

DEAD IN THE WATER? ADDRESSING THE FUTURE OF WATER CONSERVATION IN THE COLORADO RIVER BASIN

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The Colorado River Basin is drying up, and with it, the water supply of seven states in the American West. Historically, the West relied on consumption-based laws to fuel development despite the arid landscape. The Colorado River Compact allocated water among the states, but those allocations suffered from two basic flaws: (1) The agreed-upon water flow of the river was based on a particularly wet season in the region, and (2) the Compact was not designed to adapt to changing environmental circumstances. As climate change decreases rainfall and increases temperatures, water availability will sharply decline. But outdated legal doctrines incentivize farmers to use all their water or otherwise see their water allocations dwindle, increasing water waste. Furthermore, water rights and agriculture are mostly within the jurisdiction of states, which are often paralyzed to act due to either economic competition or a lack of resources.

This Note argues that the federal government must step in to overcome the collective action problem and realign market incentives. It proposes a program focused on improving water efficiency, paying farmers not to plant harmful crops, and allowing farmers to exit the market entirely. Particularly, the Department of the Interior’s Bureau of Reclamation has rulemaking authority to implement necessary programs to counteract harmful incentives in the region. Other agencies, like the Department of Agriculture, can bolster this approach. Effectively, the end result would be a market that promotes conservation as an economically beneficial and rational decision for every farmer.

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INTRODUCTION

In 1890, John Wesley Powell presented a map of the American West to the Senate Select Committee on Irrigation and Reclamation of Arid Lands.¹ The map was visually enthralling.² It was a culmination of all the knowledge he had gained from a three-month expedition to explore the Colorado River.³ The map divided the region based on watersheds, each

1. John F. Ross, *The Visionary John Wesley Powell Had a Plan for Developing the West, But Nobody Listened*, *Smithsonian Mag.* (July 3, 2018), <https://www.smithsonianmag.com/smithsonian-institution/visionary-john-wesley-powell-had-plan-developing-west-nobody-listened-180969182/> [https://perma.cc/C5EE-X856] [hereinafter Ross, *Plan for the West*].

2. See *id.* (discussing Powell’s 1890 map, which “offered a radical new vision of the American West centered on watersheds rather than on traditional political boundaries”).

3. See John Wesley Powell, *Exploration of the Colorado River of the West and Its Tributaries*, at ix–xi (1875), <https://pubs.usgs.gov/unnumbered/70039238/report.pdf>

of which represented a different state.⁴ Powell argued that the federal government needed to control the water supply, keep water within watersheds,⁵ legally tie water to the land within which it flowed, and create mechanisms for monitoring meteorological and ecological developments. Already wary of settlement in a harsh region, Powell felt these steps were necessary to avoid “environmental ruin and mass human suffering” from land development.⁶ Powell’s view on the limited viability of settlement in the West was not new. As early as 1819, the West had been described as a “Great Desert” and “wholly unfit for cultivation.”⁷

Fast forward 150 years since Powell’s expedition, and his fears have materialized. The Colorado River Basin has not only been in a drought for twenty-three years but, from 2002 through 2021, saw the driest period recorded in more than one hundred years.⁸ In 2021, the federal government announced water shortages, requiring unprecedented water cuts in both Arizona and Nevada.⁹ The various reservoirs throughout the basin, responsible mainly for water storage and hydropower generation, have gone from being ninety-five percent full in 2000 to a record low of thirty-nine percent in 2021.¹⁰ Climate conditions are only expected to worsen, and states in the basin have “no plan” for how to cut water use in the region.¹¹ If drought conditions continue, parts of the region will likely

[<https://perma.cc/F7PP-Q5MZ>] (discussing the summer he spent developing “a survey embracing the geography, geology, ethnography, and natural history” of Colorado).

4. Ross, Plan for the West, *supra* note 1.

5. A watershed is defined as “an area of land that drains rainfall and snowmelt into streams and rivers.” Watershed, Nat’l Geographic, <https://education.nationalgeographic.org/resource/watershed/> [<https://perma.cc/N3NN-SEVL>] (last updated Oct. 19, 2023); see also What Is a Watershed?, Nat’l Ocean Serv., <https://oceanservice.noaa.gov/facts/watershed.html> [<https://perma.cc/YM3X-J8JL>] (last updated Jan. 20, 2023).

6. John F. Ross, How the West Was Lost, *The Atlantic* (Sept. 10, 2018), <https://www.theatlantic.com/ideas/archive/2018/09/how-the-west-was-lost/569365> (on file with the *Columbia Law Review*); see also Abraham Lustgarten & Naveena Sadasivam, Holy Crop: How Federal Dollars Are Financing the Water Crisis in the West, *ProPublica* (May 27, 2015), <https://projects.propublica.org/killing-the-colorado/story/arizona-cotton-drought-crisis> [<https://perma.cc/VZH4-2UD2>].

7. Stephen Long, who was dispatched to explore the West by President James Monroe, labeled his report on the region “Great Desert.” Richard H. Dillon, Stephen Long’s Great American Desert, 111 *Proc. Am. Phil. Soc’y* 93, 95, 102 (1967).

8. Colorado River Drought Conditions and Response Measures: Hearing Before the Subcomm. on Water, Oceans, and Wildlife of the H. Comm. on Nat. Res., 117th Cong. 7–12 (2021) (statement of Tanya Trujillo, Assistant Sec’y for Water and Sci., Dep’t of the Interior) [hereinafter Colorado River Drought Conditions].

9. Joshua Partlow & Karin Brulliard, U.S. Announces More Water Cuts as Colorado River Hits Dire Lows, *Wash. Post* (Aug. 16, 2022), <https://www.washingtonpost.com/climate-environment/2022/08/16/colorado-river-bureau-of-reclamation/> (on file with the *Columbia Law Review*).

10. *Id.*

11. Rachel Estabrook & Michael Elizabeth Sakas, The Colorado River Is Drying Up—But Basin States Have ‘No Plan’ on How to Cut Water Use, *CPR News* (Sept. 17, 2022), <https://www.cpr.org/2022/09/17/colorado-river-drought-basin-states-water-restrictions/>

run dry within forty to fifty years.¹² Currently, forty million people rely on the Colorado River Basin for water, a number that is expected to grow.¹³ Residents in many cities are subjected to conservation measures, including restrictions on grass lawns, and some farmers have been forced to leave their fields fallow.¹⁴

FIGURE 1. JOHN WESLEY POWELL'S PROPOSAL TO THE SENATE¹⁵



This is the new reality for the American West. Decades of mismanagement and misuse have seen water supplies dwindle. The failure to address water conservation threatens everyone from farmers to the federal

[<https://perma.cc/QB2U-LBMR>] (quoting J.B. Hamby, Vice President of the Board of Directors, Imperial Irrigation District).

12. *Id.*; Abrahm Lustgarten, As Colorado River Dries, the U.S. Teeters on the Brink of Larger Water Crisis, ProPublica (Aug. 25, 2022), <https://www.propublica.org/article/colorado-river-water-shortage-jay-famiglietti> [<https://perma.cc/8Q3Z-22LU>] [hereinafter Lustgarten, As Colorado River Dries].

13. Estabrook & Sakas, *supra* note 11; Lustgarten, As Colorado River Dries, *supra* note 12.

14. See Gabrielle Canon & Richard Luscombe, US Issues Western Water Cuts as Drought Leaves Colorado River Near 'Tipping Point', The Guardian (Aug. 16, 2022), <https://www.theguardian.com/us-news/2022/aug/16/drastic-water-cuts-expected-as-megadrought-grips-western-us-states> [<https://perma.cc/U64C-UPCU>].

15. Ross, Plan for the West, *supra* note 1.

government. The Colorado River Compact, which governs interstate water allocations, and state laws have incentivized the overuse of river water. The Compact was an agreement among the several states in the region that allocated more water than actually existed in the Colorado River.¹⁶ State laws incentivize farmers to use all their water; if they don't, they will lose access to it to someone else downstream—commonly known as “use it or lose it” laws.¹⁷ Federal subsidies incentivize growing water-intensive crops, like cotton, by providing insurance that covers farmers' costs during bad harvests.¹⁸ For farmers as market players wanting to take every advantage available, conserving water is an irrational decision.¹⁹ Farmers have no incentive to conserve water in the Colorado River Basin, and their use is unsustainable.

Current literature posits that water markets are the solution to address the water crisis in the American West.²⁰ These markets, akin to cap-and-trade markets for pollution, would price water based on its availability, allowing individuals to trade based on their needs while other market players opt to invest in less water-wasting methods.²¹ In theory, this system would result in water's price accurately reflecting its scarcity and removing the market to a more efficient water allocation.²² But such discussions fail to consider the general economics facing farmers. Farmers, often cash-strapped and subsidy-dependent, would likely be immediately priced out by municipalities and cash-rich industries—essentially hung out to dry, threatening a vital industry in one fell swoop.

To address this issue, this Note advocates for government intervention that focuses on facilitating private market transactions that offer financial

16. See Naveena Sadasivam, *Politicians Knew the Inconvenient Truth About the Colorado River 100 Years Ago—And Ignored It*, *Grist* (Dec. 3, 2019), <https://grist.org/climate/politicians-knew-the-inconvenient-truth-about-the-colorado-river-100-years-ago-and-ignored-it/> [<https://perma.cc/M96E-LVPZ>] (“Eugene Clyde LaRue, a young hydrologist with the U.S. Geological Survey, concluded that the Colorado River's supplies were ‘not sufficient to irrigate all the irrigable lands lying within the basin.’”).

17. See Abrahm Lustgarten, *Use It or Lose It Laws Worsen Western U.S. Water Woes*, *Sci. Am.* (June 9, 2015), <https://www.scientificamerican.com/article/use-it-or-lose-it-laws-worsen-western-u-s-water-woes/> [<https://perma.cc/ZFY9-GYLL>] [hereinafter *Lustgarten, Use It or Lose It*] (“‘Use it or lose it’ clauses, as they are known, are common in state laws throughout the Colorado River basin and give the farmers, ranchers and governments holding water rights a powerful incentive to use more water than they need.”).

18. *Lustgarten & Sadasivam*, *supra* note 6.

19. See *Understanding the Economic Crisis Family Farms Are Facing*, *Farm Aid* (Sept. 14, 2020), <https://www.farmaid.org/blog/fact-sheet/understanding-economic-crisis-family-farms-are-facing/> [<https://perma.cc/U9EJ-JAAW>] (describing the historical and contemporary context for the economic struggles that family farms are facing).

20. See Jonathan H. Adler, *Water Rights, Markets, and Changing Ecological Conditions*, 42 *Env't L.* 93, 102 (2012) (“Insofar as water rights are currently allocated to comparatively inefficient uses, water markets can help reallocate water to where there is greater need.”).

21. See *id.*

22. *Id.*

benefits to act as a counterweight to pernicious incentives. To provide a financially beneficial alternative, this Note outlines the informational and resource gaps that prevent farms, the largest consumers of water, from being able to efficiently use water. Agriculture is responsible for up to eighty percent of water usage in the Colorado River Basin, and most water used in agriculture is wasted by low-tech irrigation techniques.²³ To combat these inefficiencies as water supplies dwindle, the federal government would need to reduce transaction costs, which would allow parties to contract for implementing water-conserving practices. This would allow for a marketplace in which farmers have a financial incentive through the possibility of receiving either (1) funding to implement highly efficient irrigation methods or (2) market rates for fallowing their fields. These incentives would result in environmentally beneficial outcomes including the decrease in agricultural water usage and preservation of water for growing urban areas.

This Note proceeds in three parts. Part I discusses the current legal regime governing the allocation of water as well as basic water operations in the Colorado River Basin. Additionally, it outlines important federal policies that shape decisionmaking for many farmers in the region. Part II highlights the effects of the legal regime, including the detrimental incentives on water use for farmers who rely mainly on the Colorado River. Part III provides a solution, suggesting that the Bureau of Reclamation, the primary federal agency in charge of water management, should introduce a market to facilitate market transactions by counteracting negative incentives created by the current legal regime.

