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Robert W. Adler

Michele Straube

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WATERSHEDS AND THE INTEGRATION OF U.S. WATER LAW AND POLICY: BRIDGING THE GREAT DIVIDES

ROBERT W. ADLER^{*} & MICHELE STRAUBE[†]

I. INTRODUCTION

It is difficult to imagine a legal and policy regime as fractured as that used to govern water resources in the United States.¹ Connected issues are addressed without coordination, and authority is divided among federal, state and local entities that have little incentive to coordinate their interrelated actions.²

Several great divides in U.S. water law and policy stand out amidst this widespread fragmentation. First, the law of water rights and allocation, which is dictated largely by individual states, operates apart from the law and regulation of water pollution, the basic structure of which is governed principally by federal statutes.³ Second, decisions about water resources are divorced from closely related land use policies.⁴ Third, the riparian rights doctrine of water law inherited from England and prevalent in the east stands in sharp contrast to the prior appropriation doctrine of western water law.⁵ Fourth, water issues often are addressed

^{*} Robert W. Adler is a Professor of Law, Wallace Stegner Center for Land Resources and the Environment, University of Utah College of Law. This article draws significantly from a report to the National Academy of Public Administration's Learning from the Environmental Innovations Project. See *infra* note 11. We appreciate the comments on drafts of that report provided by DeWitt John, Judi Greenwald and Rick Minard of NAPA, Doug Kenney of the Natural Resources Law Center, University of Colorado, Boulder, and other participants in the NAPA process. Finally, we are grateful to James Alder, an attorney with the Western States Water Council and an LL.M. candidate at the University of Utah, whose LL.M. seminar paper on a related topic provided useful ideas and information

[†] Michele Straube is an environmental mediator, attorney and policy consultant, and president of CommUnity Resolution, Inc. in Salt Lake City, Utah.

¹ Robert W. Adler, *Addressing Barriers to Watershed Protection*, 25 ENVTL. L. 973, 991 (1995).

² See *id.* at 991-95.

³ See *infra* Part II.A.

⁴ See *infra* Part II.B.

⁵ See *infra* Part II.C.

independent of broader questions of ecosystem health.⁶ Finally, the fundamental divide of federalism spans across all of these more discrete issues.⁷ Given the depth and breadth of these divides, it is little wonder that the balkanized nature of U.S. water law and policy is so frequently criticized.⁸

In recent years, however, the renewed idea of restoring, protecting and managing water resources on an integrated, watershed basis has been promoted at all levels of government, by public and private advocates, and in all parts of the country.⁹ Watershed programs differ widely in many respects. Indeed, one of the main advantages of a watershed approach is the opportunity to identify and solve problems on a site-specific rather than a generic basis. The fact that the recent watershed revolution seems to be taking root in virtually every state regardless of its legal backdrop and approach to water quality, water quantity, or land use, in itself reflects some movement toward a more nationwide philosophy of water resources law and policy.

In some respects, the implementation of collaborative watershed programs around the country is bridging some of the deep-rooted divides in water law and policy in the United States. Major differences in water law remain, and are likely to do so for some time. As noted above, one principal advantage of watershed programs is that they address rather than avoid legitimate local and regional variations. However, the watershed approach has highlighted some of the fundamental problems of fragmentation caused by past U.S. water law and policy in all parts of the country. More importantly, watershed programs in very different regions of the country are devising and implementing surprisingly similar solutions to some of those problems. Some of these solutions seek to bridge the water quality/water quantity divide by addressing those previously disparate issues in a coordinated way. Similarly, watershed programs increasingly are looking to changes in land use in order to protect and restore water resources. This trend also indicates that western and eastern water systems may be developing more common legal and institutional approaches than previously believed likely, and may portend a natural although only partial convergence in U.S. water law and policy across the traditional east-west divide.

⁶ See *infra* Part II.D.

⁷ See *infra* Part II.E.

⁸ See Adler, *supra* note 1, at 991 & nn.86-87.

⁹ See generally Proceedings, WATERSHED '96, Moving Ahead Together, Technical Conference and Exposition (June 8-12, 1996) (documenting hundreds of watershed program efforts around the country).

This article is based in part upon research on four large watershed programs conducted for the National Academy of Public Administration (NAPA) as part of their "Learning from Innovations in Environmental Protection Project."¹⁰ In particular, it relies on a comparison of the watershed program attributes of the Colorado River Basin Salinity Control Program (CRBSCP) with three other large watershed programs around the country, including those designed to restore the Chesapeake Bay, Everglades and San Francisco Bay Delta ecosystems.¹¹ Among the many issues highlighted by that comparison¹² was the manner in which the programs seek to address multiple environmental and natural resource issues and problems in an integrated way. We do not imply complete endorsement of any of these programs, acknowledging that each of which has strengths and weaknesses. Rather, we use these four programs to illustrate how watershed programs are beginning to develop more integrated approaches to water quality, water quantity, land use, and ecosystem protection, and how such approaches are likely to have more in common across the country than have previous fragmented approaches to water resource protection and management. Some of these programs, however, are missing important additional opportunities for water program integration.

Part II of this article describes the three "great divides" in more detail, and explains why they present obstacles to more rational and effective water resource management and protection. Part III describes the four large watershed programs used to illustrate the development of a more integrated approach. Part IV evaluates the significance of the new approaches contained in these programs, and explains how they are

¹⁰ The full project is described on NAPA's website, at <http://www.napawash.org>.

¹¹ See Robert W. Adler & Michele Straube, *Lessons from Large Watershed Programs, A Comparison of the Colorado River Basin Salinity Control Program with the San Francisco Bay-Delta (CALFED) Program, Central and South Florida (Everglades) Project, and Chesapeake Bay Program*, A Report to the National Academy of Public Administration Learning from Environmental Innovations Project (1999) ("NAPA Report").

¹² In the NAPA Report we evaluated large watershed programs by reference to five basic components: (1) establishment of a consensus decisionmaking process that takes advantage of incentives for cooperation and respects, and takes advantage of different roles for a variety of participants; (2) development of comprehensive, watershed-based resource inventories that identify the full range of problems and sources that contribute to those problems; (3) establishment of appropriate, measurable performance goals and standards to guide the program; (4) adequate and stable funding and strategic targeting of solutions; and (5) ongoing monitoring, assessment and adaptive management. See *id.* at 8.

beginning to bridge the vast divides that have hampered U.S. water law and policy in the past.

II. DEFINING THE GREAT DIVIDES

A. *The First Divide: Water Quality and Water Quantity*

If a hypothetical lawmaker were to start from scratch, the logical approach would be to devise a single set of substantive principles and governing institutions to manage, allocate and protect water resources in an integrated way. For historical and other reasons, this is hardly the case in the real world.

First, the law governing water rights and allocation is fragmented because it is controlled mainly by the states¹³ (fifty states, fifty sets of laws). By contrast, the law of water pollution in the United States is bound together under the overarching structure of the federal Clean Water Act (CWA).¹⁴ Even the CWA, however, under which individual states are responsible for actual implementation of most components of the law,¹⁵ results in fragmented approaches to resource protection in the case of interstate waters and watersheds.¹⁶

Second, even within a particular state, laws and institutions designed to address water quantity and water quality are rarely well coordinated. Water allocation decisions are made by one government official or entity (such as a state engineer, water court, water master, or division of water resources, typically housed in a department of natural resources).¹⁷ Water quality issues are decided by other entities (typically a

¹³ See JOSEPH L. SAX ET AL., *LEGAL CONTROL OF WATER RESOURCES* 804 (2d ed. 1991) ("[T]he United States has been seen as entrusting to the states the primary role in establishing and defining water rights.").

¹⁴ See 33 U.S.C. §§ 1251-1387 (1994).

¹⁵ See, e.g., *id.* §§ 1313 (water quality standards), 1319 (nonpoint source pollution), 1341 (water quality certification), 1342 (permitting program, on delegation from EPA). See also, *id.* § 1251(b) ("It is the policy of the Congress to recognize, preserve, and protect the primary responsibilities and rights of States to prevent, reduce, and eliminate pollution.").

¹⁶ See *Arkansas v. Oklahoma*, 503 U.S. 91 (1992) (dispute over pollution control in interstate rivers); JEFFREY A. FORAN, *REGULATING TOXIC SUBSTANCES IN SURFACE WATERS* 69-80, 100-17 (1993) (discussing extreme differences in state water quality standards within shared water bodies in the Great Lakes).

¹⁷ In Utah, for example, water rights issues are determined by the Division of Water Rights and the State Engineer. UTAH CODE ANN. §§ 73-2-1 (State Engineer), 73-2-1.1 (Division of Water Rights) (1998).

division of water quality within a state's department of environmental resources or protection and often a quasi-legislative water quality board or commission).¹⁸ Allocation decisions are made with little consideration of water quality or other environmental impacts, while water quality decisions are divorced from issues of water supply.¹⁹

More pointedly, because of the provisions in the CWA designed to reserve the province of water law to the states,²⁰ there are serious open questions about the degree to which federal water quality laws can intrude upon state water laws and rights. Justice O'Connor's famous recent pronouncement that trying to separate issues involving water quality from those related to water quantity is "an artificial distinction,"²¹ has prompted some commentators to predict more federal involvement in traditional state water law under the auspices of the CWA.²² The actual outcome of that dynamic, however, is far from certain.

This fragmentation poses a number of challenges for sound water resource management and protection. We provide only a few of many possible examples:

First, while one major goal of the CWA is to eliminate the discharge of pollutants into the waters of the United States,²³ and while many pollution controls under that statute are based on the best available technology without regard to receiving water characteristics,²⁴ the water quality standards aspects of the law necessarily link water quality and water quantity. Under the CWA, the states and the EPA are obligated to ensure that aggregate pollution from multiple sources does not exceed levels established in state or federal ambient water quality standards.²⁵

¹⁸ See, e.g., UTAH CODE ANN. §§ 19-1-105(1)(f) (Division of Water Quality), 19-5-103 (Water Quality Board) (1998).

¹⁹ See Adler, *supra* note 1, at 993. See also DAVID H. GETCHES ET AL., CONTROLLING WATER USE: THE UNFINISHED BUSINESS OF WATER QUALITY PROTECTION 100 (1991).

²⁰ See 33 U.S.C. §§ 1251(g), 1370 (1994).

²¹ PUD No. 1 of Jefferson County v. Washington Dep't of Ecology, 511 U.S. 700, 701 (1994).

²² See, e.g., Jan G. Laitos, *Water Rights and Water Quality: Recent Developments*, 23 Col. Law. 2343, 2346 (1994). See also Katherine P. Ransel, *The Sleeping Giant Awakes: PUD No. 1 of Jefferson County v. Washington Department of Ecology*, 25 ENVTL. L. 255, 275 (1995). But see generally Gregory J. Hobbs, Jr. et al., *Water Quality Versus Water Quantity: A Delicate Balance*, 24 ROCKY MT. MIN. L. INST. 12 (1988).

²³ See 33 U.S.C. § 1251(a)(1) (1994).

²⁴ See *id.* §§ 1311(b), 1314(b). See generally *E.I. Du Pont de Nemours & Co. v. Train*, 430 U.S. 112 (1977).

²⁵ See *id.* §§ 1311(b)(1)(C), 1313(d), 1341. See generally *Arkansas v. Oklahoma*, 503 U.S. at 9. See also PUD No. 1 of Jefferson County, 511 U.S. at 700.

This process is affected, however, both by the total amount of pollution reaching the water body, and by the amount of water present to “dilute” or to “assimilate” those wastes. This dynamic is becoming increasingly apparent with the revival of the CWA total maximum daily load (TMDL) program,²⁶ which is designed to identify and allocate among various sources the maximum amount of pollution that can occur without causing violations of water quality standards.²⁷ This system cannot work properly if the water quality agency limits pollution allocations while the water rights department simultaneously—and without coordination—allows more water withdrawals. To paraphrase Professor Rodger’s Clean Air Act analysis, one entity sells more tickets without knowing that another is reducing the size of the stadium.²⁸

Second, water withdrawals and uses can result in significant amounts of chemical, physical and biological water pollution. Justice O’Connor’s “artificial distinction”²⁹ reflects the fact that water withdrawals and other hydrological modifications can impair aquatic ecosystems as significantly as discharges of pollutants to water bodies.³⁰ Irrigation return flows can cause water body contamination by salts and toxic metals that dissolve into return flows and reach the water body via surface runoff or percolation.³¹ Dams, diversions, flood control structures and other water resource management projects can cause significant physical, chemical and biological changes to riparian and instream

²⁶ See OLIVER A. HOUCK, *THE CLEAN WATER ACT TMDL PROGRAM: LAW, POLICY, AND IMPLEMENTATION* (1999).

²⁷ See 40 C.F.R. 130 (1994). Major changes to these regulations were promulgated recently, 65 Fed. Reg. 43586-43670 (July 13, 2000), but the changes will not take effect until “30 days after the date that Congress allows EPA to implement” the rules. See *id.* at 43856. The new rules are based in part on the recommendations of a federal advisory committee. See U.S. ENVIRONMENTAL PROTECTION AGENCY (100-R-98-006), *REPORT OF THE FEDERAL ADVISORY COMMITTEE ON THE TOTAL MAXIMUM DAILY LOAD (TMDL) PROGRAM* (1998).

²⁸ WILLIAM H. RODGERS, *ENVIRONMENTAL LAW* 205 (2d ed. 1994). For a more extensive comparison of the TMDL program with the analogous state implementation plan (SIP) program under the Clean Air Act, see Robert W. Adler, *Integrated Approaches to Water Pollution: Lessons from the Clean Air Act*, 23 HARV. ENVTL. L. REV. 203 (1999).

²⁹ See *PUD No. 1 of Jefferson County*, 511 U.S. at 719.

³⁰ EPA identifies hydrologic modification as a leading source of impairment to rivers, streams, lakes, and reservoirs. U.S. ENVIRONMENTAL PROTECTION AGENCY (841-R-97-008), *NATIONAL WATER QUALITY INVENTORY, 1996 REPORT TO CONGRESS* 32-33, 50-51 (1998) [hereinafter 1996 REPORT].

³¹ See NATIONAL RESEARCH COUNCIL, *A NEW ERA FOR IRRIGATION* 73-74 (1996).

habitats.³² While the CWA definition of “pollution”³³ is broad enough to cover these impacts, the EPA and state implementation of the law traditionally has been restricted largely to pollutant discharges. Thus, a wide range of decisions by water resource agencies, made without consultation or coordination with the EPA and state water quality agencies, can have significant implications for overall water body health.

B. The Second Divide: Land Use and Water Resources

An equally important source of fragmentation in water law and policy is the fact that control of land use policy is most often divorced from the regulation, control, and protection of water resources. Yet it is increasingly clear that most human impacts on aquatic ecosystems originate on the land and not in the water itself. Virtually all land uses present significant potential for harm to rivers, lakes, and coastal waters; there is compelling evidence that land use-related pollution of various kinds is the largest single source of aquatic ecosystem impairment in the United States.³⁴ This is true in both urban settings, where sprawling urban and suburban development has radically altered both hydrology and water chemistry, and in rural areas, where runoff and stream alteration from farming, grazing, logging, mining, and other activities has devastated many aquatic ecosystems.³⁵

One challenge in land use policy stems from the fact that the policy itself is fragmented among numerous, disparate entities. Traditionally, land use is viewed as the exclusive province of state and local governments.³⁶ In practice, however, this translates to a patchwork of authority spread among various levels within those governments, from local city planning and zoning to broader state policies with equally important impacts on land uses and development patterns. Moreover, especially in the west, huge land areas are controlled by several different

³² See MICHAEL COLLIER ET AL., DAMS AND RIVERS—PRIMER ON THE DOWNSTREAM EFFECTS OF DAMS 1126 (1996).

³³ 33 U.S.C. §1362(19) (1994) (“The term ‘pollution’ means the man-made or man-induced alteration of the chemical, physical, biological, and radiological integrity of water.”).

³⁴ See 1996 REPORT, *supra* note 30 (identifying nonpoint source pollution from agriculture and urban areas as leading sources of water pollution).

³⁵ See *id.* at 32-33

³⁶ See 33 U.S.C. § 1251(b) (1994) (Congressional policy to preserve states’ rights to plan the development and use of land (and water) resources).

federal entities, and each of which has somewhat different land use missions and mandates.³⁷

A second, related challenge, however, is that many of those disparate entities responsible for land use management historically have done so with little or no consideration of water quality, water quantity, or broader aquatic ecosystem impacts. It is no secret that Congress, while seeking to impose nationwide water quality and other aquatic ecosystem protection requirements through such statutes as the CWA, Endangered Species Act (ESA), and Coastal Zone Management Act (CZMA), has purposefully left land use issues to the traditional state and local domain.³⁸ This is particularly true for so-called "nonpoint source pollution"—polluted runoff from a diverse array of land use activities—over which federal statutory control is weak.³⁹

The implications of this divide are profound, given the common realization that the widespread impairment of aquatic ecosystems derives from so many land-based sources and activities. The overriding goal of the CWA—to restore and maintain the chemical, physical, and biological integrity of the nation's waters⁴⁰—cannot be achieved with even the best controls on point sources of pollution. Moreover, as currently written, the nonpoint source and other planning provisions of the CWA provide neither the EPA nor the states with adequate authority to protect water bodies from damaging land uses.⁴¹ Such authority resides in several other local, state, and federal agencies, whose authority and duty to protect water quality is often vague or secondary to their primary missions or

³⁷ These include, for example, the National Park Service Organic Act, 16 U.S.C. §§ 1-4 (1994); the National Forest Management Act of 1976, Pub. L. No. 94-588, 90 Stat. 2949 (codified as amended in scattered sections of 16 U.S.C. (1994)); the Federal Land Policy and Management Act of 1976, Pub. L. No. 94-579, 90 Stat. 2744 (codified as amended in scattered sections of 7, 16, 30, 40, 43 U.S.C. (1994)); and the Wilderness Act, 16 U.S.C. §§ 1131-1136 (1994).

³⁸ See 33 U.S.C. § 1251(b) (1994).

³⁹ See 33 U.S.C. § 1329 (1994) (assigning principal responsibility for nonpoint source pollution control to the states).

⁴⁰ See 33 U.S.C. § 1251(a) (1994).

