WATER RIGHT EXACTIONS

*Karrigan Börk**

Water rights and their associated infrastructure support human wants and needs but also create significant external costs, including impacts on other infrastructure, ecosystems, and food production. Current approaches to managing water rights do not adequately address the externalities associated with water withdrawals, leading to economically inefficient water use, over-consumption of water, and subsequent loss of the goods and services provided by intact water systems. I propose a novel solution: the exactions framework. Long used by local governments to manage or mitigate public costs associated with land use changes, exactions offer a framework for water rights permitting that would address these shortcomings. State water management agencies should condition both new and existing water rights with exactions that require funding or in-kind contributions to offset the external costs associated with water rights and associated infrastructure. Water right exactions could internalize the public costs of water withdrawals, mitigate existing distributive concerns, and provide dedicated funding and water for mitigation of public costs of water use. Imposition of water right exactions would dramatically improve water use decisions.

Table of Contents

* Karrigan Börk is an Acting (tenure track) Professor of Law, U.C. Davis, with a Ph.D. in Ecology from U.C. Davis and a J.D. from Stanford Law School. He appreciates feedback on this article from his colleagues at the Rocky Mountain Mineral Law Foundation Natural Resources Law Teachers Institute Works-in-Progress, the NorCal Junior Faculty Workshop, the 9th Annual Sabin Colloquium on Innovative Environmental Law Scholarship at Columbia Law School, and the University of Utah S.J. Quinney College of Law/Rocky Mountain Mineral Law Foundation Water Law Professors Works-in-Progress Workshop.

Introduction

Water rights and their associated infrastructure support human needs and wants, from agriculture to drinking water to industrial uses,[1] but also impose significant external costs, including impacts on infrastructure, ecosystems, and food production.[2] Early water users saw water rights as rights without duties, or at least rights without any obligations to the public.[3] The very nature of water, however, means that use invariably generates externalities,[4] those costs borne by

1. *See, e.g.*, Rhett B. Larson, *Water Security*, 112 Nw. U.L. Rev. 139, 165 (2017) ("[W]ater lies at the heart of human conflict and cooperation and is, therefore, the foundational element not only of life but also of law."); Bernadette R. Nelson, *Muddy Water Blues: How the Murky Doctrine of Equitable Apportionment Should Be Refined*, 105 Iowa L. Rev. 1827, 1828 (2020); Richard Damania, *The Economics of Water Scarcity and Variability*, 36 Oxford Rev. Econ. Pol'y 24, 26 (2020).

2. *See, e.g.*, Robin Kundis Craig, *Resilience Theory and Wicked Problems*, 73 Vand. L. Rev. 1733, 1736 (2020) (noting the problems associated with "almost all water engineering anywhere in the world"); Dan Tarlock, *Hydro Law and the Future of Hydroelectric Power Generation in the United States*, 65 Vand. L. Rev. 1723, 1735 (2012).

3. From the very beginning of western water law, courts and legislatures have pushed back against this view, largely unsuccessfully. *See, e.g.*, Hill v. Smith, 27 Cal. 476, 482 (1865) (confirming that "[t]he maxim, *sic utere tuo ut alienum non laedas* . . . has lost none of its governing force; on the contrary, it remains now, and in the mining regions of this State, as operative a test of the lawful use of water as at any time in the past, or in any other country"); Karrigan S. Börk et al., *The Rebirth of California Fish & Game Code 5937: Water for Fish*, 45 U.C. Davis L. Rev. 809, 813–15 (2012) (describing the California legislature's early efforts to ensure water use and infrastructure did not destroy California's salmon runs).

4. Jamison E. Colburn, *Don't Go in the Water: On Pathological Jurisdiction Splitting*, 39 Stan. Env't L.J. 3, 10 (2019) (suggesting "one party, place, or state's reach for water will almost surely threaten someone, somewhere else"); Dustin E. Garrick & Robert W. Hahn, *An Economic Perspective on Water Security*, 15 Rev. Env't Econ. & Pol'y 45, 49 (2021) (discussing the "pervasive externalities across the water cycle, including the negative externalities associated with water extraction").

someone other than the market actor making a particular decision. The externalities were easy to ignore when sufficient water was available and nature seemed inexhaustible, but they have become overwhelming in the face of increased use and broad market and institutional failures.[5] In some cases, these costs can be partially abated through careful water management and engineering solutions, but such mitigation requires dedicated funding and water,[6] both of which are typically scarce.[7] Current approaches to water right regulation do not adequately address the externalities associated with water withdrawals, leading to over-consumption of water[8] and subsequent loss of the services and other values provided by intact water systems.[9] In this article, I propose a novel solution: water right-permitting entities should impose exactions on both future and existing water right holders to internalize these external costs and thereby encourage more rational water use. In the land use context, exactions are money or other property paid by developers in exchange for discretionary land use permits.[10] Exactions impose some of the public costs of development on the devel-

5. Ruth Meinzen-Dick, *Beyond Panaceas in Water Institutions*, 104 PROC. NAT'L ACAD. SCI. 15200, 15200 (2007); Garrick & Hahn, *supra* note 4 at 49; Shyamkrishna Balganesh & Gideon Parchomovsky, *Structure and Value in the Common Law*, 163 U. PA. L. REV. 1241, 1279 (2015).

6. *See infra* Part IV.C.

7. Tarlock, *supra* note 2, at 1763 (discussing methods "to create a new, synthetic hydrograph that performs a reasonable range of pre-dam and predevelopment functions"). *See generally* Reed D. Benson, *Reviewing Reservoir Operations: Can Federal Water Projects Adapt to Change?*, 42 COLUM. J. ENV'T L. 353 (2017) (describing competing priorities for water stored behind large federal dams and outlining the process by which federal agencies manage this water).

8. *See* Christine A. Klein, *Water Bankruptcy*, 97 MINN. L. REV. 560, 565 (2012); Dave Owen, *Water and Taxes*, 50 U.C. DAVIS L. REV. 1559, 1561 (2017) (discussing water use inefficiencies); Janet C. Neuman, *Beneficial Use, Waste, and Forfeiture: The Inefficient Search for Efficiency in Western Water Use*, 28 ENV'T L. 919, 992–96 (1998).

9. Denise D. Fort, Water and Population in the American West, 107 HUM. POPULATION & FRESHWATER RES.: U.S. CASES & INT'L PERSPS. 17, 18–19 (2002) (arguing that approaches are unsustainable); Kalyani Robbins, *Allocating Property Interests in Ecosystem Services: From Chaos to Flowing Rivers*, 42 HARV. ENVTL. L. REV. 197, 205 (2018) (noting a need for "reliable pathways to protect" ecosystem services); Daniel A. Auerbach et al., *Beyond the Concrete: Accounting for Ecosystem Services from Free-Flowing Rivers*, 10 ECOSYSTEM SERVS. 1, 2 (2014). Although this article focuses on the impacts to ecosystem services, for a discussion of shortfalls in the ecosystem services approach, see Bonnie Colby, *Acquiring Environmental Flows: Ecological Economics of Policy Development in Western U.S.*, 173 ECOLOGICAL ECON. 1, 2 (2020).

10. *See* Hannah J. Wiseman, *Taxing Local Energy Externalities*, 96 NOTRE DAME L. REV. 563, 568–69 (2020). In this article, for ease of use and maximal descriptive power, I use the term exactions very broadly to apply to the requirement that a permit applicant give up property (including money) in exchange for a discretionary benefit. This would include uniform legislative fees, like impact fees, which some scholars would exclude from exactions. *See infra* notes 181–185 and accompanying text for a discussion of the dispute over the outer edges of the exaction definition.

oper, leading the market to deliver a more optimal level of development. Other authors have argued for using exactions to address the climate change and energy impacts of new developments, but this proposal is different.[11] Rather than targeting developments and assessing their impacts on different sectors, this piece proposes exactions on water rights *directly*. In short, water permitting agencies should impose charges on both new and existing water rights based on the public costs associated with those water rights. This is a novel application of exactions, moving the concept from the land use setting to condition other discretionary permits. Most water right-permitting entities already have the power to impose exaction-like terms and conditions on water rights, although they generally fail to do so.[12] Exactions are a feasible approach that offer many benefits: internalizing water right externalities, addressing distributional fairness issues around the costs and benefits of water use, and providing dedicated funding and water for ecosystem protection.[13] Overall, they will better maximize the societal benefits of water use.[14]

Part I begins with an introduction to externalities and then details the many externalities associated with water rights and their infrastructure, with a focus on impacts from using flowing surface waters and groundwater. As a general matter, a perfectly functioning economy should produce perfect economic efficiency,[15] the social optimum,[16] but this requires many assumptions that inev-

11. *See, e.g.*, J. Peter Byrne & Kathryn A. Zyla, *Climate Exactions*, 75 MD. L. REV. 758, 758–59 (2016) (arguing for applying exactions to new developments based on their climate impacts); Jim Rossi & Christopher Serkin, *Energy Exactions*, 104 CORNELL L. REV. 643, 643 (2019) (arguing for applying exactions to new developments based on their energy impacts); *see also* Brian Scaccia, *"Taking" a Different Tack on Just Compensation Claims Arising Out of the Endangered Species Act*, 37 ECOLOGY L.Q. 655, 655 (2010) (arguing for use of the exactions framework for takings analysis in the water context); Wiseman, *supra* note 10, at 563 (arguing for taxes based on energy externalities).

12. Many, perhaps most, water rights were initially obtained under the common law or granted by permitting agencies working in a purely ministerial role and contain no requirements for mitigation. More modern water rights may contain restrictions based on the public interest or environmental conditions, but the literature and independent research shows very few water rights that put affirmative obligations on the right holder. *See* Karrigan Börk & Sonya F. P. Ziaja, *Amoral Water Markets* (forthcoming).

13. *See infra* Part IV.

14. At least in those cases where the benefits of imposing exactions outweigh the costs of doing so. Megan Hennessy, *Colorado River Water Rights: Property Rights in Transition*, 71 U. CHI. L. REV. 1661, 1679 (2004). This is true in an overall efficiency sense but failing to impose them may raise distributional fairness concerns.

15. *See generally* Daniel B. Kelly, *Strategic Spillovers*, 111 COLUM. L. REV. 1641, 1650 n.28 (2011) (explaining an economist's general approach to studying policies based on their impact on social welfare).

16. Guido Calabresi & A. Douglas Melamed, *Property Rules, Liability Rules, and Inalienability: One View of the Cathedral*, 85 HARV. L. REV. 1089, 1094 (1972); Kelly McGee, *A Place Worth Protecting: Rethinking Cost-Benefit Analysis Under FEMA's Flood-Mitigation Programs*,

itably fail in practice,[17] often due to unclear property right allocations and market or institutional failures.[18] One of the failures comes from externalities. Because the market actor bears only the private cost of an action, not the total cost, they will engage in the action even when the benefit of the action is less than its true cost, making the market less efficient. And there are many externalities in the water context.

Society relies on a host of goods and services associated with a well-functioning river ecosystem, and water rights and associated infrastructure often negatively impact those services in a manner that is not fully mediated through existing market or legal mechanisms.[19] Similarly, groundwater pumping can cause problems at the surface of the land, many of which also negatively impact the public at large.[20] The cost of water does not reflect these impacts.[21] Part I goes on to explain that existing water institutions have some methods of addressing externalities *between* water users, such as the no-harm rule for water transfers[22] or requirements that groundwater users mitigate impacts to other users,[23] but externalities that impact the public more broadly frequently go unaddressed by water permitting agencies.[24] This is particularly true for historic water rights that remain in use today.[25] Other authors have explicitly considered the subset of externalities that affect other water users,[26] but few legal commen-

88 U. CHI. L. REV. 1925, 1933 (2021); Mauricio Guim & Michael A. Livermore, *Where Nature's Rights Go Wrong*, 107 VA. L. REV. 1347, 1377 (2021).

17. *See* Michael Hanemann, Caitlin Dyckman & Damian Park, *California's Flawed Surface Water Rights*, *in* SUSTAINABLE WATER: CHALLENGES AND SOLUTIONS FROM CALIFORNIA 52, 52–54 (Allison Lassiter ed., 2015).

18. Michael Hanemann & Michael Young, *Water Rights Reform and Water Marketing: Australia vs the US West*, 36 OXFORD REV. ECON. POL'Y 108, 108–29 (2020).

19. *See generally* Robbins, *supra* note 9, at 226.

20. Dave Owen, *Law, Land Use, and Groundwater Recharge*, 73 STAN. L. REV. 1163, 1166 (2021) [hereinafter *Groundwater Recharge*]; Dave Owen, *Taking Groundwater*, 91 WASH. U. L. REV. 253, 256–64 (2013) [hereinafter *Taking Groundwater*].

21. Owen, *supra* note 8, at 1617.

22. Leila C. Behnampour, *Reforming a Western Institution: How Expanding the Productivity of Water Rights Could Lessen Our Water Woes*, 41 ENV'T L. 201, 221 (2011) (explaining the Colorado no-harm rule).

23. Stephen N. Bretsen & Peter J. Hill, *Water Markets as a Tragedy of the Anticommons*, 33 WM. & MARY ENV'T L. & POL'Y REV. 723, 762 (2009).

24. The public interest test provides a good example of the problem. *See infra* note 119 and accompanying text.

25. Karrigan Börk, *Time Limits for Water Rights*, NAT. RES. & ENV'T (forthcoming 2022) (explaining that "[m]ost of these old rights have never been assessed in a modern legal framework").

26. Rebecca Nelson, *Paying Back the River: A First Analysis of Western Groundwater Offset Rules and Lessons for Other Natural Resources*, 34 STAN. ENV'T L.J. 129, 133–34 (2015); Lawrence J. MacDonnell, *Colorado's Law of "Underground Water": A Look at the South Platte Basin & Beyond*, 59 U. COLO. L. REV. 579, 597 (1988).

tators consider the broader social impacts of water withdrawals on the public through an externality lens.[27]

Policymakers try to mitigate some water right externalities through many modern environmental laws,[28] addressing problems like species declines and reductions in ecosystem services through mandate-based approaches like the federal Endangered Species Act ("ESA") and state approaches like the public trust doctrine,[29] but these are seen as less efficient than market-based solutions and often impose the cost of addressing the externalities on the public, not on the right holders.[30] Because the water right holders do not pay the costs of mitigating their own externalities,[31] price incentives are inadequate for private market ordering to maximize societal benefits of water use.[32] Improving price signals will reduce or shift water use; this is paradigmatic environmental economics.[33] But, in most cases, there are no price signals—the water itself is still free.[34] Successful pricing mechanisms could make for much more rational water use;[35] thus far such efforts have seen little implementation and existing water markets are localized, stilted affairs that fall short of producing economically efficient outcomes.[36] They also reinforce existing power structures in ways that frustrate

27. Background research found three articles focused on these impacts. *See* Nelson, *supra* note 26, at 163 (providing "the first systematic, comparative, empirical analysis of groundwater offset rules as they stand across the West"); Owen, *supra* note 8, at 1590–92 (recommending Pigouvian taxes to address the externalities of water use); and, tangentially, Robbins, *supra* note 9, at 225 (considering ecosystem services in the real property context, including exactions).

28. Owen, *supra* note 8, at 1596–97; Larson, *supra* note 1, at 151–53.

29. *See infra* Part III.A.1.a. Note that many of the mandate-based laws are actually applied in a flexible way that involves significant negotiations. *See* Dave Owen, *The Negotiable Implementation of Environmental Law*, 75 STAN. L. REV. 3, 39–40 (2022).

30. Emily Hammond & David B. Spence, *The Regulatory Contract in the Marketplace*, 69 VAND. L. REV. 141, 171–73 (2016); Kevin L. Brady, *An Economic Review of Inefficiency in Utah Groundwater Law: Cache County Emphasis*, 38 ENV'T L. REP. NEWS & ANALYSIS 10021, 10024 (2008).

31. For a discussion of related distributive fairness concerns, see Gregory S. Alexander, The Social-Obligation Norm in American Property Law, 94 CORNELL L. REV. 745 (2009).

32. *See* Owen, *supra* note 8, at 1604–05; Auerbach et al., *supra* note 9, at 2.

33. Robert Glennon, *Water Scarcity, Marketing, and Privatization*, 83 TEX. L. REV. 1873, 1883 (2005); Colby, *supra* note 9, at 1.

34. Most everyone pays for water, but this obfuscates an important fact: the water itself is generally free. Aside from the cases where water is acquired through a market transaction, the bills reflect infrastructure and other delivery costs, not a cost for the water itself. *See infra* notes 213–16 and accompanying text.

35. Barton H. Thompson, Jr., *Institutional Perspectives on Water Policy and Markets*, 81 CALIF. L. REV. 671, 734–35 (1993).

36. Eric Biber, *Law in the Anthropocene Epoch*, 106 GEO. L.J. 1, 47 (2017) (discussing challenges to water markets); Henry E. Smith, *Property as the Law of Things*, 125 HARV. L. REV. 1691, 1711 (2012); Colby, *supra* note 9, at 2 (finding "relatively few examples of well-developed water markets").

their objectives.[37] Pigouvian taxes offer a potential solution, although their feasibility is suspect and legislatures have been loath to impose them.[38] The exactions approach I advocate here would provide pricing benefits as more rational water markets continue to develop.

Finally, Part I explains the exactions framework, long used by local governments to manage public costs associated with land use changes. Using exactions, local governments condition discretionary permits for land use changes on dedication of land or payment of funds to offset the associated public costs.[39] Exactions might include "land or easement dedications for schools, parks, or trails; impact fees to defray the cost of increased traffic or facility usage; purchase or donation of equipment or off-site parcels for public use; and linkage fees to finance affordable housing for the employees of incoming commercial tenants."[40] Exactions are politically expedient and face few circumscriptions under state law, making them a preferred tool for municipalities;[41] they are ubiquitous, shaping our communities, improving economic efficiency,[42] and making projects more palatable to the public in virtually every city nationwide.[43] Part I concludes with a review of the relevant Supreme Court precedent, concluding that the Court treats exactions with suspicious approval; as both a "hallmark of responsible land-use policy" and a potential source of abuse.[44] Courts uphold exactions as constitutional when the exactions both have an essential nexus with the harm being remedied[45] and demonstrate "'rough proportionality' . . . both in nature and extent to the impact."[46]

Part II is the meat of the proposal, explaining how water right entities could impose effective exactions on water rights. The exactions would be imposed by state water permitting agencies or the equivalent, depending on the state, and would be imposed on both new and existing water rights as a condition of continuing to use the water. The exactions would be based on the public costs of the water use and associated infrastructure, like dams and canals. This

37. *See, e.g.*, Daniel W. Bromley, *Resources and Economic Development: An Institutionalist Perspective*, 19 J. ECON. ISSUES 779, 781 (1985) (highlighting institutional aspects of market failures); *see also* Colby, *supra* note 9, at 1–2.

38. *See infra* Part IV.A.3.

39. *See infra* Part I.E. *But see* Christopher S. Elmendorf & Darien Shanske, *Auctioning the Upzone*, 70 CASE W. RES. L. REV. 513, 526 (2020).

40. Danielle S. Pensley, *Real Cities, Ideal Cities: Proposing a Test of Intrinsic Fairness for Contested Development Exactions*, 91 CORNELL L. REV. 699, 700 (2006).

41. John A. Henning, Jr., *Mitigating Price Effects with a Housing Linkage Fee*, 78 CALIF. L. REV. 721, 722 (1990).

42. *See infra* Part I.E.

43. Mark Fenster, *Takings Formalism and Regulatory Formulas: Exactions and the Consequences of Clarity*, 92 CALIF. L. REV. 609, 615 (2004).

44. Koontz v. St. Johns River Water Mgmt. Dist., 570 U.S. 595, 605 (2013).

45. Nollan v. Cal. Coastal Comm'n, 483 U.S. 825, 837 (1987).

46. Dolan v. City of Tigard, 512 U.S. 374, 391 (1994).

practical guidance, rooted in an understanding of water institutions and the existing power and value differences among competing water interests,[47] addresses concerns about water reallocation and demonstrates how the exactions can meet water management goals. Part II concludes with several case studies of existing exaction-like arrangements in the water law world. These proof-of-concept examples demonstrate the effectiveness of water right exactions.

Part III next establishes that the water right exactions I propose would be constitutional. In many ways, water rights are comparable to the rights at issue in exaction cases. This is not obvious—land use rights seem fundamentally different than water rights,[48] which are "usufructuary" rights to a common pool resource.[49] But, as Part III demonstrates, the key aspect of land use rights, from an exactions perspective, is that they condition permits that are considered privileges, not permits that merely recognize an existing right; because the local government could deny the permit outright, conditioning the permit with appropriate exactions is constitutionally acceptable.[50] Similarly, water rights are not issued automatically; water agencies generally have a great deal of discretion in determining whether to issue a permit, based both on state police powers and on the pre-existing limitations on water rights.[51] Broadly, water rights are much more restricted than land use rights,[52] and "[e]very major change in western

47. *See generally* Ronald H. Coase, *Nobel Prize Lecture: The Institutional Structure of Production*, NOBEL PRIZE (Dec. 9, 1991), https://perma.cc/82KQ-W6JY (arguing that "[i]t makes little sense for economists to discuss the process of exchange without specifying the institutional setting within which the trading takes place since this affects the incentives to produce and the costs of transacting"); *see also* Sonya F. P. Ziaja, *Rules and Values in Virtual Optimization of California Hydropower*, 57 NAT. RES. J. 329, 333 (2017) (explaining that "[i]nstitutional arrangements are essential for an accurate understanding of resource allocation and conflicts").

48. Richard A. Epstein, *The Necessity of Convergence in Private Law*, 92 S. CALIF. L. REV. 751, 758 (2019) ("[I]n no society do the rules governing water rights parallel those for land, chattels, and animals, which differ in lesser ways among themselves. The water rights start with the notion of common (res commune) property in a state of nature."); *see also* Carol M. Rose, *Property as the Keystone Right?*, 71 NOTRE DAME L. REV. 329, 351 (1996); Julie E. Cohen, *Property as Institutions for Resources: Lessons from and for IP*, 94 TEX. L. REV. 1, 13 (2015); Richard A. Epstein, *Playing by Different Rules? Property Rights in Land and Water*, *in* PROPERTY IN LAND AND OTHER RESOURCES 317 (Daniel H. Cole & Elinor Ostrom eds., 2012).

49. Chad O. Dorr, "*Unless and Until It Proves to Be Necessary": Applying Water Interest to Prevent Unjust Enrichment in Interstate Water Disputes*, 101 CALIF. L. REV. 1763, 1774 (2013); *see also* Larson, *supra* note 1, at 177.

50. *See infra* Part I.E.

51. Elise L. Larson, *In Deep Water: A Common Law Solution to the Bulk Water Export Problem*, 96 MINN. L. REV. 739, 741 (2011) ("States' police powers allow them to control property rights in water resources through statute, regulation, and permitting systems."); *see infra* Part III.A.1.a.

52. *See, e.g.*, Lee Anne Fennell, *Adjusting Alienability*, 122 HARV. L. REV. 1403, 1418–19 (2009) (describing many limits on water rights).

water law, despite adverse effects on existing claims of right, has been sustained as valid non-compensable regulation."[53] As I show, water rights can be constitutionally conditioned with exactions as well.[54]

Of course, it is a little more complicated than this introductory sketch suggests. Most surface water sources in the western United States have been fully appropriated for almost half a century,[55] meaning that all the water available in the streams and rivers in a normal year has already been claimed under existing water rights.[56] Thus, to be effective, exactions must not only apply to the rare application for new water rights but also must be added to many existing rights. This challenge is not insurmountable, but it adds a complicating wrinkle.[57]

In Part IV, I address the broad benefits of this approach, relying in part on the case studies. First, as its raison d'être, the exactions framework can internalize many of the externalities associated with water rights, inducing more efficient water use and a more optimal distribution of water-related costs and benefits. In particular, water agencies may be more willing to impose a fair cost on water users than to simply regulate the water use, which these agencies are often loathe to do. Second, it addresses distributional fairness concerns by requiring beneficiaries of water projects to pay more of the real costs associated with water use. Third, because funds and property generated through exactions are earmarked for use to mitigate project impacts, an exactions approach will provide much needed dedicated funding and water for management of public water-use costs. A robust system of exactions that internalize water right costs will raise many questions, and this part concludes by considering a few of the early concerns.

