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Implementing Ecosystem-Based Management

Brian Gray

Jennifer L. Harder
University of the Pacific, jharder@pacific.edu

Karrigan Bork
University of California, Davis

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BRIAN GRAY, JENNIFER HARDER, AND KARRIGAN BORK*

ABSTRACT

Most freshwater ecosystems in the United States are in a state of collapse. Existing management efforts take a piecemeal approach, addressing individual stressors, managing the systems for individual benefits, and protecting individual species. These disjointed efforts are doomed to fail. Both the legal literature and the scientific literature are rich with articles extolling the advantages of ecosystem-based management; that is, simultaneous management of water, land, and organisms to achieve a desired ecosystem condition benefiting both native biodiversity and human well-being. This approach has succeeded in other aquatic systems, particularly marine ecosystems, but the ecosystem-based management approach has struggled for adoption in the freshwater ecosystem context.

The primary challenge lies in implementation. Freshwater ecosystems face a complex web of local, state, and federal law, and those laws create a perceived legal barrier to adoption of ecosystem-based management. Nevertheless, the existing legal literature offers little practical guidance for developing the legal and governance framework to implement freshwater ecosystem-based management in practice.

Using the state of California as a case study, this article shows that the California Water Board is empowered and well-positioned to implement freshwater ecosystem-based management in California. By demonstrating that existing state and federal laws allow and even support ecosystem-based management, this article lays out a new state-level legal framework for better management of freshwater ecosystems. This approach, which does not require controversial changes to state and federal law, offers a reasonable and realistic way to improve the state of freshwater ecosystems.

INTRODUCTION

A narrow range of species and stressors drive management of freshwater ecosystems. In California, most freshwater ecosystem management occurs under the guise of water quality regulation and fisheries protection, but these frameworks historically have focused on individual stressors, individual beneficial uses of water, and individual species. Although the standards and operational constraints that derive from these policies often overlap, they are not applied in an integrated manner that recognizes hydrological, biological, and chemical relationships within aquatic ecosystems. Nor do they account for conflicts and tensions that may arise when regulations designed to protect one aquatic species differ from those focused on another. This piecemeal approach is fundamentally flawed.

The flaws of single-species management are brought into sharp focus by the plight of freshwater species in California. State and federal

laws protect more than 100 freshwater-dependent species of plants and animals; although some extinctions have been prevented, few of the species show signs of recovery and many are locally extinct in their native habitats.[1] The number of freshwater species likely to become extinct due to ecosystem failures likely far outweighs the number of currently protected species.[2] For example, during California's 2012–16 drought, eighteen fish species were nearly extirpated in key habitat regions, but only half of those species are currently protected.[3]

Current conservation actions are not only unsuccessful, they also have outsized impacts on public water suppliers and other consumptive uses of water.[4] Continued single-species management will lead to continued ecosystem-level declines, and these changes will continue to disrupt water management and complicate the already complex management of social and economic uses of water in the state.[5] California needs a new approach.

The Public Policy Institute of California's[6] 2019 report *A Path Forward for California's Freshwater Ecosystem*s ("PPIC Report") proposes a new management strategy to facilitate integrated and holistic management of California's freshwater resources based on ecosystem structure and function.[7] The PPIC Report proposes

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*Brian Gray is a Senior Fellow at the Public Policy Institute of California in the Water Policy Center and a Professor *emeritus* at the University of California Hastings College of the Law. The authors would like to thank Leon Szeptycki, Andy Sawyer, Jeff Mount, and Ellen Hanak for their helpful comments on this work. Jennifer Harder is a Professor of Law, Legal Practice, at the University of the Pacific, McGeorge School of Law in Sacramento, California. She is co-author of WEBER, HARDER, AND BEARDEN, CASES & MATERIALS ON WATER LAW (10th ed. 2020). Karrigan Bork is an Acting Professor of Law at the University of California, Davis, where he serves as an Associate Director at the Center for Watershed Sciences. His research is available at bit.ly/BorkSSRN.

1. JEFFREY MOUNT ET AL., A PATH FORWARD FOR CALIFORNIA'S FRESHWATER ECOSYSTEMS at 5 (Public Policy Institute of California 2019), https://www.ppic.org/publication/a-path-forward-for-californias-freshwater-ecosystems/ [hereinafter PPIC REPORT].

2. *Id.*

3. *Id.*

4. *Id.* at 4, 8, 14–15; *see* U.S. DEPARTMENT OF JUSTICE, THE INTERSECTION OF THE ENDANGERED SPECIES ACT AND WATER PROJECTS (June 27, 2018) (describing water and ESA litigation in California's Central Valley), https://www.justice.gov/enrd/i-i-water-projects (last visited Apr. 4, 2021).

5. *Id.*

6. The PPIC is a nonprofit, nonpartisan think tank seeking to improve California public policy through independent research. *Mission, Vision, & Values*, PPIC (Aug. 19, 2020, 10:00 AM), https://www.ppic.org/about-ppic/mission-vision-values/.

7. PPIC REPORT, *supra* note 1. The PPIC Report was supported with funding from the S.D. Bechtel, Jr. Foundation and the funders of the PPIC CalTrout Ecosystem Fellowship. This

ecosystem-based management (EBM) as a more adaptable approach that will both improve species' conditions and better accommodate water use. The PPIC Report defines EBM as "the simultaneous management of water, land, and organisms to achieve a desired ecosystem condition that benefits both native biodiversity and human well-being."[8]

Although the general concept of ecosystem management has been explored many times,[9] the PPIC proposal provides a specific vision of EBM designed to protect species more effectively, reduce new federal and state species listings, improve habitat quality, and decrease conflict between environmental and human uses of water.[10] The approach focuses on varied and dynamic habitat improvement to provide better species recovery than a narrow focus on a single species.[11] We refer to the model of EBM proposed by the PPIC as cooperative ecosystem-based management (CEBM). This nomenclature distinguishes the proposal from other forms of EBM and reflects two important aspects of the PPIC proposal—-locally developed plans within a state framework, a form of cooperative subfederalism,[12] and negotiated agreements based on cooperation among stakeholders to achieve ecosystem management. The PPIC Report concludes that CEBM will allow regulators and managers to incorporate new science more readily, respond to environmental changes more quickly, conduct

article evolved from a technical appendix to the PPIC Report authored by Gray, Harder, and Bork.

8. *Id.* at 8. Although definitions vary, most are roughly similar to this definition. *See, e.g.*, Karen L. McLeod et al., *Scientific Consensus Statement on Marine Ecosystem-Based Management*, COMMUNICATION PARTNERSHIP FOR SCIENCE AND THE SEA at 1 (2005), (defining EBM as "an integrated approach to management that considers the entire ecosystem, including humans. The goal of ecosystem-based management is to maintain an ecosystem in a healthy, productive and resilient condition so that it can provide the services humans want and need. Ecosystem-based management differs from current approaches that usually focus on a single species, sector, activity or concern; it considers the cumulative impacts of different sectors.").

9. For an overview in the marine sector, see RICHARD BURROUGHS, COSTAL GOVERNANCE (2011). For a broader perspective, see Martin Nie, *Whatever Happened to Ecosystem Management and Federal Land Planning?*, THE LAWS OF NATURE: REFLECTIONS ON THE EVOLUTION OF ECOSYSTEM MANAGEMENT LAW AND POLICY 68, 87 (Kalyani Robbins ed., 2013). *See generally* Steven L. Yaffee, *Collaborative Strategies for Managing Animal Migrations: Insights from the History of Ecosystem-Based Management*, 41 ENV'T. L. 655 (2011).

10. PPIC REPORT, *supra* note 1, at 10.

11. *Id.* at 15.

12. *See generally* Dave Owen, *Cooperative Subfederalism*, 9 U.C. IRVINE L. REV. 177 (2018).

meaningful adaptive management, and better account for climate change and population growth.[13]

Freshwater ecosystems are under serious threat globally, and the existing regulatory approaches have failed to halt the slide.[14] EBM offers an approach to better address these risks. The key piece that distinguishes EBM from other approaches lies in its core assertion that "human society [i]s an integral part of [the] ecosystem."[15] However, in spite of years of support in the law literature for EBM, there has been little adoption in the field outside of marine fisheries management, where it has been generally successful.[16] Most efforts at EBM outside of the marine realm offer little more than halting steps toward true EBM.[17]

What accounts for the broad failure to adopt EBM in spite of its theoretical and even political support? The challenges are in implementation. Some criticize EBM as too complex for the "real world."[18] Others note that "[d]espite the widely accepted need for ecosystem-based management of coastal and marine systems, many managers struggle with how to put these principles into practice."[19]

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13. PPIC REPORT, *supra* note 1, at 14–15.

14. Simone D. Langhans et al., *Combining Eight Research Areas to Foster the Uptake of Ecosystem-Based Management in Fresh Waters*, 29.7 AQUATIC CONSERVATION: MARINE AND FRESHWATER ECOSYSTEMS 1161, 1161 (2019) (noting that "anthropogenic risks [to freshwater ecosystems] have not yet been tackled satisfactorily.").

15. R. D. Long, A. Charles & R. L. Stephenson, *Key Principles of Marine Ecosystem-Based Management*, 57 MARINE POL'Y 53, 53 (2015).

16. *Id.*

17. *See, e.g.*, Ryan P. Kelly & Margaret R. Caldwell, *"Not Supported by Current Science": The National Forest Management Act and the Lessons of Environmental Monitoring for the Future of Public Resources Management*, 32 STAN. ENV'T. L.J. 151, 167 (2013) (noting that "late-Clinton-era regulations [rooted] USFS decision making in principles of ecosystem-based management and sustainability, but were quickly replaced by a new set of rules early in the George W. Bush administration"); Rachel D. Long et al., *Key Principles of Ecosystem-based Management: the Fishermen's Perspective*, 18 FISH & FISHERIES 244, 244 (2017) (noting that "[d]espite the growing popularity of [EBM] in national legislation and in research and institutional literature, there is often an implementation gap 'on the ground,' impeding widespread adoption in fisheries."); Nie, *supra* note 9; *see also* Robin Kundis Craig, *Learning to Live with the Trickster: Narrating Climate Change and the Value of Resilience Thinking*, 33 PACE ENV'T. L. REV. 351, 391 (2016) (calling for "across-the-board *serious* implementation of ecosystem-based management based on a *strong* precautionary principle . . . now informed by the new reality that all bets are off for ecosystems in a climate change era.").

18. Langhans, *supra* note 14, at 1161 (citing J. Ansong et al., *An Approach to Ecosystem-based Management in Maritime Spatial Planning Process*, 141 OCEAN & COASTAL MGMT., 65–81 (2017)).

19. Heather Tallis et al., *The Many Faces of Ecosystem-Based Management: Making the Process Work Today in Real Places*, 34.2 MARINE POL'Y 340, 340 (2010).

Many commentators blame our existing legal framework for creating a serious barrier to EBM implementation.[20] This criticism refers to federal and state laws that operate independently of one another, implemented by agencies that rely on siloed regulatory processes to implement uncoordinated (and sometimes conflicting) standards. One commentator suggested that "frequent, wide-scale, and synchronized interaction between agencies was simply not contemplated by existing natural resource management laws, so that coordinated ecosystem-based management is still the exception in natural resource governance."[21] Others point to problems like "rigid budgetary systems, insufficient funding, deficiencies in leadership, and an assortment of organizational biases and legal challenges."[22] In short, "[t]he need to identify a more focused set of governance conditions that better facilitate EBM seems clear."[23] Efforts to encourage EBM in freshwater ecosystems should thus aim at how EBM can work in practice.[24] This article takes on the challenge by demonstrating a legal pathway for implementation of CEBM in California based on the PPIC's CEBM work.[25]

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20. Deborah A. Sivas & Margaret R. Caldwell, *A New Vision for California Ocean Governance: Comprehensive Ecosystem-Based Marine Zoning*, 27 STAN. ENV'T. L.J. 209, 228 (2008) (noting that "California's Fragmented Existing Infrastructure for Regulating Marine Resources and Uses Prevents Effective Interagency Coordination [and] Impedes Ecosystem-Based Management.").

21. Alejandro E. Camacho, *Assisted Migration: Redefining Nature and Natural Resource Law Under Climate Change*, 27 YALE J. ON REGUL. 171, 208 (2010).

22. Nie, *supra* note 9, at 87.

23. Jason S. Link & Howard I. Browman, *Operationalizing and Implementing Ecosystem-Based Management*, 74 *ICES J. MARINE SCI.* 379, 380 (2017). Prof. Keiter highlights the problem in Robert B. Keiter, *Beyond the Boundary Line: Constructing a Law of Ecosystem Management*, 65 U. COLO. L. REV. 293, 316–17 (1994) and continues to push EMB forward in his recent work. *See generally* Robert B. Keiter, *Toward A National Conservation Network Act: Transforming Landscape Conservation on the Public Lands into Law*, 42 HARV. ENV'T. L. REV. 61 (2018); Robert B. Keiter, *The Greater Yellowstone Ecosystem Revisited: Law, Science, and the Pursuit of Ecosystem Management in an Iconic Landscape*, 91 U. COLO. L. REV. 1, 163 (2020) (noting that the failure of early ecosystem management efforts in the 1990s "still hangs over the federal agencies, serving as a precautionary lesson against comprehensive, region-wide federal initiatives.").

24. Langhans, *supra* note 14, at 1161.

25. Readers seeking a broader take on the literature around the science of freshwater EBM could review the PPIC publication, the collected articles in a 2017 issue of the ICES Journal of Marine Science, Link & Browman, *supra* note 23, at 379, or Langhan's review, Langhans, *supra* note 14.

California offers a long and complicated history of water and environmental regulation. The politics are messy and fierce, but California offers some hope for those advocating the CEBM approach. In particular, the implementation of water quality law in California has given the State Water Resources Control Board ("State Water Board" or "Board") broad power to set water quality standards for all of California's surface water systems and, in concert with its nine regional water quality boards, to enforce those standards through water rights and pollutant-discharge permitting.[26] This means that the Board has the power to regulate the quality, volume, and timing of waterflows through California's freshwater ecosystems. The Board's broad authority also gives it the power to incentivize land use and management actions that could align with its direct water regulation. Together, this gives the State Water Board the scope of authority required to simultaneously manage "water, land, and organisms to achieve a desired ecosystem condition that benefits both native biodiversity and human well-being."[27] The PPIC Report proposes that the Water Board, using its authorities under state and federal water quality laws, has the best potential of any existing entity to integrate CEBM into the laws that govern fish protection.[28]

Despite these advantages, CEBM through the Water Board poses challenges. This article examines whether the State Water Board and other agencies could incorporate principles of CEBM into their regulatory policies and apply those principles consistent with existing laws. We conclude that they could do so and propose two policy changes that would enhance the ability of regulators and water managers to implement ecosystem-based strategies.[29]

This article takes a wide view of California and federal law to identify a framework for implementing CEBM and then addresses the most common legal objections to this approach.[30] This broader vision is a necessary first step in transforming California's relationship to its ecosystems. Moreover, this blueprint for CEBM in the nation's most

26. PPIC REPORT, *supra* note 1, at 15–16.

27. *Id.* at 3.

28. *Id.* at 22.

29. See *infra* Section III.

30. Admittedly, there is a lot more law that affects ecosystem-based management than what this article covers. We only briefly address the California Environmental Quality Act (CEQA), or its federal counterpart, the National Environmental Policy Act (NEPA). We generally do not discuss citizen suit provisions and their enduring role in ensuring compliance with California and federal environmental law. We also largely omit the messy federal, state, and local politics that mark California water law.

populous state, with a water law system marked by deeply entrenched interests and long running conflicts, should provide a useful case study for other states looking to transform their freshwater ecosystem management.

Section II explains PPIC's proposal for cooperative ecosystem-based management and then shows how existing California law provides both a governing framework and authority for the water board to implement cooperative ecosystem-based management. Section III analyzes existing laws that could interfere with cooperative ecosystem-based management and demonstrates that these laws could be harmonized with this approach. Section IV proposes two policy reforms to improve implementation of cooperative ecosystem-based management, and Section V briefly concludes.

I. A Governance Framework for Ecosystem-based Management

A. PPIC's Approach to Ecosystem-based Management

The heart of the PPIC proposal is simple. Local stakeholders and water managers would develop "sustainable watershed management plans."[31] These plans would either be required, or strongly encouraged, by the Board and would "set priorities, identify trade-offs, and create water allocation and habitat plans to better mitigate impacts and provide greater certainty for freshwater ecosystems and the water user community."[32] The Water Board would provide guidance, technical support, and oversight.[33] The PPIC's innovative vision would structure the sustainable watershed management planning processes similarly to the process for groundwater management plans in California's Sustainable Groundwater Management Act of 2014 (SGMA),[34] which itself reflects a state-level version of the cooperative federalism model endemic in modern environmental law.

The sustainable watershed management plans would be based in part on negotiated agreements between water managers and water users to facilitate more rapid development and avoid protracted litigation.[35] Ultimately, the Board would integrate these agreements

31. PPIC REPORT, *supra* note 1, at 21–22.
32. *Id.*
33. *Id.*
34. CAL. WATER CODE § 10727 (West 2019).
35. PPIC REPORT, *supra* note 1, at 21–22.

into the state's existing water quality control plans, prepared under state and federal water quality laws, which would make the agreements legally binding and enforceable. The plans would include specific timelines for development and revision of agreements, to facilitate continued development of the plans.[36] In sum, the approach would consist of sustainable watershed management plans covering every watershed in the state. The plans would build on negotiated agreements, and the agreements would be enforceable after their adoption into the state's water quality control plans.

This recommendation focuses on the State Water Board for two reasons. First, under existing law, the Board is the primary administrator of the laws that govern freshwater ecosystems in California—state and federal water quality law and water rights permitting.[37] Second, the Board plays an essential role in integrating other regulatory policies into state water management, including fish and wildlife protections, federal hydropower licenses, and state and federal endangered species requirements.

The PPIC Report outlines several benefits achieved by this vision of ecosystem-based management. First, the proposed approach would integrate human uses into ecosystem management.[38] Under the current water management system, environmental health is viewed as a limiting factor for water use.[39] True ecosystem-based management seeks to move away from simplistic binary choice of people versus nature, and instead to integrate diverse social and economic interests to improve both human well-being and ecosystem condition. The environment would hold assets in an ecosystem water budget, and therefore become a partner in water management, rather than just a constraint.[40]

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36. *Id.* at 22–23.

37. *Id.*

38. *Id.* at 14–15.

39. *Id.*

40. *Id.* at 13 ("An [ecosystem water budget] EWB is a volume of water allocated to the environment. This water should be managed by an ecosystem trustee or other individual with both the responsibility and authority to allocate the EWB in the most efficient way to meet ecosystem objectives while reducing impacts on other water users. Critically, the EWB should have the status of a priority water right, allowing the trustee to store and use water in surface reservoirs and aquifers and to trade water with other users. Establishing an EWB for a watershed creates assurances for stakeholders, regulators, and water users about environmental allocations. Most importantly, it integrates ecosystem and water management by giving the environment an asset—the EWB itself—along with a seat at the table.").

