress" in implementing the program of experimental steady flows prescribed in the RPA. See *supra* text accompanying note 133.

¹⁶³ Memorandum from Field Supervisor, Fish & Wildlife Serv., U.S. Dep't of the Interior, to Reg'l Dir., U.S. Bureau of Reclamation, Salt Lake City, Utah 3 (May 27, 1999) (on file with author).

¹⁶⁴ Memorandum from Field Supervisor, Ariz. Ecological Servs. Field Office, U.S. Fish & Wildlife Serv., U.S. Dep't of the Interior, to Reg'l Dir., U.S. Bureau of Reclamation, Salt Lake City, Utah 2 (Apr. 3, 1997) (on file with author).

for the humpback chub.¹⁷⁰ Instead, working through the Adaptive Management Program established under the 1996 Record of Decision, the Bureau modified the dam's operations in two ways. First, it made future BHBFs contingent on, and required that they be timed to take advantage of, significant inputs of sediment into the Colorado by floods from its tributary, the Paria, at Lee Ferry.¹⁷¹ The idea behind this change was that the high flow of a BHBF can be effective at restoring beaches and sandbars if and only if it occurs at a time when there is sufficient sand available in the river bottom for the flood to lift onto the beaches and sandbars. And data collected and analyses performed since 1996 indicated that sufficient sand was present in the river bottom only for a limited time following a large input from a flood on the Paria before it was swept downstream into Lake Mead.¹⁷² The new plan for BHBFs was designed to fit them within this window of opportunity. A BHBF under the new plan was conducted in November 2004.¹⁷³

Second, the Bureau created a new type of experimental flow, "the non-native fish suppression flow." This type of flow, which is suspiciously (to this author) similar to the highly fluctuating flows permitted before 1991, involves ramping the river up and down from a minimum flow of 5000 cfs to a maximum of 20,000 cfs every day for three months during the winter and early spring, ostensibly for the purpose of disrupting the spawning and recruitment of rainbow trout.¹⁷⁴ Such flows were conducted in 2003, 2004, and 2005.¹⁷⁵ Of course, one effect of such flows was to restore, for three months each winter in those years, most of the peaking power generation that had been taken away by the MLFF's restrictions on daily flow fluctuations, but that was not the Bureau's publicly-stated purpose for instituting such flows.¹⁷⁶

H. The 2007 Grand Canyon Trust Lawsuit

In December 2007, the Grand Canyon Trust, one of the two environmental

¹⁷⁰ See *supra* text accompanying note 133.

¹⁷¹ See 2002 FISH SUPPRESSION EA, *supra* note 169, at 27.

¹⁷² See *id.* at 24.

¹⁷³ See *id.* at 27.

¹⁷⁴ *Id.* at 38-39.

¹⁷⁵ SCORE REPORT, *supra* note 8, at 8.

¹⁷⁶ A proposal for similar flows prepared by the Western Area Power Administration, which markets power from Glen Canyon Dam, labeled such flows "load following" flows, demonstrating, if there was any doubt, that the similarity was not coincidental. See Alternative Experimental Flow Regimes in WY 2002-2003 for Consideration by the TWG, Preliminary Draft (Mar. 14, 2002), available at <http://www.usbr.gov/uc/rm/amp/twg/mtgs/02mar20cc/Attach3.pdf>.

Although such flows were designed to disrupt rainbow trout spawning and recruitment, they were nonetheless considered to likely be beneficial to the rainbow trout sport fishery, which had suffered from an excessive number of small fish and a paucity of large fish. It was hoped that reducing the number of fish competing for the river's limited food resources would allow the remaining fish to grow bigger. See SCORE REPORT, *supra* note 8, at 38.

ments and that it still treats other resources—hydroelectric power production and non-native sport fisheries—with a higher priority than the law provides. The EA explains that, despite the requirements of the RPA, the Bureau avoided proposing low steady flows during the summer months because steady flows at that time would have a greater impact on hydropower production than in the fall.¹⁸⁴ It also indicates that the timing of the proposed high-flow event was chosen to minimize the public perception of harm to trout fishing opportunities rather than to maximize benefits to the endangered chub.¹⁸⁵