I briefly conclude by reiterating the major arguments for the water right exactions framework. I turn now to the explanation of the impacts of water rights and their associated infrastructure.

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53. Joseph L. Sax, *The Constitution, Property Rights and the Future of Water Law*, 61 U. COLO. L. REV. 257, 259 n.4 (1990) (collecting cases).

54. *See infra* Part III.A.1.a.

55. *See generally* U.S. WATER RES. COUNCIL, SECOND NATIONAL WATER ASSESSMENT (1978).

56. Joseph Novak, *Abandonment and Forfeiture: How to Hold a Water Right as Development Takes Place*, 28 ROCKY MTN. MIN. L. INST. 1249, 1264 (1982); *see also* NAT'L RSCH. COUNCIL, WATER TRANSFERS IN THE WEST: EFFICIENCY, EQUITY, AND THE ENVIRONMENT 1 (1992).

57. Klein, *supra* note 8, at 582–96 (providing a "comprehensive cataloguing of the techniques that states have employed to reallocate water" away from existing right holders); *see infra* Part III.A.1.a.

I. Water Use Causes Significant Externalities

This Part explains externalities and then discusses the external costs of water use and water use infrastructure to advance the arguments that exactions should be used to internalize these impacts.

A. What are Externalities and Why are They Bad?

Neoclassical economists posit that a perfectly functioning economy will settle at perfect economic efficiency, generating maximum social benefits.[58] This perfectly functioning economy requires a host of assumptions and supporting institutions—fully rational actors, zero transaction costs, perfect information, no natural monopolies, perfect property regimes, no externalities, and so on.[59] The assumptions often fail in practice, introducing "market distortions," which is where things get interesting.[60] As a general rule, eliminating or reducing these "market distortions" allows market forces to produce outcomes that more closely align with an optimum allocation of resources across society, provided that the benefits of government intervention outweigh the administrative and other costs associated with it.[61] This justifies government intervention to address market distortions.[62] Other, noneconomic justifications for government intervention include normative or rights-based concerns.[63]

Externalities, sometimes called spillovers, side effects, third-party costs and benefits,[64] or social costs, are *the* classic market distortion in environmental

58. *See generally* Kelly, *supra* note 15, at 1650 n.28; Calabresi & Melamed, *supra* note 16, at 1093–94. Even in a perfectly functioning economy, the ultimate allocation of costs and benefits depends on the initial allocation of property rights, reflected in the institutional and legal structure that underlies the economy. Ziaja, *supra* note 47, at 333–35.

59. *See* Vanessa Casado-Pérez, *Missing Water Markets: A Cautionary Tale of Governmental Failure*, 23 N.Y.U. Env't L.J. 157, 165 (2015).

60. *See* Damania, *supra* note 1, at 36–37; *see also* Interview with Dr. John King, Exec. Dir. of Analysis & Pol'y, Graduate Stud., Univ. Cal., Davis, (May 15, 2021) (noting that market models rely on many assumptions and that failures of these assumptions are commonplace).

61. *See* Jonathan S. Masur & Eric A. Posner, *Toward a Pigouvian State*, 164 U. Pa. L. Rev. 93, 100 (2015); Thompson, *supra* note 35, at 679–80.

62. *See generally Groundwater Recharge*, *supra* note 20, at 1207–10 (discussing when market distortions justify government intervention).

63. Casado-Pérez, *supra* note 59, at 165 ("The economic rationales for government intervention in markets may coexist with non-economic reasons for government action, such as redistribution of wealth or human rights concerns."); *see also* Calabresi & Melamed, *supra* note 16, at 1096–99 (discussing wealth distribution as a motivation).

64. Lisa Grow Sun & Brigham Daniels, *Externality Entrepreneurism*, 50 U.C. Davis L. Rev. 321, 327 (2016).

economics.[65] The idea is simple: every action generates costs and benefits for the actor, but also for other people or the public at large.[66] Externalities are costs and benefits that fall on other people or the public at large and which are not mediated through market or other mechanisms.[67] Negative externalities move society away from optimum efficiency by encouraging the rational actor to overconsume or over produce, provided that there is any marginal benefit to the actor from doing so.[68] This is because, at some level of production, the actor will "have an incentive to engage in an activity if the activity's private benefits exceed its private costs even though, as a result of the externality, the activity is undesirable as its social costs exceed its social benefits.[69] Thus, the rational market actor will engage in the activity even though the total social cost of the action exceeds the private value of the action, which makes the market less efficient.[70]

Economists spend a great deal of time thinking about how to internalize externalities in order to maximize overall benefits in the use of resources.[71] Many policy levers can accomplish this internalization,[72] including the common

65. R. H. Coase, *The Problem of Social Cost*, 3 J.L. & ECON. 1, 1 (1960) (noting that "[t]he standard example is that of a factory the smoke from which has harmful effects on those occupying neighbouring properties").

66. Richard A. Epstein, *Positive and Negative Externalities in Real Estate Development*, 102 MINN. L. REV. 1493, 1495–96 (2018).

67. Kelly, *supra* note 15, 1650–51; *see also* ROBERT S. PINDYCK & DANIEL L. RUBINFELD, MICROECONOMICS 661–63 (7th ed. 2009).

68. Masur & Posner, *supra* note 61, at 100 (describing how the cost of pollution associated with over production is imposed on society). *See generally* ARTHUR C. PIGOU, THE ECONOMICS OF WELFARE 185–226 (AMS Press 1978) (1920); Henry N. Butler & Jonathan R. Macey, *Externalities and the Matching Principle: The Case for Reallocating Environmental Regulatory Authority*, 14 YALE L. & POL'Y REV. 23, 29 (1996); *see* Daniel C. Esty, *Environmental Protection in the Information Age*, 79 N.Y.U. L. REV. 115, 154 (2004); WILLIAM J. BAUMOL & WALLACE E. OATES, THE THEORY OF ENVIRONMENTAL POLICY 16–19 (2d. ed. 1988).

69. Kelly, *supra* note 15, at 1644.

70. Meinzen-Dick, *supra* note 5, at 15200–02 (discussing "large externalities and other sources of market failure in the water sector"). Even in a well-functioning economy, the question of what is considered an externality raises fundamental questions of allocation of property rights. Bromley, *supra* note 37 at 781–83 (noting that the allocation of entitlements is "the basic economic question in a society").

71. Shi-Ling Hsu, *A Two-Dimensional Framework for Analyzing Property Rights Regimes*, 36 U.C. DAVIS L. REV. 813, 833 (2003) ("If externalities can be internalized, individual ownership with strong use rights is the best regime for making productive use of the resource."). *But see* Butler & Macey, *supra* note 68, at 29–30. This quest to internalize externalities may explain much of environmental law. David B. Spence, *Regulation and the New Politics of (Energy) Market Entry*, 95 NOTRE DAME L. REV. 327, 328 n.5 (2019) (collecting citations); Todd J. Zywicki, *Environmental Externalities and Political Externalities: The Political Economy of Environmental Regulation and Reform*, 73 TUL. L. REV. 845, 850 (1999).

72. Hsu, *supra* note 71, at 833, 856–57.

law tort of nuisance,[73] Coasean bargaining,[74] Pigouvian taxes,[75] and zoning and environmental laws or other command and control approaches.[76] This article argues that innovative exactions applied to water rights can promote better social efficiency in the water use context. I next discuss prior work on addressing negative externalities in the water use decisions.

B. Surface Water Externalities

Understanding the impacts of water withdrawals and their associated infrastructure requires more than a surface level understanding of streams and rivers. A river is not just its water; a river is also its bed and banks and living things.[77] These parts of a river shape the way the water flows and are in turn shaped by that flow. Early efforts to manage water withdrawal impacts focused almost exclusively on maintaining minimum flows during dry periods,[78] but by the mid-1990s, freshwater ecologists and fluvial geomorphologists[79] recognized that desirable river conditions required more than starvation rations,[80] even if restoration of the full historic flow regime is difficult or impossible given existing infrastructure, land use patterns, and human water use.[81] As a middle ground, current environmental flows research embraces a "functional flows" ap-

73. *See* Calabresi & Melamed, *supra* note 16, at 1094. Nuisance allows a party bearing the cost of another actor's decision to impose that cost on the original actor, internalizing the externality.

74. The Coase Theorem suggests properly attached property rights can allow the involved parties to negotiate a benefit-maximizing outcome, assuming no transaction costs, among other things. *See generally* Coase, *supra* note 65.

75. Most economists prefer use of a Pigouvian tax to internalize negative externalities. Masur & Posner, *supra* note 61, at 94. The Pigouvian tax is named after the economist Arthur Pigou and imposes a cost on market actions equal to the harm that the action imposes on third parties. PIGOU, *supra* note 68, at 185–226. Pigouvian taxes impose minimal intrusions on the self-governing market. *See, e.g.*, Masur & Posner, *supra* note 61, at 101–02; Hammond & Spence, *supra* note 30, at 171–72. Very few Pigouvian taxes have been imposed. *Id.*

76. As in most American environmental laws, governments often interfere in markets through prescriptive and proscriptive rules that limit the extent of externalities, as suggested by Garrett Hardin's work on the "tragedy of the commons." *See* Garrett Hardin, *The Tragedy of the Commons,* 162 SCIENCE 1243, 1247 (1968); Hammond & Spence, *supra* note 30, at 172.

77. Sarah M. Yarnell et al., *Functional Flows in Modified Riverscapes: Hydrographs, Habitats and Opportunities*, 65 BIOSCIENCE 963, 963–70 (2015).

78. *Id.* at 963 (noting the early focus on species-based minimum instream flows).

79. "'[F]luvial geomorphology' comes from the Greek terms '[g]eo,' meaning earth; 'morphe,' meaning shape; and 'ology,' meaning study, and from the Latin word 'fluvial,' meaning of rivers." Oppliger v. Vineyard, 803 N.W.2d 786, 798 (Neb. Ct. App. 2011). Fluvial geomorphologists study "river dynamics and processes, i.e., how rivers move, change, and behave." *Id.*

80. Yarnell et al., *supra* note 77, at 963–64.

81. Karrigan Börk, *Governing Nature: Bambi Law in a Wall-E World*, 62 B.C. L. REV. 155, 201 (2021).

proach, which means identifying and restoring enough of the historic flow regime to drive the key geomorphological and ecological processes for ecosystems to function.[82] This approach recognizes that the river is a three-legged stool, its nature determined by a complex interaction of hydrology, geology, and biology. A flood provides a useful illustration of the interactions of the three legs of the stool.

First, a flood clearly conveys how hydrology drives geomorphological processes.[83] As it moves from the mountains to the plains, flowing water carries a load of sediment, and the total volume and particle size of the sediment varies based on the speed and volume of the current.[84] As flood waters rise, a river begins to pick up more and larger sediment, moving larger and larger rocks and debris downstream. Flood survivors recount the "sound of boulders crashing down the river in the blackness" and remember the way "[b]oulders rolling down the riverbed rattled pictures on the wall."[85] In river stretches where flood waters slow, perhaps as they leave constricted canyons and spread into more forgiving reaches, they lack the concentrated force to carry large rocks and boulders, and those rocks settle out into the riverbed to create cobble bars or rock foundations for islands. The flooding river still carries sediment, but the load shifts toward finer and finer debris, like sand and silt. As the waters reach the broad floodplains characteristic of lower river reaches, it again slows and spreads, and some of this sediment too settles out, creating sandbars and fertile floodplain soils. The flood waters may fill old channels and carve new ones, changing the structure of the river. As the flood recedes, the remade river emerges. Although floods demonstrate geofluvial processes in a dramatic way, these same geofluvial forces constantly interact with the substrate geology to create familiar river patterns: runs and riffles, pools and islands, and graceful channel meanders. The hydrology and geology together make a river's bed, banks, and floodplain.

Second, the waters do more than just reshape the physical river corridor. They directly affect the biota in the river ecosystem. Sticking with the floodwater example, floods serve an array of vital ecological processes, forming and shaping river life.[86] The living things in a river system vary in their resistance to a flood (that is, their ability to survive the flood in place) and in their resilience

82. Yarnell et al., *supra* note 77, at 964.

83. Sam Lake, Nick Bond & Paul Reich, *Floods Down Rivers: From Damaging to Replenishing Forces*, 39 ADVANCES ECOLOGICAL RSCH. 41, 41–42 (2006).

84. *See generally* Ellen Wohl et al., *The Natural Sediment Regime in Rivers: Broadening the Foundation for Ecosystem Management*, 65 BIOSCIENCE 358, 361 (2015).

85. Eric Gorski, *Big Thompson Canyon Struck Again by Tragic Flooding*, DENVER POST (Sept. 28, 2013), https://perma.cc/FSW5-VRW8.

86. "Biota" is the plant and animal life of a particular region, the living portion of an ecosystem, which is defined as "all of the organisms . . . in a given area interacting with the physical environment . . . ." EUGENE P. ODUM, FUNDAMENTALS OF ECOLOGY 6 (3rd ed. 1971).

(their capacity to recover after the flood).[87] The intensity and regularity of flooding, then, influence what biota are favored in a particular river system. Floods also determine "the degree of connectivity, the exchange of matter and the processing of organic matter and nutrients across river-floodplain gradients" and create a "shifting habitat mosaic" along the river corridor.[88] These characteristics influence which organisms can live in the broader river system, and the increased "patchiness" created by the variety of physical habitats increases overall biodiversity in the river ecosystem.[89] For example, "flood plains are amongst the most dynamic and heterogeneous ecosystems, showing complex patterns of variation over a wide range of temporal and spatial scales."[90] Further, many species exhibit life history events tied to particular hydrologic events in a river system, like salmon migration tied to floods or cottonwood germination on falling spring flows.[91] As with the fluvial geomorphology example, a flood is merely a dramatic way to portray processes or relationships that occur throughout a river's normal range of flow; droughts, water quality, water temperature, and other intra- and interannual variability in volume and timing of flow influence a river's biota. The species present in a river ecosystem depend on the water.

Third and finally, the river biota both affect and are affected by the geomorphology of the river system itself. Many organisms require particular kinds of sediment as a growing or breeding substrate; for example, spawning salmon require larger cobble free of fine sediments, while different plant species need their own particular growing media with appropriate nutrient availability and drainage.[92] At a larger scale, the shape of the river influences the makeup of its biota; many species require particular river habitats, like slower, warmer backwaters or floodplain habitats, to support particular life stages.[93] And the biota directly affect the geomorphology of the river system from the fine scale (e.g., delivery of ocean nutrients to upstream ecosystem through large scale salmon

87. For example, floods uproot some plants and wash them away or wash fish so far downstream that they cannot survive, and species (and individuals within species) vary in their ability to withstand these impacts. Lake et al., *supra* note 83, at 41–43.

88. Klement Tockner, Mark S. Lorang & Jack A. Stanford, *River Flood Plains Are Model Ecosystems to Test General Hydrogeomorphic and Ecological Concepts*, 26 River Rsch. & Application 76, 77 (2010).

89. The plants and animals within a river system also interact with each other through relationships like predation, parasitism, or commensalism. *See* Erik Stokstad, *On the Origin of Ecological Structure*, 326 Science 33, 33 (2009).

90. Tockner et al., *supra* note 88, at 77.

91. Yarnell et al., *supra* note 77, at 967. Juliet C. Stromberg et al., *Flood Flows and Dynamics of Sonoran Riparian Forests*, 2 Rivers 221, 221 (1991).

92. *See generally* Stromberg, *supra* note 91; G. Mathias Kondolf & M. Gordon Wolman, *The Sizes of Salmonid Spawning Gravels*, 29 Water Res. Rsch. 2275, 2275 (1993).

93. *See* U.S. Fish & Wildlife Serv., Colorado Pikeminnow Recovery Goals viii (2002), https://perma.cc/HCL6-39Y8.

migrations or sequestration of nutrients in plant matter)[94] to the large scale (e.g., plant roots securing sediments to create and protect bars and islands or woody debris forming debris dams that trap sediments and create new river structures).[95] A river's geomorphology and biota have a mutually constitutive relationship.

This back-of-the-envelope ecogeomorphological[96] sketch provides the context to understand the impacts of water withdrawals. Water use inevitably shakes the legs of the metaphorical stool, from small scale changes in flow volume due to direct diversion to large scale changes due to dams that facilitate the physical process of water withdrawals. Because the three-legged river ecosystem emerges from the interactions within and between the river's hydrology, geology, and biology, water withdrawals or water infrastructure changing one of these characteristics can push the river system in a new direction.

These river changes impose significant external costs.[97] Ecosystem services analyses, [98] particularly those that include geosystem services,[99] provide a useful[100] framework for assessing costs associated with water withdrawals.[101] Consider dams. As their primary function, dams store water by interrupting the river's flow. This leads to a cascade of changes to the river system,[102] including changes in the timing, volume, quality, and temperature of downstream flows;

94. *See generally* Cornelia W. Twining et al., *Nutrient Loading by Anadromous Fishes: Species Specific Contributions and the Effects of Biodiversity*, 74 CAN. J. FISH AQUATIC SCI. 609.

95. *See generally* Leonard A. Smock, *Role of Debris Dams in the Structure and Functioning of Low-Gradient Headwater Streams*, 70 ECOLOGY 764 (1989).

96. Martin C. Thoms & Melissa Parsons, *Eco-geomorphology: An Interdisciplinary Approach to River Science*, 276 INT'L ASS'N HYDROLOGICAL SCI. 113, 118–19 (2002); *see also Ecogeomorphology*, U.C. DAVIS CTR. FOR WATERSHED SCIS., https://perma.cc/8KVJ-KEPZ.

97. Auerbach et al., *supra* note 9, at 1–2.

98. "Ecosystem services are the conditions and processes through which ecosystems, and the species that make them up, sustain and fulfill human life. . . . [R]eframing biophysical processes as services allows them to be valued," facilitating cost-benefit decision-making. Andrew J. Guswa et al., *Ecosystem Services: Challenges and Opportunities for Hydrologic Modeling to Support Decision Making*, 50 WATER RES. RSCH. 4535, 4535–36 (2014). For a detailed discussion of ecosystem services and the property issues they raise, see Robbins, *supra* note 9, at 200–05.

99. Keith H. Hirokawa, *The New Law of Geology: Rights, Responsibilities, and Geosystem Services*, 52 ENV'T L. REP. 10380, 10381–82 (2022).

100. Some aspects of ecosystems defy conversion into dollar amounts. Margaret V. du Bray et al., *Does Ecosystem Services Valuation Reflect Local Cultural Valuations? Comparative Analysis of Resident Perspective in Four Major Urban River Ecosystems*, 6 ECON. ANTHROPOLOGY 21, 21 (2019). Rights-based and other absolutist approaches are also not susceptible to economic analysis.

101. Auerbach et al., *supra* note 9, at 1.

102. *See, e.g.*, Michael T. Pyle, *Beyond Fish Ladders: Dam Removal as a Strategy for Restoring America's Rivers*, 14 STAN. ENV'T L.J. 97, 103–04 (1995).

which result in changes in downstream geomorphology;[103] which both together cause changes in the in-river and riparian ecosystems.[104] Together, these changes disrupt or eliminate many ecosystem services, negatively impacting:

- Transportation (altered flow and sediment regimes may impact traditional transportation uses);
- Recreation and esthetics (dams may diminish "non-motorized boating, native sport fishing, and wildlife viewing in the river corridor," with attendant property value changes);
- Food and fiber production (dams generally degrade traditional or commercial fisheries and floodplain agriculture);
- Insurance from water-related catastrophes (dams can increase the destructive impacts of very large flows);
- Native biodiversity (dams generally result in native species declines);
- Pollutant and disease risk (dams can concentrate pollutants and increase undesirable eutrophication); and
- Maintenance of riverbanks, levees, deltas, and in-river human infrastructure.[105]

Sediment impacts of dams provide an example. As noted, both during floods and at normal flows, rivers carry sediment from upstream erosional areas down to depositional zones, the flatter, lower reaches where sand, gravel, and other sediments settle out of the slower moving river. A dam interrupts this process, slowing the water and causing it to drop its load of sediment. Sediment remains trapped behind the dam, and water emerging from the dam is "hungry;" it has enough force to carry significant sediment loads but no sediment to absorb that force.[106] As the channel is scoured out by the hungry flows, the river deepens and loses its connection to the riparian and floodplain areas, eventually destroying vital floodplain and in-river habitat,[107] while remaining instream habitats change so they are unable to support many native species, creating a sterile environment that short-circuits the river ecosystem.[108] Beyond the

103. Geomorphology refers to the physical features of Earth's surface. *Geomorphology*, MERRIAM-WEBSTER, https://perma.cc/XFD3-P68A.

104. William L. Graf, *Downstream Hydrologic and Geomorphic Effects of Large Dams on American Rivers*, 79 GEOMORPHOLOGY 336, 336 (2006).

105. *See* Auerbach et al., *supra* note 9, at 1–3 (reviewing impacts and collecting citations).

106. *Id.*

107. "This disconnection of the river from its historic floodplain greatly constrains the natural maintenance, regeneration and expansion of riparian habitat." SACRAMENTO CNTY., AMERICAN RIVER PARKWAY PLAN 51 (2008). These changes reduce the value of riparian habitat and reduce the woody debris essential for healthy streams and fish survival. *Id.*

108. S. C. Zeug et al., *Gravel Augmentation Increases Spawning Utilization by Anadromous Salmonids: A Case Study from California, USA*, 30 RIVER RSCH. & APPLICATIONS 707, 707 (2014).

ecosystem impacts, the hungry water eats away at downstream infrastructure support, impacting everything from bridges and levees to riverside housing.[109]

The impacts of blocking the sediments behind the dam extend far downstream, eventually reducing the sediment reaching deltas and beaches.[110] Ninety-five percent of the sediment entering the world's oceans comes from rivers, but dams have reduced sediment delivery at all scales, with an estimated overall reduction in the total amount of sediment moving into the ocean of more than 40%.[111] The loss of sediments has global-level, real-world impacts in the near term, both downstream of dams and in coastal area; due to sediment loss, deltas are sinking many times faster than sea levels are rising, aggravating global change-induced flooding,[112] and the rate of coastal erosion, including erosion of beaches, is increasing.[113] Loss of sediments has decreased the rates of sand replenishment on beaches by as much as 50% in Southern California.[114] The ecosystem services cost of dam impacts on sediment alone is staggering.

All of the changes—from ecosystems degradation to loss of beaches—are water use costs that fall on people other than the water users, often on the public at large. Generally, there are no mechanisms to ensure that the water users themselves bear the costs.[115] In an economic sense, they are externalities, which encourage water users to use more water than is optimum, provided that there is any marginal benefit to the actor from doing so.[116]

Water right and infrastructure decisions already consider these impacts in some ways. Council on Environmental Quality guidelines require consideration of ecosystem service impacts for federal spending on water projects for most relevant agencies (Department of the Interior, U.S. Army Corps of Engineers, etc.),[117] and hydrologists are already developing methodologies to provide accu-

109. G. Mathias Kondolf, *PROFILE: Hungry Water: Effects of Dams and Gravel Mining on River Channels*, 21 ENV'T MGMT. 533, 533 (1997).

110. Matthew J. Slagel & Gary B. Griggs, *Cumulative Losses of Sand to the California Coast by Dam Impoundment*, 24 J. COASTAL RSCH. 571, 571 (2008).