Second, the proposed approach would align agency priorities and actions.[41] Many federal, state, and local agencies have regulatory responsibilities for aquatic ecosystems. Time-consuming, costly, and often ineffective regulatory systems are frequently identified as the single largest impediment to specific projects designed to restore ecosystems. As proposed by the PPIC, ecosystem-based planning creates the opportunity to organize and align regulatory permitting, monitoring, and management actions.[42]

The PPIC Report emphasizes that both the process by which the plans and agreements are developed and their contents are pivotal to ensuring that ecosystem protection avoids the flawed outcomes of current approaches. At minimum, the PPIC specifies five governance requirements that must be met for successful CEBM: (1) explicit goals for desired ecosystem conditions, benefits, and beneficiaries; (2) metrics and time-specific performance measures to assess goal achievement; (3) strong, transparent, and collaborative science; (4) regulatory alignment across multiple agencies with transparent governance and administration; and (5) reliable funding for habitat improvements, ongoing operations and maintenance, science and monitoring, and administration.[43] The actual management in CEBM also requires a suite of five specified management approaches: (1) ecosystem water budgets; (2) connecting structural habitat to functional flows; (3) managing water quality and quantity together; (4) active management of both native and non-native species; and (5) management at the appropriate scale, often the watershed, to protect dynamic physical and biological connections.[44]

The laws affecting freshwater ecosystems are numerous and complicated. Other commentators have referred to the "law of the river," a morass of sometimes conflicting state and federal law including state-level public trust, environmental, and water rights law, federal environmental law, water project authorizations, and a mixture of other administrative laws.[45] We break these laws into two broad

41. *Id.*

42. *Id.*

43. *Id*. at 10–11.

44. *Id.*

45. *See, e.g.*, Adell Louise Amos, *Developing the Law of the River: The Integration of Law and Policy into Hydrologic and Socio-Economic Modeling Efforts in the Willamette River Basin*, 62 U. KAN. L. REV. 1091 (2013); Craig Anthony Arnold, *Environmental Law, Episode IV: A New Hope: Can Environmental Law Adapt for Resilient Communities and Ecosystems*, 21 J. ENV'T. &

categories: the water quality and water rights laws that empower the Water Board, and the laws seen as constraining the Board, including special laws governing dam operations and the state and federal endangered species acts.[46] Below, we review the Water Board's existing powers against the PPIC requirements for CEBM and demonstrate that the Board's existing authority gives it the power and flexibility to implement CEBM. In the next Section, we address the laws seen as constraining ecosystem-based management and conclude that these laws are more flexible than commonly understood and do not pose insuperable barriers to CEBM. To the contrary, in many instances, ecological science suggests that CEBM is in fact best-suited to the directives of these statutes.

B. Empowering the Water Board: Water Quality & Water Rights Laws

CEBM relies on California's principal laws governing water quality and water rights. These laws grant regulators broad authority to decide which blend of strategies is best suited to achieve defined ecological, public health, and water supply goals. California's state-level clean water act, the Porter-Cologne Water Quality Control Act ("Porter-Cologne") provides a broad regulatory framework, complemented by the water boards' other powers. Foremost among these other powers, California's public trust doctrine and the reasonable use mandate of Article X, Section 2 of the California Constitution provide additional authority for the broad balancing CEBM requires.

SUSTAINABILITY L. 1, 15 (2015) (defining this mix to include "surface water rights, groundwater rights, point source pollution controls, urban nonpoint source pollution and runoff controls, rural and agricultural nonpoint source pollution controls, wetlands protection, land use planning and regulation, protection of endangered species and their habitats, navigation and recreation management, water development projects, flood management, and energy law.").

46. This necessarily omits some law, particularly project or place specific laws, but, as a whole, it captures both the laws that give the Water Board power to implement ecosystem-based management and the biggest legal barriers to its implementation. The PPIC Report includes an addendum, "Other Important Laws for Ecosystem-Based Management," describing the following as also highly relevant: The Sacramento-San Joaquin Delta Reform Act, CAL. WATER CODE §§ 85000–85350 (West 2019); The Central Valley Flood Protection Act, CAL. WATER CODE §§ 9600–9625 (West 2019); The Sustainable Groundwater Mgmt. Act, CAL. WATER CODE §§ 10720–10737.8 (West 2019); Clean Water Act, 33 U.S.C. § 1344 (2018); Lake and Streambed Alteration Agreements, CAL. FISH & GAME CODE §§ 1600-1616 (West 2019), Habitat Restoration and Enhancement Act, CAL. FISH & GAME CODE §§ 1650–1657 (West 2019); Reg'l Conservation Inv. Strategies Act, CAL. FISH & GAME CODE §§ 1850–1861 (West 2019); Nat'l Env't Pol'y Act, 42 U.S.C. §§ 4321–4335 (2018); CEQA CAL. PUB. RES. CODE §§ 21100–21189.57 (West 2019).

1. California's Porter-Cologne Water Quality Control Act

The federal Clean Water Act (CWA) relies on a cooperative federalism model, where states can take on much of the administration of the CWA by passing appropriate state legislation. California's framework for regulating water quality is found in Porter-Cologne, which drives California's own water quality goals and also implements the CWA.[47] To implement Porter-Cologne and CWA, the State Water Board oversees a network of regional water boards. The State Water Board and the regional boards have wide-ranging authority under Porter-Cologne to define ecological objectives, establish priorities and implementation strategies, and regulate principal ecosystem stressors (including water diversions and discharge of pollutants).[48] Together, the boards determine what beneficial uses a given water body should support and then mandate water quality standards, called objectives, to ensure a water body is clean enough and otherwise fit to support the designated beneficial uses. If the boards determine that a given river stretch should support cold water fisheries, for example, water quality objectives for sediment, water temperature, flow, and other parameters of concern would then be set to ensure that the stretch would in fact support cold water fisheries.

This simple approach belies the boards' significant authority. In *United States v. State Water Resources Control Board*, a case challenging the State Water Board's 1978 Water Quality Control Plan for the Sacramento-San Joaquin River Delta and Suisun Marsh, the

47. Clean Water Act section 1313(c) recognizes the primary authority of each state to establish water quality standards, establishing a mandate that each state to adopt water quality standards that define "designated uses" of the "waters of the United States" within state boundaries, as well as the "water quality criteria for such waters based upon such uses." These standards must "protect the public health or welfare, enhance the quality of water and serve the purposes of [the Clean Water Act]." With a breadth similar to Porter-Cologne, the federal statute directs that "standards shall be established taking into consideration their use and value for public water supplies, propagation of fish and wildlife, recreational purposes, and agricultural, industrial, and other purposes . . . ." 33 U.S.C. § 1313(c)(2)(A) (2018). State standards are subject to review by EPA to ensure that they are at least as stringent as necessary to comply with federal requirements, and EPA has authority to set its own standards if a state fails to comply with federal law. 33 U.S.C. § 1313(c)(3)–(4) (2018); 40 C.F.R. § 131.5 (2019).

48. Porter-Cologne applies to all waters of the state, surface and underground. In contrast, the Clean Water Act authorizes federal regulation of activities that may affect the "waters of the United States"—a jurisdictional limitation that has been expanded and contracted by administrative rulemaking and judicial interpretation. *See* U.S. Env't Protection Agency, *Definition of "Waters of the United States" Under the Clean Water Act* (2019), https://www.epa.gov/nwpr/about-waters-united-states (last visited Feb. 17, 2021).

California Court of Appeal explained the breadth and flexibility of the state-wide Board's powers, which the regional boards generally share:

> [T]he Board is invested with wide authority '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.' In fulfilling its statutory imperative, the Board is required to 'establish such water quality objectives . . . as in its judgment will ensure the reasonable protection of beneficial uses,' within the broader constraints of the reasonable use mandate of Article X, Section 2 of the California Constitution. The conceptual classification of beneficial uses is far-reaching. Beneficial uses 'include, but are not necessarily 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.' This formulation, giving the Board broad power to determine beneficial uses and then set water quality standards and carry out water quality planning in service of beneficial uses, gives the Board tremendous powers and responsibilities.[49]

The Boards' discretion is not unlimited. For example, federal and state regulations prohibit changes that would reduce water quality below existing levels.[50] Federal law also requires state water quality

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49. United States v. State Water Res. Control Bd., 182 Cal.App.3d 82, 109–10 (1986) (citing Cal. Water Code §§ 13000 and 13241). The Porter-Cologne Act's delegation of authority to the regional boards is similarly broad. It states that the factors each board shall consider in setting water quality standards that provide reasonable protection to all designated beneficial uses include but are not necessarily limited to: "(a) Past, present, and probable future beneficial uses of water. (b) Environmental characteristics of the hydrographic unit under consideration, including the quality of water available thereto. (c) Water quality conditions that could reasonably be achieved through the coordinated control of all factors which affect water quality in the area. (d) Economic considerations . . ." (citing CAL. WATER CODE § 13241 (West 2019)). The regional boards thus have authority to consider the aggregate effects of pollution loading within a watershed, chemical and biological interactions among pollutants, the assimilation capacity of the receiving waters (as affected by other discharges and diversions), and the risks of varying levels of each pollutant to public health and safety, agricultural and commercial uses, fish and wildlife, and other beneficial uses. This type of integrative analysis is consistent with the principles of ecosystem-based management.

50. The federal regulations require that "existing instream water uses and the level of water quality necessary to support the existing uses shall be maintained and protected." It also provides, however, that where water quality exceeds the "levels necessary to support the propagation of fish, shellfish, and wildlife and recreation, . . . the quality of water shall be maintained and protected unless the State finds that lower water quality is necessary to accommodate important economic or social development." 40 C.F.R. § 131.12(a) (2019). California's anti-degradation policy declares that "water quality will be maintained unless it has been demonstrated that a change: (1) is consistent with the maximum benefit to the people of the State, (2) does not unreasonably affect present and anticipated beneficial uses of the waters, and (3) does not result

plans to mandate water quality that "support[s] the most sensitive use."[51] Yet, neither of these requirements are inconsistent with CEBM; the requirements would simply establish minimum targets for the sustainability plans. The fact that a legal standard may limit the boards' discretion does not affect the utility of the water quality process as a framework for implementing CEBM.

The Water Board also possesses the authority, flexibility, and institutional expertise to address unusual cases. A 2009 decision on Piru Creek illustrates how the State Water Board may exercise its discretion to address the increasingly important question of conflicts between the needs of individual species. This case arose in the context of the Board's water quality certification of an application for an amendment to a license issued by the Federal Energy Regulatory Commission ("FERC") for the reoperation of Pyramid Dam. Although Pyramid Reservoir serves primarily as terminal storage for the State Water Project, the dam also releases water into Piru Creek, whose waters ultimately flow to the Pacific Ocean. The creek is home to several species of fish, including rainbow trout, and amphibians. One of these species, the arroyo toad, is listed as endangered under the federal Endangered Species Act.

The proposed amendment reduced instream flows during times when those flows exceeded natural levels, to prevent flooding of the arroyo toad's breeding pools. The reduction in flows was opposed by anglers, however, because the change was likely to be detrimental to the rainbow trout—a popular sport fish. Nevertheless, the Board approved the amendment. "[A]ssuming that we must choose between the two species," it reasoned, "the proper course is to protect the more sensitive native endangered toad rather than the non-endangered trout."[52] After explaining that this was consistent with its policies on maintaining existing uses, the Board concluded it had the power to choose one species over another. Facing "two conflicting uses, the quality of water for one use may be reduced where the change improves water quality for the other . . . . Absent the ability to balance

in water quality less than that prescribed in the Basin Plan." CAL. STATE WATER RES. CONTROL BD., *Statement of Policy With Respect to Maintaining High Quality of Waters in California, Resolution 68-16* (Oct. 28, 1968).

51. 40 C.F.R. § 131.11(a) (2019).

52. CAL. STATE WATER RES. CONTROL BD., *Re-Operation of Pyramid Dam for the California Aqueduct Hydroelectric Project*, Order WQ 2009-07 (2009).

conflicting uses in this way, it would be difficult to synthesize the requirements for Clean Water Act water quality standards."[53]

The Piru Creek case confirms the Board's broad and nuanced authority to set water quality standards that encompass the types of choices that arise within the context of CEBM. The Board's decision to protect the more sensitive (and legally protected) species also shows how endangered species requirements may be integrated into the broader ecological perspectives of the water quality laws.

2. Water Rights Permitting and Waste Discharge Requirements

The primary means of implementing water quality standards is through water rights permits and licenses[54] issued by the State Water Board and waste discharge requirements (i.e., pollutant discharge permits) granted by the regional boards. Water rights permits and licenses allow the Board to limit withdrawals from water bodies, thereby increasing or decreasing the amount of water in an ecosystem at a given time. Waste discharge permits allow the regional boards some control over the characteristics (temperature, volume, contaminants, etc.) of the water entering the ecosystem.

i. Water Rights Permitting

The State Water Board has permitting and licensing jurisdiction over appropriations of surface water commenced after December 14, 1914 (the effective date of the Water Commission Act).[55] Pursuant to this authority, the Board issues permits and licenses to California's largest water projects—including the State Water Project (SWP) and the federal Central Valley Project (CVP)—and to a panoply of other

53. *Id.*

54. The Water Board issues a permit to allow water users to develop a water diversion project and begin diverting water, then issues a final license after project development. The license confirms the amount of water under beneficial use and remains in effect as long as beneficial use continues and other requirements are met. CAL. STATE WATER RES. CONTROL BD., *Water Right Applications: Permitting and Licensing Program* (Aug. 19, 2020, 10:00 AM), https://www.waterboards.ca.gov/waterrights/water_issues/programs/applications/.

55. The Water Commission Act of 1913 exempted riparian rights, pre-1914 appropriative rights, and groundwater rights from the Board's permitting and licensing jurisdiction. CAL. WATER CODE §§ 1200-1202. Although there is no hydrologic justification for these exemptions—and the exclusion of these water rights from the Board's permitting jurisdiction has caused a variety of problems with its supervision of California's water resources systems—the statutory exemptions exist to this day. MOUNT ET AL., PUB. POLICY INST. OF CAL., MANAGING CALIFORNIA'S FRESHWATER ECOSYSTEMS: LESSONS FROM THE 2012–16 DROUGHT, at 39 (2017) [hereinafter *Managing Freshwater Ecosystems*].

facilities that supply water to municipal, industrial, and agricultural users throughout the state.[56]

The Board's water rights powers are broad and multifaceted. In administering the water permitting system, the legislature directs the Board to "allow the appropriation for beneficial purposes of unappropriated water under such terms and conditions as in its judgment will best develop, conserve, and utilize in the public interest the water sought to be appropriated."[57] In making this public interest determination, the Board must "consider the relative benefit to be derived from . . . all beneficial uses of the water concerned including, but not limited to, use for domestic, irrigation, municipal, industrial, preservation and enhancement of fish and wildlife, recreational, mining and power purposes, and any uses specified to be protected in any relevant water quality control plan."[58] Based on these criteria, the Board has authority to grant permits and licenses subject to "such terms and conditions as in its judgment will best develop, conserve, and utilize in the public interest, the water sought to be appropriated."[59]

It is common for these terms and conditions to require appropriators to limit diversions to prevent harm to aquatic species, to release water to aid spawning and migration, and manage project operations to comply with water quality standards that protect both instream and extractive uses.[60] The Board's powers under its water rights permitting authority are thus directly linked to its water quality jurisdiction and, as recognized in key court cases, the scope of the Board's powers to weigh various beneficial uses is as capacious as its

56. Federal law recognizes the Board's authority to require permits for the operation of federal water projects. Section 3406(b) of the Central Valley Project Improvement Act requires the Bureau of Reclamation to operate the CVP "to meet all obligations under state and federal law, including but not limited to . . . all decisions of the California State Water Resources Control Board establishing conditions on applicable licenses and permits for the project." Bureau of Reclamation, Central Valley Project Improvement Act, P.L. 102-575 § 3406(b) (2003). Other federal reclamation projects must comply with the terms of water rights, permits, and licenses granted by the State Water Board unless compliance with a specific term or condition on project operations would conflict with an express congressional directive. California v. United States, 438 U.S. 645, 670–71, n. 7 (1978).

57. CAL. WATER CODE § 1253 (West 2019).

58. CAL. WATER CODE § 1257 (West 2019).

59. *Id.*

60. Greg Gartrell & Brian Gray, *A Brief Review of Regulatory Assignment of Water in the Sacramento–San Joaquin Delta*, *in* A NEW APPROACH TO ACCOUNTING FOR ENV'T WATER: INSIGHTS FROM THE SACRAMENTO-SAN JOAQUIN DELTA, PUB. POL'Y INST. OF CAL., 2, 14–15 (2017); *Managing Freshwater Ecosystems* at 55.

water quality planning authority.[61] The Board's authority to guide allocation of water to protect the public welfare extends to rights outside the permitting system, enabling the Board to manage the water resources of the state as an integrated whole.[62]

In some instances, the Board has authority which it has not yet fully exercised. For example, within the water rights permitting system, the Board occasionally includes conditions requiring habitat restoration and regulation of land use activities, as it did in modifying Los Angeles' water rights licenses in the Mono Basin, described below.[63] However, the Board generally does not require these types of water quality implementation measures. The ecosystem-based management approach proposed herein recommends that the Board invoke this authority to achieve better ecosystem-wide results.

ii. Waste Discharge Requirements

Pursuant to the state's Porter-Cologne Act, the waste discharge requirement ("WDR") system is the primary means by which the state regulates the entry of pollutants into California waters.[64] The WDR is the California version of the more familiar National Pollutant Discharge Elimination System (NPDES) permit required under the

61. The legislature has instructed the Board to "be guided by the policy that domestic use is the highest use and irrigation is the next highest use of water" when acting on applications to appropriate water." CAL. WATER CODE § 1254 (West 2019). The court has noted, however, that "[n]onconsumptive or 'instream uses,' too, are expressly included within the category of beneficial uses to be protected in the public interest." United States v. State Water Res. Control Bd., 182 Cal. App. 3d 82, 103 (1986). For example, the legislature also has directed the Board to "take into account, whenever it is in the public interest, the amounts of water needed to remain in the source for protection of beneficial uses, including any uses specified to be protected in any relevant water quality control plan." CAL. WATER CODE § 1243.5 (West 2019). These beneficial uses include "preservation and enhancement of fish and wildlife resources." CAL. WATER CODE § 1243(a) (West 2019). The California Supreme Court has held that neither instream uses nor extractive uses "can claim an absolute priority." Nat'l Audubon Soc'y v. Superior Court, 658 P.2d 709, 729 n.30 (1983).

62. *See infra* Section II.A.

63. *See infra* Section I.B.4.

64. The WDR program includes authority to implement the federal NPDES permitting program that governs discharges of pollutants from "point sources" (such as industrial facilities, municipal sewage treatment plants, and other conduits) to the waters of the United States. For point source discharges to these waters, the state and regional boards have authority to issue combined WDR/NPDES permits. STATE WATER RES. CONTROL BD., NAT'L POLLUTANT DISCHARGE ELIMINATION SYS. (2019). The WDR program also applies to discharges from "non-point sources," including agricultural drainage and return flows—although most drainage from irrigated lands is governed by general discharge standards, rather than individual permits. These "waivers" are part of a broader Irrigated Lands Regulatory Program. STATE WATER RES. CONTROL BD., IRRIGATED LANDS REGULATORY PROGRAM (2019).

federal CWA, although WDRs regulate a broader range of activity.[65] In contrast to the water rights permitting system, in this water quality context, the nine regional boards have the principal authority to issue WDRs while the State Water Board primarily plays a supervisory role.[66] When granting WDRs, the regional boards must ensure that all discharges are consistent with applicable water quality standards and do not unreasonably affect designated beneficial uses.[67] WDRs also must comply with federal and state policies that maintain existing water quality as a floor for future regulation.

