Can the Clean Water Act Succeed as an Ecosystem Protection Law?

by Holly Doremus and A. Dan Tarlock*

The modern Clean Water Act [1] ("CWA") has come to be seen chie$y as a technology-based pollution con - trol law, but it was intended to be much more . Its stated objective was (and remains) "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters."[2] In other words, the CWA was speci!cally intended to protect aquatic ecosystems and encourage their restora - tion where they had already become degraded. Yet forty years after the Act's passage, the nation's aquatic ecosystems are among its most stressed and distressed.[3]

Others have examined why the CWA has yet to ful!ll its water quality objectives through the control of point and nonpoint source discharges.[4] In this Article, we look one level beyond water quality to the ecosystem conservation and restoration the CWA is intended to facilitate .[5] As federal and state governments have begun to invest in ecosystem res - toration, this aspect of the CWA has been thrust into the spotlight in several locations . We tell the story of the San Francisco Bay/Sacramento-San Joaquin-Delta ("Bay-Delta" or "Delta") as a case study of the intersection between the CWA and ecosystem restoration.

e Bay-Delta story is worth exploring both for its unique attributes and for those it shares with other ecosystem restoration e"orts. # e Bay-Delta story runs counter to conventional understanding of the history of water pollution control in the United States . Water pollution, so the usual story goes, was !rst recognized as a serious urban problem in the nineteenth century after contaminated water was linked to infectious diseases.[6] States thereafter began to control water pollution, but even in progressive states such as Wisconsin e"orts proved inadequate.[7]

e Bay-Delta story is di"erent . It shows that pollution can be a rural problem, and that sincere state e"orts to address pollution face structural, as well as political, barriers. As early as the beginning of the twentieth century, California was actively engaged in salinity control in the Bay-Delta .[8] # e inability to control salinity stemmed not from a lack of aggressive legislative and administrative attempts, but from the entanglement of control e"orts with deeply entrenched property rights .[9]

e Bay-Delta story is also important because it is dis - tinctly Western, di"erent in an important respect from the Eastern experiences that drove the CWA's passage. In the West, water quality standards con$icted with consumptive water rights in ways that were not clearly anticipated by the framers of the CWA.[10] # e major focus of the CWA was on cleaning up Eastern rivers.[11] Given the region's abundance of water and the Act's focus on controlling industrial sources, there was little apparent tension between consumptive uses and pollution control. # ere was some concern that the new limitations on the use of rivers as waste sinks would be challenged as takings of property rights .[12] Commentators-correctly assumed, however, that because pollution was a com - mon law nuisance, what later came to be called "background

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1. Clean Water Act of 1972 ("CWA"), 33 US.C. §§ 1251–1387 (2006).
2. Federal Water Pollution Control Act Amendments of 1972, Pub . L. No. 92-500, § 2, 86 Stat . 816, 816 (1972) (codi!ed as amended at 33 U .S.C. § 1251(a) (2006)).
3. *See infra* notes 120–22 and accompanying text.
4. # e literature includes Robert L . Glicksman & Matthew R . Batzel, *Science, Politics, Law, and the Arc of the Clean Water Act: ! e Role of Assumptions in the Adoption of a Pollution Control Landmark* , 32 W%- /. U. J.L. ; P.1'6 99 (2010); William L. Andreen, *Water Quality Today: Has the Clean Water Act Been a Success?*, 55 A1% L. R(:. 537 (2004); Robert W. Adler, *! e Two Lost Books in the Water Quality Trilogy: ! e Elusive Objectives of Physical and Biological Integrity*, 33 E):21. L. 29 (2003); Lawrence S Bazel, *! e Clean Water Act at ! irty: A Failure After All ! ese Years?* 18 N%2. R(-.03+(- ; E):'246 (2003).
5. *See* CWA § 101(a), 33 U.S.C. § 1251(a).
6. William L. Andreen, *! e Evolution of Water Pollution Control in the United States—State, Local, and Federal E"orts, 1789-1972: Part II* , 22 Stan . Envtl. L.J. 215, 287 (2003).
7. *See generally* J%&'(B()'*'+,-.), T/(C01203(.4 F10-/')5: A S.+%1%)* L(5%1 H'-2.36 .4 S(7%5((2007) (tracing the rise of sewage treatment, the discharge of wastes into streams and lakes, and the rise of e"orts to control these discharges in the !rst three decades of the twentieth century); E%31 F')-8%3 M039/6, W%2(3 P03'26: A S20*6') L(5%1 C.)23.1 .4 N%203%1 R(--.03+(- 134 (1961).
8. Michael Hanemann & Caitlin Dyckman, *! e San Francisco Bay-Delta: A Failure of Decision-Making Capacity*, 12 E):21. S+'. ; P.1'6 710, 713 (2009).
9. *Id.* at 712.
10. Dave Owen, *Law, Environmental Dynamism, Reliability*, 37 E):21. L. 1145, 1154–56 (2007).
11. Richard A. Lovett, *Clean Water Act at 40: Rivers No Longer Burn but Climate ! reats and Runo" Now Rush In*, N%203(, Nov. 14, 2012, *available at* http://www.nature.com/news/mixed-reviews-for-us-clean-water-act-1.11809.
12. *See* United States v. 531.13 Acres of Land, 366 F.2d 915, 916 (4th Cir. 1966).

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limitations" on property rights would immunize pollution control from takings challenges.[13] In the West, states did see a threat from the CWA, but not the one that haunts the Bay-Delta today. Western irrigators depend on return flows, including municipal sewage discharges.[14] There was concern that technology-forcing standards would reduce these return flows.[15] Congress assuaged these fears by exempting irrigation return flows from the CWA's permit requirements.[16]

Salinity presented a more difficult problem because it was so intimately connected with flows. The Sacramento and San Joaquin rivers and their tributaries are subject to large consumptive water rights dating to the late nineteenth and early twentieth centuries.[17] Controlling salt levels in the Bay-Delta estuary is a zero sum game pitting ecosystem protection against the exercise of those rights.[18] Salinity within the Bay is a function of flows; high freshwater flows mean salty water stays closer to the Golden Gate, but lower flows allow it to intrude further upstream in the Bay-Delta.[19] But, any water allowed to flow to the Bay to hold back salty ocean waters means that much less can be taken out of the rivers for agricultural or municipal uses.[20]

Our review of the Bay-Delta experience highlights several lessons. First, we acknowledge that the CWA, by itself, cannot effectively ensure ecosystem protection.[21] But, no law needs to function in isolation. The CWA can and should play an important role in a larger suite of laws and policies that support aquatic ecosystem protection. Second, the CWA can only play its role effectively if the relevant states are full and enthusiastic partners.[22] The Bay-Delta is in some ways a best case example of the prospects for CWA-based ecosystem protection because California has its own strong water pollution laws implemented by an agency with unusually broad authority.[23] The CWA, as implemented in California, is the centerpiece of a reasonably robust state-federal partnership for water quality protection. But third, the fact that the Bay-Delta ecosystem nonetheless continues to decline shows that, even in this best case ecosystem scenario, protection tools have not yet proved sufficient.[24] In part, the shortfall is a result of political timidity and lack of creativity in implementing the CWA and its state analogue. We discuss how federal and state regulators could do more with their existing tools. But the Bay-Delta's continuing ecological decline also highlights both the limits of our understanding of the steps needed to restore degraded aquatic ecosystems and the very real political barriers to taking those steps. Although the CWA provides some incentives for increasing our knowledge, those incentives need to be used more effectively, and information generated through the CWA needs to be better integrated with information gained through other programs. The political barriers cannot be easily removed, but it might be possible to improve the incentives for states to at least more clearly acknowledge the conflicts between ecosystem protection and the exercise of existing water entitlements.

In short, the primary lesson of this case study is that water quantity is an indispensable dimension of water quality protection,[25] but the CWA alone cannot reliably integrate the two. The cooperation and active participation of the state agencies with the authority to allocate water is essential, but institutionally, as well as politically, difficult to procure. In the end, we offer some suggestions for incremental improvement, but offer no hope that this is a problem that can easily be solved.

I. The Clean Water Act's Ecosystem Protection Objective

The primary historical innovation of the CWA was its recognition of federal responsibility to protect public health.[26] The federalization of water pollution control both broadened the scope of pollution control and enshrined the power of engineers, as opposed to water managers, to define what elements

13. In a major foundation case, *Weyerhaeuser Co. v. Costle*, 590 F.2d 1011, 1043 (D.C. Cir. 1978), the D.C. Circuit observed that prior to its holding, "the right of polluter was pre-eminent, unless the damage caused by pollution could be proven. Henceforth, the right of the public to a clean environment would be pre-eminent, unless pollution treatment was impractical or unachievable." Although most courts did not use a rights analysis to describe the CWA, implicit in this statement is that the pre-1972 "right to pollute" was based more on government inaction and the limitations of common law litigation than the existence of any legally protected property right. *See id.* In 1966, the Fourth Circuit rejected a takings claim by a textile mill which had to build a treatment facility to comply with South Carolina's water quality standards with the observation that "[n]o absolute right%%%% was vested in [the company] under the law of South Carolina to discharge untreated wastes%%%% *531.13 Acres of Land*, 366 F.2d at 918.
14. W. W&' ( ) P*+,-. R(/,(0 A1/,2*). C*3 3'4, W&' ( ) ,4 '5(W(2': C5&+-+(46(7*) '5(N(8' C(4'9). 4–15 (1998).
15. *Id.*
16. *Id.* at 4–6.
17. *See* S'&' (W&' ( ) R(2. C*4') *+ B1., C&+. E4/'+. P) *'. A6(4-., W&' ( ) Q9&+,'. C*4') *+ P+&4 7*) '5(S&4 F)&4-,2-* B&. /S&-)&3 (4' *-S&4 J*&: 9,4 D(+'&E2'9&). ; (1995) [hereinafter 1995 W&' ( ) Q9&+,'. C*4-') *+ P+&4] (describing the high volume of demand for use of water from the Sacramento-San Joaquin river basin).
18. Hanemann & Dyckman, *supra* note 8, at 711.
19. *See id.* at 713 (discussing the various impacts on freshwater flow and how it affected salinity).
20. *Id.* at 716.
21. W. W&' ( ) P*+'. R(/,(0 A1/,2*). C*3 3'4 *supra* note 14, at xii–xxxi.
22. *See id.* at 4–24 (describing the means through which federal agencies and state and local governments must work together to achieve restoration of aquatic ecosystems).
23. *See infra* notes 191–193 and accompanying text.
24. We recognize that the section%404 program, which requires that a person who discharges dredge or <ll material into navigable waters obtain a permit from the U.S. Army Corps of Engineers, is an ecosystem protection and restoration program. *See* CWA §%404, 33 U.S.C. §%1344 (2006)" at permit requirement, though, applies primarily to wetland <lls, and it has never served as a framework for the protection of broader aquatic ecosystems. Our focus here is on the prospects for broader protection.
25. Justice O'Connor recognized this connection in *PUD No. 1 of Jefferson Cnty v. Wash. Dept. of Ecology*, 511 U.S. 700, 719 (1994), when she noted that any distinction between water quantity and water quality is "arti<cial."
26. C+&91,& C*=(+&41, C*46. R(2(&) -5 S( ) /., RL30030, C+(&4 W&' ( ) A-': A S9 3 3&). *7 '5(L&0 2 (2010), *available at* http://cf.ncseonline.org/nle/crsreports/10May/RL30030.pdf.

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of water quality received primary protection .[27] ! e control of point source discharges is a major success story, but it also illustrates the challenges of using the CWA to move to a more holistic view of the relationship between water quality and healthy ecosystems

Water pollution regulation in the United States began at the state level speci"cally in response to public health, rather than environmental protection, concerns.[28] Little was done about protecting water uses other than drinking; indeed, many states explicitly classi"ed many waters not needed for drinking water supply as receptacles for waste disposal.[29]

! e federal government did not get into the business of water pollution control until after World War II, and then only very gingerly . ! e stated goals of the 1948 Federal Water Pollution Control Act were to recognize state primacy in controlling water pollution, support research to improve treatment of industrial e#uent, and provide federal technical assistance and "nancial aid.[30] Although Congress made some minor changes to federal water pollution law in 1956, those limited purposes remained in place and, tellingly, the law was left under the supervision of the Public Health Service.[31] In 1961, "nally recognizing that the Act's scope extended "far beyond usual public health legislation,"[32] Congress moved formal implementation responsibility to the Department of Health, Education and Welfare, but again the goals remained unchanged .[33]

By 1965, as the environmental era was dawning, it was clear that the states were not doing enough to control water pollution.[34] Congress again amended the Water Pollution Control Act, this time revising the Act's goals to include "enhanc[ing] the quality and value" of the nation's water resources and establishing a national policy "for the prevention, control, and abatement of water pollution."[35] ! e 1965 amendments put water quality at center stage for the "rst time, requiring that states adopt water quality standards for interstate waters su<cient "to protect the public health or welfare ."[36] As that language suggests, the 1965 amendments extended the function of water quality standards well beyond public health; the amendments required that standards consider the value of waters "for public water supplies, propagation of "sh and wildlife, recreational purposes, and agricultural, industrial, and other legitimate uses."[37] A year later oversight authority was transferred to the Department of the Interior, an agency focused on environmental protection rather than human health.[38]

! e broader statutory language and new institutional home should have catalyzed a shift to ecosystem protection. State resistance and a weak institutional structure, however, prevented any real advance. All states adopted water quality standards by the 1967 deadline, but few of those standards met with federal approval .[39] By 1971, barely over half the states had fully approved water quality standards,[40] and water quality was continuing to decline .[41]

Interior Secretary Stewart Udall's concerted e)ort to make the statute work was stymied by two major limitations. First, except in the most extraordinary cases, the standards could only be enforced through conferences with a)ected states and polluters .[42] ! ese conferences could drag on for years, and compliance with the infrastructure upgrades they tended to recommend was uneven .[43] Second, where water quality was violated, it was typically di<cult to tie responsibility for that violation to any speci"c polluter.[44]

Congress reacted in 1972, adopting the modern CWA ! e new law, which radically overhauled the old, began with a sweeping statement of purpose: " ! e objective of this chap

27. *Id.* at 6.
28. William L. Andreen, *! e Evolution of Water Pollution Control in the United States—State, Local, and Federal E"orts, 1789–1972: Part I*, 22 S$%&. E&'$(. L. J. 145, 178—185 (2003) [hereinafter Andreen, *Part I*]. ! ose early e)orts sought to protect water quality, but not at anything like "pristine" levels. For example, in 1959 the governments of Canada and the United States agreed to allow the International Joint Commission to investigate pollution in the Rainy River, on the border between Minnesota and Ontario . ! e resulting report documented extensive sewage and pulp mill discharges and recommended that standards be set for coliform bacteria, suspended solids and dissolved oxygen levels. ! e report's statement of water quality objectives re*ected the then-enlightened view of pollution control:

> ! e Commission recognizes that the maximum bene"cial use of available water resources should be permitted and unreasonable use of water should be prevented . ! e disposal of wastes into a river should be controlled so as to achieve the highest quality consistent with the maximum bene"t to all users.
>
> ! e Commission considers that discharging suitably treated domestic and industrial wastes into a river is a reasonable use of these waters provided that such use does not create a hazard to public health or cause undue interference with the rights of others to use these waters for legitimate purposes.

