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### Glen Canyon Dam Operating Authority; Producing Electricity and Protecting the Grand Canyon Environment

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# COMMENT

## GLEN CANYON DAM OPERATING AUTHORITY; PRODUCING ELECTRICITY AND PROTECTING THE GRAND CANYON ENVIRONMENT

### INTRODUCTION

The Colorado River is the western United States' major water supply.<sup>1</sup> The dams, reservoirs and hydroelectric facilities on the Colorado River form a major integrated system of water storage and power production.<sup>2</sup> The Colorado River Compacts<sup>3</sup> and a treaty with Mexico<sup>4</sup> required the development of water allocation schedules for this great system. The sale of electric power produced by the river's hydroelectric facilities helps to pay for the dams, the numerous irrigation projects, and helps to defray operating costs of these major reclamation projects.<sup>5</sup>

The Colorado River flows through the Grand Canyon National Park.<sup>6</sup> Just above the park boundary, Glen Canyon Dam<sup>7</sup> impounds the Colorado River and creates Lake Powell.<sup>8</sup> The hydroelectric facility at Glen Canyon Dam is operated by the Bureau of Reclamation (BOR),<sup>9</sup> an agency within the Department of Interior. BOR operates

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1. Meyers, *The Colorado River*, 19 STAN. L. REV. 1 (1966).

2. *Id.*

3. The Colorado River Compact, ch. 72, 42 Stat. 171 (1921); Upper Colorado River Basin Compact, ch. 48, 63 Stat. 31 (1949).

4. Water Treaty with the United Mexican States, Feb. 3, 1944, United States-Mexico, ch. 72, 59 Stat. 1219, T.S. 994 (1945). The Treaty is known as the Mexican Water Treaty of 1944 as it was signed on February 3, 1944 and then ratified by the United States Senate on April 18, 1945. *Id.*

5. 43 U.S.C. § 620d (1988).

6. Meyers, *supra* note 1. See *infra* map page 221.

7. Glen Canyon Dam is located in northern Arizona on the main stem of the Colorado River at Page, Arizona. The 170-foot-high concrete dam creates Lake Powell which contains 27 million acre-feet of water and extends for 186 miles up the Colorado River and 71 miles up the San Juan River. M. ROBINSON, *WATER FOR THE WEST THE BUREAU OF RECLAMATION 1902-1977*, 86 (1979).

8. *Id.*

9. These acronyms and abbreviations are used throughout the paper for easy reference:

BCPA - Boulder Canyon Project Act  
BCPAA - Boulder Canyon Project Adjustment Act  
BOR - U.S. Bureau of Reclamation  
CRSP - Colorado River Storage Project Act  
EA - Environmental Assessment  
EIS - Environmental Impact Statement  
ESA - Endangered Species Act  
FONSI - Finding of No Significant Impact  
GCES - Glen Canyon Environmental Studies  
NEPA - National Environmental Policy Act  
NPOA - National Parks Organic Act  
OFM - Operational Flexibility Margin

the Glen Canyon Dam according to an electric power demand schedule directed by the Western Area Power Administration (WAPA).<sup>10</sup> WAPA, an agency of the Department of Energy, is responsible for marketing the electric power.<sup>11</sup>

Glen Canyon Dam is primarily used to regulate downstream water delivery, but also serves WAPA's needs as a "peaking" unit hydroelectric facility. Water output, thus, varies greatly on a daily basis in response to electrical demand.<sup>12</sup> This variation produces rapidly changing flows in the Colorado River downstream of the Glen Canyon Dam.<sup>13</sup> The varying flows threaten the future of the natural river

Protection Act - Grand Canyon Protection Act  
 Secretary - Secretary, U.S. Dep't of Interior  
 The Compact - The Colorado River Compact  
 The 1968 Act - The Colorado River Basin Project Act  
 The Upper Compact - The Upper Colorado River Basin Compact  
 WAPA - Western Area Power Administration

10. UNITED STATES DEP'T OF INTERIOR, GLEN CANYON ENVIRONMENTAL STUDIES: FINAL REPORT D-33 to D-34 (1988) [hereinafter GCES: FINAL REPORT]. The Department of Energy was formed in 1977 under Section 302 of Public Law 95-91 and assumed federal power marketing responsibilities. WAPA was established shortly thereafter by Secretarial Order to market and transmit federal power to fifteen western and central states. *Id.* at D-33. After the authorization and creation of WAPA, BOR and WAPA reached an agreement in 1980 defining their roles: BOR manages the reservoirs and generates hydroelectric power, and WAPA markets and transmits the power to the customers. *Id.* at D-34. WAPA operates and maintains approximately 16,200 circuit-miles of transmission lines and 240 substations which cover a distribution area of 1.25 million square miles. *Id.* at D-33.

11. WAPA's responsibilities include planning, designing, constructing, operating and maintaining the transmission systems. WAPA markets the federal power to a six-state area from Wyoming to Arizona and sets rates to assure that revenues are sufficient to accomplish repayment of all the operating and capital costs. *Id.* at D-34.

The marketing of the federal power is governed by several statutory criteria, including:

- (1) preference in the sale of power must go to municipalities, public corporations, cooperatives, and nonprofit organizations; (2) revenues generated from the sale of power must be adequate to pay for the total costs of generating the power and all allocated investment costs identified under the original CRSP Act; and (3) the power must be marketed at the lowest possible rates consistent with sound business practices.

*Id.*

The power generated at Glen Canyon Dam and the other powerplants is marketed either on a "long-term firm basis through electrical sales contracts, or on a short-term basis through agreements with firm power customers or associated utilities interconnected with the CRSP transmission system." *Id.*

12. GCES: FINAL REPORT, *supra* note 10, at 10-11. The Glen Canyon Dam hydroelectric facility is used as a peaking unit to generate electricity to meet the increasing demand during the peak usage periods of the day. The dam's output flow is increased accordingly. Then, when the demand for electricity decrease in the evening, the dam's power and flow output are decreased. *Id.*

13. The power plant at Glen Canyon Dam is a multiple-use facility capable of base load and peaking power operation. Glen Canyon Dam can vary the release of water on a daily, monthly, and seasonal basis to produce electricity. This allows generation of the electricity when it is most needed and its economic value is the greatest. For example, it is not uncommon for flows to be varied from 5,000 cfs [cubic feet per second] to 30,000 cfs in a day. Thus, the river level can change from seven to more than thirteen feet, depending upon the width of the river and distance downstream of the dam. *Id.*

environment.<sup>14</sup>

Hydroelectric power has always been viewed as a clean, efficient and renewable means of generating electricity. Although environmentalists have long complained about the devastation caused by the upstream impoundment of millions of acre feet of water,<sup>15</sup> historically little attention was paid to the downstream effects of a hydroelectric facility.<sup>16</sup> The attention of environmental groups and the government is now being focused on the adverse downstream effects of Glen Canyon Dam operations.

The Secretary of Interior (the Secretary) is not operating Glen Canyon Dam in a manner that effectively protects the Grand Canyon environment. The Glen Canyon operating criteria, created by the Secretary as required by statute,<sup>17</sup> do not address the environment. An attempt to correct this omission was made by proposed legislation called the Grand Canyon Protection Act (Protection Act).<sup>18</sup> The proposed legislation was a comprehensive directive to the Secretary to mitigate the adverse environmental effects of Glen Canyon Dam operations.<sup>19</sup>

Unfortunately, the Protection Act, as drafted, would have fallen short of protecting the Grand Canyon. The proposed legislation ordered studies and required reports, but did not mandate protection of the Grand Canyon river environment. This comment will illustrate (1) that the Protection Act, as drafted, would not have saved the Colo-

14. Two aspects of current operations, flood releases and fluctuating releases, were found to have substantial adverse effects on downstream resources. GCES: FINAL REPORT, *supra* note 10, at Summary And Principal Conclusions.

15. E. GOLDSMITH & N. HILDYARD, *THE SOCIAL AND ENVIRONMENTAL EFFECTS OF LARGE DAMS* (1984). The Bureau of Reclamation had plans for a dam on the Colorado River which would have flooded portions of the Grand Canyon National Park and National Monument. Intense opposition from the public resulted in the plans being dropped. Ragsdale, *Law and Environment in Modern America and Among the Hopi Indians: A Comparison of Values*, 10 HARV. ENVTL. L. REV. 417, 464 n.205 (1986).

16. E. GOLDSMITH & N. HILDYARD, *supra* note 15.

17. 43 U.S.C. § 1552 (1988). The operating criteria is a plan for the coordinated long-range operation of the reservoirs on the Colorado River. *Id.* See *infra* notes 51-58 and accompanying text for a further detailed explanation of the operating criteria.

18. The Grand Canyon Protection Act, H.R. 4498, 101st Cong., 2d Sess. (1990). The Grand Canyon Protection Act was a proposed bill that passed the U.S. House of Representatives on July 30, 1990. The United States Senate passed H.R. 2567 on October 26, 1990. The Senate bill was actually the Reclamation Reauthorization Bill which contained the Senate's version of the Grand Canyon Protection Act. It also contained many other miscellaneous bills including the Reclamation Reform Act Amendments. However, the Protection Act did not become law as the House negotiating staff (there was not enough time to call the Conference Committee) could not resolve the differences in the Reclamation Reform Act Amendment before the 101st Congress ended. Therefore, H.R. 2567 never reached the floor of the House for a final vote and the Grand Canyon Protection Act failed to get enacted. Telephone Interview with Steve Lanich, Associate Staff Director of the Interior Subcommittee on Water and Power and Offshore Energy Resources (Nov. 5, 1990). The full text of H.R. 4498 and S. 2807 is set out in APPENDICES A and B.

19. H.R. 4498, 101st Cong., 2d Sess. § 3(a) (1990) and S. 2807, 101st Cong., 2d Sess. § 3 (1990).

rado River environment; (2) that existing statutes provide the Secretary of Interior with sufficient legal authority to respond to the adverse environmental effects of erratic downstream flows; and (3) that the river and the Grand Canyon may be protected without sacrificing electric production.

### BACKGROUND

A comprehensive discussion of the Colorado River management system involves five sub-topics: the history of the river, the "Law of the River," statutory interpretations, operations of the Glen Canyon Dam, and current issues.<sup>20</sup>

#### *History of the River*

The Colorado River, which has its origin in the mountains of Wyoming and Colorado, drains some 250,000 square miles and travels through parts of seven western states.<sup>21</sup> In 1869, Major John Wesley Powell led the first documented expedition down the Colorado River, covering over 1,000 miles of uncharted rapids and scenic canyons. Powell's accounts of the Colorado River were reported in 1878.<sup>22</sup> He stated that the river would become the *sine qua non* to agriculture in the region.<sup>23</sup> Powell's theory, which he advocated to Congress, was to utilize the West's water and land resources efficiently by constructing dams and canals to divert rivers and store flood waters for summer use.<sup>24</sup>

The Bureau of Reclamation (BOR) was founded on similar principles under the 1902 Reclamation Act.<sup>25</sup> In the early 1900's, California farmers were trying to irrigate the Imperial Valley from the Colo-

20. Current issues include the controversy over the Environmental Impact Statement, the Glen Canyon Environmental Studies, and the drafting of the Grand Canyon Protection Act.

21. The main stream of the Colorado River is joined by two principal tributaries in western Colorado and eastern Utah; the Green River out of Wyoming and the Gunnison River which originates in Colorado. In southern Utah, the Colorado River is joined by the San Juan River. Lee's Ferry, Arizona, a key point for water measurement, is just below this confluence. Meyers, *supra* note 1, at 1-2.

22. Powell reported his experience with the Colorado River in REPORT ON THE ARID LANDS OF THE UNITED STATES WITH A MORE DETAILED ACCOUNT OF THE LANDS OF UTAH. This report was made to the Secretary of Interior, Carl Schurz, and was a compilation of Powell's recommendations and experiences in the arid west. It ultimately became recognized as one of the most important books ever written on the West. T. BOX, THE ARID LANDS REVISITED; 100 YEARS AFTER JOHN WESLEY POWELL 3 (1978).

23. NATIONAL ACADEMY OF SCIENCES, RIVER AND DAM MANAGEMENT: A REVIEW OF BUREAU OF RECLAMATION'S GLEN CANYON'S ENVIRONMENTAL STUDIES ix (1987) [hereinafter NATIONAL ACADEMY OF SCIENCES].