111. Des E. Walling, *Human Impact on Land–Ocean Sediment Transfer by the World's Rivers*, 79 GEOMORPHOLOGY 192, 192, 200 (2006); James P.M. Syvitski et al., *Sinking Deltas Due to Human Activities*, 2 NATURE GEOSCIENCE 681, 683 (2009).

112. Syvitski et al., *supra* note 111, at 685.

113. Cope M. Willis & Gary B. Griggs, *Reductions in Fluvial Sediment Discharge by Coastal Dams in California and Implications for Beach Sustainability*, 111 J. GEOLOGY 167, 167 (2003).

114. Slagel & Griggs, *supra* note 110, at 571.

115. Bonnie G. Colby, *Transactions Costs and Efficiency in Western Water Allocation*, 50 AM. J. AGRIC. ECON. 1184, 1184–86 (1990) (noting that environmental externalities in the water context generally go uncompensated).

116. Masur & Posner, *supra* note 61, at 100–01. *See* PIGOU, *supra* note 68; Butler & Macey, *supra* note 68, at 29; Esty, *supra* note 68, at 154; BAUMOL & OATES, supra note 68, at 18.

117. COUNCIL ON ENV'T QUALITY, PRINCIPLES AND REQUIREMENTS FOR FEDERAL INVESTMENTS IN WATER RESOURCES 6–7 (2013).

rate and useful accounting for water-related ecosystem services.[118] Moreover, as noted, many water rights and water infrastructure decisions are subject to broader "public interest" tests and can only proceed if the permitting agency determines that the right serves the public interest.[119] But these approaches, which merely consider ecosystem service impacts as part of a go/no go cost-benefit or public interest analysis, are insufficient—even water rights or water infrastructure with substantial public costs can be permitted, if the permitting agency decides the benefits overall outweigh the costs. In those cases, though, the water user will be overconsuming the water, because the external costs are borne by the public, not the water user. Internalizing the costs and then allowing the water user to decide how much water use makes sense leads to a more efficient level of use.

Fortunately, in some cases, the impacts of water withdrawal, including infrastructure impacts, can be partially mitigated through careful flow management,[120] engineering solutions, habitat improvement, and other direct actions.[121] Under current water rights permitting, these mitigation efforts are not tied in any way to the water rights, are generally underfunded, and are paid for by the public—not by the water right holder—so the cost incentives for the right holder remain misaligned. Current approaches to mitigating surface water right impacts are insufficient.

C. Groundwater Externalities

Externalities also result from groundwater use. Groundwater serves a vital role as part of the water supply in the United States, both for ecosystems and for human use.[122] Groundwater is generally cleaner, cooler, and more consistently available than surface water.[123] As of 2014, 130 million people in the United States use groundwater for drinking,[124] and well over half of irrigated farm lands in the United States rely on groundwater.[125] Using groundwater is deceptively simple: sink a pipe and start pumping groundwater. But extracting groundwater, as with extracting surface water, creates many costs. Some of the costs are internalized, like the cost of power to run the pump and the cost of

118. *See generally* Guswa et al., *supra* note 98, at 4535.

119. Mark Squillace, *Restoring the Public Interest in Western Water Law*, 2020 Utah L. Rev. 627, 628 (2020).

120. Yarnell et al., *supra* note 77.

121. *See infra* Part IV.

122. *Groundwater Recharge*, *supra* note 20, at 1165.

123. *Id.*

124. Leslie A. DeSimone et al., U.S. Geological Surv., The Quality of Our Nation's Waters: Water Quality in Principal Aquifers of the United States, 1991–2010, at 1 (2014), https://perma.cc/KF29-X6EZ.

125. Stefan Siebert et al., *Groundwater Use for Irrigation: A Global Inventory*, 14 Hydrology & Earth Sys. Sci. 1863, 1872 (2010).

digging a deeper well when the water level drops, but many other costs are external.[126] Externalities associated with groundwater extraction[127] include the following:

- Groundwater pumping can reduce groundwater levels, raising the energy costs for extraction or putting the water out of reach.
- Groundwater pumping in coastal areas can remove enough fresh water that seawater intrudes, making some groundwater wells unusable.
- Groundwater extraction can increase or redirect the movement of water contaminated by pollutants into areas with wells, requiring expensive treatment of the groundwater.
- Although the law tends to treat groundwater and surface water separately,[128] the two are generally related, so pumping groundwater can reduce surface water flows,[129] negatively impacting both surface water users and groundwater-dependent ecosystems.
- Groundwater often provides support for the soil above it; when this groundwater is removed, the soil sinks, generally irreversibly (termed subsidence).[130] Subsidence can be extreme, exceeding 25 feet in some areas.[131] This uneven change in the land's surface elevation has tremendous negative impacts, damaging public and private infrastructure like bridges, roads, canals, and homes,[132] and permanently reducing groundwater storage capacity.[133]

The cost of these groundwater extraction externalities is generally not incorporated into any permitting process nor imposed on the water user,[134] but rather shared by many members of the public.[135] This distorts the groundwater users' decision-making, resulting in undue increases in water use while also imposing extra costs on society that would be more efficiently born by water right holders themselves.

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126. Nelson, *supra* note 26, at 143.

127. *See* Nell Green Nylen et al., Ctr. for L., Energy & Env't, U.C. Berkeley Sch. Law, Trading Sustainably: Critical Considerations for Local Groundwater Markets Under the Sustainable Groundwater Management Act 28 (2017).

128. Christine A. Klein, *Groundwater Exceptionalism: The Disconnect Between Law and Science*, 71 Emory L.J. 487, 490 (2022).

129. *Id.* at 493.

130. Jennele Morris, *Subsidence: An Emerging Area of the Law*, 22 Ariz. L. Rev. 891, 892 (1980).

131. Christopher B. Amandes, *Controlling Land Surface Subsidence: A Proposal for a Market-Based Regulatory Scheme*, 31 UCLA L. Rev. 1208, 1214 (1984).

132. Claudia C. Faunt et al., *Water Availability and Land Subsidence in the Central Valley, California, USA*, 24 Hydrogeology J. 675, 683 (2016).

133. Amandes, *supra* note 131, at 1210.

134. Nelson, *supra* note 26, at 144.

135. *See, e.g.*, Danielle Bergstrom, *Money to Repair Central Valley Canal in House Bill. A Large Funding Gap Remains*, Fresno Bee (July 9, 2020), https://perma.cc/84SL-5EEQ.

D. Water Externalities Remain Unaddressed

As the above sections make clear, "[w]ater . . . is subject to pervasive externalities as a result of the interconnected nature of the water cycle and water systems."[136] Water use depends on both an institutional infrastructure and a physical infrastructure which have long focused on the "subjugation and exploitation of water,"[137] with little concern for the externalities resulting from that subjugation and exploitation.[138] To a large degree, these externalities remain unaddressed, resulting in widespread negative impacts.[139] Generally, in response to problems related to water use, governments "have reacted by either regulating the amount of water people can use, banning or limiting certain water-use-intensive activities, or placing limits on specific secondary consequences of water consumption," through acts like the ESA.[140] The regulatory approach dominates, both because it provides some certainty about the likely (or at least the hoped for) outcome, and because it offers the advantages of familiarity and existing regulatory structures.[141] The regulatory regime evolved in part because the common law regime was simply inadequate to address the environmental and water-related harms of the industrial revolution.[142] Nevertheless, the existing regulatory and common law regime falls short in many ways, and the search for alternative approaches continues.[143]

Externalities themselves have seen remarkably little consideration in the water law literature, at least outside of the context of water markets.[144] There are a few exceptions. Most notably, Professor Owen proposes a Pigouvian tax on water.[145] He argues that Pigouvian taxes could reduce water use "more efficiently and more equitably than alternative modes of regulatory constraint."[146]

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136. Garrick & Hahn, *supra* note 4, at 46; *see* Casado-Pérez, *supra* note 59, at 171.

137. Larson, *supra* note 1, at 151.

138. *See id.*

139. *But see* Owen, *supra* note 8, at 1562. Considerations of equity, justice, and fairness have begun to move to the fore and are rapidly becoming an essential aspect of water policies. *See* Amber Wutich & Melissa Beresford, *The Economic Anthropology of Water,* 6 ECON. ANTHROPOLOGY 168, 170–76 (2019).

140. Owen, *supra* note 8, at 1596–97.

141. *Id.* at 1608–09.

142. JOHN BELLAMY FOSTER, THE VULNERABLE PLANET: A SHORT ECONOMIC HISTORY OF THE ENVIRONMENT 51 (1st ed. 1994).

143. Owen, *supra* note 8, at 1562.

144. Perhaps this is due, in part, to lack of a clear property rights scheme. *See generally* Hanemann et al., *supra* note 17. Coasian bargaining is frustrated in this context, especially where externalities affect large portions of the public and affect them in different ways. Henning, *supra* note 41, at 733–34; Casado-Pérez, *supra* note 59, at 171.

145. Owen, *supra* note 8, at 1564.

146. *Id.* at 1586, 1572; *see* Thomas Lee, *The Water Excise Tax: Preserving a Necessary Resource*, 4 NW. J.L. & SOC. POL'Y 171–73 (2009) (discussing that thus far, such arguments have found no traction with law-makers).

No other authors appear to advocate a water tax so directly,[147] and few other authors spend much time considering externalities related to water use writ large.[148]

Professor Nelson's detailed analysis of western groundwater offsets provides the other exception to this general statement. Groundwater offset rules require groundwater users to offset some of the impacts of the groundwater extraction on other right holders, usually by providing supplemental surface water,[149] although the rules generally ignore non-right related public impacts.[150] Professor Nelson's detailed review of groundwater offset rules in eight western states is an important contribution to the literature and provides detailed analysis of existing groundwater offset regimes and recommendations for improvement. As discussed below in Part III.B, the groundwater offset rules already function in a way very similar to exactions, but the current mitigation schemes are ultimately too narrow to encompass most of the public externalities related to groundwater pumping.

Most of the discussions of water right externalities in the legal literature come up in a more tangential way, in discussions advocating market-based approaches to water allocation problems.[151] Water right transfers, the goal of water markets, generally involve changing some key aspect of the water right, like the place of use, type of use, or time of use. These changes may alter the amount or quality of water that returns to the river, reducing the water quality or quantity available for other users or instream uses; these negative externalities have been the subject of some study.[152] Unsurprisingly, the commentators argue for internalization of externalities generated by water transfers, to ensure that rational participants proceed only when the total benefits of the transfer exceed

147. Owen, *supra* note 8, at 1566 (noting that imposing new taxes is difficult, but still seeking "to introduce and support [a Pigouvian water tax as] a policy idea that has merit, and thus, perhaps, to extend slightly the realm of political possibility").

148. *Id.* at 1562. *But see* Rex A. Mann, *A Horizontal Federalism Solution to the Management of Interstate Aquifers: Considering an Interstate Compact for the High Plains Aquifer*, 88 TEX. L. REV. 391, 413 (2009).

149. Nelson, *supra* note 26, at 130–31, 134.

150. *Id.* at 143 ("In practice, . . . groundwater offset rules in the western United States tend to only address the impacts of pumping groundwater on surface water."); *id.* at 194.

151. *See, e.g.*, Eric T. Freyfogle, *Context and Accommodation in Modern Property Law*, 41 STAN. L. REV. 1529, 1556 (1989) (collecting citations); Thompson, *supra* note 35, at 764; Hsu, *supra* note 71, at 861–62; Glennon, *supra* note 33, at 1883; Dean Baxtresser, *Antiques Roadshow: The Common Law and the Coming Age of Groundwater Marketing*, 108 MICH. L. REV. 773, 775 (2010); Klein, *supra* note 8, at 594; Richard A. Epstein, *Why Restrain Alienation?*, 85 COLUM. L. REV. 970, 990 (1985) (examining common-law restraints on alienation due to externalities in transfers of riparian rights). I discuss the role of markets in promoting efficiency more fully in Part IV.A.

152. *See generally* Casado-Pérez, supra note 59; Richard A. Epstein, *How Spontaneous? How Regulated?: The Evolution of Property Rights Systems*, 100 IOWA L. REV. 2341 (2015); Hennessy, *supra* note 14.

the societal costs.[153] To address this issue, most jurisdictions impose a no-injury rule on transfers.[154] The no-injury rule allows other water users or the state to stop the transfer if it would alter stream conditions in a way that hurts their interests. The rule effectively grants an entitlement to other users of water in the watershed of origin, and the clear property rights provide some incentive for Coasean bargaining or other efforts to address the externalities generated by the transfer.[155] Professor Casado-Pérez has also suggested Pigouvian monetary taxes or water "taxes" to account for externalities visited on the public by transfers.[156] A few states—California, Wyoming, New Mexico, and Utah—include public values beyond impacts to other water right holders in their water transfer review process.[157] Beyond the analysis of externalities in water markets and the two articles discussed above, however, the legal literature offers few explicitly externality-based analyses of water rights. This is odd, given economists' preoccupation with externalities and the rampant externalities associated with water rights and their infrastructure.[158]

Local governments face similar problems with land use change or development permitting decisions. All land use changes impose externalities,[159] ranging from increased burdens on sewage systems, increased traffic, and increased demand for educational or other public services, to increased pressure on water supplies, loss of ecosystem services due to the loss of urban forest and wetlands, and loss of open and unused space. These externalities vary considerably among projects, and localities use land use exactions at least in part to address the unique externalities of each project,[160] among many other purposes.[161] Exactions offer similar benefits in the water right context.

E. Land Use Exactions Internalize Externalities

The exactions mechanism is well known. Property owners who want to make major changes to their existing land use, perhaps by subdividing parcels or increasing the intensity of their land use, generally require discretionary ap-

153. Hennessy, supra note 14, at 1678.

154. Also called a no-harm rule. *See* Klein, *supra* note 8, at 594. The no-harm rule can be a significant barrier to functional water markets.

155. Hsu, *supra* note 71, at 861–62.

156. Casado-Pérez, *supra* note 59, at 173–74.

157. Charles W. Howe, *Protecting Public Values in a Water Market Setting: Improving Water Markets to Increase Economic Efficiency and Equity,* 3 U. DENV. WATER L. REV. 357, 369 (1999).

158. Hsu, *supra* note 71, at 866 (Economists often "begin with the premise that externalities must be internalized and use limitations imposed . . . .").

159. *See generally* Epstein, *supra* note 66.

160. Fenster, *supra* note 43, at 622–24.

161. *Id.*

proval from one or more local permitting authorities.[162] These permitting authorities consider the impacts of the proposed change and impose conditions, termed "exactions," on the permit that require the property owner to mitigate some of those impacts, usually after some negotiation.[163] Exactions include financial or in-kind provision of infrastructure to mitigate the project's expected negative impacts,[164] like land for new roads, schools, or parks; on-site amenities like trees or community centers for public use; and fees to provide public services to fund acquisition of land for public amenities.[165] Exactions can also address offsite impacts, like an increased need for affordable housing or firefighting resources. Exactions have been used to "shape the physical environment, generate revenue, force the internalization of external costs where private ordering is unlikely to do so, and resolve political conflict."[166]

Exactions are governed by the unconstitutional conditions doctrine, which addresses situations where the state burdens a discretionary benefit, like a job or funding or a land use permit, with a requirement that the person give up a constitutional right, like the right to free speech or the right to receive just compensation when private property is taken for public use.[167] The Supreme Court's exaction decisions limit their use in important ways. In *Nollan v. California Coastal Commission*,[168] the Court upheld the constitutionality of exactions generally, but required a permissible exaction to have an "essential nexus" with the harms associated with the proposed land use.[169] The court reasoned that if a permitting authority could deny a discretionary permit to protect a particular interest without effecting a taking, then "providing the owner an alternative to that prohibition which accomplishes *the same purpose*" would likewise not constitute an unconstitutional taking.[170] Next, in *Dolan v. City of Tigard*,[171] the Court held that the government must show that exactions are in "'rough proportionality' . . . both in nature and extent to the impact of the proposed development."[172] Finally, in *Koontz v. St. Johns River Water Management District*,[173] the Court held that these requirements apply whether the exactions involve

162. *Id.* at 623. The permitting authorities run a wide gamut of types and subject matter, from planning boards to coastal commissions. *See id.* at 622–23, 626.

163. *Id.* at 623.

164. *Id.* at 624.

165. *Id.* at 623–24.

166. *Id.*

167. Lingle v. Chevron U.S.A. Inc., 544 U.S. 528, 547 (2005).

168. 483 U.S. 825 (1987).

169. *Id.* at 837.

170. *Id.*

171. 512 U.S. 374 (1994).

172. *Id.* at 391.

173. 570 U.S. 595 (2013).

property or payments, provided the payment is linked to a particular parcel of land.[174]

There are two wrinkles requiring brief discussion in the Court's exactions analysis. First, the positioning of the *Nollan/Dolan* framework as part of the Court's takings jurisprudence versus its substantive due process jurisprudence is not entirely clear.[175] The Court in both *Nollan* and *Dolan* relied on *Agins v. City of Tiburon*[176] for the proposition that local land use regulation that denies particular land uses outright "does not effect a taking if it substantially advances legitimate state interests and does not deny an owner economically viable use of his land."[177] The Court disavowed this language as a takings test in *Lingle v. Chevron U.S.A. Inc.*,[178] by clarifying that "substantially advances a legitimate state interest" describes a substantive due process test based on *Village of Euclid*.[179] Instead, the Court clarified that there are three proper takings tests: "a 'physical' taking, a *Lucas*-type 'total regulatory taking,' [or] a *Penn Central* taking."[180]

Second, a great deal of judicial and scholarly uncertainty clouds the edges of when the exaction analysis applies.[181] It is unclear, for example, whether uniform legislative fees tied to particular land use changes are exactions,[182] or the extent to which purely monetary fees should be considered as a tax or user fee, not subject to *Nollan/Dolan* analysis, though courts have tended to construe these requirements narrowly.[183] In keeping with the broad definition of "exac-

174. *Id.* at 612.

175. Zygmunt J. B. Plater & Michael O'Loughlin, *Semantic Hygiene for the Law of Regulatory Takings, Due Process, and Unconstitutional Conditions—Making Use of a Muddy Supreme Court Exactions Case*, 89 U. Colo. L. Rev. 741, 788 (2018).

176. 447 U.S. 255, 260 (1980).

177. Nollan v. Cal. Coastal Comm'n, 483 U.S. 825, 834 (1987) (cleaned up); *see also* Dolan v. City of Tigard, 512 U.S. 375, 385 (1994).

178. Lingle v. Chevron U.S.A. Inc., 544 U.S. 528, 548 (2005).

179. *Id.* at 540–41 (citing Village of Euclid v. Amber Realty Co., 272 U.S. 365, 395 (1926)).

180. *Id.* at 548.

181. Lee Anne Fennell & Eduardo M. Peñalver, *Exactions Creep*, 2013 Sup. Ct. Rev. 287, 288; Sarah Schindler, *The "Publicization" of Private Space*, 103 Iowa L. Rev. 1093, 1124–25 (2018).

182. Timothy M. Mulvaney, *The State of Exactions*, 61 Wm. & Mary L. Rev. 169, 194–206 (2019); *see* Cal. Bldg. Indus. Ass'n v. City of San Jose, 577 U.S. 1179, 1181 (2016) (Thomas, J., concurring in the denial of certiorari) ("I continue to doubt that 'the existence of a taking should turn on the type of governmental entity responsible for the taking.'"); Fennell & Peñalver, *supra* note 181, at 339–40; Christina M. Martin, *Nollan and Dolan and Koontz—Oh My! The Exactions Trilogy Requires Developers to Cover the Full Social Costs of Their Projects, but No More.*, 51 Willamette L. Rev. 3, 15–16 (2014). *But see* John D. Echeverria, *Koontz: The Very Worst Takings Decision Ever?*, 22 N.Y.U. Env't L.J. 1, 53 n.254 (2014) (suggesting impact fees are subject to the Nollan/Dolan test after Koontz).

183. Koontz v. St. Johns River Water Mgmt. Dist., 570 U.S. 595, 615 (2013) ("It is beyond dispute that taxes and user fees are not takings."); *see* Mulvaney, *supra* note 182, at 190–92.

tion" I use in this article, I assume that a *Nollan/Dolan* analysis is required for any requirement that a permit applicant give up property (including money) in exchange for a permit, whether the requirement results from legislative or adjudicative process.[184] This is not a considered normative position, but rather a practical one. The broad definition is not likely to be underinclusive of cases requiring *Nollan/Dolan* analysis, and the extent to which it is overinclusive is very important for the constitutional tests applied to mechanisms for land use planning, but not as important for making the case for the application of exactions to water rights. Moreover, any such requirement that survives the *Nollan/Dolan* analysis would survive the less exacting rational basis review generally applied to government actions aimed at particular social outcomes where the actions do not implicate fundamental rights or suspect classifications.[185] Thus, for the purposes of this article, the broader definition and application of the *Nollan/Dolan* analysis facilitates discussion of the benefits and constitutionality of water right exactions and poses little risk.

Putting the pieces back together, then, an exactions analysis proceeds in two stages. First, a court asks whether the underlying permit could have been denied without creating a takings issue under one of the three tests.[186] If so, the court then proceeds to the *Nollan/Dolan* essential nexus and rough proportionality tests, to determine whether the exactions pass constitutional muster.[187] The Supreme Court continues to describe *Nollan/Dolan* as a takings test, but it may be more accurately described as a due process test.[188]

Regardless of the labels, taken together, these decisions make clear that exactions allow the state to require dedications of money or property in exchange for a discretionary permit, even "dedications of property so onerous that, outside the exactions context, they would be deemed *per se* physical takings."[189] They also make explicitly clear that exactions may be used to internalize the external costs of development, among other purposes.[190] They might be able to play the same role in a water rights context.

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184. *But see* Fennell & Peñalver, *supra* note 181, at 289 n.7, 300 ("[M]ost if not all land use law can be framed as deal making given that the laws are conditional in nature and subject to frequent and fine-grained revision.").

185. *Id.* at 294 n.30.

186. Plater & O'Loughlin, *supra* note 175, at 795.

187. *See generally* Koontz v. St. Johns River Water Mgmt. Dist., 570 U.S. 595 (2013). If not, the Court considers whether the conditions applied to the permit amount to a taking, without the benefit of the exactions carve out. *See* Plater & O'Loughlin, *supra* note 175, at 796.

188. Plater & O'Loughlin, *supra* note 175, at 788–89.

189. Lingle v. Chevron U.S.A. Inc., 544 U.S. 528, 547 (2005); *see also* Nollan v. Cal Coastal Comm'n, 483 U.S. 825, 834–37 (1987).

190. *See Koontz*, 570 U.S. at 606 ("Our precedents thus enable permitting authorities to insist that applicants bear the full costs of their proposals . . . ."); Fenster, *supra* note 43, at 652 n.219 (noting proper exactions "could produce an ideal cost internalization"); Vicki Been, *"Exit" as a Constraint on Land Use Exactions: Rethinking the Unconstitutional Conditions Doctrine*, 91

II. Water Right Exactions Can Internalize Externalities

In this Part, I explain how something like land use exactions could be applied to water rights. I begin with a brief overview of water rights law as a necessary foundation, and then describe how exactions could be applied to various kinds of new and existing water rights in differing contexts. I conclude with several unusual real-world examples of current practices that look something like a water right exaction, to show how the idea might work in practice.

