# Moving Water: Managed Retreat of Western Agricultural Water Rights for Instream Flows

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*Climate change-induced megadrought and rapid urbanization are forcing western agriculture into retreat as water supplies diminish and heat and drought ravage crops and livestock. At the same time, the megadrought is imposing deep ecological harm on riparian areas, fish species, and soil and increasing the concentration of pollutants in dwindling waterways. These developments raise the question of how to use the water rights left behind as western irrigated agriculture inevitably shrinks. We argue that federal purchase of some of these rights could create a pool of water available for instream flows (also termed environmental flows) to preserve waterways and aquatic ecosystems. We propose that the federal government acquire some western water rights from agricultural holders, just as it has acquired homes in residential "managed retreat" programs, and dedicate those rights to instream flows. This proposal is novel in agricultural policy, which has stubbornly subsidized agriculture in place, and in the scholarship on government managed retreat from climate change, which has focused on retreating people and land, not rights in natural resources. Federal government managed retreat of western water rights reasserts a federal role in western water allocation, a feature we contend accords with current needs as well as history. The allocation of western water and the system of state and private water ownership are largely the result of the post-Civil War response to illegal gold and silver mining thought necessary to encourage western settlement. These policies no longer respond to the modern urbanized West and its*

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*present environmental challenges. Drought retreat presents an opportunity for the federal government to move toward a more balanced allocation of western water and create durable environmental benefits.*



## I. INTRODUCTION

Accelerating climate change is stressing the construct of Western agriculture. The West is now experiencing an agricultural "drought retreat" as farmers reduce or shutter agricultural operations and leave the West in response to the current megadrought.[2] In an earli-

2. Stephanie M. Stern & Dan Tarlock, *Managed Retreat of Agriculture in the Arid West*, ECOL. L.Q. (forthcoming 2024) [on file with the authors] (establishing third wave of drought retreat). For descriptions of the plight of small farmers forced to change either locations or shift to non-agricultural business, see Dan Frosch, *Drought in the U.S. West Leads Farmers to Look Elsewhere for Revenue*, WALL ST. J. (Sept. 30, 2022), https://www.wsj.com/story/drought-in-us-west-leads-farmers-to-diversify-their-revenue-streams-e844b5b1#:~:text=They%20are%20leaning%20on%20other,revenue%20during%20the%20prolonged%20drought [on file with the Journal] (farmers turning to solar arrays, RV hook ups, gas and oil leases, and tours and festivals on their lands); Somini Sengupta, *It's Some of America's Richest Farmland. But What is it Without Water?*, N.Y. TIMES (June 28, 2021), https://www.nytimes.com/2021/06/28/climate/california-drought-farming.html [on file with the Journal] (describing decrease in farm crops and increase in alternative, non-farming revenue on smaller farms); Shelby Vittek, *Western Drought Forces Farmers to Make Tough Decisions*, MOD. FARMER (June 7, 2021),

er article, we argued that the western megadrought and resulting retreat of western agriculture require a federal policy to provide a more humane climate transition for farmers.[3] This Article focuses on a different aspect of drought retreat: the opportunity created by drought and climate change to address the misallocation of western water. The efforts to sustain large-scale agriculture in the harsh climate of the West have resulted in the misallocation of water to agriculture at a great cost to the environment.[4] We argue that a federal policy of managed retreat, in the form of government purchase of water rights, could produce a pool of water rights that could improve water allocation and support instream flows.

The western megadrought, which began in 2000, is the most severe drought in world history since 800 CE.[5] Moreover, the megadrought has entered what scientists term a period of "rapid intensification," suggesting it will become more severe in the near-future.[6] Climate change has caused the unusual intensity and longevity of the megadrought by increasing evaporation of surface water and soil moisture, decreasing snowfall and snowpack, and shifting storm patterns.[7] As a result of the megadrought, the Colorado River, a major source of western water supply, reached its lowest measured level in

https://modernfarmer.com/2021/06/western-drought-forces-farmers-to-make-tough-decisions [https://perma.cc/8HR2-T92C] (climate-driving relocation of farmers to the Midwest).

3. *See* Stern & Tarlock, *supra* note 2.

4. A. Dennis Lemly, *Irrigated Agriculture and Freshwater Wetlands: A Struggle for Coexistence in the Western United States*, 3 WETLANDS ECOL. & MGMT. 3, 4–11 (1994); Amy E. East & Gordon E. Grant, *A Watershed Moment for Western U.S. Dams*, 59 WATER RES. RSCH. 1, 1–4, 6 (Oct. 2023).

