



Fall 2012

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Recommended Citation

John Loomis & Jeffery Ballweber, *A Policy Analysis of the Collaborative Upper Colorado River Basin Endangered Fish Recovery Program: Cost Savings or Cost Shifting*, 52 Nat. Resources J. 337 (2012). Available at: <https://digitalrepository.unm.edu/nrj/vol52/iss2/5>

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A Policy Analysis of the Collaborative Upper Colorado River Basin Endangered Fish Recovery Program: Cost Savings or Cost Shifting?

ABSTRACT

This case study evaluates potential benefits to water users and taxpayers from voluntary collaboration versus the "business as usual" regulatory approach to Endangered Species Act (ESA) implementation. It examines whether cooperative efforts between stakeholders work by shifting costs to taxpayers or result in real cost savings to society. The analysis suggests that voluntary collaboration provide significant cost savings to the cooperating water users, taxpayers, and those who receive benefits from species protection. Savings are demonstrated in multiple ways. First, irrigation and water districts in the Upper Colorado River Basin saved \$657 million in water costs through a cooperative recovery program for ESA compliance. These cost savings get passed on to end water users such as farmers, industries, rural and urban water users. Second, there have been no lawsuits associated with the Recovery Program allowing both private and public stakeholders to spend their money on species recovery efforts, instead of litigation. Third, a broader range of recovery efforts have been employed than would be possible with the Fish and Wildlife Service's traditional regulatory mechanisms. Even if this increases the likelihood of endangered species recovery by 10 percent more than "business as usual" the benefits to society would effectively be tens of millions of dollars more than without collaboration. Over the last ten years, the sum of the net cost savings to society from the collaborative Recovery Program is estimated at over \$300 million.

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I. INTRODUCTION AND BACKGROUND

This article provides a policy analysis of the distribution of benefits and costs associated with the Upper Colorado River Endangered Fish Recovery Program as compared to the ESA's individual Section 7 consultations.¹ In particular, we analyze whether the Recovery Program resulted in net cost savings to society or if it was an attempt by water users (and perhaps environmentalists) to simply shift ESA compliance costs to the federal taxpayers. This article provides empirical evidence supporting the view that a collaborative system wide approach can be more beneficial to society than regulations or litigation to clarify the rules and power.

Since its passage in 1973, the Endangered Species Act (ESA)² has been widely viewed as presenting a stark choice between preservation of endangered species and their critical habitat, or economic development.³ This stark choice is most apparent when ESA instream flow requirements, designed to protect listed species' critical habitat, collide with western water law. In the western U.S., the ESA can directly conflict with interstate water compacts and the legal framework of state prior appropriation water laws. These laws prioritize and allocate water diversions from a stream for beneficial, consumptive uses among various competing users within a single state.⁴

Since the 1970's, the potential environmental consequences related to building and operating water resources development projects has been a major national public policy issue. The issue in the arid western United States is the water development needed to satisfy the ever growing consumptive water demands at the expense of non-consumptive uses such as instream flows.⁵ The passage of landmark federal envi-

1. Endangered Species Act of 1973 (ESA), 16 U.S.C. § 1536(a)(2) (2006).

2. ESA, 16 U.S.C. § 1531 *et seq.*

3. Beneficial use is a basic tenant of prior appropriation water law. Historically, a beneficial use required withdrawing water from a water body for a specific "consumptive" use (e.g., mining, agriculture, drinking water, etc.). By definition, any water remaining in a river or stream for non-consumptive uses (e.g., instream flows, endangered species protection, fish and wildlife habitat, recreation, etc.) was not serving a beneficial use. Increasingly, state water laws are explicitly recognizing non-consumptive, instream uses as beneficial. *See e.g.*, PETER D. NICHOLS, ET AL., WATER AND GROWTH IN COLORADO A REVIEW OF LEGAL AND POLICY ISSUES (Univ. of Colo., Sch. of Law Nat. Res. Law Cent., 2001); COLO. FOUND. FOR WATER EDUC., CITIZEN'S GUIDE TO COLORADO WATER LAW (2004).

4. *E.g.*, WILLIAM J. McDONALD, THE UPPER BASIN'S POLITICAL CONUNDRUM: A DEAL IS NOT A DEAL (1997) (Report to the Western Water Policy Review Advisory Commission).

5. *Id.*

ronmental laws in the late 1960s and into the 1970s⁶ implicitly interjected non-consumptive instream flow requirements into federal water resource development project planning. These instream flow requirements protected fisheries, river recreation, riverine habitats, and endangered species that could be adversely affected by federal water resources development projects.⁷ Interstate water compacts and state water laws also increasingly began to recognize non-consumptive instream uses.⁸

This new federal attention to instream flow was tested when the Fish and Wildlife Service (FWS) listed four fish species in the Upper Colorado River Basin as threatened or endangered under the ESA; the Colorado pikeminnow,⁹ humpback chub,¹⁰ bonytail chub,¹¹ and the razorback sucker.¹² Multiple factors contributed to the decline of these species: hydrologic modifications (i.e., dams, dewatering and channelization), loss of habitat, competition with and predation from introduced fish species, and parasitism.¹³ However, the listing of endangered fish species caused the ESA to conflict with state water law and interstate water compacts, setting the stage for litigation in the Upper Colorado River Basin.

Litigation played a role in the Pacific Northwest during the 1980's over various ESA processes pertaining to endangered and threatened salmon and spotted owls.¹⁴ The courts issued assorted judicial decisions

6. As relevant here, the triumvirate of major federal legislation began with the National Environmental Policy Act, 42 U.S.C. § 4321 (2006), in 1969, continued with the Clean Water Act 33 U.S.C. § 1251 (2006) in 1972, and culminated with the passage of the ESA, 16 U.S.C. § 1531. *See also*, NICHOLS, ET AL. *supra* note 3.

7. McDONALD, *supra* note 4.

8. *See e.g.*, Antonio Rossman, *A New Law and the "Era of Limits" on the Colorado*, 18 NAT. RESOURCES & ENV'T 3 (2003); Lawrence J. MacDonnel, et al., *The Law of the Colorado River: Coping with Severe Sustained Drought*, 31 WATER RESOURCES BULL. 825 (1995); COLO. FOUND. FOR WATER EDUC., *supra* note 3.

9. Meeting Notice, 32 Fed. Reg. 4001 (Mar. 11, 1967). Since this listing predated the ESA's enactment, the Colorado Squawfish was "grandfathered" into ESA protection. The American Fisheries Society changed the name to Colorado pike minnow from the earlier Colorado squawfish. U.S. FISH & WILDLIFE SERV. REGION 6, U.S. DEP'T OF INTERIOR, FINAL PROGRAMMATIC BIOLOGICAL OPINION FOR BUREAU OF RECLAMATION AND IMPLEMENTATION OF RECOVERY PROGRAM ACTIONS IN THE UPPER COLORADO RIVER ABOVE THE CONFLUENCE WITH THE GUNNISON RIVER, available at <http://coloradoriverrecovery.org/documents-publications/section-7-consultation/15mile/FinalPBO.pdf> [hereinafter 15-Mile Reach PBO].

10. *Id.*

11. Determination that the Bonytail Chub (*Gila elegans*) is an Endangered Species, 45 Fed. Reg. 27,713 (Apr. 23, 1980).

12. Endangered and Threatened Wildlife and Plants; the Razorback Sucker (*Xyranthen texanus*) Determined To Be an Endangered Species, 56 Fed. Reg. 54957-01 (Oct. 23, 1991).