A. Introduction to Water Law

Water rights are usufructuary rights, defined as a right to use water, but not to own it.[191] State property laws generally determine the nature and extent of these use rights, so water rights vary widely across the United States.[192] State surface water right systems generally come in three flavors: riparian right systems, where rights are based on the ownership of riparian land abutting a water source; appropriative right systems, where rights are based on the use of water; and blended systems, which use both types of rights.[193]

Riparian rights do not allocate a fixed amount of water. Instead, riparians may make reasonable use of the water,[194] only on the riparian land and must restrict their use on a correlative basis in times of shortage.[195] Riparian rights do not allow for storage or for long distance transport of the water.[196] Private riparian rights are subject to "[a] continuing sovereign interest in the appropriate exercise of [the] riparian right,"[197] particularly in navigable waters, including

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Colum. L. Rev. 473, 482 (1991); Henning, *supra* note 41, at 723. Many commentators argue that exactions are not actually designed to serve an internalization function, but rather serve as revenue strategies that extract value from developers or as mechanisms to discourage growth. *See* Elmendorf & Shanske, *supra* note 39, at 525–27 (arguing that "the notion that fees and exactions may only be used to recover costs that a development imposes on the public" is largely pretextual).

191. *See* Epstein, *supra* note 151, at 982–84.

192. *See* Klein, *supra* note 8, at 566.

193. *See* Owen, *supra* note 8, at 1566–67.

194. *See* James H. Davenport & Craig Bell, *Governmental Interference with the Use of Water: When Do Unconstitutional "Takings" Occur*, 9 U. Denv. Water L. Rev. 1, 23–24 (2005) (explaining that reasonableness definitions vary by state).

195. *See* Barton H. Thompson, Jr. et al., Legal Control of Water Resources: Cases and Materials 28 (5th ed. 2013).

196. *Id.*

197. Davenport & Bell, *supra* note 194, at 24; *see* Virginia v. Maryland, 540 U.S. 56, 67 (2003) ("[D]ominion over navigable waters, and property in the soil under them, are so identified with the exercise of the sovereign powers of government that a presumption against their separation from sovereignty must be indulged." (quoting Massachusetts v. New York, 271 U.S. 65, 89 (1926))).

interests like fisheries or navigation, as the Supreme Court has noted.[198] Many riparian states have moved from a pure riparian approach to a variant called "regulated riparianism," which is essentially a water right permitting system built on a reasonable use foundation.[199] Regulated riparian statutes grant time-limited permits for water rights, which may be used on any non-riparian lands, but water use remains subject to the reasonableness requirements.[200] The state reconsiders the permit at its expiration and may or may not renew the permit, although in practice most of the permits are renewed, albeit sometimes under newer and more stringent conditions.[201]

In contrast, appropriative rights provide the user with a fixed amount of water and a set priority among all right holders, based on the date the use began.[202] In times of drought, more senior (higher priority) right holders have the first chance to use water, and more junior users only get their water if there is enough left after the more senior rights are filled.[203] Appropriative rights allow for storage and transportation of water, which can be used anywhere. Most appropriative rights systems explicitly assign ownership of all waters to the state, include a public interest test for water use, and require that the water be used beneficially.[204] Most states now grant these water rights through some kind of state water rights agency,[205] but most appropriative water right systems are an uncomfortable mishmash of newer permits and historic rights that predate modern permitting systems.[206]

Riparian rights dominate in the eastern states, where water is more available, but all states west of the Mississippi River embrace appropriative rights.[207] Western coastal states and midwestern states tend toward a hybrid approach that includes some riparian rights, while the drier states take a purer appropriative rights approach.[208]

198. Holyoke Co. v. Lyman, 82 U.S. 500, 506 (1872).

199. For more details, see AM. SOC'Y OF CIVIL ENG'RS, ASCE/EWRI STD. 40-03: REGULATED RIPARIAN MODEL WATER CODE (2003).

200. Joseph W. Dellapenna, *The Evolution of Riparianism in the United States*, 95 MARQ. L. REV. 53, 87–88 (2011).

201. *Id.*

202. Dan Tarlock, *Prior Appropriation: Rule, Rhetoric, or Principle*, 76 N.D. L. Rev 4, 882 (2000); Lloyd Burton, *Disputing Distributions in a Shrinking Commons: The Case of Drought in California*, 32 NAT. RES. L.J. 779, 784 (1992).

203. *Id.*

204. John D. Leshy, *A Conversation About Takings and Water Rights*, 83 TEX L. REV. 1985, 1988, 1993 (2005).

205. Squillace, *supra* note 119, at 650. Colorado is unusual in that its water rights are administered by a specialized water court. *See* GEORGE VRANESH, VRANESH'S COLORADO WATER LAW 162, 223 (James N. Corbridge, Jr. & Teresa A. Rice eds., 1999) (1987).

206. Squillace, *supra* note 119, at 650.

207. Owen, *supra* note 8, at 1566.

208. *Id.* at 1566–67.

Groundwater rights also vary significantly from state to state, from an unpermitted capture approach to metering and permitting and everything in between.[209] Professor Owen's detailed investigation of groundwater takings litigation notes that groundwater law remains "inchoate," and even in those places with some regulation, "[t]he on-the ground reality . . . still resembles the pre-regulatory regime, with uneven coverage, sparse monitoring, and little enforcement."[210] In states that require permits for groundwater rights, those rights may be administered by state water rights agencies[211] or local permitting entities.[212]

Beyond the formal water right systems, end users of water get their water in many different ways. Most water users do not hold water rights, but instead get their water, directly or indirectly, through a contract with a right holder.[213] The underlying right holder might be a state or federal agency, like the Bureau of Reclamation, which then contracts with an irrigation district or a city or a water agency, which in turn contracts for water delivery with the water user—a farmer or school or a single household.[214] In other cases, a right holder may also be the water user, as with farmers or a utility that uses water from its own well or other water source.

In all cases, the water itself is generally free. Users pay, but the payment is generally not for the water; rather, the cost covers infrastructure, energy, treatment, and administrative costs, with no commodity cost for the water itself.[215] For right holders, aside from a small administrative fee for a permit, they generally pay nothing except the cost of moving the water to where they want to use it.[216] Water infrastructure, like Reclamation dams or canals, tends to be heavily subsidized, and the costs reflect past infrastructure investment, not the cost of future infrastructure needs, so the user's price also fails to reflect the true

209. *See Taking Groundwater*, *supra* note 20, at 266–70 (describing the history of groundwater law and the general approaches that states use today).

210. *Id.* at 257.

211. *See* Nelson, *supra* note 26, at 147–48.

212. *E.g.*, Kurt Stephenson, *Groundwater Management in Nebraska: Governing the Commons Through Local Resource Districts*, 36 NAT. RES. J. 761, 761–75 (1996); Anita Milman et al., *Establishment of Agencies for Local Groundwater Governance Under California's Sustainable Groundwater Management Act*, 11 WATER ALTERNATIVES 458 (2018).

213. Owen, *supra* note 8, at 1568.

214. *Id.*

215. Robert Glennon, *The Price of Water*, 24 J. LAND RES. & ENV'T L. 337, 340 (2004); Glennon, *supra* note 33, at 1883; Owen, *supra* note 8, at 1569. *See generally* Ellen Hanak et al., *Myths of California Water: Implications and Reality*, 16 HASTINGS W.-NW. J. ENV'T L. & POL'Y 3, 21 (2010). In situations where the water provider is buying water from another right holder, however, they will generally pay the seller for the water itself, but even in those cases neither the provider nor the seller will have paid the *public* for water.

216. W. M. Hanemann, *The Economic Conception of Water*, *in* WATER CRISIS: MYTH OR REALITY 61, 76–77 (Peter P. Rogers et al. eds., 2006).

infrastructure cost.[217] Despite these complexities, and with some minor exceptions, homeowners, agricultural, and industrial or commercial water users all alter water use in response to price signals, which suggests that the low cost of water relative to its true social cost encourages overuse.[218]

The precise contours of water law and water delivery vary extensively from state to state and among different kinds of rights, but in the next section I discuss how exactions could be applied to different kinds of water rights (new appropriations, riparian rights, existing appropriations, etc.) and to water rights that use different methods for extracting water from its source (direct appropriation, via small diversion dams, via larger state or federal projects) under a generic water right scheme.

B. The Mechanics of Water Exactions

This section first presents an initial sketch of exaction imposition in the simplest context, for a new appropriative right in a state with a water right permitting agency, before developing more complicated scenarios. When an applicant submits a water right application, the typical permitting agency must make a host of determinations. Is there water available for appropriation during the time and at the place the applicant seeks to use the water? Does the application implicate state laws around environmental analysis, endangered species, or the public trust? And ultimately, is the proposed water right in the public interest? Because state water right permitting agencies are already addressing these questions, they are well positioned and possess the necessary expertise to impose exactions.[219] For example, assessing whether a particular water right is in the public interest requires an informal weighing of costs and benefits, and those calculations can be formalized and extended to allow the agency to impose exactions based on the external costs. In many states, other state agencies, like state wildlife or other state resource agencies, are already part of the permitting process, and the permitting agencies should continue to integrate their expertise when developing exactions.

Thus, when an applicant seeks a new appropriative water right, the permitting agency should, with its sister agencies, assess the external costs of the water extraction and any associated infrastructure, and then impose those costs on the applicant as part of the permitting process. In many cases, water agencies' broad authority already gives them the power to condition permits, and

217. *Id.*

218. Owen, *supra* note 29, at 1590–92.

219. *See generally* Keith H. Hirokawa & Elizabeth J. Porter, *Aligning Regulation with the Informational Need: Ecosystem Services and the Next Generation of Environmental Law*, 46 AKRON L. REV. 963 (2013).

conditioning them with exactions should fall within their existing authority.[220] As with land use exactions, the process of estimating the costs and developing the proposed exactions would be a negotiation in order to find solutions that both adequately protect the public and serve the applicant's interest.

The exactions should match the temporal term of the water right; if the water right is a permanent grant, the exaction should take into consideration the longer-term impacts, or the right should include terms and conditions that require re-imposition of new exactions on a 10- or 20- year term, which might result in more efficient and more accurate exactions. In contexts where the water right itself is term limited, as with many eastern riparian rights, the exactions should cover the costs associated with the full term of the right.[221] This is the approach the Federal Energy Regulatory Commission ("FERC") uses with its licensing procedures, which has allowed FERC to adjust license requirements when evaluating permit renewals.[222]

Applying exactions to new and existing riparian rights would be similarly straightforward in many states. Many eastern states use a form of regulated riparianism, where a state agency permits those rights for a particular use and for a limited period. Although the permits are founded on riparian principles, these rights go through a permitting process, which would allow for the imposition of exactions as outlined above for new appropriative rights. Applying exactions to riparian rights in places like California, where riparians have ill-defined rights that vary year to year and have no permitting requirements, would be much more difficult. Few states follow the California model, however, and even California has reporting water-use requirements for riparians that could provide a foundation for calculating exactions based on past water use.[223]

Applying exactions to other kinds of existing water rights would be more complicated, but necessary, since most available water has already been appropriated.[224] For existing appropriative rights, there are at least three ways that exactions could be applied. First, for most appropriative rights, any change in

220. For example, the California Water Board conditioning Los Angeles' water right; s*ee infra* Part II.C.3; Neuman, *supra* note 8, at 958 ("[S]tate water agencies have ample authority to define and elucidate the concept of beneficial use through either adjudication or rulemaking.").

221. This is a significant difference from development exactions, which are one-time payments or property transfers. This change accommodates the usufructuary and often temporally limited nature of water rights.

222. Paul Kibel, *Passage and Flow Considered Anew: Wild Salmon Restoration via Hydro Relicensing*, 37 PUB. LAND & RES. L. REV. 65, 76 (2016).

223. Finding an appropriate mechanism to apply exactions to riparian rights in California could be difficult, but I suggest one approach below. *See infra* note 229 and accompanying text.

224. *See generally* U.S. WATER RES. COUNCIL, SECOND NATIONAL WATER ASSESSMENT 12 (1978). This is a shared challenge to any improvement in the water permitting or distribution system. *See* Neuman, *supra* note 8, at 960–61. The discussion here leaves aside other

the place of water use or the time of the use or the actual use of the water requires a permit change.[225] State permitting agencies should condition approval of these changes on imposition of exactions on water rights. Alberta, Canada already imposes something very similar to this, allowing the water management agency to withhold up to 10% of water transferred in some cases.[226] Some states, like Washington state, may have restrictions on the conditions that can be imposed on a transfer request,[227] which could frustrate broad adoption through this approach, and using these approvals as triggering events might dissuade some right holders from making changes; but when the profits of changing water use become sufficient, this approach would allow for better overall water use efficiencies.

Second, many states also have mechanisms for basin adjudications, proceedings where a court or other entity decides the ownership of all water rights in a surface or groundwater basin.[228] These proceedings resolve longstanding ownership conflicts and provide an opportunity for the adjustment of conflicting water rights. The entity overseeing the adjudication should impose conditions on the water rights, including exactions. In California, adjudications also include riparian rights, setting definite terms for those rights, so that exactions could be applied to this harder-to-pin-down category of water rights in that state.[229]

Third and finally, many state permitting agencies have a continuing supervisory power over individual existing water rights under various state doctrines.[230] California's robust public trust doctrine gives the state water board the power it needs to add exactions to existing water rights of all kinds;[231] in other states that power may flow from the state ownership doctrine,[232] public interest

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categories of water rights for future work (e.g., federal reserved rights, tribal rights, pueblo rights).

225. *See, e.g.*, *Water Rights Petitions Program,* California Water Boards, https://perma.cc/2QT6-XLJ5 (explaining the process to change the typical terms in a water right).

226. Gov't of Alberta, Administrative Guideline for Transfer of Water Allocations 7 (2014), https://perma.cc/N9NB-3EC3.

227. Wash. Rev. Code Ann. § 90.03.380 (West) ("No applicant for a change, transfer, or amendment of a water right may be required to give up any part of the applicant's valid water right or claim to a state agency, the trust water rights program, or to other persons as a condition of processing the application."). Note that this does not limit other conditions on water transfers, like monetary payments or in-kind work on aquatic or riparian habitat.

228. Rhett Larson & Kelly Kennedy, *Bankrupt Rivers*, 49 U.C. Davis L. Rev. 1335, 1347 (2016) (noting that these are almost uniformly tremendously "time-consuming, resource-intensive, and lengthy").

229. Arthur L. Littleworth & Eric L. Garner, California Water (3d ed. 2019).

230. For a review and a robust defense of these powers, see Sax, *supra* note 53.

231. *See supra* Part III.A.1.a.

232. Leshy, *supra* note 204, at 1991 (citing Sporhase v. Nebraska, 458 U.S. 941, 953 (1982)).

requirements,[233] or the waste and reasonable use doctrines.[234] While political will might limit an agency's ability to add exactions to existing water rights,[235] the law often provides the power to do so. In some cases, state agencies have been able to generate political support among water users for exaction-like approaches, where the alternative is losing portions of an existing water right.[236] In any case, if the agency can generate the initial political will, the pressure on the agency in the long term may be far lower once an exactions framework is in place and market forces can provide the necessary impetus for conservation.[237] This last option is the most difficult for agencies, but waiting for transfer or change applications is too slow a process to address existing rights, is unfair to new users, and may induce continued inefficient lower value uses.

The section has spelled out processes for adding exactions to the most common forms of water rights—new appropriative rights, riparian rights of all kinds, and existing appropriative rights. Beyond the types of water rights, the method of diversion may also complicate the exactions process.

Water diverted directly from a water source is easy—the exaction need only address the externalities related to the removal of the water itself. But in many cases, water right holders get their water through water projects that store and then transport the water, which allows users access to water throughout dry seasons or dry years.[238] Infrastructure ranges from small diversion dams providing brief storage and creating sufficient water for easy diversion to large, multi-dam projects that store and transport many years' worth of water.[239] For these rights, the external costs associated with the water rights are much higher, due to the impacts of the infrastructure itself. The exactions should account for these higher external costs, to reflect the societal costs of the infrastructure.

Assessing the full external costs of the infrastructure against the water right holder, however, would err by setting too high a cost, because most infrastructure serves multiple purposes. Consider Bureau of Reclamation dams; construction costs of Reclamation dams are supposed to be funded by the water users who use the water they provide, but the portion of construction costs paid for by those users is adjusted based on other uses of the reservoirs, like flood

233. *See generally* Squillace, *supra* note 119.

234. *See generally* Neuman, *supra* note 8.

235. Esty, *supra* note 68, at 184 ("The capacity for more refined internalization of externalities must be matched with the political will to do so.").

236. *See infra* text accompanying note 341.

237. Terry L. Anderson & Donald R. Leal, *Fishing for Property Rights to Fish, in* TAKING THE ENVIRONMENT SERIOUSLY (Roger E. Meiners & Bruce Yandle eds., 1993) (noting the benefits of "property rights regimes that can move us out of the political arena and into the market where individuals face opportunity costs of their actions").

238. *See generally Chapter 3, in* CAL. DEP'T WATER RES., CALIFORNIA WATER PLAN UPDATE 2013.

239. *Id.*

control, recreation, and purported fish and wildlife benefits.[240] Thus, the water users pay for a much smaller percentage of the construction costs.[241] Likewise, with exactions, the external costs of large infrastructure projects should be allocated to the various uses of the infrastructure, with the water right holders paying only their portion.

Because federal water projects follow state water laws with regard to water rights,[242] the state permitting agencies could impose overall exactions on the project, which the project managers (Bureau of Reclamation, Army Corps of Engineers, etc.) would then apply to the appropriate parties on a pro rata basis. The actual payment of these costs could follow the model used in the Upper Colorado native fish program, discussed below, where water users pay a fee based on their allocation of the project water.[243] As with other water right permits, large infrastructure project construction and operations already generate a great deal of information on associated costs, benefits, and environmental impacts that could be used to generate exactions.[244]

This section has provided an initial sketch for operationalizing exactions, although many details would have to be ironed out in future work. The following section provides three real world examples of existing programs that look something like exactions. They give concrete details about how the program works and show that exaction-like approaches can provide real benefits and improve water management.

C. Examples of Water Right Exactions

Water right exactions can address some impacts of water withdrawals and associated infrastructure. For example, judicious application of water (in the right amount and at the right time) can mitigate impacts of reduced overall flows and of water control infrastructure; this functional-flows approach "focuses on flow and geomorphic components with process-based outcomes."[245] Developing flow regimes that support geomorphic and ecologic processes and functions reduces the impacts of water infrastructure and water withdrawals while still meeting varied human needs. Exactions can produce dedicated water

240. U.S. Gov't Accountability Off., GAO 14-764, Bureau of Reclamation: Availability of Information on Repayment of Water Project Construction Costs Could Be Better Promoted 6 (2014).

241. *Id.*

242. *See* Börk et al., *supra* note 3, at 891.

243. *See* U.S. Dep't of the Interior & U.S. Fish & Wildlife Serv. Region 6, Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin 1–8 (1987), https://perma.cc/U673-SB7K.

244. *See, e.g.*, Nat'l Marine Fisheries Serv., Biological Opinion on Long-term Operation of the Central Valley Project and the State Water Project (2019), https://perma.cc/W86W-W2D8.

245. Yarnell et al., *supra* note 77, at 970.

and funding streams required by the functional flows approach and allow for restoration of degraded habitat, the biggest problem facing aquatic habitats today.[246] But showing that exactions can work is better than telling. Here I provide three examples of existing practices that look something like water right exactions, even if they have not been viewed in that light before, and then conclude with a smattering of exaction-adjacent examples. Together, these examples provide convincing evidence for the value of water right exactions. Though the case studies suggest the benefits of water right exactions, such programs are the exception, not the rule, and much broader use of mechanisms like these would result in better private water use decisions.

1. Oregon Conserved Water Transfers

Oregon's Conserved Water Program greatly facilitates the transfer or change in use of conserved water in exchange for a share of the conserved water.[247] Under the program, a water right holder submits a proposal to conserve part of their existing water right, generally through increased water transportation efficiency or a better method of irrigation,[248] to make the conserved water available for sale or for other uses.[249] Oregon's Water Resources Commission reviews the proposal's impacts on other water users and assigns part of the conserved water to mitigate those impacts, then issues new water rights certificates for the water right holder, while keeping back some of the water for the state itself.[250] The state gets water back, while the right holder benefits in several ways.

First, the program protects the conserved water from other users and from forfeiture by abandonment, safeguarding it for the right holder's future use.[251] Second, both the state's new right and the water right holder's right generally retain the priority date of the user's original water right, allowing the user to make new use of the water without losing their place in the priority pecking order.[252] Third, and perhaps most importantly, the right holder may transfer (via sale or lease) or change the place of use of their conserved water with the original priority date and without proceeding through Oregon's more difficult

246. Robert W. Adler, *Restoring the Environment and Restoring Democracy: Lessons from the Colorado River*, 25 VA. ENV'T L.J. 55, 61 (2007).

247. OR. REV. STAT. §§ 537.455–.500 (2007). *See generally* ADELL LOUISE AMOS, FRESHWATER CONSERVATION: OREGON WATER LAW AND POLICY 90 (2009), https://perma.cc/A5FQ-8CEE.

248. BRUCE AYLWARD, RESTORING WATER CONSERVATION SAVINGS TO OREGON RIVERS: A REVIEW OF OREGON'S CONSERVED WATER STATUTE 5 (2008), https://perma.cc/TZ6V-LTS5.

249. OR. REV. STAT. § 537.465 (2021).

250. *Id.* §§ 537.465–.470 (2021).

251. *Id.* §§ 537.490–.500 (2021).

252. *Id.* § 537.485 (2021).

water transfer permitting process, enabling them to avoid the no-harm analysis.[253] This allows the right holder to avoid administrative review when, for example, they want to enlarge the number of acres they irrigate or transfer the water to a new irrigator.

In exchange for these benefits, the state gets at least 25% of the conserved water, subject to upward adjustment as required by the particulars of the project.[254] The water right holder may choose to dedicate more of the water to the state, or, if more than 25% of the funds for the conservation project come from public funds not subject to repayment, the state gets a percentage of the conserved water equal to the percentage of project cost paid by public funds up to 75%.[255] If the state determines that its portion of the conserved water is needed for instream flow purposes, the state's portion becomes an instream water right; if not, it becomes available for new appropriations by the public.[256]

A detailed analysis of the program in 2008 suggested that roughly two thirds of the program participants were paid by private conservation organizations for the state's portion of their conserved water,[257] suggesting that some additional encouragement may be important for many program participants. These conservation organizations have been very successful in returning water to rivers,[258] but ideally the program would function solely based on the proffered incentive of allowing additional uses. The review concluded that "[t]he innovative, market-based incentive to spread water to new consumptive uses has only infrequently been used and has not resulted in significant spreading of water to new out-of-stream uses or ecological restoration,"[259] but more recent data suggests that may no longer be the case. Newer data indicate that participation by private conservation organizations has fallen in recent years, with most projects undertaken by individual farms and irrigation districts.[260] More detailed analysis is needed, but much of the applicants' conserved water has been used on their land, suggesting that the program's incentives may be more compelling than originally thought.[261] The 2008 review also noted that transaction costs can be a hurdle,[262] although those may also have fallen given agency familiarity with the program.

253. OR. ADMIN. RULES 690-380-0010(2)(a) (2008); *see also* OR. REV. STAT. §§ 540.510, 510(2) (2007).

254. OR. REV. STAT. § 537.470(3) (2021).

255. *Id.*

256. *Id.*

257. AYLWARD, *supra* note 248, at 16.

258. Gail L. Achterman & Robert Mauger, *The State and Regional Role in Developing Ecosystem Service Markets*, 20 DUKE ENV'T L. & POL'Y. F. 291, 297–302 (2010).