⁴¹ See ROBERT ADLER ET AL., *THE CLEAN WATER ACT TWENTY YEARS LATER* 241 (1993). See also Lynn L. Schloesser, *Agricultural Nonpoint Source Water Pollution Under Sections 208 and 303 of the Clean Water Act: Has Forty Years of Experience Taught Us Anything?*, 54 N.D. L. REV. 589 (1978); Daniel R. Mandelker, *Controlling Nonpoint Source Water Pollution: Can it be Done?*, 65 CHI.-KENT L. REV. 479 (1989); Robert D. Fentress, Comment, *Nonpoint Source Pollution, Groundwater, and the 1987 Water Quality Act: Section 208 Revisited?*, 19 ENVTL. L. 807 (1989).

motives.⁴² Absent a mechanism to coordinate the actions of these entities with the goal of restoring and protecting aquatic ecosystems, full restoration and protection of aquatic ecosystem health will likely remain elusive.

C. *The Third Divide: East and West*

A central premise of U.S. water law, and one of the first points covered in any course on water law, is the vast divide between the riparian rights regime used in most eastern states⁴³ and the prior appropriation doctrine⁴⁴ used west of the 100th meridian.⁴⁵ The two approaches were developed to address very different hydrological, geographic, political, and economic conditions.⁴⁶

Especially in the west, the roots of water law run both wide and deep, and longstanding traditions and institutions affecting water rights die hard. As a result, efforts to modify or “reform” western water law, while increasingly frequent and often compelling,⁴⁷ have achieved only limited success.⁴⁸ Moreover, because of the strong tradition of states’ rights in the area of water rights and allocation, federal environmental statutes that otherwise might interject some nationwide consistency in water law and

⁴² See HOUCK, *supra* note 26, at 87 (noting that “the history of nonpoint source pollution control since 1972 is of an attempt to find replacements [for strict standards of the Clean Water Act] through voluntary, local programs.”).

⁴³ See generally SAX ET AL., *supra* note 13, at 137-48.

⁴⁴ See generally *id.* at 137-42.

⁴⁵ In his classic biography of John Wesley Powell, Wallace Stegner explains the evolution of western water law in the context of the vastly different hydrology that western settlers experienced as they crossed the 100th meridian in the western portion of the Great Plains. See WALLACE STEGNER, *BEYOND THE HUNDREDTH MERIDIAN, JOHN WESLEY POWELL AND THE SECOND OPENING OF THE WEST* (1953). See also, CHARLES WILKINSON, *CROSSING THE NEXT MERIDIAN: LAND, WATER, AND THE FUTURE OF THE WEST* (1992).

⁴⁶ See SAX ET AL., *supra* note 13, at 45-47 (noting that favorable topographic and climactic conditions, for example, resulted in perpetuation of the riparian system in the east, as opposed to the arid conditions of the west).

⁴⁷ See, e.g., Reed D. Benson, *Recommendations for an Environmentally Sound Federal Policy on Western Water*, 17 STAN. ENVTL. L.J. 247 (1998); Harrison C. Dunning, *Revolution (and Counter-Revolution) in Western Water Law: Reclaiming the Public Character of Water Resources*, 8 FORDHAM ENVTL. L.J. 439 (1997); David H. Getches, *Changing the River's Course: Western Water Policy Reform*, 26 ENVTL. L. 157 (1996).

⁴⁸ See WESTERN WATER POLICY REVIEW ADVISORY COMMISSION, *WATER IN THE WEST: CHALLENGE FOR THE NEXT CENTURY*, 1-1 (1998) [hereinafter WESTERN WATER POLICY REPORT] (“Major social change such as this is always difficult.”).

policy typically contain express provisions preserving states' rights in this area.⁴⁹ Of course, several federal statutes, such as the CWA and the ESA, impose substantive requirements that affect, as opposed to supercede, various aspects of state water laws.⁵⁰

This divide does not inherently impair efforts to integrate water law and policy within states and within watersheds in the same way as the first two. Not many watersheds cross the divide between riparian and prior appropriation states (aside from the Mississippi, which spans more than half the land mass of the continental United States). Thus, with respect to this factor water law can remain integrated within most watersheds. Of course, even less significant differences in state water law can impede coordination and cooperation in the large number of interstate watersheds, a factor that has resulted in considerable amounts of controversy over the years,⁵¹ but also some cooperation in the form of interstate compacts and other forms of cooperation.⁵²

Historically, the east-west divide has impeded the search for national approaches to the most pressing water-related issues, as each state has jealously guarded its prerogative to establish and implement its own water laws and policies.⁵³ For this reason, the fact that both eastern and western watershed programs appear independently to be developing some similar mechanisms to integrate water quality, water quantity, and land use issues is all the more significant.

D. *The Fourth Divide: Water Systems and Ecosystems*

The use of water and the health of aquatic ecosystems are integrally related to the health of large numbers and assemblages of aquatic, avian and terrestrial species.⁵⁴ To some degree, these linkages are anticipated and addressed in various laws designed to protect and manage

⁴⁹ See Federal Power Act, 16 U.S.C. § 821 (1994); Clean Water Act, 33 U.S.C. §§ 1251(g), 1370 (1994); Reclamation Act, 43 U.S.C. § 383 (1994).

⁵⁰ See *PUD No. 1 of Jefferson County*, 511 U.S. at 700-720 (effect of CWA on water use); *Natural Resources Defense Council v. Houston*, 146 F.3d 1118 (9th Cir. 1998) (effect of ESA on water contracts).

⁵¹ For examples of interstate water disputes, see *Colorado v. New Mexico*, 459 U.S. 176 (1982); *Arizona v. California*, 373 U.S. 546 (1963); *Nebraska v. Wyoming*, 325 U.S. 589 (1945); *Wyoming v. Colorado*, 259 U.S. 419 (1922).

⁵² See, e.g., *Colorado River Compact*, 70 CONG. REC. 324 (1928); *Delaware River Basin Compact*, Pub. L. 87-328, 75 Stat. 688 (1961).

⁵³ See Houck, *supra* note 26, at 14-19.

⁵⁴ See generally ADLER ET AL., *supra* note 41, at 58-86.

water resources. The principal objective of the CWA, for example, is to “restore and maintain the chemical, physical, and biological integrity of the Nation’s waters.”⁵⁵

There are many ways, however, in which actions and programs designed to manage and protect water quality and water quantity are implemented with little or no regard for broader issues of ecosystem health.⁵⁶ Only recently, for example, did the EPA and the U.S. Fish and Wildlife Service begin to engage in consultation under section 7 of the ESA⁵⁷ regarding the impact of CWA decisions on threatened and endangered species.⁵⁸ Similarly, ESA consultation regarding the impacts of various federal water project decisions has been prompted only through recent litigation,⁵⁹ and not through routine institutional coordination.

More fundamentally, decisions that affect broader ecosystem health are made by an even wider array of federal, state, and local entities than those involved in water decisions alone.⁶⁰ Major land use and management decisions involve land managers such as the National Park Service, the U.S. Forest Service, and the Bureau of Land Management (BLM).⁶¹ Each of these federal entities has been operating increasingly under an ecosystem management philosophy for a number of years.⁶² More recently, the federal government proposed an overall watershed management policy for federal lands.⁶³ How these ecosystem and watershed management approaches will be coordinated remains uncertain. Moreover, often the lands involved consist of a patchwork of federal, state, local, and private lands. Activities on these lands rarely are coordinated within a single land management construct, much less one that is coordinated with an analogous watershed effort.⁶⁴

Other regulatory programs that affect ecosystem health are implemented by yet another set of players: state and federal fish and game or wildlife resource agencies, whose missions are to maintain and manage

⁵⁵ See 33 U.S.C. § 1251(a) (1994).

⁵⁶ See ADLER ET AL., *supra* note 41, at 199.

⁵⁷ See 16 U.S.C. § 1536 (1994).

⁵⁸ See *American Forest and Paper Association v. EPA*, 137 F.3d 291 (5th Cir. 1998).

⁵⁹ See *Natural Resources Defense Council*, 146 F.3d at 1118.

⁶⁰ See NATIONAL RESEARCH COUNCIL, *supra* note 31, at 30.

⁶¹ See *supra* note 37.

⁶² See Robert B. Keiter, *Beyond the Boundary Line: Constructing a Law of Ecosystem Management*, 65 U. COLO. L. REV. 293 (1994).

⁶³ Unified Federal Policy for Ensuring a Watershed Approach to Federal Land Resource Management, 65 Fed. Reg. 8834 (Proposed Feb. 22, 2000).

⁶⁴ See 1996 REPORT, *supra* note 30.

game and non-game wildlife populations.⁶⁵ Often these agencies focus on target species for hunting, fishing, and other purposes. Obviously, the actions of these agencies will affect, and be affected by, the actions of water quality and water management agencies. Usually, however, coordination occurs with respect to particular projects or impacts, and not to address overall ecosystem interactions.

E. *The Fifth Divide: Federalism*

Related to and overarching each of these divides is the fundamental divide of federalism. This last divide was imposed intentionally as part of the basic system of checks and balances designed to safeguard liberty in our republican form of government.⁶⁶ Nevertheless, it poses significant challenges for the management and protection of water resources and aquatic ecosystems.

There are numerous examples of ways in which issues of federalism complicate water resource management and protection.⁶⁷ Water rights and allocation are governed largely by state law, although the federal government plays a major role in many aspects of water resource development and use. The nation's largest dams and other water projects were built, and many continue to be managed, by federal agencies (such as the Bureau of Reclamation⁶⁸ and the U.S. Army Corps of Engineers⁶⁹) with federal dollars. Others are regulated by federal agencies under federal laws such as the Federal Power Act.⁷⁰ In large areas of the west in particular, the headwaters of many major river systems are on federal lands,⁷¹ and in others the federal government claims significant amounts of water under the federal reserve rights doctrine of water law.⁷²

⁶⁵ See, e.g., U.S. FISH AND WILDLIFE SERVICE, CONSERVING THE NATURE OF AMERICA 2 (1999) (stating that the mission of the FWS is to "conserve, protect, and enhance fish, wildlife, plants and their habitats").

⁶⁶ See Henry J. Friendly, *Federalism: A Forward*, 86 YALE L.J. 1019 (1977) (reviewing the historical basis for federalism).

⁶⁷ See HOUCK, *supra* note 26, at 14.

⁶⁸ See MICHAEL C. ROBINSON, WATER FOR THE WEST, THE BUREAU OF RECLAMATION 1902-1977 (1979). See also Adler, *supra* note 1, at 1015-1019.

⁶⁹ See Adler, *supra* note 1, at 1023-37.

⁷⁰ See 16 U.S.C. §§ 791-828(c) (1994). See also *id.* at §§ 1019-23.

⁷¹ See WESTERN WATER POLICY REPORT, *supra* note 48, at 4-17 to 4-20.

⁷² See *Cappaert v. United States*, 426 U.S. 128 (1976); *Winters v. United States*, 207 U.S. 564 (1908).

The realm of water quality, by contrast, is governed largely by the overriding mandate of the federal CWA, with strong roles for the EPA⁷³ and the U.S. Army Corps of Engineers.⁷⁴ However, because of the system of cooperative federalism designed into that law, most states retain a lead role in implementing the Act.⁷⁵ As with water quantity, actions on federal lands also can have dramatic impacts on water quality, and federal resources can be impaired significantly by actions on state and private lands.

In addition to federal-state issues, the fact that watersheds cross state boundaries leads to significant interstate conflicts in the areas of both water quality and water quantity. The federal government, in turn, often plays a significant role in resolving or deciding such disputes, either through administrative or judicial processes.⁷⁶

Most of these problems repeat or derive from issues identified in the first four divides. Nevertheless, federalism deserves separate attention because it cuts across all of the other divides, and because it lies at the heart of many water resource issues and disputes in all regions of the country.

III. THE EMERGENCE OF INTEGRATED APPROACHES IN LARGE WATERSHED PROGRAMS

A. *The Colorado River Basin Salinity Control Program*

1. Watershed and Program Description

The Colorado/Green River⁷⁷ flows for roughly 1,700 miles through portions of seven U.S. states.⁷⁸ It then crosses into Mexico and empties into the Gulf of California. The watershed covers almost a quarter of a

⁷³ See 33 U.S.C. § 1361 (1994) (general authority for EPA administration of Act).

⁷⁴ See *id.* § 1344 (administration of dredge and fill program).

⁷⁵ See *id.* § 1251(b).

⁷⁶ See HOUCK, *supra* note 26, at 14.

⁷⁷ The Colorado and Green Rivers meet in southeastern Utah, and constitute the two co-principal headwaters of the Colorado River mainstem. The Colorado River contributes larger flows at the point of confluence, while the Green River is longer. Other major tributaries, proceeding upstream to downstream, include the Yampa, the White, the Gunnison, the San Juan, the Little Colorado, the Virgin, and the Gila Rivers.

⁷⁸ The basin states are Wyoming, Colorado, New Mexico, Utah, Arizona, Nevada and California.

million square miles (157 million acres).⁷⁹ It begins in the mountains of Wyoming and Colorado and drops about two miles in elevation through the spectacular canyons of the Colorado Plateau and the semi-Sonoran and Sonoran Desert regions of the southwest and Mexico. Most of the watershed is extremely arid.⁸⁰ Agriculture often depends on irrigation, as natural rainfall is inadequate to support many crops.⁸¹ Most of the region is sparsely developed, with major urban populations concentrated in relatively small geographic areas. The largest metropolitan regions that rely on Colorado River water (such as Los Angeles, San Diego, Salt Lake City, Denver, Colorado Springs, and Albuquerque) are outside of the Colorado River basin, but receive Colorado River water via trans-basin diversions.⁸² Over a third of the river's annual water supply is transported out of the basin each year.⁸³

Before major human alterations began over the past century, the Colorado River system was characterized by extreme seasonal and annual variability.⁸⁴ In its natural state, the river also reportedly carried up to 175 million cubic yards of silt per day, or 85 million tons per year.⁸⁵ Most of this material was flushed downstream by annual spring floods to the river's delta at the Gulf of California. On its way south, however, the river's silt formed an ever-changing pattern of channels, backwaters, sloughs, beaches, sand bars and terraces, which in turn supported important instream and riparian habitat.⁸⁶

The highly variable natural hydrology, water chemistry, and ecology of the Colorado River supported one of the most unusual communities of fishes on the continent. Because the system is so isolated from other major drainage basins, approximately 70 percent of the fish

⁷⁹ DALE PONTIUS, COLORADO RIVER BASIN STUDY, FINAL REPORT, REPORT TO THE WESTERN WATER POLICY REVIEW ADVISORY COMMISSION 2 (1997).

⁸⁰ For general descriptions of the watershed, see *id.* at 2-8. See also U.S. DEP'T OF THE INTERIOR, QUALITY OF WATER COLORADO RIVER BASIN. PROGRESS REPORT NO. 18, 5, 8 (1997) [hereinafter PROGRESS REPORT 18].

⁸¹ See PROGRESS REPORT 18, *supra* note 80, at 8.

⁸² See PONTIUS, *supra* note 79, at 8-12.

⁸³ See *id.* at 8.

⁸⁴ Spring runoff brought torrential spring flows (up to 82,575 cubic feet per second (cfs)), followed by extremely low flows (as low as about six cfs) during the rest of the year. River flows also varied considerably from year to year—from an estimated historical annual low of 6 million acre-feet (maf), to a calculated high of 24 maf. See R. DANA ONO ET AL., VANISHING FISHES OF NORTH AMERICA 87 (1983). See also *id.* at 6.

⁸⁵ PONTIUS, *supra* note 79, at 5.

⁸⁶ See generally COLLIER ET AL., *supra* note 32, at 65 -79; ONO ET AL., *supra* note 84, at 87-88.

species in the system were endemic.⁸⁷ These endemic species include the Humpback chub, the Bonytail chub, the Colorado squawfish, the Razorback sucker, and the Woundfin.⁸⁸ These species were uniquely adapted to the highly variable flows in the system, since they had to survive rapid flood flows as well as extreme low-flow conditions. They also evolved in waters that were generally warm and often quite turbid.⁸⁹

The Colorado River basin was changed dramatically through the massive system of dams and diversions built this century by the BOR and others.⁹⁰ These changes offset the variable annual flood-drought cycle described above, and implemented the delicate legal, political and institutional arrangement—known colloquially but almost universally as the “Law of the River”—by which Colorado River flows are apportioned among the seven basin states.⁹¹ To facilitate human use for summer irrigation and year-round municipal use, most of this water was stored for use when it was needed, and diverted to points of use both within and outside the basin.⁹² While fulfilling these hydrological, legal, and political functions, damming the Colorado River also brought fundamental changes

⁸⁷ ONO ET AL., *supra* note 84, at 87-88.

⁸⁸ *See id.* at 92-105.

⁸⁹ *See id.* at 88.

⁹⁰ These include most notably Hoover Dam (completed 1935), Glen Canyon Dam (1963), and a large series of smaller projects constructed through the Colorado River Storage Project Act and the Colorado River Basin Project Act. This system of dams facilitates irrigation, hydroelectric power production, and diversion of large amounts of Colorado River water to fuel rapid urban growth in Southern California and other urban areas. Due largely to these structures, Colorado River water is used to irrigate approximately 1.7 million acres of land, to generate 11.5 billion kilowatt-hours of electric power annually, and to supply municipal water to over 18 million people. *See* PROGRESS REPORT 18, *supra* note 80. *See also* PONTIUS, *supra* note 79.

⁹¹ The “Law of the River” is comprised of the Colorado River Compact of 1922, which was negotiated as a prerequisite to construction of the Hoover Dam and ratified by all seven of the basin states except Arizona, and which divided the estimated river flows roughly equally between the upper and lower basin states; the Upper Colorado River Compact, which was negotiated to divide the upper basin allotment; various federal statutes authorizing construction of federal water projects designed to help the basin states use their share of compact water; a 1962 U.S. Supreme Court decision, *Arizona v. California*, 373 U.S. 546 (1963), which resolved the remaining legal disputes between Arizona and the other compact states; and treaties between the United States and Mexico, under which the United States has agreed to deliver certain minimum amounts and quality of water across the border each year.

⁹² All told, dams in the basin store approximately four times the average annual flow of the Colorado River, the largest storage percentage of any major river system in North America. *See* PONTIUS, *supra* note 79, at 8.

to the hydrology of the river system.⁹³ Dramatic annual fluctuations were replaced by far more homogenous flow patterns. Warm, turbid waters were supplanted in many places by cold, clear flows, into which resource agencies have planted game fish (especially trout) for recreational purposes. Sediment that once flowed downstream and supported bars, backwaters, beaches and other habitats is now trapped behind concrete dams. Diversions throughout the system dewatered the lower reaches of the river.