V. THE CAUSES OF THE BUREAU OF RECLAMATION'S CONTINUING NON-COMPLIANCE WITH THE ENDANGERED SPECIES ACT

As demonstrated in the narrative above, for the last dozen years, the Bureau of Reclamation has failed to comply with the Reasonable and Prudent Alternative set forth in the Fish & Wildlife Service's 1994 Biological Opinion. Under the RPA, the Bureau should have implemented a program including low steady flows in the summer and fall beginning in 1997, but it did not. Once the Fish & Wildlife Service determined that the Bureau was not making sufficient progress with respect to steady flows, the Bureau should have begun operating Glen Canyon Dam according to the Seasonally Adjusted Steady Flows alternative, but again it did not. Because the Bureau has failed to implement the RPA, it has been operating Glen Canyon in a manner that the Fish & Wildlife Service has determined jeopardizes the continued existence of the humpback chub and adversely modifies the chub's critical habitat. The Bureau has therefore been in violation of section 7 of the Endangered Species Act.

In memoranda to the Fish & Wildlife Service, the Bureau has offered two reasons for its failure to implement the steady flows required by the RPA: (1) a purported need for additional research, analysis, planning, and collection of baseline data before implementing low steady flows, and (2) delays caused by the Glen Canyon Dam Adaptive Management Program. This Part discusses these two purported reasons and concludes that the first does not justify the Bureau's failure to implement the RPA. On the other hand, the AMP, which effectively substitutes collaborative decisionmaking by a diverse group of stakeholders for the legal requirements of the Endangered Species Act, has played a significant role in facilitating, if not causing, the Bureau's non-compliance with the Act.

A. *The Purported Need for Additional Research, Analysis, Planning, and Baseline Data Collection*

Ever since the Fish & Wildlife Service developed the RPA calling for a program of steady flows, the Bureau of Reclamation has treated such flows as

¹⁸⁴ 2008 EXPERIMENTAL RELEASES EA, *supra* note 179, at 12.

¹⁸⁵ *See id.* at 13.

that it would "strive to have a complete program of experimental flows developed" by later that year.¹⁹⁰

The problem with the Bureau's insistence on the need for additional planning and study before it can implement the steady flows required by the RPA is that, during the many years it has been conducting this planning and study, the Bureau has been operating Glen Canyon Dam under a prescription, the MLFF alternative, that was itself never subjected to the years of additional planning and study that the Bureau now claims are a prerequisite to steady flows. The MLFF alternative and the Seasonally Adjusted Steady Flows alternative were presented side-by-side in the Bureau's 1995 EIS, were described with the same level of specificity, and were subject to the same level of environmental analysis. The Bureau promptly adopted the MLFF alternative on completion of the EIS, yet it subsequently claimed that steady flows could not be adopted without years of additional study and planning.

Moreover, current operations under the MLFF regime, which cause the level of the Colorado River in the Grand Canyon to rise and fall by three feet every day in order to enhance the value of power production, are a major departure from the natural condition of the river, and have already been determined by the Fish & Wildlife Service to jeopardize endangered native fish and adversely modify their critical habitat. Steady flows, in contrast, would simply be an exercise in letting the river run, for limited times, in a manner that more closely resembles the natural conditions under which the fish survived and propagated for thousands of years. To treat the MLFF as a safe, default position, while treating steady flows as a radical departure, strains credibility.

The Bureau's position that steady flows are an experiment that should not be implemented without years of preparatory study and planning is also glaringly inconsistent with the Bureau's willingness to adopt, with relatively little study and planning, the severely fluctuating "non-native fish suppression flows" that were implemented in 2003, 2004, and 2005, for three months each time.¹⁹¹ These flows were a much more radical experiment, in the sense that they involved a much greater artificial manipulation of the river environment, than either the MLFF alternative or the steady flows required by the RPA. They also depended on the previously untested hypothesis that they would benefit, rather than harm, native fish by reducing non-native fish populations. Nonetheless, they were planned and executed in a remarkably short time. After a problem was identified based on scientific data and analyses published in 2001 and 2002,¹⁹² an environmental assessment was published in September

¹⁹⁰ Memorandum from Rick L. Gold, Reg'l Dir., Upper Colo. Reg'l Office, U.S. Bureau of Reclamation, U.S. Dep't of the Interior, to Field Supervisor, U.S. Fish & Wildlife Serv., Phoenix, Ariz. 2-3 (May 8, 2002) (on file with author) [hereinafter 2002 Implementation Status Memo].