24. M. ROBINSON, *supra* note 7, at 11.

25. Reclamation Act of 1902, 43 U.S.C. §§ 371-616 (1988). The Reclamation Act was intended for "the construction and maintenance of irrigation works for the storage, diversion and development of waters for the reclamation of arid and semi-arid lands in the . . . States . . ." Reclamation Act, ch. 1093, 32 Stat. 388 (1902).

rado River.<sup>26</sup> However, the natural Colorado River flows varied from silt-laden floods in the spring to low flows during the later hot, dry summer months.<sup>27</sup> Due to these erratic flows and a series of floods in 1904-1905,<sup>28</sup> the farmers persuaded Congress to have the "Reclamation Service"<sup>29</sup> pursue a "high dam" to tame the Colorado River and an "All-American Canal" to deliver water consistently to the Imperial Valley in California.<sup>30</sup> Before Congress would approve building these structures, the seven Colorado River Basin states<sup>31</sup> had to develop an allocation compact that would define and protect each state's rights to the water.<sup>32</sup>

### *The "Law of the River"*

The seven Colorado River Basin states negotiated a compact that formally became the Colorado River Compact (the Compact).<sup>33</sup> This was the first of the Colorado River laws collectively known as the "Law of the River."<sup>34</sup> The Compact divides the Colorado River into an upper and lower basin at Lee's Ferry, Arizona.<sup>35</sup> Each basin was

26. In the late 1890's, an irrigation system was built by the California Development Company to irrigate and reclaim parts of Southern California's Imperial Valley. The irrigation system was completed in 1901. M. ROBINSON, *supra* note 7, at 49.

27. *Id.* These flows varied during the year from 4 million to 22 million acre-feet at Lee's Ferry. *Id.* at 85.

28. During the winter of 1904-1905, excessive rains caused the Colorado River to flood the Imperial Valley creating the immense Salton Sea. During these floods, the river ran uncontrolled and destroyed many homes and farms. *Id.* at 49.

29. Since the Reclamation Act did not create an organization to administer the reclamation program, Secretary of Interior, Ethan Allen Hitchcock, created a Reclamation Service within the United States Geological Survey. The Reclamation Service later became known as the Bureau of Reclamation. *Id.* at 19.

30. *Id.* at 50. The 1904-1905, floods destroyed the irrigation works constructed in the Imperial Valley creating political pressure for the construction of a large storage dam on the river. NATIONAL ACADEMY OF SCIENCES, *supra* note 23, at 16. The site chosen would later become Hoover Dam. See *infra* note 40 and accompanying text.

31. The seven basin states are: Wyoming, Utah, Colorado, New Mexico, Nevada, Arizona and California. Generally, Wyoming, Utah, Colorado and New Mexico are referred to as the Upper Basin states, and Nevada, Arizona and California are known as the Lower Basin states.

32. It is of historical importance to note that the irrigation system in California's Imperial Valley had reclaimed 75,000 acres of land by 1904. Colorado, Utah, Wyoming and New Mexico, all of whom followed the prior appropriation doctrine, feared that California would claim priority over the Colorado River and that their states' rights would be lost. Thus, these four states were anxious to initiate negotiations of an interstate compact to ensure their future water rights would be preserved. M. ROBINSON, *supra* note 7, at 49-50; NATIONAL ACADEMY OF SCIENCES, *supra* note 23, at 20-21.

The Supreme Court applied the law of prior appropriation in equitable apportionment actions between states which followed the prior appropriation doctrine. *Id.*

33. The Colorado River Compact, ch. 72, 42 Stat. 171 (1921).

34. NATIONAL ACADEMY OF SCIENCES, *supra* note 23, at 19-20. The "Law of the River," described in the background section of this comment, is the collection of court decrees, compacts, agreements and statutes that control the allocation and the right to use the Colorado River water.

35. The Colorado River Compact, ch. 72, 42 Stat. 171 (1921). In Article I, the Compact provides for the equitable division and apportionment of the use of the waters of the Colorado River system; it establishes the relative importance of different

allocated the use of 7,500,000 acre feet of water per year in perpetuity.<sup>36</sup> The Compact also recognized that a future Colorado River treaty with Mexico might be necessary, and if so, the obligation would be discharged by the two basins equally.<sup>37</sup> The Compact was signed into law by the Secretary of Commerce, Herbert Hoover, on November 24, 1922.<sup>38</sup>

Having struck a basic legal agreement on water allocation, the Lower Colorado River Basin states — California, Nevada, and Arizona — moved forward to garner the congressional support needed for funding and construction of the “high dam” on the lower Colorado River. The result was the 1928 Boulder Canyon Project Act (BCPA), which was signed into law by President Coolidge.<sup>39</sup> The BCPA endorsed the Compact and provided \$165 million dollars for a dam at Boulder Canyon, known today as Hoover Dam.<sup>40</sup>

After construction of Hoover Dam, development of the Lower Colorado River Basin boomed compared to the development of the Upper Colorado River Basin.<sup>41</sup> However, upstream of Hoover Dam at Lee's Ferry, erratic flows continued to make interstate allocation of the Colorado River very difficult.<sup>42</sup> With development of the Lower Basin, the Upper Basin states became concerned that, despite the guarantees of the Compact, they would eventually lose their allocation to “water hungry” California if they did not capture and control the flow of the Colorado River.<sup>43</sup> Additionally, in 1944 the United States

beneficial uses of water; promotes interstate comity; removes causes of present and future controversy; and secures the expeditious agricultural and industrial development of the Colorado River basin, the storage of its waters and the protection of life and property from floods. WYO. STAT. § 41-12-301 (1977).

36. The Colorado River Compact, ch. 72, 42 stat. 171 (1921). The annual flow of the river at the time of the signing of the Compact was estimated at 15 million acre-feet. The 7.5 million acre-feet was supposedly an equal division of the Colorado River between the two basins. M. ROBINSON, *supra* note 7, at 50.

37. See *supra* note 4. Water Treaty with the United Mexican States, Feb. 3, 1944, United States-Mexico, ch. 72, 59 Stat. 1219, at Article III (c), T.S. 994; Meyers, *supra* note 1, at 13. Eventually a treaty with Mexico was signed by the United States in 1944. This treaty allocated 1.5 million acre feet of the Colorado River to Mexico annually. M. ROBINSON, *supra* note 7, at 97.

38. 43 U.S.C. § 617 (1988).

39. *Id.* §§ 617-619b.

40. M. ROBINSON, *supra* note 7, at 51. The lower basin states consented to the Compact which limited their right to continue to appropriate Colorado River water in order to obtain federal construction of Boulder Dam, known today as the Hoover Dam (the high dam). The 1928 Boulder Canyon Project Act required California to limit its use to 4.4 million acre feet of water. NATIONAL ACADEMY OF SCIENCES, *supra* note 23, at 21. See *supra* note 32.

41. The dam transformed the economy of the Lower Basin states by providing water and power for rapid growth. M. ROBINSON, *supra* note 7, at 51.

42. For instance, the Colorado River had a high flow of 19.2 million acre-feet in 1929, 13.1 million acre-feet in 1930, 6.4 million acre-feet in 1931, 15.3 million acre-feet in 1932, 9.7 million acre-feet in 1933 and 4.4 million acre-feet in 1934. Meyers, *supra* note 1, at 9.

43. Agricultural development was proceeding at an unprecedented rate in the Imperial Valley. The growth of Upper Basin water usage was relatively slow and the fear

entered into a treaty with Mexico to deliver 1.5 million acre-feet of water annually at the Mexican border.<sup>44</sup> Consequently, the Upper River Basin states determined they had to develop and control their rights in the Colorado River.

The Upper Basin states proposed to build several large storage reservoirs to hold surplus water during the runoff.<sup>45</sup> These reservoirs, including Lake Powell, created by Glen Canyon Dam, would provide an adequate supply to meet the Compact and the Mexican Treaty allocation requirements. Before development could begin, however, the Upper Basin states — Colorado, Utah, Wyoming, and New Mexico — needed to agree on the division of their 7.5 million acre-feet of water.<sup>46</sup> In 1948, the Upper Colorado River Basin Compact (Upper Compact)<sup>47</sup> was signed by the four Upper Basin states and Arizona. The Upper Compact apportioned the Upper Colorado River Basin share of the river.<sup>48</sup> The development of the Upper Colorado River Basin continued with the 1956 passage of the Colorado River Storage Project Act (CRSP).<sup>49</sup> Congress' intention in passing the CRSP was to accomplish a comprehensive development of the Upper Colorado River Basin so that Colorado River flows might be regulated and future run-off stored.<sup>50</sup>

In 1968, Congress passed the Colorado River Basin Project Act (the 1968 Act)<sup>51</sup> to further develop the Colorado River. The 1968 Act

was that California's prior appropriation would be legislated as more important.

44. Water Treaty with the United Mexican States, Feb. 3, 1944, United States-Mexico, ch. 72, 59 stat. 1219, T.S. 994 (1945). See *supra* note 4.

45. See *infra* notes 49-52 regarding the Colorado River Storage Project legislation and the projects which it authorized.

46. The Upper Basin states agreed to a percentage of the amount reserved to them. They did this because the BOR would not recommend any reclamation projects in the Upper Basin until each state had a firm entitlement. NATIONAL ACADEMY OF SCIENCES, *supra* note 23, at 21.

47. Upper Colorado River Compact, ch. 48, 63 Stat. 31 (1949). The Upper Compact was ratified by the states on October 11, 1948 and the consent of Congress was given to the Upper Compact in 1949. *Id.*

48. The Upper Compact gave Arizona 50,000 acre-feet per year in addition to its share of Lower Basin water. The remainder was apportioned to Colorado at 51.75 percent, New Mexico at 11.25 percent, Utah at 23 percent and Wyoming at 14 percent. An Upper Colorado River Commission was also created with representatives of the federal government and each state except Arizona. M. ROBINSON, *supra* note 7, at 85.

49. 43 U.S.C. §§ 620-620c (1988).

50. H.R. 1087, 84th Cong., 2d Sess., reprinted in 1956 U.S. CODE CONG. & ADMIN. NEWS 2346-47. The House Report stated that the storage units and participating projects would accomplish the initial requirement for storage and river regulation in the upper basin and would also meet the need for developing land and water resources. The Report also concluded that the storage units and participating projects together comprised a sound and feasible development. Therefore, in order to achieve the fullest practicable consumptive use of the water resources, the House Report determined that priority should be given to planning the consumptive use projects named in the legislation. *Id.*

51. 43 U.S.C. §§ 1501-1556 (1988). The Colorado River Storage Project of 1956 authorized the construction of reservoirs on the Colorado River. *Id.* § 620. The Colorado River Basin Project Act of 1968 directed a program of comprehensive management of those reservoirs. *Id.* § 1501.



directed the Secretary to develop operating criteria, a specific plan for the operation of the reservoirs and powerplants built pursuant to the CRSP.<sup>52</sup> Congress' intent in passing the 1968 Act was to ensure that the Colorado River reservoirs and power plants would be operated as a balanced system.<sup>53</sup> This would allow the Upper Basin states to store and utilize water, yet meet the allocation commitments of the Compacts and the treaty with Mexico.<sup>54</sup>

The balanced operation of the Colorado River facilities is accomplished by the implementation of operating criteria. The Secretary of Interior presents the operating criteria in an Annual Operating Report. The Secretary's Annual Operating Report shows the preceding year's actual operation of reservoirs and power plants, including Glen Canyon Dam, and describes the projected operations for the current year.<sup>55</sup> According to the *GCES: Final Report*,<sup>56</sup> the Secretary's operating criteria consider the great diversity of users and beneficiaries of the Colorado River.<sup>57</sup> The operating criteria state that they consider the environment, but this is not apparent in the actual operation of Glen Canyon Dam.<sup>58</sup>

52. 43 § 1552. The 1968 Act directed the Secretary of Interior to develop long-term operating criteria for the coordinated operation of the Upper Basin reservoirs and Lake Mead, but only after consultation with the Colorado River Basin States. These criteria were to be consistent with the provisions of the Colorado River Compact, the Upper Colorado River Basin Compact and the Mexican Water Treaty. *Id.*

53. H.R. 1312, 90th Cong., 2d Sess., reprinted in 1968 U.S. CODE CONG. & ADMIN NEWS 3666, 3671. The Committee on Interior and Insular Affairs concluded that the five:

Upper Basin projects [authorized by the] Act are needed and will greatly enhance the economies of the areas which they will serve. They have been found to be economically and physically feasible under the provisions of both this Act and the [CRSP] and they meet all of the standards and criteria established by the Committee and the Congress for authorization.