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29. Andreen, *Part I*, supra note 28, at 185.
30. *Id.*
31. Water Pollution Control Act Amendments of 1956, Pub . L. No. 84-660, § 1(a), 70 Stat. 498, 498.
32. William L. Andreen, *! e Evolution of Water Pollution Control in the United States—State, Local, and Federal E"orts, 1789–1972: Part II*, 22 S$%&. E&'$(. L.J. 215, 243 (2003) [hereinafter Andreen, *Part II*] (quoting H.R. R+,. N-. 87-306, at 4 (1961)) ,).
33. Federal Water Pollution Control Act Amendments of 1961, Pub. L. No. 87-88, 75 Stat. 204. In practice, the program remained "buried deep within the [Public Health Service] . . . ." Andreen, *Part II*, *supra* note 32, at 243.
34. Andreen, *Part II*, *supra* note 32, at 244–45.
35. Water Quality Act of 1965, Pub L. No. 89-234, § 1(a), 79 Stat. 903, 903.
36. *Id.* § 5(a), 79 Stat. at 906–08.
37. *Id.*
38. Reorganization Plan No. 2 of 1966, 31 Fed . Reg. 6857 (Feb. 28, 1966), *reprinted in* 80 Stat. 1608 (1966); *see also* Press Release, Dep't of the Interior, Transfer of Federal Water Pollution Control Administration to Department of the Interior Is E)ected (May 10, 1966), *available at* http://www.bia.gov/cs/groups/public/documents/text/idc017374.pdf (announcing the transfer of responsibility).
39. *Id.*
40. S. R+,. N-. 92-414, at 4 (1971), *reprinted in* 1 C-&9. R+3+%. =0 S+. '., A L+913(%$1'+ H13$-. 5 - / $0+ W%$+. P-((4$1-& C-&$. -(A=$ A2+&62+&$3 - / 1972, at 1422 (1973).
41. *Id.* at 4–5, 8, *reprinted in* 1 C-&9. R+3+%. =0 S+. '., A L+913(%$1'+ H13$-. 5 - / $0+ W%$+. P-((4$1-& C-&$. -(A=$ A2+&62+&$3 - /1972, at 1422–23, 1426.
42. Water Quality Act of 1965, Pub L. No. 89-234, § 5(a), 79 Stat. 903, 908–09 (amending section 10 of the Federal Water Pollution Control Act, 33 U.S.C. § 466g).
43. *See* Andreen, *Part I*, supra note 28, at 254 (explaining both the old and new conference processes were not optimal).
44. As William Hines noted in 1968, "the standards are not intended to serve *primarily* enforcement purposes." N. William Hines, *Controlling Industrial Water Pollution: Color the Problem Green*, 9 B.C. I&643. 8 C-2. L. R+'. 553, 590 (1968).

ter is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters ."[45] ! e baseline to which the waters were to be returned was their natural condition, prior to anthropogenic modi"cation.[46] ! at baseline was intended not only to protect human health and recre - ational opportunities, but also to preserve and restore the full complement of aquatic life.[47]

In order to achieve the "integrity" objective, Congress declared twin goals with short deadlines: eliminating the discharge of pollutants to waters by 1985;[48] and achieving "water quality which provides for the protection and propagation of "sh, shell"sh, and wildlife and provides for recreation in and on the water" by 1983, "wherever attainable ."[49] Despite the co-equal presentation of the goals, technology-based pollution control took priority as the new law was implemented.[50]

As of 1972, then, federal water pollution law included a clear ecosystem protection purpose, although it did not use that term. ! e CWA was intended to restore and maintain natural water quality conditions, and the living systems those conditions supported.[51] ! at purpose was not redundant with any other law ! e modern Endangered Species Act ("ESA"), which is currently the broadest ecosystem protection law in the United States, did not yet exist . ! ere were already a number of federal conservation laws that provided some protection for aquatic ecosystems, including the National Forest Organic Administration Act,[52] National Park Service Organic Act,[53] and Fish and Wildlife Coordination Act,[54] but their coverage was limited to federally owned lands or federally approved actions . Private purchasers were already protecting terrestrial systems,[55] but the complexities of water 7ow and water law made that strategy much less suitable for aquatic systems.[56]

Even today with the ESA in place, the CWA's ecosys - tem protection aspects are not irrelevant . ! e CWA theo retically provides much more comprehensive coverage than the ESA. Its goal is to restore and maintain the entire suite of the nation's waters . If the CWA can be put into practice e8ectively, that goal is far broader than the ESA's protection, which is limited to rapidly disappearing species . ! e CWA can also help address two important criticisms of the ESA: that its focus on individual species leaves the larger systems in which those species are embedded at risk;[57] and that by the time it can be invoked, recovery to self-sustaining levels is costly or even impossible.[58]

E8ective implementation, of course, is the key issue. Ecosystem protection is inextricably bound up with the CWA's water quality provisions. ! e CWA's major legal innovation, feasibility-based limits on pollution discharges by industrial sources, cannot by itself protect or restore aquatic ecosystems. Ecosystem protection also requires ensuring that industrial sources are not concentrated on sensitive waters, dealing with non-industrial discharges, and limiting diversions . As explained in the next Part, although the CWA contemplates the "rst two of those steps, they have substantially lagged the implementation of technological pollution controls.[59]

45. Federal Water Pollution Control Act Amendments of 1972, Pub. L. No. 92-500, §#2, 86 Stat 816, 816–17 (codi"ed as amended at 33 U .S.C. §#1251(a) (2006)). Robert Adler has described this objective as "one of the broadest whole ecosystem restoration and protection aspirations in all of environmental law." Adler, *supra* note 4, at 29.
46. ! e Senate bill had stated the objective as "to restore and maintain the natural chemical, physical, and biological integrity of the Nation's waters." Federal Water Pollution Control Act Amendments of 1972, Pub. L. No. 92-500, §#2, 86 Stat. 816, 816 (1972) (codi"ed as amended at 33 U .S.C. §#1251(a) (2006)). Although the word "natural" was removed in the "nal version, the intent was unchanged. *See* H.R. R$% N&. 92-911, at 76 (1972), *reprinted in* 1 C&' (. R$)$*+, - S$+.., A L$(/)0*1/.$ H/)1&+2 &3 1-$ W*1$+ P&0041/&' C&' 1+&0 A, 1 A5$' 65$' 1) &3 1972, at 753, 763 (1973) (" ! e word 'integrity' as used is intended to convey a concept that refers to a condition in which the natural structure and function of ecosystems is maintained.#### Although man is a 'part of nature' and a product of evolution, 'natural' is generally de"ned as that condition in existence before the activities of man invoked perturba - tions which prevented the system from returning to its original state of equilibrium.#### Any change induced by man which overtaxes the ability of nature to restore conditions to 'natural' or 'original' is an unacceptable perturbation."). Congress stuck to the objective of restoring natural water quality in the face of objections from the Nixon Administration's Environmental Protection Agency ("EPA"). *See* H.R. R$% N&. 92-911, at 148, *reprinted in*, 1 C&' (. R$)$*+, - S$+.., A L$(/)0*1/.$ H/)1&+2 &3 1-$ W*1$+ P&0041/&' C&' 1+&0 A, 1 A5$' 65$' 1) &3 1972, at, 753, 835 (reproducing a letter from EPA Administrator William D. Ruckelshaus to Hon. John A. Blatnik, Chairman, House Committee on Public Works) ("We do not support the new purpose of [sic] 'general objective' that would be provided. ! e pursuit of natural integrity of water for its own sake without regard to the various bene"cial uses of water in [sic] unnecessary, uneconomic, and undesirable from a social, economic, or environmental point of view.").
47. *See, e.g.*, Federal Water Pollution Control Act Amendments of 1972, §#2, 86 Stat. at 817 (codi"ed as amended at 33 U .S.C. §#1252(a) (2006)) (directing EPA, in developing programs to reduce pollution, to give due regard "to the improvements which are necessary to conserve such waters for the protection and propagation of "sh and aquatic life and wildlife.###"); Federal Water Pollution Control Act Amendments of 1972, §#2, 86 Stat . at 850 (codi"ed as amended at 33 U .S.C. §#1314(a)(1) (2006)) (directing EPA to develop "criteria for water quality accurately re7ecting the latest scienti"c knowledge (A) on the kind and extent of all identi"able e8ects on health and welfare including, but not limited to, plankton, "sh, shell"sh, wildlife, plant life, shorelines, beaches, esthetics, and recreation which may be expected from the presence of pollutants.#### [and] the e8ects of pollutants on biological community diversity, productivity, and stability.###").
48. *Id.* at §#2, 86 Stat . at 816 (codi"ed as amended as amended at 33 U .S.C. §#1251(a)(2)).
49. *Id.*
50. Kenneth M. Murchison, *Learning from More ! an Five-and-a-Half Decades of Federal Water Pollution Control Legislation: Twenty Lessons for the Future*, 32 B.C. E' .10. A33. L. R$.. 527, 551–56 (2005). In voting on the "nal bill that became the CWA, the Senate appeared to endorse assigning secondary priority to the Act's water quality provisions "to the extent limited manpower and funding may require a choice between a water quality standards process and early and e8ective implementation of the e9uent limitation-permit program." *Consideration of the Report of the Conference Committee Before the S. Comm. on Pub. Works*, 93d Cong. (1972), *reprinted in* 1 C&' (. R$)$*+, - S$+.., A L$(/)0*1/.$ H/)1&+2 &3 1-$ W*1$+ P&0041/&' C&' 1+&0 A, 1 A5$' 65$' 1) &3 : ; <=, at 161, 171.
51. CWA §#101(a), 33 U.S.C. §#1251(a) (2006).
52. 30 Stat. 34 (1897) (codi"ed as amended at 16 U.S.C. §§#473–82 (2006)).
53. 39 Stat. 535 (1916) (codi"ed as amended at 16 U.S.C. §§#1–18f-3 (2006)).
54. 48 Stat. 401 (1934) (codi"ed as amended at 16 U.S.C. §§#661–667c (2006)).
55. Prior to the 1960s private philanthropists such as John D . Rockefeller, Jr., played a major role in purchasing land for inclusion in national parks . John Daugherty, *! e National Park Service: ! e First Seventy Five Years, Biographical Vignettes, John D. Rockefeller, Jr.*, U.S. N*1'0 P*+> S$+.., http://www.cr.nps.gov/history/online_books/sontag/rockefeller.htm (last updated Dec. 1, 2000). ! e Nature Conservancy, a nonpro"t organization that works to further conservation primarily through land purchases, made its "rst acquisition in 1955. *Our History: History & Milestones of the Nature Conservancy* , T-$ N*14+$ C&')$+.*', 2, http://www.nature.org/about-us/vision-mission/history/index.htm (last visited Apr. 11, 2013).
56. *See infra* Part III.
57. *Id.*
58. John Charles Kunich, *! e Fallacy of Deathbed Conservation Under the Endangered Species Act*, 24 E' .10. L. 501 (1994).
59. *See infra* Part II.

Moreover, because of strong western opposition to federal intrusion on water allocation decisions, the CWA does not directly deal with !ow.[60] As we shall explain later, however, the CWA can help states appreciate the need for !ow regula tion and "nd the political courage to impose it.[61]

II. Disappointing Progress on Water Quality

Progress on water quality, and therefore progress on protect - ing and restoring aquatic ecosystems, has been slow in the forty years since adoption of the modern CWA. # e nation's waters, although not as obviously polluted as the burning rivers that catalyzed the adoption of the CWA, remain sub stantially altered from their natural conditions. A high per centage of them do not meet water quality standards. # e nation's aquatic ecosystems are in similarly poor shape. # eir poor health is traceable both to limits inherent in the CWA's structure and to the limited enthusiasm with which key CWA provisions have been implemented.

A. *Reading the Scorecard: The Unhealthy State of the Nation's Waters*

When the modern CWA was before Congress, the U.S. Environmental Protection Agency ("EPA") estimated that one-third of the nation's stream-miles violated existing water quality criteria.[62] # e agency's most recent water quality report, covering the state of the nation's waters as of 2004, suggests that conditions have, if anything, worsened. It concludes that forty-four percent of assessed stream-miles and sixty-four percent of assessed lakes and reservoirs are impaired.[63] # e agency speculates that the startlingly bad numbers might be due in part to states directing limited monitoring resources to waters they suspect are impaired.[64] Even if that were persuasive,[65] at best the report indicates that water quality remains a serious problem forty years into the CWA era.

Other sources corroborate the dismal state of the nation's aquatic systems. # e Heinz Center for Science, Economics and the Environment, for example, reported in 2008 that chemical contaminants were detectable in virtually all of the nation's streams and stream sediments, and that more than half of stream waters, stream sediments, and estuarine sediments tested contained at least one contaminant at levels threatening to aquatic life.[66] Chemical pollution is far from the only problem. # e vast majority of the nation's waters and waters-edge systems have been structurally altered by !oodplain development, removal of riparian vegetation, dam construction, water diversions, and other changes.[67]

Given the extensive modi"cation of aquatic systems in the United States, it should come as no surprise that the native inhabitants of those systems are su5ering. # e Heinz Center's 2008 study concluded that thirty-seven percent of native freshwater species were at risk nationwide, twice as high a proportion as in major terrestrial habitats;[68] and that on a state-by-state basis between twenty and sixty percent of freshwater plant communities were at risk.[69] Ten years ear lier, # e Nature Conservancy and NatureServe reported that forty percent of the nation's freshwater "sh, half of its cray - "sh, and two-thirds of its mussels were at risk of extinction.[70]

Climate change will make the situation worse for many aquatic ecosystems, especially wetlands and deltas.[71] # e impacts of climate change include altering water !ow pat - terns, disrupting the hydrologic assumptions on which both discharge and water quality standards have been set; increasing !oods and droughts that may interfere with spe- cies reproduction and thus a5ect species composition and ecosystem productivity; increasing water temperatures that will alter ecological processes and the geographic distribu- tion of species; and weakening aquatic ecosystem water qual- ity from phenomena such as algal blooms.[72] # e net impacts are di6cult to predict.[73] Staggering levels of uncertainty and geographic variation complicate predictive e5orts.[74] It seems likely, though, that climate change will be even more dis - ruptive for aquatic than for terrestrial ecosystems because aquatic !ora and fauna are less able to move to more suitable locations. # e Pew Center has concluded:

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60. *See infra* Part II.B.1.
61. *See infra* Part III.
62. 117 C$%&. R'(. 38834 (Nov. 2, 1971) (statement of Sen. Walter Mondale (D-Minn.).
63. O))*(' $) W+, '-., U.S. E%. , /. P-$, . A&'%(0, N+,*$%+/ W+, '- Q1+/ - *,0 I%. '%, $-0: R'2$-, ,$ C$%&-'33, 2004 R'2$-, *%& C0(/' 1–2, *available at* http://water.epa.gov/lawsregs/guidance/cwa/305b/upload/2009_01_22_305b_2004report_2004_305Breport.pdf.
64. *Id.* at 7.
65. States have incentives to underplay, rather than overplay, the extent to which their waters are impaired, because they must prepare Total Maximum Daily Loads for waters they report as impaired. CWA § 301(d)(1)(C), 33 U.S.C. § 1313(d)(1)(C) (2006). It seems unlikely that states are deliberately seeking out their worst waters for preferential testing.
66. T7' H. J$7% H'*%8 III C, -.)$- S(*., E($%. 9 , 7' E%. ',, T7' S,+, ' $) , 7' N+, *$%3 E($303, ' : 3 2008: M'+31-*%& , 7' L+%; 3, W+, '-3, +%; L*. *%& R'3$1-('3 $) , 7' U%*, ' ; S,+, '319 (2008).
67. Adler, *supra* note 4, at 51–52.
68. T7' H. J$7% H'*%8 III C, -.)$- S(*., E($%. 9 , 7' E%. ',, *supra* note 67, at 21.
69. *Id.* at 22.
70. T7' N+, 1-' C$%3'-. +%(0, R*. '-3 $) L*)': C-*, *(+/ W+, '-37', 3)$- P-$, '(, *%& F-'37 <+, '- B*$; *. '-3*, 0 1, 7 (Lawrence L. Master, Stephanie R. Flack & Bruce A. Stein eds., 1998), *available at* http://www.natureserve.org/library/riversolife.pdf. Aquatic species were more endangered than any other groups.
71. *See generally* N. L'-$0 P$)), M+-= M. B-*%3$% 9 J$7% W. D+0, J-., A>1+, *(E($303, ' : 3 +%; G/$?+/ C/*: +, ' C7+%&': P$, '%, *+/ I: 2+(, 3 $% I%/+%; F-'37 <+, '- +%; C$+3, +/ W', /+%; E($303, ' : 3 *% , 7' U%*, ' ; S,+, '3 18–22 (2002) (discussing the e5ects of temperature change and altered water regimes on freshwater wetlands).
72. *Id.* at ii.
73. As the Pew Center's report puts it:

    > Assuming no change in food resources, invertebrate production of streams and rivers may increase, potentially yielding more food for "sh. However, higher water temperatures will also increase the rate of microbial activity and thus the rate of decomposition of organic mate rial, which may result in less food being available for invertebrates and ultimately "sh . . . . In either case, warmer water holds less dissolved oxygen, so water quality will be reduced for organisms such as inverte brates and "sh that have a high oxygen demand.

    Id. at 7.
74. *See id.* at 32 (describing e5ects such as habitat loss, fragmentation, and species migration).