13. RECOVERY PROGRAM, *infra* note 25.

14. Victor Sher, *Travels with Strix: The Spotted Owl's Journey through the Federal Courts*, 14 PUB. LAND. L. REV. 41 (1993).

ranging from summary judgments for and against agency actions to granting or denying temporary restraining orders and injunctions against water diversions and timber harvests.¹⁵ It is extremely difficult to track or allocate the true cost of ESA litigation for federal, state and local governments and agencies or the private sector. It has become evident that often the outcome of the litigation is not the goal of the lawsuit. Instead it appears the goal of the litigation is to keep the issue in court for as long as possible.¹⁶ While litigation may stop or at least delay proposed development, it has contributed little to species recovery efforts.¹⁷

In 1983, litigation's inability to resolve the conflict between the ESA and state water rights came to a head. In the Upper Colorado River Basin, the FWS proposed that individual water projects would have to replace water diversions on a one acre-foot per one acre-foot basis to comply with the ESA.¹⁸ This would have mandated individual diversion projects to protect the equivalent of one acre-foot of remaining instream flows or provide in one way or another, one acre-foot of new water to

15. See generally, WILDLIFE & MARINE RESOURCES SECTION, ENVTL. & NAT. RESOURCES DIV., DEP'T OF JUSTICE, OVERVIEW OF THE ENDANGERED SPECIES ACT AND HIGHLIGHTS OF RECENT LITIGATION (2004), available at <http://apps.americanbar.org/enviro/committees/endangered/OverviewoftheESA.pdf>. Litigation in and of itself is an expensive undertaking. Furthermore, an injunction or temporary restraining order preventing a water withdrawal can result in the loss of a crop or jeopardize public water supplies regardless of the case's final disposition. See also U.S. GEN. ACCOUNTING OFFICE ("GAO"), GAO-03-949T, ENDANGERED SPECIES: DESPITE CONSULTATION IMPROVEMENT EFFORTS IN THE PACIFIC NORTHWEST, CONCERNS PERSIST ABOUT THE PROCESS (2003) available at <http://www.gao.gov/new.items/d03949t.pdf>; Daniel D. Huppert, *Columbia River Salmon Recovery: Where are We Going? And How do We Get There?*, Portland State University's Salmon Symposium "What We Don't Know about Pacific Northwest Fish Runs: An Inquiry in Decision-making under Uncertainty", July 7-8, 2000. Sponsored by the Henry M. Jackson Foundation.

16. It is very difficult to objectively and accurately determine the public and private costs of ESA implementation. It is probably fair to report that the real costs are significant to federal and state agencies as well as to the private sector. However, it is equally likely that the real costs and time requirements are not nearly as significant as often perceived. See generally, GAO, GAO-02-581, ENDANGERED SPECIES PROGRAM INFORMATION ON HOW FUNDS ARE ALLOCATED AND WATER ACTIVITIES ARE EMPHASIZED (2002), available at <http://www.gao.gov/new.items/d02581.pdf>; But cf. Departments of the Interior, Environment, and Related Agencies Appropriations Bill, 2012, H.R. Rep. No. 112-151, at 8, 112th Cong. 1st Sess. (2011).

17. E.g., Daniel D. Huppert. *Columbia River Salmon Recovery: Where Are We Going? And How do We Get There?* UNIV. OF WASH. SCH. OF MARINE AFFAIRS (Seattle, Washington) (2000), available at <http://faculty.washington.edu/huppert/SMAWorkingPaper-00-5.pdf>; Jeb Boyt, *Comment, Struggling to Protect Ecosystems and Biodiversity under NEPA and NFMA: The Ancient Forests of the Pacific Northwest and the Northern Spotted Owl*, 10 PACE ENVTL. L. REV. 1009 (1993).

18. Tom Pitts, *Update: The Upper Colorado River Endangered Fish Recovery Program*, COLO. WATER RIGHTS (Colo. Water Congress, Denver, Colo.), Fall 2000.

maintain instream flows for each acre-foot of water diverted out of the stream.¹⁹ Private water users and state agencies were faced with the critical question of how to respond to this situation.²⁰ The zero sum choices were to litigate or surrender.²¹ Litigation would mean years of project delay and uncertainty about whether the project or scaled down version of the project would ever be approved. Surrendering would mean having to incur substantial expenses to meet FWS replacement water mandates when developing their own water supplies.

A diverse set of stakeholders in the Upper Colorado River Basin including FWS, U. S. Bureau of Reclamation, Colorado, Wyoming and Utah, Colorado Water Congress (representing water users), National Audubon Society, and the Colorado Wildlife Federation recognized the pitfalls of ESA litigation and sought a cooperative win-win alternative.²² These stakeholders were faced with a series of potentially protracted and expensive litigation pitting state water laws against the ESA.²³ In such a battle, financial resources would be diverted from both water develop-

19. *Id.*

20. Ann Brower, et al., *Consensus versus Conservation in the Upper Colorado River Basin Recovery Implementation Program*, 15 CONSERVATION BIOLOGY 1001 (2001).

21. *See id.*

22. *See* Tom Pitts, *The Upper Colorado River Endangered Fish Recovery Program: A Success Story*, COLO. WATER RIGHTS (Colo. Water Congress, Denver, Colo.), Fall 2003, at 1, 8, available at http://digitool.library.colostate.edu//exlibris/dtl/d3_1/apache_media/L2V4bGlicmlzL2R0bC9kM18xL2FwYWNoZV9tZWRpYS8zMzg4Nw==.pdf; Brower, *supra* note 20; Karen Hopfl, *Case Study of the Endangered Fish Recovery Program of the Upper Colorado River*, Nat. Resources & Env't Policy Seminar of the Univ. of Colo. Interdisciplinary Graduate Cert. Program in Env'tl. Pol'y, Working Paper No. 94-57, 1994, available at http://www.colorado.edu/conflict/full_text_search/AllCRCDocs/94-57.htm; James H. Bolin, Jr., *Of Razorbacks and Reservoirs: The Endangered Species Act's Protection of Endangered Colorado River Basin Fish*, 11 PACE ENVTL L. REV. 35 (1993).

23. *See*, GAO, GAO/RCED-87-78, ENDANGERED SPECIES: LIMITED EFFECT OF CONSULTATION REQUIREMENTS ON WESTERN WATER PROJECTS (1987), available at <http://archive.gao.gov/d2t4/132628.pdf>. The report finds that overall from October 1977 through March 1985, the ESA's consultation requirements had little effect on western water development projects. The ESA consultations had "varying but normally limited" impacts on the projects' timing, scope and overall project costs. Furthermore, during this period no proposed water development project was terminated because of the ESA. However, the Report states that: "The major concern about consultations' effects on [water] projects has been centered in two river basins—the Upper Colorado and the Platte. In these basins, the [FWS] has held that any water depletions would likely jeopardize the endangered species present. As a result, concern among water developers has been especially intense in these areas." *Id.* at 3. While the ESA compliance costs in time and expense may have been found to be limited at the national level from 1977 through 1985, the Ute Water District's efforts to comply with the ESA in 1994 to obtain a federal easement to replace a pipeline on a Colorado River tributary was extremely expensive in staff time and cost of outside technical consultants. In person interview with Larry Clever, Manager, Ute Water Conservation District, Grand Junction, CO, (Jun. 4, 2008).

ment and species recovery to expensive litigation.²⁴ To avoid such a protracted standoff, the stakeholders negotiated the Upper Colorado River Endangered Fish Recovery Program (herein after Recovery Program) with the FWS.²⁵ On January 21, 1988 the Secretary of the Interior, the Administrator of the Department of Energy's Western Area Power Administration and the Governors of Colorado, Utah, and Wyoming signed a fifteen (15) year Cooperative Agreement to participate in and implement the Recovery Program.²⁶ In August of 2009, the Recovery Program's cooperative agreement was extended through September 30, 2023.²⁷

The Recovery Program's geographic reach includes the entire Colorado and Green rivers and their major tributaries upstream of Lake Powell.²⁸ Rather than focusing solely on preserving instream flows, the Recovery Program supports species protection and recovery through five interrelated elements.²⁹ The first element is habitat management, which is primarily concerned with providing instream flows for fish recovery.³⁰ The next element is habitat development and maintenance.³¹ Habitat development includes two categories of activities: (a) structural activities such as building fish ladders so that fish can move around diversion dams, installing fish screens at water diversion structures, and canals to keep fish out,³² (b) non-structural activities such as floodplain restoration and configuring backwater channels so that juvenile fish can safely mature before entering the mainstream of the Colorado and Green Rivers.³³ The third element is construction of fish hatcheries for stocking

24. WILDLIFE & MARINE RESOURCES SECTION, *supra* note 15 at 10, 12. *See also*, GAO, *supra* note 15.

25. U.S. FISH & WILDLIFE SER. REGION 6, U.S. DEP'T OF INTERIOR, RECOVERY IMPLEMENTATION PROGRAM FOR ENDANGERED FISH SPECIES IN THE UPPER COLORADO RIVER BASIN (1987), available at <http://coloradoriverrecovery.org/documents-publications/foundational-documents/1987BlueBook.pdf> [hereinafter RECOVERY PROGRAM]. The document is frequently referenced and cited as the "Blue Book" or by its initials "RIP."