*Id.*

These river regulating reservoirs include Curecanti (renamed Wayne D. Aspinall), Flaming Gorge, Navajo, and Glen Canyon. Lake Powell, the reservoir behind Glen Canyon Dam, has approximately 27,000,000 acre-feet of active storage if operated to capacity, while the other dams have a combined capacity of 6,500,000 acre-feet of water. All existing projects in the Upper Basin are interrelated and interdependent. The projects have different purposes but depend on Lake Powell to provide the necessary storage to fulfill delivery requirements of the downstream states. If the requirements can be met by storage, then the upper states can use the water allocated to them for irrigation and other projects. *See M. ROBINSON, supra note 7, at 86; GCES: FINAL REPORT, supra note 10, at D-8 to D-11.*

54. Water Treaty with the United Mexican States, Feb. 3, 1944, United States-Mexico, ch. 72, 59 Stat. 1219, T.S. 994 (1945). *See supra notes 4 and 37.*

55. *GCES: FINAL REPORT, supra note 10, at D-13.*

56. *Id.*

57. *Id.*

58. *Id.* The operating criteria stipulate that any plan of operation "must reflect appropriate consideration of the uses of the reservoirs for all purposes, including flood control, river regulation, beneficial consumptive uses, power production, water quality control, recreation, enhancement of fish and wildlife, and other environmental factors." *Id.* at D-13. *See infra notes 104-13 and accompanying text.*

*Statutory Interpretations*

A section of the 1968 Act, Criteria for Long-Range Operation of the Reservoirs,<sup>59</sup> states simply that the Secretary must consider "all relevant factors" after meeting the water delivery requirements of the Compact.<sup>60</sup> However, the Congressional Declaration of Purpose and Policy<sup>61</sup> is broader and includes specific language that one of the purposes of the 1968 Act is for "improving conditions for fish and wildlife."<sup>62</sup> The 1968 Act provides the most specific direction for operation of the Colorado River dams and reservoirs. BOR looks to the 1968 Act's Congressional Declaration of Purpose and Policy<sup>63</sup> to interpret the 1968 Act.<sup>64</sup> Accordingly, BOR must consider environmental factors in developing the required operating criteria for the reservoirs.

The operating criteria are further complicated by the need to comply with various other federal laws. One such law is the National Parks Organic Act (NPOA).<sup>65</sup> As previously mentioned, Glen Canyon Dam is just above Grand Canyon National Park.<sup>66</sup> The Colorado River, regulated by Glen Canyon Dam, flows through this national park. The NPOA requires that the National Park Service promote and regulate the use of the national parks by such means and measures as will conform to the fundamental purpose of the national parks.<sup>67</sup> The fundamental purpose of the national parks is to conserve the scenery, the wildlife, and the natural historic objects in such a manner as to leave them unimpaired for future generations.<sup>68</sup>

The Endangered Species Act (ESA)<sup>69</sup> also affects the operation of Colorado River reservoirs and powerplants. The ESA seeks to protect

59. 43 U.S.C. § 1552 (1988).

60. The 1968 Act states that these "relevant factors" include, but are not "limited to, historic stream flows, the most critical period of record, and probability of water supply. . . ." *Id.*

61. *Id.* § 1501 (1988).

62. *Id.* The section states that the objective of the statute is to further develop the water resources of the Colorado River Basin and provide additional and adequate water supplies for both basins. The section goes on further to state that:

[t]his program is declared to be for the purposes, among others, of regulating the flow of the Colorado River; controlling floods; improving navigation; providing for the storage and delivery of the waters of the Colorado River for reclamation of lands, including supplemental water supplies, and for municipal, industrial, and other beneficial purposes; improving water quality; providing for basic public outdoor recreation facilities; improving conditions for fish and wildlife; and the generation and sale of electrical power as an incident of the foregoing purposes.

*Id.* § 1501(a).

63. *Id.* § 1501 (1988).

64. *Id.* § 1552.

65. 16 U.S.C. §§ 1-18 (1988).

66. *Id.* §§ 221-28. Section 221 states that the Grand Canyon National Park is "reserved and withdrawn from settlement, occupancy, or disposal under the laws of the United States and dedicated and set apart as a public park for the benefit and enjoyment of the people . . ." *Id.* § 221.

67. *Id.* § 1.

68. *Id.*

69. 16 U.S.C. §§ 1531-1544 (1988).

fish, wildlife and plants that have been so depleted in numbers that they are in danger of extinction.<sup>70</sup> BOR recognizes the ESA requirements and attempts to factor them into its operational plans for the reservoirs.<sup>71</sup>

The question of whether the operation of Glen Canyon Dam is subject to the National Environmental Policy Act (NEPA)<sup>72</sup> was first considered in *Grand Canyon Dorries v. Walker*.<sup>73</sup> NEPA requires that all federal actions which significantly affect the quality of the human environment be accompanied by an Environmental Impact Statement (EIS).<sup>74</sup> The EIS requires federal agencies to consider the environmental effects of their proposed action and all reasonable alternatives prior to going forward with the action.<sup>75</sup> The tenth circuit court in *Grand Canyon Dorries* deferred to agency discretion on the issue of whether NEPA applied retroactively to the operation of Glen Canyon Dam.<sup>76</sup> Neither the Department of Interior nor BOR had considered

70. *Id.* Section 1536, requires all federal agencies to consult with the Secretary of Interior to insure that federal actions are "not likely to jeopardize the continued existence of any endangered or threatened species . . . unless such agency has been granted an exemption for such action . . ." *Id.* § 1536(a)(2). The ESA also requires a designation of "critical habitat" for each species listed. This habitat may include the species' geographical area as well as other areas determined essential for the conservation of the species. *Id.* § 1532(5)(A).

71. UNITED STATES DEP'T OF INTERIOR, GLEN CANYON ENVIRONMENTAL STUDIES: EXECUTIVE REVIEW COMMITTEE FINAL REPORT, Figure 1 Summary of Agency Objectives, 5, (1988) [hereinafter GCES: EXECUTIVE REVIEW REPORT].

72. 42 U.S.C. § 4321-4370 (1988). The National Environmental Policy Act was passed in 1969 due to citizen indignation and protest over actions or inactions of federal agencies slighting environmental considerations. Yost, *The National Environmental Policy Act*, in ENVIRONMENTAL LAW INSTITUTE, LAW OF ENVIRONMENTAL PROTECTION § 9.01(2)(a) 9-4.

73. 500 F.2d 588 (10th Cir. 1974).

74. 42 U.S.C. § 4332 (1988). The EIS is the most important action forcing procedure of NEPA. Section 4332(2)(C), provides that:  
all agencies of the Federal Government shall

(C) include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on —

- (i) the environmental impact of the proposed action,
- (ii) any adverse environmental effects which cannot be avoided should the proposal be implemented,
- (iii) alternatives to the proposed action,
- (iv) the relationship between the local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and
- (v) any irreversible and irretrievable commitments of resources which would be involved of the proposed action should it be implemented.

*Id.* See also 40 C.F.R. §§ 1500-1508.28 (1990) for the Council on Environmental Quality's NEPA regulations.

75. 43 U.S.C. § 4332 (1988).

76. 500 F.2d 588, 590 (10th Cir. 1974). The court in reviewing the record found no evidence that the Department of Interior or any of the subordinate agencies had ever considered whether NEPA applied to the operation of Glen Canyon Dam. The court stated that judicial review must await the agency action. "It is the Department which must in the first instance assemble and weigh the factors relevant to whether and how NEPA should be applied to the operation of the dam." *Id.*

the issue yet and, therefore, the court deemed it not ripe for review.<sup>77</sup> The Department of Interior subsequently decided to conduct a cumulative basin-wide EIS for the entire project.<sup>78</sup>

The basin-wide EIS was never commenced, however, because Congress had not allocated funds.<sup>79</sup> An environmental group brought suit to compel the preparation of the comprehensive EIS in *Environmental Defense Fund v. Higginson*.<sup>80</sup> During the pendency of this lawsuit, Congress, in an appropriations rider, determined that only a site-specific EIS was required for each CRSP project.<sup>81</sup> The Department of Interior was not prohibited from preparing a basin-wide EIS but neither was it required to prepare one.<sup>82</sup> The court held that the evaluation of environmental impacts under NEPA for the Colorado River Basin projects would be left to agency discretion, reviewable on an arbitrary and capricious standard.<sup>83</sup>

NEPA applies to the planning and construction of a dam.<sup>84</sup> NEPA may also apply retroactively to operations of dams constructed

77. *Id.* The court stated that the "potential application of NEPA to the ongoing operation of a dam planned and constructed prior to passage of the Act could be a substantial issue, but it is not properly before us." *Id.* at 589.

The court ruled that NEPA and its regulations rely heavily on agency action. The agency is given broad discretion and latitude in weighing environmental considerations and whether or not they apply to their agency. Hence, the court ruled, that the agency must make the first administrative determination regarding the retroactivity of NEPA before the court has authority to review their action. *Id.* at 590.

78. *Environmental Defense Fund v. Higginson*, 655 F.2d 1244, 1246 (D.C. Cir. 1981).

79. *Id.*

80. 655 F.2d 1244 (D.C. Cir. 1981).

81. *Id.* at 1246 n.3.

82. The appeals court stated that NEPA requires the Department to prepare an EIS evaluating the synergistic and cumulative effects of the proposed projects. "Whether these effects can be properly evaluated in site-specific EIS's [or in a cumulative, basin-wide EIS] is left to the Department's discretion . . ." *Id.* at 1248. Congress has never required express funding for a cumulative EIS in the budget of an agency. However, the Department of Interior sought funding from the House Appropriations Committee after members of Congress had expressed their concern over the cumulative EIS and its funding. *Id.* at 1246 n.5.

83. *Id.* at 1247. See also *State v. Andrus*, 636 F.2d 276 (10th Cir. 1980) which was a case prior to *Environmental Defense Fund v. Higginson*. In *Andrus*, the State of Utah and a water conservancy district sought a declaratory judgment. The plaintiffs argued that if the Department of Interior conducted a Colorado River basin-wide EIS as planned, then the results of that EIS could delay the Central Utah Water Project. The court held that because the funding for, execution of, and results from a basin-wide EIS were just mere speculation, the issue was not ripe for judicial review. *Id.* at 277-78.

84. See *supra* note 74. Since construction of a dam is a "major federal action" which significantly affects the quality of the environment, it would trigger the requirements of NEPA. Section 1500.3 of the Council of Environmental Quality's regulations states that these regulations are "binding on all Federal agencies for implementing the procedural provisions of [NEPA] . . . except where compliance would be inconsistent with other statutory requirements." 40 CFR 1500.3 (1990). Therefore, unless Congress has exempted a particular dam from the requirements of NEPA, BOR must prepare an environmental assessment and then either make a finding of no significant impact or prepare an EIS. 40 CFR § 1501.4 (1990).

before NEPA was enacted.<sup>85</sup> BOR has determined that NEPA should not apply retroactively to completed dams, and consequently only one of the fourteen dams on the Colorado River system has been subject to NEPA review.<sup>86</sup> However, ongoing operations may be viewed as federal action involving an allocation of revenues and resources and having a significant impact on the human environment. Arguably, therefore, an EIS may be required for ongoing dam operations.

Besides NEPA, NPOA and the ESA, BOR's Colorado River operations must comply with the Fish and Wildlife Coordination Act.<sup>87</sup> The Fish and Wildlife Coordination Act provides that wildlife conservation shall receive equal consideration and shall be coordinated with other parts of water-resource development programs.<sup>88</sup> This mandate is accomplished through planning, development and coordination of wildlife conservation and rehabilitation.<sup>89</sup> To comply with the Fish and Wildlife Coordination Act, BOR would have to consider the wildlife environment in planning the operation of the dam. Although the courts have yet to apply the Fish and Wildlife Coordination Act to Glen Canyon Dam operations, the plain language of the Act indicates that it applies.