These changes dramatically disrupted the river's natural ecosystem. Many of the system's endemic fish species are now either threatened, endangered, or extinct, unable to adapt to the river's dramatically changed conditions, or unable to compete with exotic introduced species that are more suited to the river's altered flow regime, temperature, and water chemistry.⁹⁴ The U.S. Fish and Wildlife Service (FWS) initiated a comprehensive program to restore endangered fish species in upper Colorado River. The program includes recovery plans for the Razorback sucker,⁹⁵ the Colorado squawfish,⁹⁶ the Bonytail chub,⁹⁷ and the Humpback chub,⁹⁸ and has designated large portions of the watershed as critical habitat for these species.⁹⁹ A huge multi-species recovery effort—the Lower Colorado River Multi-Species Conservation Program—is also under way to restore the habitat for approximately 100 species of fish and wildlife that are threatened or endangered in the lower river and its delta.¹⁰⁰

The Colorado River system is also naturally more saline than most other U.S. rivers.¹⁰¹ But this natural salinity has been exacerbated

⁹³ See generally ONO ET AL., *supra* note 84, at 88-91.

⁹⁴ See *id.* at 88-120.

⁹⁵ See COLORADO RIVER FISHES RECOVERY TEAM, U.S. FISH AND WILDLIFE SERVICE, RAZORBACK SUCKER (*XYRAUCHEN TEXANUS*) RECOVERY PLAN (1998).

⁹⁶ See COLORADO RIVER FISHES RECOVERY TEAM, U.S. FISH AND WILDLIFE SERVICE, COLORADO SQUAWFISH RECOVERY PLAN (1991).

⁹⁷ See COLORADO RIVER FISHES RECOVERY TEAM, U.S. FISH AND WILDLIFE SERVICE, BONYTAIL CHUB RECOVERY PLAN (1990).

⁹⁸ See COLORADO RIVER FISHES RECOVERY TEAM, U.S. FISH AND WILDLIFE SERVICE, HUMPBAC CHUB RECOVERY PLAN (1990).

⁹⁹ See U.S. Fish and Wildlife Service, 2 Endangered Species Technical Bulletin 7 (1993).

¹⁰⁰ See Lower Colorado River Multispecies Conservation Program, at <http://www.lcrmscp.org/Handout.html>.

¹⁰¹ Due to natural erosion of these materials into the river and its tributaries, as well as salt leaching by subsurface flows and discharges from natural saline springs and seeps, the Colorado River main stem historically carried salt loads of between 200 and 1,000 milligrams per liter (mg/L) (or parts per million (ppm) of total dissolved solids (TDS),

significantly. The EPA estimated in 1971 that human development has more than doubled average annual mass loadings of salts.¹⁰² Inefficient irrigation of arid lands overlying saline formations causes excess water (water not used by the crops or evaporated or transpired from the soil or plant matter) to seep down through saline soils and groundwater, and into the Colorado River or its tributaries.¹⁰³ Land use changes in the watershed, such as grazing, road construction, and development, can cause increased erosion of saline soils, especially during heavy “first-flush” storms and resulting flash flooding.¹⁰⁴ Significant consumptive water uses¹⁰⁵ within the basin, as well as trans-basin water diversions, result in substantially less dilution water and therefore higher concentrations of salinity for any given level of salt loads in the basin.¹⁰⁶

High salinity levels in Colorado River water cause a number of adverse economic effects to agricultural, municipal and industrial water users. A 1988 study for the BOR¹⁰⁷ estimated annual economic damages

depending on flow conditions and other factors. See PROGRESS REPORT 18, *supra* note 80, at 75.

¹⁰² According to this study approximately 47 percent of the salinity in the river at Hoover Dam is from natural sources, with 53 percent caused by the various artificial sources described above. See U.S. ENVIRONMENTAL PROTECTION AGENCY, THE MINERAL QUALITY PROBLEM IN THE COLORADO RIVER (1971) [hereinafter MINERAL QUALITY PROBLEM].

¹⁰³ See PROGRESS REPORT 18, *supra* note 80, at 9-10.

¹⁰⁴ See *id.* at 13-14.

¹⁰⁵ Consumptive water use must be distinguished from raw water withdrawals. Consumptive uses (such as uptake in irrigated crops or into industrial or food products) are not returned to the river system. See WAYNE B. SOLLEY, ESTIMATES OF WATER USE IN THE WESTERN UNITED STATES, REPORT TO THE WESTERN WATER POLICY REVIEW ADVISORY COMMISSION 1 (1997).

¹⁰⁶ See PROGRESS REPORT 18, *supra* note 80, at 11. Smaller but significant and more concentrated discharges of salt come from point sources, including municipal and industrial sources and abandoned or operating oil, gas and mining wells. Wells drilled for exploratory or production purposes often pierce through previously-confined aquifers, providing saline brines a conduit to other groundwaters or to surface waters. See *id.* at 10-12.

¹⁰⁷ Economic damages due to saline irrigation water include reduced crop yields, land removed from production due to salt accumulation in soils, the costs of extraordinary agricultural practices needed to deal with excess salinity (such as tile drains, land leveling, and sprinkler or drip irrigation), and shifts to lower-value but more salt-tolerant crops. Highly saline water used for municipal, commercial and industrial purposes causes damage to household appliances and car radiators, deterioration of clothing and textiles washed in saline water, corrosion of water and wastewater pipes and facilities, and industrial removal costs. See LORETTA C. LOHMAN ET AL., BUREAU OF

due to excess salinity in Colorado River water at between \$311 million and \$831 million per year (1986 dollars).

The Colorado River Basin Salinity Control Program (CRBSCP), while not often cited as a watershed program, is among the oldest continuously operating efforts in the country to address nonpoint source water pollution, and to coordinate water pollution control efforts comprehensively within a watershed, particularly at the scale of an entire river basin.¹⁰⁸ The program is designed and implemented primarily to meet dual regulatory objectives: (1) compliance with international treaty obligations with Mexico regarding the quality and quantity of Colorado River water at the international boundary;¹⁰⁹ and (2) attainment and maintenance of interstate water quality criteria for salinity adopted by the basin states and approved by the EPA pursuant to the federal CWA.¹¹⁰ On-the-ground programs to meet these obligations are provided for in the Colorado River Basin Salinity Control Act ("Salinity Control Act")¹¹¹ as well as other federal and state laws.

The salinity program involves at least six federal agencies,¹¹² as well as all seven states in the Colorado River Basin. Strong program guidance and management comes from the U.S. Bureau of Reclamation (BOR) and the Natural Resource Conservation Service (NRCS).¹¹³ The EPA, U.S. Geological Survey (USGS), and the FWS provide scientific and regulatory support.¹¹⁴ The BLM is involved primarily as the largest federal land manager in the basin.¹¹⁵ Each federal agency works independently to implement or oversee various programs or regulations relevant to the overall salinity program.

RECLAMATION, U.S. DEP'T OF THE INTERIOR, ESTIMATING ECONOMIC IMPACTS OF SALINITY OF THE COLORADO RIVER (1988).

¹⁰⁸ Another effort of similar geographic scope and longevity, the Chesapeake Bay Program, is among the comparison programs addressed in Part IV of this report.

¹⁰⁹ See Treaty on Utilization of the Colorado River, Feb. 3, 1944, U.S.-Mex., 59 Stat. 1219. See also Minute No. 242 of the International Boundary and Water Commission Concerning Colorado River Salinity, Aug. 30, 1973, U.S. - Mex., 24 U.S.T. 1971-77.

¹¹⁰ See 39 Fed. Reg. 43721-23 (1974). See also *Environmental Defense Fund, Inc. v. Costle*, 657 F.2d 275, 280-81 (1981).

¹¹¹ 43 U.S.C. §§ 1571-1599 (1994).

¹¹² These include the BOR within the DOI, the EPA, the NRCS in the U.S. Department of Agriculture (USDA), the BLM (also within DOI), the USGS, and the FWS.

¹¹³ See PROGRESS REPORT 18, *supra* note 80, at 44-48.

¹¹⁴ See COLORADO RIVER BASIN SALINITY CONTROL FORUM, 1999 REVIEW, WATER QUALITY STANDARDS FOR SALINITY, COLORADO RIVER SYSTEM 5-8 to 5-10 (1999) [hereinafter 1999 REVIEW].

¹¹⁵ See *id.* at 4-9 to 4-10. See also PROGRESS REPORT 18, *supra* note 80, at 45-48.

The Colorado River Basin Salinity Control Forum ("Forum") is an interstate organization formed in 1973 to coordinate state salinity control efforts in the basin.¹¹⁶ The forum, composed of up to three representatives appointed by the governors of each basin state, establishes the overall information and policy framework necessary to assure compliance with the interstate water quality standards.

Programmatically, the salinity program can be divided into two parts based on both geographic and statutory history and structure. Title I of the Salinity Control Act,¹¹⁷ which consists largely of a massive federally-constructed desalination plant at Yuma, Arizona, and a series of other large, capital-intensive public works programs in the lower Colorado River basin, is designed primarily to meet Mexican treaty requirements. Title II of the Act,¹¹⁸ designed to reduce salinity in the basin as a whole and to meet the interstate water quality standards, consists of both capital improvements and changes in on-farm management practices.

Since the program's inception, federal and state agencies combined have spent over \$700 million on salinity control and related projects under both Title I and II.¹¹⁹ In recent years, most expenditures and control efforts have occurred in the upper basin under Title II of the Act and related federal and state programs.¹²⁰ Federal spending on salinity control is matched by a 30 percent state share, with state funds derived from a surcharge on revenues from federal hydropower projects in the basin, as well as private cost-sharing under various statutory formulae.¹²¹

¹¹⁶ See 1999 REVIEW, *supra* note 114, at 1-2. A related group is the Colorado River Basin Salinity Control Advisory Council, which is also composed of three representatives from each basin state (often the same individuals). See COLORADO RIVER BASIN SALINITY CONTROL ADVISORY COUNCIL, 1996 ANNUAL REPORT ON THE COLORADO RIVER BASIN SALINITY CONTROL PROGRAM 1 (1997). The council was established by Congress in the Colorado River Basin Salinity Control Act of 1974 to receive information from, and to make recommendations to, the federal agencies involved in salinity control. See Pub. L.No. 93-320, 88 Stat. 266 (1974).

¹¹⁷ 43 U.S.C. §§ 1571-1579.

¹¹⁸ See *id.* §§ 1591-1599.

¹¹⁹ See U.S. DEP'T OF THE INTERIOR, AUDIT REPORT 93-I-810, IMPLEMENTATION OF THE COLORADO RIVER BASIN SALINITY CONTROL PROGRAM (1993) (hereinafter 1993 AUDIT REPORT). See also 1999 REVIEW, *supra* note 114.

¹²⁰ Federal spending over the past decade has fluctuated considerably, from a high of about \$50 million in federal FY1992 to a low of about \$9 million in FY1997 (divided between BOR, USDA and BLM), but recovered partially to \$16 million in FY1999. See 1999 REVIEW, *supra* note 114, at 1-5.

¹²¹ See 1999 REVIEW, *supra* note 114, at 5-4 to 5-6.

In 1984, Congress amended the program in several respects.¹²² It added more projects and funding for large irrigation improvement projects identified by the BOR. At the same time, however, it provided for more on-farm improvements in irrigation water delivery and management by the USDA on a basinwide as opposed to a project-specific basis. It also directed the BLM to implement a basinwide program of changes to grazing and other land use practices on the huge areas of public lands within the Colorado River basin, with the goal of reducing salinity inputs from federal as well as private lands.

While the 1984 changes broadened the scope and flexibility of the overall salinity control effort in several respects, the largest pot of salinity control money, managed by BOR for individual salinity control programs approved by Congress on a case-by-case basis, remained inflexible. Studies by the Department of the Interior (DOI) Inspector General's Office, the BOR and the U.S. General Accounting Office (GAO), and others concluded that this system resulted in missed opportunities for more cost-effective salinity control.¹²³ In 1995, Congress amended the statute once again to provide for an open, competitive, basinwide salinity control program under which BOR could invite any party, public, private or mixed, to bid for salinity control funding.¹²⁴ The BOR and the Forum have implemented this authority through an open competitive bidding process under which they select the most cost-effective salinity control projects for funding on an annual basis.¹²⁵ Preliminary results of this new competitive bidding process show a dramatic improvement in the cost effectiveness of salinity control measures (measured on the basis of cost per ton of salt prevented from reaching the river). It has also facilitated some innovative, integrated approaches to salinity control efforts discussed below.

¹²² See Pub. L. No. 98-569, 98 Stat. 2933 (1984).

¹²³ See U.S. BUREAU OF RECLAMATION, REPORT ON PUBLIC AND AGENCY REVIEW OF THE [SALINITY CONTROL] PROGRAM AND SUGGESTED REVISIONS TO THE PROGRAM (1994). See also U.S. DEP'T OF THE INTERIOR, AUDIT REPORT 93-I-258, OPERATION AND MAINTENANCE CONTRACTS, COLORADO RIVER BASIN SALINITY CONTROL PROGRAM (1992); 1993 AUDIT REPORT, *supra* note 119.

¹²⁴ See Pub. L. No. 104-20, 109 Stat. 256 (1995).

¹²⁵ See D.P. TRUEMAN, U.S. BUREAU OF RECLAMATION, U.S. DEP'T OF THE INTERIOR, COLORADO RIVER BASIN SALINITY CONTROL PROGRAM 1998 REVIEW (1998).

2. Integrated Approaches in the Salinity Program

In some respects the salinity program pioneered ways to begin to integrate water law and policy. However, because the program is focused by design on the single issue of salinity control in order to meet international treaty and domestic water quality requirements, it misses additional opportunities to address related water quality and quantity issues, as well as other environmental problems, in an integrated way.

a. Integration of Decision Making Processes

At a programmatic level, the salinity program has shown a remarkable degree of institutional coordination. Given the diverse interests and postures of the seven basin states regarding the use and allocation of the Colorado River, and the intensive interstate rivalries (as well as some intensive litigation)¹²⁶ those differences have generated, the degree to which the basin states have cooperated in the area of salinity control is quite high. At least since 1972, the seven Colorado River Basin states have worked together cooperatively through the Colorado River Salinity Control Forum. In many respects, the forum functions as the type of collaborative decision making entity that is characteristic of good watershed programs. Moreover, despite the fact that the federal and state agencies involved in salinity control do not sit at the same table in a single coordinating body, by and large there appears to be good communication and coordination between the various federal and state agencies involved in the program.

This cooperation is reflected in the agreement by the basin states to adopt common water quality standards for salinity in the basin, as well as a joint comprehensive implementation plan that is reviewed, revised, and adopted by the forum states every three years as part of the CWA triennial review process.¹²⁷ The fact that the salinity standards were adopted through a consensus process, and have been maintained consistently for over 25 years, has lent a solid sense of purpose and stability to the program that is often missing in programs with disparate and often-changing goals and targets.

In spite of these positive elements of the salinity program as a model of collaborative decision making, in other respects the program is

¹²⁶ See *Arizona v. California*, 283 U.S. 423 (1931); *Arizona v. California*, 292 U.S. 341 (1934); *United States v. Arizona*, 295 U.S. 174 (1935); *Arizona v. California*, 373 U.S. 546 (1963).

¹²⁷ See 1999 REVIEW, *supra* note 114.

less noteworthy. In particular, while the program exhibits strong interstate cooperation and collaboration, it does not employ the types of intergovernmental decision making that are evident in some other large watershed programs. In its seminal 1971 report, the EPA proposed the establishment of a joint federal-state agency or river basin commission to address the salinity problem.¹²⁸ The states elected to establish the purely interstate salinity forum instead. As a result, there is no single, multi-jurisdictional governing body for the salinity program, as there is for some other large watershed programs.

One of the most difficult issues in watershed management continues to be the appropriate respective roles of different levels of government. By and large, the respective roles of the federal and state governments in the salinity program have been fairly well defined. Nevertheless, a more formal forum might be useful to address and resolve a number of thorny intergovernmental issues, rather than leaving them uncertain. These include the relationship between salinity control and state water law, connections between salinity control and endangered species restoration efforts, and the possibility that land fallowing might constitute a viable, cost-effective strategy for salinity control.

Federal intervention very early in the history of the salinity program precipitated the adoption of the basic standards and strategies to control salinity in the Colorado River basin. While the basin states deserve considerable credit for adopting uniform salinity standards throughout the basin and for working continuously toward implementation of those standards, it is not clear that such consensus would have been achieved, or would have occurred so quickly, absent the strong role of the EPA and other federal government agencies as catalysts. Since adoption of the original salinity standards and control program, the federal role in the program has continued to be pivotal primarily through the BOR and the USDA, although the EPA's role in the program has decreased significantly. In particular, the federal government has funded the lion's share of salinity controls, both directly through congressional appropriations for cost-sharing and direct implementation of control efforts by federal agencies themselves, and indirectly through revenues from federally-financed power projects.

Because the salinity program is so heavily intertwined with issues of water use and agricultural land use, there is a strong potential for conflicts about the appropriate role of the federal government in those traditional areas of state power. For most purposes, the salinity program

¹²⁸ See MINERAL QUALITY PROBLEM, *supra* note 102, at 59-60.

appears to have succeeded in integrating water quality, water quantity and land use issues in ways that do not involve federal intrusion into traditional state domains. For example, when the federal government pays for salinity controls that result in more efficient water use, the fate of the "saved" water is determined according to state water laws and procedures. Most federal officials involved in the salinity program are sensitive to the political problems and resistance that might be encountered if they promoted a more intrusive federal role in these areas.¹²⁹

Similarly, federal agencies have been reluctant to explore more intensively the possibility that more cost-effective salinity control could be achieved through a strategic program of land fallowing and retirement.¹³⁰ In part, this reticence is explained in terms of the secondary social and economic impacts that would result from the elimination of farming in small, rural communities.¹³¹ A related concern undoubtedly is the appearance that major changes in rural land use are being driven by a federal program, when land use decisions are primarily state and local prerogatives.¹³² Again, however, the federal government does not have to approach these issues in a regulatory or otherwise intrusive way. Particularly under the new competitive bidding process, federal payments to fallow lands with low productivity but high salinity, in lieu of investments in irrigation improvements, arguably do more to enhance,

¹²⁹ It could be argued, however, that federal officials have been too timid in certain areas, out of respect for state dominance in water rights and land use, to the detriment of the salinity program. For example, little or no consideration appears to have been given to the argument that at least some of the water saved through massive federal investments in salinity control should be used to augment water flows for purposes of environmental restoration, particularly where necessary or desirable to protect endangered species and their habitats. In fact, there is a credible argument under existing state water law that a party who invests in water use efficiency by a senior appropriator is entitled to some of the water saved through those changes. See *Estate of Steed v. New Escalante Irrigation Co.*, 846 P.2d 1223, 1224-27 (Utah 1992) (upholding right of senior appropriator to retain water gained through efficiency improvements). But see *East Bench Irrigation Co. v. Deseret Irrigation Co.*, 271 P.2d 449 (Utah 1954) (upholding right of junior appropriator to appropriate upstream water so long as not in excess of water saved by senior user). The federal government either has not considered this argument, or has declined to make it for fear of appearing to tread into a traditional state domain. This would not really be the case, however, where the federal government simply works within the existing state water law system to promote a superior approach to water management to restore the health of the watershed.