I. BACKGROUND: THE LAW OF THE RIVER

This Part outlines the myriad laws that collectively govern or influence water rights in the Colorado River Basin. Section I.A discusses the background and formation of the prior appropriation doctrine, a uniquely American West invention that governs how water rights are obtained. It also explores how current state laws, heavily influenced by the doctrine, limit water use and transfers. Section I.B recounts the creation of an interstate Compact to manage water in the Colorado River Basin and discusses current jurisprudence that shapes the mechanics of Compacts. Section I.C focuses on the statutory authority and other responsibilities of the United States Bureau of Reclamation, the federal agency whose role is to manage water in the region. Lastly, section I.D discusses the origin of federal agricultural subsidies, which play a substantial role in influencing what farmers grow and indirectly affect water usage.

23. Alex Hager, *As the Colorado River Shrinks, Can New Technology Save Water on Farms? The Answer Is Complicated*, KUNC (Jan. 11, 2022), <https://www.kunc.org/environment/2022-01-11/as-the-colorado-river-shrinks-can-new-technology-save-water-on-farms-the-answer-is-complicated> [<https://perma.cc/5M2N-V5VT>]; see also Lustgarten & Sadasivam, *supra* note 6.

A. *Water Law in the West*

1. *Prior Appropriation Doctrine*. — The generally arid environment of the American West prompted the development of a unique water usage doctrine: prior appropriation. Water is scarce in the West.²⁴ Precipitation is less than what is required for crop growth during a growing season in the region.²⁵ Along with its low quantity, water tends to be found in scattered areas, far from places in which it could be used for the typical productive industries like agriculture, mining, and other common ventures.²⁶ This geographic reality necessitated a doctrine that allowed individuals to use water wherever it was needed and not necessarily have it tied to a piece of land. To deal with the sparse presence of water, early settlers relied heavily on irrigation to fuel their growth.²⁷

Prior appropriation generally relies on a first-in-time, first-in-right principle.²⁸ The doctrine gives priority rights to the earlier appropriators of a water source.²⁹ Later appropriators may have their water use cut if a more senior appropriator does not receive their full allotment of water.³⁰ This occurs when a senior appropriator “place[s] a call on the river,” which requires junior appropriators to cease use until the senior rights can be fulfilled.³¹ This call commonly occurs during water shortages in which not all rights can be fulfilled.

In addition to being first in time, a claimant generally must show that they have diverted water and put it to beneficial use to receive an entitlement. The diversion requirement is based on the precedent that assumes all legitimate “beneficial uses” are off stream, a result of the unique environment in which water is located.³² “Beneficial use” is often

24. See A. Dan Tarlock, *The Future of Prior Appropriation in the New West*, 41 *Nat'l Res. J.* 769, 769–70 (2001) (describing how prior appropriation grew out of the fear that there would not be adequate reliable water in the region).

25. See *id.* at 774 (explaining how climate change warps water allocation patterns, either decreasing precipitation due to droughts or increasing precipitation in distorted weather patterns that may not be enough to support crop growth).

26. See Chennat Gopalakrishnan, *The Doctrine of Prior Appropriation and Its Impact on Water Development: A Critical Survey*, 32 *Am. J. Econ. & Socio.* 61, 62 (1973) (“The quantity of water available is far short of the quantity that would be required for the farming of all agricultural lands.”).

27. See *id.* (describing how the arid nature of the region affected irrigation practices and the development of the prior appropriation doctrine).

28. *Id.* at 63.

29. *Id.*

30. See *id.* at 64 (describing a hypothetical whereby a stream can only provide sufficient water during a dry time to its first three claimants and then cuts off water rights to everyone else “at the very time they feel the greatest need for irrigation water”).

31. Energy & Env't Rsch. Ctr., *Water Appropriation Systems 2*, <https://undeerc.org/water/decision-support/water-law/pdf/water-appr-systems.pdf> [https://perma.cc/ZG7Z-YW5K] (last visited Jan. 25, 2024) (internal quotation marks omitted).

32. See Douglas S. Kenney, *Water Allocation Compacts in the West: An Overview 3* (2002), <https://scholar.law.colorado.edu/cgi/viewcontent.cgi?article=1132&context=>

defined as what is socially accepted as beneficial, and any beneficial use must be in connection with particular land.³³ “Beneficial use” is broad, and what is included is ever expanding.³⁴ Some uses that meet this requirement include those for agriculture, mining, environmental protection, and even recreation.³⁵ Once water meets the requirement of “beneficial use,” however, an appropriator’s right is considered absolute and cannot be defeated by later uses, even if those are deemed more important or valuable.³⁶

2. *State Laws on Water Usage.* — State laws entrench the prior appropriation doctrine and impose further restrictions on water rights. States own and regulate the water within their respective borders.³⁷ Several states, including Arizona, Colorado, Nevada, and New Mexico, maintain either water abandonment or forfeiture clauses in their water-use statutes.³⁸ These statutes require all individuals to use water for a beneficial purpose. Otherwise, water can be deemed abandoned or forfeited.³⁹ These states also maintain a “salvaged water doctrine” that prohibits deriving benefits from water conservation, as such water could be used by other downstream appropriators in need of the resource.⁴⁰ Other rules

books_reports_studies [<https://perma.cc/N79D-E35B>] (discussing general approaches to water apportionment, including formulas based on diversion).

33. See Kait Schilling, Addressing the Prior Appropriation Doctrine in the Shadow of Climate Change and the Paris Climate Agreement, 8 Seattle J. Env’t L. 98, 102 (2018).

34. See *id.* (“As populations continue to grow, bodies of water in the West have become increasingly appropriated . . . leading to a shift in what states consider to be a ‘beneficial use’ of water[,] with many becoming more explicit in their definitions or exclusions of what qualifies . . .”).

35. See *id.* (“As a general rule, when not used for domestic purposes, a water user’s withdrawal is beneficial when it adds some value to the land or an enterprise on that land. The added value does not always have to be economical, but can be recreational or ecological in nature.” (footnote omitted)).

36. *Id.*

37. Samuel T. Ayres, State Water Ownership and the Future of Groundwater Management, 131 Yale L.J. 2213, 2258 (2022) (“As such, states have a ‘practically plenary capacity . . . to legislatively characterize the legal category that water occupies’ for the purposes of state law. Exercising this authority, every state has through common or positive law defined the amount and type of *private* rights obtainable in its water.” (alteration in original) (quoting Gerald Torres, Liquid Assets: Groundwater in Texas, 122 Yale L.J. Online 143, 155 (2012), https://www.yalelawjournal.org/pdf/1118_kt9z6o78.pdf [<https://perma.cc/469C-CXGZ>])).

38. Ariz. Rev. Stat. Ann. § 45-141 (2024); Colo. Rev. Stat. § 37-92-401 (2024); Nev. Rev. Stat. Ann. § 534.090 (West 2024); N.M. Stat. Ann. § 72-5-28 (2024); see also State ex rel. Off. of the State Eng’r v. Romero, 521 P.3d 56, 57 (N.M. 2022) (upholding state water-forfeiture laws).

39. Ariz. Rev. Stat. Ann. § 45-141; Colo. Rev. Stat. § 37-92-401; Nev. Rev. Stat. Ann. § 534.090; N.M. Stat. Ann. § 72-5-28.

40. There are more claims on the water than water that exists in the river. See Peter W. Culp, Robert Glennon & Gary Libecap, The Hamilton Project & Stanford Woods Inst. for Env’t, Shopping for Water: How the Market Can Mitigate Water Shortages in the American West 14 tbl.2 (2014), https://www.brookings.edu/wp-content/uploads/2016/06/market_mitigate_water_shortage_in_west_glennon.pdf [<https://perma.cc/JTA8-8BX9>].

include requirements that any water transfer must demonstrate that other appropriators will not be harmed and that appropriators precisely indicate the new location, purpose, and use of that water.⁴¹

B. *The Need for an Interstate Governance System*

Water does not stop at borders, and with the complex laws governing water use within each state, a governance system was needed to quell interstate disputes. This section explains the current interstate governing mechanism and relevant jurisprudence.

1. *The Colorado River Compact*. — The Colorado River Compact of 1922 created a governance system for water in the region. The Compact's creation was prompted by states' concerns that each would be unable to secure rights to a large portion of the Colorado River.⁴² Specifically, there were concerns that rapidly growing states—like California, which saw its population grow sixty percent between 1900 and 1910—would establish priority rights to the river water.⁴³ Such concerns were further intensified by a Supreme Court decision holding that the law of prior appropriation applied regardless of state lines.⁴⁴ States like California, with a larger population, would have more individuals with senior rights compared to residents of other states.

The Compact divided the river into two basins: the Upper Basin (Colorado, New Mexico, Utah, and Wyoming) and the Lower Basin (Arizona, California, and Nevada).⁴⁵ Subsequent documents went on not only to establish allotments for each of the two basins (at about 7.5 million acre feet (MAF) each) but also to partition smaller allotments for each U.S. state and Mexico.⁴⁶ The Compact prohibited the Upper Basin from depleting more than a total of seventy-five MAF over any ten-year period, allowing for averaging over time to make up for drought years.⁴⁷ The allotments were based on data showing a river flow of around 16.4 MAF.⁴⁸

41. *Id.*

42. Specifically, the Compact “divide[d] the Basin in two Divisions The Upper Division was concerned the Lower Division states were growing so rapidly that they would . . . secure rights to a large portion of the Colorado River. The Lower Division states did not want to limit their current growth and wanted secure, reliable rights” Colo. River Governance Initiative, Nat. Res. L. Ctr., Univ. of Colo. L. Sch., *Colorado River: Frequently Asked Law & Policy Questions 1* (2011), https://scholar.law.colorado.edu/cgi/viewcontent.cgi?article=1005&context=books_reports_studies [<https://perma.cc/4HLE-H8FJ>].

43. See *id.*; see also Historical Population Change Data, U.S. Census Bureau (Apr. 26, 2021), <https://www.census.gov/data/tables/time-series/dec/popchange-data-text.html> [<https://perma.cc/JX96-Y7YU>].

44. *Wyoming v. Colorado*, 259 U.S. 419, 470 (1922).

45. Colo. River Governance Initiative, *supra* note 42, at 1.

46. Colorado River Basin Project Act, Pub. L. No. 90-537, § 301(b), 82 Stat. 885, 888 (1968) (codified as amended at 43 U.S.C. §§ 1501–1556 (2018)).

47. Colo. River Governance Initiative, *supra* note 42, at 1.

48. Joe Gelt, *Sharing Colorado River Water: History, Public Policy and the Colorado River Compact*, 10 *Arroyo* 1, 3 (1997).

Apportionments are based on only mainstream water; any use based on tributaries does not count toward a state's allotment.⁴⁹

FIGURE 2. COLORADO RIVER BASIN⁵⁰



2. *Compact Jurisprudence.* — The Constitution authorizes interstate compacts subject to congressional approval.⁵¹ When Congress approves a compact, its consent transforms the compact into federal law.⁵² The Supreme Court has stated it has the final authority to interpret interstate compacts.⁵³ Compacts also function as a contract between the states.⁵⁴ This

49. See *Arizona v. California*, 376 U.S. 340, 353 (1964).

50. Bureau of Reclamation, U.S. Dep't of the Interior, *Colorado River Basin Water Supply and Demand Study 2* fig.1 (2012), https://www.usbr.gov/watersmart/bsp/docs/finalreport/ColoradoRiver/CRBS_Executive_Summary_FINAL.pdf [<https://perma.cc/LDT5-QFVL>] [hereinafter Bureau of Reclamation, *Colorado River Basin*].

51. U.S. Const. art. I, § 10, cl. 3.

52. See, e.g., *Cuyler v. Adams*, 449 U.S. 433, 438 (1981) (“[T]he Detainer Agreement is an interstate compact approved by Congress and is thus a federal law subject to federal rather than state construction.”).

53. *Petty v. Tenn.–Mo. Bridge Comm’n*, 359 U.S. 275, 278 (1959) (“Moreover, the meaning of a compact is a question on which this Court has the final say.”).