> Expected rates of climate change are probably too great to allow adaptation through natural genetic selection. Many types of habitat will be diminished or possibly lost entirely (e.g., alpine wetlands). Animals and plants will need to disperse northward or to higher elevations, but aquatic species differ greatly in their dispersal abilities, so not all species will be able to move to more hospitable habitat. Further, most high-quality aquatic habitats are now spatially isolated (due to human activities), making successful dispersal even more difficult.[75]

B. Limited Tools, Limited Implementation

The CWA should not be blamed for all the woes of the nation's aquatic ecosystems, but it is certainly fair to ask why it has not come closer to achieving its water quality goals. Two major factors have contributed to the shortfall. First, the CWA provides federal authorities with only limited tools for water quality protection.[76] It leaves important areas of responsibility to the states, which have not always been anxious to take on that responsibility. Second, EPA has been slow to implement the tools the law does provide.[77]

1. Restrictions on Federal Authority

The most obvious limit on EPA's authority to protect water quality is the lack of any direct power to regulate pollution originating from nonpoint sources. The CWA draws an important line between point and nonpoint source pollution. Unpermitted discharges of pollutants from point sources to waters under federal jurisdiction are prohibited.[78] "Point source" is defined broadly to include "any discernible, confined and discrete conveyance."[79] Point source dischargers must obtain a National Pollutant Discharge and Elimination System ("NPDES") permit;[80] in most states, state authorities issue those permits under authority delegated by EPA and subject to EPA oversight.[81] Permits must include not only technology-based discharge limits, but also water-quality based limits.[82] Although the permit system has done a great deal to reduce industrial discharges to water,[83] it leaves out diffuse run-off, which is a major source of water pollution. Unchanneled run-off from agricultural lands, logging operations, roads, and residential areas carry silt, fertilizer, pesticides, oil, trash, and other pollutants into waterways.[84] All of that pollution is beyond the direct reach of the CWA.

The CWA does try to approach nonpoint source pollution indirectly, through voluntary measures and drawing attention to the problem.[85] It also uses water quality standards to highlight nonpoint source, as well as point source, pollution. States must determine which of their waters do not meet water quality standards,[86] and develop "total maximum daily loads"[87] ("TMDLs")—pollution budgets establishing the amount of discharge the waterway can accept without violating water quality standards.[88] Waters must be listed and TMDLs produced even if run-off is the only source of pollution.[89] But the CWA does not explicitly require implementation of TMDLs, or impose any penalty for failure to implement them. At the end of the Clinton Administration, EPA had the temerity to issue regulations requiring that TMDLs include reasonable assurances that contemplated load reductions would actually be achieved, but Congress blocked their implementation and the next administration withdrew them.[90] Currently, therefore, TMDLs effectively control nonpoint sources only to the extent the state decides that they should do so.[91]

Another important limit on federal authority is the CWA's stated policy of leaving authority over water allocation to the states.[92] That complicates aquatic ecosystem protection because flow and water quality are tightly coupled. As the Supreme Court has recognized, "[i]n many cases, water quantity is closely related to water quality; a sufficient lowering of the water quantity in a body of water could destroy all of its designated uses, be it for drinking water, recreation, navigation or %%%%as a fishery."[93] Many ecosystem-relevant aspects of water quality depend on the concentration of pollutants in waterways.[94] The higher the flow, the greater the pollution load can be without exceeding tolerable concentrations. Other aspects of water quality are also linked to volumes of

75. *Id.*
76. *See* Part II.B.1.
77. *See* Part II.B.2.
78. *See* CWA §%301(a), 33 U.S.C. §%1311(a) (2006) (stating that it is unlawful to discharge a pollutant without compliance with CWA section %402, 33 U.S.C. §%1342 (2006))
79. CWA §%502(14), 33 U.S.C. §%1362(14) (2006)
80. *See id.* §%401(a)(2), 33 U.S.C. §%1341(a)(2) (2006)
81. *See id.* §%402(b)–(c), 33 U.S.C. §%1342(b)–(c); *see generally National Pollutant Discharge Elimination System (NPDES): State Program Status*, U.S. E&'(). P*+(. A, -&./, http://cfpub.epa.gov/npdes/statestats.cfm (last updated Apr. 14, 2003) (showing which states have an EPA-approved NPDES Program)
82. CWA §§%301(b), 302, 33 U.S.C. §§%311(b), 1312 (2006); 40 C.F.R. §%122.44(d) (2012).
83. Andreen, *supra* note 4, at 591.
84. *See id.* at 593.
85. *Id.* at 544–45, 545 n.42.
86. CWA §%303(d)(1)(A), 33 U.S.C. §%1313(d)(1)(A) (2006)
87. *See* CWA §%303(d)(1)(C), 33 U.S.C. §%1313(d)(1)(C)
88. *Id.*
89. *See* Pronsolino v. Nastri, 291 F.3d 1123, 1139 (9th Cir. 2002).
90. Oliver A. Houck, *The Clean Water Act Returns (Again): Part I, TMDLs and the Chesapeake Bay*, 41 E&'(). L. R-1. 10208, 10210 (2011).
91. EPA regulations do require that point sources seeking a new permit to discharge to impaired waters show that "existing dischargers into that segment are subject to compliance schedules designed to bring the segment into compliance with applicable water quality standards." 40 C.F.R. §%122.4(i)(2) (2012). According to the Ninth Circuit, this provision requires that the water be brought into compliance with water quality standards. Friends of Pinto Creek v. U.S. Envtl. Prot. Agency, 504 F.3d 1007, 1014 (9th Cir. 2007) ("If there are not adequate point sources to do so, then a permit cannot be issued unless the state or [the applicant] agrees to establish a schedule to limit pollution from a nonpoint source or sources sufficient to achieve water quality standards").
92. CWA §%101(g), 33 U.S.C. §%1251(g) (2006)
93. PUD No. 1 of Jefferson Cnty. v. Wash. Dept. of Ecology, 511 U.S. 700, 719–20 (1994) (holding that the Petitioner's asserted distinction between water quality and water quantity was artificial).
94. *Water: Monitoring & Assessment, 5.1 Stream Flow*, U.S. E&'(). P*+(. A, -&./, http://water.epa.gov/type/rsl/monitoring/vms51.cfm (last updated Mar. 6, 2012).

!ow. High !ows can help scour away silt and keep waterways cool.[95]

Although wholly understandable from a political per spective, leaving allocation decisions to states puts a key tool solely in state hands. Federal agencies are supposed to stand willing to help: the CWA directs them to cooperate with state and local governments to control pollution "in concert with programs for managing water resources ."[96] " e CWA also provides states with tools they may not otherwise have to control diversions . Section 401[97],which gives states veto power over federally-authorized activities that may result in discharges to water, has been interpreted to allow states to impose minimum !ow requirements on federally-licensed hydroelectric projects independent of any con!icting water rights.[98] In other words, motivated states get some federal help in dealing with !ows, but the CWA lacks strong federal levers to move states in that direction .

2. Tentative Implementation

Of course, Congress and the states do not bear all the responsibility for the CWA's failure to protect aquatic ecosystems . EPA owns a signi$cant share of that responsibility as well . Since the CWA was enacted, EPA has consistently emphasized the law's technology-based provisions at the expense of the water quality provisions, interpreted its own authority narrowly, and avoided enforcing water quality-based requirements.

Implementation of the water quality-based provisions of the CWA began slowly EPA, which has always had limited resources for implementing the laws under its jurisdiction, picked the low-hanging fruit $rst . It concentrated initially on developing technology-based standards and approving state permitting programs . " e Senate expressly endorsed that early prioritization.[99] As a result, water quality programs lagged.

EPA did not just move slowly on water quality . It also adopted a series of narrowing interpretations of its permitting authority. Despite acknowledging the extensive water quality impacts produced by dams, for example, in 1973 EPA adopted the position that dams are not point sources requiring NPDES permits .[100] " e D.C. Circuit upheld that interpretation in 1982.[101] EPA has also successfully exempted water transfers from the permitting program.[102] Taken together, EPA's narrowing interpretations have limited the reach of the NPDES program, and therefore its ability to protect aquatic ecosystems . Congress and the courts have provided some check on EPA's attempts to narrow the scope of the NPDES program, [103] but as a practical matter, EPA has been able to delay application of the CWA's permitting requirements to some important categories of sources

EPA has also tread cautiously within the boundaries of its admitted authority . Faced with opposition from polluters and water users, it has been reluctant to push states to develop numerical water quality standards, or standards addressing the physical and biological integrity of their waters .[104] Moreover, it has rarely exercised its oversight authority to disapprove state-issued NPDES permits.[105] " at passivity, combined with the lack of numerical standards, has allowed some states to routinely issue permits lacking water quality based e1uent limitations.[106] When water quality-based provisions are included, they often simply parrot narrative water quality standards, making them nearly impossible to enforce.[107]

III. Room for Hope? Water Quality Standards and Management of the Bay-Delta

Based on the history recounted in the previous section, it would be easy to conclude that the CWA is a failure as a water-quality or ecosystem protection tool . But that would be an unfortunate and premature conclusion . " e CWA is a needed adjunct to the ESA and other conservation laws . Although the challenges are admittedly large, there is room to hope that under the right circumstances, the CWA can play an important role in protecting and restoring aquatic ecosystems.

In this Part, we consider the role and potential of the CWA in the context of the Bay-Delta . In legal and institutional terms, there are several reasons for viewing the Bay-Delta as a "best case" scenario for the CWA's ability to protect ecosystems. California, unlike some other states, is a willing partner

95. *A Citizen's Guide to Understanding and Monitoring Lakes and Streams: Chapter 3—Streams*, W%&'. S(%( ) D)*'(+, E-+.+/0, http://www.ecy.wa.gov/programs/wq/plants/management/joysmanual/streamtemp.html (last visited Apr. 11, 2013).
96. CWA § 101(g), 33 U.S.C. § 1251(g).
97. *Id.* § 401, 33 U.S.C. § 1341 (2006).
98. *PUD No. 1*, 511 U.S. at 720–21.
99. *See* 39 Stat. 535 (1916) (codi$ed as amended at 16 U.S.C. §§ 1–18f-3 (2006)).
100. *See* Nat'l Wildlife Fed'n v. Gorsuch, 693 F.2d 156, 169 (D.C. Cir. 1982) (citing Letter from Alan Kirk, Acting Assistant Adm'r for Enforcement & Gen . Counsel, U.S. Envtl. Prot. Agency, to S Leary Jones, Dir., Div. of Water Quality Control, Tenn Dep't of Pub. Health (June 23, 1973)). " e Gorsuch opinion recounts the history of EPA's interpretation. *See id.* at 166–70. Although the agency has occasionally wa1ed, it has never changed its view that dams are outside the NPDES universe. *Id.* at 169.
101. *Id.* at 183.
102. *See* Friends of Everglades v. S. Fla. Water Mgmt. Dist., 570 F.3d 1210, 1228 (11th Cir. 2009) (upholding the Water Transfers Rule as a reasonable interpretation of an ambiguous statute); National Pollutant Discharge Elimination System (NPDES) Water Transfers Rule, 73 Fed. Reg. No. 115, 33697, (June 13, 2008) (codi$ed at 40 C.F.R. pt. 122).
103. In 1987, Congress amended the CWA to make clear that permits are required for municipal and industrial stormwater discharges CWA § 402(p), 33 U.S.C. § 1342(p) (2006). Federal courts have rejected EPA's attempts to exempt pesticide application and ballast water discharges from ships from the NPDES program. Nat'l Cotton Council v . U.S. Envtl. Prot. Agency, 553 F.3d 927 (6th Cir. 2009); Nw. Envtl. Advocates v. U.S. Envtl. Prot. Agency, 537 F.3d 1006 (9th Cir. 2008). " e Supreme Court has recently taken up another long-running battle, over discharges from logging operations . Another longstanding EPA narrowing interpretation was recently upheld by the Supreme Court Decker v. Nw. Envtl. Def. Ctr., No. 11-338, 2013 WL 1131708 (U .S. Mar. 20, 2013).
104. *See* Adler, *supra* note 4, at 66–70.
105. *Id.* at 67–68, 76; CWA § 402(d), 33 U.S.C. § 1342(d).
106. *See* W%( )2 P)234(& D45, O, ,4-) +, W%&( ) 6%( )2 M / 3 (, U.S. E75(.. P2+(. A/)7 -0, R)54) 6 +, C.)%7 W%( )2 A- (§ 89: P)234((47 / , +2 S; 2,%-) C+%. M47)& <0 A**%.%- '4%7 S(%( )& F47 =47 /& > R) - + 3 3)7 =%(4+7& ES-1, 23 (2010).
107. *Id.* at 18–19.

EPA has historically been more willing to push its authority in the Bay-Delta than elsewhere.[108] State law ! lls some of the most important gaps in the CWA . Furthermore, the state agency that implements the CWA and the state's analogous water quality law also implements the state's appropriative water rights system, providing institutional opportunities to integrate management of water quality and water quantity. " e state's courts have pushed the agency in that direction, ruling decades ago that water rights can, and indeed must, be adjusted if necessary to protect water quality.[109] A close look at this context both illustrates what the CWA can do when both state and federal partners are enthusiastic about the task of protecting aquatic ecosystems and highlights remaining barriers to success.

A. *Setting the Stage: Salinity in the San Francisco Bay-Delta*

" e Delta is the paradigm of a stressed ecosystem . Until the mid-nineteenth century, it was a tidal marsh rich in biodiversity.[110] Starting in the 1860s, the sloughs and islands of the Delta were drained and diked to allow agriculture;[111] at the time, the modern idea of a "wetland," with its positive connotation of ecosystem function and ecosystem services, did not exist. Today, the transformation of the Delta from a vibrant "ecosystem that worked" into a "hard-working" one[112] is complete; only scant traces of the earlier system remain . As the leading modern historian of California, Kevin Starr, has written, "[n]ot since ancient Rome or the creation of Holland had any society comparably subdued, appropriated, and rearranged its water resources."[113]

It is widely agreed that the Delta is in crisis, both as an ecosystem and as the hub of California's water delivery system, with its associated economic rami ! cations .[114] EPA recently described the ecosystem problem in these terms:

> Water quality and aquatic resources in the Bay Delta Estuary are under serious stress. All of the waters of the Bay Delta Estuary and most of its tributaries are listed as impaired for one or more parameters under the federal Clean Water Act . Populations of many formerly abundant open-water (i .e., pelagic) ! sh species, including delta smelt, long ! n smelt, and thread ! n shad, have collapsed in recent decades. Anadromous ! shes, including the winter run chinook salmon, have su9ered a similar decline.[115]

Global climate change will exacerbate the Delta's stresses, squeezing the estuary from both directions .[116] Sea level at the entrance to the San Francisco Bay has risen signi ! cantly since the 1930s .[117] By the end of the current century, the Paci ! c Ocean is expected to rise another 70 to 185 cm,[118] pushing salty water inland. At the same time, the freshwater in : ows that hold back salt water will decrease as California's primary reservoir—the Sierra snowpack—shrinks.[119] " e net result is a projected increase in Delta salinity of roughly ten percent.[120]

" is is bad news, given that persistent e9orts since the 1920s have failed to solve the salt water intrusion problem, which has long threatened both ecosystem stability and the Delta's usefulness as a source of fresh water for municipal and agricultural use. We brie : y recount the history of those e9orts in the following sections.

1. The California Supreme Court Rejects a Bold Common Law Approach

It took decades for stakeholders and public o ; cials to view the Delta problem as one of ecosystem restoration rather than merely an economic one subject to engineering ! xes.[121] From the late nineteenth century, when large-scale irrigation withdrawals from the Sacramento and San Joaquin rivers began, water users in the Carquinez Straits and the Delta feared that salt water intrusion would render their lands and industries valueless.[122] " ese fears accelerated as the federal Central Valley Project and the California State Water Project came on line.[123] " e Delta became the transfer hub for movement of the state's water supply from the wetter north to the drier south. In any given year, ! fty percent of the state's water

108. Indeed, EPA recently announced a broad review of its authority to take ecosystem-protective steps in the region . Water Quality Challenges in the San Francisco Bay/Sacramento-San Joaquin Delta Estuary, 76 Fed Reg. 9709 (proposed Feb. 22, 2011) (to be codi ! ed at 40 C.F.R. ch. I); *see also* U.S. D#$%&' %(# I)%#*+&* #% , - ., I)%#*+. F#/#*, - A0%+&) P-,) '&*%(# C, -+'&*)+, B, 1-D#-%, 14 (2009).

109. Nat'l Audubon Soc'y v. Superior Court, 658 P.2d 709, 732 (Cal . 1983); *see* United States v. State Water Res. Control Bd., 227 Cal. Rptr. 161, 162 (Ct. App. 1986).