26. Cooperative Agreement for Recovery Implementation Program for Endangered Species in the Upper Colorado River Basin, Jan. 22, 1988, available at <http://coloradoriverrecovery.org/documents-publications/foundational-documents/cooperativeagreement.pdf>.

27. Extension of the Cooperative Agreement for the Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin, available at <http://coloradoriverrecovery.org/documents-publications/foundational-documents/2009extension.pdf>.

28. *Id.*

29. RECOVERY PROGRAM, *supra* note 25 at 4-1.

30. *Id.* at 4-1-4-10.

31. *Id.* at 4-1-4-13.

32. *Id.*

33. *Id.*

programs to supplement natural reproduction of threatened and endangered fish, and to help reestablish listed fish populations in newly restored habitats.³⁴ The fourth element is the control and management of nonnative species and sportfishing to actively encourage the removal of predatory nonnative species such as northern pike and smallmouth bass that have been introduced into the listed species' critical habitat.³⁵ Finally, the Recovery Program includes research, monitoring and data management to track the effectiveness of these five diverse elements in meeting species recovery goals and to support adaptive management.³⁶

The Recovery Program's structure involves a collaborative, consensus-based decision-making process that is coordinated by the FWS. It also involves all the stakeholders listed above (e.g., not only federal agencies and water developers, but also state water resource agencies and environmental groups). The consensus-based Recovery Program created a programmatic consultation mechanism to actively pursue recovery of the four endangered species as well as provide for water use and development to meet human needs. No changes in the ESA regulations, interstate compacts, or state water law were needed to implement the Recovery Program.³⁷ The Recovery Program greatly streamlined the ESA Section 7 consultation process, reducing the burden on the FWS, water developers, and often the Bureau of Reclamation.³⁸

The Recovery Program, with its multiple stakeholders governing committee, exemplifies a successful "boundary organization." Such an organization is a new venue that can take the form of created, altered, or newly evolved governance.³⁹ Boundary organizations are often seen as successful by participants because the organizations often create a savings for the participants. The real question is whether these savings arise from merely shifting participants' costs to the general public or if the savings are from efficiencies arising from broader scale cooperation. This analysis provides some insights on this broader policy debate by identifying and quantifying how much each stakeholder group pays for the Recovery Program and who benefits in the form of cost savings from the collaborative approach to species recovery. This article shows a substantial overall cost savings to water providers from cooperating with the state and federal agencies and conservation groups. Specifically, while

34. *Id.* at 4-14-4-16.

35. *Id.* at 4-17-4-19.

36. *Id.* at 4-20-4-22.

37. Pitts, *supra* note 18.

38. See e.g. Pitts, *supra* note 22; Brower, *supra* note 22; GAO, *supra* note 23.

39. Ingram, Helen & Barbara Bradley, *Water Sustainability: Policy Innovation and Conditions for Adaptive Learning*. Draft discussion paper prepared for the SMEP Academy, Michigan State University (Nov. 18-19, 2006).

water users pay half the costs of the Recovery Program, they save three times that much in reduced water replacement costs. The federal taxpayers pay most of the other half of the costs of the Recovery Program. However, summing all the costs and benefits, there is a net cost savings to the nation as a whole of at least \$315 million for the cooperative approach.

The first section of this paper discusses the methods and geographic scope of the analysis. The second section discusses and quantifies the collaborative Recovery Program's benefits (i.e., cost savings) in terms of ESA Section 7 consultations and water replacements as well as potential benefits of increased species recovery. Third, the paper provides a tabulation of the Recovery Program's costs. Fourth, the paper qualitatively and quantitatively compares the benefits/beneficiaries (e.g., cost savings) to the costs/bearers. Lastly, conclusions are drawn regarding whether broad scale collaboration simply shifts costs to others or results in lower costs.

II. METHODS AND SCOPE OF THE ANALYSIS

The analysis drew from a combination of: (a) published materials including journal articles, Recovery Program Highlights⁴⁰, agency websites⁴¹, and agency memos; and (b) phone and in-person interviews with several of the Recovery Program's participants. This combination of published primary and secondary materials along with interviews provides the most in-depth analysis of the economic aspects of the Recovery Program to date.

The geographic reach of the Recovery Program includes the main stem of the Colorado and Green Rivers and their tributaries. Some of the tributaries include the Gunnison, White, and Yampa Rivers where the Elkhead Reservoir expansion occurred and tributaries thereto.⁴² The participants interviewed were primarily in Colorado offices which often represented the Recovery Program's total geographic reach. This vast geographic reach should provide many opportunities to find cost effective

40. UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM, *Program Highlights*, <http://www.coloradoriverrecovery.org/general-information/general-publications/program-highlights.html> (last visited Dec. 2, 2011).

41. E.g., COLORADO WATER CONSERVATION BOARD, *CWCB's Endangered Species Efforts*, available at <http://cwcb.state.co.us/environment/endangered-species/Pages/main.aspx> (last visited Dec. 2, 2011).

42. RECOVERY PROGRAM, *supra* note 25.

solutions for on-the-ground species recovery throughout their critical habitat, as compared to a site specific, project by project approach.⁴³

III. BENEFITS OF THE RECOVERY PROGRAM

The ESA's Section 7 imposes an affirmative duty on federal agencies not to authorize (i.e., issue permits), fund or carry out any action that will harm a species listed as threatened or endangered or harm its designated critical habitat.⁴⁴ In order to determine if the federal agency's action will harm a threatened species, the FWS must go through a process to ensure the safety of the species.⁴⁵ The first step is for the action agency to prepare a biological assessment. A biological assessment describes the proposed action, when it will occur, what it will involve, and any conservation measures included (e.g., stop work during nesting, mating, or migration periods).⁴⁶ The FWS then conducts an informal consultation with the action agency based on the biological assessment. If the FWS finds that proposed action is unlikely to adversely affect a listed species or its critical habitat, then the consultation ends and the agency receives permission to continue the project.⁴⁷ However, if an agency or the FWS determines that an action may harm a listed species or its critical habitat, a formal consultation is required.⁴⁸ After a formal consultation is initiated, the agency must provide the FWS with the best scientific and commercial data available or which can be obtained.⁴⁹ After a formal consultation is initiated, the FWS has 90 days to review the data and issue a biological opinion.⁵⁰ However, if the FWS determines that additional data would provide a "better information base from which to formulate a biological opinion," the FWS can extend the formal consultation and request additional data.⁵¹ The FWS could understandably exercise an abundance of caution to seek better data to prevent potential litigation. The question of

43. E.g., Martha G. Roberts & Dan Grossman, *Healthy Rivers, Healthy Economy: Enhancing Instream Flows Will Benefit Colorado's Environment and Economy*, Environmental Defense (2008); James V. Hansen, *Endangered Economics*, 16 FORUM FOR APPLIED RESEARCH AND PUBLIC POLICY 45 (Spring 2001); John B. Loomis, *Estimating the Public's Values for Instream Flow: Economic Techniques and Dollar Values*; 34 J. OF THE AM. WATER RES. ASS'N 1007 (1998)

44. ESA, *supra* note 2 at § 1536(a)(2).

45. *Id.*

46. 50 C.F.R. § 402.12 (2008).