259. AYLWARD, *supra* note 248, at 33.

260. Email from Teri Hranac, Or. Water Res. Dep't, to author (Oct 6, 2021) (on file with author).

261. *Id.*

262. AYLWARD, *supra* note 248, at 34 ("[T]ransaction costs remain a significant hurdle.").

The program has resulted in more water remaining in-stream. As of October 2020, the program had received 125 applications and had approved 113, with two pending, thirteen withdrawn, and one denied.[263] The approved applications resulted in roughly 248.65 cubic feet per second ("cfs") permanently protected in-stream through new Instream Water Right Certificates and roughly 90 cfs temporarily managed in-stream for future use by the conserving water right holder.[264]

Viewed in the proper light, the state's acquisition of a water right as part of a private conservation project looks something like an exaction.[265] A holder of a private right seeks to change their use of their property, and the holder requires some form of government approval to make that change. Although the conservation program is voluntary, it allows the right holder to make the changes they desire without proceeding through the normal permitting process.[266] This is not granting a permit precisely, but it conveys a distinct benefit to the permittee. In exchange, the right holder gives up some of their property, here a portion of the conserved water, in exchange for the government's approval of their desired change. That seems very similar to a land use exaction, ported over to the water rights context.[267]

2. Colorado River Native Fish Restoration

Funding mechanisms for the Upper Colorado River Endangered Fish Recovery Program also amount to water right exactions applied to new water projects. Humans have transformed the Colorado River through dams, levees, and diversions, converting it from a wild and raucous torrent to "a step-series of

263. *Id.*

264. *Id.* at 19 (up from 77.2 cfs protected for instream use as of the end of 2007).

265. Indeed, although the program is voluntary, esteemed environmental law Professor Sax analyzed the constitutionality of Oregon's statute as if it were an involuntary exaction and concluded that it fell well within the bounds of permissibility: the state was acting well within its police powers in requiring the 25% dedication to instream flows. Sax, *supra* note 53, at 279–81 (noting that though there is concern that the amount of water returned to the river was not based on a finding of particular need for that river, the state water commission may increase the amount dedicated to instream use); *see* OR. REV. STAT. § 537.470(2) (1988) (addressing this concern).

266. Sax, *supra* note 53, at 278 (noting that though the right to transfer is technically an entitlement, it requires extensive analysis and proceedings through the state agency).

267. An aspect of Oregon's change-in-diversion-point permitting process also looks like an exaction. In some cases, the state "may require the installation of an appropriate fish screening or by-pass device at the new point of diversion" as a condition of granting the permit. OR. REV. STAT. ANN. § 540.525 (West). The fish screen prevents fish from entering the point of diversion, protecting fish populations. OR. REV. STAT. ANN. § 498.306 (West). The permit seeker must pay 40% of the cost of the fish screening or bypass device. OR. REV. STAT. ANN. § 498.306 (West). Thus, a permit seeker must pay to mitigate the public impacts of their private property use.

placid lakes joined by remnants of flowing river."[268] Federal dams on the river can store four times the river's annual flow, serving tens of millions of people and irrigating millions of acres of land across seven states.[269] The transformed river's ecosystems offer many benefits, but also impose significant costs.[270] The river is currently in crisis, with flows far below the annual water use, and the situation is likely going to get worse due to climate change.[271]

Four hardy endemic fish species evolved to thrive in the historic Colorado River: the humpback chub, bonytail chub, razorback sucker, and the Colorado pikeminnow.[272] But the transformed Colorado River, with consistent cold flows through degraded ecosystems,[273] no longer supports the native fish. All four were listed by the U.S. Fish and Wildlife Service ("FWS") as endangered.[274] The federal Endangered Species Act ("ESA") requires a number of protections for listed species, including a prohibition on unpermitted actions that would harm or injure the listed species;[275] a consultation process to ensure that any federal actions (including funding, authorizations via permits, or other actions) will avoid jeopardizing the future survival and recovery of the listed species;[276]

268. Adler, *supra* note 246, at 58.

269. *Id.*

270. *See* Henry Fountain, *In a First, U.S. Declares Shortage on Colorado River, Forcing Water Cuts*, N.Y. Times (Aug. 27, 2021), https://perma.cc/DTE8-JNVS; Abrahm Lustgarten, *40 Million People Rely on the Colorado River. It's Drying Up Fast*, Propublica (Aug. 27, 2021), https://perma.cc/G84Y-CC59.

271. Charles V. Stern & Pervaze A. Sheikh, Cong. Rsch. Serv., R45546 Management of the Colorado River: Water Allocations, Drought, and the Federal Role 17 (2021).

272. Adler, *supra* note 246, at 57–60.

273. *See id.* for a more detailed description of the river's near total transformation.

274. 56 Fed. Reg. 54771, 54957 (Oct. 23, 1991) (razorback sucker); 45 Fed. Reg. 27435, 27710 (Apr. 23, 1980) (bonytail chub); 2 Fed. Reg. 3961, 4001 (Mar. 11, 1967) (humpback chub and Colorado squawfish (pikeminnow)). The pikeminnow's name was changed in 1998. Joseph S. Nelson et al., *Recommended Changes in Common Fish Names: Pikeminnow to Replace Squawfish (Ptychocheilus spp.)*, 23 Fisheries 37, 37 (1998); *see also Squawfish Squawk Reels in Conundrum Insulting Fish Name Not Easy to Replace,* Spokesman-Rev. (Jan. 25, 1998), https://perma.cc/QA9V-K3UC.

275. Section 9 prohibits the "take" of "any [nonplant] endangered species of fish or wildlife," 16 U.S.C. § 1538(a)(1), which includes "significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns . . . ." 50 C.F.R. § 17.3 (2017). *See also* Babbitt v. Sweet Home Chapter of Cmtys. for a Great Or., 515 U.S. 687, 715 (1995).

276. 16 U.S.C. § 1536(a)(6) (requiring federal agencies to ensure "any action authorized, funded, or carried out by such agency . . . is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of [critical] habitat of such species"). Agencies must consult FWS before undertaking any action that "may affect listed species or critical habitat." 50 C.F.R. § 402.14(a). Section 7 applies to agency actions that fund or permit state or private actions. 16 U.S.C. § 1536(a)(2).

and development of a recovery plan to delist the species.[277] The listings thus set the stage for an epic battle between the ESA and western water interests over the Colorado River.

The FWS initially took an aggressive stance, proposing that each water project on the upper Colorado River "replace water diversions on a one acre-foot per one acre-foot basis to comply with the ESA," a tremendously expensive proposition.[278] Rather than launch into litigation, a group of stakeholders including state and federal interests, water users, and environmental groups negotiated the Upper Colorado River Endangered Fish Recovery Program in 1988.[279]

The water users agreed to two particularly relevant compromises. First, they would replace some portion of the water they took from the Colorado River for any new large diversions, although not at the 1:1 ratio.[280] Second, for new small diversions, they would pay a one-time inflation-adjusted fee of ten dollars per acre-foot of water they removed from the river.[281] The fee is tied to the required ESA permits,[282] and the funds are used for instream flow acquisition, habitat improvement, fish hatcheries, nonnative fish control, and other recovery plan elements.[283] Water user cash payments have totaled over 43 million dollars, just under 10% of the program's costs since its inception.[284] Including the cost of replacement water supplied by the water users, user contributions fund roughly half of the program.[285]

The recovery program has been a partial success. It provides ESA compliance for over 2,500 water projects, has managed to avoid *any* ESA lawsuits for the permitted projects[286]—a remarkable feat, and is also succeeding in recover-

277. 16 U.S.C. § 1533(f) (requiring development of recovery plans).

278. John Loomis & Jeffery Ballweber, *A Policy Analysis of the Collaborative Upper Colorado River Basin Endangered Fish Recovery Program: Cost Savings or Cost Shifting?*, 52 NAT. RES. J. 337, 340–41 (2012).

279. *See Swimming Upstream: The Story of the Upper Colorado River Endangered Fish Recovery*, COLO. RIVER RECOVERY (2022), https://perma.cc/NED7-K89L. *See* Loomis & Ballweber, *supra* note 278, for a detailed analysis.

280. *See* Loomis & Ballweber *supra* note 278, at 351.

281. U.S. DEP'T OF THE INTERIOR & U.S. FISH & WILDLIFE SERV., *supra* note 243, at 1-8. The fee was $22.53 per acre foot as of 2021. FY 2021 Depletion Charge and Annual Budget Adjustments (2020), COLORADO RIVER RECOVERY PROGRAM, https://perma.cc/76BY-TWVC.

282. U.S. DEP'T OF THE INTERIOR & U.S. FISH & WILDLIFE SERV., *supra* note 243 at 5-4 ("[F]ailure to make the agreed-upon financial contribution at the agreed-upon time will void the project's biological opinion and permit.").

283. *Id.* at 5-2, 5-4.

284. *See* Loomis & Ballweber *supra* note 278, at 350–60.

285. *See id.*

286. COLORADO RIVER RECOVERY, UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM AND SAN JUAN RIVER BASIN RECOVERY AND IMPLEMENTATION PROGRAM: PROGRAM HIGHLIGHTS 8, https://perma.cc/U72B-KGUS.

ing some of the listed fish species. In light of its improved status, FWS downlisted the humpback chub from endangered to threatened in October 2021[287] and proposed that the razorback sucker be downlisted from endangered to threatened in July 2021.[288]

The other two fish species have not fared as well. A 2020 status review for the Colorado pikeminnow found that its population is decreasing in most areas where it still exists,[289] and the bonytail chub has, for many years, relied on annual stocking to maintain its populations.[290] Recovery of the Colorado pikeminnow and the bonytail chub will require additional efforts, if recovery remains possible in the highly modified Colorado River ecosystem.

Again, this arrangement looks something like an exaction.[291] The water users and the associated infrastructure on the upper Colorado River impose myriad external costs on society, including the cost of losing native species like these four fish. Policy makers have addressed this externality through the ESA, generally a command-and-control statute protecting listed species,[292] employing innovative approaches to implementing the Act that couple the payment of fees and water with permit approval.[293] The ESA approvals are not entitlements, and the process of getting the approvals is onerous, so the program gives project proponents a significant benefit in exchange for their payments of money and water. In turn, the fees give FWS dedicated mitigation funding, and the water provides them with instream flows that they can customize for maximum benefit. The fees and water internalize some of the public costs of the water rights and infrastructure, sending clear price signals to the water users.

3. The Mono Basin Decision

The last example comes from the administrative reform of the Los Angeles water right at issue in the famous California public trust case *National Audubon Society v. Superior Court*.[294] Under a permit from the California State Water

287. Reclassification of the Humpback Chub from Endangered to Threatened with a Section 4(d) Rule, 86 Fed. Reg. 57588 (Oct. 18, 2021) (to be codified at 15 C.F.R. pt. 17).

288. Reclassification of the Razorback Sucker from Endangered to Threatened with a Section 4(d) Rule, 86 Fed. Reg. 35708 (July 7, 2021) (to be codified at 15 C.F.R. pt. 17).

289. U.S. Fish & Wildlife Serv., Colorado Pikeminnow 5-Year Status Review: Summary and Evaluation 7–8 (2020).

290. Utah Div. of Wildlife Res., Bonytail Species Status Statement, (Apr. 4, 2020).

291. This is certainly at the outer edge of what might be considered an exaction. *Compare* Martin, *supra* note 182, at 57–58 *and* James S. Burling & Graham Owen, *The Implications of Lingle on Inclusionary Zoning and Other Legislative and Monetary Exactions*, 28 Stan. Env't L.J. 397, 437 (2009) *with* Mulvaney, *supra* note 182, at 194–206.

292. Jeffrey J. Rachlinski, *Protecting Endangered Species Without Regulating Private Landowners*: *The Case of Endangered Plants*, 8 Cornell J.L. & Pub. Pol'y 1, 1 (1998).

293. *See* Börk, *supra* note 81, at 183, 184–85 (discussing mitigation payments for ESA permits).

294. 658 P.2d 709 (Cal. 1983).

Resources Control Board ("Water Board"), Los Angeles ("LA") had long diverted the full flow of most of Mono Lake's tributaries,[295] drying the tributaries and degrading the lake environment.[296] Environmental plaintiffs argued LA's water right should be reconsidered because it failed to consider any public trust interests,[297] and the court agreed: "before state courts and agencies approve water diversions they should consider the effect of such diversions upon interests protected by the public trust, and attempt, so far as feasible, to avoid or minimize any harm to those interests."[298] The court addressed constitutional takings concerns, holding that the public trust doctrine "prevents any party from acquiring a vested right to appropriate water in a manner harmful to the interests protected by the public trust" and "imposes a duty of continuing supervision over the taking and use of the appropriated water."[299] On remand, the trial court asked the Water Board to reevaluate the right. The Water Board eventually issued its Mono Basin Decision,[300] requiring increased flows and some habitat improvements, and a subsequent water order, Water Right Order 98-05,[301] requiring additional habitat restoration based on LA's proposed Mono Basin Stream and Stream Channel Restoration Plan (hereinafter "Stream Restoration Plan").[302]

LA's diversions imposed myriad effects on downstream ecosystems. Most obviously, the diversions reduced water levels in the lake, destroying significant nesting habitat for California gulls, threatening Mono Lake's unique saline ecosystem, and creating significant human health problems from blowing dust on the dry lakebed.[303] The diversions also damaged the streams feeding Mono Lake, destroying nearly all riparian vegetation;[304] blocking needed sediments and gravel;[305] eliminating floodplain habitat and shallow groundwater in nearby areas;[306] destroying freshwater marshes on the edges of Mono Lake that were

295. *Id.* at 424.

296. *Id.* at 424–25.

297. *Id.*

298. *Id.* at 426.

299. *Id.* at 445–46.

300. Amendment of the City of Los Angeles' Water Right Licenses for Diversion of Water From Streams Tributary to Mono Lake (Water Right Licenses 10191 and 10192, Applications 8042 and 8043) City of Los Angeles, Licensee, No. D-1631, 1994 WL 16804395, at *55 (Cal. State Water Res. Bd. Sept. 28, 1994) [hereinafter Mono Basin Decision].

301. Cal. State Water Res. Control Bd., Order No. WR 98-05, at 1 (1998) [hereinafter Water Right Order 98-05].

302. L.A. Dep't of Water & Power, Mono Basin Stream and Stream Channel Restoration Plan (Feb. 29, 1996), https://perma.cc/BJ4W-RGUX [hereinafter Stream Restoration Plan].

303. Mono Basin Decision, *supra* note 300, at *3.

304. *Id.* at *87–89.

305. *Id.* at *43, *50.

306. *Id.* at *87–89.

vital to migrating waterfowl;[307] and decimating fish and waterfowl populations.[308]

These impacts are externalities of LA's water right, particularly given that LA is the sole or primary user of water in the relevant watersheds. LA paid for the infrastructure to appropriate and transport the water, for some land and some water rights in the Basin, for a small initial permitting fee, and for power and maintenance costs; however, LA does not pay any per-unit cost for the water itself and, until the Water Board's Mono Basin Decision, LA never paid any of the external costs from its diversions.[309] Thus, the city would be unlikely to consider these costs when deciding how much water to take from the Basin every year, leading LA to take more water from the Basin than is socially optimal and leaving the public holding the bag.

In Water Rights Decision 1631, the Water Board both reduced the water available to LA under its water right and required LA to restore the streams and waterfowl habitat on both public land and LA's own land.[310] The decision relied in part on California's physical solution doctrine, which allows either the courts or the Water Board to devise a physical solution to water shortages that best serves competing needs.[311] The Water Board determined that requiring LA to physically restore some of the stream and waterfowl habitat would decrease the amount of water required to remain in-stream for ecological purposes.[312] For its authority, the Water Board relied on a California Appellate Court which held, "[t]here is no reason to suppose that cessation of diversion, i.e., a return to the natural situation, would not of itself restore the creeks and their fisheries. However, this would probably constitute a waste of water. Hence, the appropriator can be *compelled as the price of continued appropriation* to take reasonable steps to attain the same end in a manner that does not involve unreasonable use of water."[313] That sounds a lot like an exaction.

The Mono Basin resolution imposed myriad responsibilities on LA: minimum stream flows;[314] channel maintenance and flushing flows to restore stream geomorphology;[315] physical restoration of the stream bed and channel;[316] addi-

307. *Id.* at *112–15.

308. *Id.* at *96–98.

309. *See generally* JOHN HART, STORM OVER MONO: THE MONO LAKE BATTER AND THE CALIFORNIA WATER FUTURE (1996).

310. *Id.* at 2. These restoration plants were subsequently approved in Water Right Order 98-05, *supra* note 301, at 1.

311. *See* Peabody v. City of Vallejo, 40 P.2d 486, 498–99 (Cal. 1935).

312. Mono Basin Decision, *supra* note 300, at *6.

313. Cal. Trout, Inc. v. Super. Ct., 266 Cal. Rptr. 788, 801 n.6 (Cal. Ct. App. 1990) (emphasis added).

314. Mono Basin Decision, *supra* note 300, at *21.

315. *Id.* at *21, *33–35.

316. *Id.* at *37.

tion of a sediment bypass system;[317] manual revegetation of the riparian corridors;[318] physical restoration of wildlife habitat, including waterfowl habitat;[319] and even cash payments to the United States Forest Service ("USFS") for the agency to restore waterfowl habitat on nearby public lands.[320] Although the effort eventually shifted toward increased flows and less structural manipulation, the early years of the restoration effort required extensive, expensive efforts from Los Angeles as a condition of its water right.

By 2013, most of the required activities were complete or ongoing.[321] Although Mono Lake and its tributary streams are by no means fully restored,[322] the lake level has been rising (though not in the recent California droughts)[323] and the streams once again hold fish.[324] The Mono Lake effort stands as a bright spot in ecosystem restoration, heralded as "one of the iconic triumphs in US environmental history."[325]

The effort looks something like a set of exactions. LA's use of Mono Basin water imposed significant external costs on the public. Although Los Angeles already had the right to divert water, the California Supreme Court made clear that the right's inherent nature allowed the state to constitutionally take back some or all of the water.[326] Thus, the water right here is much like the land use rights in most exactions cases. The Water Board conditioned LA's continued water diversions by requiring it to allow some of its water to remain in-stream, carry out habitat improvement work,[327] and fund other habitat work carried out by another organization. This is familiar from the exactions context, where a developer may have to contribute some of her own property, build some of the required city infrastructure, and even fund other entities to address external costs. The Water Board's orders functioned as a water right exaction.

317. *Id.* at *36–37.

318. *Id.* at *38.

319. *Id.* at *117.

320. Water Right Order 98-05 *supra* note 301, at 40.

321. L.A. Dep't of Water & Power, Status of Restoration Compliance Report 5–11 (2013), https://perma.cc/6LX2-TUGQ.

322. *Saving Mono Lake: About Mono Lake,* Mono Lake Comm., https://perma.cc/AG6D-8QN6.

323. Craig Anthony Arnold, *Working Out an Environmental Ethic: Anniversary Lessons from Mono Lake*, 4 Wyo. L. Rev. 1, 24 (2004).

324. Chris Hunter et al., Fisheries Monitoring Report for Rush, Lee Vining, Parker, and Walker Creeks 4 (1999).

325. Jonathan Zasloff, *Why Did the Mono Lake Campaign Succeed?*, Legal Planet (Dec. 9, 2013), https://perma.cc/M69V-LD4T.

326. Nat'l Audubon Soc'y v. Super. Ct., 658 P.2d 709, 723 (Cal. 1983) ("[T]he [state's] . . . power . . . extends to the revocation of previously granted rights.").

327. *Cf.* Koontz v. St. Johns River Water Mgmt. Dist., 570 U.S. 595, 615 (2013) (applying the exactions test to a requirement that a "landowner . . . make improvements to public lands that are nearby").

The Water Board's exactions improved Mono Basin conditions, allowed LA to keep more of its water right, and shifted water use costs from the Mono Basin public to the water users in LA; but this case is the exception, not the rule. The Water Board generally does not impose direct habitat improvement requirements or cash payments on right holders.[328] Doing so more often would produce better outcomes in water right disputes.[329]

4. Exaction-Adjacent Examples

Several other examples resemble exactions in some regards but not others. The vignettes below exemplify the potential for flexibility in an exactions approach.

The USFS uses an exactions-like approach to increase the water availability for ecosystems and recreation and other instream uses in national forests. Water right holders who require a right of way across national forest land to access or transport their water must seek the right of way from USFS.[330] Under both the Federal Land Management and Policy Act ("FLPMA")[331] and its inherent authority as a landowner,[332] USFS occasionally requires right-of-way holders to provide water for minimum instream flows as a condition of granting the right of way,[333] which may reduce the water available for the right holder's use. In effect, USFS is exacting an in-kind payment of water in exchange for granting or renewing a discretionary permit, which closely mirrors an exaction. Their authority to do so appears to be well established,[334] and this approach allows USFS to mitigate negative instream externalities from water rights and associated infrastructure.[335]

328. Brian Gray et al., *Implementing Ecosystem-Based Management*, 31 DUKE ENV'T L. & POL'Y F. 215, 230 (2020).

329. *See id.*

330. 43 U.S.C. § 1761 (authorizing the USFS to grant right of ways for water infrastructure); *see also* David M. Gillilan, Comment, *Will There Be Water for the National Forests?*, 69 U. COLO. L. REV. 533, 570 (1998).

331. 43 U.S.C. § 1765 (authorizing the USFS to impose terms and condition to "minimize damage to scenic and esthetic values and fish and wildlife habitat," and for other purposes.).

332. *See, e.g.*, Kleppe v. New Mexico, 426 U.S. 529, 539 (1976) (allowing the government to manage public lands "without limitation" (citing United States v. San Francisco, 310 U.S. 16 (1940))).

333. Gillilan, *supra* note 330, at 570.

334. Cnty. of Okanogan v. Nat'l Marine Fisheries Serv., 347 F.3d 1081, 1086 (9th Cir. 2003); *see also* Trout Unlimited v. U.S. Dep't of Agric., 320 F. Supp. 2d. 1090, 1102–06 (D. Colo. 2004); Sequoia Forestkeeper v. U.S. Forest Serv., No. CV-F-09-392, 2010 WL 5059621, at *18–21 (E.D. Cal. Dec. 3, 2010); Janet C. Neuman & Michael C. Blumm, *Water for National Forests: The Bypass Flow Report and the Great Divide in Western Water Law*, 18 STAN. ENV'T L. J. 3, 26–27 (1999).

335. *See generally* Gillilan, *supra* note 330.

FERC issues 30 to 50-year licenses for all dams with a non-federal hydropower component.[336] For license renewals, FERC must ensure that the power project will "improve or develop the waterway for the benefit of commerce, water-power development, . . . enhancement of fish and wildlife, and other beneficial public uses."[337] FERC imposes renewal conditions on the license holder, including minimum stream flows; fish passage or other structural improvements; and improvements for recreational river use.[338] For example, many FERC licenses require steps to mitigate dam-induced sediment problems, by adding gravel to below-dam river stretches, which improves conditions for downstream fish, people, and infrastructure.[339] These requirements look a lot like exactions aiming to internalize the sediment-related externalities of water infrastructure, albeit infrastructure regulated based on its relation to power, not water supply. These efforts are insufficient to stop loss of downstream deltas, wetlands, and beaches associated with sediment depletion, but they offer some mitigation benefits and partially internalize the public costs associated with the dam-enabled water rights.

Private parties can also work out agreements that look something like exactions. On Maine's Penobscot River, for example, environmental and power interests agreed that environmental groups would buy and remove several dams and, in exchange for selling the dams, the power interests could proceed on FERC relicensing for six other dams without opposition.[340] Similarly, on California's San Francisco Bay and Delta, a group of state agencies, environmental interests, and water users are negotiating voluntary agreements to protect and restore habitat, which the water users hope will allow them to keep more of their water rights than would otherwise be allowed by the state.[341] Broader similarities are also apparent in other environmental offset programs, like Clean Water Act Section 404 permitting, the Kyoto Protocol's Clean Development Mechanism, the ESA Section 7 Reasonable and Prudent Alternatives, or the National Environmental Policy Act's mitigated findings of no significant im-

336. *See* 16 U.S.C. §§ 791–828(c).