110. U.S. D#$%&' %(# I)%#*+&* #% , -., *supra* note 109, at 2.

111. J, 1 L2) / #% , -., E) 3+4+&) +) 5 F2%2*#4 '&*%(# S, 0*, . #)%&-S,) J&, 62+) D#-%, 19–21 (2007).

112. A working river provides a variety of ecosystem functions including biodiversity conservation and also supports direct human uses such as irrigation, power production, and municipal water supply. C1)%(+, K&#(-#*, S, 3#%(# B, 1, P2%+) 5 !%7, 08 T&5#%(#*: M , 8+) 5 E0&414%# . R#%&* , %+&) W&*8 59 (2001).

113. K#3+) S%, **, C, -+'&*)+, : A H+4%&*1xii (2005).

114. *See, e.g.*, U.S. D#$%&' %(# I)%#*+&* #% , - ., *supra* note 109, at 2–3 (noting both ecological and economic aspects of the crisis).

115. Water Quality Challenges in the San Francisco Bay/Sacramento-San Joaquin Delta Estuary, 76 Fed. Reg. 9709, 9710 (proposed Feb. 22, 2011) (to be codi- ! ed at 40 C.F.R. ch. I).

116. James E. Cloern et al ., *Projected Evolution of California's San Francisco Bay-Delta-River System in a Century of Climate Change*, PLOS ONE, vol. 6, issue 9, Sep. 2011, at 1, *available at* http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0024465.

117. Sea level at the entrance to San Francisco Bay has increased about 2 .2 cubic meters ("cm") per decade over this period, and the frequency of extreme tides has increased twenty fold since 1915. *Id.* at 2.

118. *Id.* at 4. A recent National Research Council report integrating the e9ects of sea level rise and land subsidence projects relative sea level increase o9 San Francisco to be about 90 cm by 2100; given the high uncertainties of such projections, the report puts the range of possibility at about 42 to 166 cm, or between 17 and 65 inches C& . . . &) S#, L#3#- R+4#+) C, -., O*., < W, 4(., N, %- R#4#, *0 (C&2) 0+-, S#, -L#3#- R+4# '&*%(# C&, 4%4 &' C, -+'&*)+, , O*#5&) , ,) / W, 4 (+) 5%&) : P, 4% P*#4#)%, ,) / F2%2*#117 (2012).

119. Cloern et al., *supra* note 117, at 11.

120. *Id.* at 7. Salinity is a measure of how much sea salt is contained in a unit of water. California coastal seawater currently contains about 33 parts salt per thousand parts water by weight. " at level is expected to rise between 2.1 and 4.5 parts per thousand ("ppt"). *Id.*

121. *Id.* at 174–75.

122. W. T2**#)%+)#J, 084&) < A-,) M . P, %#*4&), W, %#* R#4. C%*. T#0 (-)+0, - C& . $-#%+&) R#$&*%W-501, T (# S, 0*, . #)%&-S,) J&, 62+) D#-%, : T (# E3&-2%+&) ,) / I . $-# . #)%, %+&) &' W, %#* P&-+01: A) H+4%&*+0, - P#*4$#0%+3# 7 (1977), *available at* http://escholarship.org/uc/item/36q1p0vj.

123. *Id.* at 188–89.

supply dedicated to the Central Valley and urban Southern California passes through the Delta into the powerful pumps at the southern end, which supply the two projects.[124] Like those who draw their water directly from the Delta, beneficiaries of the new water projects are also worried that they might get salty water.[125]

Delta salinity was initially the concern of downstream water users. Excessively saline water can harm plants, wildlife, and people.[126] Reducing salt concentration requires either removing salt or adding water. Although a bedrock principle of the CWA is that dilution is not a solution to pollution, dilution has historically been relied on to reduce salinity because the costs of desalination are extremely high and salt input is difficult to block at the source.[127]

Spanish explorers noticed the Delta's salt-fresh boundary, but the C&H sugar refinery in Crockett made the first accurate measurements between 1908 and 1920.[128] Their barges were measuring the impact of the major nineteenth century withdrawals on the San Joaquin, and subsequently, the impacts of rice farmers in the early twentieth century on the lower Sacramento.[129] The legal battle over Delta salinity control began soon afterwards, when the City of Antioch, which sits at the mouth of the San Joaquin River, sued water users who diverted from the Sacramento River north of the city of Sacramento.[130] California water law, policy, and politics have never departed from the reasons the state's Supreme Court gave for telling Antioch literally to continue sucking it up.[131]

In 1920, a very dry year, the flow of the Sacramento River dropped to 420 cubic feet per second at Sacramento.[132] Antioch asserted that upstream diversions had allowed saline San Francisco Bay water to push into Antioch's intake structures, making its water unfit for residential and commercial customers.[133] The trial court agreed; it entered an injunction setting minimum river flow levels, and therefore limiting upstream withdrawals.[134] The ruling was a legal bombshell, even more explosive than the one dropped by the Court of Appeals eighty-four years later when it held that the state can limit all water rights to meet water quality standards.[135] Then and now, though, the irrigators eventually prevailed.[136]

The *Antioch* decision was quickly reversed by the California Supreme Court. The high court agreed that appropriators generally have a right to water quality as it existed at the time of their appropriation,[137] but refused to apply that rule to salt water intrusion.[138] In a preview of later CWA debates,[139] the court drew a distinction between the addition of polluting substances and the diversion of water upstream.[140] Senior downstream water rights holders could complain about upstream withdrawals, the court held, only if those withdrawals left an insufficient volume of water in the stream to supply their established rights.[141] They could not complain, however, that upstream diversions did not leave the much greater quantity of water needed to keep the salty tides at bay.[142] That distinction, between adding pollution and removing water, held until 1986.[143]

The California Supreme Court's struggle to reverse the injunction won by Antioch below led it into the history of California's efforts to find a water law adapted to its climate.[144] In the end, the court, foreshadowing Bush v. Gore,[145] decided that it would adopt a special rule for a situation it believed to be unique.[146] Describing this location as the only one in the state where this particular conflict could arise, the court wrote that "[t]he rule that we may adopt here can scarcely be a precedent for any case except for one arising on these two rivers, concerning a similar claim of some prior appropriator near the outlets thereof."[147] Nonetheless, the court's reasoning was more general. It placed all of the risk on Antioch, the downstream user, on the grounds that one who takes water near the salt-fresh interface "must take notice of these conditions, and his rights will necessarily be restricted thereby."[148]

The real justification for the decision, however, was a straight utilitarian one: it was necessary to give preference to the diverters in the state's rapidly growing interior valleys because "the full use of the waters of the rivers and mountain streams for irrigation . . . is absolutely necessary to the continued growth and prosperity of the state."[149] The court declined to ask exactly how necessary the precise upstream uses at issue were, rejecting Antioch's objection that most of the irrigated area was planted with rice, an especially water-intensive crop.[150] Although acknowledging that "it may be that, under these circumstances, rice culture in this state should not be encouraged," the court decided that was a question properly left to the legislature.[151] Legislators declined to take up such questions, leaving protection of the Bay-Delta in the hands of engineers until the 1980s.

124. *Id.*
125. *Id.*
126. T%&' ()V. C*+%, P,-.+-/0*) &1 W(2*, R*)&3,+*): H-)2&,4, D*5*0&/ -'*.2, M(.(6*'*.2, (.7 P&0-+4 310 (Ryan Flahive & Jerry Correa eds., 2d ed. 2003).
127. J(+8)&. 9 P(22*,)&.,*supra* note 123, at 11.
128. *Id.* at 2.
129. *Id.*
130. *Id.* at 6.
131. *Id.*
132. *Id.* at 7.
133. *See* Town of Antioch v. Williams Irrigation Dist., 205 P. 688, 690 (Cal. 1922).
134. *See id.* at 689.
135. State Water Res. Control Bd. Cases, 39 Cal. Rptr. 3d 189, 323–24 (Ct. App. 2006).
136. *See id.* at 324; *Town of Antioch*, 205 P. at 695–96.
137. *Town of Antioch*, 205 P. at 691–92.
138. *See id.* at 692.
139. *See, e.g.*, S. Fla. Water Mgmt. Dist. v. Miccosukee Tribe of Indians, 541 U.S. 95, 109 (2004) (transfer of water within a single water body not an addition of a pollutant).
140. *See Town of Antioch*, 205 P. at 694.
141. *See id.* at 691.
142. *See id.* at 694.
143. *See* United States v. State Water Res. Control Bd., 227 Cal. Rptr. 161, 179 (Ct. App. 1986).
144. *See generally* State Water Res. Control Bd. Cases, 39 Cal. Rptr. 3d 189, 200 (Ct. App. 2006) (noting the history of controversy around the San Joaquin River and the intervention of the State Water Control Board).
145. 531 U.S. 98, 103, 110 (2000).
146. *See Town of Antioch*, 205 P. at 695.
147. *Id.* at 694.
148. *Id.* at 692.
149. *Id.* at 693.
150. *Id.*
151. *Id.* at 695.

2. The Engineers and Dam Operators Can Solve the Problem

After *Antioch*, California relied on engineering solutions to "solve" the Delta problem by preventing saline intrusion without limiting irrigation withdrawals Until the decision to turn the unbuilt Central Valley Project ("CVP") over to the federal government in the 1930s, there were a number of schemes to place a barrier across the bay to maintain the fresh-salt water balance.[152] ! ese plans died after the Bureau of Reclamation, as the operator of the CVP, promised to solve the problem by providing su " cient releases from upstream dams.[153] Federal and state water project managers assumed that salinity balance and #sh losses were minor technical problems that could be solved by modest upstream reservoir releases, add-ons such as #sh ladders or hatcheries, and modest manipulations of $ows through the Delta.[154]

! e precise level of salinity control releases necessary became an unresolved tug of war between the State of California and the Bureau of Reclamation, with the Delta ecosystem the ultimate loserAfter construction of the CVP and the California State Water Project ("SWP"), salinity control became an interest to be accommodated or traded o% to serve farmers in the Central Valley and the burgeoning population of Southern California .[155]

3. California Unsuccessfully Tries to Control the Bureau of Reclamation

To pry water away from the federal government, California relied on section 8 of the Reclamation Act of 1902, [156] which requires that the federal government acquire project water rights in accordance with state law . ! e Bureau of Reclamation complied with section 8 in the development of the Central Valley Project, as California had plenty of unappropriated water . ! e state's insistence on conditioning the Bureau's water rights on salinity control $ows, however, was a sticking point . ! e Bureau was willing to release some water, but the state wanted more.[157] ! e Delta was not without political power, as it was home to both large farmers and downstream urban areas and industries, all of whom were at risk from the failure to at least stabilize salinity levels .[158] In 1958, the State Water Resources Board #rst asserted the authority to condition the Bureau's exercise of its water rights on the provision of $ows needed to maintain #sheries, putting the Bureau on notice that additional salinity control releases would be required .[159]

! e Board was given the express statutory authority to impose such requirements in 1959,[160] but was reluctant to use it. Instead, in a 1961 decision, the Board reserved its right to do so in the future, while urging the state and federal government to resolve their con$ict.[161] ! e result was an important precedent that "signi#ed a degree of passivity that persisted in subsequent Delta decisions."[162]

! e same pattern played out in a series of temporizing decisions, even as the California legislature and the U.S. Supreme Court expanded the state's power ! e Bureau was con#dent it could resist any state demands for increased $ows .[163] ! e Supreme Court had ruled in 1958 that the Bureau's duty to comply with state law under section 8 of the Reclamation Act applied only to the acquisition of water rights for federal projects, not to their operation .[164] So, although the innovative Porter Cologne Act of 1969 gave the Board the authority to consider the impact on water quality of diversion applications,[165] the Bureau of Reclamation had good reason to believe that authority could not be applied to its diversions, despite their massive volume.

! e Bureau's argument, however, was undermined by the Supreme Court's 1978 change of heart . *California v. United States* abandoned the New Deal preference for federal river management. Justice Rehnquist returned to the long-established understanding of the Reclamation Program: the states control the distribution of water and the federal government pays. ! e case involved a challenge to the State Board's D-1422 decision, which imposed, *inter alia*, $ow release conditions on the operation of the Bureau's New Melones Dam .[166] Without reversing its prior CVP jurisprudence, the Court required the Bureau, if it wanted to escape state-imposed conditions on project operation, to prove that those conditions were inconsistent "with clear congressional directives respecting the project ."[167] A fter *California*, the State Board adopted the "principle" that Delta water quality conditions had to be "at least as good as those levels which would have been available had the state and federal projects not been constructed ."[168]

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152. *See* Hanemann & Dyckman, *supra* note 8, at 713.
153. *See id.*
154. *Id.* at 714.
155. *Id.* at 715 n.24.
156. 43 U.S.C. § 383 (2006).
157. J' ( )*+ , - P' . . /0*+ , ,*supra* note 123, at 50.
158. *Id.* at 55.
159. Salinity control was one of the original purposes of the Central Valley Project ("CVP"), but it was never listed a CVP purpose in the federal legislation. ! e Bureau of Reclamation continued to assure California that releases from Shasta Dam would be used for this purpose, but by the late 1940s, the Bureau began to back away from earlier commitments . "By 1952, . . . the Delta had been deprived of any commitment by the Bureau of Reclamation to control tidal salinity beyond the point required for the transferal of su " ciently pure water south." *Id.* at 50.
160. C '1. W' . /0 C+2 / § 1394 (West 2012).
161. In the Matter of Applications 5625, 5626, 9363, 9634, 9365, 9366, 9367, and 10588 of the U.S. Bureau of Reclamation, Decision No. 990, at 1, 61–62 (State Water Res. Control Bd., Feb. 9, 1961), *available at* http://www.waterboards.ca.gov/waterrights/board_decisions/adopted_orders/decisions/d0950_d0999/wrd990.pdf.
162. Hanemann & Dyckman, *supra* note 8, at 715.
163. ! e major State Water Resources Control Board decisions demanding such $ows include In the Matter of Application 5625 and 38 Other Applications of the U.S. Bureau of Reclamation, Decision No. 1379, at 1, 19, 61–62 (State Water Res. Control Bd., Sept. 16, 1961), *available at* http://www.waterrights.ca.gov/hearings/decisions/WRD1379.PDF.
164. Ivanhoe Irrigation Dist. v. McCracken, 357 U.S. 275, 291–92 (1958) . ! at holding was rea " rmed #ve years later. City of Fresno v. California, 372 U.S. 627, 630 (1963).
165. C '1. W' . /0 C+2 / §§ 1300–24 (West 2012).
166. California v. United States, 438 U.S. 645, 651 (1978).
167. Id. at 645, 676.
168. In the Matter of Permit 12720 (Application 5625) and Other Permits of the U.S. Bureau of Reclamation, Decision No. 1485, at 10 (State Water Res. Control Bd., Aug. 16, 1978) [hereinafter Decision No. 1485], *available at* http://www.waterrights.ca.gov/hearings/decisions/WRD1485.PDF.