54. *Texas v. New Mexico*, 482 U.S. 124, 128 (1987) (“[A] Compact is, after all, a contract.” (quoting *Petty*, 359 U.S. at 285 (Frankfurter, J., dissenting))).

provides a court with the power to provide contractual remedies in case of a breach by another.⁵⁵ Previously, the Supreme Court has considered monetary damages in instances of a breach, along with specific performance.⁵⁶ Other contractual remedies include injunctions, which require parties to omit specific actions, and rescissions—that is, the cancellation of a contract.⁵⁷

C. *Bureau of Reclamation's Statutory Authority*

The United States Bureau of Reclamation (USBR), housed within the Department of the Interior, is the federal agency responsible for water management for twenty states in the American West.⁵⁸ The Reclamation Act of 1902 established the USBR to oversee water resource management, including diversion, delivery, and storage projects for irrigation, water supply, and hydroelectric power generation.⁵⁹ Today, the agency is responsible for delivering water to more than thirty-one million people and providing irrigation water for ten million acres of farmland, making it the nation's largest wholesale water supplier.⁶⁰ The agency operates various water storage projects, including those that generate hydroelectric power throughout the region, the Hoover Dam in Nevada and the Glen Canyon Dam in Utah being the most prominent.⁶¹ Due to the region experiencing the worst eleven-year drought in the last century, current practices heavily rely on diverting water from storage projects to meet all requested deliveries.⁶² The Hoover and Glen Canyon Dams have thus

55. *Id.* (“[T]his power includes the capacity to provide one State a remedy for the breach of another.”).

56. *Id.* at 130 (“[W]e are quite sure that the Compact itself does not prevent our ordering a suitable remedy, whether in water or money.”). Specific performance is “a contractual remedy in which the court orders a party to perform its promise as closely as possible.” Specific Performance, Cornell L. Sch., https://www.law.cornell.edu/wex/specific_performance [<https://perma.cc/W75X-WCPY>] (last visited Nov. 4, 2023).

57. Injunction, Cornell L. Sch., <https://www.law.cornell.edu/wex/injunction> [<https://perma.cc/6JVT-JMVP>] (last visited Nov. 4, 2023); Rescission, Cornell L. Sch., <https://www.law.cornell.edu/wex/rescission> [<https://perma.cc/C46X-458Z>] (last visited Jan. 25, 2024).

58. 43 U.S.C. §§ 373–390 (2018).

59. *Id.*

60. About Us—Fact Sheet, Bureau of Reclamation, <https://www.usbr.gov/main/about/fact.html> [<https://perma.cc/R3FN-RK3W>] (last updated Jan. 19, 2024) [hereinafter Bureau of Reclamation Fact Sheet].

61. These two dams together represent about ninety percent of storage capacity. See Charles V. Stern, Pervaze A. Sheikh & Kristen Hite, Cong. Rsch. Serv., R45546, Management of the Colorado River: Water Allocations, Drought, and the Federal Role 10 (2022), <https://crsreports.congress.gov/product/pdf/R/R45546> [<https://perma.cc/H3AK-G6B7>] (last updated Nov. 1, 2023) (discussing the importance of observing water levels in the Hoover and Glen Canyon Dams); see also *id.* at 8 fig.2.

62. Bureau of Reclamation, Colorado River Basin, *supra* note 50, at 17–19 (evaluating options to resolve supply and demand imbalances in the Colorado River Basin).

become particularly important in determining water availability and whether the agency must implement water cuts.⁶³

Along with USBR's duty to promote development of the arid West, the agency was later given the responsibility to lead water-conservation efforts. In 1982, Congress passed the Reclamation Reform Act (RRA), which modified and expanded the role of the USBR.⁶⁴ The statute allowed the agency to consider and incorporate water-conservation measures for nonfederal recipients of irrigation waters if those measures were economically feasible for recipients.⁶⁵ Additionally, the agency was authorized to enter into agreements with other federal agencies that have capabilities to assist in implementing water conservation, thereby ensuring coordination with the program.⁶⁶ These agreements could include coordination with states, Indian tribes, and water-use organizations.⁶⁷

The Secretary of the Interior is authorized by the Reclamation Act of 1902 to "perform any and all acts and to make rules and regulations necessary and proper for carrying out the purposes" of the Act.⁶⁸ Such rulemaking is subject to the Administrative Procedure Act (APA), which requires use of notice-and-comment procedures for promulgating "legislative" rules that have the "force and effect of law."⁶⁹ Interpretative rules and policy guidance clarifying existing statutes or regulations can be issued without notice-and-comment procedures because they do not have the force and effect of law and are not accorded that weight in adjudicatory processes, enforcement actions, or policy settings.⁷⁰

63. This was the case in 2022, when Lake Powell's water level reached a Level One Shortage. See *infra* note 161 and accompanying text.

64. 43 U.S.C. § 390aa (2018).

65. *Id.* § 390jj(a).

66. *Id.* § 390jj(c).

67. *Id.*

68. *Id.* § 375f.

69. *Perez v. Mortg. Bankers Ass'n*, 575 U.S. 92, 96 (2015) (quoting *Chrysler Corp. v. Brown*, 441 U.S. 281, 302–03 (1979)); see also 5 U.S.C. § 551(4) (2018) ("'[R]ule' means the whole or a part of an agency statement of general or particular applicability and future effect designed to implement, interpret, or prescribe law or policy . . ."); *id.* § 553(b)–(c) (establishing a rulemaking procedure under which an agency must (1) issue a notice of the proposed rulemaking, typically in the Federal Register; (2) give interested persons an opportunity to comment on the proposed rulemaking; and (3) include in the rule "a concise general statement of [its] basis and purpose").

70. 5 U.S.C. § 553(b)(3)(A) (establishing that notice-and-comment procedures are not required for "interpretative rules, general statements of policy, or rules of agency organization, procedure, or practice"); *Shalala v. Guernsey Mem'l Hosp.*, 514 U.S. 87, 99 (1995) ("Interpretive rules do not require notice and comment, although . . . they also do not have the force and effect of law and are not accorded that weight in the adjudicatory process" (citation omitted)).

D. *Federal Agricultural Subsidies*

The USBR is not the only federal influence in the region when it comes to water. This section lays out how other federal policies affect water usage.

In the 1930s, Congress authorized the first federal crop insurance program as an experimental attempt to help agriculture recover from the combined effects of the Great Depression and the Dust Bowl.⁷¹ The program was created to encourage farmers to participate in crop insurance by heavily subsidizing insurance premiums so that the government could avoid large disaster assistance program payouts in which farmers would pay nothing.⁷² The program proved popular. Crop insurance has been part of each “Farm Bill,” which is passed approximately every five years.⁷³ Crop insurance is mainly dominated by two types of protections: yield protection and revenue protection.⁷⁴ Yield protection, as the name implies, covers farmers when their yields are below expectations.⁷⁵ Revenue protection is used when revenue falls below expected levels, including instances such as price slumps.⁷⁶ Major crops—which are defined to include corn, cotton, grain, potatoes, rice, soybeans, and wheat—are widely insured, at about eighty-nine percent of all acres planted.⁷⁷

In addition to these two coverage plans, supplemental insurance programs can be bought alone or in conjunction with traditional policies.⁷⁸ One such policy is the Stacked Income Protection Plan (STAX), which covers primarily producers of upland cotton.⁷⁹ STAX is calculated using the difference between expected and actual revenues, and federal subsidies cover eighty percent of the premium.⁸⁰ Dairy Revenue Protection

71. History of the Crop Insurance Program, USDA, <https://legacy.rma.usda.gov/aboutrma/what/history.html> [<https://perma.cc/38L8-W6HR>] (last visited Nov. 3, 2023).

72. See Keith H. Coble & Barry J. Barnett, Why Do We Subsidize Crop Insurance?, 95 *Am. J. Agric. Econ.* 498, 498 (2013) (“[P]olicy-makers expressed an objective of increasing federal crop insurance participation to a level where federal *ex post* disaster assistance would no longer be necessary.” (citation omitted)).

73. See Kate Giessel, Note, On the Permanence of Permanent Law: An Argument for the Continued Presence of the Permanent Law Provisions in the Farm Bill, 13 *Cardozo Pub. L. Pol’y & Ethics J.* 765, 791 (2015).

74. See Title XI: Crop Insurance Program Provisions, USDA, <https://www.ers.usda.gov/topics/farm-economy/farm-commodity-policy/crop-insurance-program-provisions-title-xi/> [<https://perma.cc/8R94-AS7P>] [hereinafter Title XI: Crop Insurance Program Provisions] (last updated Feb. 7, 2023).

75. *Id.*

76. *Id.*

77. Dennis A. Shields, Crop Insurance Covers Most Major Crops, Farm Credit Admin. (Sept. 28, 2017), <https://www.fca.gov/template-fca/download/EconomicReports/CropInsuranceCoversMostMajorCrops.pdf> [<https://perma.cc/LSU8-Y7M7>].

78. Title IX: Crop Insurance Program Provisions, *supra* note 74.

79. *Id.*

80. *Id.*

is livestock insurance that provides protection against declines in revenues resulting from reduced yield or price on milk produced.⁸¹

II. THE PROBLEM: WATER WOES

The current legal regime in the Colorado River Basin has created notable market failures, causing substantial inefficient use and outright waste of water as well as imposing significant costs on the government and general public. Section II.A analyzes how the legal regime has incentivized inefficient use of water through various legal mechanisms, including the interstate compact, state laws, and federal subsidies. Section II.B then examines the unintended costs to the federal government and to state governments, and section II.C turns to the economic burden such inefficient uses impose on the general public.

A. *Farmers' Incentives and Inefficient Use of Water*

1. *State Laws.* — State laws have incentivized the overconsumption of water. Nonuse of water leads to the loss of the right, also known as the “use it or lose it” principle.⁸² Several states in the West still maintain some form of a water abandonment or forfeiture clause in water-use statutes.⁸³ When a state finds that water rights have been abandoned or forfeited, the rights will revert back to the state.⁸⁴ Aware that they risk their water by nonuse and intent on preserving their access to water in the future, farmers are incentivized to use every drop they receive.⁸⁵ Wasting water is an entirely rational decision for farmers under the current legal regime.⁸⁶ It is a resource that is necessary for their livelihoods, and they see no personal benefit for conserving water for the next growing season.

What makes this situation even more tragic is that farmers are using significantly more water than they need to effectively grow their crops. The most common irrigation method in the region is the gravity system, in which water is diverted from man-made channels (ditches) that transport water to the fields, essentially flooding the fields.⁸⁷ Gravity irrigation

81. *Id.*

82. See *supra* note 17 and accompanying text.

83. See *supra* notes 38–39 and accompanying text.

84. See, e.g., Lustgarten, *Use It or Lose It*, *supra* note 17 (“If Ketterhagen piped every ditch on the ranch he runs, the pipes might not even carry enough water for the owners to be able to take their full allotment out of Ohio Creek. The Colorado authorities could confiscate their water rights.”).

85. *Id.*

86. See Janet C. Neuman & Keith Hirokawa, *How Good Is an Old Water Right? The Application of Statutory Forfeiture Provisions to Pre-Code Water Rights*, 4 *U. Denv. Water L. Rev.* 1, 3–5 (2000) (discussing the policies in abandonment systems that incentivize ranchers to waste water instead of using it).

87. Nathan Lee & Alice Plant, *State of the Rockies Project, Agricultural Water Use in the Colorado River Basin: Conservation and Efficiency Tools for a Water Friendly Future*

systems are rated as having between thirty percent and sixty percent efficiency range in water usage.⁸⁸ An efficiency rating is calculated by measuring the amount of water beneficially used and then dividing by the amount of water applied.⁸⁹ Water of beneficial use is water that sustains crops without eroding the soil, leeching nutrients, or resulting in water runoff.⁹⁰ Systems that tend to have higher efficiency ratings use less water because they are much more precise in delivering water to crops and avoiding soil damage.⁹¹ These systems also lead to higher crop productivity on average and can result in as high as twenty-five percent increased productivity compared to traditional gravity systems.⁹²

The incentive to overuse water is reflected in the prevalence of inefficient irrigation systems throughout the Colorado River Basin. Gravity systems have the lowest efficiency range and, in 2018, were present in 78.1% of farms in Arizona, 33.1% of farms in California, 77.6% of farms in Colorado, 80.2% of farms in Nevada, 78.3% of farms in New Mexico, 55.7% of farms in Utah, and 81.4% of farms in Wyoming.⁹³ Accordingly, states in the Colorado River Basin have the highest water use per acre for farming in the country.⁹⁴

Not only is there no incentive to conserve water—federal policies actively influence farmers to grow water-intensive crops. The next subsection focuses on how federal policies contribute to the overuse of water.