337. Karrigan Börk & Andrew L. Rypel, *Improving Infrastructure for Wildlife*, 34 NAT. RES. & ENV'T 38, 41 (2020).

338. *See generally* Paul Kibel, *Passage and Flow Considered Anew: Wild Salmon Restoration via Hydro Relicensing*, 37 PUB. LAND & RES. L. REV. 65 (2016).

339. *See, e.g.*, Kondolf, *supra* note 109, at 536–37; *Puget Sound Energy, Inc.*, 134 FERC ¶ 62, 192 (2011); *Pacificorp*, 109 FERC ¶ 62, 187 (2004). *Cf.* S. Yuba River Citizens League v. Nat'l Marine Fisheries Serv., 804 F. Supp. 2d 1045, 1062 (E.D. Cal. 2011).

340. Dave Owen & Colin Apse, *Trading Dams*, 48 U.C. DAVIS L. REV. 1043, 1077 (2015).

341. *Voluntary Agreements to Improve Habitat and Flow in the Delta and its Watersheds*, CAL. NAT. RES. AGENCY, https://perma.cc/6HKP-UDDN.

pact.[342] In all these cases, permit seekers contribute money or property in exchange for a discretionary permit.[343]

As these examples suggest, in isolated cases, permitting agencies are already making use of the exactions approach in ways that benefit the public and restore some rationality to water use decisions; explicit recognition and a wider embrace of the approach could lead to dramatic reductions in the external impacts of water rights.

III. Water Right Exactions are Constitutional

Water right exactions can only work if they are constitutional. This Part argues that the constitutional *Nollan/Dolan* exaction analysis is generally applicable to water right exactions and shows that water right exactions are constitutional.

The portability of the constitutional *Nollan/Dolan* exaction analysis to water law depends on how closely exactions and the land use permits they condition resemble conditions on water rights. In some ways, the ability to develop private property seems fundamentally different than the ability to use water, a public resource. But in ways important to our analysis, these rights are very similar, as explained in the next section.[344]

A. Transplanting Land Use Law to Water Rights

For a constitutional analysis, there are two key aspects of exactions. First, exactions are conditions placed on permits where the permit itself could have

342. *See generally* James Salzman & J. B. Ruhl, *Currencies and the Commodification of Environmental Law*, 53 Stan. L. Rev. 607 (2000); Nelson, *supra* note 26, at 132, 138, 140.

343. *See* Salzman & Ruhl, *supra* note 342, at 613.

344. The entities seeking permits also differ between the two contexts. In the exactions setting, the permit seekers are often developers or other private parties, while water right holders or applicants are often public entities (cities, counties, or federal agencies) or semi-public entities (irrigation districts, municipal utility districts, etc.). In most cases, this is a distinction without a difference. Public and semi-public entities generally must seek water rights like any other water user; they do not have special status. Moreover, they should not be treated differently; their use of water creates externalities and internalizing those costs will result in better decisions that maximize the benefits of water use. There is some potential for complications with federal agencies. Federal agencies generally must comply with state water laws, and in those cases, federal agencies can be treated like other water users with respect to exactions. *See* Börk et al., *supra* note 3, at 891. However, for large federal water infrastructure projects, the federal legislation authorizing the project may, in some cases, complicate imposition of exactions on the impacts of the federal water projects due to preemption concerns. *Id.* In those cases, the exactions could be imposed on associated water rights or water users by the federal agencies overseeing project operations or other federal permitting agencies. Federal reserved water rights, which are creatures of federal law, present additional challenges. These situations will require more analysis.

constitutionally been denied without causing a taking.[345] Second, "the government could not have constitutionally ordered the [applicant] to do what it attempted to pressure that person into doing."[346] That is, to be an exaction, the condition should require the applicant to give something up that the government could not constitutionally simply take from the applicant, like property or, after *Koontz*, money tied to a real property decision, in exchange for a discretionary government decision. Both aspects often hold true in the water rights context.

1. Part One: Water Rights? Or Water Privileges?

For exactions purposes, the first key aspect of the land use right is that it is actually a *privilege*, which the government could constitutionally deny outright without causing an unconstitutional taking.[347] The first question, then, in applying exactions law to water rights is whether a governmental entity can deny outright a request to use water or end a user's ability to continue using an existing water right.[348] Because state laws determine the nature of most water rights, the answer varies state by state, but some generalizations are possible. In many cases, as I explain below, the answer is yes. To get there, we take a brief detour through some of the constitutional questions about the nature of water rights.

a. Water Rights and the Constitution

Constitutional protections for water rights are contentious and unsettled, but we can work around those problems to analyze the portability of exactions to water law.[349] There are two pieces to the constitutional water right question.[350] First, are water rights a constitutionally protected form of property?[351] If not, then the answer is easy: states could certainly deny water use applications

345. Plater & O'Loughlin, *supra* note 175, at 788.

346. Koontz v. St. Johns River Water Mgmt. Dist., 570 U.S. 595, 612 (2013); *see also* Rumsfeld v. F. Acad. & Institutional Rts., Inc., 547 U.S. 47, 59–60 (2006) ("It is clear that a funding condition cannot be unconstitutional if it could be constitutionally imposed directly.").

347. Plater & O'Loughlin, *supra* note 175, at 788.

348. Because most surface waters in many areas are already fully allocated, water right exactions that address only new rights offer few benefits. Successful water right exactions must also apply to existing rights.

349. Wading through this literature takes some effort, but it pays dividends both in this analysis and in the subsequent analysis of what exactly the water right seeker is being asked to give up.

350. Robin Kundis Craig, *Defining Riparian Rights as Property Through Takings Litigation: Is There a Property Right to Environmental Quality?*, 42 ENV'T L. 115, 118 (2012) ("[B]oth the status of water rights as 'property' and the defining characteristics of any such property right—its scope and elements—are highly contested.").

or take back existing rights. And second, if water is a constitutionally protected form of property, how limited are those protections?[352] This matters because, if water rights are constitutionally protected forms of property, states could still constitutionally deny water use applications or take back existing rights if the constitutional protections were sufficiently limited.

In the conceptual battle over the existence of a constitutionally protected property right in water,[353] some argue that "the special nature of water—its inevitably common and communal character" means it should have limited or no constitutional protection in the takings context.[354] Others argue the opposite: that water is some kind of super property, such that any infringement on a water right could be a taking.[355] Fortunately, we need not attempt to settle this question. Even if water rights are as strong as land rights, the Supreme Court has a long history of upholding laws that restrict private use of private land, including existing uses,[356] within the limits of *Penn Central* and other takings

351. *Compare* Squillace, *supra* note 119, at 638 ("[W]ater . . . unlike land—is traditionally viewed as public property."), *with* James L. Huffman et al., *Constitutional Protections of Property Interests in Western Water,* 41 PUB. LAND & RES. L. REV. 27, 34 (2019).

352. Sax, *supra* note 53, at 269 (collecting cases and noting that "water's capacity for full privatization has always been limited").

353. Sandra B. Zellmer & Jessica Harder, *Unbundling Property in Water*, 59 ALA. L. REV. 679, 681–82 (2008) ("One of the most divisive issues in contemporary natural resources law in the United States is whether interests in water are legally recognized as property. . . . [T]he law is surprisingly unsettled; over two centuries of American caselaw have yielded no consistent answers."); *Taking Groundwater*, *supra* note 20, at 273–75.

354. Sax, *supra* note 53, at 279; *see* United States v. Chandler-Dunbar Co., 229 U.S. 53, 69 (1913) (stating that the idea "that the running water in a great navigable stream is capable of private ownership is inconceivable"); Hudson Cnty. Water Co. v. McCarter, 209 U.S. 349, 356 (1908); New Jersey v. New York, 283 U.S. 336, 342 (1931) (noting that "[a] river . . . offers a necessity of life that must be rationed among those who have power over it").

355. Huffman et al., *supra* note 351, at 47–53; *see, e.g.*, Casitas Mun. Water Dist. v. United States, 102 Fed. Cl. 443, 448–49 (Fed. Cl. 2011), *aff'd*, 708 F.3d 1340 (Fed. Cir. 2013); Tulare Lake Basin Water Storage Dist. v. United States, 49 Fed. Cl. 313 (Fed. Cl. 2001); Hage v. United States, 35 Fed. Cl. 147, 172 (Fed. Cl. 1996) ("[W]ithin our constitutional tradition . . . water rights, which are as vital as land rights, should receive [no] less protection . . . particularly . . . in the West where water means the difference between . . . life and death."); *see also* Est. of Hage v. United States, 82 Fed. Cl. 202, 211 (Fed. Cl. 2008) (holding that, because water rights are "defined by the right to access and use . . . water," restrictions on that use are physical takings). The Court of Claims decisions were affirmed in part, reversed in part, and vacated in part, largely based on ripeness grounds and a failure to show that any water taken would have been put to a beneficial use by the right holder. *See, e.g.*, Est. of Hage v. United States, 687 F.3d 1281, 1292 (Fed. Cir. 2012) (finding that the "Claims Court erred in holding that the Hages' regulatory takings claim was ripe" and that it also erred in finding a taking because "there is no evidence that the government actually took water that they could have put to beneficial use.").

356. Julie R. Shank, Note, *A Taking Without Just Compensation? The Constitutionality of Amortization Provisions for Nonconforming Uses*, 109 W. VA. L. REV. 225, 237 (2006) (describing the "seemingly well settled view" that amortization to end nonconforming land uses after

tests.[357] As Justice Alito noted in *Koontz*, "[i]nsisting that landowners internalize the negative externalities of their conduct is a hallmark of responsible land-use policy, and we have long sustained such regulations against constitutional attack."[358] If constitutionally protected rights in land can be limited in significant ways without running afoul of the Constitution, then the same should be true of water rights, even if we assume that water rights have the highest of constitutional property protections.

This brings us to allowable limits on water rights:[359] can they be limited, just as rights in land? As Justice Scalia wrote for the majority in the 1992 decision in *Lucas v. South Carolina Coastal Council*, a government can constitutionally deny a landowner all economic use of her land if the government's action "inhere[s] in the title [to the property] itself, in the restrictions that background principles of the State's law of property and nuisance already place upon land ownership."[360] Similarly, a government can restrict the exercise of a water right without running into a takings issue if the restrictions inhere in the water right itself.[361] Without delving into the world of takings jurisprudence too far then, it is clear that the background principles of state law determine the aspects of a water right that receive constitutional protection. On this question, the limits of the property interest in a water right, the view of the legal commentariat is clear. Most commentators agree that even "when water is viewed as some species of property, the public interest in water is unusually strong."[362] Three types of limits capture most of the nuance: water rights are limited to beneficial and non-wasteful use in virtually all jurisdictions; water rights are subject to many prior public claims on water resources; and many water rights are granted by permit, which articulate additional limitations.[363]

Even the most forceful advocates for strong constitutional protections for water rights recognize that rights are forfeit if not put to beneficial use.[364] As the Ninth Circuit has held, the beneficial use doctrine is a matter of general law

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rezoning is "per se constitutional"); *see also* PATRICIA E. SALKIN, 2 AM. L. ZONING § 12:15 (5th ed. 2021).

357. Lingle v. Chevron U.S.A. Inc., 544 U.S. 528, 547 (2005).

358. Koontz v. St. Johns River Water Mgmt. Dist., 570 U.S. 595, 605 (2013).

359. This second question can be difficult to parse out from the first; but these are two distinct inquiries and analyzing them separately brings some clarity. *See, e.g.*, Craig, *supra* note 350, at 118; *Taking Groundwater*, *supra* note 20, at 272; Zellmer & Harder, *supra* note 353, at 732–44.

360. Lucas v. S.C. Coastal Council, 505 U.S. 1003, 1029 (1992).

361. Casitas Mun. Water Dist. v. United States, 102 Fed. Cl. 443, 452 (2011), *aff'd*, 708 F.3d 1340 (Fed. Cir. 2013).

362. Craig, *supra* note 350, at 119 (suggesting water's ephemeral and capricious nature makes "water rights inherently more contextualized and adjustable than real property rights").

363. Sax, *supra* note 53, at 260.

364. Huffman et al., *supra* note 351, at 29.

among western states,[365] and the water codes of all of the western states and some western state constitutions include "beneficial use," making it an exemplar background principle.[366] Professor Neuman's exhaustive research on this issue shows that "beneficial use, without waste, is the basis, measure, and limit of a water right" throughout the West.[367] The concept of "beneficial use,' . . . operates as a permissible limitation on water rights"[368] in every western state.[369] Moreover, "[b]eneficial use is an evolving definition, so a use of water once recognized as beneficial can become non-beneficial and lose its constitutional property protections as a result."[370] Thus, the state may constitutionally reevaluate existing water uses that were once deemed beneficial and non-wasteful to determine if they still exhibit those essential attributes.[371]

Beyond the beneficial use requirement and closely related reasonableness or waste avoidance requirements,[372] prior state interests in water serve as background principles. Take, for example, the public trust, public interest, and state ownership doctrines, which all limit the scope of water rights and often enable the state to adjust those rights it has already granted. First, many states have integrated the public trust doctrine as an ongoing limit to both existing and future water rights.[373] Second, every western state except Colorado has imposed a public interest limit on the private right to use water, for both new applications and changes in use.[374] Professor Mark Squillace's deep review of public

365. United States v. Alpine Land & Reservoir Co., 697 F.2d 851, 854 (9th Cir. 1983), *cert. denied*, 464 U.S. 863 (1983).

366. Neuman, *supra* note 8, at 923.

367. *Id.* at 923–24.

368. Dep't of Ecology v. Grimes, 852 P.2d 1044, 1055 (Wash. 1993); *see also* Imperial Irrigation Dist. v. State Water Res. Control Bd., 275 Cal. Rptr. 250, 261 (Cal. Ct. App. 1990) (noting that the irrigation district "has only vested rights to the 'reasonable' use of water . . . [and] has no right to waste or misuse water").

369. Neuman, *supra* note 8, at 923–26.

370. Huffman et al., *supra* note 351, at 34; see also Imperial Irrigation Dist., 275 Cal. Rptr. at 266 ("What is a beneficial use at one time may, because of changed conditions, become a waste of water at a later time.") (quoting Tulare Irrigation Dist. v. Lindsay-Strathmore Irrigation Dist., 45 P.2d 972, 1007 (Cal. 1935)); *Alpine Land & Reservoir Co.*, 697 F.2d at 855.

371. Neuman, *supra* note 8, at 981–82 (noting state agencies' "ample existing and largely untapped authority to further define the parameters of allowable water use"); Sax, *supra* note 53, at 265 n.24 ("[T]he very essence of a law of beneficial use implies revisions over time as needs and circumstances change.").

372. *See, e.g.*, CAL. CONST. art. X, § 2; CAL. WATER CODE § 100 (2021).

373. *Cf.* Nat'l Audubon Soc'y v. Super. Ct. 33 Cal. 3d 419 (1983). Professor Robin Craig provides an encyclopedic overview of state public trust doctrines that sheds light on the way the doctrine can restrict water rights. *See generally* Robin Kundis Craig, *A Comparative Guide to the Western States' Public Trust Doctrines: Public Values, Private Rights, and the Evolution Toward an Ecological Public Trust*, 37 ECOLOGY L.Q. 53 (2010); Robin Kundis Craig, *A Comparative Guide to the Eastern Public Trust Doctrines: Classifications of States, Property Rights, and State Summaries*, 16 PENN ST. ENV'T L. REV. 1, 16 (2007).

374. Squillace, *supra* note 119, at 638.

interest tests concludes that "the public interest acts as an inherent limitation on the scope of private property rights in water, which in turn limits the scope of potential takings claims."[375] Third and finally, many western states (but no eastern ones) explicitly state that the water in the state belongs to the public,[376] which the Supreme Court has recognized "is 'not without significance' in testing state authority to manage water within its borders."[377] These state doctrines recognizing prior public interests in water offer a robust set of background principles that limit water rights and enable water right management without fear of takings.

Lastly, as noted, most states require permits of some kind for water rights,[378] and these permitting systems govern virtually every aspect of the right. For example, in all western states, right holders cannot change their type or place of water use without government permission.[379] The permitting system in most western states both allocates available water and protects third parties and the public from impacts due to new or changed appropriations.[380] In some places, permits are, at least facially, issued by right, in contrast to most land use permits.[381] But other applicable laws generally limit permit issuance, through tests like the aforementioned public interest test.[382] These laws give permitting agencies a great deal of discretion to decide whether to issue a right and what terms and conditions to apply to it. Thus water rights are, in practice, discretionary permits, closely limited based on the relevant permitting framework.

State and federal courts do recognize successful takings claims around water, generally when the government has effectively taken the entire water right.[383] Professor Robin Craig provides an excellent detailed overview of successful water rights takings claims at the federal level, generally based on appropriative rights.[384] In those cases, the federal government has (1) diverted the entire water right and appropriated that water for government or third-party

375. *Id.* at 681.

376. Leshy, *supra* note 204, at 1991 n.17 (tracing the historic trajectory of public interests in water "back at least to the Romans").

377. *Id.* at 1991 n.19 (citing Sporhase v. Nebraska, 458 U.S. 941, 953 (1982)).

378. Squillace, *supra* note 119, at 650 (noting all western states use a comprehensive permitting scheme); Dellapenna, *supra* note 200, at 86 n.178 (listing nineteen eastern states that now use a regulated riparianism approach, requiring permits for riparian rights).

379. *See, e.g.*, 45 AM. JUR. 2D IRRIGATION § 29. This is akin to the nearly ubiquitous requirement for permission for land use changes, at least in urban/suburban areas.

380. A. Dan Tarlock, *The Future of Prior Appropriation in the New West*, 41 NAT. RES. J. 769, 770 (2001); Squillace, *supra* note 119, at 655. *See generally* Dellapenna, *supra* note 200.

381. *See, e.g.*, CAL. WATER CODE § 1253 (2021).

382. *See, e.g.*, *id.* § 1255 (The board may reject an application that "would not best conserve the public interest.").

383. Craig, *supra* note 350, at 125 ("[S]uccessful takings cases based on mere 'interference' with water rights are rare.").

384. *Id.* at 125–31.

use,[385] or (2) reallocated water from a right holder to instream flows.[386] The first set of these cases look like exercises of eminent domain power,[387] where the government outright takes the property of one party for public use, and the Court's determination that such an action is a taking seems unsurprising.[388] The second set, consisting mostly of federal claims cases,[389] is harder to parse out, as the actions by the federal government in those cases looks like an exercise of restrictions that already inhered in the state-defined right. The courts likely would have allowed the state to circumscribe the water rights at issue in the same way through its own police powers or other preexisting powers over water rights.[390] But the courts in those cases seem concerned that they cannot be sure the federal government actions restrict the water rights to the same degree that a permissible action by the state would have and so have been reluctant to extend the state background principles protection to cover federal actions[391] Moreover, these cases cannot be reconciled with originalist constitutional interpretation, given the deep history of fish passage laws in the United States[392] or with past Supreme Court precedent,[393] making these precedents uncertain given today's Supreme Court. Perhaps one should not make too much of these outlier decisions.

Few cases address less-well-defined riparian rights, but generally courts do not safeguard riparian rights through constitutional protections against takings.[394] Many western states, including South Dakota, Nevada, Washington, Texas, Oregon, and Kansas, abolished outright undocumented riparian rights when they moved to an appropriative rights system, and both state and federal

385. *See, e.g.*, Int'l Paper Co. v. United States, 282 U.S. 399, 405 (1931); *see also* United States v. Gerlach Live Stock Co., 339 U.S. 725, 728–30 (1950); Dugan v. Rank, 372 U.S. 609, 612–13 (1963).

386. *See, e.g.*, Tulare Lake Basin Water Storage Dist. v. United States, 49 Fed. Cl. 313 (Fed. Cl. 2001); Casitas Mun. Water Dist. v. United States, 543 F.3d 1276 (Fed. Cir. 2008).

387. *Int'l Paper Co.*, 282 U.S. at 408.

388. Leshy, *supra* note 204, at 2008.

389. The one outlier is *Casitas Mun. Water Dist.*, 543 F.3d 1276.

390. *See* Craig, *supra* note 350, at 130–31 (stating that the cases "indicate that when government action results in the physical loss of water for plaintiffs with defined rights to divert or use a specific amount of water, the government owes compensation unless the law defining the right's scope and elements allows for future modifications by *that* government" (emphasis added)).

391. *E.g.*, Casitas Mun. Water Dist. v. United States, 102 Fed. Cl. 443 (Fed. Cl. 2011) (finding a potential taking because "[w]e are thus unable to conclude, on this evidence, that the operating restrictions imposed on plaintiff under the biological opinion duplicate the result that would have been achieved under state law"); *see* Craig, *supra* note 350, at 128–30.

392. *See generally* John F. Hart, *Fish, Dams, and James Madison: Eighteenth-Century Species Protection and the Original Understanding of the Takings Clause*, 63 MD. L. REV. 287 (2004).

393. Holyoke Co. v. Lyman, 82 U.S. 500, 512–13 (1872) (upholding Massachusetts fish-passage law); Hudson County Water Co. v. McCarter, 209 U.S. 349, 356–57 (1908).

394. Craig, *supra* note 350, at 132.

courts generally held that this did not constitute a taking.[395] Because riparian rights can often be extinguished without raising a takings problem, regulation of those rights should be constitutional.

Finally, Professor Owen provides the definitive discussion of constitutional protection for groundwater rights.[396] He concludes that "the application of a relatively mainstream version of takings doctrine, which treats groundwater rights as property but allows substantial government regulation of groundwater use, is both the most traditional and the most theoretically justifiable approach."[397] When states implement a new groundwater regulatory regime that reduces some existing groundwater use, or when they deny a permit to extract groundwater, courts generally find that no unconstitutional takings have occurred, even if limits are applied to previously unlimited rights;[398] only two reported groundwater cases, both in Texas, found both a taking and required compensation.[399]

As a whole, across the decisions addressing the different kinds of water rights, neither the state courts nor the federal courts have "imposed constitutional property obstacles to major reforms of water law."[400] Rather, the courts themselves often adjust water rights systems, sometimes fundamentally, in response to societal demands, without compensation to the right holder.[401] As Professor Sax notes, "change is the unchanging chronicle of water jurisprudence."[402]

This discussion of the nature of water rights is certainly not exhaustive; deciphering every state law regime to determine the limits of the exactions framework for addressing water right externalities is beyond the means of any single article.[403] Nevertheless, the foregoing discussion shows that, in many places and in many ways, governments can limit water rights much more severely and with fewer constitutional concerns than they can the land use rights at issue in the Court's exactions cases.[404]

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395. Sax, *supra* note 53, at 260 n.4 (collecting cases). *See* Davenport & Bell, *supra* note 194; *see also* Leshy *supra* note 204, at 1988; Joseph W. Dellapenna, *Special Challenges to Water Markets in Riparian States*, 21 GA. STATE U.L. REV. 305, 337 (2004). California is a notable outlier to this trend. Sax, *supra* note 53, at 260 n.4.

396. *Taking Groundwater*, *supra* note 20, at 284.

397. *Id.* at 254.

398. *Id.* at 286–87.

399. *Id.* at 284–85 n.193; *see also* Tiffany Dowell, *Texas Supreme Court Will Not Hear Bragg v. Edwards Aquifer Authority*, TEX. A&M AGRILIFE EXTENSION (May 4, 2015), https://perma.cc/238S-9TB8.

400. Sax, *supra* note 53, at 260 n.4 (collecting cases).

401. Leshy, *supra* note 204, at 2016.

402. Sax, *supra* note 53, at 268 (collecting cases).

403. Neuman, *supra* note 8, at 987.

404. *See* Leshy, *supra* note 204, at 1994–96; Josh Patashnik, *Physical Takings, Regulatory Takings, and Water Rights*, 51 SANTA CLARA L. REV. 365, 415–16 (2011).