The regional boards typically include terms and conditions in each WDR to ensure compliance with these requirements, including limitations on the volume, timing, and location of discharge. The boards also have the authority to require changes in land and water management to reduce the volume of pollutants entering the waters of the state. For example, the Central Valley Regional Water Quality Control Board has ordered commercial dairies to construct wastewater retention ponds to contain polluted runoff, install drains in barns and production facilities to direct wastewater into these ponds and to alter waste fertilization practices to ensure that neither groundwater nor crops grown for human consumption are contaminated.[68] Finally, consistent with PPIC's recommendations, Porter-Cologne expressly reserves the regional boards' authority to apply principles of adaptive management and to alter discharge limitations as needed to address changing water quality conditions.[69]

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65. Cal. Water Bds., *National Pollutant Discharge Elimination System (NPDES) – Wastewater* (Aug. 19, 2020, 10:00 AM),
https://www.waterboards.ca.gov/water_issues/programs/npdes/.

66. Although the State Water Board has directly issued some WDRs, the vast majority are granted by the nine regional boards. On petition by the permittee, the State Water Board has jurisdiction to review a WDR issued by a regional board. The Board also has authority to resolve conflicts between WDRs promulgated by different regional boards. CAL. WATER CODE § 13320 (West 2019).

67. CAL. WATER CODE § 13263(a) (West 2019).

68. CENT. VALLEY REG'L WATER QUALITY CONTROL BD., REISSUED WASTE DISCHARGE REQUIREMENTS: GENERAL ORDER FOR EXISTING MILK COW DAIRIES, Order R5-2013-0122, 11 (2013).

69. CAL. WATER CODE § 13263(g) (West 2019) (explaining that "discharges of waste into waters of the state are privileges, not rights," and that the discharge of waste—whether made pursuant to a WDR or otherwise—shall not "create a vested right to continue the discharge.").

3. The Public Trust and Reasonable Use Doctrines

The Board's authority is augmented by two other important laws: the common law public trust doctrine and the reasonable use mandate of Article X, Section 2 of the California Constitution. Consistent with CEBM, these laws inherently recognize the dynamic nature of aquatic ecosystems and emphasize the state's responsibility to update regulatory decisions in response to changing hydrologic and ecological conditions.

i. The Public Trust Doctrine

The public trust doctrine derives from English and American common law. Traditionally, the public trust protected certain public uses of navigable waters, including water-based commerce, navigation, and fishing. In two 20th century decisions, the California Supreme Court broadened the scope of the trust to include recreational uses and protection of ecological functions. In *Marks v. Whitney*, the Court declared that the public trust doctrine is "sufficiently flexible to encompass changing public needs," and it recognized fishing, hunting, swimming, boating, and other recreational activities as public trust uses.[70] The Court also defined the doctrine to include preservation of trust resources "so that they may serve as ecological units for scientific study . . . and as environments which provide food and habitat for birds and marine life and . . . favorably affect the scenery and climate of the area."[71] The Court then applied these principles in *National Audubon Society v. Superior Court*, the Mono Lake decision, affirming the state's authority to limit diversions from tributary streams to protect the ecological integrity and other public trust uses in Mono Lake.[72] The Court held that the state—acting through the State Water Board, the courts, and other agencies—"has an affirmative duty to take the public trust into account in the planning and allocation of water resources, and to protect public trust uses whenever feasible."[73]

The California courts also have applied the public trust doctrine to activities that may affect public trust uses of navigable waters, but which are not themselves in or on a navigable river or lake. For example, in *National Audubon,* the Supreme Court held that diversions from non-navigable streams could be limited to the extent that they adversely affect public trust uses in downstream navigable

70. 491 P.2d 374, 379–81 (1971).
71. *Id.* at 260.
72. 658 P.2d 709, 719–20 (1983).
73. *Id.* at 728.

waters.[74] In a 2018 decision, *Environmental Law Foundation v. State Water Resources Control Board*, a California court of appeal ruled that the public trust doctrine may limit the extraction of groundwater that harms public trust uses in hydrologically connected surface water systems.[75]

The modern public trust doctrine both grants state agencies the power to achieve CEBM and directs them to consider many CEBM principles. In *National Audubon*, for example, the Supreme Court described the state's responsibility to implement the public trust in terms that recognize the integrated and dynamic nature of aquatic ecosystems, and the uncertainties inherent in the understanding and administration of aquatic ecosystems.[76] The Court held that the "state as sovereign retains continuing supervisory control over its navigable waters and the lands beneath those waters. This principle, fundamental to the concept of the public trust . . . prevents any party from acquiring a vested right to appropriate water in a manner harmful to the interests protected by the public trust."[77] The Court also declared that, "in exercising its sovereign power to allocate water resources in the public interest, the state is not confined by past allocation decisions which may be incorrect in light of current knowledge or inconsistent with current needs."[78] Thus the public trust may be read to require some elements of CEBM. At a minimum, the public trust doctrine reinforces the Water Board's statutory authorities and requires it to take a broad role in protecting and balancing the myriad uses of California water.

ii. The Reasonable Use Doctrine

In *National Audubon*, the California Supreme Court also recognized that "[a]ll uses of water, including public trust uses, must now conform to the standard of reasonable use" set forth in Article X, Section 2 of the California Constitution.[79] This important mandate governs the exercise of all water rights in California, including rights otherwise exempt from the State Water Board's permitting and

74. *Id.* at 719–21.

75. *See* Envt. Law Found. v. State Water Res. Control Bd., 26 Cal. App. 5th 844, 859 (2018) (concluding that the public trust doctrine applies to extractions of groundwater if such extraction adversely impacts a navigable waterway to which the public trust doctrine also applies).

76. *Nat'l Audubon Soc'y*, 658 P.2d at 718–25.

77. *Id.* at 727.

78. *Id.* at 728.

79. *Id.* at 725.

licensing jurisdiction: riparian rights, pre-1914 appropriative rights, and groundwater rights.[80] Article X, section 2 declares that:

> Because of the conditions prevailing in this State, the general welfare requires that the water resources of the State be put to beneficial use to the fullest extent of which they are capable, and that the waste or unreasonable use or unreasonable method of use of water be prevented, and that the conservation of such waters is to be exercised with a view to the reasonable and beneficial use thereof in the interest of the people and for the public welfare.[81]

These directives form the foundation of California water resources law. The courts' interpretation of the reasonable use mandate reinforces the broad and flexible authority of the State Water Board to set and enforce ecosystem-based water quality standards. Four important themes run through the relevant judicial opinions:

First, effectuation and enforcement of the reasonable use doctrine must be based on a comprehensive assessment of water use—including ecological uses—rather than focusing narrowly on the water rights and water uses at issue in the litigation before the court. In *City of Barstow v. Mojave Water Agency*, for example, the Supreme Court reiterated that determination of "what is a reasonable use of water depends on the circumstances of each case, [and] such an inquiry cannot be resolved *in vacuo* from statewide considerations of transcendent importance."[82]

Second, the goals of the reasonable use directive include efficient use and allocation of available water to serve multiple competing uses, including instream uses and reliable water supply. Thus, in *Environmental Defense Fund v. East Bay Municipal Utility District*, the Supreme Court's recognition of the reasonable use doctrine to protect instream flows led to a "physical solution" allowing water to be diverted for municipal water supplies, but under a flow and release schedule that provided water for water quality, fish, and recreational uses downstream.[83]

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80. City of Barstow v. Mojave Water Agency, 23 Cal .4th 1224, 1226–27 (2000); Imperial Irrigation Dist. v. State Water Res. Control Bd., 186 Cal. App. 3d 1160, 1166 (1986); Light v. State Water Res. Control Bd., 226 Cal. App. 4th 1463, 1479–80 (2014).

81. CAL. CONST. art. X, § 2.

82. *Mojave Water Agency*, 23 Cal. 4th at 1242.

83. Statement of Decision, Envtl. Def. Fund v. E. Bay Mun. Util. Dist., No. 425955 (Alameda County Superior Court, filed Jan. 2, 1990) (the "Hodge decision"), at 22 (quoting Cal. State Water Res. Control Bd., Final Report of the Referee in the Lower American River Adjudication 11, 13 (1988)); *see* Brian E. Gray, *Ensuring the Public Trust*, 45 U.C. DAVIS L. REV. 973, 987–90 (2012) (describing the physical solution in the Hodge decision).

Third, all water rights must be exercised consistent with contemporary standards of reasonable use, which may change as hydrologic and other conditions change. In *United States v. SWRCB*, for example, the Court of Appeal explained that where the State Water Board concluded that new information and changes in circumstances required revised water quality standards for the Delta, the Board "had the authority to modify the projects' permits to curtail their use of water on the ground that the projects' use and diversion of the water *had become unreasonable*."[84]

Fourth, the Board's authority under the reasonable use doctrine to set ecological objectives and to determine the appropriate strategies to protect the various beneficial uses of California's water resources is as broad as its water quality authority. As Justice Racanelli of the First District Court of Appeal explained in a famous Delta case:

Obviously, some accommodation must be reached concerning the major public interests at stake: the quality of valuable water resources and transport of adequate supplies for needs southward. The decision is essentially a policy judgment requiring a balancing of the competing public interests, one the Board is uniquely qualified to make in view of its special knowledge and expertise and its combined statewide responsibility to allocate the rights to, and to control the quality of, state water resources.[85]

4. The Mono Lake Water Rights Decision: A Confluence of Authority

The landmark *National Audubon* case, described above, demonstrates how the Board's various authorities can work in synergy to accomplish CEBM. The case began when the National Audubon Society and other environmental organizations filed legal challenges to Los Angeles' diversions from four of the five tributary streams that supply Mono Lake with freshwater.[86] Although the lake itself is highly saline and alkaline, its waters support brine shrimp, a variety of migratory waterfowl and shorebirds, terrestrial wildlife, and recreational uses.[87] Flows from the tributaries maintain both the water quality and surface area of the lake and also support trout that inhabit

84. United States v. State Water Res. Control Bd., 182 Cal. App. 3d 82, 130 (1986).

85. *Id*.

86. *Nat'l Audubon Soc'y,* 658 P.2d at 711–12.

87. *Id.* at 715–16.

tributary streams.[88] The plaintiffs alleged that the city's diversions jeopardized these public trust resources of Mono Lake.[89]

As noted, the California Supreme Court ultimately held that the public trust doctrine is an integral part of California's water rights law and that Los Angeles and the State Water Board must protect the public trust uses of Mono Lake to the extent feasible.[90] This important and well-known legal determination was followed by regulatory action by the State Water Board which, although less well known than the case itself, is no less important.[91] Following extensive hearings, the Board amended Los Angeles' water rights permits in a sweeping decision that used its broad statutory, public trust, and Constitutional reasonable use powers to protect the beneficial uses of the waters of the Mono Lake ecosystem.

In its resulting water rights decision, Water Right Decision 1631, the Board considered the entirety of the Mono Lake ecosystem, including the effects of Los Angeles' diversions on the brine shrimp that inhabits the lake, the trout fishery in the tributary streams, migratory birds and local waterfowl, terrestrial species that depend on the wetlands and riparian areas within the ecosystem, air and water quality, recreational boating and swimming, access to the lake, and aesthetics. As required by the public trust doctrine and Article X, section 2, the Board also considered the human element associated with Los Angeles' needs for water for municipal and industrial supply, including alternatives to the Mono Basin sources.[92] Based on this analysis, the Board set ecological objectives for the lake and its tributary streams and limited Los Angeles' diversions to levels that both would accomplish these objectives over time, but would also be feasible for the city in light of conservation, efficiency, and alternative sources of supply. The Board required Los Angeles to provide flows in the tributary streams to support historic trout fisheries based on other statutory requirements,[93] restore and maintain the level of Mono Lake

88. *Id.* at 715; California Trout, Inc. v. State Water Res. Control Bd., 207 Cal. App. 3d 585, 596 (1989).

89. *Nat'l Audubon Soc'y*, 658 P.2d at 711–18.

90. *Id.* at 726–29.

91. City of Los Angeles, No. D-1631, 1994 WL 16804395, at *1–2 (Cal. State Water Res. Bd. Sept. 28, 1994) [hereinafter *Mono Lake Basin Decision*]. On remand, the trial court stayed the litigation pending completion of administrative proceedings by the Board. *Id.* at *5.

92. *Id.* at *1–2.

93. *See infra* notes 114–121 and accompanying text.

at 6,931 feet above sea level, and make structural habitat improvements to the streambeds.[94]

In the Mono Lake decision, and in subsequent actions, the State Board incorporated all of the important principles of CEBM while also reconciling other statutory mandates, the public trust doctrine, and the constitutional reasonable use mandate under Article X section 2. The State Board provided flows to improve ecosystem function and connected these flows to habitat improvements. The Board also addressed ecological functions at a watershed scale, linking flow standards in the tributaries to water quality objectives in the lake. It mandated physical habitat management to reduce the amount of water required for the ecosystem. And it recognized the human factor of municipal water supply requirements. In these ways, the Board's Mono Lake decision is a blueprint for EBM.

In the Mono Lake decision, the Board determined that loss of aquatic habitat had placed undue stress on rainbow and brown trout, shorebirds, migratory waterfowl, and other wildlife in the ecosystem. To address this damage, the Board ordered the city to undertake structural habitat measures including placement of gravel in streams to aid spawning, restoration of wetlands and riparian vegetation, and limitations on cattle grazing and vehicle use to protect trout habitat. The structural habitat conditions were complementary to the more conventional water-related terms that the Board also imposed as conditions of Los Angeles' water rights, such as minimum stream flows in the tributaries, channel maintenance and flushing flows, and restoration of the volume and quality of water in Mono Lake itself.[95]

The Board explained that these integrated conditions were necessary for the restoration and sustainable management of the Mono Lake ecosystem, because the interrelationships between ecosystem structure and function extended across the waters and adjacent landscapes:

"Habitat quantity and quality are critical to the algae, alkali flies and brine shrimp that form the foodweb that supports overall productivity of the Mono Lake ecosystem. . . . The loss of the linkage of hypopycnal lenses (i.e., fresh water overlying saline lake waters) with fresh water marshes and lagoons has resulted in reduced wildlife

94. *Mono Lake Basin Decision*, *supra* note 91, at *119–20; Cal. State Water Res. Control Bd., Order No. WR 98-05, 64–65 (1998) [hereinafter *Order No. 98-05*].

95. *Mono Lake Basin Decision*, *supra* note 91, at *119–20.

habitat, particularly for waterfowl. . . . [T]he diversion of tributary streams and the fall of Mono Lake [has] resulted in stream incision, erosion, and other geomorphic changes. The direct impacts to terrestrial wildlife habitats were the loss of complex multi-storied riparian forest, fragmentation of the riparian corridors, and draining of wetlands, overflow channels, delta marshes, ponds and lagoons. The result has been a reduction in habitat diversity and complexity, and an increase in lower valued wildlife habitats such as willow scrub, unvegetated floodplain, and Great Basin scrub."[96]

The Board concluded that it had the authority to include structural habitat rehabilitation and protection in its amendments to Los Angeles' water rights licenses under the public trust, Fish and Game Code section 5937 (discussed more fully below), Article X, section 2 of the California Constitution, and the physical solution doctrine.[97] In all of these ways, the Mono Lake decision is perhaps the best example of the Board invoking all of its powers to implement a cohesive vision to restore an ecosystem impacted by water development while still accommodating human water needs.

5. Water Quality and Water Rights Laws: Conclusion

Water quality and water rights laws vest abundant authority in the State Water Board and regional boards to implement "the simultaneous management of water, land, and organisms to achieve a desired ecosystem condition that benefits both native biodiversity and human well-being"—i.e., CEBM.[98] Indeed, the text of Porter-Cologne and the courts' interpretations of the public trust and reasonable use doctrines match the rubric of multi-benefit ecosystem management more precisely than single species- or single stressor-focused strategies

96. *Id.* at *58.

97. The physical solution doctrine is grounded in Article X, § 2. It allows the Board (and the courts) to require water right holders to make physical changes to their water and land use practices to achieve a reasonable accommodation of the competing interests. *Mojave Water Agency,* 23 5 P.3d at 869–870 (2000) (affirming that under Article X, Section 2 of the California Constitution courts may use their equitable power to implement physical solutions). In its Mono Lake decision, the Board explained that it had "examined the relationship between flows and fishery habitat, as well as the availability of other measures which would help restore the fishery while allowing diversion of some water for municipal use." *Mono Lake Basin Decision*, *supra* note 91, at *6. It also observed that, "in examining the use of water at Mono Lake for providing waterfowl habitat, this decision acknowledges that there are alternative ways of restoring a portion of the lost waterfowl habitat without requiring a return to the pre-1941 lake elevation." *Id.* Under these circumstances, inclusion of habitat restoration to complement the minimum stream flow and lake level restoration requirements would be "consistent with the constitutional goal of promoting maximum beneficial use of the State's water resources." *Id*.

98. *PPIC Report*, *supra* note 1, at 3.

do. Relevant judicial opinions establish that the boards have a responsibility to respond to hydrologic, ecologic, and other changes and to incorporate new scientific information into their decision making. The California legislature recognizes this as well, declaring in 2014 that the public trust and reasonable use doctrines "shall be the foundation of state water management policy."[99] Moreover, although the State Water Board's permitting and licensing authority is limited to particular water rights by statute, the public trust and reasonable use doctrines effectively extend its regulatory jurisdiction to *all* uses of water that affect freshwater ecosystems.

i. Governance Factors

As described below, the Porter-Cologne and water rights frameworks together meet most of the five governance requirements PPIC set out in its report: (1) explicit goals for desired ecosystem condition, benefits, and beneficiaries; (2) metrics and time-specific performance measures to assess goal achievement; (3) strong, transparent, and collaborative science; (4) regulatory alignment across multiple agencies with transparent governance and administration; and (5) reliable funding for habitat improvements, ongoing operations and maintenance, science and monitoring, and administration.[100] Where the requirements are not fully met, the Board has the authority needed to adjust its practice to achieve ecosystem-based management and better species protection.

First, Porter-Cologne requires establishment of desired beneficial uses for each regulated water body. These beneficial uses are developed through a public process, are local to the water body, and act as explicit goals for use of the water. With a little additional detail and development, these beneficial uses could serve as the explicit goals driving CEBM. They already promote multi-benefit water management and sustainable biodiversity, and they recognize human beneficial uses in the context of overall ecological functions. Therefore, setting more explicit goals concerning native and non-native species could develop an emphasis on active management of both native and non-native species, per the PPIC recommendation.

Second, under Porter-Cologne, the state and regional boards set water quality objectives and compliance measures to achieve the target

99. CAL. WATER CODE § 85023 (West 2019).

100. *PPIC Report*, *supra* note 1, at 10–12.

beneficial uses. This standard setting process is consistent with PPIC's vision of ecosystem-based management, which requires metrics and time-specific performance measures to assess whether goals are being achieved. Indeed, the objectives of Porter-Cologne itself would be better achieved by integration of clear, precise metrics and improved accountability with respect to performance measures.