2. *Federal Subsidies.* — Federal subsidies are incentivizing farmers to plant water-intensive crops regardless of environmental concerns.⁹⁵ The

48–49 (2013), https://www.coloradocollege.edu/other/stateoftherockies/_documents/2013RC/Agriculture.pdf [<https://perma.cc/7N8V-L8TC>].

88. *Id.* 50 fig.4 (listing estimated efficiencies and costs for irrigation methods).

89. Cal. Dep't of Water Res., WUES-DWR-2021-03, Recommendations for Commercial, Industrial, and Institutional Outdoor Irrigation of Landscape Areas With Dedicated Irrigation Meters Water Use Efficiency Standard 6-2 (2022), https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Water-Use-And-Efficiency/2018-Water-Conservation-Legislation/Performance-Measures/CIIDIMWUS_STD_-WUES-DWR-2021-03_COMPLETE.pdf [<https://perma.cc/9S4J-AK25>] (ranking the top fifteen farming commodities by gross value of production).

90. See Lee & Plant, *supra* note 87, at 49 (discussing the benefits of precise water application).

91. *Id.*

92. See *id.* at 50.

93. Nat'l Agric. Stat. Serv., USDA, AC-17-SS-1, 2018 Irrigation and Water Management Survey 100 tbl.28 (2019), https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/Farm_and_Ranch_Irrigation_Survey/fris.pdf (on file with the *Columbia Law Review*).

94. *Id.* at 108 tbl.32 (listing each state's average acre-feet of water applied per acre of land).

95. See Ann Jaworski, Note, Encouraging Climate Adaptation Through Reform of Federal Crop Insurance Subsidies, 91 N.Y.U. L. Rev. 1684, 1697–98 (2016) (“Because of highly subsidized crop insurance, farmers are more likely to continue to grow crops that have a high chance of harming the environment and a high likelihood of failure, leading to both wastefulness and increased indemnity costs to the federal government.”); see also Joseph W. Glauber, The Growth of the Federal Crop Insurance Program, 1990–2011, 95 Am.

mere existence of insurance can distort people's perception of risks when choosing crops.⁹⁶ The fact that these premiums are subsidized only further exacerbates the problem.⁹⁷ These crops often require two-to-three times more water than other staple crops like tomatoes, grain, and dry beans.⁹⁸ Farmers receive not only subsidies on costs but also robust protections against losses during bad harvests.⁹⁹ Arizona, one of the driest states in the nation, saw its farmers collect more than \$1.1 billion in cotton subsidies over the last twenty years, nine times the amount of the second-most-subsidized crop.¹⁰⁰ For a farmer in the drying American West where water is increasingly rare, it is rational to plant crops knowing they will receive some monetary benefit regardless of the crop's success, thereby avoiding the risk of planting uninsured crops.

Even subsidies on non-crop-related aspects of the agricultural industry, like dairy, have an impact on water use. Dairy subsidies result in a larger milk industry and thereby increase demand for dairy feed, including alfalfa.¹⁰¹ Alfalfa is a highly intensive water user, more so than cotton or wheat.¹⁰² California is the largest producer of alfalfa;¹⁰³ the crop has the highest overall water use out of any crop in the state at about 5.2 MAF of water.¹⁰⁴ Yet alfalfa is only the twelfth-most-valuable crop in terms of contribution to California's economy.¹⁰⁵ For comparison, grapes, which

J. Agric. Econ. 482, 483 (2013) (describing criticisms of the program because it can create moral hazard in the form of incentives to plant crops in arid areas in order to capture more payments).

96. See Jaworski, *supra* note 95, at 1686 (explaining that subsidizing premiums results in farmers not internalizing the full risks of their planting decisions).

97. See 7 U.S.C. § 9013(e) (2018) (discussing yield coverage for cotton).

98. Heather Cooley, Pac. Inst., California Agricultural Water Use: Key Background Information 4 fig.3 (2015), <https://pacinst.org/wp-content/uploads/2015/04/CA-Ag-Water-Use.pdf> [<https://perma.cc/25QW-WEK9>].

99. See 7 U.S.C. §§ 1508, 9017 (detailing the Secretary of Agriculture's agricultural risk coverage payment framework).

100. Lustgarten & Sadasivam, *supra* note 6.

101. See Matthew T. Ford, Trends in Alfalfa Growth and Ground-Water Levels in Arizona, 8 *Ariz. J. Interdisc. Stud.* 1, 1 (2022) (describing federal dairy subsidies as "incentiviz[ing] dairy production[,] which increases agricultural production" and noting that "alfalfa is a major source of feed for [the] dairy cow population"); see also Grey Moran, Could Climate Change Put an End to Arizona's Alfalfa Heyday?, *Civil Eats* (Sept. 15, 2021), <https://civileats.com/2021/09/15/climate-change-could-put-an-end-to-arizonas-alfalfa-heyday/> [<https://perma.cc/AS6E-EU67>] ("Similarly, the dairy and meat industries receive billions in federal subsidies, propping up the industries driving the demand for alfalfa.").

102. Cooley, *supra* note 98, at 4.

103. Daniel H. Putnam, Charles G. Summers & Steve B. Orloff, U.C. Div. of Agric. & Nat. Res., ANR Pub. 8287, Alfalfa Production Systems in California 1 (2007), https://alfalfasyposium.ucdavis.edu/irrigatedalfalfa/pdfs/ucalfalfa8287prodsystems_fre.pdf [<https://perma.cc/GBW5-LTNE>].

104. Cooley, *supra* note 98, at 3.

105. Cal. Dep't of Food & Agric., California Agricultural Statistics Review, 2018–2019, at 19 (2019), <https://www.cdafa.ca.gov/statistics/PDFs/2018-2019AgReportnass.pdf> [<https://perma.cc/KQJ2-KKQS>] (ranking the top fifteen farming commodities by gross value of production).

are the most valuable crop in the state's agricultural sector, only use 1.6 MAF of water.¹⁰⁶

3. *Irrigation and Farming Economics.* — Even if the government were to simply realign incentives so farmers would benefit from water conservation, most farms would be unable to afford or justify the cost of improving water use. The agricultural industry in the United States has been able to stay afloat, notwithstanding increasing tariffs and competition, due to significant federal aid.¹⁰⁷ Such programs have allowed American net farm income to reach a five-year high in 2019 despite increasing farm debt and the fact that twenty million acres were left unplanted that year.¹⁰⁸

Yet this increase in income has not been enough to justify investment in water conservation through efficient irrigation methods. Average costs for sprinkler and drip irrigation systems can reach between \$568 and \$1,000 per acre respectively for initial implementation costs.¹⁰⁹ Additionally, general annual maintenance costs are \$80 per acre for a sprinkler system and \$120 per acre for a drip system, both of which significantly exceed the annual cost of \$30 per acre for a gravity system.¹¹⁰ Sprinkler and drip systems provide between eighty-five percent and ninety percent water application efficiency and result in an approximately twelve percent increase in net operating profits.¹¹¹ These costs significantly surpass the amount most farms make in selling crops. In 2021, fifty-one percent of all farms had less than \$10,000 in sales, and just over eighty-one percent of all farms had less than \$100,000 in sales.¹¹² Only a very select few, around 7.4%, of farms had sales of \$500,000¹¹³—and even for those farms, implementation of such systems would prove to be a huge financial barrier. The average farm in New Mexico, making less than \$10,000 per

106. See Cooley, *supra* note 98, at 3 fig.2.

107. See Tara O'Neill Hayes & Katerina Kerska, *Primer: Agricultural Subsidies and Their Influence on the Composition of U.S. Food Supply and Consumption*, Am. Action F. (Nov. 3, 2021), <https://www.americanactionforum.org/research/primer-agriculture-subsidies-and-their-influence-on-the-composition-of-u-s-food-supply-and-consumption/> [<https://perma.cc/F57R-7A7W>] (“The federal government has long subsidized America’s farmers, significantly affecting our food supply and what we eat.”).

108. See John Newton, *Is Farm Income Really Up?*, Farm Bureau: Mkt. Intel (Sept. 9, 2019), <https://www.fb.org/market-intel/is-farm-income-really-up> [<https://perma.cc/B6TP-FGLP>] (“The USDA-Economic Research Service’s . . . forecast for farm sector income and finances puts net farm income . . . at \$88 billion for 2019, up \$4 billion from 2018 and up \$10 billion from 2017.”).

109. See Lee & Plant, *supra* note 87, at 50 fig.4 (reporting these average costs in 2008).

110. See *id.*

111. *Id.*

112. See USDA, *Farms and Land in Farms 2021 Summary 4* (2022), https://www.nass.usda.gov/Publications/Todays_Reports/reports/fnlo0222.pdf [<https://perma.cc/G2HS-SNCH>] [hereinafter USDA, *Farms in 2021 Summary*].

113. See *id.*

year, has 298 acres (the average among the Colorado River Basin states).¹¹⁴ Multiplying the number of acres by the per-acre technology identified above,¹¹⁵ a sprinkler system for a farm of that size would cost around \$169,264, and a drip system would cost upwards of \$298,000 for implementation alone. These upgrades would not be economically feasible for such farms because of the negligible economic benefit from implementing such systems. Even in California, which has the lowest average farm size (fifty-three acres) for those with less than \$10,000 in sales,¹¹⁶ it would require between \$30,104 and \$53,000 to implement such systems,¹¹⁷ for a net increase of at most \$1,200 in profits annually.¹¹⁸

B. *Costs Imposed on State and Federal Government*

1. *The Compact Call.* — The incentive to overuse water has raised potential legal issues that will force states to litigate ambiguities in the Colorado River Compact. The most pressing of these concerns is determining what occurs during a Compact Call. Senior appropriators can initiate a “call” when flows in a river are insufficient to satisfy all rights on the river.¹¹⁹ This forces any newer appropriators to stop using water until the older water rights are satisfied. Should this occur, states would have to undergo three phases to return to compliance: (1) an assessment of deliveries to determine a violation and bring Upper Basin states back into compliance, (2) an allocation of user curtailment among Upper Basin states, and (3) a devising and enforcement of curtailments by state water officials within their borders.¹²⁰ Each step poses a serious challenge and requires the resolution of ambiguities in the Compact.¹²¹ This includes determining whether Upper Basin states did violate the agreement, given that the Compact never considered the realities of a twenty-year

114. See *id.* at 7.

115. See *supra* note 109 and accompanying text.

116. See USDA, Farms in 2021 Summary, *supra* note 112, at 7.

117. These figures were calculated by multiplying the average acreage amount by the cost per acre to implement each system. See Lee & Plant, *supra* note 87, at 50 fig.4. (reporting average capital cost and average annual cost per acre for each irrigation system).

118. Implementing drip irrigation generally leads to a twenty-five percent crop yield, but accounting for other additional costs due to increased yields, such as chemical, fertilizer, and seed costs, the net operating profit is just twelve percent, hence only \$1,200 in additional profits for a farm making \$10,000. See *id.* at 51 fig.7 (calculating the potential gains of implementing drip irrigation over furrow irrigation).

119. See Stern et al., *supra* note 61, at 17.

120. Anne Castle & John Fleck, The Risk of Curtailment Under the Colorado River Compact 33–34 (2019), <https://ssrn.com/abstract=3483654> [<https://perma.cc/HH6Q-L3NP>].