¹⁹¹ See *supra* text accompanying notes 174-76.

¹⁹² See 2002 FISH SUPPRESSION EA, *supra* note 169.

1. Function of the AMP

As described above, the heart of the AMP is the Adaptive Management Work Group, a federal advisory committee that, among other things, provides recommendations to the Secretary of the Interior regarding modifications to the operations of Glen Canyon Dam.¹⁹⁸ As will be discussed below, the AMWG has never recommended to the Secretary that the Bureau implement the low steady flows required by the Fish & Wildlife Service's RPA, and an overwhelming majority of the AMWG recently voted against a motion to recommend adoption of Seasonally Adjusted Steady Flows as required by the "hammer" clause of the RPA.¹⁹⁹ Thus, in a very direct sense, the AMWG has been a force against implementation of the RPA.

Of course, as an advisory committee, the AMWG has no legal authority to mandate or veto changes in dam operations, nor can its recommendations excuse a violation of the Endangered Species Act by the Bureau of Reclamation. Nonetheless, the Interior Department has assigned the AMWG a role that far exceeds simply providing advice. It has described the AMWG as the "key" to the AMP, and the AMP is the Bureau's program for deciding on possible changes to future dam operations:

All of the elements are now in place for an effective, credible adaptive management effort. The AMWG is the key; the TWG [Technical Work Group] providing detailed guidance on issues and objectives; the Science Center to conduct the research and monitoring needed to evaluate operations; and the independent review panel, the outside review necessary to provide the credible science.

The AMWG continues public involvement in the decision-making process and incorporates those stakeholders with interest in the operation of Glen Canyon Dam and downstream resources. By blending the best science and management practices, the AMWG makes recommendations to the Secretary on how to protect the resources and meet the requirement of the law.²⁰⁰

Given the resources and the credibility that the Interior Department has invested in the AMP, to which the AMWG is the "key," and given its claim that the AMWG "blend[s] the best science and management practices," the Interior Department would be hard-pressed to turn around and ignore its recommendations.

The extent to which the AMP has actually caused, rather than acted as a public excuse for, the Bureau's failure to comply with the Fish & Wildlife Service's RPA cannot be known without reading the minds of the Bureau's decisionmakers (or their superiors in the Interior Department and the White House). But given the Bureau's own statements that its failure to timely im-

¹⁹⁸ See *supra* text accompanying note 148.

¹⁹⁹ See *supra* text accompanying note 133.

²⁰⁰ Glen Canyon Dam Adaptive Management Program – Background Reclamation UC Region, <http://www.usbr.gov/uc/tm/amp/background.html#background> (last visited May 17, 2008).

The AMWG is supported by a Technical Work Group ("TWG") that provides advice and recommendations to the AMWG on scientific and technical issues, but the TWG, despite its title, is not actually a scientific or technical committee. It comprises one representative from each of the same twenty-five entities that are represented on the AMWG itself. Although these representatives are supposed to be "technical," the TWG is, in essence, another stakeholder committee that simply mirrors the AMWG in composition.

3. *Bringing the Issue to a Head: A Recent Vote of the AMWG*

A recent vote of the AMWG brought into sharp focus the conflict between the multi-stakeholder composition of the AMWG and the legal priority that is supposed to be given to protection of endangered species. At an AMWG meeting on August 30, 2007, the representative of the Grand Canyon Trust, one of the two environmental representatives on the committee, moved that the committee recommend to the Secretary of the Interior that Glen Canyon Dam be operated under a regime of Seasonally Adjusted Steady Flows, i.e., essentially what is required by the "hammer" clause of the RPA issued by the Fish & Wildlife Service over a dozen years ago. The motion was defeated by a vote of thirteen to four, with four representatives abstaining and three absent.²⁰³ Voting for the motion, besides the Grand Canyon Trust, were the representatives of the Grand Canyon River Guides, the National Park Service, and the Fish & Wildlife Service. Votes against the motion included the representatives of all of the basin states, the Bureau of Reclamation and its power marketer the Western Area Power Administration, electric power companies, the Federation of Fly Fishers, and the Pueblo of Zuni.²⁰⁴ Thus, the voice of the Fish & Wildlife Service, the agency authorized by the Endangered Species Act to determine what changes in dam operations are needed to prevent extinction of the humpback chub, was reduced to one of four dissenting votes against an overwhelming committee majority determined to avoid making those changes.