Third, the Porter-Cologne framework supports strong, transparent, and collaborative science. In implementing Porter-Cologne, the boards emphasize that strong science must drive the water quality process and require ongoing monitoring to determine whether the beneficial uses for a particular water body are supported by its water quality.[101] Federal law requires the state and regional boards to review water quality criteria every three years and revise the standards as they deem appropriate to fulfill their statutory obligations.[102] This framework allows for adaptive management in response to (and in anticipation of) changing conditions and new scientific information, including the effects of climate change.

Fourth, the State Water Board can facilitate or require regulatory alignment across multiple agencies with transparent governance and administration. To achieve fully integrated CEBM, the Board must engage with other agencies to control invasive species and to regulate land use activities that may influence down-gradient freshwater conditions. The Board's supervisory authority over the regional boards' WDR permitting program and its many opportunities to collaborate with other state and federal agencies can facilitate this engagement.[103] In actions regarding water rights and water quality, for example, the Board is statutorily required to consult with various agencies.[104] Federal and state environmental analysis laws can further

101. *See, e.g.*, CAL. WATER CODE § 13393 (West 2019) (sediment water quality objectives must be based on scientific information).

102. 33 U.S.C. § 1313(c)(1) (2018).

103. As described in more detail in the concluding section, the Board also can make better use of its authority require habitat improvements and protection as part of its water rights administration and to expand its water quality regulation to include endangered species standards.

104. *See, e.g.,* CAL. WATER CODE § 1243(b) (West 2019) ("The board shall notify the Department of Fish and Wildlife [CDFW] of any application for a permit to appropriate water [and CDFW] . . . shall recommend the amounts of water, if any, required for the preservation and enhancement of fish and wildlife resources and shall report its findings to the board"); CAL. WATER CODE § 1433 (West 2019) (requiring the Water Board to consult with CDFW before approving a temporary urgency change); CAL. WATER CODE § 13144 (West 2019) ("During the process of formulating or revising state policy for water quality control the state board shall consult with and carefully evaluate the recommendations of concerned federal, state, and local agencies"); cf. CAL. WATER CODE § 1703 (West 2019) (petitioner for a change to an application,

facilitate even more comprehensive coordination. For example, the California Environmental Quality Act (CEQA), a state version of the National Environmental Policy Act (NEPA), applies to most Board decisions.[105] Successful CEQA analysis requires coordination among state, local, and, in many cases, federal agencies.[106] Although CEQA has not generally been used to achieve coordination among the public resources agencies, such coordination is vital to the regulatory streamlining required for CEBM. The boards should capitalize on CEQA's significant opportunities for regulatory alignment to facilitate CEBM.

The fifth element, funding, presents a different challenge that the other governance requirements identified by PPIC. Here the question is not one of Board authority or capacity; funding depends on legislative prioritization of the Board's important work on water and species issues. Current levels of funding fall significantly short in providing the reliable funding required for habitat improvements, ongoing operations and maintenance, science and monitoring, and administration. Implementing CEBM would require additional funding, just as implementation of SGMA has required funding to match the new obligations placed on local stakeholders.[107]

ii. Analysis of Ecosystem Management Factors

Existing law also provides the Water Board and regional boards with the authority to implement PPIC's five ecosystem management approaches: ecosystem water budgets; connecting structural habitat to functional flows; managing water quality and quantity together; active management of both native and non-native species; and management

permit, or license must notify CDFW); CAL. WATER CODE § 12608 (West 2019) (CDFW may appear at any Water Board hearing).

105. The CEQA process requires review of the environmental impacts of Water Board actions like issuing waste discharge permits, water rights permits, grants and loans, and some planning actions. STEVEN H. BLUM, CEQA FOR WATER QUALITY REGULATION AND PLANNING 11–13 (2008), http://ice.ucdavis.edu/files/ice/ICE%20Talk%20%20Final%20Final.pdf.

106. *See, e.g.*, Banning Ranch Conservancy v. City of Newport Beach, 392 P.3d 455, 469–71 (2017) (holding CEQA analysis inadequate due to insufficient coordination with the California Coastal Commission); No Oil, Inc. v. City of Los Angeles, 529 P.2d 66, 78 (1974) (noting one purpose of CEQA review is to inform other government agencies about proposed actions and their environmental consequences).

107. *See, e.g.*, CAL. DEP'T WATER RES., SMG GRANT PROGRAM 2019 GUIDELINES 5 (2019).

at the appropriate scale.[108] Although the boards do not consistently invoke the full extent of their existing authorities on these topics, the boards have made some progress, and there is potential to achieve significantly more.

In this regard, water quality control plans adopted under Porter-Cologne are perhaps the clearest application of ecosystem-based management by the Water Board. For example, PPIC recommends ecosystem water budgets, which are defined as blocks of water "managed by an ecosystem trustee or other individual with both the responsibility and authority to allocate the [water budget] in the most efficient way to meet ecosystem objectives while reducing impacts on other water users."[109] The Water Board has not yet embraced that approach entirely, but the water quality control plan for the Sacramento-San Joaquin Delta does set aside a significant amount of water for environmental protection. The plan contains a directive that water right holders on the Stanislaus, Tuolumne, and Merced Rivers maintain a 40 percent average outflow to the San Joaquin River (with a 30% to 50% adaptive range) from February through June of each year to facilitate salmon spawning and migration.[110] The Delta Water Quality Control Plan also manages water quality and quantity together, focusing on temperature, volume, timing, and quality of the water moving into the Delta.

Likewise, water quality control plans sometimes manage at an appropriate scale to protect dynamic physical and biological connections. Consider the Central Valley Basin Plan, which divide the valley into three main parts (the Sacramento, San Joaquin, and Tulare sub-basins). These plans set water quality objectives for each sub-basin and consider interactions among them. Yet, they also address special problems (e.g., toxic drainage from west-side agriculture, salmon recovery in the San Joaquin River system, and nitrate pollution from

108. *PPIC Report*, *supra* note 1, at 12–13.

109. *Id.* at 13.

110. STATE WATER RES. CONTROL BD., WATER QUALITY CONTROL PLAN FOR THE SAN FRANCISCO BAY/SACRAMENTO-SAN JOAQUIN DELTA ESTUARY 24–25 (2018). The plan contains a number of specific features of ecosystem-based management. For example, the narrative standard for San Joaquin River outflow requires flows that "more closely mimic the natural hydrographic conditions to which native fish species are adapted, including the relative magnitude, duration, timing, and spatial extent of flows as they would naturally occur. Indicators of viability include population abundance, spatial extent, distribution, structure, genetic and life history diversity, and productivity." *Id.* at 15. Similarly, the criteria for Suisun Marsh include water quality conditions that are "sufficient to support a natural gradient in species composition and wildlife habitat characteristic of a brackish marsh throughout all elevations of the tidal marshes bordering Suisun Bay." *Id.* at 14.

concentrated animal feeding operations) on a regional and watershed scale.[111]

Similarly, the Water Quality Control Plan for the Central Coast sets general effluent limitations for individual categories of dischargers, while supplementing these with specific total maximum daily load ("TMDL") limitations for individual pollutants and individual watersheds within the region.[112] In another example, the San Francisco Bay Basin Plan not only focuses on water quality and beneficial uses in the bay and adjacent coastal waters, but also divides the basin into seven hydrologic planning areas. This allows the regional board to tailor its discharge limitations and other regulations to address specific regional problems (e.g., high salinity and poor circulation in the south bay, wetlands habitat in Suisun Marsh, and agricultural runoff affecting Tomales Bay shellfish) and to set specific TMDLs for individual stream systems.[113] These flexibilities are consistent with ecosystem-based strategies, which depend on integrated management across landscapes and specialized regulation to address the unique characteristics of individual watersheds and sub-regions.

At the same time, however, much more can be done to protect species under water quality control plans. For example, the Board has yet done little to embrace connecting structural habitat to functional flows, or to actively manage both native and non-native species. The point is, however, that existing law clearly bestows upon the Board the authority to use these ecosystem-based management approaches, as it did in the Mono Lake decision.

In sum, the Board has the authority under existing state and federal water quality and water rights laws to implement CEBM. Historically, the Board has used that authority in fits and starts, but the Board could and should be more willing to use these authorities to improve species protection. As the PPIC report demonstrates, the weight of science suggests that broader and more consistent action by the Board to implement the governance and ecosystem management

111. CENT. VALLEY REG'L WATER QUALITY CONTROL BD., WATER QUALITY CONTROL PLAN (BASIN PLAN) FOR THE SACRAMENTO RIVER BASIN AND THE SAN JOAQUIN RIVER BASIN 4-3, 4-59, (5th ed. 2018). *See also* CENT. VALLEY REG'L WATER QUALITY CONTROL BD., WATER QUALITY CONTROL PLAN FOR THE TULARE BASIN (3rd ed. 2018).

112. CENT. COAST REG'L WATER QUALITY CONTROL BD., WATER QUALITY CONTROL PLAN FOR THE CENTRAL COAST BASIN 47, 96–255 (2019).

113. S.F. BAY REG'L WATER QUALITY CONTROL BD., SAN FRANCISCO BAY BASIN WATER QUALITY CONTROL PLAN 4-103 (2017).

criteria identified by PPIC is likely to result in significantly improved management of California's freshwater ecosystems.

II. Harmonizing Existing Law with Ecosystem-based Management

As described above, state water quality and water rights laws give the state and regional boards the authority necessary to adopt and implement CEBM strategies. The analysis also must consider several other laws that, theoretically, could constrain the boards' exercise of authority on some river systems.

A. Special Laws that Apply to Waters Affected by Dam Operations

Of the laws that directly affect dam operations, the most important are section 5937 of the California Fish and Game Code—which directs all dam owners to bypass or release water to protect fish downstream—and the Federal Power Act—which requires nonfederal hydroelectric power generators to comply with licenses issued by the Federal Energy Regulatory Commission ("FERC"). As described below, the constraints of these laws apply directly to water project operators rather than to the State Water Board. However, because dams alter the volume and flow of California rivers and thereby affect other beneficial uses, the Board must account for operational restrictions imposed under these laws. In addition, the terms of FERC licenses often include their own water quality, flow, and discharge requirements that must be harmonized with the state and regional boards' water quality plans and implementing decisions.

1. California Fish and Game Code Section 5937

Section 5937 of the California Fish and Game Code declares that dam owners "shall allow sufficient water at all times to pass through a fishway, or in the absence of a fishway, allow sufficient water to pass over, around or through the dam, to keep in good condition any fish that may be planted or exist below the dam."[114] The state and federal courts have held that section 5937 requires the dam owner to "release sufficient water . . . to reestablish and maintain the fisheries which existed in [the river] prior to its diversion of water."[115] Other cases have adopted a broader view of the "good condition" standard based on the

114. CAL. FISH & GAME CODE § 5937 (West 2019).

115. Cal. Trout v. Superior Court, 218 Cal.App.3d 187, 194 (1990) (Mono Lake tributaries); Nat. Res. Def. Council v. Patterson, 333 F. Supp. 2d 906, 917–19 (E.D. Cal. 2004) (San Joaquin River).

recognition that the historic fishery may be impossible to replicate and that the contemporary ecosystem may support a variety of native and non-native species.[116]

Section 5937 creates a more focused regulatory mandate than those set forth in the water quality statutes, prioritizing protection of fish and their habitat. One court of appeal has held, "the function of balancing of the public interest between contending uses ordinarily performed by the Water Board is not applicable because the balancing has already been accomplished by the Legislature" in its enactment of section 5937.[117] Although ecosystem-based management typically encompasses broader ecosystem goals, rather than focusing on one beneficial use—viz. fish—section 5937 can be, and should be, implemented in a way that is consistent with CEBM.[118] While section 5937 began as a stand-alone statute,[119] the contemporary law is a component of the California Department of Fish and Wildlife's ("CDFW") overall stewardship responsibilities. These include a 2013 legislative directive that the department "use [ecosystem-based management] informed by credible science in all resource management decisions to the extent feasible."[120] Consonant with the PPIC Report,

116. Karrigan Bork et al., *The Rebirth of California Fish and Game Code Section 5937: Water for Fish,* 45 U.C. DAVIS L. REV. 809, 907–08 (2012); *In re* Big Bear Mun. Water Dist., No. WR 95-04, 1995 Cal. ENV LEXIS 16, at *32–33 [hereinafter *Water Right Order 95-04*]. The California Department of Fish and Wildlife and the courts have concurrent authority to enforce section 5937. The State Water Board also has authority to consider section 5937 in its water quality and water rights decision-making, and it must ensure that all water right holders—including those that are exempt from its permitting and licensing authority—comply with the statutory mandates. In addition, the legislature has directed the Board to include conditions in all water rights permits or licenses in Mono and Inyo Counties to ensure "full compliance with" section 5937. CAL. FISH & GAME CODE § 5946 (West 2019).

117. *Cal. Trout*, 218 Cal.App.3d at 211 (1990) (Mono Lake tributaries).

118. *Water Right Order 95-04*, *supra* note 116, at *23. In requiring a water district to release water to support a downstream fishery, the Board concluded that section 5937 must be applied consistent with the flexible principles of reasonable use. After noting the court of appeal's holding that section 5937 is a legislative expression of the public trust, the Board explained that the statute "legislatively establishes that it is reasonable to release enough water below any dam to keep fish that exist below the dam in good condition . . . [yet] release of water that is much in excess of the amount needed to keep the fish in good condition . . . could be unreasonable within the meaning of California Constitution Article X, section 2 if there would be adverse effects on other beneficial uses . . . ." *Id.* at *29–30.

119. The antecedents of section 5937 date back to the earliest days of statehood. A series of statutes enacted between 1852 and 1915 (when the legislature adopted the modern version of the law) created civil and criminal penalties for obstructing fish passage. *See* Bork et al., *supra* note 116, at 1817–24.

120. CAL. FISH & GAME CODE § 703.3 (West 2019).

the legislature has defined ecosystem-based management as "an environmental management approach relying on credible science . . . that recognizes the full array of interactions within an ecosystem, including humans, rather than considering single issues, species, or ecosystem services in isolation."[121]

Section 5937's requirement to maintain fish in good condition must be interpreted in the context of this directive to employ ecosystem-based science. On those dams to which the statute applies, neither the state nor local water managers can ignore or minimize the fisheries' needs in favor of other beneficial uses. The State Water Board (in consultation with CDFW) has broad power, however, to decide how best to restore and protect the various fish species, and it may employ multi-benefit analysis to make this determination. For example, Section 5937 played a key role in Decision 1631, the Mono Lake water rights decision, where the State Water Board reconciled section 5937, public trust, reasonable use, and EBM in practice.

2. The Federal Power Act and FERC Licensing

The Federal Power Act requires the owners of nonfederal dams and other facilities that generate hydroelectric power to obtain a license from the Federal Energy Regulatory Commission ("FERC").[122] These licenses contain a variety of conditions, including approval of design and construction, limitations on the volume and timing of diversions and return flows, operational standards for flood control, and regulation of the transmission of project electricity.[123] A number of California's important river systems—including the Feather, Yuba, Mokelumne, Tuolumne, and Ventura—are governed in part by dam and reservoir operation conditions set forth in their FERC licenses.

Although the grant and renewal of these licenses require an additional layer of regulatory review, the FERC licensing process nonetheless can provide a forum for implementation of CEBM.[124] In

121. CAL. FISH & GAME CODE § 43 (West 2019).

122. 16 U.S.C. § 797(e) (2018).

123. 16 U.S.C. § 803 (2018). Federal dams and hydroelectric power facilities are exempt from FERC licensing, except where a third party seeks to use the facility for its own power production. 16 U.S.C. § 797(e) (2018).

124. Although FERC issues licenses in its regulatory capacity, most FERC licensing proceedings are comprised of elaborate and lengthy negotiations among the commission, the license applicant, the State Water Board, the state and federal fish agencies, other water users, environmental NGOs, affected counties, Native American communities, and other interested parties. The operating conditions and flow requirements set forth in the FERC license, therefore, are usually based on negotiated agreements among these parties. AARON LEVINE ET AL., NAT'L RENEWABLE ENERGY LABORATORY, NEGOTIATING TERMS AND CONDITIONS: AN OVERVIEW

important part, the Federal Power Act requires FERC to give "equal consideration" to power production, energy conservation, "protection, mitigation of damage to, and enhancement of, fish and wildlife (including related spawning grounds and habitat), the protection of recreational opportunities, and the preservation of other aspects of environmental quality."[125] Indeed, this statutory language may be considered as an explicit directive to FERC to employ an ecosystem-based perspective when placing conditions on hydroelectric projects within its jurisdiction.

Despite this broad statutory language, the Federal Power Act could be a challenge for state-driven CEBM in three ways. First, in key respects, the Act preempts state law.[126] Second, the FERC has authority to issue licenses for up to fifty years, which limits the state's ability to integrate new information or adapt to changing conditions.[127] Third, new regulations strictly limit the timeline for state participation in the FERC licensing process, which makes state involvement much more difficult.

Ultimately, however, these challenges do not preclude implementation of CEBM under the Federal Power Act framework. Although the Federal Power Act vests exclusive authority in FERC to issue operating licenses to jurisdictional hydropower facilities, as a practical matter, under related federal laws the Board retains substantial power to ensure that federally licensed projects operate in a manner that fulfills comprehensive and integrated state management policies for river systems. Specifically, federal law grants the State Water Board significant authority to impose its own water quality requirements on FERC-licensed projects. Section 401(a) of the federal Clean Water Act requires applicants for federal permits and licenses—including FERC licenses—to obtain state certification that the licensee will comply CWA § 303 (including state water quality and flow standards). Section 401(d) then makes these water quality and flow standards conditions of the federal license.[128] Thus, if the State Water Board were to adopt water quality standards or other project-specific

OF THE FEDERAL ENERGY REGULATORY COMMISSION HYDROPOWER SETTLEMENT AGREEMENT PROCESS (2018).

125. 16 U.S.C. § 797(e) (2018).

126. California v. Fed. Energy Regulatory Comm'n, 495 U.S. 490, 506 (1990).

127. 16 U.S.C. § 799 (2018).

128. 33 U.S.C. § 1341(a), (d) (2018); S.D. Warren Co. v. Me. Bd. Env't Prot., 547 U.S. 370, 386–87 (2006).

requirements that incorporate CEBM principles, these conditions would be included in the FERC license and would be binding on the federal licensee.

One significant challenge is license duration. The State Water Board's opportunity to impose its own water quality requirements on the licensee exists only at the licensing (or relicensing) stage, and federal law does not provide an opportunity for recertification of FERC licenses if hydrologic, ecologic, or other conditions change. Thus, unless amended by FERC, the terms of the federal license (including the conditions set forth in the state's section 401 certification) are fixed throughout the license term.[129]

California has addressed this limitation in two ways. First, section 27 of the Federal Power Act recognizes state jurisdiction to regulate the appropriation of water for "irrigation or for municipal or other uses."[130] The courts have held that this preserves the State Water Board's authority to regulate the aspects of FERC-licensed projects that relate to irrigation, municipal, and other water supply purposes.[131] For example, the Board relied on this authority in amending the Yuba County Water Agency's water rights to require increased stream flows to protect the lower Yuba River fishery, as discussed below.

Second, the Board now includes in its section 401 certifications a term that authorizes it to reopen certification and to adopt revised conditions where there are significant changes in water quality standards or project operations. Conditions of certification also may include continuing oversight or adaptive management. For example, the 2016 water quality certification for a Pacific Gas and Electric Co. ("PG&E") project on Butte Creek and the West Branch of the Feather River requires PG&E to submit plans for Board approval of fish passage improvements, ramping rate schedules, reductions in thermal loading, fish and wildlife monitoring, and streamflow contingencies for extreme dry year operations.[132]

FERC licensing proceedings for the Yuba River Development Project, ongoing as of this writing,[133] also provide a useful example of

129. *California*, 495 U.S. at 506.