121. See Colo. River Governance Initiative, Nat. Res. L. Ctr., Univ. of Colo. L. Sch., Does the Upper Basin Have a Delivery Obligation or an Obligation Not to Deplete the Flow of the Colorado River at Lee Ferry? 2–5 (2012), https://scholar.law.colorado.edu/cgi/viewcontent.cgi?article=1006&context=books_reports_studies [<https://perma.cc/9788-5ASV>] (“The language of the Compact (specifically Article III(a) and (d)) support different interpretations as to the priority of water rights between the Upper and Lower Basins.”).

megadrought and instead assumed the river would always contain the same amount of water.¹²² Moreover, Upper Basin states might be reluctant to accept the position that they violated the agreement, fearing even greater curtailments of their uses to ensure deliveries to Lower Basin states.¹²³

2. *Constitutional and Ethical Concerns for the Federal Government.* — As conditions worsen due to the incentive structure created by the current legal regime, the quagmire in the Colorado River could raise serious constitutional (and ethical) concerns for the federal government. A critical issue will be what occurs when states seek contractual remedies, such as an injunction, specific performance, or even rescission in Compact disputes. These are all in the realm of possibility as the situation continues to deteriorate based on precedent in dealing with interstate agreements.¹²⁴ A judge could enjoin additional Upper Basin water use or issue a rescission that nullifies contractual obligations.¹²⁵ Under the latter, the water in the river would revert to the traditional system, resulting in an inequitable apportionment of water because the Lower Basin states have rights senior to those of the Upper Basin states.

C. *Burdens to the General Public*

The current water-use regime places additional economic costs on those living in the region. The region has already seen higher prices for water, decreased energy output from hydroelectric plants, fewer farms, and restrictions on green lawns with a shift towards xeriscape.¹²⁶ This is the case in Arizona, where water rates for residents are expected to increase 31.6% by 2028.¹²⁷ Arizona already has the ninth-highest water prices in the country, and other Colorado River Basin states are not far behind.¹²⁸ These issues are only expected to worsen, as states that rely on the Colorado River are rapidly growing, with projections putting growth at a staggering rate

122. *Id.* at 4 (explaining that the Upper Basin's violation will hinge on how "obligation not to deplete" is interpreted).

123. See *id.* at 6–7 (discussing how this interpretation of the Compact inspired Upper Basin concerns regarding future violations and further cession to the Lower Basin).

124. See *supra* notes 52–57 and accompanying text.

125. See *supra* notes 55–57 and accompanying text.

126. Xeriscaping is the practice of designing landscapes to need little to no water, relying solely on the natural climate. See Xeriscaping, Nat. Geographic, <https://education.nationalgeographic.org/resource/xeriscaping> [<https://perma.cc/DQ29-ZK9Q>] (last updated Oct. 19, 2023).

127. See Cent. Ariz. Project, Final 2023–2028 Rate Schedule 1 (2022), <https://library.cap-az.com/documents/departments/finance/2023-2028-CAWCD-Final-Water-Rate-Schedule.pdf> [<https://perma.cc/FMW6-KRH9>].

128. Erick Burgeño Salas, Average Monthly Water Prices in the United States as of July 2022, by Selected State, Statista (Apr. 17, 2023), <https://www.statista.com/statistics/1244458/monthly-water-prices-in-the-united-states-by-state/> (on file with the *Columbia Law Review*).

of nineteen percent (close to twelve million people) between 2020 and 2040.¹²⁹

Additionally, the current situation could result in a transition to the use of more environmentally harmful energy sources. Hydroelectric power is a clean, renewable source of energy fueled by water stored in reservoirs.¹³⁰ For the American West, hydroelectric power can provide up to twenty percent of annual electricity demand and up to thirty percent in particularly wet years.¹³¹ With the continuing drought and high water usage, however, many dams, including the Hoover Dam, are seeing their water stores decline.¹³² In California, drought conditions in 2021 were expected to result in hydropower generation nosediving from fifteen percent in a normal year to just eight percent.¹³³ The dip in hydropower meant a projected six-percent increase in carbon dioxide emissions from other sources as well as projected energy price hikes of about five percent.¹³⁴

The failure to conserve any water also threatens to accelerate environmental damage caused by rising global temperatures. As temperatures increase, the atmosphere can extract more water from the surface, drying it out.¹³⁵ States like Arizona could see temperatures soar above ninety-five degrees for six months in a year.¹³⁶ Increasing temperatures

129. The largest growth is expected in states like Arizona (twenty-six percent), California (fifteen percent), Colorado (thirty-two percent), Nevada (thirty percent), and Utah (thirty-four percent). Samuel Stebbins, *How Arizona's Population Will Change in the Next 20 Years*, Ctr. Square (Feb. 24, 2022), https://www.thecentersquare.com/arizona/how-arizona-s-population-will-change-in-the-next-20-years/article_86c80054-4e38-5825-b0d1-ede98be1c649.html [<https://perma.cc/W8FD-V4F3>].

130. *Benefits of Hydropower*, Off. of Energy Efficiency & Renewable Energy, <https://www.energy.gov/eere/water/benefits-hydropower> [<https://perma.cc/L6U5-8HQD>] (last visited Nov. 3, 2023).

131. *Study Finds Hydropower Provides Reliable Electricity Even During Historic Droughts*, Off. of Energy Efficiency & Renewable Energy (Sept. 20, 2022), <https://www.energy.gov/eere/water/articles/study-finds-hydropower-provides-reliable-electricity-even-during-historic> [<https://perma.cc/336Q-AKKW>].

132. Joshua Partlow & Karin Brulliard, *U.S. Announces More Water Cuts as Colorado River Hits Dire Lows*, *Wash. Post* (Aug. 16, 2022), <https://www.washingtonpost.com/climate-environment/2022/08/16/colorado-river-bureau-of-reclamation/> (on file with the *Columbia Law Review*).

133. Kavya Balaraman, *California Drought Could Halve Summer Hydropower Generation, Leading to More Natural Gas*, *EIA Finds, Util. Dive* (May 27, 2022), <https://www.utilitydive.com/news/california-drought-could-halve-summer-hydropower-share-leading-to-more-nat/624489/> [<https://perma.cc/FFJ3-K2F7>].

134. *Id.*

135. Justin S. Mankin, Isla Simpson, Andrew Hoell, Rong Fu, Joel Lisonbee, Amanda Sheffield & Daniel Barrie, *NOAA Drought Task Force Report on the 2020–2021 Southwestern U.S. Drought 4* (2021), <https://www.drought.gov/sites/default/files/2021-09/NOAA-Drought-Task-Force-IV-Southwest-Drought-Report-9-23-21.pdf> [<https://perma.cc/3LKW-QDVJ>].

136. Al Shaw, Abrahm Lustgarten & Jeremy W. Goldsmith, *New Climate Maps Show a Transformed United States*, *ProPublica* (Sept. 15, 2020), <https://projects.propublica.org/climate-migration/> (on file with the *Columbia Law Review*).

contribute to highly variable precipitation cycles that result in more periods of extreme precipitation and drought.¹³⁷ Conserving water can help mitigate environmental issues during periods of intense droughts, similar to what the region is currently experiencing. Water conservation will become increasingly necessary as the climate rapidly continues to change and warm.

The entire country will suffer from the lack of water conservation in the Colorado River Basin, especially as water supplies dwindle. The region produces ninety percent of the nation's annual supply of winter vegetables.¹³⁸ If conditions continue to deteriorate, the nation might need to develop a new food system to obtain staple vegetables.¹³⁹ The United States may find it difficult to find a replacement even abroad, as the climate in the Colorado River Basin is uniquely suited to grow vegetables year-round.¹⁴⁰ Consumer prices will likely increase as the supply of crops continue to diminish.

D. *Current Scholarship in This Area Fails to Solve the Problem*

In this area, scholarship has generally focused on the creation of water markets as a solution to dealing with increasing water scarcity.¹⁴¹ Although these proposals seem promising, they fail to consider the economics of agriculture, which is a heavily subsidy-dependent industry.¹⁴²

In essence, proponents claim that water markets would facilitate the movement of water to where there is a greater need and higher value use.¹⁴³ A market would generally focus on the creation of a cap that limits

137. See Drought and Climate Change, Ctr. for Climate & Energy Sols., <https://www.c2es.org/content/drought-and-climate-change/> [https://perma.cc/DF7S-ZQ2E] (last visited Mar. 20, 2024).

138. Water Risks and Opportunities in the Colorado River Basin, Feeding Ourselves Thirsty, <https://feedingourselfsthirsty.ceres.org/regional-analysis/colorado-river> [https://perma.cc/8QSY-58RM] (last visited Nov. 3, 2023).

139. Hunter Bassler, No More Winter Vegetables? Upcoming Yuma Water Cuts to Threaten Entire US Food System, Experts Say, KPXX (Aug. 25, 2022), <https://www.12news.com/article/news/local/water-wars/arizona-farmers-struggle-to-find-solutions-after-unprecedented-colorado-river-water-cuts/75-d677a202-8687-480c-94b4-63784044002f> [https://perma.cc/37RH-UG4F] (indicating that finding a replacement for winter staples such as lettuce, spinach, broccoli, and cauliflower may be difficult due to the unique climate existing in Arizona).

140. See *id.*

141. See *infra* note 143.

142. See *supra* section II.A.

143. See Adler, *supra* note 20, at 102 (“Insofar as water rights are currently allocated to comparatively inefficient uses, water markets can help reallocate water to where there is greater need.”); Vanessa Casado-Pérez, Missing Water Markets: A Cautionary Tale of Governmental Failure, 23 N.Y.U. Env’t L.J. 157, 161 (2015) (“[G]overnment needs to play [a role] in order for water markets to thrive and make overall allocation more efficient.”); James L. Huffman, Water Marketing in Western Prior Appropriation States: A Model for the East, 21 Ga. St. U. L. Rev. 429, 429 (2004) (“This Article concludes, optimistically, that the future will lead to more water marketing and, as a result, to better use and protection of scarce water

how much water can be used, the establishment of water rights with a legal basis, and then the implementation of trading rules to facilitate reallocation.¹⁴⁴ A cap would ensure that the market reflects actual water supplies so that all rights could be satisfied.¹⁴⁵ In addition, a properly set cap would ensure enough baseline water to sustain rivers and aquifers over time to avoid environmental harm. Ignoring the legal hurdles of creating an interstate water market,¹⁴⁶ such a market would immediately price out farmers in both the short and long term. Farmers' incomes are generally relatively low and dependent on federal subsidies, with around fifty percent of farms making less than \$10,000 in sales a year.¹⁴⁷ A water market would inevitably shift water from farmers to cities or high-value-add industries.¹⁴⁸ Water is one of the essential inputs in agriculture. Increasing the costs of obtaining a basic and necessary input would have large-scale effects on the agricultural sector in terms of output or crop choice. These drastic shifts in the farming sector could have spillover effects in other industries, including pesticides, dairy, and seed dealing.¹⁴⁹ A better approach to addressing water scarcity would focus on water efficiency, as farmers still provide valuable services.¹⁵⁰ The following Part proposes a

resources.”); see also Aliya Gorelick, *California Is Thirsty for Groundwater: Could a Trading Market Encourage Year-Round Sustainable Groundwater Management?*, 52 U. Pac. L. Rev. 473, 487 (2021) (“A groundwater trading market and Chapter 678 will work together to incentivize wet- and dry-season recharge to maintain groundwater storage and increase sustainable groundwater management.”).

144. See D. Garrick, T. Iseman, G. Gilson, N. Brozovic, E. O'Donnell, N. Matthews, F. Miralles-Wilhem, C. Wight & W. Young, *Scalable Solutions to Freshwater Scarcity: Advancing Theories of Change to Incentivize Sustainable Water Use*, Water Sec., Apr. 2020, at 1, 3–4 (describing the general mechanics of water markets).

145. See *id.* at 3.

146. See Micah Goodwin, *Environmental and Economic Pitfalls of Interstate Water Transfers*, 80 La. L. Rev. 739, 762 (2020) (“A few things are clear under current Supreme Court jurisprudence. Express limitations on interstate water transfers, or those that burden the markets in practical effect, must pass strict scrutiny because they are facially discriminatory and burden an item of commerce.”).