VI. HOW ADAPTIVE MANAGEMENT OF GLEN CANYON DAM WENT WRONG

The Adaptive Management Program for Glen Canyon Dam has given adaptive management a bad name by causing, or at least facilitating, extended non-compliance with the Endangered Species Act by the Bureau of Reclama-

boaters in the Grand Canyon. Moreover, at least one of the entities included in this count, the Arizona Game and Fish Department, has an institutional mission that includes promotion of sport fisheries, including the rainbow trout fishery on the Colorado River whose maintenance may conflict with protection of the chub.

²⁰³ E-mail from Linda Whetton, Mgmt. Analyst, Upper Colo. Region, U.S. Bureau of Reclamation, U.S. Dep't of the Interior to the author (Oct. 9, 2007) (on file with author) (with attached spreadsheet); *see also* Letter from Nikolai Ramsey, Grand Canyon Trust, to Dirk Kempthorne, Sec'y of the Interior (Sept. 18, 2007) (on file with author) (containing a minority report on the defeated motion).

²⁰⁴ The other Native American tribal representatives abstained or were absent.

corrective action when outcomes differ from predictions. And "using the results to update knowledge and adjust management actions" can be achieved through a supplement to the EIS²⁰⁸ and re-initiation of section 7 consultation.²⁰⁹

Unfortunately, however, the Interior Department's definition of adaptive management also adds another element, which is less consistent with the ESA:

Adaptive management requires the participation of stakeholders. Stakeholders include people and organizations who use, influence, and have an interest, or "stake," in a given resource. Stakeholders should be involved early in the adaptive management cycle, to help assess the problem and design activities to solve it. Stakeholders also can help to implement and monitor those activities, and participate in the evaluation of results. Involvement of stakeholders from the beginning increases management effectiveness and the likelihood of achieving agreed-upon outcomes.²¹⁰

While collaboration among stakeholders may be an attractive concept from many perspectives, it is not a logical or necessary part of the definition of adaptive management.²¹¹ Monitoring the effects of management actions and incorporating the results of that monitoring into future management decisions can be performed by an agency or by a group of experts; it does not require the collaboration of stakeholders.²¹² And while the notion of a partnership between

²⁰⁸ See 40 C.F.R. § 1502.9(c) (2006).

²⁰⁹ See 50 C.F.R. § 402.16 (2006).

²¹⁰ TECHNICAL GUIDE, *supra* note 205, at 4-5 (citations and emphasis omitted).

²¹¹ Professor Adler also argues that adaptive management and stakeholder collaboration are two distinct concepts, and that the Glen Canyon Dam Adaptive Management Program has improvidently merged the two. "[M]erging those goals [stakeholder collaboration and adaptive management] into a single interactive process serves neither goal well, and fundamentally misconstrues the concept of adaptive management." Adler, *supra* note 80, at 103.

Collaborative management by stakeholders should not be confused with providing opportunities for, and consideration of, public input. This author has argued that public input is essential to informed agency decisionmaking. See, e.g., Joseph M. Feller, *Grazing Management on the Public Lands: Opening the Process to Public Participation*, 26 LAND & WATER L. REV. 571 (1991). Moreover, the Grand Canyon Protection Act requires the Secretary of the Interior to consult with the public, including the parties represented on the AMWG. See Grand Canyon Protection Act of 1992 §§ 1804(c)(3), 1805(c), Pub. L. No. 102-575, 106 Stat. 4600, 4671-72. But consultation with various parties and consideration of their input is not the same thing as deference to a majority or consensus of their views. The purpose of seeking public input should be to ensure that agency decisionmakers are fully informed, not to ensure that their decisions are acceptable to all, or a majority of, interested parties.

²¹² See, e.g., ADAPTIVE ENVIRONMENTAL ASSESSMENT AND MANAGEMENT (C.S. Holling ed., 1978); CARL WALTERS, ADAPTIVE MANAGEMENT OF RENEWABLE RESOURCES (1986). These two works, which are described as "seminal" by the Interior Department's Adaptive Management Technical Guide, TECHNICAL GUIDE, *supra* note 205, at 1, extensively describe and discuss adaptive management processes, but do not include stakeholder collaboration as a necessary component of such processes. The former work, at pages 140-297, presents five case studies of adaptive environmental assessment and management, none of which involves a stakeholder committee.