### *Operations of the Glen Canyon Dam*

The operation of Glen Canyon Dam is controlled by technical as well as legal requirements. BOR operates the Glen Canyon Dam and regulates the flow of the Colorado River in coordination with the other projects authorized by the CRSP, the BCPA and the 1968 Act. Congress determined that hydroelectric production was the key to the CRSP's economic feasibility.<sup>90</sup> Consequently, BOR must operate the dam with strong deference to reimbursing the costs of the project by

85. Section 1500.6 of the Council on Environmental Quality's regulations state: [a]gencies shall review their policies, procedures, and regulations accordingly and revise them as necessary to insure full compliance with the purposes and provisions of [NEPA]. The phrase "to the fullest extent possible" in section 102 means that each agency of the Federal Government shall comply with that section unless existing law . . . expressly prohibits or makes compliance impossible.

40 CFR § 1501.2 (1990). Also, section 1508.18(a) defines "major Federal actions" as "[a]ctions include new and continuing activities, including projects and programs entirely or partly financed, assisted, conducted, regulated, or approved by federal agencies . . ." *Id.* at § 1508.18(a) (emphasis added).

86. Telephone Interview with Dave Wegner, Glen Canyon Environmental Studies Manager, U.S. Bureau of Reclamation (November 2, 1990). Dave Wegner states that according to the Council on Environmental Quality's NEPA regulations, 40 CFR § 1502.4, no agency is required to apply NEPA retroactively. *Id.*

87. 16 U.S.C. §§ 661-666c (1988). The Fish and Wildlife Coordination Act has been amended many times since its enactment in 1934. Congress continues to recognize the importance of considering fish and wildlife in the development of water resource projects. Somach, *The Excess in Environmental Regulation of the Water Resources*, 20 PAC. L.J. 337, 342 (1989).

88. 16 U.S.C. § 661-666c (1988).

89. *Id.* § 661.

90. M. ROBINSON, *supra* note 7.

producing as much electricity as possible.<sup>91</sup>

Hydroelectric facilities use water power to generate electricity.<sup>92</sup> Water is collected behind the wall of the dam and then is released down through turbine-generator units.<sup>93</sup> The units spin rapidly and generate electricity.<sup>94</sup> The amount of electricity generated may be increased or decreased by varying the flow of water.<sup>95</sup>

A hydroelectric facility operates as one part of a bigger system. The country's electric power system is divided into grids of interconnected power supply and distribution networks.<sup>96</sup> Each grid contains a number of electric power generating facilities.<sup>97</sup> Some of the facilities are nuclear, some are fossil fueled and some are hydroelectric. The demand for electricity on the grid is met by different combinations of generating facilities.<sup>98</sup> The choice of which facility to use at any given time is based on numerous factors which include availability, reliability, and cost.

Nuclear units are most cost efficient when they are base loaded, which means kept at a constant power output.<sup>99</sup> Fossil fueled power plants are much more flexible than nuclear but are also most efficient when output variations are minimized.<sup>100</sup> Hydroelectric facilities, which are the most efficient and flexible, are often used as "peaking units."<sup>101</sup> Peaking units generate minimum power during the night when power demand is low, and then generate maximum power dur-

91. 43 U.S.C. § 620d. The CRSP authorized the creation of the Upper Colorado River Basin Fund. This Fund collects all revenue in connection with the operation of the Colorado River Storage Project and participating projects. The funds are "available, . . . , for (1) defraying the costs of operation, maintenance, and replacements of, and emergency expenditures for, all facilities of the Colorado River Storage Project and participating projects. . . ." *Id.*

92. J. RAABE, *HYDRO POWER* 25 (1985).

93. *Id.* at 26.

94. *Id.*

95. *Id.*

96. C. BARY, *OPERATIONAL ECONOMICS OF ELECTRIC UTILITIES* 17, 25 (1963).

97. *Id.* at 17.

98. *Id.* at 18.

99. One of the most monitored and restricted components of a nuclear generating facility is the reactor vessel. This is the component that contains the nuclear fuel. The vessel has a limit to the number of times that it may be heated and cooled. Each heat up and cool down is measured and recorded. The usable life of the vessel, and therefore the nuclear plant, is extended by minimizing the number of heat up and cool down cycles.

Additionally, the thermal efficiency of the plant is designed to be at a maximum at higher power levels, and significant time is required to adjust the power level through a broad range. Also, the likelihood of a casualty is higher during periods of transients in the power level.

For all of the above reasons, utilities desire to operate their nuclear units as base loaded rather than having them supply varying loads.

100. C. BARY, *supra* note 96, at 128-29.

101. Efficiency means getting the most electricity at the least expense. Hydroelectric facilities have virtually an unlimited and always available source of "fuel" in the impounded water. This is the basic reason why they are more efficient. *See generally, Id.* at 128-138.

ing the day and at other times when power demand is highest.<sup>102</sup> Hydroelectric facilities are used in this supplementary role because of the nature of their power source. Water is easily supplied and controlled. The costs are relatively fixed and the unit can be operated on a flexible schedule without the high costs and long start-up time of fossil fueled or nuclear units.<sup>103</sup> The hydroelectric facility is more efficient as a peaking unit than most other generating sources.

Using a hydroelectric facility as a peaking unit results in erratic downstream flows.<sup>104</sup> The variable flows destroy the physical environment of the river, adversely impact fish and wildlife, and disrupt river rafting and sport fishing.<sup>105</sup> Specifically, the erratic flows cause significant and rapid changes in river depth, temperature, width, and water quality.<sup>106</sup> Rapid changes in river depth cause water to seep into and out of the river banks.<sup>107</sup> This hydraulic cycling quickly erodes the river bank and destroys beaches.<sup>108</sup> New beaches will form, but they will erode under the constant cycling. Hydraulic cycling also disrupts the environment for edge dwelling species.<sup>109</sup>

The variable flows are also disruptive for fish. Varying flows eliminate stagnant pools that some species of fish depend upon for their young to develop and mature.<sup>110</sup> Another harmful effect of dam operations is the lack of normal silt content in dam outlet flow. Some spe-

102. *Id.*

103. *Id.*

104. Cushman, *Review of Ecological Effects of Rapidly Varying Flows Downstream from Hydroelectric Facilities*, 5 N. AM. J. FISH. MGMT. 330 (1985).

105. The issue of Glen Canyon Dam output flows disrupting white water rafting operations was raised in *Grand Canyon Dorries v. Walker*, 500 F.2d 588 (10th Cir. 1974).

106. Cushman, *supra* note 104, at 330-39.

107. Interview with Dr. Wayne Hubert, Professor of Zoology University of Wyoming (September 7, 1990) [hereinafter Hubert].

108. *Id.* Also the reduced sediment load of dam effluent means new beaches are less likely to form. *Id.* This point is in controversy with WAPA according to testimony by their Administrator, Mr. William Clagett in front of the United States Senate Subcommittee on Water and Power. Mr. Clagett stated that:

[b]each erosion in the Grand Canyon has been portrayed, particularly by the media, as extensive and rapid. However, the studies that have been done do not support these allegations. An unpublished 1984 National Park Service study by Brian and Thomas examined 227 beaches in the Grand Canyon that could be matched to beaches studied by Weeden et al. in 1973, a decade earlier. Size capacity changes after 10 years, and more importantly after the 1983 flood flows, showed a 34% decrease in small campsites, an 80% increase in medium campsites, and a 10% decrease in large campsites.

W. Clagett, Testimony before the Subcommittee on Water and Power, Committee on Energy and Natural Resources, United States Senate (July 24, 1990 the testimony was on S.2807) (emphasis as in original).

109. Hubert, *supra* note 107.

110. Cushman, *supra* note 104, at 330-39. According to the GCES: FINAL REPORT, the Fish and Wildlife Service has concluded that the Glen Canyon Dam operation is jeopardizing the existence of the humpback chub and also limiting the populations of the Colorado squawfish, bonytail chub and the razorback sucker. GCES: FINAL REPORT, *supra* note 10, at 12.

cies of fish depend on silt-laden water to hide from predators.<sup>111</sup>

Still another harmful effect on fish is the water temperature fluctuation. When the powerplant goes to high power, water is drawn from deeper in the lake and is colder. This cold water replaces warmer water downstream. Cut-throat trout have flourished under these conditions, but other species of fish have not been so fortunate. The depletion in fish population and loss of habitats downstream of hydroelectric facilities, although only recently documented, is being widely studied by biologists and zoologists.<sup>112</sup> The extent of the damage has not been quantified. Researchers recommend continuing detailed study.<sup>113</sup>

The variable flows are a continuing byproduct of using the Glen Canyon Dam hydroelectric facility as a peaking unit. Environmentalists dispute the necessity of operating Glen Canyon Dam as a peaking unit. The debate over the actual operation of the dam has generated a number of current issues.

### *Current Issues*

In the late 1970's, BOR studied the feasibility of increasing the generating capacity of Glen Canyon Dam.<sup>114</sup> BOR studied two alternatives. The first alternative was the addition of one or more generators. The second alternative was an increase in capacity of the existing generators by an "uprate and rewind" program.<sup>115</sup>

The study of the first alternative, adding a generator, was called the Glen Canyon Dam Peaking Power Study. This option was discarded in 1980 due to adverse public opinion.<sup>116</sup> The second option was pursued in the Uprate and Rewind Study.<sup>117</sup> The study required the initiation of a full pre-NEPA review.<sup>118</sup> This was the first time that the public-at-large could become involved in the review of the

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111. Turbidity is the measure of suspended solids, such as silt. The water that is sent through the generators of a hydroelectric facility is filtered. Therefore, the output water has very low turbidity. The fish that depend on turbidity use the silt-laden water to hide and deceive predators. When the water is clear of suspended solids, these fish are particularly vulnerable. Hubert, *supra* note 107.

112. *Id.*

113. GCES: EXECUTIVE REVIEW REPORT, *supra* note 71, at 6-7. See *infra* notes 128-29 and accompanying text.

114. GCES: FINAL REPORT, *supra* note 10, at 11.

115. *Id.*

116. *Id.*

117. *Id.*

118. *Id.* In 1975, it was determined that the generators at Glen Canyon Dam had reached their service life and that a rewinding was necessary. Since BOR classifies a rewind as normal maintenance, no NEPA compliance is required. *Id.* at D-24. However, a decision to uprate the eight generators at Glen Canyon Dam was made to increase power generation. Because an uprate is not classified by BOR as a normal maintenance function, BOR determined that NEPA compliance was required. *Id.*



operation of Glen Canyon Dam under the umbrella of NEPA.<sup>119</sup>

Following the review, BOR prepared an Environmental Assessment (EA) in December, 1982, and made a "Finding Of No Significant Impact" (FONSI). BOR determined that the "uprate and rewinding" of the generators would not have any significant environmental impact.<sup>120</sup> This finding was based on revised peak powerplant flow of 33,100 cfs (cubic feet per second) which was not significantly greater than the pre-upgrade peak flow of 31,500 cfs.<sup>121</sup> BOR went ahead with the uprate and rewind of the generators. However, since environmental opposition did not subside,<sup>122</sup> BOR agreed to restrict peak powerplant releases to 31,500 cfs.<sup>123</sup> BOR also agreed to a joint<sup>124</sup> comprehensive study called the Glen Canyon Environmental Studies (GCES).<sup>125</sup>

The initial phase of the GCES was a series of environmental and technical studies designed to clarify whether operation of Glen Canyon Dam impacted downstream natural and recreational resources in the Grand Canyon, and to quantify those impacts.<sup>126</sup> The GCES drew conclusions about how changes in the operation of Glen Canyon Dam could minimize the impacts of fluctuating flows and floods.<sup>127</sup> The results were reported in the *Glen Canyon Environmental Studies: Final Report*.<sup>128</sup> The BOR and cooperating agencies were careful in their announcement of the Final Report. They made clear that the Final Report was not a NEPA document as it did not encompass all of NEPA's statutory and procedural requirements.<sup>129</sup>

119. Telephone Interview with Dave Wegner, *see supra* note 86. According to Dave Wegner, this was the first time the public had the ability to get involved. Under the Peaking Power Studies, there were hearings but not the procedural public comment hearings as required by NEPA. *Id.*

120. GCES: FINAL REPORT, *supra* note 10, at 11.

121. *Id.* Note that the peaking power alternative (adding generators) would have increased the powerplant capacity from 31,500 to 40,000 cfs. *Id.*

122. According to the Executive Review Committee Report, the controversy arose over the proposed peaking power plan (the addition of generator(s)) and from the Environmental Assessment developed for the uprating and rewinding of the generators. However, the public was not as concerned about the uprating and rewinding as it was with the long and short-term environmental and recreational impacts in operation of Glen Canyon Dam. GCES: EXECUTIVE REVIEW REPORT, *supra* note 71, at 1.