147. USDA, *Farms in 2021 Summary*, *supra* note 112, at 5.

148. See *Managing Water Sustainability Is Key to the Future of Food and Agriculture*, Org. for Econ. Coop. & Dev., <https://www.oecd.org/agriculture/topics/water-and-agriculture/> (on file with the *Columbia Law Review*) (last visited Jan. 25, 2024) (“[F]armers in many regions will face increasing competition from non-agricultural users due to rising urban population density and water demands from the energy and industry sectors.”); Reuben Siegman, *Water Banking: A Potential Solution or Misguided Idea*, *Geo. Env't L. Rev.* (Mar. 13, 2022), <https://www.law.georgetown.edu/environmental-law-review/blog/water-banking-a-potential-solution-or-misguided-idea/> [<https://perma.cc/5KXC-V2Y7>] (discussing concerns that financial firms may seek to purchase water as a speculative asset).

149. See George A. Gould, *A Westerner Looks at Eastern Water Law: Reconsideration of Prior Appropriation in the East*, 25 U. Ark. Little Rock L. Rev. 89, 112–13 (2002) (discussing indirect externalities created by water transfers, including reduction in business activity in the community from which water is transferred).

150. See Goodwin, *supra* note 146, at 775 (“Most of the country's water use issues can be addressed by better consumption and conservation management at the local level—that is, dealing with demand.”).

different mechanism than the traditional water market solution, allowing for water conservation but avoiding negative economic outcomes for farmers and the greater agricultural sector.

III. THE SOLUTION: REALIGNING INCENTIVES

The previous two Parts have discussed how the current legal regime has caused market failures as a result of the water-use practices it has engendered throughout the Colorado River Basin. Farmers, acting as rational market players, see no economic benefit—and indeed risk economic harm¹⁵¹—from conserving water. To rectify this issue, Part III suggests that the USBR could use its regulatory authority to create a marketplace in which cities are able to fund farmers in return for water-conservation efforts. Such a market would change the economic incentives so that farmers are no longer penalized for water conservation. Under this framework, water usage would move toward an efficient allocation, the first step in alleviating environmental strain. Section III.A explains why private market action alone cannot address this issue. Section III.B discusses why the USBR is best suited to tackle this issue and what the agency can do to remedy the situation. Section III.C lays out important considerations for designing the program, including how to involve other key stakeholders and minimize conflicting incentives. Section III.D dissects international case studies that provide a promising look into the application of a solution focused on providing economic incentives for environmental issues. Lastly, section III.E addresses two key counterarguments concerning whether the agency may exceed its statutory authority in implementing this program.

A. *Private Market Action Is Not Enough*

State laws restrict water use and water transfer, raising transaction costs for private parties attempting to address water conservation.¹⁵² Laws requiring that parties seeking to transfer water show that the transfer will not harm other appropriators and demonstrate the new location and use of the water raise transaction costs the most.¹⁵³ For farmers, most of whom make less than \$10,000 per year from on-farm sales,¹⁵⁴ addressing water conservation may seem prohibitively costly. Furthermore, because this is a collective-action problem, it might seem an entirely futile effort to pursue water conservation for any environmental benefit.¹⁵⁵ Any attempt to address water conservation would necessarily require a large-scale response and participation to stabilize water supplies and avoid free riders.

151. See Lustgarten, *Use It or Lose It*, supra note 17.

152. See supra section II.A.

153. See Culp et al., supra note 40, at 13–16, 14 tbl.2 (providing an overview of “legal doctrines [that] impede the transfer of water in the West”).

154. See USDA, *Farms in 2021 Summary*, supra note 112, at 5.

155. See supra Part II.

To be effective, conservation efforts would inherently have to address the demand for water, and private parties are ill-equipped to handle this problem. The most cost-effective approach to water scarcity is decreasing demand as the supply is limited.¹⁵⁶ Water rights assigned far exceed the amount of water existing in rivers.¹⁵⁷ It has become increasingly difficult to manage or even satisfy most of these claims, which are commonly referred to as “paper rights.”¹⁵⁸ California, for example, has granted five times its average annual river flow.¹⁵⁹ Solely reforming restrictions on water transfers to allow private parties to guide the market to efficient use would be insufficient. Market participants would have difficulty ascertaining whether parties transacting have access to “wet water” or just “paper rights.”¹⁶⁰

Water conservation is not a new issue; the market has been unable to address the problem, and the situation has reached a critical point. In August 2021, USBR declared the first-ever Level One Shortage, and one year later the agency was forced to institute a Level 2a Shortage, triggering water cuts for states.¹⁶¹ The drought in the Colorado River Basin has persisted for over two decades and has no end in sight.¹⁶² Put frankly, it is clear that the market needs intervention to correct its failure to address water conservation.

B. *USBR's Unique Role*

The USBR should develop its own program to allow parties to contract around water conservation. The USBR has the expertise,

156. See G. Tracy Mehan III, *Coping With Water Scarcity, Risk & Uncertainty: Resilience & Hope*, 1 *Tex. A&M J. Prop. L.* 1, 5–7 (2013) (“[I]t is necessary to redefine proper water management to encompass demand-side management as much as the supply-side, and proper pricing of water and water services to include not just the cost of collection, treatment, and delivery, but also water’s scarcity value.”).

157. See Sadasivam, *supra* note 16.

158. See, e.g., Stephanie Sy & Lena I. Jackson, *Despite Owning Rights to Colorado River, Tribes Largely Cut Off From Accessing Water*, PBS NewsHour (July 18, 2023), <https://www.pbs.org/newshour/show/despite-owning-rights-to-colorado-river-tribes-largely-cut-off-from-accessing-water> (on file with the *Columbia Law Review*) (“American Indian tribes own rights to about a quarter of the [Colorado River]. In reality, for most tribes, they are only ‘paper rights’ not amounting to water they can use.”).

159. Culp et al., *supra* note 40, at 15.

160. See A. Lynne Krogh, *Water Right Adjudications in the Western States: Procedures, Constitutionality, Problems & Solutions*, 30 *Land & Water L. Rev.* 9, 12–18 (1995) (explaining that water right adjudications exist because of “the lack of an accurate record of water rights”).

161. See Press Release, Dep’t of Interior, *Interior Department Announces Actions to Protect Colorado River System, Sets 2023 Operating Conditions for Lake Powell and Lake Mead* (Aug. 16, 2022), <https://www.doi.gov/pressreleases/interior-department-announces-actions-protect-colorado-river-system-sets-2023> [<https://perma.cc/V44Y-T8NZ>]; Press Release, Bureau of Reclamation, *Reclamation Announces 2022 Operating Conditions for Lake Powell and Lake Mead* (Aug. 16, 2021), <https://www.usbr.gov/newsroom/news-release/3950?filterBy=year&year=2021> [<https://perma.cc/2VN3-MJFT>].

162. Colorado River Drought Conditions, *supra* note 8, at 2 (statement of Rep. Jared Huffman).

resources, relationships, and statutory authority to implement a large-scale water-conservation program. The agency is responsible for delivering and managing water to a large swath of farmland in the Colorado River Basin (4.5 million acres).¹⁶³ Any program or initiative would have to work with the agency to encourage water conservation. The agency has the expertise and resources to deal with programs of an interstate magnitude, including a team of over 550 scientists, engineers, and other staff.¹⁶⁴ Along with its specialized knowledge, the USBR already has working relationships with state water agencies managing water issues in the region.¹⁶⁵ The USBR also has the statutory authority from Congress to implement water conservation and the ability to coordinate with other federal agencies to ensure a unified federal response.¹⁶⁶ These factors can empower the agency to lower transaction costs for parties, allow for interstate cooperation, and provide the necessary resources. Its position within the water legal regime can allow it to become the primary vehicle to institute water conservation in the region.

The current climate provides an excellent opportunity to implement such a program. Against dwindling water supplies, absent an efficient irrigation system, farmers in the region will likely face decreases in revenues and yields. Financially, however, this option may be out of reach for many farms. This situation provides farms an economic incentive to participate in the program, as it would provide a source of funding. The agency should minimize transaction costs, including informational gaps, and counteract other pernicious incentives.

C. *Designing the Program*

1. *Identify Problematic Areas/Use Statutory Authority to Create a Program.* — The USBR should pilot a program that limits parties to contracting around three main efforts: implementing efficient irrigation systems, fallowing fields, or exiting the market. The participating parties

163. Bureau of Reclamation, U.S. Dep't of the Interior, Colorado River Basin SECURE Water Act Section 9503(c) Report to Congress 1 (2021), <https://www.usbr.gov/climate/secure/docs/2021secure/basinreports/ColoradoBasin.pdf> [<https://perma.cc/9AFT-C4WG>]; see also *supra* section I.C.

164. See Technical Service Center, Bureau of Reclamation, <https://www.usbr.gov/tsc/> [<https://perma.cc/3T36-4SBM>] (last visited Nov. 3, 2023) (“The TSC consists of approximately 565 scientists, engineers, and other professional and office staff”); see also Research and Development Office, Bureau of Reclamation, <https://www.usbr.gov/research/> [<https://perma.cc/UB2C-J9YU>] (last visited Nov. 3, 2023) (discussing the Research and Development Office’s programs to address resource-related problems).

165. See, e.g., Press Release, U.S. Bureau of Reclamation & Cal. Dep't of Water Res., Agreement Between U.S. Bureau of Reclamation and California Department of Water Resources Supported by Public Water Agencies (Dec. 12, 2018), <https://wwd.ca.gov/wp-content/uploads/2018/12/VA-Joint-Contractor-Press-Release.pdf> [<https://perma.cc/557K-EG99>] (discussing the Bureau of Reclamation’s efforts in fostering cooperation among intrastate agencies in California for water storage projects).

166. See *infra* note 181.

would create contractual duties to provide funding and implementation for one of three measures for water conservation. Parties could opt to rely on the water-transfer process through their state agencies or require the farm to abandon or forfeit their water pursuant to state laws.

The narrow scope of the program will lower transaction costs for water conservation. It is imperative that the program removes barriers that would otherwise provide disincentives for water transfers. One such way is through the scope of the program. The agency should narrow the program's focus to solely enabling additional water availability for growing residential areas. This would lower the compliance costs regarding state law requirements such as precise location, purpose, and use of water.¹⁶⁷ Additionally, the agency should provide any other information the parties would require in fulfilling their contractual obligations. This may include assisting in providing state agencies with information on how such a transfer may affect other appropriators.¹⁶⁸

The program's limited focus on mutually beneficial methods such as irrigation, fallowing, or exiting the market provides financial incentives to conserve water. Efficient irrigation systems increase productivity and, on average, increase net operating income.¹⁶⁹ As water cuts are implemented throughout the region, farmers will have to grow with less water, unless they can use water more efficiently to sustain current output. Alternatively, paying for fallow fields during certain years would save water and allow farmers to cover costs. In this case, it would be important to offer rates similar to or slightly higher than those of federal crop insurance (which covers expected revenue or yield, based on historical data, between fifty percent and eighty-five percent).¹⁷⁰ Lastly, parties can contract around paying expenses for a farm to exit the market.¹⁷¹ Discussions around exit would likely focus on providing funds to pay for any outstanding loans or costs in selling equipment. Transition plans would likely be unnecessary because nearly half of farms in the country already rely on off-farm work to generate income and receive benefits, including health care.¹⁷²

167. See *supra* notes 32–37 (discussing how water rights are formed in Western states).

168. See Culp et al., *supra* note 40, at 26 (discussing the federal government's role in supporting states in governing water transfers).

169. See Lee & Plant, *supra* note 87, at 50 (discussing various efficient irrigation systems and their resulting crop productivity).

170. See Title XI: Crop Insurance Program Provisions, *supra* note 74 (“The farmer selects a yield-coverage level, which can range from 50 to 75 percent of average yield (up to 85 percent in some areas) . . .”).

171. Concerns regarding the economic impact of having farmers exit the market are not without merit, but this impact on production would have likely occurred regardless, as farms are already struggling. See *supra* note 19 (discussing the current issues facing farmers, even with subsidies).

172. See Christine Whitt, *A Look at America's Family Farms*, USDA Blog (Jan. 23, 2020), <https://www.usda.gov/media/blog/2020/01/23/look-americas-family-farms> [https://perma.cc/WS75-XX58] (“Where the spouses of principal operators held an off-farm job, a majority cited ‘health care benefits’ as one reason for working off the farm.”); Debbie

Providing the means to exit would allow a party to transition into areas outside of agriculture while reducing water use and decreasing the number of appropriators.