¹³⁰ See PROGRESS REPORT 18, *supra* note 80, at 58.

¹³¹ See MINERAL QUALITY PROBLEM, *supra* note 102, at 56.

¹³² See 33 U.S.C. § 1251(b) (1994). See also PONTIUS, *supra* note 79, at 19-20.

rather than to limit, the land and water use choices of local farmers and communities.

In some cases, potentially legitimate salinity control strategies have apparently been avoided, at least to date, because of uncertainty over the correct interpretation or application of state law. The prime example is the apparent reluctance of the project review committee to recommend funding for programs in which irrigation is discontinued on certain lands because of uncertainty about where the saved water will otherwise be used.¹³³ This uncertainty probably increases project risk. However, the salinity program would be better served by establishing a formal or informal mechanism whereby such issues could be resolved by the relevant state water law establishment (such as the state engineer) so that project selection decisions can be made on a more informed basis. Again, this approach would respect rather than intrude on the state water law system, while promoting more flexibility in the salinity program.

b. Integration of Substantive Issues

The salinity program also demonstrates integration of substantive issues that are usually addressed separately. Especially under Title II efforts in the upper basin, salinity reduction, which is primarily a water pollution problem, is now achieved largely through efforts to improve water use efficiency by irrigators who apply Colorado River water on lands underlain by highly saline soils.¹³⁴ Thus, the program simultaneously seeks to improve the efficiency with which federal project water is used, and to reduce salt loadings within the basin. This strategy recognizes the essential link between water use, land use, and water quality in the Colorado River basin, and implements solutions designed largely to prevent additional salt loadings rather than to treat them after the fact.¹³⁵ Moreover, since the 1984 amendments to the salinity program, these efficiency improvements focus not only on the efficiency of systemic distribution methods (improving system efficiency and reducing seepage by lining canals or replacing them with pipes), but also on the efficiency of on-farm irrigation practices through strategies such as replacing flood irrigation with more efficient sprinkler systems.¹³⁶

¹³³ See MINERAL QUALITY PROBLEM, *supra* note 102, at 56-58.

¹³⁴ See 1999 REVIEW, *supra* note 114, at 4-2 (stating that salinity improvements were achieved largely through BOR and USDA efficiency improvements).

¹³⁵ See TRUEMAN, *supra* note 125, at 1.

¹³⁶ See *id.* at 4-6.

The salinity program has also evolved over time into one that seeks the most cost-effective solutions by addressing the salinity problem on a watershed-wide rather than project-specific basis.¹³⁷ As early as the 1960s, agency and other scientists conducted studies to identify which regions in the basin were underlain with marine shale formations and soils, which of those areas were subject to irrigation and natural or artificially-exacerbated erosion, and, based on those factors, which regions were likely causes of excess salinity and hence potential control program targets.¹³⁸ Moreover, in amendments to the Salinity Act, Congress expressly directed federal agencies such as the BLM and the USDA to approach salinity controls from a watershed as opposed to a fragmented perspective.¹³⁹ For example, the BLM's 1987 report to Congress, which was prepared in response to the 1984 amendments, includes maps identifying areas of federal lands throughout the basin with high potential for salinity inputs based on soil characteristics.¹⁴⁰ The Forum's triennial reviews, the BOR's biennial progress reports to Congress, and other documents include efforts to relate total estimated salt loadings in the basin to past and potential future control efforts, and thereby to predict the nature and magnitude of controls needed to meet the salinity standards on a basinwide basis.¹⁴¹ Recent efforts to use market incentives via the newer competitive bidding process seek to achieve even more efficient basinwide results, and in some cases cross-issue integration, by encouraging public

¹³⁷ See *id.* at 5.

¹³⁸ See L. D. Whittig, et al., *Evaporite Mineral Species in Mancos Shale and Salt Efflorescence, Upper Colorado River Basin*, SOIL SCI. SOC. AM. J. 645, 646 (1982). See also JONATHAN B. LARONNE, EVALUATION OF THE STORAGE OF DIFFUSE SOURCES OF SALINITY IN THE UPPER COLORADO RIVER BASIN 77 (1977); W. V. IRONS ET AL., U.S. DEP'T OF THE INTERIOR, GEOLOGICAL SURVEY PROFESSIONAL PAPER 441-A, WATER RESOURCES OF THE UPPER COLORADO RIVER BASIN – TECHNICAL REPORT 19-36 (1965). The sixteen initial salinity control “units” identified in the 1972 Salinity Control Act were somewhat limiting in terms of the ability of BOR and other agencies to identify, fund, and implement the most cost-effective control measures. As identified in the program evaluations conducted in the 1980s and 1990s, however, they were not chosen based on purely arbitrary factors. Rather, Congress approved the initial control units based on studies by the EPA, the BOR, and the states with a view towards identifying potentially effective targets for salinity control.

¹³⁹ See 43 U.S.C. § 1593(b)(2) (1994). See also *id.* §§ 1592(c), 1598(c).

¹⁴⁰ BUREAU OF LAND MANAGEMENT, SALINITY CONTROL ON BLM-ADMINISTERED PUBLIC LANDS IN THE COLORADO RIVER BASIN, A REPORT TO CONGRESS (1987) [hereinafter BLM SALINITY CONTROL REPORT].

¹⁴¹ See, e.g., 1999 REVIEW, *supra* note 114, at 2-1 to 2-10. See also, e.g., PROGRESS REPORT 18, *supra* note 80, at 84-89.

and private entities to identify and to bid on the most effective strategies for salinity control.¹⁴²

Despite these examples of integration, the narrow scope of the salinity program limit other types of substantive program integration. While the program has performed fairly well in conducting basinwide inventories for purposes of salinity control *per se*, it does not parallel the types of comprehensive watershed programs that are designed to identify and address the full range of pollution and related environmental problems that impair watershed health.¹⁴³ At the same time, however, from a broader perspective it is legitimate to ask whether such a single-issue focus makes sense in terms of the allocation of overall public and private environmental protection efforts.

For example, the BLM believes that it makes little sense to address salinity runoff from federal lands independent of broader efforts to reduce erosion and to improve range conditions, which are designed to address a wider range of nonpoint source pollution problems, such as sediments, nutrients, pathogens, and temperature.¹⁴⁴ Moreover, at least several other major environmental issues plague the Colorado River watershed, many of which are related in some way to the salinity control problem. These include the effects of dams and water diversions on downstream habitat and flow, and efforts to mitigate those impacts through improved reservoir operation and release strategies,¹⁴⁵ related programs for threatened and

¹⁴² For example, the Ferron (Utah) Watershed Project Committee, comprised of the canal and reservoir company, two adjacent cities, a soil conservation district, the Cooperative Extension Service, NRCS, a zone of the Utah Association of Conservation Districts, and a power company (PacifiCorp), combined to reorganize the region's entire irrigation delivery system. This will allow improvements to both irrigation and municipal and industrial water supplies, improve water use efficiency dramatically, and reduce salinity inputs by an estimated 39,000 tpy. Another unique partnership between the Ashley Valley Wastewater Treatment Plant, the EPA, the BOR, the state of Utah, and the USGS is being considered which will reduce both selenium pollution in the area and salinity by lining treatment ponds in the area's sewage treatment plant. The recognition that this project will have cross-cutting benefits allows some salinity program dollars to be used to solve a related pollution problem—and vice versa.

¹⁴³ Those who design and implement the existing salinity control program, of course, cannot and should not be criticized for this limitation in the existing program. The program was authorized by Congress, and initially envisioned by the EPA and the BOR as well as the states, to address the very specific issue of high salinity levels affecting downstream water users in the United States and Mexico. From that perspective, the program has been quite comprehensive.

¹⁴⁴ See BLM SALINITY CONTROL REPORT, *supra* note 140, at 9-10.

¹⁴⁵ See PONTIUS, *supra* note 80, at 49-50.

endangered fish recovery,¹⁴⁶ pollution by selenium, high temperature, and other parameters,¹⁴⁷ and the multi-species recovery process for the lower reaches of the river.¹⁴⁸ As just one example of how salinity control could be better coordinated with some of these other problems, apparently little or no thought has been given to whether and how some of the water saved as a result of salinity control projects might be used to help restore flows for endangered species.¹⁴⁹

Viewed at another level, many other environmental problems in the watershed probably justify a basinwide or similarly comprehensive effort similar to that in place for salinity control. The correct approach to this situation is open to legitimate dispute. Some have proposed a comprehensive watershed program to address all related environmental (including water quantity and allocation) issues in the basin.¹⁵⁰ This could eliminate duplication and fragmentation in many aspects of watershed program management, such as monitoring, assessment, modeling, etc. It could also lead to control strategies that either address multiple issues simultaneously, or avoid potentially conflicting approaches, and thus improve overall program efficiency and effectiveness.

On the other hand, the single-issue approach by definition allows concentrated focus on that one problem, which may help to explain both the high level of consensus and cooperation and the overall success of the salinity program. Efforts to consolidate all issues into a single umbrella program might not achieve the same level of salinity control, or might not do so as efficiently, because program officials would need to balance salinity controls against other priorities. An alternative approach, therefore, might be to have separate (or parallel) comprehensive programs to address different specific issues in the basin, with improved coordination among each program to assure that individual programs do not work at cross-purposes or miss opportunities for inter-program coordination and efficiencies. Even if this latter approach is adopted, however, clearly better efforts could be made to coordinate salinity program efforts with other environmental programs in the basin.

¹⁴⁶ See, e.g., *Humpback Chub Recovery*, *supra* note 98.

¹⁴⁷ See PONTIUS, *supra* note 80, at 49.

¹⁴⁸ See *id.* at 53-56.

¹⁴⁹ NATIONAL RESEARCH COUNCIL, *supra* note 31, at 117 (noting that the state of Washington, for example, has initiated a program in which it pays for water efficiency improvements in return for legal control over the saved water).

¹⁵⁰ David H. Getches, *Colorado River Governance: Sharing Federal Authority as an Incentive to Create a New Institution*, 68 U. COLO. L. REV. 573 (1997).

Another limitation in the new program as currently implemented is that, in at least two respects, structural changes in the Colorado River's extensive system of water projects have discouraged more fundamental, decentralized, and prevention-oriented approaches to salinity control. Environmental groups argue that, in addition to highly capital-intensive treatment strategies such as the desalination plant and large canal lining projects, even large investments in improved irrigation delivery and on-farm use fail to address the underlying nonstructural cause of salinity problems.¹⁵¹ These groups argue persuasively that salinity pollution occurs in part due to the subsidized irrigation of saline, low quality soils to produce relatively low-value crops (such as alfalfa for hay).¹⁵² Simply eliminating the water subsidies that allows such lands to be farmed would reduce salinity inputs in many areas. Moreover, simply requiring farmers to pay the full costs of water would reduce (but probably not eliminate) the need for federal and state investments in water efficiency which forms the centerpiece of the salinity program, because individual farmers and irrigation districts would have the necessary economic incentives to invest in more efficient water use on their own initiative.

B. *The Chesapeake Bay Program*

1. Watershed and Program Description

The Chesapeake Bay watershed covers 64,000 square miles over a seven-state area,¹⁵³ roughly one quarter the size of the Colorado River watershed. While much smaller, the Bay watershed spans equally diverse terrain, from its headwaters in the Appalachian Mountains in upstate New York and the Blue Ridge of Virginia, through rolling Piedmont farms, to sprawling suburbs, major East Coast metropolises, and some of the largest concentrations of heavy industry in the world.¹⁵⁴

¹⁵¹ See *Amending the Colorado Basin Salinity Control Act to Authorize Additional Measures to Carry Out Purposes of the Act: Hearing on H.R. 930 Before the House Comm. On Resources*, 104th Cong. 4 (1995) (testimony of Daniel F. Luecke, Environmental Defense Fund).

¹⁵² See *id.* at 4-5.

¹⁵³ See TOM HORTON & WILLIAM M. EICHBAUM, *TURNING THE TIDE, SAVING THE CHESAPEAKE BAY* 3 (1991). [hereinafter *TURNING THE TIDE*] (Jurisdictions include New York, Pennsylvania, Maryland, West Virginia, Virginia, Delaware and the District of Columbia. For simplicity purposes, they all will be referred to as states).

¹⁵⁴ See *id.*

The Chesapeake Bay also supported, at least before human interference, one of the most productive ecosystems on earth.¹⁵⁵ Populations of herring, rockfish, and anadromous shad rivaled the great salmon runs of the Pacific Northwest.¹⁵⁶ Crab and oysters were similarly abundant,¹⁵⁷ as were massive populations of waterfowl¹⁵⁸ and other species. Despite severe declines in these resources, the Bay continues to supply a bounty of seafood and other economic and ecological benefits.¹⁵⁹

Based in part on the work of the Chesapeake Bay Commission established by Maryland and Virginia in 1980, four jurisdictions bordering the Bay entered into the Chesapeake Bay Agreement in 1983¹⁶⁰ (amended in 1987 and 1992). The agreement set goals for improving the water quality and viability of natural resources in the Chesapeake Bay, along with an accompanying set of objectives and commitments by the participants.¹⁶¹ While the program is administered by the multi-jurisdictional Chesapeake Bay Program with an executive council and multiple subcommittees, actual on-the-ground implementation of environmental and other controls is done primarily at the state and local levels.¹⁶² Federal participation and funding is provided for in a Bay-specific provision of the CWA.¹⁶³

The vital signs that highlighted the need for the Chesapeake Bay Program are now used as indicators of the ecosystems recovering health. Many seafood species, such as striped bass and oysters, experienced such reduced populations that commercial harvesting was restricted.¹⁶⁴ Wetlands were being lost at a dramatic rate.¹⁶⁵ Heavy nutrient loadings,

¹⁵⁵ See *id.* at 21-23.

¹⁵⁶ See *id.* at 6, 24, 105-07.

¹⁵⁷ See *id.* at 21.

¹⁵⁸ See TURNING THE TIDE, *supra* note 153, at 21-22.

¹⁵⁹ See TURNING THE TIDE, *supra* note 153, at 21.

¹⁶⁰ See CHESAPEAKE BAY PROGRAM, A "WHO'S WHO" IN THE CHESAPEAKE BAY PROGRAM 1-3 (1999) [hereinafter WHO'S WHO] (noting that Maryland, Virginia, Pennsylvania, and the District of Columbia are referred to as the "signatory states," and New York, West Virginia, and Delaware are referred to as "non-signatory" states. The 1983 Agreement is reprinted in CHESAPEAKE EXECUTIVE COUNCIL, THE FIRST PROGRESS REPORT UNDER THE 1987 CHESAPEAKE BAY AGREEMENT 1 (1989). The Agreement is currently being renegotiated once again).

¹⁶¹ See WHO'S WHO, *supra* note 160, at 2.

¹⁶² See *id.* at 1-4.

¹⁶³ See 33 U.S.C. § 1267 (1994). See also Adler, *supra* note 1, at 1071-72.

¹⁶⁴ See TURNING THE TIDE, *supra* note 153, at 105-112.

¹⁶⁵ See *id.* at 149-55.

caused primarily by agricultural activities, were found in many tributaries to the Bay.¹⁶⁶ Extremely high phosphorus and nitrogen levels were found in the Bay itself, probably contributing to the decline in seafood harvests due to eutrophication and its related effects on underwater grasses and dissolved oxygen levels.¹⁶⁷ Toxic pollutants were found in dangerous concentrations in the water column, sediment, and biota of the Bay.¹⁶⁸

In an effort to reverse these trends, the Chesapeake Bay Agreement set a goal of 40 percent reduction of nutrients entering the Bay by the year 2000.¹⁶⁹ This 40 percent reduction goal was renewed in the 1992 amendments to the agreement, along with a commitment to address nutrients at their source within the tributaries to the Bay. Based on this overarching goal, nutrient reduction targets have been developed for each of the Bay's ten major tributary basins, with detailed implementation strategies developed by each state under its individual regulatory authority.¹⁷⁰ Reductions in nutrient loadings have been accomplished through sewage and industrial treatment plant upgrades, as well as nonpoint source controls developed on a tributary-by-tributary basis.¹⁷¹

The Chesapeake Bay Program has addressed other ecological damage in a similar way.¹⁷² The program works as an interjurisdictional policy development body that identifies potential causes of damage and sets long-term goals, but leaves to each state the details of the exact nature of the implementation strategies to meet those goals. For example, the program developed a baywide toxics reduction strategy that seeks to prevent the accumulation in sediments of additional toxins that bioaccumulate in the food chain.¹⁷³ After designating regions of concern at the Bay program level, each affected state has developed an action plan tailored to each region of concern within its jurisdiction. Similarly, the

¹⁶⁶ See *id.* at 41-47.

¹⁶⁷ See *id.* at 46.

¹⁶⁸ See *id.* at 75-83.

¹⁶⁹ See WHO'S WHO, *supra* note 160, at 1.

¹⁷⁰ See CHESAPEAKE BAY PROGRAM, NUTRIENT REDUCTION PROGRESS AND FUTURE DIRECTIONS-NUTRIENT REEVALUATION SUMMARY REPORT 5 (1997) [hereinafter 1997 REEVALUATION].

¹⁷¹ See generally *id.* See also U.S. ENVIRONMENTAL PROTECTION AGENCY, CHESAPEAKE BAY PROGRAM, THE STATE OF THE CHESAPEAKE BAY (1995) [hereinafter 1995 STATE OF BAY]. But see CHESAPEAKE BAY FOUNDATION, THE STATE OF THE BAY REPORT (1999) (noting that Bay nutrient loadings are still 7 times higher than in pre-colonial times).

¹⁷² See WHO'S WHO, *supra* note 160, at 2-3.