47. 50 C.F.R. § 402.13.

48. 50 C.F.R. § 402.14.

49. 50 C.F.R. § 402.14(d).

50. 50 C.F.R. § 402.14(e).

51. 50 C.F.R. § 402.14(f).

how much data is sufficient to issue a biological opinion is certainly ripe for adjudication.⁵²

A biological opinion can result in one of three outcomes.⁵³ A “no jeopardy” opinion essentially allows the action to proceed as proposed.⁵⁴ The next type of opinion is a “jeopardy” opinion which finds that a proposed action could jeopardize a listed species or its critical habitat.⁵⁵ In this case, the FWS has two options.⁵⁶ The FWS can stop the proposed action⁵⁷ or the it can issue an opinion that includes viable ways to modify the proposed action or includes additional conservation measures creating a “reasonable and prudent alternative” to a jeopardy opinion.⁵⁸ A “reasonable and prudent alternative” allows the now modified action to proceed.⁵⁹ However, the reasonable and prudent alternative may involve opportunity costs to the developer in terms of less allowable water diversion.

A. Streamlined Section 7 Consultations with the Recovery Program

It is costly for FWS to attempt to identify reasonable and prudent alternatives for several hundred individual projects so as to not have to stop all these projects altogether, and these individual consultations may not be able to address the cumulative impact of all the individual projects together. Recognizing the limitations of individual project by project consultations, the FWS instead conducts programmatic consultations to collectively address multiple similar projects on a broader geographic scale such as watershed or other ecological unit basis.⁶⁰ “The benefits of a programmatic approach include: 1) streamlined site-specific consultation processes; 2) minimization of the potential ‘piece-meal’ effects that can occur when evaluating individual projects out of the context of the complete agency program; 3) more cost-effective integration of ecosystem/recovery planning activities with action agency activities; 4) added predictability for all parties; and 5) the opportunity to improve

52. *E.g.*, WILDLIFE AND MARINE RESOURCES SECTION, *supra* note 15.

53. Bolin, *supra* note 22, at 13.

54. 50 C.F.R. § 402.13(a).

55. 50 C.F.R. § 401.14(g)(8)(h)(3).

56. 50 C.F.R. § 402.14(g)(7). Depending on the proposed action, the FWS can consider authorizing an incidental take of listed species.

57. 50 C.F.R. § 402.14(h)(3).

58. *Id.*

59. 50 C.F.R. § 402.14(h).

60. *Endangered Species Consultation Handbook Procedures for Conducting Consultation and Conference Activities Under Section 7 of the Endangered Species Act*, U.S. FISH AND WILDLIFE SERVICE AND NATIONAL MARINE FISHERIES SERVICE, Mar. 1998, <http://www.fws.gov/caribbean/es/PDF/Sec%207%20Handbook.pdf> (last visited Oct. 19, 2011).

and more efficiently integrate the action agency's [ESA §] 7(a)(1) responsibilities at the program level."⁶¹

In response to the limited and costly individual project consultations, the Recovery Program was developed collaboratively and approved by the FWS as a programmatic consultation to provide a reasonable and prudent alternative for water development projects in the Upper Colorado Basin.⁶² The Recovery Program's Action Plan is an adaptive management approach to guide the Program's on the ground activities and budget decision process.⁶³ The Recovery Action Plan is reviewed and updated annually and is the basis of the Program's annual work plan.⁶⁴ The work plan in turn addresses and prioritizes each of the Recovery Program's five elements to pursue positive population responses in the four listed species.⁶⁵ As such, the Recovery Program epitomizes a consensus based, programmatic alternative to the FWS's usual project-by-project, ESA Section 7 consultations. The ESA's general principle of project-by-project review is desirable when the water diversion projects are very large and quite different in the location and method used to divert water.⁶⁶ On the other hand, a project-by-project review of several hundred of the Upper Colorado River basin's water related projects with very small diversions does not make economic sense.⁶⁷ For example, many of the 1,111 water diversions listed in Table 1 are stock ponds to water livestock or very small diversions to provide water for small 35 acre hobby ranches common in Colorado.⁶⁸ Calculations based on Table 2 below indicate the average water diversion for these small projects was 185 acre-feet (205,917 acre feet divided by 1,111 projects). This compares to a large water diversion of 28,600 acre-feet discussed

61. U.S. FISH AND WILDLIFE SERVICE, REGIONAL OFFICE, REGION 2, PROGRAMMATIC BIOLOGICAL AND CONFERENCE OPINION: THE CONTINUED IMPLEMENTATION OF THE LAND AND RESOURCE MANAGEMENT PLANS FOR THE ELEVEN NATIONAL FOREST AND NATIONAL GRASSLANDS OF THE SOUTHWEST REGION, 1 (June 10, 2005) available at http://www.biologicaldiversity.org/programs/public_lands/forests/pdfs/BO_20050610_FS_LRMP.pdf.

62. UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM, RECOVERY IMPLANTATION PROGRAM SECTION 7 CONSULTATION, SUFFICIENT PROGRESS AND HISTORIC PROJECTS AGREEMENT (Oct 15, 1993 (Revised Mar. 8, 2000)) AND RECOVERY IMPLEMENTATION PROGRAM RECOVERY ACTION PLAN (RIPRAP) (Mar. 25, 2011) available at <http://www.coloradoriverrecovery.org/documents-publications/foundational-documents/RIPRAP/RIPRAPmarch25-11rev.pdf> [hereinafter "RECOVERY ACTION PLAN"].

63. *Id.*

64. *Id.*

65. *Id.*

66. See *Endangered Species Consultation Handbook*, *supra* note 60.

67. See *e.g.*, RECOVERY PROGRAM *supra* note 25.

68. In person interview with Al Phister, Project Leader, Fish and Wildlife Service, Western Colorado Field Office in Grand Junction, CO (Jun. 4, 2008) and 15-Mile Beach PBO, *supra* note 9.

below. The 185 acre-foot diversions compared to the Colorado River's 13,416 acre-foot average daily flows during the six month run off season⁶⁹ is less than 2% of the flows, and would be expected to minimally impact the four listed fish species.

Prior to the Recovery Program, the FWS initiated individual, site-specific Section 7 consultations to verify this is the case.⁷⁰ With the site-specific approach, each water developer was required to provide the information needed by the federal permitting agency and the FWS for this consultation.⁷¹ In addition to being responsible for the consultation costs, each water developer would have also had to either develop or purchase water to replace their diversions on a one acre-foot-to-one acre-foot basis as discussed above.⁷²

The Recovery Program includes several elements to streamline and accelerate the ESA's Section 7 consultation process for federal and non-federal water projects on the Upper Colorado River.⁷³ During the Section 7 consultation process, the FWS gathers and reviews the "best scientific and commercial data available or which can be obtained during the consultation."⁷⁴ Unlike the biological opinions discussed above, in conjunction with the Recovery Action Plan, sub-basin specific Programmatic Biological Opinions (PBO) allow the FWS to evaluate an entire group of projects in a similar geographic area that are also similar in type (e.g., water diversion).⁷⁵ The FWS can then issue a single PBO specifying types of actions or projects and corresponding conservation measures necessary to avoid jeopardizing the continued existence of listed species.⁷⁶ Collectively, the Recovery Program, its Recovery Action Plan and sub-basin specific PBOs are a Reasonable and Prudent Alternative (RPA) to ESA Section 7 consultations in the Upper Colorado Basin. Together, these documents allow the FWS to use a streamlined system to expeditiously evaluate and consider hundreds of proposed small diversions in the Upper Colorado Basin.