123. GCES: FINAL REPORT, *supra* note 10, at 11.

124. Participants included Bureau of Reclamation, National Park Service, Fish and Wildlife Service, Arizona Game and Fish Department, and the Western Area Power Administration.

125. GCES: EXECUTIVE REVIEW REPORT, *supra* note 71, at 1. Since environmental research is not a traditional mission of the Bureau of Reclamation, the initiative came as a surprise to the environmental community. NATIONAL ACADEMY OF SCIENCES, *supra* note 23, at 28.

126. NATIONAL ACADEMY OF SCIENCES, *supra* note 23, at 28.

127. GCES: EXECUTIVE REVIEW REPORT, *supra* note 71, at 1.

128. GCES: FINAL REPORT, *supra* note 10, at 83-86.

129. GCES: EXECUTIVE REVIEW REPORT, *supra* note 71, at 1. For instance, the report does not address the potential economic benefits or costs associated with changes in operation. The report also does not include a full public review to comply with the procedural provisions of NEPA. The Glen Canyon Environmental Studies were ini-

After the initial GCES technical studies were completed in 1987, the GCES Executive Review Committee was established to study the Final Report and to recommend action to the Department of Interior.<sup>130</sup> The Executive Review Committee determined there was a need for further study to quantify the impact of fluctuating flows.<sup>131</sup> The Department of Interior concurred with the committee's findings.<sup>132</sup>

Public pressure for the execution of an EIS did not subside after the completion of the GCES. In response to this pressure, the Secretary of Interior announced his intention to conduct a full EIS on the operation of Glen Canyon Dam.<sup>133</sup> He also announced the development of environmental criteria to be used in drafting the Secretary's Annual Operating Plan.<sup>134</sup> This information would identify specific options in the operation of Glen Canyon Dam to minimize the impact on the downstream resources.<sup>135</sup>

Congress apparently recognized the need to offer direction to the Secretary on how to operate the Glen Canyon Dam. On July 30, 1990 the House of Representatives passed a bill, H.R. 4498, titled the Grand Canyon Protection Act (Protection Act) as an amendment to

tially only meant to study how the Glen Canyon flow patterns affect the Grand Canyon riverine environment; concentrating on the low-flow effects on recreational river rafting and sport fishing. *Id.* The studies were to consider the low-flow regimes of 1,000, 4,000, 5,000 and 8,000 cfs. They were also to identify the discharge at which material impacts appeared in beach erosion, recreation and fisheries. Letter from Bureau of Reclamation (BOR) Commissioner Robert M. Broadbent to BOR Salt Lake City Regional Director (Dec. 6, 1982).

When the studies were completed, the objective, as stated by Dave Wegner (the Studies Director), was to assess the impact of the operating pattern of the dam on the river environment in the Grand Canyon. See NATIONAL ACADEMY OF SCIENCES, *supra* note 23 at 37.

130. GCES: EXECUTIVE REVIEW REPORT, *supra* note 71, at 1.

131. *Id.*

132. Letter from Assistant Secretary, Water and Science and Assistant Secretary, Fish and Wildlife and Parks to the Director, Fish and Wildlife Service; the Director, National Park Service; and the Commissioner, Bureau of Reclamation discussing the Glen Canyon Environmental Studies (June 16, 1988). The Assistant Secretaries' stated that they had completed the review of the Executive Review Committee Report. They agreed with Executive Review Committee's report which asserted that several areas required further study and analysis before action could be taken by the Department of Interior. The areas indicated were: "(1) the effects of both low and fluctuating flows on endangered fish species, the trout fishery and beach aggradation and degradation, and (2) detailed economic analysis of operational options." *Id.*

Therefore, the Assistant Secretaries directed the Fish and Wildlife Service, the National Park Service, and the Bureau of Reclamation to develop a coordinated study to address the foregoing areas. They also stated that the data necessary for the studies be acquired during normal operation of Glen Canyon Dam and examine a range of minimum and fluctuating flows. The data would then allow for "a complete analysis of the relationships between operations of Glen Canyon Dam and the downstream impacts." *Id.*

133. 54 Fed. Reg. 43,870-71 (Oct. 27, 1989); 55 Fed. Reg. 6488-89 (Feb. 23, 1990).

134. *Id.*

135. *Id.*

the CRSP.<sup>136</sup> The Senate version of the Protection Act was attached to the Reclamation Reauthorization bill which passed in the last days of the 101st Congress.<sup>137</sup> However, the Protection Act did not become law because the House negotiating staff could not reach final agreement with the Senate sponsors on another piece of attached legislation.<sup>138</sup> Therefore, the proposed Protection Act did not return to the floors of the House and Senate for a final vote before the close of the 101st Congress.<sup>139</sup>

Both the House and Senate proposals recognized the environmental problems downstream of the Glen Canyon Dam and specified that the problems are caused in part by the fluctuating flows which result from using Glen Canyon Dam as a peaking unit.<sup>140</sup> Both versions of the Protection Act directed the Secretary to take reasonable measures to mitigate adverse impacts to the downstream environmental resources in Grand Canyon National Park.<sup>141</sup> The proposed legislation required that the Secretary operate the dam in conformity with existing water allocation compacts,<sup>142</sup> but at the same time required the Secretary to attempt to avoid adverse environmental effects.<sup>143</sup> The proposed legislation also required the establishment of interim operating procedures until sufficient studies could be completed to establish long-term operating procedures for the minimization of adverse envi-

136. See APPENDIX A.

137. See APPENDIX B.

138. See *supra* note 18.

139. Presumably the legislation will be reintroduced in the 102nd Congress.

140. H.R. 4498, 101st Cong., 2d Sess. § 2(a)-(d) (1990). S.2807, 101st Cong., 2d Sess. § 2(1) (1990).

The Commissioner of Reclamation, Dennis B. Underwood testified on the proposed Senate bill, Grand Canyon Protection Act, before the Senate Energy and Natural Resources Committee. Commissioner Underwood stated that he was the Department of Interior's representative and testifying on behalf of the Secretary. Testimony by Commissioner Dennis B. Underwood to the Senate Energy and Natural Resources Committee (July 24, 1990 on S. 2807).

The Commissioner stated the Department of Interior shares the interest of the Committee and others concerning the operation of Glen Canyon Dam. However, the Department believes that "it is premature to significantly alter the planned operations until after . . . complet[ion] of the ongoing studies of] research flows." *Id.* According to the Commissioner, these studies are needed to examine the effects of the operation of Glen Canyon Dam under normal and less unusual conditions than some of the research conducted under the Glen Canyon Studies which were studied under several years of unprecedented high river flows. *Id.* If interim flows are imposed, the Commissioner stated, it would alter the baseline from which changes and impacts are to be measured. This could require overall adjustments to the research flow program to meet storage and water delivery obligations. *Id.* The Commissioner stated that once the research flow studies are completed, the Department would be in a position to develop interim power operating criteria for operation of Glen Canyon Dam. *Id.*

141. H.R. 4498, 101st Cong., 2d Sess. § 3(a) (1990); S. 2807, 101st Cong., 2d Sess. § 3 (1990).

142. The Colorado River Compact of 1921 and the Upper Colorado River Basin Compact of 1949. See *supra* note 3.

143. H.R. 4498, 101st Cong., 2d Sess. § 3(b)(1)-(2) (1990); S. 2807, 101st Cong., 2d Sess. § 4(b)(1)-(6) (1990).

ronmental impacts.<sup>144</sup>

The Senate version of the Protection Act listed specific statutes that require the Secretary to operate Glen Canyon Dam so as to mitigate adverse impacts to the Grand Canyon National Park environment.<sup>145</sup> The House version did not contain a comparable section but did state the necessity of complying with the existing compacts and treaties.<sup>146</sup> Congress' attention to Glen Canyon Dam operations, as seen in the Protection Act, demonstrates the national interest in the current issues surrounding Glen Canyon Dam.

#### ANALYSIS

The Grand Canyon Protection Act, as drafted, was inadequate to protect the Colorado River environment in Grand Canyon National Park. The Secretary has the authority, in the absence of the Protection Act, under existing statutes, to act to protect the river environment. In general, this analysis will show why the Protection Act was inadequate and what can be done to protect the river until an effective law is passed.

More specifically, this analysis will show that the proposed legislation did not specify the variables that must be quantified to determine optimum use of Glen Canyon Dam. The operation of the dam involves various competing interests and each interest will be discussed from the standpoint of its effect on the operational flexibility of the dam.

The analysis will further demonstrate that the "Law of the River," and other statutes, authorize the Secretary to take immediate action. The Secretary should institute interim flow restrictions, conduct detailed studies of specific alternatives, and, when the studies are completed, revise the operating criteria to balance environmental and electric power interests optimally.

#### *The Protection Act*

The key to understanding why the Protection Act fails is an analysis of the tension between the various competing interests in Glen Canyon Dam operations. The proposed Protection Act did not specify what competing interests must be evaluated to correctly balance environmental and electric power concerns. The proposed Protection Act left the Secretary with total discretion to choose which competing interests to investigate.<sup>147</sup>

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144. H.R. 4498, 101st Cong., 2d Sess. § 4 (1990); S. 2807, 101st Cong., 2d Sess. § 4(a)(1)-(3) (1990).

145. S. 2807, 101st Cong., 2d Sess. § 2(5) (1990).

146. H.R. 4498, 101st Cong., 2d Sess. § 3(b) (1990).

147. The key words in both the House and Senate versions are "minimize adverse impacts." Without specifying which of the competing interests must bend to accommo-

These competing interests may each be addressed because there is operational flexibility at Glen Canyon Dam. The flexibility is not total however, because there are fixed interests that must be satisfied. The fixed interests are water delivery requirements under the various treaties and compacts, flood control considerations, and the physical limitations of the dam. Each of these fixed interests constrains how the dam is operated. After the fixed interests have been satisfied, there is a margin of operational flexibility remaining that may be expended to satisfy the remaining non-fixed, or variable, interests. The variable interests include electric production and environmental/recreational concerns.

The authors will use the term "Operational Flexibility Margin" (OFM)<sup>148</sup> to describe the amount of flexibility available after the fixed interests have been satisfied. OFM is analogous to the money left over in a small business' budget after the bills have been paid at the end of the month. The left over money may be spent on new equipment or it may be put into savings. The flexibility margin exists in the ability to vary the savings and new equipment expenditures each month.

The "new equipment" and "savings" at Glen Canyon Dam are electric production and environmental/recreational concerns respectively. The OFM is the amount of "money" that may be "spent" on these two competing interests.

The OFM is currently expended for electric production goals at the expense of the environmental/recreational concerns. The Glen Canyon Dam operational decisions attempt, within the confines of higher priority interests, to have all discharges be through the turbines.<sup>149</sup> These discharges are varied to maximize water through the turbines during times of high electric demand and minimize it during low demand, thereby maximizing electric production revenue.<sup>150</sup> The

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date the environmental protection, the proposed legislation was impotent.

148. The Operational Flexibility Margin (OFM) is analogous to the balance in your checkbook. Operational flexibility is the money. If I am totally unencumbered by limitations on how I operate the dam, then my flexibility is the greatest. My balance the highest. As I pay off my bills, some for water delivery requirements, some for flood prediction maximum storage requirements, and some for the physical flow limitations of the dam my balance goes down. I have less flexibility left in how I may operate the dam. Some bills have to be paid and some are luxuries. When my necessary bills are paid, I can decide how to spend my discretionary money. The balance left in the account is the Operational Flexibility Margin. It is the amount of operational flexibility left after all the mandatory requirements have been satisfied. The question becomes how to spend the balance. The OFM can be used to meet the peak demand for electricity by varying output flows throughout the day. Alternatively, the OFM may be used to stabilize flows and protect the natural river environment.