To return to the key question in the applicability of the exactions analysis to water rights, it is clear that in many, perhaps most, cases, a governmental entity can deny outright a request to use water or can reconsider a user's ability to continue using an existing water right, due to the background principles of water law, just as it can choose not to issue a development permit. In these cases, with respect to the first question of comparability, the exactions framework is a good conceptual fit for the constitutionality of conditioning water rights.

2. Part Two: An Otherwise Impermissible Taking?

Turning to the second requirement for applying the constitutional *Nollan/Dolan* exaction analysis, we must consider the second boundary requirement for an unconstitutional conditions analysis, that "the government could not have constitutionally ordered the [applicant] to do what it attempted to pressure that person into doing."[405] When a permitting agency conditions initial or continued use of water on dedication of funds or non-water property, this seems an easy analysis: the government could not simply take those things without payment.[406] For demands of money or non-water property, the exactions framework is a clean analytical fit.[407]

But what if the state demands the right holder give up some water in exchange for keeping the rest?[408] Try to consider this situation from an exactions viewpoint; the state is requiring the right holder to give up some of its property, the water right, in exchange for keeping the rest of the benefit (the rest of the water right). This is somewhat akin to giving up an easement in exchange for a development permit. But here the tenuous nature of water rights could trip us up.

If, as proponents of strong constitutional property protections for water rights suggest, water rights are as protected as property, this still appears to be a good fit for the constitutional *Nollan/Dolan* exaction analysis. But if, as most scholars suggest, the "owner of a water right has a lesser property right than the

405. Koontz v. St. Johns River Water Mgmt. Dist., 570 U.S. 595, 612 (2013).

406. *Id.* at 613 (taking money does not generally support a takings claim, but this changes when the demand for money at issue "[does] 'operate upon . . . an identified property interest.'" (citing E. Enters. v. Apfel, 524 U.S. 498, 540 (1998) (Kennedy, J., concurring))).

407. If, as some commentators and courts argue, impact fees and other purely monetary conditions are better regarded as taxes and thus not subject to the constitutional *Nollan/Dolan* exaction analysis, the conditions would be subject to the more relaxed rational basis test and would almost certainly survive scrutiny. *See* Fennell & Penalver, *supra* note 181 and associated text.

408. Why order the return of water as a condition on a permit instead of simply taking it? Doing so could offer political advantages or could allow the state to create an instream water right with the same priority as the right it took. *See infra* Parts II.C.1, IV.A.

landowner in *Nollan*,"[409] and the state has the power to restrict it nearly at will, then the analysis breaks down; exactions *must* require conditions that would otherwise be unconstitutional.[410] In some ways, it is an odd requirement; if a condition on a permit *could* be constitutionally ordered *without* the permit, then the condition is certainly constitutional,[411] though not an exaction.[412] It would be easiest, perhaps, to simply frame this as the state taking back a portion of the right holder's water, pursuant to whichever state water law doctrine allows it that kind of power over the waters of the state (public trust, beneficial use, waste, etc.).[413] Regardless, conditioning an existing right holder's permit with a requirement that they surrender some water in exchange for keeping the rest appears to be either definitely constitutional—under the lesser constitutional protection view of water rights, or subject to the constitutional *Nollan/Dolan* exaction analysis—under the greater constitutional protection view of water rights. In the remainder of this article, I discuss conditions that require a permit holder to give up water as an exaction—because they accomplish many of the purposes of an exaction (e.g., internalizing costs)—and are generally constitutional or subject to the exactions test.

B. Setting Constitutional Exactions

Constitutional exactions must pass the *Nollan/Dolan* essential nexus and rough proportionality tests.[414] In some cases, defining the external costs of water rights precisely enough to meet those standards may be a challenge,[415] although continued improvements in the science surrounding externalities from water

409. Sax, *supra* note 53, at 280.

410. *Koontz*, 570 U.S. at 613.

411. Rumsfeld v. F. Acad. & Institutional Rts., Inc., 547 U.S. 47, 59–60 (2006) ("[A] . . . condition cannot be unconstitutional if it could be constitutionally imposed directly.").

412. Giving back part of a discretionary benefit to maintain the rest is not an exaction exactly, but it also seems to be something that lacks a name at the present. The answer may lie somewhere in the givings literature. *See* Abraham Bell & Gideon Parchomovsky, *Givings*, 111 YALE L.J. 547, 611 (2001).

413. *See* Leonard & Leonard v. Earle, 279 U.S. 392 (1929); Horne v. Dep't of Agric., 576 U.S. 351, 366–67 (2015) (characterizing Leonard & Leonard v. Earle as holding that the state of Maryland could constitutionally require oyster packers to give the state 10% of their oyster shells because "oysters, were *feræ naturæ* that belonged to the State under state law, and no individual had any property rights in them other than such as the state may permit him to acquire. The oyster packers did not simply seek to sell their property; they sought to appropriate the State's" (cleaned up)).

414. *See generally Koontz*, 570 U.S. 595; Scaccia, *supra* note 11, at 655 (rough proportionality, an individualized determination of the relationship between the harm and the exactions, and some effort to quantify findings).

415. Fenster, *supra* note 43, at 626; *See* Nelson, *supra* note 26, at 144–45 (explaining that water rights' impacts are relatively case-specific).

rights makes internalizing those externalities through pricing mechanisms a realistic goal.[416]

There is a well-established tension between accuracy and comprehensiveness in assessing external costs and permitting speed and transaction costs;[417] establishing and documenting *perfect* exactions would so burden the application process that water right permitting would grind to a halt.[418] Exactions that address more impacts will be more expensive to develop, but under-inclusive exactions risk allowing continued overconsumption of water. Others have offered many ways to address this problem in the environmental offsets context, through mechanisms like post-hoc adjustments, offset ratios that allow for some underestimate of costs, and other solutions.[419] In the water permitting context, state permitting agencies could promulgate general regulations that establish a set exaction or no exaction for de minimis diversions with no associated infrastructure, and then create tiers of exactions for higher-impact water rights.[420] The Oregon conserved water program uses this approach, claiming a default of 25% of conserved water for the state but allowing or requiring adjustments under particular circumstances.[421] Similarly, the Colorado River example imposes a default fee on all water projects, with additional requirements for large projects. The process would have to provide for review of any standardized exactions, to meet *Dolan's*[422] and larger diversions or diversions with significant associated infrastructure should have exactions customized to the project, because their more serious impacts are more important to address. Water agencies should note that perfect exactions are not required; rough proportionality, an individualized determination of the relationship between the harm and the exactions, and some effort to quantify findings generally will suffice.[423]

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416. Esty, *supra* note 68, at 188.

417. For groundwater, "even the most complex modeled approaches are unlikely to ensure complete accuracy, because the characteristics of subsurface environments are rarely completely known." Nelson, *supra* note 26, at 136, 161. *See also* Hennessy, *supra* note 14, at 1676–77 (2004).

418. *See generally* Nelson, *supra* note 26.

419. *Id.* at 151–52.

420. As Nelson suggests, permitting agencies should "[f]irst, adopt a clear threshold of impact for individual actions in the default case; simultaneously, set a trigger value of cumulative impacts beyond which previously exempt or low-impact activities will be brought within the sphere of regulated activities, and ensure regular accounting of those impacts." *Id.* at 189.

421. State Of Or. Water Res. Dep't, Allocation of Conserved Water Program (2013).

422. Byrne & Zyla, *supra* note 11, at 775. *But see* Cal. Bldg. Indus. Ass'n v. City of San Jose, 351 P.3d 974, 1009 (Cal. 2015) (under rational basis review, "individualized studies to determine the size of fee needed for mitigating the impacts of each development" would not be required).

423. Scaccia, *supra* note 11, at 655.

Initial impositions of exactions will certainly be time consuming and likely frustrating,[424] but as agencies and applicants learn how to navigate the process, speeds should improve.[425] In other environmental offset contexts, markets have emerged that offer mitigation credits of various kinds (e.g., wetland banks, carbon offsets),[426] which facilitate fast, low-transaction-cost offsetting. Similar markets would likely emerge in the water permitting context, offering mitigation like levee setbacks, flood plain restoration, or seasonal supplies of high-quality water.

Finally, which sovereign is entitled to impose constitutional conditions like exactions seems to be an open question. It may be that an exaction must be imposed by the same government that is granting the benefit, or only by a sovereign that could constitutionally deny the underlying permit, although this area of unconstitutional conditions jurisprudence requires additional theorizing and development. In cases like *Casitas*, where the federal government tries to condition a water right granted by the state, some courts tend to reject state-background-principle-based arguments.[427] In contrast, in the exactions context, city or regional entities often condition rights that flow from the state government.

Based on this analysis, the exactions approach generally appears to be a constitutional method to condition water rights. But that, by itself, is not enough. Just because we *can* apply exactions here does not mean that we *should*. I turn now to an explanation of the benefits of water right exactions.

IV. Water Right Exactions Improve Water Management

A. Internalizing Water Right Externalities

Internalizing water right externalities is the primary goal of water right exactions and has been the focus of much of the discussion in this paper. Exactions will not solve all problems with water rights systems,[428] but by internalizing many externalities they would induce more efficient water use decisions and incentivize a more socially optimum distribution of water-related costs and benefits. As others have made clear, water management works best when it is accomplished through polycentric governance that involves state, collective, and market institutions that together provide flexibility within appropriate constraints to safeguard the public interest.[429] Change comes through "a complex

424. Nelson, *supra* note 26, at 151–52.

425. *See supra* Part II.C.1.

426. Nelson, *supra* note 26, at 140–41.

427. *See* text accompanying *supra* note 391.

428. *See* Meinzen-Dick, *supra* note 5, at 15201.

429. *Id.*

interweaving of litigation, legislation and administrative actions that compel change in water use, interspersed with periods of voluntary water trading."[430] To that end, I next discuss the ways that exactions compare or would work with other methods of increasing efficiency or internalizing costs, concluding that exactions could provide agencies with a strong economic tool to encourage water use and water markets to better account for the public costs of water use.

1. Exactions and Water Markets

The pervasive water market literature makes a strong case for using water markets to increase water use efficiency.[431] Water is a difficult commodity for markets,[432] and most existing markets are somewhat distorted affairs,[433] but the theory is nevertheless sound: water right holders who use their water for relatively low value applications could sell to those who could make higher value use of the water. By encouraging water users to confront the private opportunity cost of their water use,[434] water markets would drive water use toward increased efficiency.[435] But real markets do not produce the most efficient outcomes, regardless of the metric for measuring efficiency, because users' private cost does not reflect the true social cost of water.[436] Private water markets miss many values, like "the unique importance of social and cultural values generated by water, the important instream values that are not protected by property rights, external costs imposed directly on other parties due to jurisdictional boundaries that relieve water users of liability for damage, and the 'secondary economic impacts' imposed on areas-of-origin."[437] Without accounting for impacts to these values, private water market ordering alone will not produce the desired level of social efficiency. As noted, many commentators argue for inter-

430. Colby, *supra* note 9, at 5.

431. *See, e.g.*, Casado-Pérez, *supra* note 59; Thompson, *supra* note 35.

432. Many aspects of water—high transportation costs, erratic supply, interconnected uses, variability of quality, lack of information, high transaction costs, limited sellers, and high nonmarket values—make water a difficult commodity for a well-functioning market. *See* Freyfogle, *supra* note 151, at 154 n.65.

433. Neuman, *supra* note 8, at 991 (noting a "vast gulf" between "market theory and . . . the actual practice of western water allocation").

434. Howe, *supra* note 157, at 359.

435. Casado-Pérez, *supra* note 59, at 173–74.

436. In other words, markets do a good job of making market participants confront private opportunity costs, but often fail to address social opportunity costs. Thilak Mallawaarachchi, et al., *Water Allocation in Australia's Murray-Darling Basin: Managing Change Under Heightened Uncertainty*, ECON. ANALYSIS AND POL'Y 2, 13 (2020) ("Water trading is unreliable in determining *social opportunity costs*."). *See generally* JOHN QUIGGIN, ECONOMICS IN TWO LESSONS: WHY MARKETS WORK SO WELL, AND WHY THEY CAN FAIL SO BADLY (2019).

437. Howe, *supra* note 157, at 361.

nalization of externalities generated by water transfers, to ensure that rational participants proceed only when the total benefits of the transfer exceed the societal costs,[438] but very few states consider externalities that affect the public when assessing water transfers,[439] focusing instead on impacts to other water users. Water right exactions offer a method for states to incorporate these public costs to improve market function and, by increasing the cost of water, induce more market transfers for higher value water uses. Exactions work with market forces to improve efficiency.

On the other hand, exactions that apply only to water transfers would impede market function. As noted, water markets already generally address externalities that impact other water users, through the no-harm rule, which gives existing right holders an effective veto over water transfers that would negatively impact their rights.[440] The no-harm rule is "not about causing potential economic inefficiencies or social inequalities; rather, it is aimed at preventing one specific kind of waste: the disruption of existing resource use."[441] This narrow focus means that the no-harm rule can dramatically increase transaction costs and impede water markets while simultaneously offering inadequate protection,[442] although no-harm rules remain politically popular, and it is difficult to imagine fair water transfers absent some kind of no-harm requirement. Professor Colby has argued that high transaction costs are themselves a policy, what she terms "policy-induced transactions costs," that signal concerns about water transfers.[443] Adding an exactions requirement to water transfers could further increase the costs of water transfers and constrain market function. There are several mitigating factors, however. First, as noted, no water reform can effectively (or fairly) be applied only to new or transferred water rights. The exactions approach would be most effective if applied to all water rights because most water has already been allocated under existing rights. If exactions are applied to all rights in a wholesale manner, then they would not have an outsize impact on water transfers. Second, transfers already must go through complex regulatory analysis, to determine what portion of the water right may be transferred, to ensure compliance with the no-harm rule, and often to determine whether the transaction itself is in the public interest.[444] This analysis provides the same information that regulators would need to quantify and impose exactions, so the marginal costs of creating exactions is unlikely to dramatically increase transaction costs, although it will (by design) increase the cost of water.

438. Hennessy, *supra* note 14, at 1678.

439. Howe, *supra* note 157, at 357.

440. *See supra* note 151 and accompanying text.

441. Michael Pappas, *Anti-Waste*, 56 Ariz. L. Rev. 741, 770 (2014).

442. *See* Freyfogle, *supra* note 151, at 1539–40.

443. Colby, *supra* note 115, at 1184 (noting that environmental externalities in the water context generally go uncompensated).

444. *See generally* Behnampour, *supra* note 22 (describing several states' transfer protocols).

Nevertheless, when the economic incentives are high enough, water transactions would proceed.

2. Exactions and Regulatory Approaches

While the literature is clear that cost incentives like exactions are more cost effective than command and control interventions alone,[445] I do not argue that exactions should displace the existing regulatory approaches. Some interests simply are not for sale at any price, and the command-and-control approach to water use regulation may do a better job of providing *absolute* protection for these interests. Even if a water user is willing to pay the calculated social cost of an extinction due to water use, for example, regulations like the ESA reflect a legislative determination that the "value of endangered species [is] 'incalculable.'"[446] In a case construing the ESA, the Supreme Court noted that "[t]he plain intent of Congress in enacting this statute was to halt and reverse the trend toward species extinction, whatever the cost."[447] Thus, regulations sometimes protect interests seen as absolute, a very different goal than exactions. But even when exactions and regulations overlap in purpose, there are benefits to the traditional regulatory approach (e.g., certainty, familiarity, signaling),[448] and policy makers need not abandon one approach to embrace the other. For example, in the context of the water-specific public interest requirement for water transfers, permitting agencies may want to exclude outright those transactions where, in their estimate, the public costs outweigh the public benefits, even if a given actor has a high willingness to pay that would allow the transaction to proceed in the face of very high exactions. Combining exactions with the existing approach would allow permitters to bar some transactions while ensuring that the public costs are borne by the water users in cases that do go forward, providing the benefits of both approaches.

Finally, of note, exactions may be particularly appealing for water permitting agencies because these agencies are generally loath to deny permits outright, which makes command-and-control approaches less effective in this setting. Water agencies have a long history of ignoring or downplaying command-and-control laws that purport to require them to restrict or eliminate water rights.[449] As Professor Squillace has demonstrated, water agencies almost never deny water right applications due to concerns over the public interest.[450]

445. Sheila M. Olmstead et al., *Do Consumers React to the Shape of Supply? Water Demand Under Heterogeneous Price Structures*, at *2 (RES. FOR FUTURE, Discussion Paper 05-29, 2005).

446. Tenn. Valley Auth. v. Hill, 437 U.S. 153, 187 (1978) (citing H.R. REP. NO. 412 at 4–5 (1973)).

447. *Id.* at 178.

448. *See* Owen, *supra* note 8, at 1599–1600.

449. *See generally* Börk et al., *supra* note 3.

450. Squillace, *supra* note 119, at 658.

Other commentators note the historic wholesale abdication of public trust responsibilities by water agencies when those responsibilities conflicted with water appropriations.[451] In many cases, water agencies are likely to continue to approve water uses that impose significant public costs; absent exactions, the public costs will still fall entirely on the public. Exactions offer regulators a way out; they can approve water uses but ensure that the private cost of those water uses reflects the social cost, which discourages the use without banning it outright. This may be more palatable to the water agencies.[452] Other commentators have described this phenomenon with environmental offsets more generally, where providing regulatory agencies a way to approve permits while offsetting impacts provides a politically palatable solution.[453] Exactions provide a mechanism for water permitting agencies to issue permits, as they tend to do, while also mitigating the negative costs of those permits. This approach recognizes the political economy of water while still producing better and more efficient outcomes.

3. Exactions or other Externality Internalizers?

Exactions are not the only way to internalize costs. Other approaches include common law tort approaches,[454] Coasean bargaining,[455] Pigouvian taxes,[456] and command-and-control approaches.[457] Existing tort and regulatory approaches have not succeeded in addressing the myriad externalities of water rights, but the choice between exactions, Coasean bargaining, and Pigouvian taxes merits some discussion.

Coasean approaches require firm property rights and low transaction costs, which are often absent under real world conditions; as other commentators have noted, the wide range of interests implicated by water right externalities likely bars successful negotiations among private entities,[458] even if all the relevant property rights could be firmly established in one entity or another. However, exactions could be construed as a method of *enabling* Coasean bargaining, with the permitting agency standing in for the public in the bargaining process by protecting public interests.[459] There are important distinctions from private

451. Börk et al., *supra* note 3, at 814–15.

452. Water agencies may be incentivized to apply exactions that are too low, which suggests a need for public and judicial review. *See* Salzman & Ruhl, *supra* note 342, at 677–78.

453. *See id.* (describing the many factors that motivate agencies to engage in environmental offsets); Nelson, *supra* note 26, at 145–46.

454. Calabresi & Melamed, *supra* note 16, at 1094.

455. *See generally* Coase, *supra* note 65.

456. Masur & Posner, *supra* note 61, at 94.

457. Hammonde & Spence, *supra* note 30, at 172.

458. Casado-Pérez, *supra* note 59, at 171.

459. *See* Lee Anne Fennell, *Hard Bargains and Real Steals: Land Use Exactions Revisited*, 86 IOWA L. REV. 1, 81 (2000); WILLIAM A. FISCHEL, THE ECONOMICS OF ZONING LAWS: A

bargaining in this context, including power dynamics that may favor the state due to its effective monopoly power[460] and the (perhaps faulty) assumption that the permitting agency adequately represents the public's interests.[461] Some externalities will also likely be beyond the permitting agencies' jurisdiction and so would remain unaddressed by the bargain.[462] But, taken as a whole, exactions offer promise as a method of enabling Coasean approaches to increasing water use efficiency.

Pigouvian taxes on water offer many of the same benefits as water right exactions: allowing each water user to make their own water use decision after taking into account costs that reflect the true cost of the water,[463] "provid[ing] an effective common metric for evaluating water use, which could help facilitate reallocation of water both among and within different sectors of the economy [and coexistence] with other regulatory systems."[464] Taxation offers other advantages as well, beyond those offered by exactions: simplicity, more barriers to abuse by rent seekers,[465] and the ability to easily affect every water user.[466] This last point is the most significant; as others have noted in the land use exaction setting, exactions put much of the cost of community infrastructure and other needs on new development, not existing users.[467] In contrast, a Pigouvian tax spreads the cost over all users. In the water setting, where the goal is to internalize the external costs of all water rights across all water right holders, the tax offers a clear advantage over exactions *if* the water right exactions are not applied to existing users. Water right exactions that apply only to new rights and to water transfers would further limit market participation and could exclude new users.[468]

Pigouvian taxes would also be easier to apply to existing water uses. They could be applied to water end use, not to specific water rights, and thus reach most water uses through a single government action. Water right exactions, by design, apply to the water rights and are crafted to match the impacts of each water right, which dramatically increases the information needs and transaction

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PROPERTY RIGHTS APPROACH TO AMERICAN LAND USE CONTROLS 74–149 (1985); ROBERT H. NELSON, ZONING AND PROPERTY RIGHTS: AN ANALYSIS OF THE AMERICAN SYSTEM OF LAND-USE REGULATION 22–51 (1977). *But see* David Schleicher, *City Unplanning*, 122 YALE L.J. 1670, 1681–83 (2013).

460. Aziz Z. Huq, *The Negotiated Structural Constitution*, 114 COLUM. L. REV. 1595, 1618 (2014).

461. Schleicher, *supra* note 459, at 1682–83.

462. *See id.* at 1683.

463. Owen, *supra* note 8, at 1598.

464. *Id.* at 1600.

465. *Id.* at 1599.

466. *Id.* at 1598.

467. Rossi & Serkin, *supra* note 11, at 659.

468. *See* Steven J. Eagle, *Koontz in the Mansion and the Gatehouse*, 46 URB. LAW. 1, 11 (2014).

costs for exactions as compared to Pigouvian taxes.[469] These advantages, among others, explain the broad theoretical preference for the Pigouvian tax approach.[470] And, indeed, if Pigouvian taxes were feasible, they would theoretically produce better outcomes than other approaches across a host of regulatory arenas.[471]

Despite their academic popularity, Pigouvian taxes have not been widely adopted. A 2015 study found "only a few isolated examples of a pure Pigouvian tax in U.S. law."[472] "[A]version to Pigouvian taxes is so powerful that people will make welfare-reducing choices to avoid them."[473] Even ardent Pigouvian tax supporters agree "the word tax' is toxic."[474] In short, people hate new taxes. This unpopularity translates into significant institutional barriers to new taxes in many states: to create new taxes, "sixteen states have supermajority requirements, and an additional three states require voter approval."[475] Even if one can convince politicians to embrace such taxes, these institutional barriers are very difficult to overcome.

Political feasibility, then, is a major advantage of water right exactions. Land use exactions are wildly popular with planners and nearly ubiquitous, at least among those on the permitting side of land use decisions. They offer a familiar framework to regulators, one that is already in use in nearly every community in the country.[476] And, as noted,[477] they resemble arrangements that some permitting agencies already occasionally use. Asking water right permitting agencies to apply a popular method for cost internalization that resembles some existing practices is a far easier lift than asking for imposition of new taxes. Moreover, regulators could phase exactions in gradually, beginning with new rights and gradually expanding coverage. This is a pragmatic proposal that could work.

Exactions offer another benefit: the increased costs of customization for exactions may be counterbalanced by the benefits of cost customization.[478] A

469. Owen, *supra* note 8, at 1598.

470. *E.g.*, Masur & Posner, *supra* note 61, at 95 ("Other forms of regulation are inferior to the Pigouvian tax.").

471. *See* Peter N. Salib, *The Pigouvian Constitution*, 88 U. CHI. L. REV. 1081, 1081 (2021) (proposing Pigouvian taxation in the context of gun deaths and fake news); Victor Fleischer, *Curb Your Enthusiasm for Pigovian Taxes*, 68 VAND. L. REV. 1673, 1675 (2015) (noting academic support for their use on "carbon, gasoline, fat, high fructose corn syrup, guns, financial transactions, executive pay, excessive zoning, and sport utility vehicles").