130. 16 U.S.C. § 821 (2018).

131. Cty. of Amador v. El Dorado Water Agency, 76 Cal.App.4th 931, 958 (1999).

132. CAL. WATER RES. CONTROL BD., WATER QUALITY ORD. 2016-84, PACIFIC GAS AND ELECTRIC CO., DESABLA-CENTERVILLE HYDROELECTRIC PROJECT, FERC PROJECT NO. 803 (2016).

133. FERC has issued a final environmental impact statement for its relicensing of the project, which includes the flow regime set forth in the Yuba Accord and the State Water Board's 2008 water rights order as part of the environmental baseline for the project. FED. ENERGY

how CEBM strategies may be incorporated into a FERC license. The renewed FERC license will likely be based in part on agreements set forth in the 2007 Lower Yuba River Accord, which the State Water Board incorporated into its 2008 order amending the Yuba County Water Agency's ("YCWA") water rights permits.[134] That order established a functional flow regime below Englebright Dam to protect five species of fish (three of which are listed as threatened under state or federal Endangered Species Acts), while also allowing municipal and irrigation water supply, hydropower production, recreation, and flood control. The order also included conjunctive use, water banking, and water transfer programs that provide operational flexibility for implementation of flow requirements. In addition, to facilitate adaptive management, the order created a River Management Team with representatives from YCWA, PG&E, state and federal fish agencies, non-governmental organizations, the Department of Water Resources, and the Bureau of Reclamation.[135]

The Board anticipated that the terms of the FERC license may not adequately protect the fish and other public trust resources in the lower Yuba River over its 40–50 year term and therefore has reserved jurisdiction to amend the YCWA's water rights permits if changes "are necessary or appropriate in light of any changes [made by FERC] to the release, bypass, reservoir capacity, fish protection or related requirements."[136] The Board also reserved authority "to add to or modify the conditions of this certification . . . to implement any new or revised water quality objectives and implementation plans adopted . . . [under] the Porter-Cologne Water Quality Act, or section 303 of the Clean Water Act."[137] According to the Board, the exercise of this reserved jurisdiction would not be preempted by federal law because it would "involve modification of YCWA's water rights for irrigation and other non-hydroelectric power uses."[138] Accordingly, although the

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REGULATORY COMM'N, EIS-0281F, FINAL ENVIRONMENTAL IMPACT STATEMENT FOR HYDROPOWER LICENSE: YUBA RIVER DEVELOPMENT PROJECT (2019). As of this writing, YCWA had not yet completed its environmental impact report on its relicensing application, however, and the Board therefore has not issued its final § 401 certification.

134. CAL. WATER RES. CONTROL BD., ORDER WR 2008-14, *IN RE* YUBA COUNTY WATER AGENCY, 2 (2008) [hereinafter Water Right Order 2008-14].

135. *Id.* at 7–8.

136. *Id.* at 58.

137. FED. ENERGY REGULATORY COMM'N, *supra* note 133, at 829 (2019).

138. Water Right Order 2008-14, *supra* note 134, at 31.

Yuba Accord does not embrace all of the principles of CEBM, the Yuba Project relicensing does demonstrate how these principles may be infused into the delicate balance of federal and state regulation of rivers that contain hydroelectric power facilities within FERC's jurisdiction.

A timeline challenge comes from a recent decision by the U.S. Court of Appeals for the D.C. Circuit.[139] The case arose from the implementation of the 2010 Hydroelectric Settlement Agreement, which provides for the removal of a series of hydroelectric power dams on the Klamath River for the purpose of restoring salmon habitat and migratory access.[140] The owner of the dams asked FERC to approve the transfer of its licenses to the Klamath River Renewal Corporation, which would decommission and remove the dams.[141] The court held that FERC had unlawfully failed to find that California and Oregon had waived their certification authority for the relicensing of the existing project by delaying decision for more than the one-year period specified in section 401.[142] The parties to the settlement had attempted to evade this requirement by having the petitioner withdraw and resubmit its request for section 401 certification before the one-year limit expired.[143]

Although this interpretation of section 401 will place severe time pressures on the state and regional boards, it does not preclude state certification. The decision does create a strong incentive, however, for the Board to have current water quality standards in place for all rivers downstream of FERC-licensed projects so that the Board can quickly update and tailor the standards to the specific context of the proposed federal licensing. Whether the court's interpretation of section 401 renders negotiated settlements in FERC licensing proceedings impossible remains an open (and important) question.[144]

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139. Hoopa Valley Tribe v. Fed. Energy Regulatory Comm'n, 913 F.3d 1099 (2019).

140. *Id.* at 1101.

141. *Id.* at 1102.

142. *Id.* at 1104.

143. *Id.* at 1103-05.

144. In 2020, the California Legislature considered trailer bill language that would have allowed the State Water Board to issue water quality certification before completing CEQA review if delaying action would present a risk of waiving its § 401 authority. The legislature did not enact this language into law, however. *See* Elizabeth McCormick et al., *Legislative Proposal in California Seeks To Avoid Waiver for Water Quality Certifications under Section 401 of the Clean Water Act*, WASHINGTON ENERGY REPORT (June 1, 2020), https://www.troutmanenergyreport.com/2020/06/legislative-proposal-in-california-seeks-to-avoid-waiver-for-water-quality-certifications-under-section-401-of-the-clean-water-act/ (last

In summary, although the preemptive aspects of the Federal Power Act may sometimes fragment the otherwise unified authority of the State Water Board, the Act's "equal consideration" mandate directs FERC to set ecosystem-based operational and flow standards, and relevant federal law preserves the Board's broad and flexible authority to ensure that FERC licensees comply with California's water rights and water quality laws. Other challenges may also be overcome, and if not, FERC actually licenses relatively few California dams.[145] Of course, full integration of regulatory authority in the State Water Board would be better. But the existing regulatory regime nonetheless affords a workable means of effectuating CEBM on those river systems that are affected by FERC-licensed hydroelectric facilities.[146] To the extent that state water quality standards and implementing water rights decisions are ecosystem-based, they can both shape FERC's own balancing of interests and apply independently through state certification.

B. The State and Federal Endangered Species Acts

The California and federal Endangered Species Acts ("ESAs") have profoundly influenced water use and water management in California. The federal fisheries agencies—the National Marine Fisheries Service ("NMFS") for anadromous fish (e.g., salmon, steelhead, and sturgeon), and the U.S. Fish and Wildlife Service ("USFWS") for freshwater fish and terrestrial species—have listed 42 California fish and amphibian species as endangered or threatened.[147] They also have listed eighty California species of birds, mammals, reptiles, and invertebrates, as well as 188 plant species, for protection

visited April 4, 2021); Senate Budget & Fiscal Review, Subcommittee No. 2, Issue 326 (May 24, 2020) (describing proposed trailer bill).

145. *See* Karrigan Bork et al., *The Rebirth of California Fish and Game Code Section 5937: Water for Fish*, 45 U.C. DAVIS L. REV. 809, 888 (2012) (noting that, as of 2011, there were more than 1,390 dams in California, and FERC had taken licensing action on approximately 162 of them).

146. *See* Hoopa Valley Tribe v. Fed. Energy Regulatory Comm'n, 913 F.3d 1099, 1101 (2019) (providing an example of how the state certification process interacts with the federal process).

147. The California ESA defines endangered species, threatened species, conservation, and recovery in CAL. FISH & GAME CODE §§ 2061–2062, 2064.5, 2067 (West 2019). The federal ESA defines these terms in 16 U.S.C. §§ 1532(3), 1532(6), 1532(20), 1533(f) (2018). *Federal Listed Species*, CAL. BIOLOGIST'S HANDBOOK, https://biologistshandbook.com/species/protected-wildlife-of-california/protected-species/federal-esa (last visited Feb. 16, 2021).

under the Act.[148] Many of these species (e.g., fairy shrimp, crayfish, and various grasses and flowering plants) are dependent on the state's freshwater ecosystems.[149] In addition, the California Department of Fish and Wildlife ("CDFW") has listed twenty-one species of fish and twelve amphibian species as endangered or threatened, along with fifty-four other species of fauna and 194 flora species.[150] These species are located throughout California's aquatic ecosystems and across its myriad landscapes.

The state and federal fish and wildlife agencies are the principal administrators of the ESAs. The agencies have the authority to place terms and conditions on water project operations, development, land use, and other activities. Although the State Water Board does not have direct statutory responsibility for ESA administration, the state and regional boards must consider ESA requirements in setting and enforcing water quality standards; endangered and threatened species are among the beneficial uses that the state and regional boards are charged with protecting under the water quality laws. Moreover, the operational limitations set by the agencies to enforce the ESA and protect listed species necessarily and significantly affect the volume and flow of water, and therefore must be integrated into overall ecosystem management.

The state and federal ESAs pose more difficult questions for CEBM than the laws described in the preceding sections, because they contain more rigid directives than the water quality, water rights, and related laws. These strictures include the "take" prohibitions of both statutes and the "no jeopardy" and adverse habitat limitations that

148. *Id.*

149. PPIC REPORT, *supra* note 1, at 5; *Managing Freshwater Ecosystems*, *supra* note 55, at 5–7; Jeanette K. Howard et al. *Patterns of Freshwater Species Richness, Endemism, and Vulnerability in California*, PLOS ONE (July 6, 2015), https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0130710.

150. *See Threatened and Endangered Species*, CAL. DEP'T FISH & WILDLIFE, https://wildlife.ca.gov/Conservation/CESA (last visited Feb. 16, 2021). Sixteen of nineteen state-listed fish species, and five of twelve state-listed amphibians, are also listed under the federal ESA. *Id.* State and federal law also recognize that there are species that have not yet been listed who should be closely monitored. These are known as "candidate species" and "species of special concern" under the California ESA and "candidate species" under the federal ESA. *E.g.*, CAL. FISH & GAME CODE § 2068 (West 2019); U.S. FISH & WILDLIFE SERV., CANDIDATE SPECIES (2017); *Species of Special Concern*, CAL. BIOLOGIST'S HANDBOOK, https://biologistshandbook.com/species/protected-wildlife-of-california/protected-species/species-of-special-concern/ (last visited Feb. 16, 2021). The term "species of concern" is sometimes used informally under the federal ESA. *See, e.g.*, NOAA Fisheries, Species of Concern List, 69 Fed. Reg. 19,975 (Apr. 15, 2004). CDFW has designated 19 species of fishes, 21 species of amphibians, and 170 other animal species as species of special concern. *Id.*

arise from interagency consultation requirements of the federal ESA. The categorical species protection standards of the ESAs are, of course, binding on the state and federal regulators and on those whom they regulate. All implementation and compliance decisions must comport with those statutory directives. In most circumstances, however, the categorical protection standards could be enforced consistent with the principles of CEBM. Moreover, these same categorical protections, coupled with citizen suits, are a large part of what has made the ESAs effective. The ESAs' categorical protections drive conversations about and acceptance of approaches like CEBM.[151]

One legal requirement that applies ubiquitously under the ESAs is the mandate to use the "best available science" in listing species, protecting habitat, considering the potential for proposed action to cause harm, and taking other actions.[152] Because the principles that drive CEBM are familiar, verified through scientific method, and have better outcomes for species, we believe that federal and state agencies implementing the ESA are required to at least consider CEBM. In some instances, the best available science standard may actually require application of ecosystem-based principles.

1. Take, Jeopardy, and Critical Habitat

The primary purposes of the state and federal ESAs are to conserve and recover species that are at risk of extinction or likely to become at risk in the near future unless corrective actions are taken. In accomplishing this goal, both statutes expressly emphasize the need to restore and protect the habitat on which listed species depend for their survival and recovery. The California ESA declares that "it is the policy of the state to conserve, protect, restore, and enhance any endangered species or any threatened species and its habitat and . . . consistent with conserving the species, to acquire lands for habitat for these species."[153] Similarly, the federal ESA states that the purpose of

151. *See, e.g.*, Siobhan McIntyre & Timothy P. Duane, *Water, Work, Wildlife, and Wilderness: The Collaborative Federal Public Lands Planning Framework for Utility-Scale Solar Energy Development in the Desert Southwest*, 41 ENV'T L. 1093, 1119 (2011) ("[L]egal constraints—in particular, those imposed by the federal Endangered Species Act (ESA)—are particularly important for generating ecosystem-based management regimes across jurisdictional boundaries that yield substantive environmental results.").

152. *See* 16 U.S.C. § 1533(b)(1)(A) (2018) for listing decisions, § 1533(b)(2) for critical habitat decisions, and § 1536(a)(2) for interagency consultations.

153. CAL. FISH & GAME CODE § 2052 (West 2019).

the statute is "to provide a means whereby the *ecosystems* upon which endangered species and threatened species depend may be conserved."[154]

In furtherance of these goals, both the state and federal ESAs prohibit the unauthorized "taking" of any protected species.[155] In addition, section 7 of the federal statute requires federal agencies, such as the Bureau of Reclamation, to engage in an "interagency consultation" to ensure that their actions are not likely to jeopardize the continued existence of any listed species or adversely modify their critical habitat.[156] These consultations culminate in the issuance of a "biological opinion" in which USFWS or NMFS describes the terms and conditions pursuant to which the project must operate to avoid violation of the no jeopardy/adverse modification prohibitions, and to minimize the effects of project operations on listed species.[157]

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154. 16 U.S.C. § 1531(b) (2018) (emphasis added).

155. CAL. FISH & GAME CODE § 2080 (West 2019); 16 U.S.C. § 1538(a)(1)(b) (2018). Section 9(a)(1) of the federal ESA directly prohibits the taking of endangered species. 16 U.S.C. § 1538(a)(1)(b) (2018). Section 4(d) provides that USFWS and NMFS "may by regulation prohibit with respect to any threatened species any act prohibited under section 1538(a)(1)." 16 U.S.C. § 1533(f) (2018). Pursuant to this authority, NMFS has prohibited the taking of several California fish species, including Central Valley spring-run salmon, California steelhead, Central Coast and South-Central Coast steelhead, and green sturgeon. The take rules contain a variety of exemptions for specific actions that may benefit these species or facilitate human uses. These include limited harvesting pursuant to NMFS-approved fisheries management plans, takings for scientific research, limited take of hatchery-reared fish, and incidental takings associated with state-certified habitat restoration projects. NAT'L MARINE FISHERIES SERV., A CITIZEN'S GUIDE TO THE 4(D) RULE FOR THREATENED SALMON AND STEELHEAD ON THE WEST COAST 8–12 (2000). Along with the incidental take permits described in the text, the § 4(d) rules thus provide some flexibility in the fisheries agencies' administration of the federal ESA's take prohibition.
Until September 26, 2019, threatened species (including the Delta smelt) subject to USFWS jurisdiction were automatically made subject to the take prohibition of section 9(a)(1). Determination of Threatened Status for the Delta Smelt, 58 Fed. Reg. 12,854, 12,862 (Mar. 5, 1993); cf. 50 C.F.R. §§ 17.31(a), (c) (applying take prohibition to species listed on or prior to September 26, 2019). In September 2019, the Trump Administration rescinded this rule. The change applies only to future listings, however, so the Delta smelt remains protected by the take restrictions of section 9(a)(1). Endangered and Threatened Wildlife and Plants; Regulations for Prohibitions to Threatened Wildlife and Plants, 84 Fed. Reg. 44,753, 44,760 (Aug. 27, 2019) (codified at 50 C.F.R. pt. 17). In January 2021, the Biden Administration announced its intent to review the 2019 regulatory changes. The White House, Exec. Order 13990 (Jan. 20, 2021) (Executive Order on Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis), published at 86 Fed. Reg. 7037 (Jan. 25, 2021).

156. 16 U.S.C. § 1536(a)(2) (2018).

157. 16 U.S.C. § 1536(b)(3) (2018). The California ESA does not have an equivalent consultation requirement. It does provide, however, that if a water project operator or other person has obtained incidental take authorization or an incidental take permit from the USFWS or NMFS, and the California Fish and Wildlife Director determines that the authorization or permit is consistent with the state ESA, "no further authorization or approval is necessary." CAL. FISH & GAME CODE § 2080.1 (West 2019).

On the other hand, both the state and federal ESAs allow for the "incidental taking" of listed species subject to criteria designed to ensure that the authorized takings do not violate the paramount requirements to conserve and recover species.[158] Thus, USFWS and NMFS may include "incidental take statements" in their biological opinions for federal actors.[159] These statements typically place a numeric limit on the protected species that may be taken as a result of project operations.[160] USFWS and NMFS may not grant incidental take authorization, however, if such takings would be likely to jeopardize the continued existence of protected species or adversely modify critical habitat.[161] Similarly, the California ESA authorizes incidental take only if the activity would not "jeopardize the continued existence of the species,"[162] although it adds the requirement that that the impacts of authorized take must be "minimized and fully mitigated."[163]

Non-federal actors may qualify for federal ESA "incidental take permits." The federal statute requires those who receive incidental take permits to prepare habitat conservation plans ("HCPs") that will ensure that authorized taking "will not appreciably reduce the likelihood of the survival and recovery of the species in the wild."[164] The plans also must, "to the maximum extent practicable, minimize and mitigate the impacts of [the incidental take]."[165] The California

158. 16 U.S.C**.** § 1539(a)(2)(B)(4) (2018)**;** CAL. FISH & GAME CODE § 2081(b), (c) (West 2019)**.**

159. 16 U.S.C § 1536(B)(4) (2018).

160. *See, e.g.,* Oregon Natural Res. Council v. Allen, 476 F.3d 1031, 1037 (9th Cir.2007).

161. 16 U.S.C. § 1536(b)(4) (2018).

162. CAL. FISH & GAME CODE § 2081(c) (West 2019).

163. CAL. FISH & GAME CODE § 2081(b)–(c) (West 2019). In addition, California law designates 37 species (including 10 fishes and 3 amphibians) as "fully protected species" for which CDFW may not issue incidental take permits. *Fully Protected Species*, CAL. BIOLOGIST'S HANDBOOK,

https://biologistshandbook.com/species/protected-wildlife-of-california/protected-species/fully-protected-species/ (last visited Feb. 16, 2021). However, CDFW may "authorize the taking of a fully protected fish for necessary scientific research, including efforts to recover fully protected, threatened, or endangered species." CAL. FISH & GAME CODE § 5515 (West 2019). The legislature also has granted special exemption authorizing limited take of several fully protected species in the context of highway repair, dam removal, water project maintenance, and habitat restoration. CAL. FISH & GAME CODE §§ 2081.4–2081.12 (West 2019).

164. 16 U.S.C. § 1539(a)(2)(B)(4) (2018).

165. 16 U.S.C. § 1539(a)(2) (2018).