A third work described as "seminal" in the Technical Guide does place heavy emphasis on negotiation among diverse parties. See KAI N. LEE, COMPASS AND GYROSCOPE:

Stakeholders have achieved a degree of respect for the positions of one another and they share a commitment to using science to achieve a better understanding of the relationship between dam operations and Colorado River resources.²¹⁶

The report concedes, however, that the goals of actually improving habitat for, and recovering the population of, the endangered humpback chub have proven “challenging” and that “[d]uring the course of the [AMP], both recruitment of this fish and population levels of adults have declined.”²¹⁷ The report concludes that “[t]he net effect [of the Adaptive Management Program] may not be to speed the process so much as to assure that there is greater agreement on the outcome.”²¹⁸

From the perspective of the hierarchy of laws governing management of Glen Canyon Dam, a committee of multifarious stakeholders is peculiarly unsuited to make recommendations regarding the management of the dam. These laws provide essentially two mandates, one governing total annual releases of water from the dam and the other effectively governing seasonal and daily variations. A stakeholder committee is not well-suited to achieving compliance with either mandate.

Total annual releases from Glen Canyon Dam are governed by the provisions of the Colorado River Compact, the Boulder Canyon Project Act, and other laws regarding the division of water between the Upper and Lower Basin states. In a process completely separate from the Glen Canyon Dam Adaptive Management Program, the Department of the Interior recently adopted detailed guidelines for annual releases that are designed to ensure compliance with those requirements.²¹⁹ These guidelines, which were recommended to the Department of the Interior by the seven basin states, will govern annual releases from the dam, leaving no role for a stakeholder committee.

As for seasonal and daily fluctuations, the task facing the Bureau is to choose, within the constraint imposed by the total annual release requirements, that seasonal and daily flow pattern that has the greatest likelihood of conserving and restoring endangered fish populations, particularly the humpback chub, and their habitat. Making that choice is an extraordinarily difficult problem requiring expertise and judgment in fisheries biology, hydrology, sedimentology, and other disciplines. And a process of experimentation and adaptation may be an excellent process for finding the right choice. But it is hard to see how finding the right choice will be, or has been, aided by a stakeholder committee consisting of twenty-five individuals who were chosen, not because of their exper-

²¹⁶ *Id.* at 6.

²¹⁷ *Id.* at 5.

²¹⁸ *Id.* at 6.

²¹⁹ U.S. DEPT OF THE INTERIOR, RECORD OF DECISION—COLORADO RIVER INTERIM GUIDELINES FOR LOWER BASIN SHORTAGES AND THE COORDINATED OPERATIONS FOR LAKE POWELL AND LAKE MEAD 1 (Dec. 13, 2007), available at <http://www.usbr.gov/lc/region/programs/strategies/RecordofDecision.pdf>.

pass because it is treated now as the "no action" alternative, requiring no committee meetings, no study, and no approval by the AMWG.²²³

The combination of the cumbersome nature of the Adaptive Management Program and the requirement of a two-thirds vote of the AMWG to recommend any change in dam operations has not only facilitated non-compliance with the Endangered Species Act, it has also been antithetical to the concept of adaptive management, which is supposed to be based on experimentation and adaptation. Instead of encouraging adaptation, the Adaptive Management Program has entrenched existing management of the dam and served as an excuse for the Bureau of Reclamation's failure to change that management. Given the effective rigging of the process in favor of continuance of the MLFF, it is no wonder that it remains the dominant management regime fourteen years after it was found unlawful by the Fish & Wildlife Service.

VII. A PROPOSAL FOR LAWFUL, ADAPTIVE, NON-COLLABORATIVE MANAGEMENT OF GLEN CANYON DAM

Management of Glen Canyon Dam can be harmonized with the Endangered Species Act and other applicable laws, as well as with principles of adaptive management, by correcting the two fundamental flaws identified in the previous part of this Article. Specifically:

(1) As soon as practicable, the Bureau of Reclamation should begin operating the dam under a regime of Seasonally Adjusted Steady Flows during the months of April through October of each year, as prescribed in the Reasonable and Prudent Alternative presented in the Fish & Wildlife Service's 1994 Biological Opinion. This prescription is also the same as that proposed in the failed motion that was supported by the Grand Canyon Trust, the U.S. Fish & Wildlife Service, the National Park Service, and Grand Canyon River Guides at the August 2007 AMWG meeting. This flow regime would be the starting point for future adaptive management of Glen Canyon Dam. If this flow regime fails to improve spawning and recruitment of humpback chub, departures from this regime could be implemented through the Adaptive Management Program.