4. Engineers Once Again to the Rescue

! e Board's decision was immediately challenged, but for a time, it looked like there might be a technological "x .[169] After the initial small releases proved insu#cient, the federal and state governments discovered what they thought was a win-win solution.[170] A new "peripheral canal" would divert Sacramento River water at the northern end of the Bay-Delta, deliver it to the federal and state pumps near Tracy, and release some water for salinity control along the way .[171] ! e canal would have relieved stresses on the Delta by decreas ing the use of pumps at the Clifton Forebay in the south Delta.[172] Initially, the canal seemed to be a[173] and 1980, the state's voters approved a constitutional amendment that represented a compromise between the now powerful envi - ronmental movement and big urban and agricultural water users.[174] Most of the state's undammed north coast rivers would be designated as wild and scenic and the Delta would be protected by the peripheral canal .[175] ! e canal, however, ultimately fell victim to a lethal combination of environmen tal concern about its impact on the Delta, which was now seen as a valuable ecosystem, and traditional northern Cali - fornia hostility to sending "our" water to the alien south .[176] After just two years, voters repealed the 1980 Amendment and killed the Peripheral Canal.[177]

5. The State Courts Step In

Four years after defeat of the Peripheral Canal proposal, a state appellate court e$ectively reversed *City of Antioch*, with a decision that appeared to upend settled interpretations of the relationship between water rights and water quality .[178] ! e *Racanelli* decision, as it has come to be known, did more than just rea#rm the Board's power to impose salinity con trol conditions on water projects It held that the Board had an a#rmative *duty* to adopt salinity water quality standards for the Delta *and* to integrate those standards into the state's dual system of appropriative and largely unquanti"ed ripar - ian water rights .[179] ! is decision was almost without prec - edent in the West.[180] Water rights holders were accustomed to taking their water without even minimal consideration of water quality impacts because their rights were established long before states began to regulate water quality .[181]

When the states did eventually begin to regulate waste discharges, they typically assigned that responsibility to pub- lic health, rather than water rights, agencies .[182] California, however, took a more progressive path, in large part because of the Delta .[183] ! e 1969 Porter-Cologne Act[184] merged the State Water Quality Control Board with the State Water Rights Board and required the new State Water Resources Control Board ("SWRCB") to consider both the quantitative and qualitative impacts of new water rights applications.[185] When the state's failure to control salinity was directly chal lenged, the courts used two related theories to impose new duties on the state .[186] ! e path-breaking *Racanelli* decision took the Porter-Cologne Act at its word,[187] especially in light of the 1983 *Mono Lake* decision, which had imposed a con - tinuing duty on the State Water Rights Board to apply the public trust to new and perfected water rights .[188]

6. The State Is Unable to Implement the *Racanelli* Decision

! e *Racanelli* decision had less impact on the Delta's eco - systems than might have been expected because political realities intervened . ! e Board initially complied with the spirit of the decision by proposing to cap water diversions at 1985 levels and imposing spring salinity and "sh conser - vation releases.[189] ! e Board's draft decision threatened the coalition of powerful federal water contractors and private holders of unquanti"ed water rights along the rivers.[190] ! ese powerful interests were soon also threatened by the feder - alization of water pollution control in 1972[191] and the rise of ""sh power."[192] ! ere is a long history of e$orts to-miti gate the impact of dams on "sh populations, but the ESA gave environmental protection advocates a new legal basis to subordinate other uses to species preservation, and salin - ity control was a direct bene"ciary of this development .[193] ! e aggressive e$orts to integrate water quantity and qual - ity energized strong constituencies invested in the status quo and ultimately prevented any e$ort to achieve a consensus among all Delta interests.[194] Farmers played the stakeholder game not to reach a solution, but to delay a solution

169. N%&&'(H) * +, - ., J&, T / - G&-01 T / '&(1: C0, '2%&* '0* (0* + W01-&: A H-(1%&. 315 (Univ. of Cal. Press rev. ed. 2001).
170. *Id.* at 315–16.
171. Id. at 315.
172. Id.
173. *Id.* at 325.
174. Id.
175. Id. at 327.
176. Id.
177. *Id.* at 331–32.
178. *See* United States v State Water Res Control Bd., 227 Cal. Rptr. 161, 179 (Ct. App. 1986).
179. *See id.* at 179–80.
180. *See* D03'+ H. G-14 / -(, L05&- *4- J. M04D%* * -, , 6 T-&-(0 A R'4-, C%*- 18%, , '*7 W01-& U(-: T / - U*2' * '(/ -+ B) ('* -((%2 W01-& Q) 0, '1. P8%- 1-41%* 97 (1991) (providing an excellent examination of the state of water quantity and quality integration at the time of the decision).
181. *See id.* at 4–5, 92–93.
182. *See id.* at 94–98.
183. *See id.* at 5–6, 97.
184. C0, . W01-& C%+ - §§ 13000–16104 (West 2012).
185. *See id.* §§ 13100, 13274.
186. *See* United States v State Water Res Control Bd., 227 Cal. Rptr. 161, 197 (Ct. App. 1986).
187. *Id.* at 173–74.
188. Nat'l Audubon Soc'y v. Superior Court, 658 P.2d 709, 732 (Cal. 1983).
189. *See* Hanemann & Dyckman, *supra* note 8, at 718.
190. *See id.* at 718–19.
191. *National Pollutant Discharge Elimination System (NPDES): Clean Water Act* , U.S. E*31, . P8%1. A7- *4. , http://cfpub.epa.gov/npdes/cwa.cfm?program_id=45 (last updated Dec. 17, 2012).
192. *See* Hanemann & Dyckman, *supra* note 8, at 719 . For a survey of how the environmental movement constrained dam operation and construction for the bene"t of "sh species, see A. Dan Tarlock, *Hydro Law and the Future of Hydroelectric Power Generation in the United States*, 65 V0* +. L. R-3. 1723 (2012).
193. *See* U.S. D-9'1%2 A7&'4. -1 0, ., C%,%&0+% R'3-& B0('* S0, '*'1. C%* 1&%, P8%7&0 : F-+-&0, A44%: 9, '(/ : - *1 R-9%&1 2%& F'(40, Y-0& 2011, at 14 (2011), *available at* http://www.usbr.gov/uc/progact/salinity/pdfs/FedAccompRep-2011.pdf.
194. *See* Hanemann & Dyckman, *supra* note 8, at 719.

By this time, the polarization of Bay-Delta interests was intense, and both environmental interests and water users trashed the Board's draft decision.[195] It was quickly withdrawn.[196] Chastised, the Board punted.[197] In 1991, it issued a final decision that set stringent water quality standards for the Delta, but that avoided mandatory flow releases.[198] At this point, EPA and the Department of Interior intervened. The initiative passed from the state to the federal government, which embraced the newly emerging theory of place-based consensus stakeholder solutions.[199]

B. *The Clean Water Act Helps Drive Collaboration, For a Time*

1. State Inaction Triggers Federal Action

Declaring the law is one thing. Enforcing it is another. The implementation of controversial judicial decisions by political actors is often a major stumbling block,[200] and so it proved with the *Racanelli* decision. The Board was reluctant to set water quality standards that would modify major water entitlements.[201] Joint federal-state control of the Delta slipped away in the midst of a five-year drought as federal environmental laws took center stage.

In 1993, the federal government listed the Delta smelt as a threatened species under the ESA.[202] To bolster the ESA's protections, EPA threatened to exercise its CWA authority to impose stringent Delta water quality standards. In 1994, in the midst of a drive by the new Republican majority in the House of Representatives to weaken the ESA, the federal government cobbled together a major federal-state-stakeholder initiative, known as Cal-Fed, to "fix the broken Delta."[203]

Understanding the role the CWA played in Cal-Fed requires familiarity with the framework of water pollution law in California. The state's Porter-Cologne Water Quality Control Act[204] makes the SWRCB responsible for formulating water quality control policy[205] and implementing the CWA.[206] The modern Board's charge is "comprehensive planning and allocation of [surface] waters" within the state.[207] The California legislature has directed that

> activities and factors which may affect the quality of the waters of the state shall be regulated to attain the highest water quality which is reasonable, considering all demands being made and to be made on those waters and the total values involved, beneficial and detrimental, economic and social, tangible and intangible.[208]

Responsibility for most detailed water quality planning, permit issuance, and identification of impaired waters has been delegated to nine Regional Water Quality Control Boards ("Regional Boards")[209] Regional Boards are required to adopt water quality control plans,[210] subject to review by the State Board.[211] The State Board also has independent water quality planning authority; any plan it adopts supersedes any conflicting Regional Board plan.[212] The State Board has made a practice of issuing its own plans for the Delta, covering the effects of water supply operations.[213] The plans, whether issued at the State or Regional Board level, must include "water quality objectives" (the state's terminology for water quality standards) sufficient to reasonably protect the water's beneficial uses[214] and a program to achieve those objectives.[215]

To comply with the CWA, state designated uses must include all existing uses[216] in several specified categories, including "propagation of fish and wildlife."[217] EPA encourages states to divide ecosystem-protection uses more finely,[218] and California has done so. Under state law, beneficial uses for water quality planning purposes "include, but are not limited to, domestic, municipal, agricultural and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves."[219] Beneficial uses designated in the state's various water quality plans include a range of specific ecosystem and ecosystem-service-focused functions, such as: commercial, sport, and subsistence fishing; shellfish harvesting; aquaculture; water quality enhancement; flood attenuation; freshwater, estuarine, inland saline, marine, and wetland habitat; preservation of areas of special biological significance; preservation of rare, threatened, or

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195. *See id.*
196. *See id.*
197. *See id.*
198. Decision No. 1485, *supra* note 169, at 10.
199. *See* Hanemann & Dyckman, *supra* note 8, at 720.
200. A famous example is *Worchester v. Georgia*, 31 U.S. 515 (1832), in which Chief Justice John Marshall rejected the state's assertion of sovereignty on Cherokee lands. President Andrew Jackson is supposed to have reacted with the derisive statement, "John Marshall has made his decision. Now let him enforce it." Kathleen Sands, *Territory, Wilderness, Property, and Reservation: Land and Religion in Native American Supreme Court Cases*, 36 A$. I%&. L. R' (. 253, 310 n.267 (2012). There is no evidence that Jackson actually made this statement, *see Andrew Jackson: On Indian Removal*, E%)*)+, -. &/0 B1/20%%/)0, I%) ., http://www.britannica.com/presidents/article-9116896 (last visited Apr. 11, 2013), but he did successfully resist Marshall's Native American jurisprudence, Sands, *supra* at 297.
201. A. D0% T01+,)3 '2 A+., W02' 1 R'4, 51) '4 M0%06' $ '%2: A C04' 7, , 3 /% L08 0%& P57+/) P, +/) * 753 (6th ed. 2009).
202. Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the Delta Smelt, 58 Fed. Reg. 12854 (Mar. 5, 1993) (codified at 50 C.F.R. pt. 17).
203. T01+,)3, W02' 1 R'4, 51) '4 M0%06' $ '%2, *supra* note 202, at 753–60 (tracing the origins of Cal-Fed).
204. C0+. W02' 1 C, &' §§ 13000–16104 (West 2012).
205. *Id.* § 13140.
206. *Id.* § 13160.
207. Nat'l Audubon Soc'y v. Superior Court, 658 P.2d 709, 726 (Cal. 1983).
208. C0+. W02' 1 C, &' § 13000.
209. *See id.* §§ 13200–275 (describing the composition and functions of Regional Boards).
210. *Id.* § 13240.
211. *Id.* § 13245.
212. *Id.* § 13170.
213. 1995 W02' 1 Q50+/2* C, %21, + P+0%, *supra* note 17, at 8.
214. C0+. W02' 1 C, &' § 13241 (West 2012).
215. *Id.* § 13242.
216. Existing uses, according to EPA regulations, include any uses that have been attained since November 28, 1975. 40 C.F.R. § 131.3(e) (2012).
217. CWA § 303(c)(2)(A), 33 U.S.C. § 1313(c)(2)(A) (2006).
218. 40 C.F.R. § 131.10(c); *2.3 Use Subcategories—40 CFR 131.10(c)*, in *Water Quality Handbook—Chapter 2: Designation of Uses (40 CFR 131.10)*, U.S. E%(2+. P1, 2. A6'%)*, http://water.epa.gov/scitech/swguidance/standards/handbook/chapter02.cfm#section3 (last updated Aug 1, 2012).
219. C0+. W02' 1 C, &' § 13050(f).

endangered species; migration of aquatic organisms; and spawning, reproduction, and/or early development of aquatic organisms.[220]

California law requires only "reasonable" protection of bene!cial uses, considering economic as well as other fac - tors.[221] " e CWA, however, is less #exible As interpreted by EPA, it mandates that water quality standards protect the most sensitive designated use.[222] Water quality standards are established based on criteria—or, in California's terminology "objectives"—that will protect the uses . EPA has established reference criteria for many pollutants,[223] but states may also choose to adopt their own criteria, so long as they are scien- ti!cally defensible.[224] California's water quality plans include both numeric and narrative objectives covering such ecosys- tem-protection factors as dissolved oxygen, pesticides, pH, sediment, temperature, and turbidity.[225] EPA does not pro- duce criteria for minimum #ows, but California water qual - ity planning documents have included #ow objectives since at least the 1960s.[226]

Unlike EPA's, the state's regulatory authority extends beyond point sources. " e regional boards have statutory authority to regulate any discharge of waste "that could a$ect the quality of the waters of the state," regardless of its source.[227] In general, discharges are forbidden unless per - mitted by the boards through issuance of "waste discharge requirements."[228] " e requirement for individual discharge approval, however, can be waived.[229] Historically, the boards issued waivers for nonpoint sources, such as timber and agri- cultural operations, with few conditions and no oversight.[230] Beginning in 1999, however, the state legislature imposed a series of new restrictions on waivers. Currently, the Board cannot issue a waiver without an a%rmative !nding that it is in the public interest Waivers must be reconsidered every !ve years, and generally must require monitoring.[231]

Importantly, the State Board's authority is not limited to regulating water pollution. It also has responsibility for administering the state's surface water rights permitting sys- tem.[232] In addition to ruling on applications for new water rights or for modi!cation of existing rights, the Board has both the right and the duty to supervise existing rights.[233] In the *Mono Lake* decision,[234] the California Supreme Court declared that water rights are subject to public trust restric - tions and that the Board has continuing supervisory power to ensure that public trust interests are protected to the extent feasible.[235] " at power is most necessary when (as in *Mono Lake* itself) the initial allocation has been made with- out regard to public trust values, but it is not limited to those circumstances. As the court put it:

> In exercising its sovereign power to allocate water resources in the public interest, the state is not con!ned by past allo- cation decisions which may be incorrect in light of current knowledge or inconsistent with current needs. " e state accordingly has the power to reconsider allocation decisions even though those decisions were made after due consider - ation of their e$ect on the public trust.[236]

A few years later, in the *Racanelli* decision, the California Court of Appeal squarely concluded that the Board enjoys authority to modify water rights, including those held by the federal and state governments for the CVP and SWP, in order to achieve water quality objectives.[237] Furthermore, relying on *Mono Lake*, the court clari!ed that those objectives can, indeed must, protect all the bene!cial uses enumerated by the legislature, including preservation of !sh, wildlife, and other aquatic resources.[238] Bene!cial uses, however, need only be "reasonably" protected, not absolutely.[239] Accord- ingly, the *Racanelli* court, echoing the California Supreme Court many years earlier, endorsed the Board's determina tion that the Projects need not provide the high #ows needed to meet salinity standards at Antioch.[240]

EPA's gradually more aggressive implementation of the CWA was an important driving force behind the Cal-Fed experiment.[241] As it had been since the 1920s, the key water quality issue was salinity.[242] But, whereas the earlier salinity concerns had focused on protecting agricultural, municipal, and industrial uses, since the 1960s, state-federal con#ict over Bay-Delta salinity has been primarily about ecosystem protection.[243]

" e state's e$orts have been marked by consistent delay and procrastination, received by federal authorities with increas - ing impatience. In 1967, when the state !rst transmitted water quality standards for the Bay-Delta, the Department

220. J&' B. M()*+(,-,S.(./W(./)R/*.C&'.)&0B1., C(0.E'2.0.P)&.. A3/',4, A C&5670(.7&'&8W(./)Q9(07.4G&(0* 4–5 (16th ed. 2011), *available at* http://www.waterboards.ca.gov/water_issues/programs/water_quality_goals/docs/wq_goals_text.pdf.
221. C(0.W(./)C&1/§:13241.
222. *See* 40 C.F.R. §:131.11(a)(1) (2012).
223. *See id.* §:131.11; *Water Quality Handbook—Chapter 3: Water Quality Criteria (40 CFR 131.11)*, U.S. E'2.0.P)&.. A3/',4, http://water.epa.gov/scitech/swguidance/standards/handbook/chapter03.cfm (last updated Feb. 14, 2013).
224. *See* 40 C.F.R. §:131.11.
225. M()*+(,-, *supra* note 221, at 7.
226. *See* S.(./W(./)R/*.C&'.)&0B1., C(0.E'2.0.P)&..A3/',4, W(./)Q9(07.4 C&'.)&0 P0('': S(,)(5/'.&-S('J&(;97' R72/)('1 S97*9' M()*+, at IV-7 to IV-10 (1978) [hereinafter 1978W(./)Q9(07.4 C&'.)&0 P0('].
227. C(0.W(./)C&1/§:13260(a) (West 2012).
228. *Id.* §:13264.
229. *Id.* §:13269.
230. Lee N. Smith & Loren J. Harlow, *Regulation of Nonpoint Source Agricultural Discharge in California*, 26 N(..R/*&9),/*<E'2'.28, 28, 30 (2011); S.(./W(./)R/*.C&'.)&0B1., C(0.E'2.0.P)&..A3/',4, I)73(./1L('1* R/390(.&)4P)&3)(5 (n.d.), *available at* http://www.waterboards.ca.gov/water_issues/programs/agriculture/docs/about_agwaivers.pdf.
231. C(0.W(./)C&1/§:13269.
232. *See id.* §:174.
233. *! e Water Rights Process*, S.(./W(./)R/*.C&'.)&0B1., C(0.E'2.0.P)&.. A3/',4, http://www.waterboards.ca.gov/waterrights/board_info/water_rights_process.shtml (last visited Apr. 11, 2013).
234. Nat'l Audubon Soc'y v. Superior Court, 658 P.2d 709 (1983).
235. *Id.* at 726–27.
236. *Id.* at 728.
237. United States v. State Water Res. Control Bd., 227 Cal. Rptr. 161, 185, 187 (Ct. App. 1986).
238. *Id.* at 148–51.
239. *Id.* at 122.
240. Antioch diverters were not left high and dry by this decision. " e Projects had o$ered to provide a substitute freshwater supply, an approach that protected Antioch's water supply at far lower cost in Project water. *Id.* at 133–34.
241. *See* Elizabeth Ann Rieke, *! e Bay-Delta Accord: A Stride Toward Sustainability* 67 U. C&0&. L. R/2. 341, 355 (1996).
242. *See* Hanemann & Dyckman, *supra* note 8, at 721.
243. *See id.*

of Interior, which at that time was in charge of implementing federal water pollution law, proposed additional standards for chloride and total dissolved solids.[244] Interior eventually approved the state's standards without those requested additions based on the state's commitment to revise its salinity standards by 1970.[245]