69. U.S. GEOLOGICAL SURVEY (USGS), WATER-DATA REPORT 2010: 09085100 COLORADO RIVER BELOW GLENWOOD SPRINGS, CO 2 (2010), <http://wdr.water.usgs.gov/wy2010/pdfs/09085100.2010.pdf>.

70. Pitts, *supra* note 18, at 8.

71. *Id.*

72. *Id.* at 3.

73. RECOVERY PROGRAM, *supra* note 25.

74. FWS Formal Consultation, 50 C.F.R. § 402.14(d) (2012).

75. See generally 50 CFR § 402; Endangered Species Consultation Handbook, *supra* note 60; 15-Mile Reach PBO, *supra* note 9.

76. See generally Interagency Cooperation—Endangered Species Act of 1973, 50 C.F.R. § 402 (2012); see also Endangered Species Consultation Handbook, *supra* note 60; 15-Mile Reach PBO, *supra* note 9.

B. The Recovery Program’s Benefits to Small Diverters

Figure 1 illustrates how Section 7 consultations can be performed in the Upper Colorado Basin under the 15-Mile Reach PBO for individual consultations in this 15-mile stretch of the Colorado River east (upstream) of Grand Junction, Colorado. Section 7 consultation refers to the typical time period the FWS and water diverter would interact once a federal agency, like the U.S. Bureau of Reclamation or irrigation district, provides information requesting a formal consultation. “Fees” refers to whether a one-time depletion fee of \$17 an acre-foot must be paid into the Recovery Program.

FIGURE 1. Time and Financial Costs of Section 7 Reviews under the Recovery Plans 15-Mile Reach PBO⁷⁷

	----- ----- -----→		
	0-----100AF-----4,500 AF-----in excess of		
4,500 AF			
Sec.7 consultation	2-3 days	21-30 days	135 to 300 days
One-time Fees	none	\$17/AF	\$17/AF

As seen in Figure 1, for small water diversions of 100 acre feet or less, such as stock ponds or permits for small (e.g., ranchette) water diversions, the Section 7 consultation can take place in a few days and no depletion fee is required. As detailed below, the tiered approach shown in Figure 1, represents significant savings for the water user, the federal action agency, and the FWS, since the FWS no longer has to write a separate Biological Opinion for every Section 7 consultation on every small diversion.

The blanket Section 7 approval for projects over 100 acre-feet, but less than 4,500 acre-feet also saves water users and the FWS substantial time, since with the Recovery Program RPA, diverters do not have to develop individual RPA’s that can involve elaborate hydrological modeling. Hydrologic modeling to refine the estimates of the net water depletions for replacement purposes can cost about \$2 million and take 2-3

77. 15-Mile Reach PBO *supra* note 9. The 15-Mile Reach Programmatic Biological Opinion is so named to specifically identify the particular stretch of the Colorado River it covers. The 15-Mile designation is a spatial reference unrelated to quantity of water withdrawals

years to develop and refine. Instead, the water user simply pays the \$17 one-time fee for each acre-foot of water diverted. Based on discussions with the FWS, the time to complete a Section 7 consultation has been reduced on these projects from a minimum of 30 or more days to 30 days or less.⁷⁸

In 2000, the cost and time savings from the Recovery Program were estimated to be in the millions of dollars.⁷⁹ Many of the small and medium size projects up to 4,500 acre-feet would have likely been seriously delayed or possibly cancelled due to the lack of FWS personnel to process 1,540 Section 7 consultations in a timely manner.⁸⁰ The time costs to the project sponsors would also have been substantial in providing the information required by FWS to conduct site specific Section 7 consultations. It is difficult to calculate a specific estimate of the amount of savings but they could be on the order of several million dollars.⁸¹

B. Additional Section 7 Cost Savings to Large Water Projects

There are also cost savings to the large non-federal water projects involving more than 4,500 acre-feet. These projects now see substantial savings in time and money as compared to before the PBO. An example of this is the case study of Ute Water District which is used to quantify the cost savings from the Recovery Program of large projects.⁸²

In 1994, the Ute Water District proposed building a replacement pipeline from Plateau Creek, a tributary to the Colorado River, to utilize 28,600 acre-feet of water.⁸³ This consultation preceded the PBO, and the proposed new depletion was greater than the 3,000 acre-foot RPA limit at the time. (The RPA limit was raised to 4,500 acre-feet in 2001⁸⁴) The Section 7 consultation “required a number of iterations of hydrologic model runs” and more than a dozen meetings.⁸⁵ The initial consultations suggested that Ute Water District would have to make up or replace its diversions by as much as 18,600 acre-feet.⁸⁶ “To refine this estimate, the

78. In person interview with Al Phister, Project Leader, Biologist, Fish and Wildlife Service, Western Colorado Field Office in Grand Junction, CO (Jun. 4, 2008).

79. Pitts, *supra* note 18.

80. Al Phister Interview, *supra* note 78.

81. Pitts, *supra* note 18, at 8.

82. Larry Clever Interview, *supra* note 23; Joseph S. Stilbrich & Thomas J. Charles, *Resolution of Endangered Species Act Issues in Permitting the Plateau Creek Pipeline*, 36 J. OF THE AM. WATER RES. ASS'N 1263 (2000).

83. Stilbrich & Charles, *supra* note 82.

84. Email from Angela Kantola, Assistant Dir., Recovery Program FWS, to John Loomis, author (Mar. 22, 2010, 13:18 MST) (on file with author).

85. *Id.*

86. *Id.*

water district spent two years refining its water model, which ultimately estimated that 11,000 acre-feet of water would have to be replaced.”⁸⁷ During this time, a series of Recovery Program meetings were attended by a wide range of stakeholders, and led to FWS issuing a PBO.⁸⁸ The first 3,000 acre-feet of this replacement water would be covered under the PBO.⁸⁹ The FWS required Ute Water to re-consult before depletions beyond 3,000 acre-feet were authorized.⁹⁰ The Ute Water District was expected to exceed depletions of 3,000 acre-feet in 2015.⁹¹

The permit was issued in 1999; five years after the District initiated its request. The Ute Water District estimated that it spent \$2.4 million on the ESA Section 7 consultation, much of which was spent to develop and refine a hydrologic model of the river basin.⁹² The \$2.4 million in direct costs did not include the district’s internal costs in personnel time and travel, nor did they include the internal personnel and travel costs to other federal agencies, Colorado state agencies, or stakeholders to participate in the prolonged negotiations.⁹³

In 1999, the FWS approved a PBO covering the 15-Mile Reach of the Colorado River that Ute Water District’s project affected. The PBO allows the FWS to evaluate an entire group of projects in this geographic area that are of a similar in type (e.g., water diversion) without individual project specific biological opinions.⁹⁴ The 15-Mile Reach PBO allows up to 120,000 acre-feet of new depletions. This PBO would have been applicable to the Ute Water District’s project. Had the 15-mile Reach PBO been in place in 1995, the Ute Water District estimates that a similar, but new 28,600 acre-feet diversion today would likely only take one year to be approved today and cost approximately \$250,000.⁹⁵ Thus the 15-mile Reach PBO approach would have eliminated four years of delay and associated costs. This alone would have saved the Ute Water District around \$2.15 million.⁹⁶ Federal and state agencies would also have reduced staff expenses from the shorter review period.

To provide a rough estimate of the future cost savings to future large projects recall that the 15-Mile Reach PBO allows for up to 120,000

87. *Id.*

88. *See* 15-Mile Reach PBO, *supra* note 9.

89. Stilbrich, & Charles, *supra* note 82, at 1267.

90. *Id.*

91. *Id.*

92. Larry Clever Interview, *supra* note 23.

93. *Id.*

94. *See generally* 50 C.F.R. § 402 (2012); Endangered Species Consultation Handbook, *supra* note 60; 15-Mile Reach PBO, *supra* note 9.