(2) The AMWG and the TWG should be abolished. Funds currently devoted to the AMWG and the TWG should be used to create a special unit within the U.S. Fish & Wildlife Service dedicated to adaptive management of Glen Canyon Dam. This unit would comprise fisheries biologists, hydrologists, sedimentologists, and other specialists in disciplines relevant to the conservation of the humpback chub and other endangered species and their habitats in the Grand Canyon. This special unit would be responsible for annually reviewing and revising the Reasonable and Prudent Alternative in the 1994 Biological Opinion to incorporate, and adapt to, the latest information on the effects of

²²³ See, e.g., 2008 EXPERIMENTAL RELEASES EA, *supra* note 179, at 8 (treating MLFF as the "no action" alternative).

Under existing law, the top priorities in dam operations are meeting the water supply mandates of the Colorado River Compact and associated laws, and conservation of endangered species. These two priorities are compatible, but neither priority requires, or is well-served by, the stakeholder committee at the heart of the existing Adaptive Management Program. The former priority is addressed by the annual water release guidelines that have been developed outside the Adaptive Management Program. Within the constraints of those guidelines, seasonal and daily flow patterns should be determined by an adaptive management program structured for the specific purpose of protecting endangered species rather than seeking collaboration and consensus among stakeholders.

This Article's insistence on legal compliance may be viewed by some as an archaic and inflexible reaction against a new, innovative, and promising paradigm of public resource management. To this view, I offer two brief responses. First, the democratic values that purportedly motivate proposals for stakeholder management also demand respect for the laws passed by the Congress that was elected by the public. In the broadest sense, all of the American people are stakeholders in the Grand Canyon and in the fish, wildlife, and other natural resources therein. These stakeholders have chosen Congress to represent them, and disobedience to the mandates of Congress disempowers them.

Second, in practice, the stakeholder-driven Adaptive Management Program for Glen Canyon Dam has not been innovative at all. Because it has, in effect, made a two-thirds vote of a large stakeholder committee a prerequisite to changes in dam operations, it has served to entrench existing dam management and prevent the kind of adaptation and experimentation that is supposed to be the hallmark of adaptive management. Ironically, strict adherence to the requirements of the Endangered Species Act would likely result in management that is more adaptive than current management, which is "adaptive" in name only.

EPILOGUE

On February 27, 2008, as this Article was nearing completion, the U.S. Fish & Wildlife Service issued a Biological Opinion on the Bureau of Reclamation's proposed five-year (2008–2012) plan for flows from Glen Canyon Dam.²²⁶ This new Biological Opinion concludes that the proposed plan, which would continue implementation of the MLFF alternative except for a single high-flow event in 2008 and steady flows in September and October each year, would not jeopardize the continued existence of the humpback chub or ad-

²²⁶ Memorandum from Field Supervisor, U.S. Fish & Wildlife Serv., U.S. Dep't of the Interior, Phoenix, Ariz., to Deputy Reg'l Dir., U.S. Bureau of Reclamation, Upper Colo. Region, Salt Lake City, Utah, (Feb. 27, 2008), available at <http://www.usbr.gov/uc/env/docs/bo/FinalGCDBO2-26-08.pdf> [hereinafter Final BO Memorandum]. For a discussion of the five-year plan, see *supra* Part IV.I.

reau's plan by calling on the Bureau to reform dam operations to include high flow events every year or two and steady flows during the summer (as opposed to the plan's single high flow event and fall-only steady flows) for the benefit of the humpback chub.²³² Finally, the new Opinion does not change the central thesis of this Article, namely, that the Bureau's Adaptive Management Program for Glen Canyon Dam has substituted the needs and desires of a group of stakeholders for the hierarchy of laws that should govern operation of the dam and that, for many years, the program facilitated non-compliance with the Endangered Species Act.

²³² April Reese, *Colorado River: High Flows Should Run Regularly to Restore Grand Canyon Resources, Park Chief Says*, LAND LETTER, Apr. 10, 2008, available at <http://www.eenews.net/Landletter/2008/04/10/4> (subscription required).