472. Masur & Posner, *supra* note 61, at 97.

473. Gary M. Lucas, Jr., *Voter Psychology and the Carbon Tax*, 90 TEMP. L. REV. 1, 17–18 (2017).

474. Masur & Posner, *supra* note 61, at 142.

475. Erin Adele Scharff, *Green Fees: The Challenge of Pricing Externalities Under State Law*, 97 NEB. L. REV. 168, 180 (2018).

476. Rossi & Serkin, *supra* note 11, at 659.

477. *See* Part IV.

478. For other challenges to the Pigouvian approach, see generally Fleischer, *supra* note 471.

uniform Pigouvian tax is ideal when "each individual causes the same amount of harm with each incremental increase in activity on the margin,"[479] but when social cost varies in meaningful ways, a uniform Pigouvian tax designed to address an average level of harm leads to over-consumption in places where social costs are high and under consumption in places where social costs are low.[480] Water externalities exhibit this wide variation; water availability varies extensively across space and time in the United States,[481] and many water rights are explicitly tied to a particular place and season.[482] In some places and at some times, exercising a water right may produce very few externalities. For example, directly drawing from the flow of a river during high water to store water or for other purposes generally imposes few social costs, while storing flood water behind a dam may impose significant costs due to the infrastructure involved. A uniform Pigouvian tax would treat both right holders in the same way, despite the differences in externalities they generate, which would in turn introduce additional inefficiencies. A more customized approach could produce more socially optimum outcomes, provided that the costs of implementation were low enough. This is likely to be true in cases where a water right agency is already making a determination about the water right, under the public interest test or another metric.

As a whole, water right exactions can integrate external costs while working well with markets and with more traditional regulatory approaches. Although they may lack some of the advantages of Pigouvian taxes, they are a much more feasible alternative that could be applied under existing law, dramatically increasing water use efficiency.

B. Addressing Equity, Fairness, and Justice Concerns

Maximizing net economic benefits, the primary focus of much of this article and a major motivator for exactions, is "only one of many indicators" in the water context,[483] and equity, justice, and fairness should be central to the way we analyze water policies.[484] Toward that end, I first consider the distributional improvements exactions can offer and then address potential concerns about the impacts of exactions on the human right to water, changing water use, and spillover effects.

Water rights and their associated infrastructure impose costs and bestow benefits, and the costs and benefits often flow to different parties, creating seri-

479. *Id.* at 1673.

480. *Id.* at 1676–77.

481. Larson, *supra* note 1, at 176.

482. *See, e.g.*, *Water Rights Petitions Program,* CAL. WATER BDS., https://perma.cc/2QT6-XLJ5 (explaining the typical terms in a water right).

483. Garrick & Hahn, *supra* note 4.

484. *Id.*; *see* Wutich & Beresford, *supra* note 139, at 173.

ous distributional fairness concerns.[485] In her famous *Dams* paper, Nobel Laureate Esther Duflo and colleague Rohini Pande documented the distributional effects of large irrigation dams in India, demonstrating convincingly that dams improve the plight of some populations (often agricultural areas receiving the water from the dam) while other areas suffer increased poverty and environmental impacts.[486] The Indian example is representative of distributional concerns worldwide,[487] including in the United States.[488] Places receiving additional water or more consistent water benefit from the infrastructure, while displaced communities, downstream areas, and others relying on the ecosystem services associated with intact aquatic ecosystems bear many of the costs. In the groundwater setting, groundwater users get the benefits of the extracted water, while the impacts of subsidence or decreased water availability may be felt in geographically distant areas. The distribution of benefits and costs tends to follow pre-existing power dynamics and often constrain the range of possible solutions,[489] but exactions offer a way to shift more costs onto the parties who are reaping the benefits. This may even benefit project proponents; development exactions sometimes allow projects "to go forward despite their generation of public harms because they provide the means to mitigate those harms."[490]

Beyond the inherent distributional fairness concerns in this uneven spread of costs and benefits, the disconnect may also explain some political conflicts over dams. Interests that receive the benefits of the infrastructure while avoiding many of the costs have a clear incentive to seek construction of additional infrastructure—it is rational rent seeking behavior. LA residents who paid only a portion of the true cost of Mono Basin water would rationally demand that the city build the infrastructure to extract as much of that water as possible. This may explain the continued support for dam construction even in the face

485. Esther Duflo & Rohini Pande, *Dams*, 122 Q.J. Econ. 601 (2007).

486. *Id.*; *see also* Hiroyuki Takeshima, *Distributional Effects of Agricultural Infrastructure in Developing Countries: Large Irrigation Dams and Drought Mitigation in Nigeria*, 52 J. Developing Areas 1, 12–13 (2018).

487. Marc Jeuland, *The Economics of Dams,* 36 Oxford Rev. Econ. Pol'y 45, 68 (2020); *see generally* Eric Strobl & Robert O. Strobl, *The Distributional Impact of Large Dams: Evidence from Cropland Productivity in Africa*, 96 J. Dev. Econ. 432 (2011).

488. Sarah E. Null et al., *Optimizing the Dammed: Water Supply Losses and Fish Habitat Gains from Dam Removal in California*, 136 J. Env't Mgmt. 121, 131 (2014); Samuel G. Roy et al., *A Multiscale Approach to Balance Trade-offs among Dam Infrastructure, River Restoration, and Cost*, 115 Proc. Nat'l Acad. Scis. 12069, 12069–74 (2018); Michelle Ho et al., *The Future Role of Dams in the United States of America*, 53 Water Res. Rsch. 982, 1, 8 (2017); *see generally* Cecilia Llamosas & Benjamin K. Sovacool, *The Future of Hydropower? A Systematic Review of the Drivers, Benefits and Governance Dynamics of Transboundary Dams*, 137 Renewable & Sustainable Energy Revs. 110495 (2021).

489. Ziaja, *supra* note 47, at 333 ("Existing power relations constituted an initial distribution that conditioned what outcomes were possible.").

490. Byrne & Zyla, *supra* note 11.

of engineering and economic studies suggesting that building more dams should be a low priority for those seeking to improve water security.[491] Exactions could bring the public's expectations about water infrastructure more in line with reality.

Next, I shift to justice concerns about implementing exactions. Water right exactions will increase the price of water. This is inherent in exactions, and the benefits of exactions rely on increased costs. Increasing costs make water less affordable. Low-income people already generally pay more of their income for water, and higher water costs will have more of an impact on those least able to pay.[492] However, methods exist to mitigate these impacts.[493] The quantity of water required to meet basic human needs is actually quite small. The United Nations General Assembly has recognized a human right to water and sanitation,[494] and it estimates that 50 to 100 liters of water per person per day, at a cost of less than 3% of household income, meets those requirements.[495] Consider those numbers in a water supply context. California has roughly 40 million people; ensuring that all Californians had sufficient water to fulfill their human right to water would thus take roughly 4 billion liters. Four billion liters is equivalent to roughly 3,250 acre-feet,[496] while the Sacramento River, California's largest river, has a mean annual flow of 18 *million* acre-feet ("MAF"),[497] and the state water project delivers about 2.4 MAF per year.[498] Nationwide, 1% of water use would be enough to meet the human right to water.[499] Thus, to mitigate the disparate economic impacts of more expensive water, some small initial quantity of water should be made affordable through income-based cash distributions to low-income people or through progressive water pricing models.[500]

Increased water cost is also likely to change water use by shifting water use to higher value uses and reducing overall water use. This will likely mean main-

491. MARK BALDASSARE, PUB. POL'Y INST. CAL., PPIC STATEWIDE SURVEY: SPECIAL SURVEY OF THE CENTRAL VALLEY 10 (2002); *see also* Alvar Escriva-Bou et al., *Dams in California*, PUB. POL'Y INST. CAL. (2019), https://perma.cc/7T7F-PXSZ.

492. Owen, *supra* note 8, at 1614–15.

493. For an overview of methods to address price impacts on poor people, see *id.*

494. G.A. Res. 64/292 (July 28, 2010).

495. *The Human Right to Water and Sanitation,* UNITED NATIONS, https://perma.cc/5MDG-86JG.

496. *Liters to Acre Feet Conversion,* MILLILITER.ORG, https://perma.cc/9SSH-LK2V.

497. BUREAU OF RECLAMATION, U.S. DEP'T OF THE INTERIOR, SECURE WATER ACT SECTION 9503(C) SACRAMENTO AND SAN JOAQUIN RIVER BASINS (2016).

498. CAL. DEP'T OF WATER RES., THE FINAL STATE WATER PROJECT DELIVERY CAPABILITY REPORT 2019 (2020), https://perma.cc/42YY-PYTF.

499. *Cf.* Robert Glennon, *supra* note 33, at 1896 ("The real issue confronting the United States is not whether to recognize a human right to water, it is how to allocate the remaining 99% that we use each day.").

500. *See, e.g.*, Owen, *supra* note 8, at 1615–16.

taining or increasing most urban or industrial use while reducing agricultural uses.[501] Changing water use, even when the original users are compensated, is often a fraught process,[502] and changing water use through imposition of "new" costs by internalizing externalities will be unpopular with some interests.[503] But this is a necessary consequence of the benefits of adopting exactions to produce a more rational water rights system; at a societal level, water is often used in inefficient ways,[504] and water users have long been insulated from paying the true costs of that use.[505] This will undoubtedly generate resistance to exaction schemes, [506] but it may be preferable to the command-and-control approaches water permitting entities could otherwise use to achieve the same objectives.[507] Although water reallocation will be painful either way, leaving the ultimate decision-making power in the hands of the water users, subject to better cost-signals, should promote more efficient outcomes than the command-and-control approaches. [508] Reducing uses that cannot bear water's full cost moves us closer to an optimum allocation of a scarce resource.[509]

Finally, the broad geographic scale of externalities associated with water rights poses some fairness concerns, particularly with regard to spillover effects.[510] Spillover effects occur when the positive or negative impacts of an action occur outside the jurisdiction of the entity permitting the action.[511] Some impacts of water rights and associated infrastructure are felt far downstream (e.g. beach erosion due to sediment loss)[512] or far upstream (e.g. loss of nutrient infusions due to blocked fish migrations).[513] These impacts may span state lines or sub-state agency jurisdictions, making them spillover effects. The risk arises when an entity imposes exactions: the imposed exactions may ignore these spillover effects, such that the exaction is underinclusive and does not reflect expensive public costs in other areas; it might include these costs but fail to

501. Howe, *supra* note 157.

502. Thompson, *supra* note 35, at 734–35.

503. Colby, *supra* note 9, at 9.

504. Owen, *supra* note 8, at 1588–90.

505. *See id.* at 1609–17 (dismantling several objections to market interventions that increase the price of water).

506. Colby, *supra* note 9, at 9 (noting how academic work in this area can lead to changes in water allocation systems).

507. *Id.* at 1616.

508. Glennon, *supra* note 215, at 340.

509. Bretsen & Hill, *supra* note 23, at 725.

510. Robert B. Keiter, *Public Lands and Law Reform: Putting Theory, Policy, and Practice in Perspective*, 4 UTAH L. REV. 1127 (2005).

511. *See* Karrigan S. Börk & Keith Hirokawa, *Trends in Local Ecosystem Governance*, 3 FRONTIERS IN CLIMATE 1, 4 (2021).

512. *See supra* Part I.B.

513. Christopher M. Tonra et al., *The Rapid Return* of *Marine-Derived Nutrients to a Freshwater Food Web Following Dam Removal*, 192 BIOLOGICAL CONSERVATION 130, 130 (2015).

allocate the funds to the relevant outside jurisdiction; or the outside jurisdiction might seek to impose the costs but be unable to do so due to limited regulatory authority. In any case, careful coordination may be useful in addressing the problem, although spillover effects are notoriously difficult in many settings.[514] This problem will be especially challenging when the spillover occurs across international borders; the current struggles to address the downstream impacts of U.S. dams on the Colorado River Delta in Mexico illustrate some of these challenges.[515]

By assigning more of the costs of water rights and associated infrastructure to the right holders, exactions can address some distributional fairness problems without aggravating other justice concerns.

C. Providing Dedicated Funding and Water

Property taken through an exaction must be used to address the impacts from the permitted activity.[516] Applying exactions to water rights would generate funds and property (including water) dedicated to mitigating project impacts, providing essential funding, water, and other resources specifically for management of public water-use impacts.

Consider the importance of dedicated water. The literature has documented the benefits of water rights dedicated to the environment, sometimes called environmental water rights or ecosystem water budgets.[517] An environmental water right—as compared to administratively set minimum flows, flows implemented through litigation, or flows designed to protect a single species—offers managers advantages.[518] First, the rights offer flexibility to manage aquatic systems for multiple benefits. When the Public Policy Institute of California interviewed water managers after the 2012–2016 drought, they found "the lack of flexibility in managing ecosystem water even in well run systems

514. *See* Börk & Hirokawa, *supra* note 511.

515. Colby, *supra* note 9, at 8.

516. *See, e.g.*, Nollan v. Cal. Coastal Comm'n, 483 U.S. 825, 836–37 (1987); Martin, *supra* note 182, at 46; Byrne & Zyla, *supra* note 11; WASH. REV. CODE ANN. § 82.02.020 (West) (requiring funds from exactions to be held in a reserve account and used only for mitigation).

517. *See, e.g.*, JEFFREY MOUNT ET AL., PUB. POL'Y INST. CAL., MANAGING CALIFORNIA'S FRESHWATER ECOSYSTEMS: LESSONS FROM THE 2012–2016 DROUGHT (2017), https://perma.cc/X8GQ-QJ56; Gray et al., *supra* note 328, at 222; Lynda L. Butler, *Environmental Water Rights: An Evolving Concept of Public Property*, 9 VA. ENV'T L.J. 323 (1990); Joshua Harris, *A Lasting Proposal for Endangered Bay-Delta Fish Survival: The Environmental Water Account and the Accumulation of Water Contract Rights in the Central Valley Project and the State Water Project*, 26 ENVIRONS ENV'T L. & POL'Y J., 121, 134 (2002); Alf W. Brandt, *An Environmental Water Account: The California Experience*, 5 U. DENV. WATER L. REV. 426, 428 (2002); Kara Gillon, *An Environmental Pool for the Rio Grande*, 47 NAT. RES. J. 615, 629–30 (2007).

518. *See* Colby, *supra* note 9, at 9.

proved challenging," slowing reaction times and limiting effective solutions for water crises.[519] With the added flexibility of environmental rights, managers could integrate broader ecological and ecosystem services related goals; vary management by water year; and engage in water solutions that have traditionally been beyond the reach of instream rights, like water trading, above or below ground storage, or sales.[520] The rights also allow managers to meet ecosystem flow needs throughout the year. The "functional flows" approach discussed above requires identifying and restoring enough of the historic flow regime to drive key geomorphological and ecological processes;[521] a minimum flow requirement generally does not address these varying flow needs throughout the year and across wetter or drier years. In contrast, an adroit manager can use the environmental water right, in conjunction with other flows, to drive the processes that support the historical ecosystem and its goods and services. These aspects of environmental water rights make them particularly well suited to mitigate water right externalities.

The aquatic restoration literature also documents the challenge in financing long term management.[522] To understand this challenge, recall the three-legged stool model of a river. Changing one leg—flows, geology, or biology—makes things unsteady, and the river shifts to accommodate the change, which can impose significant costs on beneficiaries of goods and services provided by the river.[523] Keeping the stool steady may require expensive and intensive long-term management,[524] like frequent addition of gravel and other sediments downstream of dams, maintenance of flood plain dynamics, and other habitat restoration.[525] In the Mono Lake case study, for example, Los Angeles has engaged in more than two decades of management and monitoring to ensure that the impacts from their diversions are adequately mitigated.[526] Similarly, the Upper Colorado River fish programs require ongoing fish stocking, nonnative species removal, water management, and other actions.[527] Managers are essentially left to farm these ecosystems for the goods and services we choose to protect,

519. MOUNT ET AL., *supra* note 517, at 31.

520. *Id.* at 34.

521. Yarnell et al., *supra* note 77, at 964.

522. *See* Börk, *supra* note 81, at 227–32.

523. Margaret Palmer & Albert Ruhi, *Linkages Between Flow Regime, Biota, and Ecosystem Processes: Implications for River Restoration*, 365 SCIENCE 1, 1 (2019).

524. Emily S. Bernhardt et al., *Restoring Rivers One Reach at a Time: Results from a Survey of US River Restoration Practitioners,* 15 RESTORATION ECOLOGY 482, 488 (2007) (noting that "there was no funding available for post-implementation maintenance for nearly one-third of the projects where such maintenance was required").

525. *See generally id.*; Emily S. Bernhardt et al., *Synthesizing US River Restoration Efforts*, 308 SCIENCE 636 (2005) (cataloging strategies used in U.S. river restoration projects).

526. *See infra* Part II.C.3.

527. *See infra* Part II.C.2.

and that requires dedicated funding,[528] which is difficult to obtain when the public tends to undervalue and overlook the benefits of ecosystem services.[529] Further, if ecosystem management is undertaken as mitigation for the external impacts of water rights and associated infrastructure, long term monitoring is essential to ensure that the work actually addresses those impacts.[530] Funds for long term monitoring are typically in short supply.[531] Exactions are a fairly unique solution that can provide those funds and protect them from other budgetary demands.

Depending on how they are administered, water right exactions could provide other benefits as well. Some states allow localities to impose impact fees or other exactions only within the context of a broader land use plan.[532] Using a similar approach for water right exactions could allow legislatures to push water permitting agencies to better integrate water rights with regional water planning; to promote conjunctive management of surface and groundwater; to coordinate water rights with other areas of water policy, like water quality, equity, or even land use planning; and to accomplish watershed-level ecosystem management.[533] This is a grander view of the potential role of exactions, but it would mirror existing efforts in the world of land use.

D. Open Questions

Water right exactions raise more questions than one article can address. I have addressed many of the more foundational aspects of water exactions in the piece, and here I briefly note some additional issues.

In contemplating externalities, one must first consider the initial allocation of property rights (sometimes termed entitlements).[534] Although the allocation of entitlements is perhaps "the basic economic question in a society,"[535] it is often addressed only implicitly in the environmental and water contexts; this is strange, given that environmental and water policy determine where and to

528. Harriet Elizabeth Moore & Ian D. Rutherfurd, *Lack of Maintenance Is a Major Challenge for Stream Restoration Projects*, 33 River Rsch. & Applications 1387, 1389, 1397 (2017) ("Ongoing interventions pose the greatest challenge for river restoration because they need ongoing funding and permanent arrangements for management.").

529. *Id.*

530. Margaret Palmer et al., *River Restoration in the 21st Century: Data and Experiential Knowledge to Inform Future Efforts*, 15 Restoration Ecology 472, 472 (2007); Nelson, *supra* note 26, at 180–82.

531. Bernhardt et al., *supra* note 524, at 482–83 (noting the lack of funding for project monitoring).

532. *See, e.g.*, Wash. Rev. Code Ann. § 82.02.050 (West).

533. *See* Gray et al., *supra* note 328.

534. *See generally* Robbins, *supra* note 9, at 198.

535. Bromley, *supra* note 37, at 782.

whom many of the costs and benefits of water systems accrue.[536] The government role in defining property rights in an externalities analysis "determines whether there are compensable externalities and how easy it is to measure them."[537] Does the water user have a right to cause downstream impacts? Or does the public have a right to a well-functioning stream? Allocating these rights is "the fundamental thing that law does . . . these are the first order of legal decisions."[538] The answers to these questions frame the way people think about externalities, where they assign the blame for market failures, and what solutions they are likely to adopt.[539] Implicit in my analysis, then, is an assumption that water right holders do not have an entitlement to do most of the harm associated with water rights, and that the public does have an entitlement to an environment free of those harms. This is a key assumption for the exactions analysis. If the public is entitled to healthy floodplains, to riparian habitat, or to extant populations of trout and salmon, then the harm to these values due to use of water rights and associated infrastructure is a compensable negative externality. If there is no property right to these things, then there is no *compensable* externality. This article's analysis reflects, in my view, the implicit assumptions underlying much of our environmental law,[540] but an exactions framework makes these implicit assumptions more obvious, and they may require further analysis.

The exaction framework itself is also open to more questions after *Koontz*.[541] Commentators have raised serious concerns about whether *Koontz* will chill negotiations over exactions or result in more outright permit denials.[542] Others have argued that, post-*Koontz*, the costs of establishing defensible exactions will swamp the societal benefits they offer.[543] More broadly, other commentators have discussed general problems with exactions,[544] and importing the exactions framework into the water law world might invite some of those same problems. But even with their flaws, exactions supply an accounting for exter-

536. Colby, *supra* note 9, at 2 (noting "the centrality of policy in determining how the costs and benefits of water trading are distributed across stakeholders").

537. Casado-Pérez, *supra* note 59, at 161–62, 170–71.

538. Calabresi & Melamed, *supra* note 16, at 1090.

539. *See, e.g.*, Grow Sun & Daniels, *supra* note 64, at 332–33; Lisa Grow Sun & Brigham Daniels, *Mirrored Externalities*, 90 NOTRE DAME L. REV. 135, 138, 154, 162–63 (2014).

540. *See* Robbins, *supra* note 9, at 198 (providing examples of standard public expectations related to clean air, clean water, and a livable environment).

541. *See, e.g.*, John D. Echeverria, *The Costs of Koontz*, 39 VT. L. REV. 573 (2014). *But see* Plater & O'Loughlin, *supra* note 175 (arguing that the impacts are likely to be less significant).

542. Sean F. Nolon, *Bargaining for Development Post-Koontz: How the Supreme Court Invaded Local Government*, 67 FLA. L. REV. 171 (2015); Molly Cohen & Rachel Proctor May, *Revolutionary or Routine?* Koontz v. St. Johns River Water Management District, 38 HARV. ENVTL. L. REV. 245 (2014).

543. *See* Echeverria, *supra* note 541.

544. *See* Fennell, *supra* note 459; Schindler, *supra* note 181.

nalities that water rights law has long been missing, and they offer better prospects for more efficient water use than continuing to ignore these costs.

Finally, theoretical and qualitative work by Professors Salzman and Ruhl in the environmental offsets arena makes a strong case that permitting agencies in environmental offset programs are likely to approve exchanges that provide insufficient protection for public interests.[545] Although exactions are not precisely environmental offsets, they are similar and, in many ways, present agencies with the same incentives to under-protect that Salzman and Ruhl documented in their work (e.g. political pressure, consolidating agency power).[546] Traditional approaches to cabining agency discretion, notice and comment public participation and deferential judicial review, may be insufficient to address the problem.[547] Their suggestions, including more aggressive judicial review, better public participation, and collaborative decision making,[548] may also be required in the water right exactions context. Additional research will be needed in this area.

Conclusion

Current water right permitting approaches allow water users to impose rampant externalities on the general public. When a prospective water right holder can externalize some of the costs of the water right, they will overuse the water, because the private cost of the water to the user does not include the full social cost of the water. On the flip side, the public bears the extra cost of the water use and has less water available for other uses. If the water user could be made to bear the full social cost of the water, they would rein in their use to reflect this higher cost, and the public would not be left holding the associated costs. Overall, the pricing signals and the user's rational choices would produce a more optimal outcome. Water right permitting agencies should impose exactions on both new and existing water rights. Water right exactions would internalize the public costs of water withdrawals and restore some much-needed rationality to water use decisions. This framework will also mitigate existing distributive concerns; provide dedicated funding and water for management of public costs from water use; and promote better judicial decisions concerning takings in the water right context.

545. *See generally* Salzman & Ruhl, *supra* note 342.

546. *Id.* at 676–79.

547. *Id.* at 687.

548. *Id.* at 687–94.