95. Larry Clever Interview, *supra* note 23.

96. *Id.*

acre-feet of depletions. In principle, up to four projects the size of the Ute Water District could have been covered under the procedures outlined in the PBO, with 5,600 acre-feet available for smaller projects. Rather than taking five years, the Ute Water District example discussed above indicates that Section 7 consultation for projects larger than 4,500 acre-feet are now estimated to take one year and cost approximately \$250,000, for a savings of \$2.15 million per project as compared to before the PBO.

Applying this \$2.15 million per project cost savings to three additional similar sized projects that could be permitted within the 120,000 acre-foot total depletions yields nearly \$6.5 million in cost savings. Likewise, applying a three-year-per-project time savings to three additional large projects would yield nine years of avoided time delay. At the other end of the project size range, up to 17 additional moderately sized projects, larger than the 4,500 acre-foot cut-off (e.g., 5,000 acre-feet), could be permitted within the Recovery Program's 120,000 acre-foot depletion cap. This would still leave 5,000 acre-feet for smaller projects. If the Section 7 consultations for these 17 additional projects had been similar in expense and duration to the Ute Water District, then total savings would be about \$36 million. During the next several decades, the project sizes put forward will most likely be a mix of Ute Water District sized projects (28,000 acre-feet plus) and medium projects. Therefore, the cost savings would be at least \$6.5 million and could be as high as \$36 million. A projected combination of large and medium sized projects will provide an estimated \$21 million of cost savings.

C. The Recovery Program's Water Depletion Savings to Water Users

Avoiding the proposed requirement for one acre-foot of replacement water for each one acre-foot of water diverted also generates significant savings. With the Recovery Program, mitigation for diversions occurs with a broader set of recovery management actions. Rather than just focusing on preventing any reduction in flows as the sole basis for recovery of the four species, the Recovery Program supports a mix of concurrent management actions including: (a) habitat restoration; (b) habitat development and maintenance; (c) non-native predator fish management; (d) propagation via hatcheries of endangered fish; and (e) in-stream flow protection.⁹⁷ Consideration of a wider range of fish recovery actions than just instream flows, has the potential to result in lower costs of recovery or greater recovery for a given amount of money spent. These savings occur for several reasons. First, there are other factors beyond limited flows that contribute to species endangerment. Second,

97. RECOVERY PROGRAM, *supra* note 25, at ii-iii.

there is a diminished incremental effect of what additional flows can accomplish in terms of species recovery. Third, there are also significant economies of scale in several of these actions, particularly in habitat restoration and hatchery construction/operation. For example, the cost per fish raised from a large hatchery is often lower than from several small project specific hatcheries since each small hatchery would have much duplication of specialized staff and equipment that would not be needed at all times. Finally, there may be lower per unit costs of a basin wide approach versus a project by project mitigation approach. This savings arises because there are opportunities to find the optimum locations for habitat restoration or hatcheries, versus being constrained to perform these functions within a narrow single project area. One example of the economies of scale approach is the enlargement of Elkhead Reservoir to meet both water supply and endangered fish flow augmentation. The water district was going to raise the height of an existing dam 15 feet to increase water supply capability. It turned out it was cheaper to raise the dam height an additional 10 feet to provide fish flows rather than build an entirely new dam to provide fish flow augmentation.⁹⁸

As shown in Table 1, the Recovery Program has allowed for more than 300,000 acre-feet of new water depletions, involving more than a thousand projects. About half the projects were smaller than 100 acre-feet, and cumulatively represented less than 10,000 acre-feet of diversions. The remaining projects were all under the 4,500 acre-foot amount, and hence merely paid the one time fee of \$17 per acre-foot for an expedited Section 7 consultation.⁹⁹ Prior to the PBO, Section 7 consultation on projects larger than 100 acre-feet often required extensive and expensive hydrologic and biological assessments by individual water users of federal projects.¹⁰⁰ The PBO eliminates the need for these detailed project assessments. As Pitts noted “[t]his alone will save hundreds of thousands if not millions, of dollars in study and analysis costs”.¹⁰¹

98. *Elkhead Reservoir Enlargement Project*, COLO. RIVER DIST., http://www.crwcd.org/page_28 (last visited Apr. 19, 2012).

99. Email from Angela Kantola, Assistant Dir., Recovery Program, FWS, to author (Feb. 22, 2010).

100. Pitts, *supra* note 18, at 8.

101. Pitts, *supra* note 18, at 6.

TABLE 1. Upper Colorado River Endangered Fish Recovery Program Summary of Section 7 Consultations by State 1988 to 2009¹⁰².

State	Number of Projects	New Depletions Acre-feet/year	Depletion Fees Paid by Water Users
Colorado	1111	205,917	\$893,563
Utah	198	75,616	\$622,188
Wyoming	164	33,427	\$243,395
Multi-State (Regional)	238		0
TOTALS	1,711	314,961	\$1,759,146

To illustrate the cost savings of the reduced water replacement, we investigate the savings in the State of Colorado in more detail. As seen in Table 1, Colorado waters had 205,917 acre-feet of new depletions associated with an eleven-year time period. Without the Recovery Program, FWS would have required Colorado water users to replace 205,917 acre-feet of water to offset the new diversions (i.e., no net reductions in flow). With the multipronged Recovery Program, water replacement was only one of several ways to mitigate reduced flows (i.e., other options included non-native fish management, endangered fish propagation and habitat restoration). As such, the Colorado water users as a group were only required to replace about 59,000 acre-feet. This includes 48,000 acre-feet of water already dedicated to augment base flows in the Colorado River in the critical habitat reach¹⁰³ plus an additional 10,825 acre-feet of water that must be permanently provided to supplement instream flows in the Colorado River's 15-Mile Reach by December 2009 to benefit listed fish.¹⁰⁴

The cost savings from reduced need to replace water are substantial. We estimate these cost savings using cost data from alternative water supply projects for the 10,825 acre-foot replacement requirement.

102. Email from Angela Kantola, Fish and Wildlife Service, Regional Office, Denver, CO to John Loomis, author, Aug. 4, 2010 (on file with author).

103. UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM AND SAN JUAN RIVER BASIN RECOVERY AND IMPLEMENTATION PROGRAM: PROGRAM HIGHLIGHTS 2007–2008 (2008) available at <http://www.coloradoriverrecovery.org/general-information/general-publications/briefingbook/2007-2008Highlights.pdf>.

104. GRAND RIVER CONSULTING COOPERATION, 10825 WATER SUPPLY ALTERNATIVES SUMMARY: PHASE 2 ASSESSMENT (2008) available at <http://www.coloradoriverrecovery.org/documents-publications/technical-reports/isf/10825SumJan08.pdf>. The number 10825 in the Study's title reflects to volume of water which must be found for the 15-Mile Reach to satisfy the PBO. See 32 Fed. Reg. 4001 *supra* note 9.

We cap this cost per acre-foot at the most likely maximum irrigation values in the Grand Valley in Grand Junction where orchards are irrigated, since at that cost it would be cheaper to purchase water from irrigated cropland. Using this data, Colorado water users would have incurred costs of \$863 million to replace the 205,917 acre-feet of water diverted. Instead, the water users only needed to replace 59,000 acre-feet. The opportunity cost to Colorado water users of this 59,000 acre-feet is \$206 million, for a savings of \$657 million.

D. The Recovery Program's Cost Savings from Flexibility and a Basin-Wide Approach to Meet Flow Recommendations

The cooperative Recovery Program's basin-wide approach also reduces the costs of providing recommended flows. There are two sources of cost savings: 1) flexibility afforded to program participants to meet recovery flow targets; and 2) economies of scale that lower the per unit costs of meeting recovery flow objectives.