ESA offers similar permits, but again the impacts of authorized take must be "minimized and fully mitigated."[166]

On many of California's important river systems, the consultation, critical habitat, and take requirements of the state and federal ESAs have significantly altered the ways in which projects are operated and water is allocated.[167] This is especially true in the Sacramento-San Joaquin and Delta ecosystem, where the biological opinions that govern CVP and SWP operations have created water quality and flow standards that differ in several key respects from the water quality criteria adopted by the State Water Board.[168]

Unlike the state and federal water quality standards, the requirements of the biological opinions and take limitations are not based on a multifactor analysis that seeks to provide "reasonable protection" for all beneficial uses. Rather, all actions governed by the state and federal ESAs must neither contravene nor undermine the overriding conservation mandates. Although the fish and wildlife agencies may authorize incidental takings, they may do so only if the taking would not jeopardize the continued existence of listed species or, under the federal act, adversely modify their critical habitat. Indeed, the take prohibitions of the federal statute are so pointed that the U.S. Supreme Court has recognized that they exert "a powerful coercive effect" on the agencies and project operators to whom they are directed.[169]

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166. CAL. FISH & GAME CODE § 2081(b)–(c) (West 2019). In addition, California law designates 37 species (including 10 fishes and 3 amphibians) as "fully protected species" for which CDFW may not issue incidental take permits. *Fully Protected Species*, CAL. BIOLOGIST'S HANDBOOK, https://biologistshandbook.com/species/protected-wildlife-of-california/protected-species/fully-protected-species/ (last visited Feb. 16, 2021). However, CDFW may "authorize the taking of a fully protected fish for necessary scientific research, including efforts to recover fully protected, threatened, or endangered species." CAL. FISH & GAME CODE § 5515 (West 2019). The legislature also has granted special exemption authorizing limited take of several fully protected species in the context of highway repair, dam removal, water project maintenance, and habitat restoration. CAL. FISH & GAME CODE §§ 2081.4–2081.12 (West 2019).

167. *See Managing Freshwater Ecosystems*, *supra* note 55, at 18 ("California's current approach to allocating water to ecosystems generally involves setting minimum flow and water quality standards that focus on the needs of one or more endangered species.").

168. *See* Gartrell & Gray, *supra* note 60, for an overview of the challenges and resulting policies for this ecosystem. Other aquatic ecosystems significantly affected by ESA limitations include the Klamath, Trinity, Russian, and Ventura River systems. NAT'L RESEARCH COUNCIL ET AL., ENDANGERED AND THREATENED FISHES IN THE KLAMATH RIVER BASIN 312–29 (2004); *Managing Freshwater Ecosystems*, *supra* note 55, at 31; Nathanial Brown, *Casitas Mun. Water Dist. v. United States*, U. DENV. WATER L. REV. (Dec. 12, 2013), http://duwaterlawreview.com/casitas-mun-water-dist-v-united-states/.

169. Bennett v. Spear, 520 U.S. 154, 169 (1997).

The state and federal ESAs thus create a categorical imperative that water project operations shall not jeopardize the existence of listed species or adversely modify their critical habitat, which in turn may constrain other regulatory and water management decisions. Even if the Board were to base state water quality standards on principles of ecosystem management, it still would be required to honor these ESA obligations. But these obligations and CEBM are not mutually exclusive. Within the goalposts of mandatory species protection there is significant choice, and significant ability to choose among various regulatory paths. Both statutes can accommodate CEBM. Although the focus of the ESAs is on individual species and their critical habitat, there is nothing in the statutes to preclude the fish and wildlife agencies from adopting a more integrated and holistic approach.

Indeed, the courts have emphasized that regulatory agencies have substantial latitude to decide how best to fulfill their statutory obligations to avoid jeopardy, protect critical habitat, and limit unlawful take. As the U.S. Court of Appeals described in its review of a key biological opinion governing state and federal water project operations:

> [T]he agency must base its actions on evidence supported by "the best scientific and commercial data available." The determination of what constitutes the "best scientific data available" belongs to the agency's "special expertise . . . . When examining this kind of scientific determination, as opposed to simple findings of fact, a reviewing court must generally be at its most deferential."[170]

The question of whether regulatory agencies have authority to incorporate ecosystem-based strategies into their decision making therefore may be framed as follows: "What are good scientific metrics for predicting and assessing ecosystem functions (e.g., food web productivity) on which each species relies for its survival and recovery, and are these better expressed as ecological system metrics, rather than through the salinity, flow, and temperature metrics that are currently employed?"[171] If the agencies conclude based on the best available science that ecosystem-based strategies provide an effective means of

170. San Luis & Delta-Mendota Water Auth. v. Jewell, 747 F.3d 581, 601–02 (9th Cir. 2014) (alterations in original).

171. Brian Gray et al., *Is Ecosystem-Based Management Legal for the Sacramento-San Joaquin Delta?,* CAL. WATERBLOG (Mar. 8, 2018), https://californiawaterblog.com/2018/03/08/is-ecosystem-based-management-legal-for-the-sacramento-san-joaquin-delta/.

conserving and recovering each listed species, they would have discretion (at least) to include these strategies as part of their incidental take and interagency consultation processes.

This same analysis would apply to regulatory and management strategies that include specialization of habitat within a broader ecosystem. For example, fisheries biologists and other scientists have proposed to create a "North Delta Habitat Arc" that would recognize Suisun Marsh, the northern Delta, and restored floodplain and wetlands of the lower Sacramento River and Yolo Bypass as the area within the Delta ecosystem that is best suited to the conservation and recovery of a variety of listed species. These include winter-run Chinook salmon, Central Valley steelhead, Delta smelt, and long-fin smelt.[172] The habitat arc would be managed to harness freshwater flows and tidal energy, take advantage of existing and future landscape improvements, and improve food web productivity.[173]

Although the proposal would reduce *the current regulatory emphasis on the central and south Delta as critical habitat for some*

172. The Delta smelt population has fallen to such low numbers that the species may be functionally extinct in the wild. Some scientists therefore have recommended that the North Delta Habitat Arc serve as a managed refuge for wild smelt, whose survival is "critical for maintaining the genetic diversity of the captive population" at the U.C. Davis Fish Culture and Conservation Laboratory. Peter Moyle et al., *Delta Smelt: Life History and Decline of a Once-Abundant Species in the San Francisco Estuary*, 14 S.F. ESTUARY & WATERSHED SCI., July 2016, at 20. The scientists recognize that the Delta Smelt remain vulnerable to warming waters and diminished flows, but conclude that intensive management of the sheltered population within the North Delta Habitat Arc could provide: (1) invasive species control, (2) reduction in contaminant levels, (3) flows from the Sacramento River "at crucial times of year to promote environmental variability and transport of larvae," (4) high-quality habitat for spawning, (5) "production of the right food organisms in the right places for rearing," (6) separation of the smelt from the Central and South Delta where they are vulnerable to predation, entrainment, pollution, and poor habitat, and (7) thermal regime management. *Id.* They also note that this management program also could provide "major benefits to declining anadromous fishes such as Longfin Smelt, Chinook Salmon, and Green Sturgeon." *Id.*

173. For a three-part proposal, see Jeffrey Mount, *Advice on Voluntary Settlements for California's Bay-Delta Water Quality Control Plan Part 1: Addressing a Manageable Suite of Ecosystem Problems*, CAL. WATERBLOG (Feb. 13, 2018), https://californiawaterblog.com/2018/02/13/advice-on-voluntary-settlements-for-californias-bay-delta-water-quality-control-plan-part-1-addressing-a-manageable-suite-of-ecosystem-problems/; Jeffrey Mount, *Advice on Voluntary Settlements for California's Bay-Delta Water Quality Control Plan Part 2: Recommended Actions to Improve Ecological Function in the Delta*, CAL. WATERBLOG (Feb. 21, 2018), https://californiawaterblog.com/2018/02/21/advice-on-voluntary-settlements-for-californias-bay-delta-water-quality-control-plan-part-2-recommended-actions-to-improve-ecological-function-in-the-delta/; Jeffrey Mount, *Advice on Voluntary Settlements for California's Bay-Delta Water Quality Control Plan Part 3: Science for Ecosystem Management*, CAL. WATERBLOG (Feb. 27, 2018), https://californiawaterblog.com/2018/02/27/advice-on-voluntary-settlements-for-californias-bay-delta-water-quality-control-plan-part-3-science-for-ecosystem-management/.

species, it nevertheless could be implemented consistent with the ESAs. The laws provide the fisheries agencies with the authority to determine the appropriate geographic scope for conservation and recovery. The laws also afford the agencies considerable flexibility in setting priorities for habitat types and locations—e.g., focusing on the North Delta Habitat Arc as the best means of protecting a multiplicity of species—as long as this conservation and recovery strategy would satisfy the mandatory directives of the statutes, such as: no jeopardy, protection of critical habitat, and take limitations for each listed species.[174]

Additionally, the North Delta Habitat Arc strategy would not be constrained by the U.S. Supreme Court's 2019 decision in *Weyerhaeuser v. U.S. Fish and Wildlife Service.*[175] In *Weyerhaeuser*, the Court held that section 4 of the federal ESA limits the definition of "critical habitat" to areas that are actually habitat for the species, rather than other areas that may be transformed into habitat.[176] All of the waters embraced within the North Delta Arc are within the historic and current range of habitat of the various species described in the text. Moreover, the Supreme Court recognized that "habitat can, of course, include areas where the species do not currently live, given that the statute defines critical habitat to include unoccupied areas."[177]

In August 2019, partly in response to the *Weyerhaeuser* decision, USFWS and NMFS revised their rules for designating critical habitat. Under the new regulations, before the Services may define an unoccupied area as critical habitat, they must determine that the area is essential to conservation of the listed species and that the occupied habitat of the species is inadequate to ensure its conservation.[178] "Conservation" in this context means "to bring any endangered species or threatened species to the point at which the measures provided pursuant to this Act are no longer necessary."[179] The Services must also determine that there is a "reasonable certainty" that the unoccupied area will contribute to the conservation of the species and that it

174. Gray et al., *supra* note 159**.**

175. Weyerhaeuser v. U.S. Fish & Wildlife Serv., 139 S. Ct. 361 (2018).

176. *Id.* at 368.

177. *Id.* at 369.

178. Regulations for Prohibitions to Threatened Wildlife and Plants, 84 Fed. Reg at 45,021–23; CONGRESSIONAL RESEARCH SERVICE, THE ENDANGERED SPECIES ACT AND CLIMATE CHANGE: SELECTED LEGAL ISSUES (R45926) (2019).

179. 16 U.S.C. § 1532(3) (2018).

contains one or more physical or biological features essential to the conservation of the species.[180]

Moreover, the state and federal ESAs authorize the fisheries agencies to alter take limitations for several purposes that could facilitate ecosystem-based water management. For example, section 10(a) of the federal act allows the USFWS and NMFS to permit the taking of listed species "for scientific purposes or to enhance the propagation or survival of the affected species."[181] The California ESA incorporates this take authorization by exempting any person who holds a federal "enhancement of survival permit" from the take prohibitions of state law.[182] Although these permits might not provide general authority for CEBM strategies, they could be useful in specific contexts. For example, the North Delta Habitat Arc would shift species conservation and recovery efforts from the Delta as a whole and concentrate them in the more productive and manageable habitat along the northern arc. The fisheries agencies could facilitate this by granting research and enhancement permits that would allow the relocation and assisted migration of species into the northern Delta (including the Yolo Bypass). They also could reduce incidental take restrictions in the central and south Delta where the habitat is less productive and even harmful to some species. If the best available science supported such a strategy as a means of enhancing the propagation or survival of the species, the agencies would have authority to approve it under section 10(a).[183]

Section 10(a) of the federal ESA also authorizes the fisheries agencies to exempt from take "acts necessary for the establishment and maintenance of experimental populations" of listed species.[184] This authority is more limited than the scientific research permit and "enhancement of survival" exemptions, however, as experimental populations (including offspring) must be "wholly separate geographically from the non-experimental populations of the same

180. Regulations for Prohibitions to Threatened Wildlife and Plants, 84 Fed. Reg at 45,021.

181. 16 U.S.C. § 1539(a)(1)(A).

182. CAL. FISH & GAME CODE § 2080.5. The state ESA also independently authorizes the taking of listed species for "scientific, educational, or management purposes." CAL. FISH & GAME CODE § 2081(a). As noted previously, this includes the taking of fully protected species for scientific research and recovery purposes. CAL. FISH & GAME CODE §§ 3511, 4700, 5050, 5515.

183. NMFS has granted the USFWS a research and enhancement permit to capture, breed, and reintroduce Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley steelhead in the Livingstone National Fish Hatchery on the Sacramento River. NOAA Fisheries, Issuance of Section 10(a)(1)(A) Enhancement Permit 16477, 82 Fed. Reg. 52,712 (Nov. 14, 2017).

184. Endangered Species Act, 16 U.S.C. § 1539(a)(1)(A) (2012).

species" and, on paper, must be "outside the current range of such species."[185] Courts have given the agencies significant leeway in interpreting this requirement.[186]

The National Marine Fisheries Service has authorized the release and management of an experimental population of San Joaquin River spring-run Chinook salmon as part of the San Joaquin River Restoration Program approved by Congress in 2009.[187] NMFS concluded that reintroduction would further the conservation of the species, which was extinct in the wild, and that the experimental population is essential to the continued existence of the species.[188] The agency adjusted the incidental take permits for CVP and SWP south Delta export facilities to account for migration of fish from the experimental population in the vicinity of the pumps.[189] NMFS prohibited direct takings by anglers, but it exempted a variety of unintentional activities that might harm or kill individual fish, including water management, agricultural and municipal use, recreation, and flood control.[190] Although some proponents of San Joaquin River restoration have criticized these exemptions, they nonetheless demonstrate flexibilities that are available within the confines of endangered species administration.

To summarize, CEBM therefore could be implemented consistent with the jeopardy, critical habitat, and take criteria of the state and federal ESAs. The fish agencies have substantial authority consistent with the best available science to craft appropriate conservation and recovery strategies, to set incidental take limits, and to define and regulate critical habitat. This includes discretion to manage for a multiplicity of listed and non-listed species and other beneficial uses and to set priorities that focus on specialized areas of critical habitat and ecological function that in their judgment will best conserve and

185. 16 U.S.C. § 1539(j)(1) & (2). The California ESA recognizes the federal experimental population designation and generally waives incidental take requirements for those who comply with the terms of the federal permit. CAL. FISH & GAME CODE § 2080.4.

186. Karrigan Bork, *An Evolutionary Theory of Administrative Law*, 72 SMU L. REV. 81 (2019).

187. National Marine Fisheries Service, Endangered and Threatened Species: Designation of a Nonessential Experimental Population of Central Valley Spring-Run Chinook Salmon Below Friant Dam in the San Joaquin River, California, 78 Fed. Reg. 79622-33 (2013).

188. *Id.* at 79623-25.

189. *Id.* at 79626-27.

190. *Id.* at 79626, 79632.

recover the listed species. Each river and estuarine system will present its own specific hydrologic, biologic, and habitat-related characteristics. Water regulators and managers must address each system in a manner that meaningfully grapples with its ecological nuances. The best conservation and recovery strategies for one system may not be appropriate in another. However, where the best available science indicates that ecosystem-based objectives and metrics would be an effective means to fulfill the purposes of the ESAs, the decision to include such strategies is well within the regulatory agencies' professional expertise and discretion.

2. Habitat Conservation Plans, Natural Community Conservation Plans, and Safe Harbor Agreements

If the take, jeopardy, and adverse modification strictures of the endangered species acts may be administered to *accommodate* CEBM, other important aspects of endangered species policy *encourage* the use of ecosystem-based strategies. These programs include Habitat Conservation Plans ("HCPs") authorized under the federal ESA, Natural Community Conservation Plans ("NCCPs") developed in accordance with California law, and Safe Harbor Agreements authorized under both federal and state law.

These programs allow state and federal regulators to approve comprehensive plans for the integrated management of waters, lands, and multiple species within a watershed or region. Land and resource development are usually the catalyst for specific HCPs, NCCPs, and Safe Harbor Agreements, because the laws provide clarity about the scope and conduct of the permitted activities and offer assurances that actions authorized by the plan or agreement will comply with the ESAs. But, as part of the approval process, these programs also provide a forum in which the ecological needs of multiple species (listed and non-listed) can be evaluated and protected. As such, the programs often are a better means of conserving and recovering listed species and their critical habitat than are the more specific and reactive policies of merely limiting take and avoiding jeopardy.

For example, the federal ESA requires incidental take permittees to operate pursuant to an approved conservation plan that minimizes and mitigates the effects of their actions on listed species. These HCPs must ensure that the permittee's activities (including the authorized incidental taking) "will not appreciably reduce the likelihood of the

survival and recovery of the species in the wild."[191] According to USFWS, "HCPs can apply to both listed and non-listed species . . . Conserving species before they are in danger of extinction or are likely to become so can . . . provide early benefits and prevent the need for listing."[192] The ability to anticipate future risks to aquatic species and their habitats is an important aspect of CEBM.[193]

Similarly, the California Natural Communities Conservation Act authorizes CDFW to sign agreements with individuals and public entities to create NCCPs.[194] The purposes of these plans are to "provide comprehensive management and conservation of multiple wildlife species" (including species listed for protection under the state or federal ESA) and to "identify and provide for those measures necessary to conserve and manage natural biological diversity within the plan area while allowing compatible and appropriate economic development, growth, and other human uses."[195] NCCPs also are designed to "provide an early planning framework for proposed development projects within the planning area in order to avoid, minimize, and compensate for project impacts to wildlife," including non-listed species.[196] Again, this type of proactive stewardship is a key feature of CEBM.

Both laws contemplate multi-species conservation, multi-benefit resource use, and specialized habitat management. Indeed, the state statute closely tracks the principles of CEBM described in the PPIC Report. The criteria that govern the department's approval of NCCPs declare, for example, that the plan must protect "habitat, natural communities, and species diversity on a landscape or ecosystem level through the creation and long-term management of habitat reserves or other measures that provide equivalent conservation of covered species appropriate for land, aquatic, and marine habitats." They also

191. 16 U.S.C. § 1539(a)(2).

192. U.S. FISH & WILDLIFE SERVICE, HABITAT CONSERVATION PLANS UNDER THE ENDANGERED SPECIES ACT (2011).

193. PPIC Report, *supra* note 1.

194. In contrast with the federal HCPs, NCCPs are not necessarily linked to incidental take permits, as the state statute authorizes any person or public agency to undertake "natural community conservation planning" CAL. FISH & GAME CODE § 2809. The NCCP Act provides, however, that specified NCCPs may include incidental take authorization. CAL. FISH & GAME CODE § 2830.

195. CAL. FISH & GAME CODE § 2810(a).

196. CAL. FISH & GAME CODE § 2801(b), (g).

require the plan to integrate adaptive management strategies that "will assist in providing for the conservation of covered species and ecosystems within the plan area."[197]

In addition, Safe Harbor Agreements, which are available under both federal and California law, can help to encourage landowners and water users to participate in HCPs, NCCPs, and other resource management agreements. California's safe harbor program allows landowners to manage their lands for the benefit of endangered or threatened species, as well as candidate species and "declining or vulnerable species." It also offers protections against the imposition of additional restrictions on land or water use if species populations increase or other protected species are attracted to the property.[198] CDFW may approve a safe harbor agreement—including incidental take authorization associated with management of the protected species and their habitat—if it determines that "implementation of the agreement is reasonably expected to provide a net conservation benefit to the species" and that the agreement "is of sufficient duration and has appropriate assurances to realize these benefits."[199]

The federal safe harbor program, which was created by regulation, offers similar protections. "In exchange for actions that contribute to the recovery of listed species on non-federal lands, participating property owners receive formal assurances from the [USFWS or NMFS] that if they fulfill the conditions of the [agreement], the Service will not require any additional or different management activities by the participants without their consent."[200] Under both the state and federal programs, at the conclusion of the term of the agreement the

197. CAL. FISH & GAME CODE § 2820(a)(2)–(3). The federal ESA requires that HCPs "minimize and mitigate" the impacts of the project or activity for which the incidental take permit was granted. 16 U.S.C. § 1539(a)(2). In contrast, state law requires NCCPs to include "methods and procedures within the plan area that are necessary to bring any covered species to the point at which the measures provided [in the California ESA] are not necessary." CAL. FISH AND GAME CODE § 2805(d). Although the law also states that an NCCP must include "provisions to ensure that implementation of mitigation and conservation measures on a plan basis is roughly proportional in time and extent to the [project's] impact on habitat or covered species authorized under the plan" CAL. FISH & GAME CODE § 2820(b)(9), some have argued that the department may not approve an NCCP unless it concludes that the plan will achieve full recovery of covered species. For an analysis of this question, see Jeffrey Mount et al., *The Draft Bay-Delta Conservation Plan: Assessment of Environmental Performance and Governance*, 20 WEST·NORTHWEST 245, 262–67 (2014).