¹⁷³ See *id.* at 2.

program developed Bay-wide management plans for specific species (e.g., oysters, blue crabs).¹⁷⁴

In certain circumstances, specific prohibitions on polluting activity have been recommended by the program and adopted in affected jurisdictions. Maryland and Pennsylvania, for example, placed moratoria on the capture, sale, or possession of shad to allow the fishery to recover.¹⁷⁵ All seven Bay watershed jurisdictions have banned the use of phosphate detergents as a simple measure to reduce nutrient loadings.¹⁷⁶

With over ten years of experience in implementing the Chesapeake Bay Agreement, the program is moving towards meeting its year 2000 goals.¹⁷⁷ It is also learning that ecosystem restoration is a long-term endeavor, with results that may not be realized until decades after the sources of pollution have been eliminated. This delayed gratification phenomenon presents a great challenge to a program that relies on voluntary cooperation by its state partners, and in many cases, by private landowners in the watershed.

2. Integrated Approaches in the Chesapeake Bay Program

The Chesapeake Bay Program addresses pollution from a large number of nonpoint sources in a far-reaching basin. As in the CRBSCP, the pollution has its effects far downstream from the source, possibly offering an opportunity for source reductions trading. By contrast to the CRBSCP, the Chesapeake Bay Program has a more comprehensive infrastructure of policy-making and coordinating bodies, allowing a comparison of the effectiveness of different management approaches for multi-jurisdictional watershed programs.

a. Integration of Decision Making Processes

The Chesapeake Bay Program is an excellent example of watershed-wide information management as a basis for integrated ecosystem restoration efforts. The coordinating entity has marshaled a wide variety of resources and information to identify the scope of the environmental problems and their possible causes, to brainstorm potential solutions, and to explore approaches that can address multiple

¹⁷⁴ See 1995 STATE OF BAY, *supra* note 171.

¹⁷⁵ See TURNING THE TIDE, *supra* note 153, at 110.

¹⁷⁶ See 1997 REEVALUATION, *supra*, note 170, at 11.

¹⁷⁷ See WHO'S WHO, *supra* note 160, at 2-3. *But see* CHESAPEAKE BAY FOUNDATION, *supra* note 171 (challenging adequacy of progress in many areas).

environmental concerns. This contrasts sharply with the CRBSCP, which is designed largely to address a single environmental issue.¹⁷⁸ Unlike the CRBSCP, however, the Chesapeake Bay Program does not target or implement solutions on its own, although it does provide targeted cost-sharing funding for state and local solutions.¹⁷⁹ It must rely on the political will and financial resources of each of the seven affected state jurisdictions, of which four participate actively in the program.¹⁸⁰ The participating states have agreed to joint restoration goals and to maintain flexibility to take actions in their jurisdiction to meet that watershed-wide goal. In addition, the Chesapeake Bay Program integrates the efforts of more than 25 different federal agencies through a series of memoranda of agreements and periodic updates to a federal agencies' version of the overall Bay agreement.¹⁸¹

The Chesapeake Bay Program is a federal-state-local partnership that includes four state jurisdictions, the EPA, and the Chesapeake Bay Commission. The Chesapeake Bay Commission, made up primarily of legislators from the signatory states,¹⁸² is a unique coalition intended to facilitate implementation of program goals at the state legislative level. The policymaking body of the program—the Chesapeake Executive Council—includes the elected governors of each signatory state, the mayor of the District of Columbia, the Administrator of the EPA, and the Chesapeake Bay Commission chair.¹⁸³ The executive council operates with twelve major committees; it reaches its policy decisions with the input of these policy and technical committees, along with scientific, citizen and local government advisory groups.¹⁸⁴ The Chesapeake Bay Program Office is the executive council's staff,¹⁸⁵ taking direction from its various policy committees, technical subcommittees, advisory groups, workgroups, and task forces. The program office staff totals about 75 people, one-third from the EPA, with the remainder coming from other federal agencies, state agencies, and academic institutions, all located in the same office.¹⁸⁶

¹⁷⁸ See Getches, *supra* note 150.

¹⁷⁹ See WHO'S WHO, *supra* note 160, at 1-4

¹⁸⁰ See *id.* at 4.

¹⁸¹ See *id.* at 59.

¹⁸² See *id.* at 62.

¹⁸³ See *id.* at 5.

¹⁸⁴ See WHO'S WHO, *supra* note 160, at 6-58.

¹⁸⁵ See *id.* at 7.

¹⁸⁶ See *id.* at 63-64. Other federal agencies having staff in the program office or located close by include the National Park Service, U.S. Fish and Wildlife Service, U.S.

There are many benefits to this structure. Because of the program and the commission, the Chesapeake Bay has a well-funded and knowledgeable champion. The fact that the executive council is composed of the respective jurisdiction's highest elected (state) or appointed (EPA) officials lends much higher profile than the salinity forum, which is composed of gubernatorial appointees.¹⁸⁷ This, of course, may reflect the far more inclusive scope of the Bay program, as well as the importance of the Bay's health to the region's ecological and economic welfare.

The ecological and economic issues affecting the Bay are viewed as a "big picture," in light of which cross-jurisdictional, cross-media and cross-discipline strategies are considered and developed. Program officials track the efforts of affected state jurisdictions, as well as all relevant federal agencies, and make suggestions for coordination. This makes it possible to conduct restoration efforts for the Bay in a "life cycle" manner, including research into the extent and causes of the problem, holistic suggestions for improvement, monitoring of the impacts of restoration actions taken, reassessment of their value, and changes in restoration approach where appropriate.

The primary limitation to the Chesapeake Bay Program's structure is the lack of power within the program itself to implement actual restoration programs. Thus, program planning is integrated, but implementation remains relatively more fragmented. The program states implement restoration efforts, and each state views Bay-related issues with different levels of political will. This, in turn, can be accompanied by significant differences in the type and stringency of implementation chosen by each state. Such variation can be viewed as positive if it promotes innovation and different but equally effective restoration and protection programs. It could be negative and potentially inequitable, however, if some states adopt significantly more effective programs than others. For example, statutes adopted by Maryland and Virginia to regulate land use in the coastal zone differ both in geographic reach and in the stringency of control requirements.¹⁸⁸ Unlike the CBRSCP, the Chesapeake Bay Program does not directly target or implement many "projects" that meet the ecological restoration goals for the Bay. As a

Department of Agriculture, Army Corps of Engineers, and the National Oceanic and Atmospheric Administration (NOAA).

¹⁸⁷ See *id.* at 5.

¹⁸⁸ See Adler, *supra* note 1, at 1072-73 n.611. See also TURNING THE TIDE, *supra* note 153, at 158-65.

result, solutions must, by definition, be designed at the state rather than the regional level.

b. Integration of Substantive Issues

The Chesapeake Bay Program serves as a prototype for comprehensive, integrated watershed-based resource assessment and analysis.¹⁸⁹ The states, the EPA, and other federal agencies have devoted tremendous resources to study and evaluate a wide range of issues that affect the health of the Bay, including nutrient enrichment by both point and nonpoint sources, discharges and in-place contamination from toxics, loss of wetlands and other natural habitat, and the relationship between these specific impairments and broader issues such as population growth and major changes in land use within the watershed.¹⁹⁰ Unlike the CRBSCP, therefore, the Bay program was designed to identify and address all of the causes of health and ecological impairment of the Bay in an integrated way. One program is more comprehensive; the other is more focused.

The more comprehensive approach to watershed protection allows officials to search for solutions that solve multiple problems, and to coordinate efforts to ensure that solutions to one problem do not interfere with others. It also allows officials to prioritize among, as well as within, issues so that funding, personnel, and other resources can be allocated based on an assessment of which issues are most important to the overall health and welfare of the Bay and the human and other populations that use it. By contrast, there is no mechanism to make such determinations in the Colorado River watershed, for example, to decide what level of federal and state resources should be devoted to salinity control as opposed to endangered species recovery.¹⁹¹ On the other hand, it can be argued that one of the main reasons for the success of the CRBSCP has been its narrow focus on a single important issue, and the consistency with which that issue has been addressed. Financial and other resources, scientific and technical analysis, and implementation have been directed carefully toward a single main purpose. While disagreements arise about the best strategies to achieve salinity control, there is little dispute about the nature and importance of meeting the goal.

¹⁸⁹ See WHO'S WHO, *supra* note 160, at 1 (identifying Bay program as "a national and international model for estuarine research and restoration programs").

¹⁹⁰ See *id.* at 2.

¹⁹¹ See Getches, *supra* note 150.

Like the CRBSCP, the Chesapeake Bay Program is driven by a set of consensus-based interstate goals and objectives.¹⁹² Unlike the salinity program, however, these goals have not been translated into formal interstate water quality standards or other legally-enforceable requirements. Thus, while the Bay program standards address a much broader range of issues than the single set of interstate salinity standards, they are subject to variable adoption and interpretation by the individual states. With TMDLs on the horizon, the federal and state Bay program partners have committed to adopt consistent, baywide water quality standards that address nutrient and sediment enrichment.

The 1987 Chesapeake Bay Agreement, in fact, included a set of consensus goals and objectives for the watershed addressing a wide range of issues.¹⁹³ These included living resources, water quality, population growth and development, public information, education and participation, and governance.¹⁹⁴ Program implementation and success, however, required that these general goals and objectives be translated into more specific, measurable performance goals and standards.

The most notable of these more specific goals is the basinwide 40 percent nutrient reduction goal.¹⁹⁵ While each state retains its authority to set water quality standards, and while different water quality standards apply to different parts of the Bay and its tributaries, the uniform goal has acted as a motivator for change. Indeed, it could be argued that having an overarching goal, rather than a legally enforceable water quality standard, has fostered creative problem-solving within the program and among the states. Thus, some states have instituted a total ban on phosphate detergents, a solution which might not have been selected based on a strict water quality standard approach, or which might not have been possible if all of the basin states had to agree with it.¹⁹⁶ Another example of a specific performance goal agreed to by the participants is the restoration of submerged aquatic vegetation from 70,000 to 114,000 acres by the year 2005.¹⁹⁷

Ultimately, program accountability must be assessed by reference to actual improvements in ambient water quality over time. The 40 percent reduction goal, however, is applied on a state-by-state rather than

¹⁹² See WHO'S WHO, *supra* note 160, at 3.

¹⁹³ See *id.*

¹⁹⁴ See *id.* at 1-4.

¹⁹⁵ See 1997 REEVALUATION, *supra* note 170.

¹⁹⁶ See *id.* at 13.

¹⁹⁷ See WHO'S WHO, *supra* note 160, at 2.

basinwide basis.¹⁹⁸ Thus, even if controls were more feasible or cost-effective in one state than another, there does not appear to be a mechanism for interstate trading of nutrient reductions, as there is in the salinity program. One program subcommittee is currently investigating the potential for a nutrient trading program, in anticipation of a possible basinwide decision that the 40 percent reduction should be considered a permanent load cap.¹⁹⁹ If that becomes the basinwide goal, program partners recognize that alternative approaches to nutrient reduction will become necessary to meet that goal cost-effectively.

The Chesapeake Bay Program has adopted the goal approach in virtually all aspects of its watershed restoration efforts, rather than imposing uniform standards that must be met in all signatory states.²⁰⁰ This approach, which keeps the focus on cooperative, consensus-based decision making, has had the effect of fostering a diversity of solutions to the underlying ecological problems of the region. For example, the states of Maryland and Virginia have adopted somewhat different commercial fishing restrictions to protect the blue crab.²⁰¹ Similarly, states have developed different action plans to reduce toxics in sediments within the Chesapeake Bay region. In part because of differences in the nature of the toxics problem at each area of concern and in the potential sources of funding in each state, the approaches to toxics reduction differ significantly.

The Chesapeake Bay Program plays a large role in encouraging a holistic approach to ecosystem restoration. The program synthesizes diverse information about causes of the Bay's poor ecological health, as well as potential solutions. In formulating plans, states are educated about what is possible and may think more expansively about how to meet the goals that have been set.

Ecological problems affecting the Chesapeake Bay relate more heavily to water quality than to water quantity.²⁰² Moreover, because of significantly higher annual and seasonal precipitation, most agricultural land in the region is not irrigated.²⁰³ As a result, the Chesapeake Bay Program does not use the same type of synergistic, integrated approach to

¹⁹⁸ See *id.* at 3.

¹⁹⁹ See *id.*

²⁰⁰ See *id.* at 1-3.

²⁰¹ Note that not all interests view this non-uniform approach to meeting the goals as a positive attribute. The Chesapeake Bay Foundation has recommended that Maryland and Virginia move towards a more uniform application of fishing restrictions.

²⁰² See WHO'S WHO, *supra* note 160, at 1.

²⁰³ See *id.* at 2.

water quality and water quantity as does the CRBSCP. Of necessity, however, the Bay Program's focus on nutrient enrichment has required the signatory states to focus heavily on solutions related to land use, including the application of new agricultural best management practices within the watershed.²⁰⁴

Program planning efforts have also resulted in multiple-issue approaches to reversing ecological damage. Many of the recommended solutions will have far-reaching ramifications for the natural resources in the watershed. Nutrient and toxics reductions, for example, will improve water quality, which in turn will allow aquatic species to recover. While the water quality improvements are desired goals in and of themselves, their importance is magnified because of their contribution to the health of the entire ecosystem. Due to the program's limited authority, the result is a coordinated conceptual approach to ecosystem restoration, if not necessarily fully coordinated implementation.

C. *The CALFED Bay-Delta Program*

1. Watershed and Program Description

The San Francisco Bay and Sacramento-San Joaquin Delta (Bay-Delta), the largest estuary on the West Coast, covers almost 750,000 acres and is home to over 750 plant and animal species.²⁰⁵ The Bay-Delta system is formed by the confluence of the Sacramento River from the north and the San Joaquin River from the south, along with their numerous tributaries and contiguous wetlands and sloughs, and San Francisco Bay on the west.²⁰⁶ The larger watershed that affects the Bay-Delta, however, covers roughly half the State of California, from headwaters in the Sierra Nevada Mountains, through California's rich Central Valley, and into two of the State's largest urban areas of Sacramento and San Francisco.²⁰⁷ Like the Colorado River system, this watershed has been modified substantially by a huge complex of dams, diversions, levees, canals, and

²⁰⁴ See TURNING THE TIDE, *supra* note 153, at 47.

²⁰⁵ See CALFED Bay-Delta Program, Revised Phase II Report, Draft Programmatic EIS/EIR Technical Appendix 1 (1999) [hereinafter DEIS]. See also T. R. MONGAN & B. J. MILLER, WATER QUALITY AND WATER MANAGEMENT SACRAMENTO-SAN JOAQUIN RIVER SYSTEM, IN WATER QUALITY IN NORTH AMERICAN RIVER SYSTEMS 85 (C. Dale Becker & Duane A. Neitzel eds., 1992).

²⁰⁶ See DEIS, *supra* note 205, at 3.

²⁰⁷ See *id.* at 4.

other artificial structures designed both to provide more usable water to farms and cities, and to protect human structures from flooding.²⁰⁸

The Bay-Delta area provides drinking water for millions of people, and irrigation water for a large portion of California's agricultural sector.²⁰⁹ The ecological health of the Bay-Delta area has been affected by urban and agricultural activities. Water quality has been affected by mining, inadequate wastewater treatment, and nonpoint source pollution.²¹⁰ Water quantity and distribution have been changed by land use patterns, as well as the construction of the extensive levee system to manage water distribution and the large number of dams and diversions in the upstream watershed.²¹¹ The region contains habitat for many important but threatened species, including chinook salmon and striped bass.²¹²

Initiated in 1995, the CALFED Bay-Delta Program is a partnership between state and federal environmental and natural resource agencies,²¹³ working together to address water quality and water quantity problems in California's Bay-Delta region.²¹⁴ The CALFED program has its own staff and borrows staff from the partnership agencies to accomplish its management mandate.²¹⁵ A planning process to develop alternatives for addressing the region's problems is being undertaken over a five-year period. A draft programmatic environmental impact statement (EIS) containing three alternatives was issued in 1998, and a revised programmatic EIS containing the preferred alternative was released in June 1999.²¹⁶ During this time period, the CALFED program also

²⁰⁸ See *id.* at 1-2.

²⁰⁹ The region's water resources supply 2/3 of California's population and are used to irrigate about 7 million acres. See *id.* at 1.

²¹⁰ See *id.* at 12.

²¹¹ See *id.* at 11-13.

²¹² See MONGAN & MILLER, *supra* note 205, at 106-10.

²¹³ The CALFED agencies include BOR, FWS, USGS, BLM, NRCS, EPA, the U.S. Army Corps of Engineers, National Marine Fisheries Service, U.S. Forest Service, Western Area Power Administration, California Department of Water Resources, California Department of Fish and Game, and the California Environmental Protection Agency (through the State Water Resources Control Board). See DEIS, *supra* note 205, at 5.

²¹⁴ For a general history of the program, see Elizabeth Ann Rieke, *The Bay-Delta Accord: A Stride Toward Sustainability*, 67 U. COLO. L. REV. 341 (1996).

²¹⁵ See DEIS, *supra* note 205, at 5.

²¹⁶ See *id.* at 7. A final Programmatic EIS is expected summer 2000. See *id.*

provided over \$200 million in funding for initial ecosystem restoration projects.²¹⁷

The CALFED program restoration approach is designed to meet four primary objectives related to water quality, ecosystem quality, water quantity, and levee maintenance and stabilization.²¹⁸ To meet these objectives, the program has multiple components. It seeks ways to coordinate planning, regulatory and permitting processes. It provides funding for and selects projects designed to meet program goals. Its plan, and the projects it funds, include extensive ecosystem restoration, levee system integrity, point and nonpoint source water quality, local watershed management coordination, water use efficiency, and water transfer policy.²¹⁹

The CALFED program solicits proposals for ecosystem restoration programs and projects from interested public and private parties,²²⁰ and provides funding for those that receive the highest scores from the program's technical review panels.²²¹ The most recent solicitation for bids²²² requested proposals in one of seven categories,²²³ each of which identified "focused actions" a project proposal could address.²²⁴ Proposals

²¹⁷ CALFED Bay-Delta Program, Ecosystem Restoration Projects and Programs, February 1999 Proposal Solicitation Package, Proposal Solicitation 1.2 (1999) [hereinafter RfP]. The program has funded 173 projects to date for a total of \$177 million. An additional 13 projects costing \$52 million were approved in 1999. *See id.* at 1.2.

²¹⁸ *See* DEIS, *supra* note 205, at 12-14. *See also id.* at 1.1.

²¹⁹ *See* DEIS, *supra* note 205, at 25-28.

²²⁰ The most recent CALFED proposal solicitation package describes seven types of applicants: state agencies, universities, federal agencies, non-profit organizations, private (for profit) individual entities, local government/ districts, and public/non-profit joint ventures. *See* RfP, *supra* note 217, at 2.2.