! ose standards turned out to be much longer in coming, however, and were unimpressive when they arrived. In 1978, the State Board adopted a new Water Quality Control Plan for the Bay-Delta ("Delta Plan").[246] Again, federal o " cials were not convinced the Delta Plan did enough to protect the aquatic ecosystem, but again they approved it, conditioned on the state's agreement to make needed revisions if indicators of #sh health declined.[247] Despite those promises, and notwithstanding continued declines in the indicators, periodic urging by EPA, and its own acknowledgment that the standards were inadequate to protect the estuary's #sh, the State Board continued to drag its heels on tightening salinity standards.[248] Meanwhile, the ecosystem's decline accelerated. By the early 1990s, three #sh species were listed under the federal ESA and all the major #sh species of the Delta were in decline.[249] Finally, in 1991, the State Board revised the Delta Plan, slightly changing the standards for salinity, dissolved oxygen, and temperature.[250] ! ose changes, however, did not satisfy EPA. Concluding that the salinity and temperature standards remained inadequate to protect the Bay-Delta's designated #sh and wildlife uses, EPA disapproved those parts of the Delta Plan.[251] After the State Board's next attempt at revising the Plan also fell short, EPA, prodded by litigation,[252] eventually proposed,[253] and ultimately adopted,[254] federal standards, as the CWA requires.[255]

! e #nal federal standards required that the low salinity zone, essentially the transition between salt and fresh water, be maintained at speci#ed locations in Suisun Bay beyond the western Delta during the spring months in order to protect the designated Estuarine Habitat.[256] EPA also set performance standards to protect the Fish Migration and Cold Freshwater Habitat designated uses.[257] Rather than specify conditions believed to support successful passage, EPA framed its #sh migration standard in terms of an index of survival of salmon smolts passing through the Delta.[258] Although EPA derived the standard from a set of management measures proposed by the U.S. Fish and Wildlife Service to protect salmon populations, EPA's framing intentionally left the state free to implement the standard through any combination of management measures that would produce the desired outcome.[259]

2. An Attempt at Collaboration

EPA's 1991 disapproval of the Delta Plan was a shot across the state's bow. It came as the federal agencies were negotiating a coordinated approach to Bay-Delta issues, which seemed to threaten the state's management primacy,[260] and as the National Marine Fisheries Service ("NMFS") was developing its #rst ESA biological opinion on the operations of the CVP.[261] Fear on the state side of losing control of water resource management, coupled with uncertainty on the federal side about the scope of legal authority to force water reallocation (and no doubt concern about the political consequences of testing those waters),[262] triggered the Cal-Fed experiment, a short-lived attempt at state-federal cooperative ecosystem management in the Bay-Delta.

Cal-Fed was based on an agreement between the state and federal water operations and environmental protection agencies with authority in the Bay-Delta. In the June 1994 "Bay-Delta Accord," state and federal o " cials agreed to cooperate on water project operations, water quality standard setting, and development of a long-term management strategy.[263] Negotiating that long-term agreement took #ve years; its lifetime was shorter than its gestation period.[264]

One expectation of the Cal-Fed agreement was that the process would, in EPA's words, "lead to approvable state standards for protecting the designated uses in the Bay/Delta estuary," which would then replace EPA's standards.[265] EPA's standard-setting process, already underway and with litigation-driven deadlines, continued in parallel with a stakeholder negotiation process.[266] In December 1994, that process produced agreement on export limits and the location of the "X2" saltwater to freshwater transition zone in Suisun Bay.[267] ! ose principals, together with EPA's agree-

244. 1978 W$%&' Q($)*%+ C, -%',) P)$-, *supra* note 227, at IV-3.
245. *Id.*
246. *Id.* at I-2.
247. Water Quality Standards for Surface Waters of the Sacramento River, San Joaquin River, and San Francisco Bay and Delta of the State of California, 59 Fed Reg. 810, 811 (proposed Jan. 6, 1994) (to be codi#ed at 40 C.F.R. pt. 131).
248. *Id.*
249. *Id.*
250. *Id.* at 812.
251. *Id.*
252. Rieke, *supra* note 242, at 355–56.
253. *Id.*
254. Water Quality Standards for Surface Waters of the Sacramento River, San Joaquin River, and San Francisco Bay and Delta of the State of California, 60 Fed Reg. 4664, 4683 (Jan. 24, 1995) (codi#ed at 40 C.F.R. pt. 131).
255. CWA § 303(c)(4), 33 U.S.C. § 1313(c)(4) (2006).
256. Low salinity was de#ned in the rule as two ppt, representing the mixing zone between salt water, which typically contains about thirty ppt, and fresh water, which usually has less than one ppt. Water Quality Standards for Surface Waters of the Sacramento River, San Joaquin River, and San Francisco Bay and Delta of the State of California, 60 Fed. Reg. at 4671 & n.10. ! e two ppt isohaline remains a crucial element not only of water quality standards but also of the Endangered Species Act ("ESA") biological opinions for water project operations. It is commonly referred to these days as "X2" *Id.*
257. *Id.* at 4681–82.
258. *Id.* at 4683–85.
259. *Id.* at 4683.
260. Jody Freeman & Daniel A. Farber, *Modular Environmental Regulation*, 54 D(/& L.J. 795, 840 (2005).
261. N$%) M$'*-& F*01&'*80 S&'2., N$%) O3&$-*3 4 A%5, 061&'*3 A75*-., B*,), 8*3$) O6*-*, -9, '%1& O6&'$%&', -, 9%1& F&7&'$) C&-%'$) V$))&+ P', :&3%$-7%1& C$)*9, '-*$ S%&$%& W$%&' P', :&3% 1–2 (1993), *available at* http://www.science.calwater.ca.gov/pdf/workshops/SP_workshop_ocap_CVP-SWP_021293.pdf.
262. Rieke, *supra* note 242, at 355–56.
263. *Id.*
264. Freeman & Farber, *supra* note 261, at 843.
265. Water Quality Standards for Surface Waters of the Sacramento River, San Joaquin River, and San Francisco Bay and Delta of the State of California, 60 Fed Reg. 4664, 4667 (Jan. 24, 1995) (codi#ed at 40 C.F.R. pt. 131).
266. Rieke, *supra* note 242, at 362–63.
267. CALFED B$+-D&)%$ P', 8'$5, P'*-3*6)&0 9, ' A8'&&5&-%, - B$+-D&)%$ S%-7'70 B&%; &&-%1& S%&$%& ,9 C$)*9, '-*$ $-7%1& F&7&'$)

ment "to withdraw Federal standards pursuant to the Clean Water Act when the SWRCB adopts a !nal plan consistent with these Principles,"[268] became the basis for State Board revisions of the Delta Plan.[269]

" e new Plan was issued in May 1995. Its focus was a new set of water quality objectives for the !sh and wildlife uses of the Bay-Delta.[270] Not surprisingly, it concentrated on #ow criteria and water project operations, although the Board contended those were not subject to EPA approval.[271] In September, EPA approved the 1995 Delta Plan.[272] EPA did not, however, immediately withdraw its own standards.[273] " e State Board's 1995 Delta Plan established new water quality objectives, but the objectives needed to be implemented through a water rights proceeding.[274] " at proceeding, which culminated in Water Rights Decision D 1641, was not completed until March 2000.[275] Six years later, the California Appellate Court ruled that D 1641 failed to adequately implement several of the #ow and salinity objectives of the 1995 Delta Plan.[276] Cal-Fed had failed to produce a viable water quality plan.

C. *After Things Fall Apart, Can the CWA Help Put Them Back Together?*

It is easy to criticize Cal-Fed In retrospect, its premise appears naive. Cal-Fed's architects assumed that a stakeholder process could produce a win-win management solution for the Bay-Delta that would be accepted by environmentalists and farmers alike. Everyone, it was promised, could "get better together."[277] Cal-Fed would restore the Bay-Delta's ecological health while making more water available to irrigators.[278] Reducing con#ict among stakeholders, and the attendant litigation, was explicitly identi!ed as one of the program's key goals.[279]

" e problem, of course, is that, ultimately, !ghts for limited resources are unlikely to produce true win-win solutions Hamstrung by expectations that it could please all constituencies, Cal-Fed exalted process over substance and never faced the fundamental fact that restoration of the ecosystem's health required cutbacks in irrigation water deliveries. Its focus on reducing con#ict kept it from doing what Australia has begun to do in the similarly stressed Murray-Darling Basin: set environmental outcomes.[280]

Not surprisingly, Cal-Fed failed to produce the results it had promised. As one commentator puts it, a program premised on increasing water supply and improving ecosystem conditions "might succeed if brilliantly implemented by resourceful and well-funded managers, and under relatively benign and stable environmental conditions, but its chances of failure seem uncomfortably large."[281] Cal-Fed failed as an ecosystem protection strategy, as a program for ensuring water reliability, and as an institutional innovation. By 2005, the fragile truce Cal-Fed had forged among competing Delta interests had fractured. " e state of the ecosystem was worse than ever; !sh populations were in dramatic decline.[282] Water quality had not improved.[283] Both water users and environmentalists, frustrated by Cal-Fed's failure to ful!ll its lofty promises, had resorted once again to the courts.[284] Political support and funding both evaporated.[285]

State e8orts to restore the Bay-Delta ecosystem have continued post-Cal-Fed, generating more meetings and paper than tangible progress. " e SWRCB has continued its established practice of kicking the water quality can down the road. In 2006, it issued a revised Water Quality Plan for the Bay-Delta that left the tough decisions about responsibilities of water rights holders to a future water rights decision that has never materialized.[286] " e new plan maintained the contested San Joaquin #ow objectives, claiming the Board lacked information to improve them.[287] Rather than deal forthrightly with the salinity problem, the Board announced the launch of a salinity management plan with a !fty-year timeline.[288] " e seemingly endless process of revising water quality plans for the Bay-Delta continues, well behind schedule.[289]

On a separate track, as directed by the legislature in 2009, the SWRCB has completed a study of the #ows needed to support public trust resources in the Bay-Delta.[290] Although SWRCB has emphasized that this study has no direct regula

G$%&' ( )&(* 1 (1994), *available at* http://www.calwater.ca.gov/Admin_Record/G-000143.pdf.

268. *Id.* at 5.

269. 1995 W+*&' Q ,+-.*/ C$ (*'$- P-+(,*supra* note 17, at 6–7.

270. *Id.* at 3–4.

271. *Id.* at 3.

272. D+%0 N+1. 2 J&+(&**& M+3M.--+(, A, *4$'.*/ +(0 E55&3*%&(&66 $5 *4& S*+*& W+*&' R&6$, '386 C$ (*'$- B$+'023 (2008).

273. *Id.*

274. *See id.*

275. *Id.*; In the Matter of: Implementation of Water Quality Objectives for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary, Decision No. 1641, at 23 (State Water Res. Control Bd., Mar. 15, 2000), *available at* http://www.waterrights.ca.gov/Decisions/D1641rev.pdf.

276. State Water Res. Control Bd. Cases, 39 Cal. Rptr. 3d 189, 201 (Ct. App. 2006).

277. L, (0 &* +-., *supra* note 112, at 87.

278. CALFED B+/-D&-*+ P'$7'+), P'$7'+))+*.3 R&3$'0 $5 D&3.6.$ (9–10 (2000), *available at* http://calwater.ca.gov/content/Documents/ROD.pdf.

279. *Id.* at 9.

280. *Water Act 2007* (Cth) ss 3–4 (Austl.).

281. Dave Owen, *Law, Environmental Dynamism, Reliability: ! e Rise and Fall of CALFED*, 37 E (%*-. L. 1145, 1201 (2007).

282. L.**-& H$$%&' C$))'(, S*.-- I)9$'.-&0, S*.-- I)9&'.-&0, S*.-- I)9$'*+(*: T4& L.**-& H$$%&' C$)).66.$ ('6 R&%&1 $5 *4& CALFED B+/-D&-*+ P'$7'+) 33 (2005); L, (0 &* +-., *supra* note 112, at 87; Owen, *supra* note 282 at 1202–03.

283. L.**-& H$$%&' C$))'(, *supra* note 283, at 32.

284. L, (0 &* +-., *supra* note 112, at 88; Owen, *supra* note 282, at 1202–03.

285. Owen, *supra* note 282, at 1204.

286. G.*+ K+9+4. &* +-., S*+*& W+*&' R&6. C$ (*'$- B0., C+-. E (%*-. P'$*. A7&(3/, W+*&' Q ,+-.*/ C$ (*'$- P-+(5$' *4& S+(F'+(3.63$ B+//S+3-'+)&(*$-S+(J$+: , . (D&-*+ E6*, +'/3 (2006).

287. *Id.* at 6.

288. *Id.*

289. *See* U.S. E (%*-. P'$*. A7&(3/, W+*&' Q ,+-.*/ C4+--&(786. (*4& S+(F'+(3.63$ B+//S+3'+)&(*$-S+(J$+: , . (D&-*+ E6*, +'/: EPA'6 A3*.$ (P-+(8 (2012); Letter from " omas Howard, Exec. Dir., State Water Res. Control Bd., Cal. Envtl. Prot. Agency, to Gerald H. Meral, Deputy Dir., Cal. Natural Res. Agency (Dec. 19, 2011) [hereinafter Howard Letter] (on !le with author).

290. P4.- C'+0&' &* +-., S*+*& W+*&' R&6. C$ (*'$- B0., C+-. E (%*-. P'$*. A7&(3/, D&%&-$9)&(* $5 F-$1 C'.*&'.+ 5$' *4& S+3'+)&(*$-S+(J$+: , . (D&-*+ E3$6/6*&) 2 (2010), *available at* http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/delta#ow/docs/!nal_rpt080310.pdf.

tory consequence,[291] it will certainly have to be considered in setting future !ow objectives and in the regulatory deci - sions of other state and federal agencies with authority over Bay-Delta resources. " e report's key conclusion is unsurprising: "Recent Delta !ows are insu#cient to support native Delta $shes for today's habitats."[292] In fact, recent !ows do not come close to what is needed. " e SWRCB believes that preservation of the system and its native $sh would require !ows on the order of seventy-$ve percent of unimpaired (i.e., pre-project) Delta out!ows from January through June; seventy-$ve percent of unimpaired Sacramento River in!ow from November through June; and sixty percent of unimpaired San Joaquin River in!ow from February through June.[293] Over the last twenty years, Delta out!ows in dry years have been only about thirty percent of unimpaired lev - els, late spring Sacramento River in!ows have averaged only about $fty percent of unimpaired levels, and San Joaquin River in!ows have been only twenty percent of unimpaired levels in dry years.[294]

" e state has tried to replace Cal-Fed's coordination func - tion by creating a new Delta planning body. In 2009, the legislature enacted a series of water reform bills, including the Delta Reform Act, creating a new Delta Stewardship Council[295] as the successor to the Bay-Delta Authority, the state arm of Cal-Fed. But, there is still no mechanism at the state level for making the tough trade-o%s, and questions about overlapping and competing agency authorities have not been answered. " e Delta Reform Act declares that the state has "two coequal goals" in the Delta: "providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem."[296] It directs the Council to develop and implement a Delta Plan to further those coequal goals,[297] but does not indicate how any con!icts between the goals are to be resolved. " e Act does not specify how the Delta Plan would interact with other Delta management e%orts, such as the State Water Board's water quality plans for the Delta.