5. Climate scientists define a megadrought as a severe, multi-decade drought that persists for longer than any drought event in historical record (*i.e.*, the nineteenth or twentieth centuries). Benjamin I. Cook et al., *North American Megadroughts in the Common Era: Reconstructions and Simulations*, 7 WIREs CLIMATE CHANGE 411, 411–12 (2016); A. Park Williams et al., *Rapid Intensification of the Emerging Southwestern North American Megadrought in 2020–2021*, 12 NAT. CLIMATE CHANGE 232, 233 (2022) (analysis of tree rings finding that 2000–2021 was the driest 22-year period globally since 800 CE).

6. Williams et al., *supra* note 5, at 232–33 (finding that aridity accelerated during the most recent years of the current megadrought).

7. *See* Sourav Mukherjee, Ashok Mishra & Kevin E. Trenberth, *Climate Change and Drought: A Perspective on Drought Indices*, 4 CURRENT CLIMATE CHANGE REPS. 145, 148 (2018) (climate change responsible for 42% of the current megadrought); Tiffany Means, *Climate Change and Drought: What's the Connection?*, YALE CLIMATE CONNECTIONS (May 11, 2023), https://yaleclimateconnections.org/2023/05/climate-change-and-droughts-whats-the-connection [https://perma.cc/38JY-9MC9].

the summer of 2021.[8] Many western regions also have severe groundwater shortages.[9]

The megadrought's most dramatic manifestations are the dwindling Colorado River and falling western groundwater levels due to less recharge of aquifers.[10] More generally, drought, in combination with the longtime overconsumption of western surface and groundwater, have wrought widespread ecological damage on a region already stressed by aridity. Drought causes desertification as soil in arid and semi-arid regions loses moisture and degrades.[11] Desertification in turn reduces plant biodiversity and increases sickness in wild animals.[12] Drought also shrinks riparian areas and wetlands and threatens cold-water fish, such as salmon, by reducing water flow and amplifying the climate change effect of higher water temperature.[13] The evaporative effects of drought concentrate pollutants in water, where lower and slower river flows increase the time pollutants remain in water bodies.[14] With respect to humans, the megadrought has threatened water access for residential and agricultural users and eroded the quality of drinking water as pollutants

8. NOAA DROUGHT TASK FORCE REPORT ON THE 2020-2021 SOUTHWESTERN U.S. DROUGHT 7 (2021); *see generally* Robert S. Pulwarty et al., *The Hardest Working River: Drought and Critical Water Problems in the Colorado River Basin*, *in* WATER CRISES: SCIENCE, TECHNOLOGY AND MANAGEMENT ISSUES 249, 258–59 (Donald A. White ed., 2005) (describing decline in Colorado River water levels).

9. Pang-Wei Liu et al., *Groundwater Depletion in California's Central Valley Accelerates During Megadrought*, NATURE COMM., Dec. 19, 2022, at 3–4; Leonard F. Konikow, *Long-Term Groundwater Depletion in the United States*, 53 GROUNDWATER, Jan.–Feb. 2015, at 3–5.

10. Agriculture, mining, and residential development, as well as flawed water laws, depleted western water supply before the megadrought and increased western vulnerability. The influence of the interstate compacts and federal laws in enabling overuse and suggestions to reallocate the river are thoroughly covered in CORNERSTONE AT THE CONFLUENCE: NAVIGATING THE COLORADO RIVER COMPACT'S NEXT CENTURY (Jason Anthony Robison, ed. 2022). Mining also depleted water reserves in the west. Overmining is usually defined as withdrawals in excess of sustainable yield, although this standard can be quantified in various ways and over multiple time periods.

11. Israel R. Orimoloye et al., *Drought: A Common Environmental Disaster*, 13 ATMOSPHERE 111, 119 (2022).

12. *Id*. at 120; Chandra Prakash Chala, *Environmental and Socioeconomic Impacts of Drought in India: Lessons for Drought Management*, 5 APPLIED ECOLOGY & ENV'T SCI. 43, 44 (2017).

13. Iris T. Stewart et al., *Water Security Under Severe Drought and Climate Change: Disparate Impacts of the Recent Severe Drought on Environmental Flows and Water Supplies in Central California*, J. OF HYDROLOGY X, 2020, at 8.