198. CAL. FISH & GAME CODE § 2089.2(a).

199. CAL. FISH & GAME CODE § 2089.6(a).

200. U.S. Fish and Wildlife Service, Safe Harbor Agreements (2018).

landowner may return the enrolled property to the "baseline conditions" that existed before the safe harbor program began.[201]

During the past twenty-five years, the fish and wildlife agencies have signed HCPs, NCCPs, and Safe Harbor Agreements throughout California that protect a variety of species that inhabit common or overlapping ecosystems.[202] Many of these plans are structured to integrate land use and water resources management, while also accommodating development and water use. They include the Kern Water Bank HCP/NCCP (1997), the Lower Colorado River Multi-Species Conservation Program (2004, the Green Diamond Aquatic HCP/SHA (2007 & 2018), Rock Creek Upper Pool and Rock Creek SHAs (2015 & 2016), the South Sacramento HCP and Aquatic Resources Plan (2018), the Eel River Estuary Preserve SHA (2018), the Santa Clara River Seven Species HCP (pending), the Upper Santa Ana River HCP (under development), and the Solano Multi-Species HCP (also under development).[203]

The Upper Santa Ana River HCP, under development as of this writing, provides a useful model for CEBM under the endangered species laws. The catalyst for the HCP was a proposal by the San Bernardino Valley Municipal Water District ("SBVMWD") to capture up to 198,000 acre-feet per year of stormwater and use it for groundwater recharge.[204] Because the project could affect the Santa

201. Federal law authorizes similar protective arrangements for species that qualify for listing and other "at-risk" species. The USFWS may enter into Candidate Conservation Agreements by which landowners and resource users "voluntarily commit to implement specific actions designed to remove or reduce threats to covered species, so that listing may not be necessary." To allay concerns that the protection of candidate species may become listed and cause restrictions to be placed on the participating parties' ability to use their land or resources, the USFWS also may sign a Candidate Conservation Agreement with Assurances. These assurances agreements provide that if a covered species is listed, "additional land, water, or resource use limitations will not be imposed on them, unless they consent to such changes." U.S. FISH AND WILDLIFE SERVICE, CANDIDATE CONSERVATION AGREEMENTS (2017).

202. CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE, NCCP PLAN SUMMARIES (2019); CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE, SAFE HARBOR AGREEMENTS (2019); NOAA FISHERIES, HABITAT CONSERVATION AGREEMENTS (2019); U.S. FISH AND WILDLIFE SERVICE, HABITAT CONSERVATION PLANS (2019).

203. PPIC Report, *supra* note 1, Technical Appendix B (describing several of these plans).

204. SAN BERNARDINO VALLEY MUNICIPAL WATER DISTRICT, UPPER SANTA ANA RIVER HABITAT CONSERVATION PLAN: COVERED SPECIES (2019); SAN BERNARDINO VALLEY MUNICIPAL WATER DISTRICT, UPPER SANTA ANA RIVER TRIBUTARIES RESTORATION PROJECT AND MITIGATION RESERVE PROGRAM: DRAFT ENVIRONMENTAL IMPACT REPORT (2019) [hereinafter SAN BERNARDINO EIR].

Ana sucker, which is listed as threatened under the federal ESA, the district requested an incidental take permit from the USFWS.

Pursuant to the draft HCP, SBVMWD and several other agencies will restore aquatic habitat in four tributaries to the Santa Ana River in Riverside County. The habitat improvements will focus on the Santa Ana sucker and the arroyo chub, a species of special concern under California law. In addition, the proposed HCP will cover twenty other plant and animal species—including the arroyo toad and five other species of amphibians and reptiles, eight bird species, and two mammals. Ten of these other species are listed as endangered or threatened under state or federal law.

The draft HCP includes a variety of structural habitat changes, which include "improving conditions in existing channels, excavating new channels, [and] restoring associated floodplain surfaces and habitats."[205] The plan also will provide reliable clean flows by directing stormwater and treated wastewater discharges into the tributaries. Additional actions include removal of non-native vegetation and monitoring programs to limit human disturbance of the restored habitat while also encouraging recreational uses within the project area.[206]

The restoration program will extend across the full range of relevant landscapes, "creating functional spawning and refugia habitat within tributaries hydrologically connected to the mainstem Santa Ana River, preventing backwater habitat from developing within or at the mouth of the tributaries . . . to reduce the habitat suitability for nonnative predator fishes, . . . and restoring the hydrologic connection with historic floodplains to provide additional areas to where overbank flows can spread into riparian zones." [207] It also will establish a "Mitigation Reserve Program that will "create an ecologically functional, self-sustaining mosaic of aquatic and riparian habitats that are resilient to a range of natural disturbances (drought, flood, fire, etc.)."[208]

Overall, the draft HCP has served as a framework for integrated planning, analysis, and permitting. SBVMWD is lead agency for a consortium of eleven other water agencies and conservation districts (including the City of Rialto), and the HCP negotiations include two

205. San Bernardino EIR, *supra* note 204.
206. *Id.*
207. *Id.*
208. *Id.*

NGOs and six state and federal regulators and resource managers.[209] Based on the draft plan and the accompanying environmental impact report, the proponents of the HCP are seeking a fifty-year incidental take permit from the USFWS, a thirty-five-year Lake and Streambed Alteration Agreement from CDFW, and two twenty-year § 404 permits from the U.S. Army Corps of Engineers.[210] They also will ask the Santa Ana Regional Water Quality Control Board to use the HCP as the basis for new water quality standards for the Upper Santa Ana River.[211]

The Upper Santa Ana River is a highly altered, urban watershed, and the draft HCP has yet to be approved or tested. It, however, incorporates the essential features of CEBM. Thus, it may serve as a promising template for integrated, multi-benefit management in other developed and relatively undeveloped watersheds that are home to endangered and threatened species.

Of course, each of the aquatic ecosystem plans described above is tailored to the specific needs and circumstances of the species they are designed to protect and to the land and water uses that they regulate. Nevertheless, these and other regional conservation agreements demonstrate that state and federal endangered species policies can integrate CEBM.[212]

3. Recovery Planning

Section 4(f) of the federal ESA requires USFWS and NMFS to "develop and implement plans. . .for the conservation and survival" of listed species;[213] conservation includes recovery.[214] These plans are nonbinding and expensive to create, so they have generally been a low priority for the listing agencies. USFWS has promulgated only eight recovery plans for endangered or threatened species in California,

209. San Bernardino Valley Municipal Water District Upper Santa Ana River Habitat Conservation Plan: HCP Team (2019).

210. *Id.*

211. *Id.*

212. Negotiation of HCPs, NCCPs, and Safe Harbor Agreements can be lengthy and expensive. For this reason, the California Legislature recently authorized CDFW and other public agencies to create Regional Conservation Investment Strategies (RCIS). Cal. Dept. of Fish and Wildlife, *Regional Conservation Investment Strategies Program* (Aug. 19, 2020, 10:00 AM), https://wildlife.ca.gov/conservation/planning/regional-conservation.

213. 16 U.S.C. § 1533(f)(1).

214. 16 U.S.C. § 1532(3) (2018).

mostly for terrestrial species.[215] NMFS has published four recovery plans for anadromous fish that spawn in California rivers: Southern California Coast Steelhead (2012); South-Central California Coast Steelhead (2013); Southern Oregon/Northern California Coast Coho Salmon (2014); and the Sacramento River Winter-Run Chinook Salmon, Central Valley Spring-Run Chinook Salmon and the Distinct Population Segment of California Central Valley Steelhead.[216] All of these recovery plans bear hallmarks of CEBM, including multi-species conservation and recovery strategies, a broad landscape or watershed focus, benefits to other beneficial uses, structural habitat improvements, water quality and flow standards, and control of stressors. They therefore provide useful lessons for CEBM elsewhere.

The best example of integration of CEBM in recovery planning is in the Sacramento River basin, where water users and landowners have joined with state and federal regulators, scientists, environmental groups, fishing advocates, and other interested parties to devise a comprehensive program to protect fish, waterfowl, terrestrial wildlife, and economic uses of the region's rivers and wetlands.

The Sacramento Valley Salmon Recovery Program is part of the broader federal recovery plan for Sacramento River salmonids.[217] The program is a voluntary cooperative effort to implement the 2014 federal recovery plan on a watershed scale by setting conservation and recovery priorities based on the best available science, and then integrating those priorities into land use and water management decisions. The program also is designed to effectuate the policies of the state's Delta Smelt and Sacramento Valley Salmon Resiliency Strategies.[218] Along with fisheries benefits, the program accommodates

215. U.S. FISH AND WILDLIFE SERVICE, RECOVERY PLANNING (2018). Two of the recovery plans include aquatic species—the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon (USFWS 2005) and the Recovery Plan for Tidal Marsh Ecosystems in Northern and Central California (USFWS 2013).

216. NOAA FISHERIES, SOUTH-CENTRAL/SOUTHERN CALIFORNIA COAST STEELHEAD RECOVERY PLANS (2013); NOAA FISHERIES, RECOVERY PLANS (2014); NATIONAL MARINE FISHERIES SERVICE, RECOVERY PLAN FOR THE SACRAMENTO RIVER WINTER-RUN CHINOOK SALMON AND CENTRAL VALLEY SPRING-RUN CHINOOK SALMON AND THE DISTINCT POPULATION SEGMENT OF CALIFORNIA CENTRAL VALLEY STEELHEAD (2014) [hereinafter RECOVERY PLAN FOR SACRAMENTO RIVER]. NMFS is preparing two other recovery plans for California fish species: the California Coastal Chinook Salmon and Northern California Steelhead. NOAA FISHERIES, RECOVERY PLANS (2014). CDFW also has prepared recovery plans for steelhead (1996) and Coho salmon (2004). CALFISH RECOVERY PLANS (2018). These plans are out-of-date, however, and the state law that authorized recovery planning expired in 2017.

217. RECOVERY PLAN FOR SACRAMENTO RIVER, *supra* note 195.

218. Natural Resources Agency, Delta Smelt Resiliency Strategy (2016); Natural Resources

agricultural and other economic uses of water in the Sacramento River basin. It has gained support from all major water districts and farming groups in the Sacramento Basin.[219]

Integrated salmon recovery efforts are also underway on several of the tributaries, which are especially important because they provide the last remaining salmon spawning habitat. The most advanced and successful tributary restoration is the Butte Creek Salmon Recovery Program—a cooperative partnership among farmers, water managers, and environmental groups.[220] Since 1995, the program has removed four dams (opening 25 river miles to unimpaired fish passage), installed fish ladders on the remaining four dams upstream, restored spawning beds and riparian habitat, and provided functional flows to aid salmon migration.[221] The program also has connected Butte Creek to the Sutter Bypass, which allows juvenile salmon access to the shallow, slow moving, and nutrient-rich waters that they need for early development.[222]

The Salmon Recovery Program covers six species of anadromous fish, four of which are listed under either the state or federal ESAs, as well as the Delta smelt. Habitat restoration, wetlands enhancement, and other water management actions implemented under the program provide incidental benefits to a variety of migratory waterfowl and terrestrial wildlife. The project receives both state and federal funding, and the dedicated funding has allowed the program to make long term

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Agency, Sacramento Valley Salmon Resiliency Strategy (2017).

219. Northern California Water Agency, Voluntary Agreements Will Catalyze and Complete Long-Standing Priority Salmon Projects and Implement the Sacramento Valley Salmon Recovery Program (2019) [hereinafter Priority Salmon Projects]. In addition, the "Nigiri Project"—an experimental program spearheaded by scientists at UC Davis and California Trout—is testing whether post-harvest flooded rice fields in the Yolo Bypass also can be used to support captive juvenile salmon that could be released into the wild after they feed from the nutrient-rich waters of the bypass. If the pilot project is successful, it could serve as a management template for other agricultural lands in the lower Sacramento River basin. California Trout, The Nigiri Concept: Salmon Habitat on Rice Fields (2019).

220. Northern California Water Agency, Butte Creek Salmon Recovery: A Lesson in Functional Flows (2017).

221. *Id.*

222. *Id.* Other important tributary streams include Cow, Battle, Antelope, Mill, and Deer Creeks. During the 2012–16 drought, CDFW signed agreements with water right holders along Antelope and Mill Creeks to provide water for base and pulse flows to support spawning and out-migration. When negotiations with users along Deer Creek failed, the Board issued curtailment orders to achieve the same purposes. *Managing Freshwater Ecosystems*, *supra* note 55.

plans for habitat restoration.[223] The program seeks to protect anadromous species through all stages of their freshwater life cycles. For example, the program divides the Sacramento River Basin below Shasta Dam into three segments:

In the upper river and its tributaries, the program focuses on structural habitat improvements and cold-water releases from Shasta and Whiskeytown reservoirs to protect spawning adults and their eggs and fry. Projects include "adding spawning gravel beds and riffles, developing side channels, refugia projects and other safe habitat for fry and juvenile fish."[224]

The middle river serves as a migratory corridor for spawning adults and out-migrating juveniles. The program includes removal of barriers to in-migration and pulse flows to reduce straying from the main channel. It also includes fish screens to reduce entrainment of juveniles and projects to mitigate "predator hotspots."

In the lower river, the program recognizes that, before water development, the area would be a vast floodplain during winter and spring months, providing rearing habitat and abundant nutrients for out-migrating juveniles. The program thus includes several structural improvements (e.g., fish weirs, screens, and diversion gates) that encourage juvenile salmon to migrate through and linger in the Sutter and Yolo Bypasses. The nutrient-rich waters of the Yolo Bypass also form part of the North Delta Habitat Arc, described above, and may serve Delta smelt that migrate into (or are cultivated in) the Bypass.[225]

These and other strategies may be incorporated into the State Water Board's revised Water Quality Control Plan for the Delta through voluntary agreements with the Sacramento River basin water users. The agreements present an opportunity to integrate upstream habitat restoration and water management reforms with the other portions of the Sacramento-San Joaquin River and Delta ecosystem.[226]

Despite its many salutary features, the Sacramento Salmon Recovery Program will always be limited by the ability (and willingness) of the Bureau of Reclamation to deliver sufficiently cold-water releases from Shasta and Whiskeytown Reservoirs to enable salmon spawning and to protect the juveniles on their migratory path

223. *See, e.g.*, U.S. Bureau of Reclamation & U.S. Fish & Wildlife Service, Central Valley Project Improvement Act Fiscal Year 2014 Annual Report, Pub. L. No. 102-575, at 10 (2016).

224. NORTHERN CALIFORNIA WATER AGENCY, SACRAMENTO VALLEY SALMON RECOVERY PROGRAM (2019).

225. *Id.*

226. PRIORITY SALMON PROJECTS, *supra* note 219.

downriver to the ocean. And the catastrophic events of 2014 and 2015—when warm-water releases from Shasta Reservoir contributed to the death of more than ninety-five percent of chinook salmon eggs and fry—certainly serves as a cautionary tale.[227] But the creativity and constructive collaboration on which the program is founded is strong evidence that the recovery planning process can serve to foster comprehensive water management and reform.

4. Endangered Species Acts: Conclusion

The state and federal Endangered Species Acts, which are too often characterized as impediments to CEBM, are in fact conducive to multi-species and multi-benefit strategies. Although the fundamental goal of both statutes is to conserve and recover listed species, there is room within these strictures to engage in broader and more integrative strategies that set ecological priorities and that employ habitat specialization and multifaceted implementation programs to accomplish those priorities. The agencies have tremendous flexibility in implementing the acts and have used that flexibility to fundamentally alter the ESAs in the past;[228] the implementing agencies should use that same flexibility to enable ecosystem-based approaches. Indeed, if the best available science supports ecosystem-based approaches, the state and federal fisheries agencies *must* consider these strategies in their analysis and decision making.

In addition, there are important features of both the state and federal ESAs that expressly embrace ecosystem-based policies. HCPs, NCCPs, Safe Harbor Agreements, recovery plans, and other freshwater resource programs are now guiding integrated and multifaceted species conservation across California. They, too, demonstrate that CEBM is consonant with the existing structure and policies of the endangered species act.

III. RECOMMENDATIONS FOR REFORM

This article shows that the laws governing water quality and water rights in California empower the Water Board to implement CEBM, and that the laws governing dam operations and endangered species are consistent with that approach. As described above, existing state

227. Managing Freshwater Ecosystems, supra note 55.

228. See generally Bork, supra note 173.

and federal laws applicable to water management may incorporate the principles of CEBM in two fundamental respects. First, the State Water Board (with the assistance of the regional boards) has authority to engage in CEBM under the multifaceted and flexible directives of the water quality, water rights, and related laws. Second, in contexts in which the Board does not have primary regulatory authority—such as FERC licensing and administration of the state and federal endangered species acts—the agencies charged with implementing and enforcing those laws also have considerable discretion to incorporate ecosystem-based principles into their regulatory decisions.

For the reasons described above, section 5937 review and FERC licensing are reasonably well integrated into the Board's water quality and water rights authority. In both contexts, the Board incorporates the project bypass and discharge standards required under the other regulatory regimes into its water quality planning, and it has authority to enforce those water quality and flow requirements against project operators through its water rights authority.

Nevertheless, two aspects of the State Water Board's regulatory practice could be improved to effectuate the strategies required for comprehensive ecosystem-based management. In this final section, we first recommend that the Board more explicitly incorporate endangered species protections into its water quality planning by, where necessary, employing its water quality powers to set additional, complementary standards to ensure the reasonable protection of listed species. Second, we also urge the Board to more systematically integrate structural habitat considerations into its water rights decision making.