149. Hourly releases from the dam follow a schedule that is dictated by requirements to meet the monthly schedule. They are limited by the physical constraints of the plant and respond to the electrical demand. The priority of interests for determining releases is as follows: 1) minimize bypass of the turbines; 2) maximize releases when electric demand is greatest; and 3) maintain reservoir level at a level for efficient generator use. GCES: FINAL REPORT, *supra* note 10, at D-24.

150. *Id.*

reservoir level is kept where it is most efficient for the turbines.<sup>151</sup> This use of the OFM, strictly for electric production, results in adverse impacts to downstream environmental/recreational concerns.

The Protection Act failed to specify the competing interests that must be quantified in order to determine the amount of the OFM. The competing interests include: *Fixed Interests*- (1) water delivery obligations, (2) the physical limitations of the dam, (3) flood control storage requirements; and, *Variable Interests*- (4) power revenues, (5) long-term electric power sales contracts, (6) environmental concerns, and (7) recreational interests. Each of these interests impacts operational flexibility in a unique way.

The most important fixed interest in operation of the Glen Canyon Dam is water delivery.<sup>152</sup> The Department of the Interior through BOR is charged with meeting the water allocation requirements of the various compacts, treaties, contracts and court decrees.<sup>153</sup> This goal must precede all other considerations in operation of the facilities on the Colorado River.

Another fixed interest is the size and composition of the dam and its components. When Glen Canyon Dam was built, it was designed for the limited purposes of regulating Lake Powell and maximizing the generation of electric power. The dam has limits on how much water passes through it at one time. The combined flow of the spillways, the penstocks and the generators is a fixed maximum.<sup>154</sup> This maximum flow dictates a minimum level that must be maintained in the reservoir because of flood control.

Flood control is another fixed interest. Mother nature's flood and drought cycles restrict dam operations. Scientists have based flood control models on the theoretical occurrence of a maximum volume flood or "100 year flood."<sup>155</sup> When the "100 year flood" happens, there must be sufficient capacity left in Lake Powell to accommodate the flood flow. The maximum amount of water that may pass through the dam is part of the calculation on how much space must be available in Lake Powell. This level requirement imposes a restriction on the flexibility of the dam's operation.

After the fixed interests have been accommodated the attention must focus on variable interests. The dollar value of the electricity generated at the dam is a variable competing interest. The most profitable condition is a maximum release of water through the generators

151. The flexibility increases when releases are moderate and decreases when the releases are small or large. GCES: FINAL REPORT, *supra* note 10, at D-22.

152. See *supra* notes 60-63 and accompanying text regarding the priority the Secretary must place on Colorado River Compact delivery requirements.

153. See *supra* note 34 and accompanying text.

154. GCES: FINAL REPORT, *supra* note 10, at D-10.

155. This flood prediction assumes a once in a hundred years frequency. This is called the 100 year flood.

at a time when the cost of getting that electricity elsewhere would be the highest. The factors that determine profitability are a complex collection of electric power production and marketing concerns. The necessity of collecting this revenue limits the operational flexibility of the dam. This limitation is manifested in the collection of revenues from long-term electric power sales contracts that WAPA has entered.<sup>156</sup>

WAPA uses short and long-term marketing strategies. The long-term strategies contain fifteen year contracts that provide for modification after ten years.<sup>157</sup> The ability to modify existing contracts could be a decisive factor in modifying dam operations. These contractual considerations are part of the variable competing interest of electric production.

Environmental concerns, another variable interest, are recognized in the plain language and the underlying intent of the statutes controlling the operation of the Glen Canyon Dam. The interest includes the preservation of the natural river environment and the wildlife. Both the impoundment of water behind the dam and the output flows directly affect the environment.

Output flows also affect the final variable interest, recreational concerns. Fishing and white-water boating are the main recreational activities affected by operation of the dam. The recreational interest is represented by non-profit and commercial users. Consideration of recreational interests is required by the CRSP.<sup>158</sup> Preservation of the recreation available in the Grand Canyon National Park is a variable interest that is supported vigorously by white-water rafters and fishermen.

156. The extent of WAPA's contractual involvement is demonstrated by the reach of its distribution:

Power generated by BOR, the Army Corps of Engineers, and the International Boundary and Water Commission is sold through WAPA to 572 municipalities, rural electric cooperatives, public utility districts, private utilities, federal and state agencies, irrigation districts, and other project-use customers. These power sources provide 9,930 MW [megawatts] of installed capacity, capable of generating 45,200 GWH [gigawatt] of energy annually.

GCES: FINAL REPORT, *supra* note 10, at D-33.

157. On February 7, 1986, WAPA published the "Final Post-1989 General Power Marketing and Allocation Criteria and Call for the Applications for Power" in the Federal Register.

The Post-1989 criteria made the following changes in the 1978 criteria and the 1984 revisions: (1) integrated CRSP with the Rio Grande Project in New Mexico and the Collbran Project in Colorado; (2) increased the marketable resources, with an optional annual purchase of 400 GWH of energy at the customer's request and expense; (3) established a single class of long-term service defined as Long-Term Firm Energy with Capacity; (4) established a 15-year contract term, with provisions for adjustments of the resource commitment after ten years; and (5) created and allocated a new customer resource pool of approximately 100 MW in either season.

GCES: FINAL REPORT, *supra* note 10, at D-39.

158. 43 U.S.C. § 620g (1988).

The proposed Protection Act failed to require the identification and quantification of the competing variable interests necessary to determine the OFM. If the OFM is not determined through careful and complete analysis, then it cannot be allocated in a manner that best balances all of the competing interests. A recommendation to modify the operation of the dam based on incomplete data will do a disservice to each of the competing interests.

To properly serve each competing interest the Protection Act should have required specific studies to evaluate the following factors: replacement power costs and effects, the legal implications of modifying or dissolving existing WAPA contracts, the economic effect on the region of the increased costs of electricity, and the feasibility, costs, and timetables for the construction of additional powerplants. The ongoing Glen Canyon Environmental Studies,<sup>159</sup> and the EIS which is underway,<sup>160</sup> are the vehicles to accomplish the needed study. However, the factors to be studied must be specified to ensure that a balanced result is obtained. The GCES and the EIS are being funded from the electric power revenues<sup>161</sup> as should any proposed expansion in the scope of the studies.

In addition to specifying what factors to study, the Protection Act must set quantifiable goals. The Protection Act, as drafted, directed the Secretary to mitigate adverse environmental and recreational impacts where reasonable but did not set specific parameters.<sup>162</sup> In fact, the Protection Act allowed exceptions for electric power priorities,<sup>163</sup> and to that extent sacrificed its effectiveness as an environmental enforcement tool. To ensure its effectiveness, any new legislation must require that quantifiable environmental goals be met. For example, a maximum change in water temperature, depth, or velocity could be specified. As drafted, the language sought to move river management in the right direction, but it failed to indicate how far the Secretary must go. The combination of requiring specific studies and setting quantifiable goals is necessary to insure that the Protection Act lives up to its name.

### *The Secretary Has the Authority to Act*

The Secretary need not wait for a revised Grand Canyon Protection Act in order to take action. The proposed Protection Act indicated strong congressional interest, and current issues demonstrate rising public concern for protection of the Grand Canyon. The Secre-

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159. See *supra* note 10.

160. See *supra* note 133 and accompanying text.

161. Wegner, *supra* note 86.

162. H.R. 4498, 101st Cong., 2d Sess. § 3(a) (1990); S. 2807, 101st Cong., 2d Sess. § 3 (1990).

163. H.R. 4498, 101st Cong., 2d Sess. § 4(e)(2) (1990); S. 2807, 101st Cong., 2d Sess. § 4 (1990).



tary should use existing statutory authority immediately to protect the river environment.

Three specific actions should be taken. First, the Secretary should direct BOR to modify operations to protect the river environment by setting minimum and maximum flow limitations. Second, the Secretary should ensure that the ongoing EIS and Glen Canyon Environmental Studies include the comprehensive analysis that is necessary for a complete review of options for long-term solutions. That comprehensive analysis should cover, as a minimum, the following factors: alternative generating source costs and environmental effects, the legal implications of modifying or dissolving existing WAPA contracts, the economic effect on the region of the increased costs of electricity, the feasibility, costs, and timetables for the construction of alternative generating sources. With this information in hand, the OFM could be determined. Third, the Secretary should allocate the OFM and modify operating criteria accordingly. Allocating the OFM means setting operational priorities that satisfy negotiable interests other than just electric power. These actions by the Secretary will ensure that the natural river environment is protected now and in the future.

The Secretary is currently not emphasizing the downstream river environment in any meaningful way. The Assumptions and Objectives underlying the Annual Operating Plan for the Glen Canyon Dam do not even mention environmental concerns despite the statutory mandate to consider the environment.<sup>164</sup>

The Secretary's authority to act comes from federal statutory history, statutory language, and legal interpretations which support taking an environmentally sensitive course of action.<sup>165</sup> As previously described, the authority to construct and operate the Glen Canyon Dam was provided by the CRSP.<sup>166</sup> The CRSP requires the Secretary of Interior to comply with the provisions of the Compact, the Upper Compact, the BCPA, the Boulder Canyon Project Adjustment Act (BCPAA)<sup>167</sup> and the 1944 Treaty with Mexico, in the operation and maintenance of all facilities in the Colorado River Basin.<sup>168</sup>

Article I of the Compact states that a purpose of the Compact is "to establish the relative importance of different beneficial uses of water."<sup>169</sup> The Upper Compact allows for the generation of electrical power, but makes such use secondary to agricultural and domestic water demands.<sup>170</sup> The Upper Compact asserts that it will not affect

164. United States Dep't of Interior, Bureau of Reclamation, *1989 Annual Operating Plan, Colorado River System, Assumptions and Objectives* 1-2 (1988).

165. See *supra* notes 46-53 and accompanying text.

166. 43 U.S.C. § 620 (1988).

167. 43 U.S.C. §§ 618-618o (1988).

168. *Id.* § 620m.

169. Colorado River Compact, ch. 72, art. I, 42 Stat. 171 (1921).

170. Upper Colorado River Compact, ch. 48, 63 Stat. 31 (1949).

existing water allocation obligations.<sup>171</sup> As with the Compact, the Upper Compact is primarily concerned with allocating Colorado River water for consumptive use. The Compact and the Upper Compact are not specific in their support for environmental concerns.

The CRSP more clearly considers the environment while providing specific direction for the development of the Colorado River Basin. Section 620b of the CRSP states the congressional intent not to build dams or reservoirs in national parks.<sup>172</sup> This statement clearly shows the intent of the legislators to protect national parks and monuments from possible harm from the development of the Colorado River Basin.<sup>173</sup> Arguably, the environmental damage from the rapidly varying flows downstream from Glen Canyon Dam violates the spirit, if not the letter, of the CRSP.

While section 620f of the CRSP directs the Secretary of Interior to utilize hydroelectric facilities "to produce the greatest practicable amount of power and energy,"<sup>174</sup> the next section of the CRSP, 620g, directs the Secretary of the Interior to conserve the scenery and the wildlife of established public recreational facilities by such means as are consistent with the primary purposes of the river project.<sup>175</sup> Provisions such as 620g demonstrate congressional intent that these Colorado River Projects were not meant for the sole purpose of generating electricity.<sup>176</sup>

The 1968 Act, like the CRSP, contains language that supports the consideration of environmental factors in the operation of Glen Canyon Dam.<sup>177</sup> In the Congressional Declaration of Purpose and Policy, section 1501, a stated purpose of the project is to improve conditions for fish and wildlife.<sup>178</sup> Section 1501 also states the additional purposes of improving navigation and ensuring delivery of water for other beneficial uses.<sup>179</sup> The goal of maintaining water quality is also

171. *Id.* at Article XIX(a).

172. 43 U.S.C. § 620b (1988).

173. Minority Views on H.R. 3383, 84th Cong., 2d Sess., reprinted in 1956 U.S. CODE CONG. & ADMIN. NEWS 2369-70.

OBJECTIONS TO BILL SUMMARIZED:

...

(2) Invasion of Dinosaur National Monument by Echo Park Dam and power facilities will be unavoidable if the bill passes.

...