²²¹ *See id.* at 2.5.

²²² The February 1999 request was the most specific one issued to date, with previous requests containing much more general descriptions of the types of projects solicited. The program has moved from the general to the more specific, in part based on increased knowledge about the ecosystem problems to be addressed, but also to sharpen the focus of the proposals it receives. *See id.* at 2.5.

²²³ The seven categories include: fish passage/fish screens, habitat restoration (channel, floodplain and marshes), local watershed stewardship, water quality, improved fish management and hatchery operations, environmental education, and introduced species. *See id.* at 2.6.

²²⁴ Most "focused actions" are tied to a specific geographic area—e.g., restore tidal marsh and riparian habitats along Georgiana Slough. Some are more regional and evaluative in nature—e.g., evaluate hatchery management and release operations in the

will be evaluated on the basis of seven criteria.²²⁵ Depending on the nature of the project, certain criteria will receive more weight. Thus, for water quality projects, the proposal's technical feasibility and inclusion of monitoring/assessment receive double weight.²²⁶ Similarly, for environmental education projects, local involvement is deemed especially important.²²⁷

The CALFED program received proposals totaling \$220 million in response to the most recent solicitation for bids, of which only \$18 million worth of projects can be funded.²²⁸ The CALFED project selection process is extensive.²²⁹ All proposals received are first reviewed and scored (using the seven criteria matrix) by a technical review panel consisting of relevant experts.²³⁰ The proposals are then evaluated by the integration panel, a group of technical agency staff, to determine the project's compatibility with restoration and funding goals. The integration panel's recommendation is forwarded to the ecosystem roundtable and Bay-Delta advisory council, a federal advisory committee.²³¹ Finally, the CALFED policy group, consisting of representatives from all CALFED member agencies, makes recommendations on which projects should be funded to the state secretary for resources and the secretary of the DOI, who make the final decision.²³²

The CALFED program has funded over 173 restoration projects to date, at a total cost of approximately \$177 million, with another 13 projects at a cost of \$52 million approved in 1999.²³³ Projects funded include fish screens, fish ladders, land acquisition, habitat restoration, as well as focused research and monitoring efforts.²³⁴ Funding comes from existing federal and state budgets, specific congressional appropriations,

general Bay-Delta area to minimize threats to naturally spawning populations of anadromous fish. *See id.* at 2.3, 3.2.

²²⁵ The seven criteria include: ecological/biological benefits, technical feasibility and timing, monitoring, assessment and reporting, local involvement, cost, cost sharing, and applicant qualifications. *See id.* at 2.6.

²²⁶ *See RfP, supra* note 217, at 2.6.

²²⁷ *See id.* at 2.6.

²²⁸ *See id.* at 2.1.

²²⁹ *See id.* at 2.5.

²³⁰ *See id.*

²³¹ *See RfP, supra* note 217, at 2.5

²³² *See id.*

²³³ *See id.*

²³⁴ *See id.* at 1.2.

and CALFED program-specific state bonds.²³⁵ While some efforts toward meeting the program's goals have already been undertaken through early implementation on ecosystem restoration, the majority of the CALFED program's implementation activity is yet to come. The CALFED program's wish list, as outlined in the draft EIS currently exiting the public comment period, is estimated to cost over \$5 billion over the next five to seven years.²³⁶ This hefty price tag, however, only underscores the importance of focusing on ways to maximize the cost-effectiveness of projects that are selected.

2. Integrated Approaches in the CALFED Bay-Delta Program

Like the CRBSCP, the CALFED Bay-Delta Program involves the relationship between water quality and water quantity issues in a large geographic area in the west. By adding habitat restoration and protection to the agenda, and by linking these environmental goals with those of levee stabilization and maintenance, the CALFED program provides an example of an even more highly integrated approach to aquatic ecosystem management and protection. Indeed, addressing these interrelationships is one of the "fundamental program concepts" identified by the CALFED effort.²³⁷ The CALFED program also represents a unique partnership between state and federal government, and between traditional environmental and natural resource agencies.

Review of the CALFED program confirms many of the similarities, but also highlights the relative complexities of a restoration effort focused on multiple potential contaminants or causes (the CALFED program), by contrast to a program focused primarily on one pollutant (in the case of CRBSCP, salinity). Like the CRBSCP, the CALFED program is working toward meeting agreed-upon water quality standards, which have provided a catalyst for coordinated action.²³⁸ Unlike the CRBSCP, however, meeting the water quality standards is not the only goal of the restoration effort; it is one component of a watershed-wide strategy to restore the environmental and biological health of the Bay-Delta estuary.²³⁹

²³⁵ See DEIS, *supra* note 205, at 140-46.

²³⁶ See *id.* at 145.

²³⁷ See *id.* at 14-16.

²³⁸ See *id.* at 11-16.

²³⁹ See *id.*

To meet this wide-reaching goal, the CALFED program has established an elaborate project selection process, which uses cost as one of six evaluative criteria.²⁴⁰ The program is in the process of reviewing its project selection process, and might benefit from reviewing the simplicity and focus of the CRBSCP approach. The CALFED state-federal partnership has created a comprehensive multi-issue approach to watershed issues. The program includes an extensive review of the scope of the problem and its potential causes, careful analysis of alternative solutions, and future targeting of restoration projects that address all components of the estuary's health.²⁴¹ Early implementation funding for the program has been concentrated, however, on ecosystem restoration activities, deferring many water quality-related activities—such as control of nonpoint sources of pollution—to the future.

a. Integration of Decision Making Processes

The CALFED program operates as a state-federal partnership, in which plans and implementation strategies are developed on the basis of an extensive and inclusive public process. In general, watershed-wide restoration objectives have been developed jointly between the state and federal agencies, with implementation falling to the appropriate agency. Discussions are under way to explore the creation of a new state-federal legal entity that could have implementation and oversight authority, but that would not include regulatory authority.²⁴²

The CALFED program consists of personnel from other agencies whose time has been dedicated to the restoration effort.²⁴³ The program itself has no direct authority to regulate, enforce, make funding decisions, or even to hire personnel.²⁴⁴ The state and federal governments created the program by entering into a memorandum of understanding under which all funding decisions are made by those entities whose money will be spent.²⁴⁵ One interviewee described the CALFED program's authority—which also forms the basis of its effectiveness—as “moral authority.” Viewed in its broadest sense, this “moral authority” reflects a commitment by federal and state governments to a partnership approach, a

²⁴⁰ See DEIS, *supra* note 205, at 6.

²⁴¹ See *id.* at 6-8.

²⁴² See *id.* at 136-40.

²⁴³ See *id.*

²⁴⁴ See *id.*

²⁴⁵ See DEIS, *supra* note 205, at 138-40.

decision at both levels that restoration of the Bay-Delta estuary is a priority, and an effort to coordinate restoration efforts to the maximum extent possible. In a practical sense, the physical presence in one office of staff from multiple agencies has facilitated "real-time" collegial decision making on technical problems that cross agency boundaries but need immediate on-the-ground solutions.²⁴⁶

Historically, there has been a great deal of controversy about the applicable water quality standards in the Bay-Delta area.²⁴⁷ The uncertainty about which standard should apply was not caused by different state requirements, since the Bay-Delta is located entirely within California, but reflected a disagreement between the State of California and the EPA, as well as the inherent conflicts between protecting various resources such as water quality, water quantity and endangered species. Interim water quality standards were agreed to through a stakeholder process and reflected in the Bay-Delta Accord in December 1994.²⁴⁸ The effect of agreed-upon water quality standards is not so much increased cooperation between governmental entities having jurisdiction in the watershed, as it is the existence of a target that all parties accept, thus making ecosystem restoration activity in the Bay-Delta area possible. Prior to the negotiated standards, no significant investment in restoration could be contemplated, because the end point of the restoration efforts was in dispute. This confirms the findings from both the CRBSCP and the Chesapeake Bay evaluations that a consensus decision on basic program performance standards is an extremely important foundation on which to build a more comprehensive, integrated program of intergovernmental cooperation.

b. Integration of substantive issues

Like the Chesapeake Bay Program, the CALFED program has undertaken a comprehensive watershed-based resource assessment and analysis. Federal and state agencies spent the first year and a half of the

²⁴⁶ One example given of such a historically contentious issue was the decision of what steps to take to maintain existing water uses while protecting endangered species when the water exportation limits are reached at a given point in time. The collaborative model of the CALFED program, where experts from the various affected agencies meet on a regular basis, has apparently reduced the conflict in such crisis situations.

²⁴⁷ See Rieke, *supra* note 214, at 345-49.

²⁴⁸ Although the water quality standards have been approved by the EPA and are a part of state law, enforceable by the state Water Quality Control Board, they are still considered "interim." See *id.* at 368. They have nevertheless been used by CALFED as one of the targets in its planning efforts. See *id.*

program identifying the full range of water quality, water quantity and natural resource problems that faced the Bay-Delta estuary. In its Phase I report, the CALFED program issued a mission statement, objectives and solution principles.²⁴⁹ The objectives reflected the scope of the ecosystem-wide issues that needed to be addressed.²⁵⁰ The CALFED implementation plan is designed to meet multiple objectives: providing good water quality for all beneficial uses, improving and increasing aquatic and terrestrial habitats, reducing the mismatch between water supplies and beneficial uses, and reducing the risk to land use, economic activities, and the ecosystem from catastrophic breaching of delta levees.²⁵¹

The next three years of the CALFED program were spent developing and evaluating proposed solutions to the ecosystem problems identified in Phase I. The draft preferred solution was described in the draft programmatic EIS. In identifying and reviewing alternative solutions, the CALFED program followed three fundamental program concepts,²⁵² the first of which underscores its comprehensive approach to watershed protection. First and foremost, the planners recognized that because the four problem areas (ecosystem quality, water quality, water supply reliability, and levee system integrity) were interrelated, the potential solutions could or should also be interrelated and overlapping. As the CALFED program moves into its implementation phase, it faces the continual challenge of maximizing the opportunities created by these interrelationships.

The CALFED program, through its public process, determines the types of restoration activities that need to be undertaken to meet program objectives. Projects are then solicited in the desired activity areas.²⁵³ Target projects address water quality, water quantity and habitat restoration, and potentially involve actions on public and private lands.²⁵⁴ The project categories are selected to implement the overall restoration and water management objectives developed by the program.

²⁴⁹ See DEIS, *supra* note 205, at 6-7.

²⁵⁰ See *id.*

²⁵¹ See *id.* at 6.

²⁵² The three fundamental program concepts are: (1) the problem areas are interrelated; (2) great variation in water flow through system does not correlate with variations in water demand, creating the need for a water management strategy; and (3) adaptive management. The CALFED's adaptive management approach is discussed later in this section. See *id.* at 14-23.

²⁵³ See *id.* at 136-140.

²⁵⁴ See *id.*

Coordination across jurisdictions, media and disciplines—a multi-issue approach—is an integral part of the program's project targeting. Projects that leverage money and effort to meet multiple restoration objectives are specifically encouraged and weighted more heavily in the evaluation criteria.

An additional factor that contributes to the integration of water policy and land use is the fact that landowner participation, where relevant, is a prerequisite to receiving funding from the CALFED program. Proposals must demonstrate "local support or involvement" for the project, which is described as governmental, adjacent property owner, and public support.²⁵⁵ In theory, no project will receive CALFED funding if affected landowners are not willing to participate. The program welcomes projects through which local government or non-profit entities can share costs. For the most part, however, the nature of anticipated landowner participation included in early implementation projects differs greatly from that required in the CRBSCP. In the CALFED projects, it appears that landowner participation at this stage has been limited primarily to granting legal authority to use their land or granting conservation easements, although a few projects have involved cost-sharing or other voluntary activities. It is likely, however, that future restoration projects developed on the basis of research being currently undertaken into the causes of certain water quality issues might require more active landowner participation in the nature of cost sharing and changes in management practices that form a part of the CRBSCP.

As with the CRBSCP, however, ongoing institutional barriers may impede certain types of solutions that, even if appropriate from an economic and environmental standpoint, conflict with prevailing political and social values. For example, the CALFED program has identified acreage that could be fallowed to meet water quality goals, but has not yet developed an implementation strategy. The land retirement approach was identified in interviews as potentially effective, but extremely controversial. It is our impression that this approach has therefore not been given a high priority in CALFED's planning efforts. Through the public participation and planning processes of both programs, officials must decide the point at which public values as opposed to technical and economic considerations will prevail.

²⁵⁵ See RfP, *supra* note 217, at 2.6, 4.2.

D. *The Central and Southern Florida Project (Everglades)*

1. Watershed and Program Description

In its natural state, the Everglades, known to many as the "River of Grass,"²⁵⁶ was a complex of rivers, lakes, wetlands and low-lying plains covering much of south and central Florida.²⁵⁷ Bounded by coastal ridges on the east and west, rainfall from the Kissimmee Valley flowed first into Lake Okeechobee—the second largest freshwater lake entirely in the United States²⁵⁸—and southward through the region's grasslands and wetlands into Florida Bay. Like the other aquatic ecosystems studied, the Everglades was one of the world's richest ecosystems, prompting its designations as an International Biosphere Reserve, a World Heritage Site, and a Wetland of International Significance.²⁵⁹ The Everglades proper are integrally connected to other related ecosystems, from the string of lakes in the Kissimmee Valley to the complex of bays, lagoons and coral reefs to the south.²⁶⁰

Fifty years ago, an artificially modified water management system in southern Florida, known as the Central and Southern Florida Project, was designed for flood protection, as well as projected human and agricultural water consumption needs.²⁶¹ The system consists of a large network of canals, levees, and water control projects designed both to supply water to areas of use and to keep water from areas of natural flooding.²⁶² This engineered alteration of the region's natural hydrology, however, along with the agricultural and urban development it has helped to support, have caused significant environmental changes.²⁶³ Roughly 70 percent less water flows through the system today than it did before human alteration.²⁶⁴ Due to this water loss along with the draining and

²⁵⁶ See generally MARJORY STONEMAN DOUGLAS, *THE EVERGLADES: RIVERS OF GRASS* (1947).

²⁵⁷ See THE CENTRAL AND SOUTHERN FLORIDA PROJECT COMPREHENSIVE REVIEW STUDY (THE RESTUDY), *RESCUING AN ENDANGERED ECOSYSTEM: THE PLAN TO RESTORE AMERICA'S EVERGLADES 1* (1999) [hereinafter RESTUDY].

²⁵⁸ See *id.* at 4. The Great Lakes straddle the U.S.-Canadian border.

²⁵⁹ See *id.* at 5.

²⁶⁰ See *id.* at 3-6.

²⁶¹ See *id.*

²⁶² The system covers 18,000 square miles and includes 1,000 miles of canals, 720 miles of levees, and almost 200 water control structures. See RESTUDY, *supra* note 257, at 3.

²⁶³ See *id.* at 3.

²⁶⁴ See *id.* at 4.

filling of wetlands, the Everglades now cover only about half of their original area.²⁶⁵ Ecosystem-wide problems are reflected in reduced bird populations (for some species, as much as ninety to ninety-five percent reduction), increased numbers of threatened or endangered species, health advisories for mercury contamination, declining fish populations, excess nutrients, water shortages, and salt water intrusion.²⁶⁶

Based on a three-fold increase in population over projections,²⁶⁷ increased knowledge about ecosystems, and the obvious detrimental effects of the current system on the ecology of southern Florida, including the Everglades, the water management system is once again being drastically altered. Known formally as the Central and Southern Florida Project (C&SF project), southern Florida's fifty-year old water management system was recently reviewed. The goal of this review was to present a comprehensive plan to Congress by July 1, 1999, outlining a twenty-year plan to restore the Everglades ecosystem.²⁶⁸ The "restudy" and comprehensive planning project were led by the U.S. Army Corps of Engineers and the South Florida Water Management District.²⁶⁹ The planning process, however, included over thirty other federal, state, local and tribal agencies, as well as academic institutions.²⁷⁰ These entities also have extensive responsibilities in implementing the comprehensive plan once it is approved by Congress.²⁷¹

²⁶⁵ See *id.* at 3.

²⁶⁶ See *id.* at 7.

²⁶⁷ See RESTUDY, *supra* note 257, at 7.

²⁶⁸ See "WHAT IS THE RESTUDY?," C&SF RESTUDY UPDATE NUMBER 1 (June 1998) [hereinafter RESTUDY UPDATE].

²⁶⁹ See RESTUDY, *supra* note 257, at 4.

²⁷⁰ Some of the agencies involved in developing the comprehensive plan include the U.S. Army Corps of Engineers, NRCS, FWS, Everglades National Park, Biscayne National Park, Big Cypress National Preserve, NOAA, National Marine Fisheries Service, EPA, Miccosukee Tribe of Indians of Florida, Seminole Tribe of Florida, Florida Department of Environmental Protection, South Florida Water Management District, Broward County Department of Natural Resource Protection, Lee County Utility Department, Miami-Dade Water and Sewer Department, Palm Beach County Environmental Research Management. Three universities were also a part of the formal comprehensive planning partnership. See *id.* at Back Cover.

²⁷¹ See RESTUDY UPDATE, *supra* note 268. Some, but not all, components of the comprehensive plan are recommended to be included in the Water Resources Development Act of 2000, which asks Congress to authorize an initial \$1.2 billion package of projects. Some of the feasibility studies and other components of the comprehensive plan, such as changes to the state's Holey Land Wildlife Management Area operation plan, can be implemented under existing legislation. See *id.*

The restudy and the resulting comprehensive plan focused on recreating the natural water cycle of the ecosystem by undoing or changing engineered water flow systems and reducing sources of contamination. The restoration goal is stated as follows: "to deliver the right amount of water, of the right quality, to the right places, and at the right time."²⁷² While the drafters of the comprehensive plan recognized that the ecosystem in southern Florida would never return to its abundance of one hundred years ago, and acknowledged that the ever-increasing demands of a growing population and agriculture would strain the capabilities of any water management system, the restudy seeks to recreate a "healthy" Everglades ecosystem.²⁷³

The four stated goals of the comprehensive plan—quantity, quality, timing and distribution—are addressed through a combination of over sixty discrete projects.²⁷⁴ New surface water storage reservoirs will be built with the capacity to store 1.5 million acre-feet of water.²⁷⁵ Additional water will be stored in groundwater aquifers for retrieval as needed. Stormwater will be treated in 35,600 acres of future man-made wetlands.²⁷⁶ Two wastewater reuse plants will be built in Miami-Dade County to change treated wastewater into recharge water for wetlands and groundwater aquifers.²⁷⁷ Seepage management tools, such as lining levees, will be implemented. Unlike the CRBSCP, in which conserved water is available for additional agricultural activity, the water that is no longer lost to seepage will be redirected to water conservation areas and natural areas, such as the Everglades National Park.²⁷⁸ More than 240 miles of existing canals and levees will be removed to facilitate the historical "sheet flow" movement of water through the ecosystem.²⁷⁹ Finally, operational changes in water delivery schedules have been designed to restore natural fluctuations in water quantity (to mimic natural rainfall patterns) that will benefit plant and animal health while still meeting the needs of human and agricultural uses. This comprehensive plan also recommends that a comprehensive integrated water quality plan

²⁷² See RESTUDY, *supra* note 257, at 9, 11.