These methods can have outsized impacts when it comes to water conservation. Reports indicate that small increases in efficiency on farms can result in large gains in water available for cities and businesses.¹⁷³ For example, it would likely cost around \$12 billion to implement better irrigation techniques if applied to all ten million acres of farm within the agency's purview.¹⁷⁴ Paying for fallowed fields would help counteract incentives to grow high-risk crops by federal crop insurance.¹⁷⁵ The growing of high-risk groups coincides with higher use of pesticides, negative impacts on wildlife and future ability to grow crops, and soil erosion rates.¹⁷⁶ These negative outcomes would be avoided if farmers are paid to forgo planting in a certain year.

The agency should identify which areas would be better suited to contract to maximize the effect of water conservation. In designing the program, the agency should partner farmers with municipalities directly affected by their current agricultural water use. Pairing would be based on several factors, including whether the parties share a watershed and determinations on immediate downstream effect by agricultural practices.¹⁷⁷ Identifying which areas are inextricably linked based on

Weingarten, *Quitting Season: Why Farmers Walk Away From Their Farms*, Civil Eats (Feb. 12, 2016), <https://civileats.com/2016/02/12/quitting-season-why-farmers-walk-away-from-their-farms/> [<https://perma.cc/G7TD-HMDA>] (“[A]pproximately 90 percent of [farming] income came from off-farm occupations. . . . Nearly half (or 1 million) of the 2.1 million farms in the U.S. require at least one member of the family to work off the farm.”).

173. See, e.g., Frank A. Ward & Manuel Pulido-Velazquez, *Water Conservation in Irrigation Can Increase Water Use*, 105 *Proc. Nat. Acad. Scis.* 18,215, 18,215 (2008) (indicating that gains can be achieved from more efficient irrigation methods); Jeff Guo, *Agriculture Is 80 Percent of Water Use in California. Why Aren't Farmers Being Forced to Cut Back?*, Wash. Post: GovBeat Blog (Apr. 3, 2015), <https://www.washingtonpost.com/blogs/govbeat/wp/2015/04/03/agriculture-is-80-percent-of-water-use-in-california-why-arent-farmers-being-forced-to-cut-back/> (on file with the *Columbia Law Review*) (“In 2010, irrigated agriculture consumed four times as much water as urban users. The state could easily save the same amount of water if it required farms to increase water efficiency by about 5 percent.”).

174. Currently, it costs about \$1,000 per acre to implement drip irrigation and an additional \$120 for annual upkeep. See Lee & Plant, *supra* note 87, at 50 fig.4 (estimating the cost of implementing new efficient irrigation systems); Bureau of Reclamation Fact Sheet, *supra* note 60 (stating that the Bureau of Reclamation provides “irrigation water for 10 million farmland acres”).

175. See Jaworski, *supra* note 95, at 1689.

176. *Id.*

177. Taeyoon Yoon, Charles Rhodes & Farhed A. Shah, *Upstream Water Resource Management to Address Downstream Pollution Concerns: A Policy Framework With Application to the Nakdong River Basin in South Korea*, 51 *Water Res. Rsch.* 787, 787 (2015) (“[E]xcessive upstream water withdrawals reduce the dilution capacity of a river, and may thereby significantly degrade water quality of downstream river reaches.” (citation omitted)); see also *Benefits of Healthy Watersheds*, EPA, <https://www.epa.gov/>

hydrological data will ensure that parties will see increased water for their immediate surroundings. Additionally, such efforts would also promote environmental health, as keeping water within watersheds provides protection against flooding and improves soil formation.¹⁷⁸ Such benefits would also prove positive for agricultural industries and residential communities alike.¹⁷⁹

2. *Matching Program.* — The USBR should include a matching program for municipalities that may struggle in obtaining capital to participate in this program. Growing cities such as Phoenix and Denver may not have as much of an issue as smaller cities or towns raising the capital to participate in this program. The USBR could match any funds provided by a party to ensure that the funds could cover costs to implement any measures. The federal government recently passed the Inflation Reduction Act, which set aside \$4 billion for water-conservation efforts in the Colorado River Basin.¹⁸⁰ Such funds could be used by the USBR in piloting this program without concern that it could stretch its budget. Increased funds would ensure that the program could have as broad public participation as possible for the greatest effect.

3. *Ending Federal Subsidies.* — Harmful federal subsidies that incentivize water waste need to be minimized to ensure that farmers will participate in this program. A farmer may not want to participate in this program if they are recipients of federal subsidies that could cover most costs. The USBR needs to exercise its statutory authority to work with federal agencies that have capabilities to assist in implementing water conservation.¹⁸¹ The Bureau would need to partner with agencies such as the USDA to suspend eligibility for such subsidies and related programs. In these instances, the USBR would likely need to provide funds to allow farmers dependent on these water-intensive crops to transition to other financially viable alternatives. This funding would be provided in conjunction with any agreement farms would negotiate under the program to

hwp/benefits-healthy-watersheds [https://perma.cc/XE5E-QBYT] (last updated Mar. 18, 2024) (explaining the necessity of keeping water within a watershed).

178. See Caleb Aldridge & Beth Baker, *Watersheds: Role, Importance, & Stewardship* 1–2 (2017), <http://extension.msstate.edu/sites/default/files/publications/publications/p3082.pdf> [https://perma.cc/99TE-9ER4] (stating that watersheds provide critical ecosystem functions and services like controlling floods, nutrient cycling, and soil formation).

179. See *id.* (“[H]uman well-being is fundamentally dependent on ecosystem services, subcategorized as provisioning, cultural, regulating, and supporting services. While it’s difficult to put an exact value to every ecosystem function and service, some estimate the cost of ecosystem losses between \$4.3 trillion and \$20.2 trillion per year.” (citations omitted)).

180. Press Release, U.S. Dep’t of the Interior, *Biden-Harris Administration Announces New Steps for Drought Mitigation Funding From Inflation Reduction Act* (Oct. 12, 2022), <https://www.doi.gov/pressreleases/biden-harris-administration-announces-new-steps-drought-mitigation-funding-inflation> [https://perma.cc/4JYS-PC6E].

181. 43 U.S.C. § 390jj(c) (2018).

secure funding for new and efficient irrigation systems. Alternatively, the agency could provide a means for the party to exit the market entirely.¹⁸²

4. *State Agencies as Enforcement Mechanisms.* — The USBR would need to partner with state water agencies to act as intermediary enforcers for deals created in this program. Water is owned by the public, and state water agencies are responsible for managing it.¹⁸³ This responsibility includes settling water disputes, maintaining water records, and reallocating water. In terms of information and expertise on their local conditions, these agencies are invaluable for the USBR. As state agencies already provide a forum for adjudicating water disputes, they could provide a forum for the contracting parties to work within and provide a monitoring mechanism to ensure that the water being conserved is directed to the parties.¹⁸⁴

D. *Case Studies on China and Costa Rica*

This section will highlight two international case studies that illustrate how a framework focused on realigning market incentives can address environmental externalities. It is important to note that these case studies do not fully comport with this Note's framework, but they are great examples showing how such programs can prompt positive environmental change.

Soil erosion, which is a form of soil degradation, increases pollution and sedimentation in waterways, clogging them and causing harm to fish and other species.¹⁸⁵ Such land has a weakened ability to retain water, resulting in more severe flooding.¹⁸⁶ Soil erosion posed a serious environmental challenge to China, which sees two-to-four billion tons of silt released into the Yangtze and Yellow rivers annually.¹⁸⁷ Approximately

182. Other concerns deal with the economic impact on communities tied to agriculture seeing farmers exit the market; however, such impact was likely to occur regardless as revenues decline with a worsening climate and implementation of water cuts. See *supra* notes 6, 17.

183. Kelly Bennett, W. Landowners All., *Water Rights in the West* 1, 2 (2017), https://westernlandowners.org/wp-content/uploads/2017/11/2017_Water-Rights_KB.pdf [<https://perma.cc/47L4-J8X7>] (“The water in nearly all western natural surface water systems like rivers, creeks, lakes and even springs, is owned by the people of their respective state and regulated by a state agency. This is also often the case for groundwater that is stored in aquifers, no matter how deep.”).

184. John E. Thorson, *Clarifying State Water Rights and Adjudications* 15–21 (2001), <https://scholar.law.colorado.edu/cgi/viewcontent.cgi?referer=&httpsredir=1&article=1009&context=water-law-and-policy-reform> [<https://perma.cc/T3MA-L3YU>] (discussing the existence of state forums to adjudicate water disputes separate from the court system); see also *supra* note 160.

185. See, e.g., *Soil Erosion and Degradation*, World Wildlife Fund, <https://www.worldwildlife.org/threats/soil-erosion-and-degradation> [<https://perma.cc/9XN7-BT27>] (last visited Nov. 3, 2023).

186. *Id.*

187. Yifan Xie, Liye Wang, Rui An, Xuan Luo, Yanchi Lu, Yaolin Liu, Shunbo Yao & Yanfang Liu, *The Effect of Sloping Land Conversion Program on Soil Erosion in Shaanxi Province, China: A Spatial Panel Approach*, 10 *Frontiers Env't Sci.* 1, 2 (2022) (explaining the mechanics of the environmental program in China).

thirty-eight percent of China's total land is affected by soil erosion, which is three times the world average.¹⁸⁸ In 1999, China, in an attempt to combat soil erosion, implemented a program called Grain for Green that offered farmers in-kind subsidies for grain, cash, and free seedlings in return for land being converted from cropland back to forests.¹⁸⁹ The government provided the funds and paid out a flat rate per hectare converted.¹⁹⁰ The program proved successful. Since 1999, China has returned 15.31 million hectares of cropland back to forests; for comparison, that is roughly equivalent to about fifty-eight thousand square miles, an area slightly bigger than the country of Bangladesh.¹⁹¹ Recent studies indicate decreases in soil erosion as well as increasing droughts, floods, and other natural disasters.¹⁹² The program also increased public awareness among other villages and mobilized participation in both Green for Grain and other environmental protection programs.¹⁹³

Similarly to China, Costa Rica faced misaligned market incentives. The country was facing a dwindling timber supply in the 1970s, which led the nation to consider providing incentives for reforestation.¹⁹⁴ This led to the creation of the Forest Credit Certificate, which provided tax rebates to participating companies for planting forests.¹⁹⁵ This program would later provide a foundation for a payments for ecosystem services (PES) program that would expand to individuals and different types of environmental services, including water quality, carbon sequestration, and biodiversity conservation.¹⁹⁶ The government created an independent agency that determined rates, managed funds, and set regulations.¹⁹⁷ The agency's funding is derived from a fossil fuel sales tax, water tariffs, and funding from international organizations like the United Nations Framework Convention on Climate Change (UNFCCC).¹⁹⁸ Overall, the small nation has been able to prevent the total loss of seventy-two thousand hectares of forest between 1999 and 2005, with recipients having sixty-one percent of

188. Michael T. Bennett, *China's Sloping Land Conversion Program: Institutional Innovation or Business as Usual?*, 65 *Ecological Econ.* 699, 709 (2008).

189. *Id.* at 703.

190. *Id.* at 703–04.

191. See Qianru Yu, Chen-Chieh Feng, NuanYin Xu, Luo Guo & Dan Wang, *Quantifying the Impact of Grain for Green Program on Ecosystem Service Management: A Case Study of Exibe Region, China*, 16 *Int'l J. Env't Rsch. & Pub. Health* 2311, 2312 (2019); Bangladesh, *Encyc. Britannica*, <https://www.britannica.com/facts/Bangladesh> [<https://perma.cc/H4SH-Q97J>] (last visited Feb. 24, 2024).

192. Yu et al., *supra* note 191, at 2323.

193. See *id.*

194. Stefano Pagiola, *Payments for Environmental Services in Costa Rica*, 65 *Ecological Econ.* 712, 712–13 (2008).

195. *Id.* at 713.

196. *Id.* at 712.

197. *Id.* at 713–16.