(11) Three physical and geological difficulties in addition to Echo Park make the project unreasonable and impractical:

(a) There is doubt whether Glen Canyon can support a 700-foot dam.

(b) The construction at Glen Canyon Dam will endanger Rainbow Bridge.

See also "objections to bill detailed" regarding the above subsections at 2388-89. Note there are no details of the compromise on H.R. 1087 except the final result of § 620b.

174. 43 U.S.C. § 620f (1988).

175. 43 U.S.C. § 620g (1988).

176. See *supra* note 50 for legislative history on CRSP.

177. 43 U.S.C. §§ 1501-1556 (1988).

178. *Id.* § 1501.

179. *Id.*

stated.<sup>180</sup> This section specifies that the generation of electricity is incidental to the foregoing purposes.<sup>181</sup> The fluctuating flows downstream of a peaking unit hydroelectric facility disturb the water quality,<sup>182</sup> deteriorate conditions for fish and wildlife,<sup>183</sup> and disrupt the safe navigation of the river.<sup>184</sup> It is illogical to interpret the 1968 Act as not including environmental mandates in light of these congressional pronouncements.

The NPOA also applies to Glen Canyon Dam operations.<sup>185</sup> Compliance with this Act was required by the Senate in its version of the Protection Act.<sup>186</sup> The Senate bill stated that this Act, among others, requires the Secretary to operate Glen Canyon Dam to preserve the natural resources of the Grand Canyon National Park and the Glen Canyon National Recreation Area. The specific language and underlying intent of the Compact, the Upper Compact, the CRSP, the 1968 Act, and the NPOA give the Secretary ample authority to protect the natural river environment.

Court interpretations of federal law are scarce on the issue of environmental priorities in Colorado River operations. However, in *Friends of the Earth v. Armstrong*,<sup>187</sup> the tenth circuit held that the intent of Congress, as expressed in its directives for the development of the Colorado River Basin, was for a balanced system with interlocking objectives.<sup>188</sup> The court refused to adopt an interpretation of the CRSP that would abrogate this balanced system.<sup>189</sup> The plaintiff proposed that the CRSP should be read to restrict the level of Lake Powell to prevent the encroachment of water on the Rainbow Bridge Monument.<sup>190</sup> This interpretation would have resulted in a maximum level in Lake Powell of nearly fifty percent less than design storage capacity. The court found that this change in the operation would disrupt many facilities in the Project.<sup>191</sup> They held that the change was unwarranted because it would frustrate the water delivery requirements of the "Law of the River."<sup>192</sup> Unlike the requested modification in *Friends of the Earth*,<sup>193</sup> the changes that are proposed for Glen Canyon Dam operations would not interfere with any CRSP or Compact objectives.

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180. *Id.*

181. *Id.*

182. Cushman, *supra* note 104, at 331.

183. *Id.*

184. *Grand Canyon Dorries*, 500 F.2d at 588.

185. 16 U.S.C. §§ 1-18 (1988).

186. *See supra* note 137.

187. 485 F.2d 1 (10th Cir. 1973), *cert. denied*, 414 U.S. 1171 (1974).

188. *Id.* at 10.

189. *Id.*

190. *Id.* at 11.

191. *Id.* at 10.

192. *Id.*

193. *Friends of the Earth v. Armstrong*, 485 F.2d 1 (10th Cir. 1973), *cert. denied*, 414 U.S. 1171 (1974).

Another important case interpreting the "Law of the River" examined the effect of a statement within the BCPA that requires that the mandates of the Compact be satisfied. In *Arizona v. California*,<sup>194</sup> the Supreme Court held that such a statement means that the water allocation requirements of the Compact must be met, but that the Compact does not control the BCPA.<sup>195</sup> The water allocation requirements of the Compact may be satisfied without sacrificing the natural river environment.

The preceding statutory interpretations are consistent. They acknowledge the environment as an important consideration, consistent with the "Law of the River," in operating Glen Canyon Dam. These interpretations further strengthen the position that the Secretary has ample legal authority to immediately advance the goal of protecting the natural river environment.

In addition to legal authority, the Secretary has public sentiment to motivate him to action. In 1980, public concern persuaded BOR to abandon a proposal to add a generator at the Glen Canyon facility and increase its peaking capability.<sup>196</sup> Public interest has affected policy and operations at the Glen Canyon Dam for more than decade.<sup>197</sup> The public also speaks through its representatives as when Senator Robert Dole addressed the Senate on behalf of the Protection Act with these words, "the legislation should leave no doubt about the Secretary's responsibility to protect the natural resources of the Grand Canyon and the will of Congress towards that end."<sup>198</sup>

The Secretary may have already acknowledged his authority evidenced by the action taken to date. BOR agreed to restrict peak power plant releases to 31,500 cfs to mitigate adverse effects to the river.<sup>199</sup> The Secretary has also initiated a site-specific EIS on Glen Canyon Dam operations.<sup>200</sup> The process includes public hearings. The additional studies recommended by the *GCES: Executive Review Report*<sup>201</sup> are to be encompassed within the EIS.

## CONCLUSION

The enactment of the Grand Canyon Protection Act,<sup>202</sup> as previously drafted, would do little to ensure adequate protection of the

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194. 373 U.S. 546 (1963).

195. *Id.* at 565-66.

196. GCES: FINAL REPORT, *supra* note 10, at 11. See also *supra* notes 114-125 and accompanying text.

197. GCES: FINAL REPORT, *supra* note 10, at 11. See also *supra* notes 114-125 and accompanying text.

198. 136 CONG. REC. 85,9180 (daily ed. June 28, 1990) (statement of Sen. Dole).

199. GCES: FINAL REPORT, *supra* note 10, at 11.

200. See *supra* note 133 and accompanying text.

201. See *supra* note 71.

202. The Grand Canyon Protection Act, H.R. 4498, and S.2807, 101st Cong., 2d Sess. (1990). See APPENDICES A and B.

river environment downstream of the Glen Canyon Dam. The proposed Protection Act, if reintroduced in the 102nd Congress, would need to define more specifically the areas that should be studied. It would have to set quantifiable goals. Any new version of the Protection Act must also define and allocate an Operational Flexibility Margin.<sup>203</sup>

The Secretary of the Interior should not wait for a new version of the Protection Act. Existing statutory authority authorizes him to protect the river environment. The underlying intent of the statutes as well as their plain language supports this interpretation. Case law does not undermine this authority.

The public sentiment, as expressed during the EIS controversy, combined with congressional intent and the results of the Glen Canyon Environmental Studies all clearly militate for action by the Secretary to protect the river. He should act immediately to reduce variable flows as much as possible, to conduct studies to define the OFM, and to create operating criteria that distribute the OFM to protect the natural river environment. These actions combined with an effective Protection Act, will help protect the natural integrity of Grand Canyon National Park.

KATHY MARION  
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203. See *supra* note 148 and accompanying text.

**APPENDIX A**

**The Grand Canyon Protection Act, H.R. 4498, 101st Cong., 2d Sess. (1990) The Act is reproduced here in its entirety.**

**Sec. 1. SHORT TITLE.**

This Act may be cited as the "Grand Canyon Protection Act of 1990".

**Sec. 2. FINDINGS.**

The Congress finds that:

(a) Current operational practices at Glen Canyon Dam, including fluctuating water releases made for the enhanced production of "peaking" hydroelectric power, have substantial adverse effects on downstream environmental and recreational resources, including resources located within Grand Canyon National Park. Flood releases from Glen Canyon Dam have damaged beaches and terrestrial resources. Damage from flood releases can be reduced if the frequency of flood releases is reduced, as has been the practice in recent years.

(b) The Secretary of the Interior (hereafter referred to as "the Secretary") announced on July 27, 1989, the preparation of an environmental impact statement (EIS) to evaluate the impacts of Glen Canyon Dam operations on downstream environmental and recreational resources. Based in part on information developed during the EIS process, the Secretary will be in a position to make informed decisions regarding possible changes to current operational procedures of Glen Canyon Dam.

(c) During the time required for preparation of the EIS and decisions by the Secretary, the current operational procedures, and resulting adverse effects on downstream resources, are not expected to change.

(d) The adverse effects of current operations of Glen Canyon Dam are significant and can be at least partially mitigated by the development and implementation of interim operating procedures pending the completion of the EIS, the Glen Canyon Environmental Studies, and the adoption of new long-term operating procedures for Glen Canyon Dam.

**Sec. 3. PROTECTION OF GRAND CANYON NATIONAL PARK.**

(a) The Secretary of the Interior shall operate Glen Canyon Dam and take other reasonable mitigation measures in such a manner as to protect, mitigate adverse impacts to, and improve the condition of the environmental, cultural and recreational resources of Grand Canyon National Park and Glen Canyon National Recreation Area downstream of Glen Canyon Dam, under operating proce-

dures that are subject to and consistent with water storage and delivery functions of Glen Canyon Dam pursuant to the Colorado River Compact, the Upper Colorado River Basin Compact, consented to by the Act of April 6, 1949 (63 Stat. 31, chapter 48), and other laws relating to regulation of the Colorado River.

(b) The Act of April 11, 1956 (Colorado River Storage Project Act, 70 Stat. 105, chapter 203; 43 U.S.C. 620 et seq.), is amended as follows:

(1) by adding the following sentence at the end of section 3: "It is the further intention of Congress that the Secretary shall operate Glen Canyon Dam and take other reasonable mitigation measures so as to protect, mitigate damages to, and improve the condition of the environmental, cultural and recreational resources of Grand Canyon National Park and Glen Canyon National Recreation Area downstream of Glen Canyon Dam, subject to and consistent with the water storage and delivery functions of Glen Canyon Dam pursuant to the Colorado River Compact, the Upper Colorado River Basin Compact, consented to by the Act of April 6, 1949 (63 Stat. 31, chapter 48), and other laws relating to regulation of the Colorado River."; and,

(2) by striking the word "Acts" in section 7 and inserting in lieu thereof the following: "Acts, nor shall he operate the hydroelectric power plant at Glen Canyon Dam in a manner which causes significant and avoidable adverse effects on the environmental, cultural and recreational resources of Grand Canyon National Park and Glen Canyon National Recreation Area downstream of Glen Canyon Dam."

(c) The Secretary is hereby authorized and directed to promulgate interim and long-term operational procedures for Glen Canyon Dam and take other reasonable mitigation measures as set forth in sections 4 and 5 of this Act, which procedures shall be consistent with the requirements of this section.

#### Sec. 4. INTERIM OPERATIONAL PROCEDURES FOR GLEN CANYON DAM.

(a) Notwithstanding any other provision of law, and pending compliance by the Secretary with the requirements of Section 5 of this Act, the Secretary shall, within 90 days after the date of enactment of this Act, develop and implement interim operating procedures for Glen Canyon Dam. Such procedures shall:

(1) not interfere with the primary water storage and delivery functions of Glen Canyon Dam, pursuant to the Colorado River Compact, consented to by the

Act of August 19, 1921 (42 Stat. 171, chapter 71) and approved by section 13(a) of the Act of December 21 1928 (45 Stat. 1064, chapter 42, the Upper Colorado River Basin Compact, consented to by the Act of April 6, 1949 (63 Stat. 31, chapter 48), and other laws relating to regulation of the Colorado River;

(2) minimize to the extent reasonably possible the adverse environmental impacts of Glen Canyon Dam operations on Grand Canyon National Park and Glen Canyon National Recreation Area downstream of Glen Canyon Dam;

(3) adjust fluctuating water releases caused by the production of peaking hydroelectric power, and adjust rates of flow changes for fluctuating flows that will minimize to the extent reasonably possible adverse downstream impacts;

(4) minimize flood releases, consistent with the requirements of section 3 of this Act;

(5) maintain sufficient minimum flow releases at all times from Glen Canyon Dam to minimize to the extent reasonably possible the adverse environmental impacts of Glen Canyon Dam operations on Grand Canyon National Park and to protect fishery resources; and,

(6) limit maximum flows released during normal operations to minimize to the extent reasonably possible the adverse environmental impacts of Glen Canyon Dam operations on Grand Canyon National Park and to protect fishery resources.