Flexibility to meet the FWS flow recommendations provides substantial potential for cost savings. The Recovery Program allows the combination of reoperation of existing reservoirs, the enlargement of other reservoirs, and improvements in irrigation canal system efficiencies to meet flow recommendations.¹⁰⁵ This flexibility allows participants in the Recovery Program, as a group, to search for the most cost-effective combination of actions and allocate their water contributions via low-cost options first. For instance, improving canal efficiencies may be a relatively inexpensive option compared with other options, such as raising dam heights to enlarge reservoirs to augment late summer river flows.¹⁰⁶ One way to improve canal efficiency is simply to line earthen canals with concrete. These concrete lined canals require less water in the canal to deliver a given amount of water to the end of the canal, thereby requiring less water being diverted from the river for irrigation.¹⁰⁷

The second source of cost savings is through economies of scale. Large projects can yield large volumetric quantities of water for less cost per acre-foot than smaller projects. The basin-wide approach of the Recovery Program allows it to build a few large projects for mitigation instead of each individual project having to offset their project depletions. An individual water user approach would have higher per unit costs. As a whole, the Recovery Program takes advantage of both economies of

105. See generally RECOVERY ACTION PLAN, *supra* note 62; 15-Mile PBO *supra* note 9.

106. *Id.*; WATER SUPPLY ALTERNATIVES SUMMARY *supra* note 104.

107. *Id.*

scale and regional flexibility to lower the overall cost of meeting flow recommendations.

E. The Recovery Program's Potential Benefits of Increased Species Recovery

With the Recovery Program in place since 1998, money and staff have been focused on species recovery efforts, not litigation.¹⁰⁸ The Recovery Program has allowed for a broader range of recovery efforts to be employed. This would not have been possible with FWS's use of ESA as the regulatory mechanism, which focuses solely on flow protection to prevent extinction (i.e. avoid jeopardy opinion). From a recovery standpoint, more funding (discussed in the next section) and a mix of recovery strategies has increased the populations of three of the four endangered fish species.¹⁰⁹ Since the Recovery Program began in 1988, stocking and reintroduction of Colorado Pikeminnow, Bonytail, and Razorback Sucker produced at Recovery Program operated hatcheries along with habitat restoration has increased populations of these three species.¹¹⁰ The Recovery Program non-native fish management may have contributed to stopping the declines and stabilizing the populations of Upper Colorado River Basin Humpback Chub.¹¹¹

The higher populations of these three fish species and avoiding further reductions of the four species provide economic benefits to people. In particular, the benefits include an existence value from knowing the species are not extinct.¹¹² That is, many people would pay to protect a species just to know it is preserved in its native habitat even if they will never see the species in the wild. Other people will pay for recovery efforts in order to provide these species to for future generations (i.e., bequest values). Estimates of the values per household for these exis-

108. The adequacy of the Recovery Program and the PBOs to satisfy the ESA's consultation provisions have not been challenged; however, litigation was used to compel the FWS to designate critical habitat for the razorback sucker. *Colorado Wildlife Fed'n v. Turner*, 1992 U.S. Dist. Lexis 22046 (D. Colo. Oct. 27, 1992).

109. See UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM AND SAN JUAN RIVER BASIN RECOVERY AND IMPLEMENTATION PROGRAM, PROGRAM HIGHLIGHTS 2010-2011 (2011), available at <http://www.coloradoriverrecovery.org/general-information/general-publications/briefingbook/2010-2011Highlights72.pdf> [hereinafter "2010-2011 HIGHLIGHTS"]. RECOVERY ACTION PLAN *supra* note 62, at 1; Brower *supra* note 22 at, 1003; *contra* Bolin, *supra* note 22.

110. 2010-2011 HIGHLIGHTS *supra* note 109, at 8.

111. *Id.*, at 3.

112. See generally John Krutilla, *Conservation Reconsidered*, 57 AMERICAN ECONOMIC REV. 777 (1967) (discussing the economic benefits of conservation); A. MYRICK FREEMAN III, THE MEASUREMENT OF ENVIRONMENTAL AND RESOURCE VALUES 141-142 (2nd Ed., 2003).

tence and bequest values for these four threatened and endangered species range from \$60 to upwards of \$200 per household.¹¹³ While estimating the exact percentage increase in populations of the three increasing fish species is difficult due to the year to year variation, the 2010-2011 Program Highlights indicate an upward trend line for the Colorado Pikeminnow. Simple calculations from the trend line suggest approximately a 25%–30% increase since the early years of the Recovery Program.¹¹⁴ Prior to the Recovery Program, populations of Bonytail and Razorback Sucker had disappeared from the Upper Colorado River.¹¹⁵ During 2009 and 2010, an increased number of Bonytail have been observed at several locations, but population estimates are not available to calculate a percent.¹¹⁶ The humpback chub population has stabilized during the Recovery Program (especially nonnative fish control) from its pre-Recovery Program downward population trend. It is not unreasonable to assume in absence of the Recovery Program, the humpback chub population in the Upper Colorado River would have continued its decline.

For the purposes of this analysis, it is reasonable to conclude that the Recovery Program's five management actions resulted in a 10% higher population of the four endangered fish species. Using an existing meta analysis of the economic values of endangered fish species, we estimate that households value this 10 percent higher population at \$16 per household.¹¹⁷ Given the 3 million households in the Upper Colorado River basin, this gain amounts to about \$51 million dollars using a Threatened and Endangered Species valuation meta-analysis model.¹¹⁸

IV. ECONOMIC COSTS OF RECOVERY PROGRAM TO FEDERAL AND STATE GOVERNMENTS AND WATER USERS

The direct costs of the Recovery Program's multipronged approach have been substantial. The cumulative 20 year cost of habitat improvements, non-native fish management, and construction of endangered fish hatcheries has been \$208 million, averaging \$10 million

113. Earl Ekstrand & John Loomis, *Incorporating Respondent Uncertainty When Estimating Willingness to Pay for Protecting Critical Habitat for Threatened and Endangered Fish*, 34 WATER RES. RESEARCH, 3149, 3154 (1998).

114. 2010–2011 HIGHLIGHTS, *supra* note 109, at 8 fig. 2.

115. *Id.* at 9–10.

116. *Id.* at 9.

117. This figure is calculated from material in Leslie Richardson & John B. Loomis, *The Total Economic Value of Threatened, Endangered, and Rare Species: An Updated Meta-Analysis*. 68 ECOLOGICAL ECONOMICS 1535 (2009); the calculations were done on spreadsheet available at <http://dare.colostate.edu/tools/benefittransfer.aspx>.

118. *Id.*

a year.¹¹⁹ In addition, there have been opportunity costs to the water users in terms of their provision of water from their existing projects to instream flows, as well as adding “fish flows” into their project expansions. This section looks at who paid those costs. Comparing these costs to the benefits (and cost savings) allows us to provide a rough comparison of who pays and who benefits from the Recovery Program, and whether there are any net cost savings from the cooperative Recovery Program to society as a whole.

A. Federal and State Funding for the Recovery Program

To increase the population of the four listed fish species and eventual delisting, the Recovery Program has consistently sought annual programmatic federal funding to leverage each partner’s contributions, both financial and in-kind.¹²⁰ In 2000, the Upper Colorado and San Juan River Basins’ Endangered Fish Recovery Programs Act was enacted to expand the federal programmatic authorization for the Recovery Program’s activities.¹²¹ The law created a series of federal funding streams to support Recovery Program activities, including authorizing \$46 million from the U.S. Bureau of Reclamation and the transfer of up to \$17 million of federal power revenues.¹²² The money supports capital construction projects, such as fish passageways around dams, fish screens on water diversion canals, fish hatcheries, and canal check structures to make the canals efficiently deliver a higher proportion of water diverted.¹²³ As indicated in Table 2, Federal funding through the U. S. Bureau of Reclamation has paid for 73 percent of the Recovery Program’s total costs.¹²⁴

119. UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM AND SAN JUAN RIVER BASIN RECOVERY AND IMPLEMENTATION PROGRAM, PROGRAM HIGHLIGHTS, 2009–2010 (2010), available at <http://www.coloradoriverrecovery.org/general-information/general-publications/briefingbook/2009-2010Highlights.pdf> [hereinafter “2009-2010 HIGHLIGHTS”]. This report compiles and collates assorted data on the Recovery Program’s overall funding sources and expenditures as well as its accomplishments for Program participants, stakeholders and Congress.