Meanwhile, a separate state-federal e%ort to harmonize water project operations with the ESA is on the brink of dissolving. " e Bay Delta Conservation Plan ("BDCP") is intended to support the issuance of long-term incidental take permits for the water projects under state and federal endangered species acts.[298] In other words, the BDCP is supposed to insulate the water projects from liability under those laws, reducing the threat that courts might order pumping reductions. " e BDCP has been under negotiation for more than six years by a group of stakeholders, including state and federal o#cials, water users, and environmental groups.[299] Although neither the complete BDCP nor the accompanying environ - mental analysis is yet available, state and federal authorities have already announced their support for the peripheral tunnel (or, as they now prefer to call it, "isolated conveyance") at the heart of the plan.[300] Partial drafts of the BDCP have been criticized by scienti$c reviewers,[301] environmental groups,[302] local governments,[303] and politicians representing the Delta region.[304] " e relationship of the BDCP to the Delta Plan is unclear. " e Delta Reform Act directs the Delta Stewardship Council to consider including the BDCP in the Delta Plan, and sets some standards the BDCP would have to meet in order to be included.[305] " e Act does not, however, clarify what signi$cance the decision to incorporate the BDCP in the Plan or leave it out would have. " e State Water Board has made it clear that it will exercise its own independent authority and judgment to the extent its permission is needed to put the BDCP into e%ect.[306]

After turning its attention away from the Bay-Delta during the George W. Bush years, the federal government has reengaged with ecosystem restoration e%orts in the region. In 2009, six federal agencies signed a Memorandum of Understanding, promising "aggressive and coordinated" e%orts to address California water issues.[307] " e federal government has certainly been engaged, with the Fish and Wildlife Service and NMFS working closely with the state in development of the BDCP, and EPA issuing an Action Plan for the Bay-Delta.[308] It is less clear that federal e%orts in the Delta have been e%ectively coordinated. As NRDC's Barry Nelson pointed out in a blog post, the BDCP, which has been publicly endorsed by the Secretary of Interior, appears to be proceeding down a path inconsistent with EPA's Action Plan.[309]

291. As the agency notes repeatedly, the study looks only at the needs of the envi - ronment, whereas its regulatory process considers all competing bene$cial uses. *Id.* at Note to Readers, 2–4.
292. *Id.* at 5.
293. *Id.*
294. *Id.*
295. Delta Reform Act, S. X7-1, 2009–10 Leg., 7th Extraordinary Sess. § 39 (Cal. 2009) (codi$ed as amended at C'(. W')*+ C, -*§ 85,200 (2012)).
296. *Id.* at § 1 (codi$ed as amended at C'(. P. /. R*0. C, -*§ 29702(a) (2012)).
297. C'(. W')*+ C, -*§ 85,300(a) (2012).
298. *Purpose and Approach*, B'1 D*()' C, 20*+3')4, 2 P('2, http://baydeltaconservationplan.com/BDCPPlanningProcess/About " eBDCP/PurposeandApproach.aspx (last visited Apr. 11, 2013).
299. *About the BDCP*, B'1 D*()' C, 20*+3')4, 2 P('2, http://baydeltaconservationplan.com/BDCPPlanningProcess/About " eBDCP.aspx (last visited Apr. 11, 2013).
300. Steven Harmon, *Gov. Jerry Brown Fires First Shot in New Water War*, M*+-5.+1N*60.5, 7 (July 25, 2012), http://www.mercurynews.com/california/ci_21160597/gov-jerry-brown-$res-$rst-shot-new-water.
301. D*()' S54. P+, 8+'7, B'1 D*()' C, 20*+3')4, 2 P('2 (BDCP) E99*5)0 A2'(1040 C, 25*:).'(F, .2-')4, 2 '2- A2'(1)45'(F+'7*6, +; '2- E2-)+'427*2) A::*2-4<6 (2012); N')'(R*0*'+5= C, .254(, A R*34*6, 9)=* U0*, 9 S54*25* '2- A-':)43* M'2'8*7*2) 42 C'(49, +24'0 D+'9) B'1 D*()' C, 20*+3')4, 2 P('23 (2011).
302. Dan Bacher, *Fishermen, Tribal Members and Enviros Blast Brown Tunnel Plan*, A()*+2*) (July 26, 2012), http://blogs.alternet.org/danbacher/2012/07/26/$shermen-tribal-members-and-enviros-blast-brown-tunnel-plan/.
303. Dan Bacher, *Sacramento County Opposes Plan to Build Peripheral Tunnels*, C'(4)450 (Aug. 28, 2012, 7:00 PM), http://www.calitics.com/diary/14533/sacramento-county-opposes-plan-to-build-peripheral-tunnels
304. Harmon, *supra* note 301; Press Release, U.S. Rep. John Garamendi, At Sacramento Rally, Garamendi Highlights Serious Flaws in the Current Bay Delta Conservation Plan Proposal (July 25, 2012), *available at* http://garamendi.house.gov/press-release/sacramento-rally-garamendi-highlights-serious-!aws-current-bay-delta-conservation.
305. C'(. W')*+ C, -*§ 85320 (West 2012).
306. Howard Letter, *supra* note 290.
307. U.S. D*:') ,9)=* I2)*+4, +*) '(., *supra* note 109, at 2.
308. U.S. D*:') ,9)=* I2)*+4, +*) '(., I2)*+47 F*-*+'(A5)4, 2 P('2 S)').0 U:-')*9, +)=* C'(49, +24' B'1-D*()':2011 '2- B*1, 2- 9 (2010), *available at* http://www.doi.gov/news/pressreleases/loader.cfm?csModule=security/get$le&PageID=104334; *Bay Delta Action Plan*, U.S. E23)(. P+,). A8*251, http://www.epa.gov/sfbay-delta/actionplan.html (last updated Jan. 18, 2013).
309. Barry Nelson, *BDCP Ignores New EPA Bay-Delta Action Plan*, S64)5=/, '+-N').+'(R*0. D*9. C, .254(S)'99 B(, 8 (Sept. 4, 2012), http://switchboard.nrdc.org/blogs/bnelson/bdcp_ignores_new_epa_bay-delta.html.

While all this maneuvering continues, the ecosystem is still su!ering.[310] A recent report card issued by the San Francisco Estuary Partnership concludes that native "sh species are in trouble throughout the system.[311] Species dependent on estuarine conditions, including, but not limited to, the endangered species, have experienced the most extreme recent declines.[312] As EPA has recognized, "[d]espite much ongoing activity, CWA programs are not adequately protecting Bay Delta Estuary aquatic resources . . . ."[313]

Could the CWA do better? $e next Part explores why the CWA has been more e!ective in the Bay-Delta than in many other locations, why it has still fallen short as an ecosystem protection and restoration law, and whether its performance can be improved

IV. The Elements of Success

$e Bay-Delta case study indicates that the CWA can be a more important force for aquatic ecosystem protection than is sometimes recognized. But it also highlights the barriers to ecosystem protection that remain, even in this "best case." It therefore o!ers both positive and negative lessons

A. *What's Gone Right*

$e major advantage in the Bay-Delta is that all the necessary institutional and legal elements are in place, at least on paper. CWA-based ecosystem protection *should* work in this setting. $ree key elements distinguish it from so many situations in which the CWA necessarily falls short.

First, the geography is favorable. $e Sacramento-San Joaquin watershed lies entirely within the boundaries of California. $at makes the problem of overlapping jurisdiction much simpler than in watersheds that cross many state lines, like the Mississippi River. Dealing with the problems of the Bay-Delta requires the cooperation of only two government partners, the state of California and the United States.

Second, the state partner is, at least relative to other states, committed to environmental protection. Public opinion in California leans strongly toward government action to address environmental problems,[314] and the state has often been well ahead of the federal government in adopting environmental protection laws.[315] State willingness to recognize and address water quality problems is crucial to the success of aquatic ecosystem restoration e!orts because the CWA provides few tools to force states to deal with water quality problems from nonpoint source pollution or excessive diversions

$ird, California's legal landscape and institutional architecture provide the tools that are missing from the CWA to integrate water quality and water allocation. A major limitation of the CWA is that it unrealistically separates the water quality problem from the water quantity problem. In reality, of course, quality and quantity are intimately and unavoidably linked, and both are essential to maintaining aquatic ecosystems. Reduced <ows mean higher pollutant concentrations at the same input level, warmer temperatures and reduced dissolved oxygen levels, and, at the extreme, the "dewatering" of streams, leaving dry stretches.[316] $e CWA, however, focuses on the addition of pollutants, leaving control over the removal of water almost entirely up to the states

California is unique among the western states in the extent to which it integrates management of water quality and water quantity. $e SWRCB bears responsibility both for the issuance and oversight of water rights and for setting state-level policy with respect to limitation of water pollution.[317] $ose functions are not perfectly integrated, of course. Di!erent divisions of the State Board carry them out.[318] Having them within the same organization, however, is unusual in the west.[319] At a minimum, the fact that both are within the Board's jurisdiction means that the Board's governing body cannot avoid being aware of the connections between water quality and quantity.

$at awareness should, under California law, factor into decisions about water rights as well as into more traditional pollution control decisions. Water rights have long prevailed over water quality in the West.[320] In many states, that hierarchy is expressly written into law: water quality protection measures must not impair, interfere with, or modify water

310. *See, e.g.*, C%&' (%() &*., *supra* note 291, at 1 (noting that degradation of the Delta ecosystem continues).

311. S.F. E+),&%- P'+. /0, T. (S)&)(12 S&3 P%&34/+41 B&- 2011, at 44–45 (2011).

312. *Id.*

313. U.S. E35)*. P%1). A6(34-, W&)(%Q,&*/)- C.&**(36(+, *supra* note 290, at 7.

314. M&%7 B&*'&++&%(()&*., P,8. P1*'- I3+). 12 C&*., PPIC S)&)(9/'(S,%-5(-: C&*/21%3/&3+ :). (E35/%13; (3) 20 (2011), *available at* http://www.ppic.org/content/pubs/survey/s_711mbs.pdf. Two-thirds of California voters who decline to state their party preference consider themselves conservationists and view environmental regulations in a favorable light. T,*4./3 R(+(&%4.: P1**/36 : S)%&)(6/4 C13+,*)/36, C&*/21%3/&D(4*/3(-)1-S)&)((DTS) V1)(%+S.19 S)%136 P%16%(++/5(, P%1-E35/%13; (3) S)&34(1 (2011), *available at* http://www.ecovote.org/sites/default/"les/CLCVEF%20DTS%20Survey%20Findings.pdf. In 2010, during the depths of an economic recession that hit the state hard, California voters soundly defeated an oil-industry funded ballot initiative that would have suspended the state's greenhouse gas emission law. Margot Roosevelt, *Prop 23 Battle Marks New Era in Environmental Politics*, L.A. T/; (+(Nov. 4, 2010), http://articles.latimes.com/2010/nov/04/local/la-me-global-warming-20101104.

315. California's leadership is most widely recognized in the context of air pollution from mobile sources, where the state has for decades led the way to progressively tighter federal standards. Ann Carlson, *Iterative Federalism and Climate Change*, 103 N9. U. L. R(5. 1097, 1107–28 (2009). But California has also been a leader in many other areas, including regulation of pesticides, C&*. D(0') 12 P(+)/4/'(R(6,*&)/13, P(+)/4/'(R(6,*&)/13 /3 C&*/21%-3/&1–11 (2011); coastal and marine resource management, *see, e.g.*, S)&3*(-S41)), G15(%3/36 C&*/21%3/&'+C1&+) 9–10 (1975); Deborah A. Sivas & Margaret R. Caldwell, *A New Vision for California Ocean Governance: Comprehensive Ecosystem-Based Marine Zoning*, 27 S)&3. E35)*. L.J. 209, 234–42 (2008); and water pollution, K&%* B1-' B%117+, B(21%(E&%). D&-: T.(C%/6/3+ 12 A; (%/4&3 E35/%13; (3)&* L&9, 1945–1970, at 66–69 (2011).

316. Reed Benson, *Pollution Without Solution: Flow Impairment Problems Under Clean Water Act Section 303*, 24 S)&3. E35)*. L. J. 199, 203–04, 216 (2005).

317. *See supra* notes 242–43 and accompanying text.

318. *Water Boards' Structure*, S)&)(W&)(%R(+C13)%1*B'., C&*. E35)*. P%1). A6(34-, http://www.swrcb.ca.gov/about_us/water_boards_structure/ (last updated July 5, 2012).

319. A handful of other states place both water pollution and water allocation authorities in a single entity, but that is distinctly a minority choice. *See* Adam Schempp, *At the Con"uence of the Clean Water Act and Prior Appropriation: #e Challenge and Ways Forward*, 43 E35)*. L. R(0. 10138, 10141 (2013) (providing a table listing the agencies with primary water quality and water allocation authority in all western states).

320. *Id.*

rights.[321] In California, by contrast, water quality is supposed to prevail.[322] New water rights may not be issued unless they are in the public interest.[323] In making that determination, the Board considers, among other things, the various beneficial uses protected by water quality plans.[324] It is not just new water rights that are, at least on paper, subordinate to water quality. Existing water rights are subject to modification if necessary to achieve water quality standards.[325] California water rights permits now include an explicit statement putting their holders on notice of this possibility.[326] Permits are also subject to modification, if necessary, to protect public trust resources.[327] Modification of water rights remains a last resort, however—available only if discharge limits alone cannot achieve water quality objectives.[328]

B. *What's Gone Wrong*

That limitation of California law encapsulates the single biggest impediment to restoring the physical, biological, and chemical integrity of the Bay-Delta ecosystem as the CWA envisions. That impediment is more a matter of politics than of law. It is the unwillingness to revise water rights, even when the legal authority, and ostensibly the legal obligation, to do so are in place. Decisions to alter existing water entitlements are never going to be easy, but they cannot be avoided if we truly want to protect our aquatic ecosystems.

In some states, the law itself stands in the way of adjusting established water rights to reflect modern environmental goals and ecosystem realities. As explained above, however, California lacks the statutory and regulatory barriers to water rights modernization that are common in other western states.[329] Any time the legal status quo is changed, there will be concerns about takings liability and its potential impact on government budgets. But water rights adjustment in California is less likely to require compensation as a taking than in other states. California's strong public trust doctrine serves as a background limitation on water rights,[330] and the state constitution limits water rights to water reasonably required to serve beneficial uses.[331] As a matter of law, therefore, California has the freedom to revise water rights to serve the modern world, in which the values of intact functional ecosystems are recognized as important and climate change imposes new hydrologic limits.

Nonetheless, political resistance poses very real barriers to that kind of adjustment. The status quo has a strong pull both on the human psyche and on the political process.[332] It is easy for academics to criticize SWRCB for its reluctance to revise water rights, but it is important to realize just how difficult those kinds of changes are for an agency that cannot be wholly divorced from political realities. The political resistance to change brings with it practical barriers. When SWRCB has undertaken water rights adjustments, the proceedings are inevitably lengthy and resource-intensive.[333] Litigation typically follows, further extending the time line before change can become final. In addition to delay, political pressure has tended to push the agency to take the most cautious position it thinks it can defend in the courts. SWRCB has, for example, defended its refusal to revise spring pulse flow standards on the grounds that it does not yet have "conclusive" data to support change.[334]

Although law is not the keystone barrier to water rights modernization, it can make a difference in the ability to shift the political keystone. The state and federal processes the CWA has triggered in the Bay-Delta have changed the political landscape. For decades, California chose not to quantify and aggressively administer water rights as other western states have done. Instead, in the words of the late Frank J. Trelease,[335] the state threw money at any problem that arose. California is still trying to "solve" the continuing decline of the Bay Delta by pouring more concrete. But Cal-Fed and subsequent processes have spotlighted the deficiencies in the administration of the system's unique dual system of water rights and the external environmental and other costs that the system has produced. The state has begun the slow process of identifying possible existing water rights, exploring how more water can be wrung from urban and agricultural water conservation, and remedying the externalities of decades of dams and diversions.[336] The scope of this achievement should not be underestimated, but it has not yet gone far enough to reverse decades of harm to the ecosystem. More needs to be, and can be, done. The CWA has a role to play in that process, in California, and beyond.