(b) The Secretary shall develop and implement the interim operating procedures described in subsection (a) of this section in consultation with-

(1) appropriate agencies of the Department of the Interior, including the Bureau of Reclamation, United States Fish and Wildlife Service, and the National Park Service;

(2) the Secretary of Energy;

(3) the Governors of the States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming; and,

(4) Indian tribes; and with the full participation of the general public, including representatives of environmental organizations, the recreation industry, and contractors for the purchase of Federal power produced at Glen Canyon Dam.

(c) The Secretary shall develop and implement the interim operating procedures described in subsection (a) of this using the best and most recent scientific data available.



(d) The interim operating procedures shall terminate upon compliance by the Secretary with the requirements of section 5 of this Act.

(e) The Secretary may deviate from the interim operating procedures described in subsection (a) of this section upon a finding that such deviation is necessary and in the public interest-

- (1) to comply with the requirements of section 5(a) of this Act;
- (2) to respond to hydrologic extremes or power system operating emergencies; or,
- (3) to further reduce adverse impacts on environmental cultural and recreational resources downstream from Glen Canyon Dam.

**Sec. 5. GLEN CANYON ENVIRONMENTAL STUDIES; GLEN CANYON DAM ENVIRONMENTAL IMPACT STATEMENT; AND LONG-TERM OPERATING PROCEDURES FOR GLEN CANYON DAM**

(a) The Secretary shall, within three years after the date of enactment of this Act, complete the final Glen Canyon Dam Environmental Impact Statement in accordance with the requirements of the National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.), and the Glen Canyon Environmental Studies.

(b) The Comptroller General shall audit the costs and benefits to water and power users and to recreational and environment; values of management policies and operating procedures identified pursuant to subsection (a) of this section and report the results of the audit to the Secretary and the Congress.

(c) Based on the findings, conclusions, and recommendations made in the studies and the statement prepared pursuant to subsection (a) of this section and the audit performed pursuant to subsection (b) of this section, the Secretary shall implement long-term operating procedures for Glen Canyon Dam that will, alone or in combination with other reasonable mitigation measures, ensure that Glen Canyon Dam is operated in a manner consistent with this Act. Such procedures shall not interfere with the primary water storage and delivery functions of Glen Canyon Dam, pursuant to the Colorado River Compact, consented to by the Act of August 19, 1921 (42 Stat. 171, chapter 71) and approved by section 13(a) of the Act of December 21, 1928 (45 Stat. 1064, chapter 42, the Upper Colorado River Basin Compact, consented to by the Act of April 6, 1949 (63 Stat. 31, chapter 48), and other laws relating to regulation of the Colorado River.

(d) Upon completion of the requirements of subsection (c) of this section, the Secretary shall submit to the Congress:

- (1) the studies and the statement completed pursuant to subsection (a) of this section; and,
- (2) a report describing the long term operating procedures for Glen Canyon Dam and other measures taken to protect, mitigate adverse impacts to, and improve the condition of the environmental, cultural and recreational resources of the Colorado River downstream of Glen Canyon Dam.

**Sec. 6. LONG-TERM MONITORING**

The Secretary shall establish and implement long-term monitoring requirements that will ensure that Glen Canyon Dam is operated in a manner consistent with the requirements and intent of this Act.

**Sec. 7. AUTHORIZATION OF APPROPRIATIONS.**

There are authorized to be appropriated such sums as may be necessary to carry out the purposes of this Act.

**Sec. 8. ENDANGERED SPECIES ACT.**

Notwithstanding the provisions of section 4 of this Act, nothing in this Act shall be interpreted as modifying or amending the provisions of the Endangered Species Act of 1973 (16 U.S.C. Sec. 1531 et seq.) with regard to the operating of Glen Canyon Dam.

## APPENDIX B

The Grand Canyon Protection Act, S.2807, 101st Cong., 2d Sess., 136 Cong. Rec. 85,9181-82 (1990). The Act is reproduced here in its entirety.

**A BILL**

To direct the Secretary of the Interior to establish and implement power operating criteria at Glen Canyon Dam, to protect the environmental and recreational resources of Grand Canyon National Park, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

**Sec. 1. SHORT TITLE.**

This Act may be cited as the "Grand Canyon Protection Act of 1990".

**Sec. 2. FINDINGS.**

The Congress finds that-

(1) current operational practices at Glen Canyon Dam, including fluctuating water releases made for the enhanced production of "peaking" hydroelectric power, and flood releases, have substantial adverse effects on downstream Colorado River environmental and recreational resources, including resources in Grand Canyon National Park;

(2) the Secretary of the Interior (referred to as "the Secretary") announced on July 27, 1989, the preparation of an environmental impact statement to evaluate the impacts of Glen Canyon Dam operations on Downstream Colorado River environmental and recreational resources;

(3) Based on existing information and with information developed during preparation of the environmental impact statement, the Secretary will be able to make informed decisions regarding possible changes to current power operational criteria and practices for Glen Canyon Dam and to take other measures to protect, mitigate adverse impacts to, and improve the condition of downstream environmental and recreational resources;

(4) the substantial adverse effects of current power operations of Glen Canyon Dam can at least be partially mitigated by the development and implementation of interim power operating criteria pursuant to section 4, pending development of power operating criteria pursuant to section 5 of this Act; and

(5) the Act of August 25, 1916 (39 Stat. 535, chapter 408; 16 U.S.C. 1 et seq.) (commonly known as the "National Parks Organic Act"), the Act of April 11, 1956 (70 Stat. 105, chapter 203; 43 U.S.C. 620 et seq.) (commonly known as the "Colorado River Storage Project Act"), the Colorado River Basin Project Act (43 U.S.C. 1511 et seq.), the

Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.), and other Federal laws require the Secretary of the Interior to operate Glen Canyon Dam in such a manner as to protect, mitigate adverse impacts to, and improve the conditions of the natural resources of Grand Canyon National Park and Glen Canyon National Recreation Area, in a manner consistent with the water storage and allocation purposes of the Glen Canyon Dam established pursuant to the Colorado River Compact, consented to by the Act of August 19, 1921 (42 Stat. 171, chapter 71) and approved by section 13 of the Act of December 21, 1928 (45 Stat. 1064, chapter 42) and other laws relating to regulation of the Colorado River.

**Sec. 3. PROTECTION OF GRAND CANYON NATIONAL PARK.**

The Secretary of the Interior shall operate Glen Canyon Dam in such a manner as to protect, mitigate adverse impacts to, and improve the conditions of the natural resources of Grand Canyon National Park and Glen Canyon National Recreation Area, under operating criteria that are consistent with the water storage and delivery functions of Glen Canyon Dam pursuant to the Colorado River Compact, the Upper Colorado River Basin Compact, consented to by the Act of April 6, 1949 (63 Stat. 31, chapter 48), and other laws relating to allocation of the Colorado River.

**Sec. 4. INTERIM POWER OPERATING CRITERIA FOR GLEN CANYON DAM.**

(a) **IN GENERAL.**- (1) Not later than thirty days after the date of enactment of this Act, the Secretary shall determine whether the scientific data that are available as of that date are sufficient to permit the implementation of interim power operating criteria for Glen Canyon Dam that would, without impeding the conduct of research flows for the purposes of completing the environmental impact statement, increase the protection and improvement of the condition of the natural resources of Grand Canyon National Park and Glen Canyon National Recreation Area.

(2) If, pursuant to paragraph (1) the Secretary determines that the available scientific data are reasonably sufficient to permit the implementation of the interim power operating criteria described in paragraph (1), the Secretary shall implement such criteria not later than 30 days thereafter.

(3) If, pursuant to paragraph (1) the Secretary determines that the scientific data are not reasonably sufficient to permit the implementation of the interim power operating criteria described in paragraph (1), the Secretary shall-

(A) submit a report to Congress stating the nature of the scientific data that are lacking so as to preclude

the immediate implementation of interim power operating criteria pursuant to paragraph (2);

(B) proceed as quickly as possible to procure such data; and

(C) implement such criteria not later than thirty days after adequate scientific data become available, and in no event later than the earlier of-

(i) 30 days after the cessation of research flows for the purposes of completing the environmental impact statement; or

(ii) September 1, 1991.

(b) **OBJECTIVES.**- The interim power operating criteria described in subsection (a) shall be designed to-

(1) not interfere with the water storage and delivery functions of Glen Canyon Dam pursuant to the Colorado River Compact, the Upper Colorado River Basin Compact, and other laws relating to regulation of the Colorado River;

(2) minimize the adverse environmental impacts of Glen Canyon Dam operations on Grand Canyon National Park and Glen Canyon National Recreation Area downstream of Glen Canyon Dam;

(3) adjust fluctuating water releases used for the production of peaking hydroelectric power and adjust rates of flow changes for fluctuating flows that will minimize adverse downstream impacts;

(4) minimize flood releases, consistent with section (3);

(5) maintain sufficient minimum flow releases from Glen Canyon Dam to minimize-

(A) adverse environmental impacts of Glen Canyon Dam operations on Grand Canyon National Park and Glen Canyon National Recreation Area downstream of Glen Canyon Dam; and

(B) protect fishery resources; and

(6) limit maximum flows released during normal operations to-

(A) minimize the adverse environmental impacts of Glen Canyon Dam operations on Grand Canyon National Park and Glen Canyon National Recreation Area downstream of Glen Canyon Dam; and

(B) protect fishery resources.

(c) **CONSULTATION AND PUBLIC PARTICIPATION.**-

The Secretary shall develop and implement the interim power operating criteria described in subsection (a) in consultation with-

(1) appropriate agencies of the Department of the Interior, including the Bureau of Reclamation, United States Fish and Wildlife Service, and the National Park Service;

(2) the Secretary of Energy;

(3) the Governors of the states of Arizona, California, Col-

orado, Nevada, New Mexico, Utah, and Wyoming; and (4) Indian tribes; and with the full participation of the general public, including representatives of environmental organizations, the recreation industry, and contractors for the purchase of Federal power produced at Glen Canyon Dam.

(d) **RELIANCE ON DATA.-**

The Secretary shall develop and implement the interim power operating criteria described in subsection (a) using the best and most recent scientific data available.

(e) **TERMINATION.-**

The interim power operating criteria shall terminate upon compliance by the secretary with section (5).

(f) **DEVIATION FROM CRITERIA.-**

The Secretary may deviate from the interim power operating criteria described in subsection (a) upon a finding that such deviation is necessary and in the public interest-

- (1) to comply with the requirements of section 3;
- (2) to respond to hydrologic extremes or power system operating emergencies; or
- (3) to further reduce adverse impacts on downstream Colorado River environmental and recreational resources.

**Sec. 5. GLEN CANYON DAM ENVIRONMENTAL IMPACT STATEMENT; POWER OPERATING CRITERIA FOR GLEN CANYON DAM.**

(a) **Studies.-** (1) Not later than 3 years after the date of enactment of this Act, the Secretary shall complete a final Glen Canyon Dam Environmental Impact Statement, in accordance with the National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.).

(2) The Comptroller General shall audit the costs and benefits to water and power users and to recreational and environmental values of management policies and operating criteria identified pursuant to section (a)(1) and report the results of the audit to the Secretary and the Congress.

(b) **OPERATING CRITERIA.-**

(1) Based on the findings, conclusions, and recommendations made in the studies and the statement prepared pursuant to subsection (a)(1) and the audit performed pursuant to subsection (a)(2), the Secretary shall implement power operating criteria for Glen Canyon Dam that will ensure that Glen Canyon Dam is operated in a manner consistent with this Act.

(c) **REPORT.-** Upon adoption of permanent power operating criteria under subsection (b), the Secretary shall submit to the Congress-

- (1) the environmental impact statement described in subsection (a); and
- (2) a report describing the power operating criteria and

other measures taken to protect, mitigate adverse impacts to, and improve the condition of the environmental and recreational resources of the Colorado River downstream of Glen Canyon Dam.

(d) **COSTS OF PREPARING ENVIRONMENTAL IMPACT STATEMENT.**- All direct costs of preparing the environmental impact statement described in subsection (a) shall be non-reimbursable.

**Sec. 6. LONG TERM MONITORING.**

The Secretary of the Interior shall establish and implement long-term monitoring requirements that will ensure that Glen Canyon Dam is operated in a manner consistent with the requirements of section 3.

**Sec. 7. AUTHORIZATION OF APPROPRIATIONS.**

There are authorized to be appropriated such sums as are necessary to carry out this Act.