120. James V. Hansen, *Endangered Economics*, FORUM FOR APPLIED RESEARCH AND PUBLIC POLICY 45, 50–51 (2001) available at <http://forum.ra.utk.edu/Archives/Spring2001/hanson.pdf>.

121. See Authorization to Fund Recovery Programs, Pub. L. No. 392-106, 114 Stat. 1602 (2000), Endangered Fish Recovery Projects for the Upper Colorado and San Juan River Basins, Pub. L. No. 107–375, 114 Stat. 1602–1603 (2002); Upper Colorado and San Juan River Basin Endangered Fish Recovery Programs Reauthorization Act of 2005, Pub. L. No. 109–183; 120 Stat. 290–291 (2006); Omnibus Public Land Management Act of 2009, Pub. L. No. 111–11, § 9107, 123 Stat. 991 (2009).

122. Authorization to Fund Recovery Programs, *supra* note 121, at §§ 3(a) and 3(c)(2).

123. *Id.* See also, 2009–2010 HIGHLIGHTS, *supra* note 119, at 7.

124. *Id.*

About half of this funding comes from direct Federal appropriations, and the other half from hydropower revenues redirected to the program.¹²⁵ Federal funds to the FWS constitute another 12 percent of the Recovery Program’s total costs.¹²⁶ Thus, the federal taxpayers pay 85 percent of the Recovery Program’s direct monetary costs. As shown in Table 2, state governments also pay a non-trivial amount of the total cost, in part due to cost sharing with the federal government.¹²⁷ The water users’ direct costs come from non-federal cost sharing and depletion fees paid, and amount to only 1.5% of the costs.¹²⁸

[TABLE 2. Allocation of Direct Costs To Different Stakeholders (FY 1989–2010)¹²⁹

Agency		% of total Costs
Federal	USBR	73%
	FWS	12%
State	Colorado	9%
	Utah	3%
	Wyoming	1.5%
Water Users		1.5%
Total		100%

B. Opportunity Costs of Water Provided by Diverters

However, Table 2 ignores the opportunity costs to the water users of the 59,000 acre-feet of water for baseflow augmentation that they do provide. As noted in the previous section, the opportunity costs of this water amounts to \$206 million which is nearly equal to the total direct monetary cost of the Recovery Program at \$208 million.

Based on the \$206 million in water users opportunity costs calculated in Section III.c. and \$208 million reported in Section IV.a. in direct

125. *Id.* at 20.

126. *Id.* at 18. 2009-2010 Highlights has a pie chart in which the FWS contribution is \$24,940,000. The pie chart lists the total as \$207,928,700. The 12% figure was calculated by dividing \$24,940,000 by the \$207,928,700 which yielded 11.99%.

127. *Id.* at 18. 2009-2010 Highlights has a pie chart in which the State of Colorado, Utah and Wyoming’s contributions are given as \$17.302 million, \$5.454 million and \$2.43 million, respectively. The pie chart lists the total as \$207,928,700. To get the percentage figures I cited, I divided each of the State’s contributions by the \$207,928,700 which yielded the percentages shown in Table 2.

128. *Id.* This was calculated from the same Pie Chart on Page 18, Dividing Water Users into the 207,928,700 and rounding.

129. *Id.* Percentages were calculated from Page 18 of the report.

monetary costs, the total economic cost of the Recovery Program has been on the order of \$414 million. Overall, water users bore about half the Recovery Program's total cost,¹³⁰ federal taxpayers bore about 43 percent,¹³¹ and state taxpayers from Colorado, Utah and Wyoming bore about 7 percent.¹³² With the federal Recovery Program Act, water users have shifted about half of the Recovery Program's cost onto federal and state taxpayers. Without the Recovery Program, the water users might have been required to purchase or pay to develop additional water to maintain base flows to offset all their water depletions. As shown in Section III.c., this would have cost \$863 million.

V. CONCLUSION

What does this case study tell us about the potential gains from collaboration via new "boundary organizations" versus the "business as usual" environmental compliance approach? Did we merely observe a new boundary organization shifting costs to the general taxpayer or were actual cost savings realized by broad scale geographic cooperation?

As shown in Table 3 below, the Recovery Program has reduced ESA water replacement costs to irrigation and water districts by \$657 million. Given the nonprofit nature of these water districts, these savings get passed on to end water users such as farmers, industries, rural and urban water customers. With the PBO serving as a Reasonable and Prudent Alternative for Section 7 consultations for the past 10 years, the savings are estimated to be \$21 million. In addition, society as a whole has benefited because the four listed fish species appear to have recovered better under the Recovery Program's science-base, multipronged approach than without the Recovery Program. As noted above, using a conservative incremental gain of 10% in listed species populations due to this multipronged approach adds \$51 million in benefits. However, the cost of the Recovery Program has been substantial at \$414 million, split nearly equally between water users and taxpayers. But this \$414 million expenditure brought about a \$729 million in savings, yielding a \$315 million in net cost savings over the two decades that the cooperative Recovery Program has been in place. In addition, there have been no lawsuits associated with the Recovery Program. Thus, both private and public

130. Water users provided \$206 million out of the Program's total \$414 million of economic cost. Thus water users provided half of the total \$414 million Program's total cost.

131. This percentage was calculated from the data in Table 2 above by taking 85% of the \$208 million of direct cost divided by the \$414 million of total economic cost.

132. This percentage was calculated from the data in Table 2 above by taking 13.5% of the \$208 million direct costs divided by \$414 million total economic cost.

stakeholders have been able to spend their money on species recovery efforts rather than litigation.

[TABLE 3. Summary of the Upper Colorado River Recovery Program's Benefits, Costs and Net Benefits] [this looks like original number calculations Lynne-JC]

Benefits/Cost Savings	1988–2009
Sec 7 Consultations- large projects	\$21 million
Sec 7 Consultations- small project	Substantial (potentially several million) but unquantified—see text
Reduced Water Replacement Costs	\$657 million
Benefits of gain in species recovery	\$51 million
Minimum Subtotal of Benefits	\$729 million
Costs	
Water Users Water Replacement & Depletion Fees	\$206 million
Recovery Program (Primarily Federal & State Agencies (Taxpayers))	\$208 million
Subtotal of Costs	\$414 million
Minimum Estimate of Net Benefits	\$315 million

While about half the Recovery Program's cost have been shifted to Federal and State taxpayers, this \$208 million taxpayer cost does save society as a whole slightly more than \$300 million. Whether shifting a portion the water providers' costs to taxpayers is equitable depends on one's prospective.¹³³ First, not all the costs are being shifted as water users are still paying half the total cost. Second, the half shifted to the taxpayers, may be partially offset by two benefits: (a) water cost savings to rural and urban water users, who will have lower water bills than if water providers had to pay the much higher costs of ESA compliance; and (b) roughly \$50 million of public benefits from increased population of the four endangered species occurring with multipronged endangered species management program.

The success of the consensus based multi-stakeholder Upper Colorado River Endangered Fish Recovery Program provides a model for other similar ESA conflicts that pit endangered species protection against

133. Reed Benson. *Symposium on "As if Equity Mattered" in Natural Resources: Introduction*, 50 NAT. RESOURCES J., 291, ix (2010).

development activities. The developers seem to have been brought to and kept at the table by reducing their cost of ESA compliance via providing greater ESA compliance flexibility and allowing a portion of the costs of ESA compliance to be shifted to the taxpayers. But taxpayers have benefitted from lower water supply costs and enhanced species recovery efforts. Rather than more than a decade of litigation that has stymied the Pacific Northwest salmon recovery effort, the Upper Colorado River Endangered Fish Recovery Program is completing its second decade of active fish recovery. Hopefully another decade of cooperation is ahead.¹³⁴

134. See Extension of the Cooperative Agreement for the Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin, *supra* note 27 (the Extension of the Cooperative Agreement extended the program through 2023).