²⁷³ See *id.* at 14-15.

²⁷⁴ See *id.* at 9.

²⁷⁵ See *id.*

²⁷⁶ See *id.*

²⁷⁷ See RESTUDY, *supra* note 257, at 11.

²⁷⁸ See *id.*

²⁷⁹ See *id.*

be developed for the region to address options beyond water storage in wetlands as possible treatment methods.²⁸⁰

The \$7.8 billion estimated cost of implementing the comprehensive plan over the next twenty years will be shared equally between the federal and state governments, for a projected annual cost of \$400 million.²⁸¹ The federal government requested authorization for an initial \$1.2 billion for specific projects.²⁸² It is also seeking programmatic authority to adopt certain projects that have not yet been designed, but for which the need is well known.²⁸³ Some feasibility studies and operational changes can be initiated under existing authority and without funding requests. The state can also implement some components of the plan without requesting additional authority or funding.

Many of the initial projects included in the funding request are pilots designed to explore the uncertainties in, and to develop technologies for, aquifer storage and recovery, seepage management, and wastewater treatment. Based on the lessons learned and the restoration goals accomplished from projects built with the initial funding, the comprehensive plan will be reevaluated periodically, and project plans will be adjusted, before additional funding is requested from Congress.

2. Integrated Approaches in the Central and South Florida Project

Like the CRBSCP and CALFED efforts, the C&SF project faces the challenge of managing water quantity while improving water quality. The sources of reduced water quality, while not fully known, include nonpoint sources that discharge far upstream from the area of ecological impact, and that offer a potential opportunity for source-control trade-offs, but that implicate significant land use issues. Despite many apparent similarities between the two programs, however, the C&SF project has followed a very different path from that of the CRBSCP, and the success and cost-effectiveness of the C&SF approach cannot yet be judged. The appropriate water quality standard for phosphorus remains uncertain, leaving an open question as to whether currently planned actions to address phosphorus contamination will be adequate.

²⁸⁰ See *id.* at 9-11.

²⁸¹ See *id.* at 18.

²⁸² See RESTUDY, *supra* note 257, at 19.

²⁸³ See *id.* at 18-20.

a. Integration of decision making processes

The C&SF project restudy is one of several ecosystem restoration efforts underway in south Florida, many of which are coordinated by the Southern Florida Ecosystem Restoration Task Force.²⁸⁴ Originally created in 1993 by a memorandum of agreement to reduce conflict and overlap between various federal agency efforts on the Everglades,²⁸⁵ the task force was authorized by Congress in 1996 and now includes representatives from seven federal departments, the State of Florida, two Indian tribes, two local governments, and the South Florida Water Management District.²⁸⁶ While the task force has set three broad goals,²⁸⁷ only one of which is "getting the water right," its primary focus to date has been involvement in the C&SF project restudy process. The governor of Florida has also recently reinstated the Governor's Commission on the Everglades.²⁸⁸ While, theoretically, all the efforts to improve the ecosystem in southern Florida are being coordinated, and each knows about the others, it is our impression that political agendas and the desire to claim credit for improvement still share equal importance with ecosystem restoration goals.

The C&SF project restudy, which was a partnership between thirty federal, state, local, and tribal governments, was a separate effort from these two coordination bodies. The task force and the governor's commission provided input and advice to, but were not members of, the restudy team. It appears that neither the task force nor the governor's commission have made much progress in implementing ecosystem restoration actions. Existing damage to the Everglades is so great that any number of separate restoration efforts can only improve the situation and certainly will do no harm. The cost effectiveness of such a multi-tiered approach, however, is not known.

²⁸⁴ See SOUTH FLORIDA ECOSYSTEM RESTORATION TASK FORCE, SUCCESS IN THE MAKING, AN INTEGRATED PLAN FOR SOUTH FLORIDA ECOSYSTEM RESTORATION AND SUSTAINABILITY (1998) [hereinafter TASK FORCE PLAN].

²⁸⁵ See *id.* at 7.

²⁸⁶ See *id.*

²⁸⁷ The three broad goals include restoring the natural hydrology of South Florida; enhancing and recovering natural areas, with primary focus on the number and health of endangered species and controlling invasive exotic plants; and reducing the negative impacts of sprawl (revitalizing urban core areas and improving their quality of life). See *id.* at 8-10.

²⁸⁸ See *id.* at 7. The previous governor's commission was entitled the Governor's Commission for Sustainable South Florida.

The restudy has been successful to date in part because the two primary agencies—the U.S. Army Corps of Engineers²⁸⁹ and the South Florida Water Management District—took control of the project and promoted it aggressively. While their approach to the restudy was inclusive and involved extensive stakeholder participation, the types of restoration activities considered were primarily those within either agency's direct control.²⁹⁰ In the end, the U.S. Army Corps had a job to do, it found the necessary resources, and it did it.

In contrast to the traditional U.S. Army Corps of Engineers approach to construction projects, the restudy developed a collaborative process to undertake the studies and planning required for the restudy. Some partner agencies physically relocated staff to the Corps' restudy offices to facilitate collaboration. Over time, the restudy project incorporated the internet as a major vehicle for collaboration. This use of electronic communication also facilitated public participation by giving any member of the public immediate access to voluminous technical information. The two main agencies' efforts to include all other potentially affected governmental entities in the review and planning process seems to have created a consensus on restoration actions to be taken to "get the water right" for the Everglades.

The main objective of the C&SF project is to reverse the ecological degradation that has occurred over the past fifty years.²⁹¹ All projects to be constructed and all operational changes to be implemented must play a significant role in reversing the historical degradation of the ecosystem, whether by addressing water quantity, water quality, water distribution or timing of water distribution. Success in meeting the plan's objectives, which can be described as "degradation reversal," will be determined by looking at numerous indicators of a restored ecosystem.²⁹²

Apart from this general goal, however, at this point the program lacks the type of universally applicable quantified performance standards

²⁸⁹ See *id.* at 4.

²⁹⁰ This is not really surprising, since the objective of the restudy was to undo the damage the two agencies had created in the past. Nevertheless, the restudy therefore may not be an example of a broad-based watershed initiative.

²⁹¹ See RESTUDY, *supra* note 257, at Back Cover.

²⁹² Indicators of a restored ecosystem in the C&SF project include wetland functions that mimic pre-drainage conditions, significant increases in animal populations at all levels in the aquatic food chain, return of large nesting rookeries of wading birds to Everglades National Park, recovery of a number of endangered species, improved health of Lake Okeechobee fishery, increased freshwater flows to bays and estuaries, improved health of seagrasses and other submerged aquatic vegetation, and greatly reduced frequency of water restrictions. See *id.* at 17.

that have been useful in driving the activities of the other three programs studied. Looking at water quality parameters in particular, "non-degradation" to the receiving waters is the stated goal for the quality of water discharged to natural areas (such as the public Everglades). However, no state numeric water quality standards have been adopted for the contaminants of concern in the Everglades, mercury,²⁹³ and phosphorus. The state will soon propose a water quality standard for phosphorus in response to a federal lawsuit; a numerical standard must be adopted by the year 2003 and approved by the EPA, or a default standard of 10 parts per billion (ppb) will become enforceable. There are still open questions about where and how to measure compliance with the state standard once it is adopted, which is likely to involve a discussion of flow-weighted averages. The lack of a currently enforceable standard in many parts of southern Florida, and the lack of experience with treatment methods to reach the standard ultimately adopted, may negatively impact project success and overall ecosystem restoration costs.

To some extent, at least during the initial phases of the program, the absence of numeric water quality standards for phosphorus may be less relevant because the planned controls are more technology-based than water quality-based. Treatment for phosphorus discharges from agricultural operations (primarily the sugar cane industry) will be provided initially in man-made wetlands.²⁹⁴ Ultimately, of course, the success of the program will still be judged by reference to the water quality standards once they are adopted. While no one knows how successful this treatment method will be, more than one person interviewed doubted whether the default federal standard (10 ppb phosphorus) could be attained by this natural attenuation method. Depending on the success of this treatment method or the State of Florida's future success in adopting a water quality standard less stringent than the federal default standard, it is possible that additional treatment will be required in the future for phosphorus runoff from agricultural operations. Given the technical, political and economic ramifications of additional treatment requirements,²⁹⁵ postponing the

²⁹³ While EPA does have a 12 ppt standard for mercury, one interviewee commented that it addresses inorganic mercury which does not bioaccumulate, and is therefore not relevant to ecosystem restoration. *See id.*

²⁹⁴ *See id.* at 11.

²⁹⁵ Non-biological treatment of phosphorus runoff may create a costly solid waste disposal problem. Since the agricultural community most affected in southern Florida represents one well-organized industry, the state can expect great resistance to any increased costs associated with wastewater treatment. *See id.*

resolution of this uncertainty until the indeterminate future may compromise timely ecosystem restoration.

b. Integration of substantive issues

The C&SF project cannot be viewed in isolation. The comprehensive plan (the restudy) developed by the U.S. Army Corps of Engineers and South Florida Water Management District is merely one major component of a more comprehensive South Florida ecosystem assessment and restoration effort, although, as explained above, this process is still evolving. The South Florida Ecosystem Task Force, made up of federal, state, local and tribal leaders, is developing a strategic plan intended to coordinate over 200 projects focused on ecosystem restoration.²⁹⁶ Existing state efforts to address water quality problems, including best management practices to reduce stormwater contamination from urban and agricultural areas, are under way separately, and presumably will fall under this bigger planning umbrella. The South Florida Ecosystem Task Force will also be addressing land use issues, trying to balance growth and resource protection for a “sustainable south Florida.”²⁹⁷ The C&SF project has been the major focus of the task force’s energies to date; ecosystem restoration initiatives in addition to those suggested in the restudy will be developed in the future.

The C&SF project is thus the opposite of a “single-issue” program. Since the ultimate goal of the project is habitat restoration, and many indicators of success relate to increased species health and diversity, program officials planned many projects with multiple benefits in mind.²⁹⁸ Improvements in water quality from wastewater treatment plants in urban areas are not seen as a solitary endpoint; rather, the “clean” water is seen as a resource to re-create needed wetlands areas to further improve water quality and to improve habitat for negatively affected species.²⁹⁹ This holistic or integrated approach to ecosystem management may be a logical outgrowth of the way in which the ecosystem was destroyed over the past fifty years. Man-made water diversions and withdrawals, in addition to polluting activities, reduced the water quantity and quality such that habitats and species were drastically reduced.³⁰⁰ Undoing the engineered

²⁹⁶ See TASK FORCE PLAN, *supra* note 284, at 13.

²⁹⁷ See *id.* at 17-18.

²⁹⁸ See RESTUDY, *supra* note 257, at 4.

²⁹⁹ See *id.* at 9-11.

³⁰⁰ See *id.*

hydrology and attempting to recreate natural water flows, while also improving water quality, by definition should recreate the synergies that "single issue" programs may ignore.

However, it appears that the C&SF project does not currently coordinate water quality and water quantity issues in a systematic fashion, although more detailed focus on water quality issues is anticipated in the future. The comprehensive plan submitted to Congress directly addresses water quantity and water flow issues for the full twenty-year implementation period. Water quality improvement will occur as a side-benefit of the water quantity and water flow projects, since it is assumed that longer storage times in wetlands areas will improve water quality. Water quality is also directly addressed by the wastewater treatment plant improvements scheduled for the Miami-Dade County area.³⁰¹ The comprehensive plan acknowledges, however, that additional direct efforts may be required to improve water quality, but defers them until additional study and planning have been completed.³⁰²

The program also addresses issues that are integrally related to land uses and land use policies.³⁰³ For example, reducing pollution from the region's extensive agricultural lands will require changes to agricultural methods and other practices. Landowner participation, however, is not currently a major feature of the C&SF project. Many of the planned construction projects involve decommissioning of existing levees and canals, an activity where landowner participation is not critical. To the extent that construction of water retention areas and other facilities will be on private land, the Corps of Engineers intends to rely on eminent domain powers, and purports to have included the cost of acquiring land in its total budget estimates. Although agricultural interests have been involved as stakeholders in developing and reviewing the comprehensive plan, it does not appear that they are perceived by the government agencies as necessary partners in accomplishing the ecosystem restoration goals of the C&SF project restudy. Rather, the restudy seems to assume that previous state efforts to change the sugar industry's best management practices³⁰⁴ have reached their full potential to reduce nonpoint source pollution at its source.

³⁰¹ See *id.* at 11.

³⁰² See *id.* at 10.

³⁰³ See RESTUDY, *supra* note 257, at 9.

³⁰⁴ In response to legal action, the state set phosphorus reduction goals for agricultural discharges, suggested appropriate best management practices, and instituted a taxing structure that tied the level of a farmer's financial contribution to the state's treatment efforts (wetland storage areas) directly to the farmer's reduction of phosphorus in its off-

IV. HAVE LARGE WATERSHED PROGRAMS BRIDGED THE GREAT DIVIDES?

A. *Bridging the First Divide: Water Quality and Water Quantity*

Nothing in the four watershed programs studied purports to change the basic existing allocation of authority over water quality and water quantity. All programs operate under the traditional assumption that state law predominates over most issues involving water quantity, while the federal CWA governs most aspects of surface water quality. Nevertheless, there are a number of ways in which some of these programs are beginning to bridge the divide between these areas of law and policy through implementation mechanisms that address the two areas in coordinated ways. At least two of the programs, the Central and South Florida³⁰⁵ and Bay-Delta³⁰⁶ programs, expressly assert the intent to address water quality and water quantity issues in concert. Actual examples of coordination in these areas, however, are far more important than these stated intentions.

One clear example of this trend is in the CRBSCP, which for many years has sought to minimize the salinity pollution of the Colorado River through programs designed to improve the efficiency with which irrigation water is delivered and used.³⁰⁷ Admittedly, the purpose of this program is to reduce salinity inputs by minimizing excess seepage of irrigation water through saline soils and subsoils, and not actually to address water quality and quantity issues simultaneously.³⁰⁸ Nevertheless, the program does serve to mitigate a water quality problem through a coordinated water quantity-based solution, and it does have the intended effect of improving both water quality and the efficiency of water use in the basin simultaneously.

At the same time, however, the salinity program illustrates ways in which even better coordination of water quality, water quantity and aquatic ecosystem protection issues could be addressed in tandem. Because of uncertainty about how water saved through the salinity program is treated under state water law, program officials thus far have rejected proposals to save water and reduce salinity pollution by retiring

site discharge. We were told that most farmers are now paying the minimum tax. *See id.* at 10.

³⁰⁵ *See id.*

³⁰⁶ *See DEIS, supra* note 205.

³⁰⁷ *See* PROGRESS REPORT 18, *supra* note 80, at 2-4.

³⁰⁸ *See id.* at 9-14.

agricultural production on some lands with highly saline soils.³⁰⁹ At a minimum, this uncertainty could be eliminated through better consultation with the appropriate institution that governs water law in the state in question.

Better yet, the program's overall effectiveness could be enhanced if each state, as part of its contribution to the Salinity Forum, would propose and implement water law decisions in which at least part of the water saved could be devoted to instream use. Some of this water, in fact, could be used in coordination with ongoing efforts to restore habitat for, and populations of, threatened and endangered species within the Colorado River system. Both the federal and state governments could gain from such an arrangement. The federal entities working on restoration efforts clearly would receive a boost to their efforts. While the states would devote additional water to instream rather than offstream uses, this water is not even available absent the salinity program, which is paid for largely with federal dollars. Given recent cutbacks in federal spending on this program, there is a strong case to be made for renewed funding for programs that serve multiple targets, particularly programs in which often contentious water rights and endangered species programs can succeed simultaneously through cooperative federal-state programs.

A similar example of intentional coordination in the areas of water quality and quantity is in the C&SF Program.³¹⁰ For example, stormwater will be treated through man-made wetlands, which will serve the multiple purposes of reducing pollution loads, mitigating historical wetland losses, and restoring more water to the Everglades ecosystem.³¹¹ Similarly, levees will be lined to reduce existing seepage, similar to canal lining projects in the Colorado basin. In South Florida, however, which does not use the same prior appropriation system of water allocation, seepage water saved through these methods will be redirected to water conservation areas and natural areas, including Everglades National Park.³¹² Additional efforts will be made to restore the amount and nature of water moving through the system by removing existing canals and levees and by changing water delivery schedules in remaining portions of the system.³¹³

³⁰⁹ It is not clear whether this saved water could be returned to the stream for enhancement of instream flows, or whether it would be available for use by the next most senior appropriator. If that use also were irrigation on saline soils, it is not clear that any salinity benefits would accrue.

³¹⁰ See RESTUDY, *supra* note 257.

³¹¹ See *id.* at 11.

³¹² See *id.*

³¹³ See *id.*

While a stated goal of the CALFED program is to address water quality, water quantity and other issues in an integrated way,³¹⁴ the program is still too young to determine whether this intention will become a reality. The two issues almost certainly will be closely linked, however, given the nature of the consensus water quality standards for the Bay-Delta. Thus, many of the same types of water efficiency projects used in the CRBSCP will also be used by CALFED, although CALFED's water efficiency program identifies a much wider range of strategies as well.³¹⁵

One of the main water "quality" issues facing the estuary has been the shift in the salinity gradient between the salt waters of the Pacific Ocean, the brackish waters of San Francisco Bay, and the fresh water of the tributary rivers.³¹⁶ Reduced water flows from the tributaries has caused the area of high salinity to move further inland, with dramatic consequences for resident fish species.³¹⁷ The new water quality standards for the Bay-Delta define the nature and location of the salinity gradient as necessary to protect and restore native species. Necessarily, this water quality standard can only be met through changes in water management practices that will enhance flows from the area's agricultural regions down into the estuary. Thus, in the CALFED Program traditional "water quality standards" typically designed to protect water quality alone are being used to address broader, more holistic ecosystem restoration goals. Indeed, in the programs studied the real "bridge" apparently being built between water quality and water quantity issues is a willingness to redefine the traditional legal norms governing water quality and quantity to address multiple rather than single objectives.