A. Water Quality Planning and Endangered Species Protection

There is a significant disconnect between endangered species management and the state and regional boards' water quality responsibilities. On most rivers with listed species, the boards do not establish their own species protection standards or explicitly incorporate those set by the fisheries agencies into the water quality control plans. Rather, they consider the terms and conditions set forth in biological opinions and incidental take authorizations as parameters for their own water quality regulation. As one member of the State Water Board's staff described, "We try to avoid conflict with the federal government to the extent possible."[229]

229. Anon. interview, on file with authors.

A policy of avoidance and deference presents several risks. First, tensions between regulatory strategies for listed species and the boards' regulatory strategies for non-listed species and other beneficial uses may not be adequately addressed. This is especially true for potential conflicts between federal endangered species requirements and state water quality objectives. During the last two years of the severe 2012–16 drought, for example, the drought put the CVP and SWP in a difficult position.[230] The projects were hard-pressed to both meet the state water quality requirements[231] and comply with the 2009 BiOps. Using water stored in CVP reservoirs to meet the spring outflow volume requirements would have depleted the amount of cold water stored in Shasta Reservoir to such a degree that biologists would not have been able to keep the water cool enough for winter-run Chinook salmon eggs and fry development.[232] The drought also challenged the projects' ability to control salinity in the Delta, usually accomplished by releasing enough fresh water to push the salt water out of much of the Delta.[233]

Although the State Water Board issued a series of temporary urgency change orders to relax Delta salinity and outflow standards, which in turn allowed the Bureau of Reclamation to retain water in Shasta Reservoir for salmon, these changes came close to allowing salinity in the Delta to exceed the levels needed to support in-Delta farming and export uses. Unfortunately, they also failed to protect the salmon; mortality rates exceeded 95 percent in 2014 and 2015.[234] Last second efforts to accommodate all uses resulted in a disaster. Better integration of planning and management of endangered species and water quality strategies can reduce the risk of these types of future conflicts. To be clear, CEBM is not magic; it does not create more water out of thin air. But, through collaborative development of goals and negotiated agreements, it can build consensus and create integrated plans that will provide certainty for stakeholders. Rather than trying to accommodate all stakeholders in a last ditch, largely unsuccessful effort to preserve a remnant species population, improved

230. Gartrell & Gray, *supra* note 60.

231. In the Matter of: Implementation of Water Quality Objectives for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary, No. D-1641 (Cal. State Water Res. Bd., Dec. 29, 1999).

232. Gartrell & Gray, *supra* note 60.

233. *Id.*

234. *Managing Freshwater Ecosystems*, *supra* note 55.

integration of endangered species concerns in water planning at the outset is more likely to ensure species protection when water is tight.

Second, separation of endangered species and water quality responsibilities can mean that synergies between regulatory and management strategies are missed, as are opportunities for ecological specialization. For example, the North Delta Habitat Arc would require collaboration among the State Water Board, the state and federal fisheries agencies, the Delta Stewardship Council, local governments, and a variety of stakeholder groups. The Board's water quality and water rights authority could serve as the regulatory umbrella for these types of collaborative efforts to approach integrated problems in a more creative manner, if the Board takes a more active role in addressing listed species.

Third, if the Board defers to federal endangered species standards, this may result in subpar protection for listed species and habitat if the federal standards and operational requirements are not adequate to provide "reasonable protection" as required by state water quality and water rights law. The recent conflicts between California and the Trump administration surrounding revisions to the Delta smelt and salmonid biological opinions for the CVP/SWP operations show that this is no longer a hypothetical concern.[235]

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235. In October 2018, President Trump directed the USFWS and NMFS to "work together to facilitate the designation of one official to coordinate the agencies' ESA and NEPA compliance responsibilities" in California and "to the extent practicable and consistent with law, promulgate joint biological opinions for CVP and SWP operations." The White House, Presidential Memorandum on Promoting the Reliable Supply and Delivery of Water in the West (2018). The revised BiOps must incorporate the mandates of the 2016 Water Infrastructure Improvements for the Nation Act (WIIN Act). The WIIN Act requires the federal fisheries agencies to "provide the maximum quantity of water supplies practicable" to CVP and SWP contractors "by approving, in accordance with applicable Federal and State laws (including regulations), operations or temporary projects to provide additional water supplies as quickly as possible, based on available information." The statute also specifies a variety of regulatory and operational changes to maximize project exports. (Pub. L. No. 114-322, 130 Stat. 1628, §§ 4004 & 4005(b)(3)).

The draft revised BiOps were published on October 21, 2019, and immediately engendered significant controversy. The draft opinions require a variety of changes to protect Delta smelt, salmon, and steelhead—including increased population monitoring and a conservation hatchery for the smelt and more storage in Shasta Reservoir dedicated to cold-water releases to aid salmonid spawning and migration. The draft opinions also are likely to allow for greater CVP and SWP exports, determinations that conflict with earlier drafts prepared by USFWS and NMFS biologists that concluded that increased exports would jeopardize the various listed species. Bettina Boxall, *A Report Shows Trump's Water Plan Would Hurt California Salmon. The Government Hid It.*, L.A. TIMES (Aug. 19, 2019), https://www.latimes.com/environment/story/2019-08-20/trump-california-water-salmon-farms; Bettina Boxall, *Trump Team Weakens Endangered Species Protections for California Salmon and Delta Smelt.*, L.A. TIMES (Oct. 22, 2019), https://www.latimes.com/environment/story/2019-10-22/trump-weakens-endangered-species-protections-california-salmon-delta-smelt; Coral

To address these risks, we recommend that the State Water Board create a program to set its own water quality criteria for listed species, candidate species, and species of special concern in the context of setting water quality criteria for *all* aquatic species and *all* beneficial uses. This program would apply to all rivers and aquatic systems that provide habitat for one or more species listed under state or federal law or whose water quality standards may be affected by endangered species policies. The Board would establish these water quality criteria in consultation with CDFW, the appropriate regional water quality control board, and (to the extent possible) the federal fisheries agencies.[236]

The state water quality standards for endangered and threatened species should not conflict with the species-protection objectives of the applicable biological opinions and incidental take authorizations. Instead, they could be more protective than the federal standards and operating criteria. The state standards also would serve as a backstop if federal standards are diminished.

Although some aspects of this proposal are new, there are several recent examples of the State Water Board using its water quality and water rights authority to engage in comprehensive ecosystem-based regulation in systems where there is a significant federal regulatory presence.[237] For example, as noted, the Board exercised its Clean

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Davenport, *Trump Administration Moves to Lift Protections for Fish and Divert Water to Farms*., N.Y. TIMES (Oct. 22, 2019).

236. Section 6 of the federal ESA requires the federal fish agencies to "cooperate to the maximum extent possible with the states," and it authorizes the federal agencies to enter into "management agreements" that allow the states to manage specific areas established for species conservation. It also authorizes "cooperative agreements" with states that have "an adequate and active program for the conservation of endangered . . . and threatened species." 16 U.S.C. § 1535(a)–(c). These processes could be used to foster greater collaboration between federal and state regulators. To date, however, section 6 has been used only sparingly. In 2009, NMFS and CFDW entered a "limited cooperative agreement" that covers 19 ocean species and one anadromous species (green sturgeon). The agreement provides federal financial assistance and pledges cooperation in "law enforcement, research, management, and public information and education activities." NOAA Fisheries 2019b. Endangered Species Act Section 6 Program: Cooperation with States.

237. Two key regulations underscore the Board's authority to protect endangered and threatened species through water quality planning. First, the Board's definition of beneficial uses includes: cold and warm freshwater habitat; migration of fish and other aquatic organisms; spawning, reproduction, and early development; inland saline water and marine habitat; wetlands and wildlife habitat; preservation of biological habitats of special biological significance; and protection of rare, threatened, or endangered species. (SWRCB n.d.) Second, for waters that support multiple beneficial uses (such as municipal and industrial supply, irrigation, *and* listed

Water Act section 401 certification powers to set water quality and flow standards in Piru Creek to protect the arroyo toad, which is a federally listed endangered species and a species of special concern under state law. These standards filled a regulatory gap left by USFWS, which had listed the toad for protection and designated the creek as critical habitat but had not placed conditions on DWR's operation of Pyramid Dam to protect the toad.[238]

The Board also published a draft water rights order amending the Bureau of Reclamation's water rights permits for the Cachuma Project on the Santa Ynez River based on its determination that the governing biological opinion is inadequate to protect Southern California steelhead, a federally listed endangered species. The order directs the Bureau "to provide higher flows under an adaptive management process during wet and above normal years when the water supply impacts of such flows would be minimized."[239] The Board concluded that "higher flows are likely to benefit steelhead by providing additional spawning and rearing habitat as well as increasing passage opportunities in the lower mainstem river."[240] According to the Board, this long-term habitat enhancement is necessary because the hearing record "supports the conclusion that the population is unlikely to be restored to a sustainable level unless the amount of suitable spawning and rearing habitat to which the steelhead have access is increased."[241] The Board relied on its authority under the public trust, section 5937,

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and non-listed species), federal regulations require the board to set water quality criteria that "support the most sensitive use." 40 C.F.R. § 131.11(a).

238. STATE WATER RESOURCES CONTROL BOARD, WATER QUALITY ORDER 2009–07: RE-OPERATION OF PYRAMID DAM FOR THE CALIFORNIA AQUEDUCT HYDROELECTRIC PROJECT, ORDER PARTIALLY GRANTING PETITION FOR RECONSIDERATION AND AUTHORIZING ISSUANCE OF REVISED WATER QUALITY CERTIFICATION.

239. In re. Permits 11308 & 11310 for the Cachuma Project on the Santa Inez River, Draft No. WR 2019-XX (Cal. St. Wat. Res. Bd. 2019).

240. *Id.*

241. The Board acknowledged that although the augmented flow requirements apply only in wet and above normal years, they "may increase to some extent projected water supply shortages during critically dry periods for those who rely on Cachuma Project water. These shortages are in addition to those already caused by implementation of the 2000 Biological Opinion." It therefore directed the bureau, in consultation with CDFW and NMFS, "to study the effects of the increased flows on steelhead to verify the amount of additional habitat provided by the flows and determine whether a different release schedule would be more beneficial to the fishery. In the unlikely event the results of the study demonstrate that the flows do not provide benefit to the steelhead fishery or are likely to harm the fishery, this order reserves the Board's authority to reduce the required instream flows." *Id.*

and Article X, Section 2 to set these new state law requirements that it believes will augment the inadequate federal standards.[242]

Finally, in its 2018 Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Ecosystem, the Board established new water quality criteria and flow requirements that complement existing state and federal endangered species standards, including minimum outflows within an adaptive range.[243] As of this writing, the Board is considering revised water quality objectives that would include minimum Sacramento River, San Joaquin River, and Delta outflow requirements, limits on CVP/SWP exports, and operational restrictions on the Delta Cross-Channel (an important transfer point that directs Sacramento River water into the interior channels of the Delta to facilitate project exports).[244] The Board has also encouraged water users within the Sacramento and San Joaquin River watersheds to negotiate voluntary agreements to create water management regimes that would comply with and implement these standards.[245]

The 2018 Water Quality Control Plan illustrates the breadth and flexibility of the Board's water quality powers. As the Board explained, it set the new water quality and flow standards "based on a subjective determination of the reasonable needs of all the consumptive and non-consumptive demands on the waters of the Estuary."[246] The plan also shows, however, that the Board can use its water quality and related powers to protect endangered and threatened species (and their habitat) through measures that complement and enhance the standards

242. *Id.*

243. The plan contains a number of specific features of ecosystem-based management. For example, the narrative standard for San Joaquin River outflow requires flows that "more closely mimic the natural hydrographic conditions to which native fish species are adapted, including the relative magnitude, duration, timing, and spatial extent of flows as they would naturally occur. Indicators of viability include population abundance, spatial extent, distribution, structure, genetic and life history diversity, and productivity." Similarly, the criteria for Suisun Marsh include water quality conditions that are "sufficient to support a natural gradient in species composition and wildlife habitat characteristic of a brackish marsh throughout all elevations of the tidal marshes bordering Suisun Bay." STATE WATER RESOURCES CONTROL BOARD, WATER QUALITY CONTROL PLAN FOR THE SAN FRANCISCO BAY/SACRAMENTO-SAN JOAQUIN DELTA ESTUARY (2018) [hereinafter BAY DELTA PLAN].

244. *Id.*

245. *Id.*

246. *Id.*

and operational constraints set forth in the biological opinions that protect the same listed species.

Based on these precedents, the Board should adopt a policy for all rivers and aquatic systems that are habitat to one or more listed species that: (1) examines how endangered species standards and operational requirements imposed by the state and federal fish and wildlife agencies may influence water quality; and (2) integrates these standards and restrictions into its own water quality planning. In addition, where it is necessary to provide "reasonable protection" of all beneficial uses and to fulfill the obligations of section 5937 and the public trust, the Board should set its own water quality objectives and flow requirements to complement and enhance ESA-based standards. These aspects of integrated water management will be essential to the coordinated regulation of California's water systems and to the infusion of ecosystem-based strategies into state water policies.

B. Water Rights, Water Quality, and Structural Habitat

The State Water Board seldom includes structural habitat restoration and management in its water rights decision making—even in cases where key habitat is within the control of the water right holder. The relevant water quality planning control plan calls for habitat management as a means of protecting water quality, fish, and other beneficial uses. In the 2018 Delta Water Quality Control Plan, for example, the Board stated that it will implement the new water quality objectives through its water rights authority, including conditions governing river flows, Delta outflow, and export limits. The Board also recognized that "[r]estoration of fish and wildlife habitat in the Delta would benefit many species of the Bay-Delta Estuary" and that a variety of "non-flow actions" would complement the flow objectives for the protection of fish and wildlife.[247] The Board deferred these structural habitat improvements, however, to other state and federal agencies, water users, and landowners.[248]

This decision reflects the Board's understanding that its water rights and water quality authority is limited, and that cooperation and coordination with other agencies and stakeholders is often necessary

247. Recommended habitat measures include: restoration and protection of marsh, riparian, and upland habitat in the Delta; levee setbacks; conversion of low-lying Delta islands to habitat areas; creation of shallows and shoals within the Delta channels; restoration of floodplain and riparian habitat along the lower San Joaquin River and its tributaries; control of vegetation; provision of coarse sediment to aid salmon spawning and rearing; and enhancement of channel complexity. BAY DELTA PLAN, *supra* note 220.

248. *Id.*

to address multifaceted ecological problems.[249] Yet, habitat improvements and protections are often necessary to effective restoration and management of aquatic systems. Functional flows bring variability back to landscapes and are essential for the natural systems that shape aquatic ecosystems.[250] For example, flows erode and deposit sediment and vegetative debris, which shapes and diversifies reconnected structural habitat. These flows are essential to the health of aquatic ecosystems.[251]

Thus, if the State Water Board is to incorporate ecosystem-based principles into its water quality administration, it will need to establish clear policies on when, and under what conditions, habitat rehabilitation, protection, and management may be included in water rights decisions and other implementing actions. The Mono Lake case provides a useful example, as discussed, of what the Board can do when it chooses to use its authority. Mono Lake was an extraordinary case, and we do not suggest that the detailed ecological analysis that underlay the Board's water rights determinations should be replicated in every decision that implements water quality standards. For those settings where habitat enhancement and protection are essential components of integrated CEBM policies, however, the Board should utilize its jurisdiction to place conditions on the exercise of water rights that include appropriate management of structural habitat.[252]

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249. The Board stated, for example, that it "will use its authority, as needed and appropriate, under section 13165 of the California Water Code to require that the following actions and studies be conducted." *Id.* This section provides that the board "may require any state or local agency to investigate and report on any technical factors involved in water quality control." Cal. Water Code § 13165.

250. Sarah M. Yarnell et al*., Functional Flows in Modified Riverscapes: Hydrographs, Habitats and Opportunities*, 65 BIOSCIENCE 963, 963 (2015).

251. *Id.*

252. The Board's long-standing legal policy has been to require structural habitat restoration and protection as a condition of the exercise of a water right only where such habitat would substitute for water that otherwise would be dedicated to stream flows and aquatic habitat. Thus, in its Mono Lake decision, the Board was careful to note that "habitat restoration can serve to restore public trust uses while requiring a smaller commitment of water." *Mono Lake Basin Decision*, *supra* note 91. The board's caution is understandable, yet there is nothing in the governing statutory law that limits the board's discretion in this area. Moreover, the Board has not consistently required habitat work even in these cases. As long as the required habitat restoration and management addresses the external costs of water development and use—or will prevent future habitat degradation—and the habitat conditions are "roughly proportional" to the water right holder's contribution to such harm, a broader habitat policy would comply with constitutional constraints on permitting and other regulatory conditions. Dolan v. City of Tigard, 512 U.S. 374 (1994); Koontz v. St. Johns River Water Mgmt. Dist., 568 U.S. 936 (2012); City of

In some cases, the key habitat will be under the control of the water right holder. Under these circumstances, the Board has authority to require the water right holder to rehabilitate or manage habitat and to maintain the habitat as an integral means of complying with water quality standards and other legal requirements. In other situations, the habitat may be under the control of a third party. The Board's ability to integrate structural habitat into the water rights decision therefore may be limited if it lacks jurisdiction to place conditions on the third-party property owner's use of its land or water resources. Courts have not yet determined the outer limits of the physical solution doctrine, so that doctrine may provide the board with authority to reach additional habitat. The Board may also be able to use its water rights jurisdiction to create incentives for the parties (the water right holder and third parties) to collaborate.

For example, the Board might encourage the water right holder to seek to acquire (or enter agreements to improve) habitat that—if properly managed and integrated into the aquatic system—could reduce or offset flow requirements. Indeed, the Board did this in the Mono Lake case. Although some of the habitat that it required Los Angeles to restore and maintain was on property owned by (or under the control of) the city, other crucial habitat was owned by the U.S. Forest Service. The Board determined that irrigation of these areas could provide high quality waterfowl habitat. It therefore ordered the city to provide financial assistance up to $275,000 to the Forest Service "for repairs and improvements to surface water diversion and distribution facilities . . . to restore or improve waterfowl habitat improvements on USFS land."[253]

The Board has included a similarly flexible habitat policy in its 2018 Delta water quality control plan. In urging water users to negotiate voluntary agreements that would define their obligations to fulfill the new flow standards, the Board explained that if the agreements "include non-flow actions recommended in this Plan or by DFW, the non-flow measures may support a change in the required percent of unimpaired flow, within the range prescribed by the flow objectives, or other adaptive adjustments otherwise allowed in this program of implementation."[254]

Habitat protection and restoration are not always vital aspects of water quality regulation, but they are likely to be important

Perris v. Stamper, 1 Cal. 5th 576 (2016).

253. Mono Lake Basin Decision, supra note 91.

254. Bay Delta Plan, supra note 220.

components of CEBM. In situations where managed habitat could provide structural or functional linkages that are essential to integrated ecological management, the Board should include this tool in its regulatory strategies.

CONCLUSION

Incorporation of cooperative CEBM into the regulation of California's rivers and estuaries could be accomplished consistent with the existing laws. Integrated and multifaceted regulation is the touchstone of contemporary water quality management, and the water rights laws that implement water quality standards are also sufficiently broad to authorize this approach. The state and federal laws that protect endangered species are more single-purpose focused, but they too allow for more holistic ecosystem-based strategies within the confines of their overarching directives to conserve and recover listed species.

In providing this overview of the myriad of ways in which the existing laws can facilitate CEBM, we do not mean to suggest that the agencies that administer these laws are actually employing ecosystem-based principles. Although there are examples of these strategies in practice today, most regulatory actions are focused on a few beneficial uses (viz. agriculture, municipal, and industrial water supplies and fish and wildlife), a few listed species, and several key stressors; they generally do not take a broader ecological perspective. Nor do we suggest that the laws described in this article are perfect or are being implemented as well as they might be. We do believe, however, that these examples show existing laws are more than adequate in incorporating CEBM principles into the various regulatory strategies, and that such a change can be accomplished without amending the current state and federal statutes. Where the science justifies broader and more nuanced ecosystem-wide approached, our existing law can accommodate cooperative ecosystem-based management.