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321. The precise wording varies from state but the idea is a universal one—where they conflict, water rights prevail over water quality concerns. *Id.* at 10143.
322. *See* CAL. WATER CODE § 1253, 1255 (West 2012).
323. *Id.* at § 1255.
324. *Id.* §§ 1243.5, 1257, 1258; United States v State Water Res Control Bd., 227 Cal. Rptr. 161, 169–70 (Ct. App. 1986).
325. *State Water Res. Control Bd*, 227 Cal. Rptr. at 169–70.
326. CAL. WATER CODE § 780 (2013).
327. Nat'l Audubon Soc'y v Superior Court, 658 P.2d 709, 712 (Cal. 1983); *id.*
328. CAL. WATER CODE § 780(b).
329. *See infra* notes 327–35 and accompanying text.
330. *See generally Nat'l Audubon Soc'y* 658 P.2d 709 (public trust allows State Water Resources Control Board to impose post-hoc limitations on the exercise of vested water rights which impose trust values).
331. CAL. CONST. art. X, § 2.
332. *See* Holly Doremus, *Takings and Transitions*, 19 J. LAND USE & ENVTL. L. 1, 21–24 (2003) (explaining why policy inertia is more likely than policy impulsiveness).
333. Rieke, *supra* note 242, at 355.
334. SWRCB, WATER QUALITY CONTROL PLAN FOR SALINITY 6 (2006).
335. The late Frank J. Trelease was the foremost water law scholar of his generation. Most of his career was spent at the University of Wyoming, but in the 1980s, health reasons forced him to move to California where he taught at the McGeorge School of Law. Professor Tarlock remembers a conversation with him shortly after his move where he expressed amazement that California did not aggressively administer its water rights to the last fraction of an acre foot, as did Colorado and Wyoming, but instead "just threw money at any water problem." For a riff on his reaction to California water rights administration see A. Dan Tarlock, *From Natural Scarcity to Artificial Abundance: The Legacy of California Water Law and Politics*, 1 HASTINGS W.-NW. J. ENVTL. L. & POL'Y 71, 77 (1994).
336. *See, e.g.*, CAL. WATER CODE § 85230 (West 2012) (creating a Delta watermaster responsible for monitoring water use and enforcing water rights and restrictions in the Delta).

C. *Taking the Next Steps*

If the nation is serious about protecting and restoring its aquatic ecosystems, it needs a stronger role in !ow decisions " is, of course, is not a new suggestion In 1998, the Western Water Policy Review Advisory Commission wrote that "[f] ul#lling the mandate of [the] CWA to protect physical and biological, as well as chemical, water quality is di$cult if not impossible without" e%ective integration of water quality and water use management.[337] " e Commission also recognized the di$culty of moving to a more integrated federal policy[338] For forty years, the nation has tread softly with respect to decisions about the quantity of water that must remain in its streams, leaving those choices primarily to the states . It is not likely to reverse that stance in the next few years We do not anticipate repeal of the Wallop Amendment, which declares, as a national policy, "that the authority of each State to allocate quantities of water within its jurisdiction shall not be superseded, abrogated or otherwise impaired by" the CWA.[339]

Although we do not foresee a CWA that forces reluctant states into wholesale reallocation of water rights, there are more limited and realistic steps that could make a di%erence in those states. We also believe EPA could do more to promote success in states, like California, which are generally trying to move ecosystem restoration forward

1. Replicating the Positive

Some of the positive aspects of the Bay-Delta story cannot be easily translated to other contexts . As we noted above, the geographic and political landscape is unusually favorable for ecosystem protection e%orts in California.[340] Where watersheds cross multiple states, that complexity cannot be reduced. Nor is there any magic pill to make public opinion in other states take on the green shade it has in California.

" e other positive element in the Bay-Delta is legal and institutional integration of water quality and quantity management. " at cannot be directly mandated by the federal government, either as a legal or as a political matter .[341] EPA could do more to encourage e%ective integration, however. It could, for example, o%er #nancial and technical assistance to states interested in more closely aligning their programs . As a starting point, EPA might undertake a survey of state programs seeking to identify "best practices" for integration under di%erent large-scale structural architectures. " e product of that survey could be a web-based resource that would help states identify relatively easy steps they might take . EPA could also undertake a study of the advantages o%ered by integration. Bureaucratic change is never as easy as it sounds, and states are understandably likely to resist it unless they see clear bene#ts. Identifying ways that integration can help stretch tight state budgets or improve decisions on discharge permits over the long term could help justify the unavoidable short-term costs.

2. Improving the Negative

In California, the CWA has helped put the need for water management reform on the table. Even in the Bay-Delta—with all its positives—the CWA and the suite of other federal and state laws that have been brought to bear have not yet overcome resistance to fundamental change . Changing that outcome will require changing the political landscape, which systematically favors the status quo EPA is using its CWA authority to that end, but it could do so more e%ectively . It could also do so more generally, in ways that would have e%ects beyond the Bay-Delta

Even in a state with strong public support for environmental protection, it is hard to overcome the political power of the status quo . By taking an aggressive stance, EPA can take some of the political pressure o% state o$cials, allowing them more room to take protective measures " at kind of dynamic has played out in the ESA context in California and elsewhere. A recent example is SWRCB's adoption of regulations limiting water spraying for vineyard frost control in the Russian River Valley[342] When there are late spring frosts, that spraying can dewater stretches of the Russian River, stranding young salmon.[343] After NMFS became aware of strandings of listed salmon smolts, it threatened SWRCB with an enforcement action under the ESA[344] " at gave SWRCB the motivation it needed to adopt regulations prohibiting such spraying as an unreasonable use of water unless the vineyards have an approved frost protection plan.[345] Some of the most aggressive aspects of the regulations have been ruled invalid by a trial court, [346] but the political point remains: SWRCB would not have felt it had the political maneuvering room to adopt the frost protection regulations without a credible push from NMFS

" e CWA does not have the "pit bull" reputation or characteristics of the ESA, [347] particularly when it comes to !ow regulation, so it cannot be used in quite the same way . But the run up to Cal-Fed shows that threats to disapprove state water quality standards and to impose federal standards can break political gridlock at the state level .[348] EPA has been remarkably patient on Bay-Delta water standards since the

337. W. W&' ( ) P*+,- . R(/,(0 A1/,2*) . C*3 3'4 *supra* note 14, at 6–20.
338. *Id.* at xxii (noting that the CWA leaves allocation decisions to the states)
339. CWA § 101(g), 33 U.S.C. § 1251(g) (2006).
340. *See supra* Part IV.A.
341. *See supra* Part II.B.

342. *Frost Protection Regulation* , S'&' (W&' ( ) R(2. C*4') *+ B1 ., C&+. E4/ '+ P) *' . A6(4- . , http://www.waterboards.ca.gov/waterrights/water_issues/programs/hearings/russian_river_frost/ (last updated Jan. 3, 2012).
343. D,/. *7 W&' ( ) R,68 '2, S'&' (W&' ( ) R(2C*4') *+ B1., C&+. E4/ '+. P) *' . A6(4- . , S'&' (C+(&),468*92(N *. 2010102053, D)&7' E4/ ,) *4 3 (4'&+ I3 :&- ' R(: *) ' : R922,&4 R,/ ( ) F) *2' P) *' (- ', *4 R(69+&', *4 10 (2011), *available at* http://www.waterboards.ca.gov/waterrights/water_issues/programs/hearings/russian_river_frost/docs/deir/draft_eir_no_#gures.pdf.
344. Regulatory authorities violate section 9 of the ESA if they authorize behavior that results in prohibited take of listed species. Loggerhead Turtle v. Cnty. Council, 148 F.3d 1231 (11th Cir. 1998); Strahan v. Coxe, 127 F.3d 155 (1st Cir. 1997).
345. C&+. C*1 (R(62. tit. 23, § 862 (2013).
346. Order Granting Petition for Writ of Mandate in Consolidated Cases, No . SCUK CVG 11 59127 (Cal. Super. Ct. Mendocino Cnty. Sept. 26, 2012).
347. J.B. Ruhl, *Climate Change and the Endangered Species Act: Building Bridges to the No-Analog Future*, 88 B.U. L. R(/. 1, 4 (2008).
348. *See supra* Part III.B.

beginning of the Cal-Fed experiment. Patience is appropriate while a state is making progress, but the time for patience has run out in the Bay-Delta. EPA notes in its recent Action Plan that progress has been much slower than promised on ecosystem protective water standards.[349] Rather than continue to defer on those standards, EPA should begin its own proceeding to identify necessary flows and salinity levels. In the larger context, EPA should make it clear that states may not demand absolute certainty before they make necessary changes when water quality standards are not protecting designated uses.

Lingering ambiguity about the extent of EPA's authority to impose standards related to flow need not deter the agency. At some point, EPA will have to push the limits of that authority if it is to achieve the goals of the CWA. It also should keep in mind that SWRCB, when it repeatedly challenges that authority in its water quality control plans,[350] is playing to its own political audience and may be bluffing. Some ambiguity about relative legal authorities may even be desirable because it can allow each level of government to push forward when political conditions allow.

Although EPA needs to make it clear that certainty can not be the trigger for action, it is true that uncertainty about causes of and solutions to decline is a difficult problem for aquatic ecosystem restoration. EPA, in partnership with the federal wildlife agencies, can play three key roles with respect to information. First, federal agencies should maintain a publicly accessible central repository for data on the intersection of water quality and water quantity. State authorities facing the uncomfortable prospect of having to revise water rights may avoid gathering or confronting relevant data.[351] In this context, it may be a good thing that EPA does not have direct regulatory authority over water rights. It should not have the same reluctance as water rights agencies to gather, interpret, and disseminate relevant monitoring data and models. Those data could be used by ecosystem advocates to push for state regulatory action. Although others have suggested that EPA could more aggressively force states to keep and disclose records on flows and their impacts on water quality,[352] we think the political context, coupled with some doubt about authority to force monitoring of this type, argues for direct federal monitoring.

Second, EPA and other federal agencies could direct funding to research designed to clarify relationships between diversions, flows, and ecosystem functions. In the Bay-Delta, the state has supplied reasonable amounts of funding for these sorts of studies, and the Delta Independent Science Board (successor to Cal-Fed's lauded science program) provides a credible venue for identifying promising projects.[353] That will not always be the case, so EPA should generally plan to support independent science. Even in the Bay-Delta, state funding is always limiting; federal funding could thus help leverage state efforts. Federal funding might be specifically targeted toward studies whose conclusions could prove useful beyond the Bay-Delta. There are obvious economies of scale in having the federal government identify and fund overarching research with significance for multiple watersheds. Federal authorities should not simply throw money at scientific problems. They should also convene and finance broad review efforts aimed at clarifying not only what is known of the relationships between flow and water quality, but also what *can* be known, and at what cost. State authorities who find uncertainty a convenient delaying tactic will have little incentive to clarify the causes of uncertainty or the prospects of reducing it. That information, however, may be crucial for reviewing courts,[354] and for effective public oversight.

Third, EPA can make information more useful by requiring finer state definition of designated uses and, therefore, of the water quality standards necessary to support those uses. California does reasonably well on this score, but many states do not. The more generally water uses are defined, the more difficult it is for EPA to oversee water quality standards, and the easier it becomes for state authorities to avoid politically difficult decisions.

V. Conclusion

One way to think about the CWA as it turns forty is to consider our reaction today to the cars on the road when the CWA was enacted. Big cars, adorned with killer tails and grills, ruled the road, guzzling gas that was then available for thirty-six cents per gallon. We thought those cars were cool, just as we thought that the CWA was cool. But, of course, times change. Few of us would want to rely on a 1972 car for transportation today, yet we are still trying to maintain and improve the quality of our nation's waters and the aquatic ecosystems they support with a clunky piece of early 1970s legislation. Ultimately, the CWA needs to be traded in.

The Delta experiment, imperfect as it is, contains an important lesson for the future. The guiding principle of a twenty-first century model CWA must be to reintroduce hydrology. This new model must be built on the Supreme Court's 1994 acknowledgment that the distinction between water quality and quantity that has come to dominate CWA implementation is "artificial."[355] Hydrology actually was an integral part of pre-1972 pollution control, although not in a way we should want to replicate. Back then, it was used to promote, rather than control, the use of rivers and lakes as waste sinks.

349. *See supra* Part II.

350. K$%/$&' ( ) $*, *supra* note 287, at 4.

351. *See* Eric Biber, *The Problem of Environmental Monitoring*, 83 U. C+*+. L. R(,. 1, 43–48 (2011) (explaining why regulatory agencies might avoid monitoring)

352. *See, e.g.*, Benson, *supra* note 317, at 257 ("EPA's first and most fundamental step should be to require that all states identify their flow-impaired waters. . . .").

353. *See Delta Independent Science Board*, D(*)$S)(/ $012&%C+345'*, http://deltacouncil.ca.gov/science-board/delta-independent-science-board (last visited Apr. 11, 2013) ("The Delta Independent Science Board (Delta ISB) is a standing board of nationally or internationally prominent scientists with appropriate expertise to evaluate the broad range of scientific programs that support adaptive management of the Delta").

354. *See* San Luis & Delta-Mendota Water Auth. v. Salazar, 760 F. Supp. 2d 855, 882 (E.D. Cal. 2010), *appeal docketed*, No. 11-15871 (9th Cir. Sept. 8, 2011).

355. PUD No. 1 of Jefferson Cnty. v. Wash. Dept. of Ecology, 511 U.S. 700, 701, 719 (1994).

Hydrology must be reintroduced and turned to ecosys - tem protection ends for three reasons. First, climate change is here. Given the unwillingness of the international community—led by China, India, and the United States—to engage in serious mitigation e!orts, all we can do is adapt.[356] We are already seeing adverse impacts on water systems and ecosystems. Second, the federal government and many states have committed billions of dollars to aquatic ecosystem res toration experiments. " e kicker is that none of these experi - ments have a clear target for what the restored system should look like in terms of climate adjusted water quantity and quality parameters. " ird, there are many gaps in the CWA's coverage that need to be closed before we can come close to meeting its goal of restoring aquatic ecosystem integrity.

As Bay-Delta restoration e!orts have tried to do,[357] we must start with the watershed. " ere have been numerous e!orts to control pollution at the watershed level, but almost none have had an adequate legislative framework. When the federal government stopped building large dams, it also abstained from any serious e!ort to create e!ective water - shed management institutions.[358] " is Progressive Era vision needs to be revived and adapted to the Environmental Pro - tection Era.

Next, we need to comb through all post-1972 e!orts to measure water quality and synthesize them with all the research on river function and the ecosystem services that water bodies provide. " e end product should be a set of acceptable stream function parameters. For each water- shed, these parameters would have to be adjusted for climate change and applied to develop an acceptable range of stream conditions. We could think of these as hydrology-based, rather than use-based, water quality standards. From here, state pollution control agencies, overseen by the federal EPA, would have to identify, using all the new land mapping tech - nology that has been developed since 1972, all major sources of harmful discharges—including dams, diversions, and farms for starters—that need to be controlled to maintain the parameters. Using legislation that gives them authority over all these sources, a mix of best practices, performance standards, and technology-based standards would be applied to bring the watershed into compliance.

" is is a big dream, and one that is not likely to be realized overnight. At some point, though, it becomes ine9cient, if not impossible, to keep a forty year old car running. Even as individual parts are replaced, the car can no longer perform the functions and services that it did when it was built. " e same can be said of the CWA. It is time to think of a trade in for something suitable to the challenges we face today in managing the natural resources that we need to survive and thrive.

356. Past emissions of greenhouse gases, together with the social inertia that is im - peding strong emission controls, make substantial global warming over the next century essentially inevitable. A recent statistical analysis of leading cli - mate models, for example, projects that average seasonal temperatures in North America will increase more than two degrees Celsius by 2070, with much high er winter increases in some locations. Emily L. Kang & Noel Cressie, *Bayesian Hierarchical ANOVA of Regional Climate-Change Projections from NARCCAP Phase II*, 22 I#$%J. A&&%( ) E*+$, O-. (+/ *$'0# 1 G(0'#20. 3 (2013).

357. U.S. E#/$% P+0$. A3(#45, W*$(+ Q6*%$5 C, *%(#3(. ;*supra* note 290, at 16–17.

358. W. W*$(+ P0%45 R(/'(7 A)/'.0+5 C08 8'#*supra* note 14, at 2–12, 13–17.

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