B. Bridging the Second Divide: Land Use and Water Resources

Similarly, nothing in the four large watershed programs studied attempts to reallocate authority over land or water resources among different levels of government. Nor do these programs seek to merge authority over land and water resources within a single entity, or to establish watershed protection as an overriding mandate governing land use planning and decisions. Rather, the programs recognize the critical need to address the many ways in which land uses, and how they are conducted, can impair the health of aquatic ecosystems. Accordingly, the

³¹⁴ See DEIS, *supra* note 205, at 11-14.

³¹⁵ See *id.* at 65-70.

³¹⁶ See *id.* at 2, 6.

³¹⁷ See *id.* at 11-14.

programs promote changes in the method and selection of land uses designed to restore and protect watershed values while maintaining the traditional political power structure.³¹⁸

The degree to which the CRBSCP addresses land use issues is relatively narrow in scope but significant in impact. Most of the salt that reaches the Colorado River system results from infiltration of irrigation water or runoff from lands disturbed by grazing and other land uses.³¹⁹ Much of the salinity program implementation addresses irrigation efficiency and other changes in on-farm practices designed to minimize the impact to the Colorado River system of farming on saline soils.³²⁰ Without intruding on traditional state and local authority to determine the propriety of using these lands for agriculture as opposed to other land uses, the program seeks to reduce the salinity impacts of traditional land uses in the regions.³²¹ The degree to which the program is seen as imposing external values on local land use decisions is minimized further by the voluntary nature of the program, which has been based largely on federal-state cost-sharing mechanisms, and more recently, the competitive bidding process.

The historical and ongoing reluctance of CRBSCP managers to promote land fallowing as a more direct method of reducing salinity pollution from relatively low-value, high salinity agricultural lands, however, may reflect a missed opportunity to improve the program's linkage of land use and water quality issues. However, this failure highlights the political realities that integrated watershed programs often face. The result of such efforts obviously would cause far more significant changes in local land uses by shifting lands currently devoted to agriculture to other uses (or to forms of agriculture with lower salinity impacts). However, so long as such changes are made through the competitive bidding program or other economic incentives, as opposed to regulation or eminent domain, this program expansion should not be viewed as significantly more intrusive, if at all, on state, local, or private land use decisions.

The Chesapeake Bay Program focuses on a broader array of land use issues, in recognition of the fact that many of the key problems facing

³¹⁸ By recognizing these traditional political realities, we do not intend to reject the more fundamental idea of regional planning and governance to overcome these barriers. This issue, however, is beyond the scope of this article.

³¹⁹ See PROGRESS REPORT 18, *supra* note 80, at 11-16.

³²⁰ See *id.*

³²¹ See *id.* at 9.

the Bay relate to both rural and urban/suburban land use.³²² The forty percent nutrient reduction goals established for the Bay have been implemented in part through point source controls (especially sewage treatment plants) and broadly-focused institutional controls such as phosphate detergent bans.³²³ A large portion of these reductions, however, can only be accomplished through better management practices on a range of agricultural practices in the basin, including both row crop agriculture and livestock operations. However, the program also considers more broadly focused land use issues. For example, one of the major issues addressed in program planning is overall population growth and development within the Bay watershed.³²⁴ The program devotes considerable time and effort to research and education of state and local decision making bodies on the connection between land use and water quality.³²⁵ Difficult issues of federalism are avoided, however, by assigning implementation responsibility to individual states. Thus, for example, Maryland and Virginia have adopted different statutory approaches to managing land use within the Bay's sensitive coastal zone.³²⁶

The water systems of both the California Bay-Delta region and Central and South Florida have been modified substantially in order to accommodate both urban and agricultural land uses within the basin. These hydrologic modifications, however, have caused similar environmental damage to both water quality and aquatic habitat. Water quality and habitat in both regions have also been impaired due to a wide range of land uses, from farming and grazing to logging, mining, power production and urbanization. Not surprisingly, then, both programs are defined broadly enough to tackle these wide-reaching land uses as well as the water system itself. In the CALFED program, for example, levee stabilization efforts will both help to restore hydrological integrity and address flood danger to low-lying land uses.³²⁷ Other program components include "watershed stewardship," which can encompass numerous changes to land use practices, as well as conservation easements, land acquisition and habitat restoration. Nutrient reduction efforts in the Everglades, like those in the Chesapeake Bay, will rely on

³²² See WHO'S WHO, *supra* note 160.

³²³ See *id.* at 1.

³²⁴ See *id.*

³²⁵ See *id.* at 17-20.

³²⁶ See Adler, *supra* note 1, at 1072-73 n.611.

³²⁷ See DEIS, *supra* note 205, at 6-8.

basic changes to agricultural practices within a large portion of the state, as well as the use of man-made wetlands treatment.

C. Bridging the Third Divide: East and West

Obviously, individual watershed programs cannot bridge the divide between the riparian rights (predominantly eastern) and prior appropriation (predominantly western) water law regimes. Nor does this divide inherently impede the integration of water law and policy within most individual watersheds, with the possible exception of some—such as the Missouri River—that physically span this east-west divide.

For many years, however, the fact that states have jealously guarded their prerogatives to define their own water laws and policies has served as a real political barrier to national proposals for better integration in this area. In this context, one major irony of the watershed movement generally is the fact that individual watershed programs both east and west independently are developing programs and policies that serve similar purposes, and do so through similar mechanisms. Evolutionary biologists call this phenomenon, in which unrelated species develop similar structural or behavioral adaptations independently, parallel evolution. Each program studied here, of course, has many unique or distinguishable features. They are far from uniform. Yet the nature and degree of similarities may well exceed what would be possible politically had Congress or some federal agency sought to impose that uniformity by law or regulation.

The clearest example of this synchronicity, or parallel development, is the fact that both eastern and western large watershed programs, through independent policy analysis as opposed to national mandate, have chosen to address major water quality, water quantity, land use and habitat restoration objectives in tandem. Three of the four programs (CRBSCP, CALFED and Central and South Florida) seek to restore chemical water quality by modifying entrenched, expensive water quantity infrastructure and use policies. Three of the four (all but the CRBSCP) overtly seek to integrate habitat restoration and protection, along with endangered species recovery efforts, with water use and water quality protection strategies. All four rely, at least to some degree, on the integration of land use reforms and watershed protection efforts. A suggestion from Congress and the EPA that such integrated water and resource protection policies should be required would likely face fatal opposition from the outset, in large part because it would be perceived as a

major assault on state water law and state and local land use authority, and because it would not take unique local values and conditions into account.

Similarly, all four of the programs studied have developed somewhat similar mechanisms and institutions for interstate and intergovernmental coordination and cooperation that would likely be rejected politically, or fail in implementation, if proposed or required by Congress, the EPA, or other central authority. While the precise methods vary, three of the four (all but the CRBSCP) include a direct, mutual forum in which federal, state, and other governmental officials sit at the same table to develop consensus goals, standards and implementing policies. Although historically federal-state tension in the area of natural resource management has been the most severe in the west, both the CALFED and the Central and South Florida programs brought federal, state and other officials together in a joint effort to develop consensus water quality standards and ways to achieve them. Notably, both programs were borne out of federal-state litigation over the absence of such standards and accompanying implementation strategies.

Still, in some respects at least, the divide between eastern and western water law regimes continues to govern the manner in which even these integrated watershed approaches can operate. For example, while water saved through efficiency improvements in Florida can be devoted to restoration of wetlands and water flows, CRBSCP officials have doubted whether even water saved through federal efficiency improvements can be devoted to such purposes instead of to the next most senior water rights holder under prior appropriation law. Federal and state officials have agreed to work together (but not to give up decision making power) within the same organizational structure in the CALFED, Chesapeake Bay and Central and Southern Florida programs. In the historically contentious Colorado River Basin, federal and state entities continue to cooperate, but only within their own individual institutional structures. Likewise, eastern states such as Virginia, with its strong tradition of home rule, participate in the cooperative, interstate Chesapeake Bay program, but only with the clear understanding that goals may be set mutually but actual implementation occurs only at the discretion of each individual state.

The gap between eastern and western water law seems to be closing more by way of a footbridge than by a major highway span. Nevertheless, watershed programs working independently seem to be doing more to bridge this divide than other, more comprehensive proposals for water law reform. Perhaps this gradual natural erosion will exceed more pointed and comprehensive efforts at engineered reforms in its ultimate effects on U.S. water law and policy.

D. *Bridging the Fourth Divide: Water Systems and Ecosystems*

Bridging two of the previous divides, between water quality and quantity, and between water policy and land use, still potentially excludes³²⁸ important issues of aquatic ecosystem health. Yet it makes little sense to address the water quality and quantity conditions necessary for aquatic ecosystem restoration and protection independent of related steps necessary to accomplish those goals. To varying degrees, the large watershed programs studied here begin this process of integrating water system and ecosystem restoration and protection.

The Chesapeake Bay Program was initiated in response to dramatic declines in fish, shellfish and other populations.³²⁹ Logically, then, the program includes significant habitat restoration and species recovery programs in coordination with those aimed at water quality alone.³³⁰ The forty percent nutrient reduction goal, which addresses water pollution, is accompanied by specific goals to restore submerged aquatic vegetation habitat.³³¹ Bay-wide management plans for species such as shad, rockfish, blue crabs and oysters will help ensure that healthy fish and shellfish populations are restored and maintained,³³² while the baywide toxics reduction strategy will reduce dangerous levels of toxic pollutants in the water column and in sediments to protect the health of people and other wildlife who harvest and consume those resources.³³³ Moreover, research efforts associated with the Bay Program are designed to assess overall ecosystem health, and not only specific water quality issues.³³⁴

Similarly, the Bay-Delta Program was driven by sharp declines in striped bass, chinook salmon, and other species, and the relationship between these problems to loss of instream flows and other major habitat alterations.³³⁵ Therefore, the program seeks to address habitat restoration and other ecosystem protection strategies in concert with its focus on

³²⁸ We say "potentially" because, if the definition of "pollution" in the Clean Water Act, 33 U.S.C. § 1362(19) (1994), were interpreted with sufficient breadth, it would encompass the full range of aquatic ecosystem issues discussed here. That interpretation, however, while becoming broader over time, still remains unfulfilled to a large degree.

³²⁹ See TURNING THE TIDE, *supra* note 153, at 105-12.

³³⁰ See *id.*

³³¹ See *id.* at 112-27.

³³² See *id.*

³³³ See *id.* at 46, 75-83.

³³⁴ See TURNING THE TIDE, *supra* note 153, at 46, 75-83.

³³⁵ See MONGAN & MILLER, *supra* note 205, at 11-13.

water quantity and water quality issues.³³⁶ Although program implementation is just beginning, in many respects the program is structured intentionally to integrate water system and ecosystem protection. Habitat restoration and protection stands on an equal footing with the program's three other main goals (water quality, water quantity, and levee maintenance).³³⁷ Categories of projects for which proposals are solicited include fish passage and fish screens; channel, floodplain and wetlands restoration; improved fish management and hatchery operations; and efforts to control exotic (non-native) species.³³⁸ Ecological benefit is one of the principal project selection criteria.³³⁹ Fish screens, fish ladders, and habitat restoration have been among the early projects funded by the program.³⁴⁰

Likewise, the Central and South Florida Project was born out of the rapid decline of the Everglades ecosystem, in particular the loss of critical wetlands and reduced populations of birds, native plants, and other species that rely on those habitats. While the principal focus of the program is to restore water flows and water quality, those objectives are designed with the overall goal of ecosystem restoration firmly in mind. Thus, program success will be measured in terms of restored ecosystem function in addition to more narrow indicators of water quality and quantity. These measures will include such factors as wetland functions, animal populations at all trophic levels, recovery of wading bird and endangered species, improved fishery population health, and improved health of submerged aquatic vegetation. One example of the manner in which these issues will be integrated is the plan to use treated wastewater, which previously was discharged without effective purpose, to restore lost or degraded wetlands in the region.

Of the four programs studied, the CRBSCP is the least focused on ecosystem restoration because of its primary focus on salinity reduction³⁴¹ to reduce the economic impacts of saline irrigation and municipal water. Some of the irrigation improvement projects funded by the salinity program require associated fish and wildlife mitigation measures. Thus, when the efficiency of irrigation delivery systems is improved, eliminating the artificially-created small wetlands associated with system leakage,

³³⁶ See DEIS, *supra* note 205. See also RfP, *supra* note 217, at 1.1.

³³⁷ See DEIS, *supra* note 205, at 25-28.

³³⁸ See RfP, *supra* note 217, at 2.6.

³³⁹ See *id.*

³⁴⁰ See *id.*

³⁴¹ See Lohman, *supra* note 107.

compensatory wetland mitigation projects may be required elsewhere in the region. Such mitigation projects, however, are incidental and not fundamental to the salinity program. Broader efforts to coordinate the salinity program with ongoing efforts to restore endangered Colorado River fish species, for example, have not occurred.

E. The Fifth Divide: Federalism

The first four divides do not exist by express design. Rather, they are incidental to other structural and institutional decisions about which entities and levels of government should be responsible for particular issues, and about which issues are most important. There should be little disagreement about the desirability of at least bridging these divides through cooperation and collaborative decision making. In some cases, the divides arguably should be closed altogether rather than merely bridged.

Federalism, by contrast, stands as an affirmative value built into the fabric of the American system of government. Eliminating the federalism divide in the area of water law and policy by centralizing power in a single entity or level of government would be extremely controversial, politically impossible, and perhaps doubtful as a matter of constitutional law. Nor would it necessarily be good public policy. By "bridging" the federalism divide, we mean instead that mechanisms be used to foster necessary intergovernmental coordination and cooperation in order to ensure that the four other substantive divides discussed above can be bridged in an appropriate way and to an appropriate degree. More fundamentally, the types of collaborative processes used in these programs highlight the potential strengths rather than the often-debated problems of federalism. Rather than viewing different levels of government as competing power structures, these collaborative planning and decision making approaches recognize and employ their unique perspectives and interests, and seek to integrate all relevant issues and concerns to accomplish better-accepted and perhaps more effective environmental results than would occur if the various entities operated independently.

To a large degree, the four watershed programs studied seek to promote federal-state-local and state-state cooperation and coordination with sensitivity to the issues of federalism that shadow water law and policy in the United States. They promote intergovernmental coordination rather than transfer authority from one level of government to another. They either foster shared goals and objectives with separate but coordinated implementation by individual state and federal entities, or

where implementation decisions are made jointly, they do so through consensus rather than by unilateral fiat. In at least two cases, cooperative programs were designed expressly to avoid more confrontational approaches to federalism, in which one or more federal agencies would have used existing statutory authority to replace or override state action.

The mechanisms adopted to achieve these results vary considerably in the four programs studied. In the CRBSCP, there is no formal entity through which both federal and state officials consider and adopt consensus positions or strategies. Interstate cooperation is fostered through the Salinity Forum,³⁴² but federal-state coordination occurs through less formal means. The Southern Florida Ecosystem Restoration Task Force was initiated by memorandum of understanding and later by Act of Congress, and reflects the input of multiple, federal, state, local and tribal entities. Yet there is no permanent or more formal committee in which decisions are made. Major short-term projects will be taken by the Corps of Engineers through the narrower Restudy effort. Additional actions will depend on future congressional and agency decisions. The Chesapeake Bay Program formally joins elected federal and state officials in a single decision making entity, the Chesapeake Bay Commission.³⁴³ However, the Commission's authority is limited to joint goal-setting and other planning actions, with program implementation left explicitly to each unit of government.³⁴⁴ The CALFED Program has similar high-level and formal participation from elected officials.³⁴⁵ Like the Chesapeake Bay Program, the CALFED Program has its own staff but borrows personnel from all affected levels of government. These officials work together as a single team, pursuant to a memorandum of understanding and the Bay-Delta Accord, to plan and, to a limited extent, implement the efforts.³⁴⁶ Decisions on the actions to be taken are made by the various agencies affected, with guidance from a formal federal advisory committee and other participants.

The diversity of approaches to intergovernmental and interstate cooperation and coordination reflected in these four programs demonstrate that there is no single "right" way to bridge the federalism divide in water law and policy. The success of these programs in overcoming historical intergovernmental tensions and barriers to integrated actions, however,

³⁴² See 1999 REVIEW, *supra* note 114.

³⁴³ See WHO'S WHO, *supra* note 160, at 59-62.

³⁴⁴ See generally ADLER ET AL., *supra* note 41, at 5.

³⁴⁵ See DEIS, *supra* note 205, at 5.

³⁴⁶ See Rieke, *supra* note 214.

shows that some such effective mechanism is desirable if not necessary to bridge not only the federalism divide, but the four substantive divides discussed above.

V. CONCLUSION

Based on our evaluation of the four large watershed programs studied, which reflect considerable geographic and programmatic diversity, it appears that watershed programs are having some success in bridging the large divides that have plagued U.S. water law and policy for many years. To varying degrees, these programs are finding ways to integrate legal and policy issues related to water quality and water quantity, water resources and land use, and water systems and ecosystems. Moreover, perhaps surprisingly, similar solutions to the problem of water policy integration appear to be emerging in areas of the country that historically have used very different approaches to water law, especially programs operating under eastern riparian rights as opposed to western prior appropriation systems of water law. Finally, in order to achieve these results, the programs have used diverse but, in all cases partially effective means to promote interstate and intergovernmental coordination and cooperation, thus helping to bridge the traditional federalism divide that has also characterized and complicated water law and policy.

In all cases, however, it is important to note that comprehensive watershed programs have merely helped to bridge these five divides, and not to eliminate them altogether. Indeed, especially in the case of federalism, a conscious policy of American government designed to ensure that no one level of government has the power to impair important rights and liberties, it is doubtful that complete elimination is either desirable or constitutional. Rather, watershed programs serve as a useful way to ensure that these divides do not stand in the way of more effective and efficient restoration and protection of water resources and aquatic ecosystems.

Legitimate arguments have been made that, to varying degrees, some of these divides *should be* eliminated altogether. In many respects existing water law stands as a significant barrier to integrated water resource policies, despite the success of some watershed programs to overcome that barrier. For example, there is a strong case to be made that the "artificial distinction" between water quality and water quantity that probably remains in the federal CWA (despite Justice O'Connor's statement to the contrary) should be reduced or eliminated altogether. It is not our purpose to engage in this debate, at least not in this article. Such

changes, if deemed desirable, face significant political and other obstacles themselves. Meanwhile, among their other benefits, watershed programs are serving as an alternative mechanism to promote better integration of U.S. water law and policy even in the face of these barriers.