198. *Id.* at 715.

their farms covered by forests compared to only twenty-one percent for nonrecipients.¹⁹⁹

As these two case studies indicate, it is possible to implement programs that provide incentives for farms to consider the externalities from harmful agricultural practices. Key differences do exist between the framework proposed in this Note and how the programs were administered in Costa Rica and China. The implementation of these programs differs from the proposed framework because of differences in legal and political structure within China and Costa Rica: Both have strong centralized governments and lack any division of laws or rights between local and national levels.²⁰⁰ Any similar programs in the United States would have to be focused on the state level or require cooperation between the different levels of government.

These proposals are encouraging; however, programs designed around direct payments, if not managed properly, could result in decreased productivity and harm to valuable industries. Due to the popularity of direct payments, some programs can be overtaken by local political interests, transforming them into blunt subsidies.²⁰¹ These programs would result in the market wildly overvaluing environmental services over other productive ventures such as farming.²⁰² If taken to its extreme, farmers might be incentivized to actively worsen their land management practices to increase the payments received.²⁰³ The proposal in this Note is able to avoid those issues with repeated direct-payment programs by offering a narrowly tailored program that allows markets to determine the value they are willing to pay for water conservation. In essence, it ensures that the program could not result in another federal incentive, similar to crop insurance, promoting certain harmful behaviors.²⁰⁴ Nonetheless, these two nations provide an endorsement in implementing a largely similar system focused on addressing environmental issues.

199. *Id.* at 720.

200. See David N. Barton, Payments for Ecosystem Services: Costa Rica's Recipe, *Int'l Inst. for Env't & Dev. Blog* (Nov. 29, 2013), <https://www.iied.org/payments-for-ecosystem-services-costa-rica-s-recipe> [<https://perma.cc/9UMU-7YSF>]; Xianchun Tan & Henry Lee, Comparative Assessment of China and U.S. Policies to Meet Climate Change Targets 3 (2017), <https://www.belfercenter.org/sites/default/files/files/publication/Comparative%20Assessment%20-%20final.pdf> [<https://perma.cc/ETH7-3FC8>] (finding that "China has a greater ability to require all levels of government to implement mandates from the central government" and so "does not have the same problem as a federal system (as in the United States), but its implementation capacity deficit is much larger").

201. Jim Salzman, *The Promise and Perils of Payments for Ecosystem Services*, 1 *Int'l J. Innovation & Sustainable Dev.* 5, 13–15 (2005) (discussing the problems with direct payments).

202. See *id.* (pointing out that recurring direct payments do not pay for "ecosystem services but, rather, for improvements in service provision" (emphasis omitted)).

203. *Id.*

204. See Jaworski, *supra* note 95, at 1694 ("[T]he fact that premiums are subsidized means that farmers are not internalizing the full risks of their planting decisions.").

E. *Addressing Counterarguments*

This section attempts to anticipate and discuss two counterarguments regarding whether the agency may exceed its authority when promulgating this program in the face of the nondelegation doctrine and major questions doctrine, which have cabined agency power in recent years.

One criticism likely to be raised is whether the agency, in promulgating this program, would violate the rising nondelegation doctrine that limits what authority agencies can exercise. The Supreme Court's increasing wariness of administrative agencies is evident from its recent attempts to revitalize doctrines limiting agency powers.²⁰⁵ Chief among these efforts is the focus on retooling and reviving the previously obscure nondelegation doctrine.²⁰⁶ The premise of the nondelegation doctrine is simple: Congress cannot delegate its legislative powers to other entities, including administrative agencies.²⁰⁷ The doctrine is premised on the idea that the Constitution vests "[a]ll such legislative powers" within Congress and to delegate such authority would make it difficult to determine who is politically accountable when policy goes awry.²⁰⁸ Currently, the doctrine has permitted Congress to delegate decisionmaking discretion as long as the agency's discretion is cabined by an "intelligible principle."²⁰⁹ This requirement had been essentially a nonexistent standard, with most delegations by Congress easily meeting the standard.²¹⁰ The current Supreme Court, however, has indicated that it is seeking to change and strengthen the requirement, and with the appointment of Justice Brett Kavanaugh and Justice Amy Coney Barrett, there may be enough votes to change the doctrine.²¹¹ An approach outlined by Justice Neil Gorsuch

205. See Joshua C. Macey & Brian M. Richardson, Checks, Not Balances, 101 *Tex. L. Rev.* 89, 102 (2022) ("[T]he Court seems poised to breathe new life into the nondelegation doctrine In 2019, in *Gundy v. United States*, Justice Gorsuch wrote in dissent that the intelligible principle test 'has been abused to permit delegations of legislative power that on any other conceivable account should be held unconstitutional.'" (footnote omitted) (quoting 39 S. Ct. 2116, 2140 (2019) (Gorsuch, J., dissenting))).

206. *Id.*

207. Chad Squitieri, Towards Nondelegation Doctrines, 86 *Mo. L. Rev.* 1239, 1245 (2021).

208. *Id.* (emphasis omitted) (internal quotation marks omitted) (quoting U.S. Const. art. I, § 1).

209. *Id.* at 1247 ("In considering whether Congress could delegate the authority to promulgate the code, the Court 'look[s] to the statute to see' if Congress had 'itself established the standards of legal obligation, thus performing its essential legislative function, or . . . has attempted to transfer that function to others.'" (quoting *A.L.A. Schechter Poultry Corp. v. United States*, 295 U.S. 495, 530 (1935))).

210. Kathryn A. Watts, Rulemaking as Legislating, 103 *Geo. L.J.* 1003, 1016 (2015) ("Rather than stressing the necessity of serious standards to guide agencies and to constrain their delegated discretion, the Court seems to look only at whether there is a complete lack of an intelligible principle."); see also Squitieri, *supra* note 207, at 1248–49 ("Another complaint lodged at the intelligible principle test is that after nearly 100 years, the test has failed to produce a judicially manageable standard.").

211. Macey & Richardson, *supra* note 205, at 102 (noting that Justice Gorsuch's proposition that the intelligible principle test has been abused to permit delegations of

known as the “guiding principles” seems to be one of the frontrunners in strengthening the doctrine’s standard.²¹² Gorsuch’s approach outlines that agency rulemaking governing “private conduct” is permissible only if it (1) involves filling in details, (2) incorporates the exercise of fact-finding, or (3) implicates the authority the Constitution separately vests in another branch (executive or judicial).²¹³

Even under Gorsuch’s “guiding principles” approach, the agency’s plan would likely satisfy the standards for a nondelegation challenge. They could do so namely by arguing that the agency is not governing “private conduct” but rather defining its role in removing transaction costs to facilitate negotiations between private actors. There would be no imposition of duties on private actors because they would be making the important decisions in what deals to pursue. Even if the agency’s conduct is considered to be governing “private conduct,” its role would still be relegated to an exercise of fact-finding. Its main objective would be providing parties with the necessary information and resources that would satisfy state requirements for water transfers.²¹⁴

The other counterargument that could be raised is whether such a program would implicate the major questions doctrine. The doctrine defines a requirement that Congress must delegate with a clear statement when it “intends to give an agency economy-transforming abilities to decide major questions.”²¹⁵ What defines a regulation as involving major questions is whether the regulation has major “economic and political significance,” but the specifics of what constitutes “major” is frequently evolving.²¹⁶ Based on recent usage by the courts, however, this Note’s proposed program is unlikely to warrant concerns. Previous invocations of

legislative power that should otherwise be unconstitutional has been supported by Chief Justice John Roberts, Justice Clarence Thomas, Justice Samuel Alito, and Justice Kavanaugh); Mark P. Nevitt, *The Remaking of the Supreme Court: Implications for Climate Change Litigation & Regulation*, 42 *Cardozo L. Rev.* 2911, 2923 (2021) (“Given Judge Barrett’s skepticism of the ‘intelligence principle’ test in her academic writings . . . we could witness the first successful nondelegation challenge since 1935 . . .”).

212. Thomas B. Griffith & Haley N. Proctor, *Deference, Delegation, and Divination: Justice Breyer and the Future of the Major Questions Doctrine*, 132 *Yale L.J. Forum* 693, 725 (2022), https://www.yalelawjournal.org/pdf/F7.GriffithProctorFinalDraftWEB_ew6xbq9e.pdf [<https://perma.cc/7S3M-UP9T>] (“While there are at least five votes to strengthen the nondelegation doctrine, there is no single answer about how to do so. In an opinion joined by Chief Justice Roberts and Justice Thomas, Justice Gorsuch identified three ‘important guiding principles’ that should inform the Court’s approach . . .” (footnotes omitted) (quoting *Gundy v. United States*, 139 S. Ct. 2116, 2136 (2019) (Gorsuch, J., dissenting))).

213. Macey & Richardson, *supra* note 205, at 103.

214. See *supra* section III.C.

215. Nathan Richardson, *Antideference: COVID, Climate, and the Rise of the Major Questions Canon*, 108 *Va. L. Rev. Online* 174, 192 (2022), https://virginialawreview.org/wp-content/uploads/2022/04/Richardson_Book.pdf [<https://perma.cc/VAB5-SMM6>] (quoting Brief for Petitioners at 14, *West Virginia v. Env’t Prot. Agency*, 142 S. Ct. 2587 (2022) (No. 20-1530), 2021 WL 5982772).

216. Chad Squitieri, *Who Determines Majorness?*, 44 *Harv. J.L. & Pub. Pol’y* 463, 473 (2021).

the doctrine struck down agency regulations based on lack of clear statements from Congress, the novelty of the statute's use, or the unprecedented nature of the regulation.²¹⁷ Unlike other agency regulations that have been struck down, the USBR has a clear statement from Congress directing it to implement water-conservation measures, and the statute clearly indicates that agency can implement water-conservation measures with nonfederal recipients.²¹⁸ The agency is not diverging from its statutory authority in some novel or unprecedented way similar to, for example, the CDC enacting measures related to housing policy. Lastly, it is important to highlight that the courts were concerned about agency action (namely the vaccine mandate and eviction moratorium) creating new regulations that impose additional duties on individuals.²¹⁹ The pilot program implemented by the USBR would not be imposing new duties on parties, as the program is focused on facilitating private action.²²⁰ The role of the USBR would be relegated to providing the necessary inputs for parties to allow for water transfers.

CONCLUSION

The situation in the Colorado River Basin is reaching a critical point. The legal regime has promoted wasteful practices because it values consumption and growth. Most of the water is needlessly wasted in low-tech irrigation systems. These practices are no longer sustainable in a drying climate. As the population continues to expand and demand for water rises, the region will need to change how it views water to thrive. Regulators must realize that water is scarce and manage it accordingly. Investing in water-efficient agriculture will be necessary to ensure water is available. Current laws at the state and federal levels, however, serve as roadblocks in allowing the market to pursue water-conscious practices. They raise transaction costs for an agricultural industry increasingly reliant on debt to survive until the next fiscal year. As this Note outlines, it will be imperative for initiatives to change the incentive structure and provide economic benefits for conserving water. This can be done by minimizing

217. Daniel T. Deacon & Leah M. Litman, *The New Major Questions Doctrine*, 109 *Va. L. Rev.* 1009, 1024 (2023) (discussing the Court's reasoning in overturning the CDC's eviction moratorium); Ilya Shapiro, *Regulating "Every Breath You Take": Police Power and OSHA's Vax Mandate*, 26 *Tex. Rev. L. & Pol.* 393, 394–95 (2021–2022) (discussing the Court's concerns for the breadth of OSHA's vaccine mandate).

218. See 43 U.S.C. § 390jj(a) (2018) ("The Secretary shall, pursuant to his authorities under . . . Federal reclamation law, encourage the full consideration and incorporation of prudent and responsible water conservation measures in the operations of non-Federal recipients of irrigation water from Federal reclamation projects . . .").

219. Lee A. Steven, *Non-Delegation, Major Questions, and the OSHA Vaccine Mandate*, *Yale J. on Regul. Notice & Comment* (Nov. 8, 2021), <https://www.yalejreg.com/nc/non-delegation-major-questions-and-the-osh-vaccine-mandate-by-lee-a-steven/> [<https://perma.cc/JB9P-TU7Z>] (explaining that Congress must expressly indicate that it wants the agency to regulate and enforce).

220. See *supra* section III.B.

transaction costs and providing resources where needed. Recalibrating the market can make rational actors value water conservation over production. This value shift will only become more important as the climate shifts to drier and drier conditions.