14. Heejun Chang & Matthew Ryan Bonnette, *Climate Change and Water-Related Ecosystem Services: Impacts of Drought in California, USA*, ECOSYSTEM HEALTH & SUSTAINABILITY, June 2017, at 11; Michael Dettinger et al., *Western Water and Climate Change*, 25 ECOLOGICAL APPLICATIONS 2069, 2077 (2015). Drought also increases the destructive force and frequency of wildfires, one effect which cannot be remedied by conserving Colorado River Water or groundwater.

and nutrient loads increase.[15] Lower water levels also reduce hydropower generation due to lower streamflow, an energy security crisis in the making for the western United States.[16]

Agriculture is both a cause and an effect of the Colorado water crisis. Agriculture uses 80–90% of western water, in a stark misallocation of limited water supply to farming arid land.[17] This misallocation took root in the nineteenth century settlement period. Western agriculture began as the result of a false belief that "rain would follow the plow" and the promotion of western settlement by both the federal government and private railways.[18] Federal dams and irrigation assistance to water western farms then dramatically increased water misallocation and set the stage for the massive losses western agriculture now faces. Today, agriculture is severely impacted by the megadrought, as well as by legal and demographic changes. In 2019, the federal government curtailed state water use for the first time under the first of two Drought Contingency Plans.[19] In 2023, under threat of further federal cuts, the western lower basin states signed a voluntary interstate agreement to reduce their Colorado

15. Ronnie B. Levin et al., *U.S. Drinking Water Challenges in the Twenty-First Century*, 110 ENV'T HEALTH PERSP. 43, 45–46 (2002).

16. Chang & Bonnette, *supra* note 14, at 5–6, 10–11.

17. Glenn D. Schaible & Marcel P. Aillery, U.S. Dep't of Agric., *Water Conservation in Irrigated Agriculture: Trends and Challenges in the Face of Emerging Demands*, 99 ECON. INFO. BULL. at 1 (Sept. 2012).

18. Barry B. Combs, *The Union Pacific Railroad and the Early Settlement of Nebraska 1868–1880*, 50 NEB. HIST. 1, 10–21 (1969) (railway promotion of western settlement); James B. Hedges, *The Colonization Work of the Northern Pacific Railroad*, 13 MISS. VALLEY HIST. REV. 311, 333–40 (1926) (describing how Northern Pacific and other railways settled the West); Gary D. Libecap & Zeynep Kocabiyik Hansen, *"Rain Follows the Plow" and Dryfarming Doctrine: The Climate Information Problem and Homestead Failure in the Upper Great Plains, 1890–1925*, 62 J. ECON. HIST. 86, 93–94, 100–01 (2002) (discussing fake science in western settlement).

19. The 2019 Drought Contingency Plan creates a tiered reduction system via an agreement between the seven basin states and the federal government. Colorado River Drought Contingency Plan Authorization Act, Pub. L. No. 116-14, 133 Stat. 850 (2019); Agreement Concerning Colorado River Drought Contingency Management and Operations, Bureau of Reclamation (May 20, 2019), https://www.usbr.gov/dcp/docs/final/Companion-Agreement-Final.pdf [https://perma.cc/BTY4-DAFS]. Subsequent federal water cutbacks occurred in 2021. *See* 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 [https://perma.cc/4NVQ-DT4X] [hereinafter Reclamation Operating Conditions] and 2023, *see* 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/HQF2-CFLW].

River water consumption.[20] In addition, western agriculture now competes with booming western municipalities for water.[21]

In response to the combined pressures of the megadrought, state and federal water curtailment, and western urban growth, farmers are now fallowing fields, reducing livestock herds, converting their land to non-agricultural uses, and, in some cases, relocating farms to water-rich eastern and midwestern parts of the country.[22] Large financial losses from diminished crop yields have battered farms, especially small operations, and disrupted food supply.[23] The current dislocation of western agriculture constitutes a drought retreat, the third such retreat to occur in western history following retreats from the drought of the 1890s and the 1930s Dust Bowl.[24] The third wave of drought retreat is poised to accelerate as climate change worsens and western cities continue to burgeon.

This crisis represents an opportunity to correct the underallocation of western water to instream flows. In this Article, we propose that the federal government adopt an agricultural managed

20. Letter from Seven Colorado River Basin States to U.S. Bureau of Reclamation About Lower Basin Plan (May 22, 2023), https://www.doi.gov/sites/doi.gov/files/lower-basin-plan-letter-5-22-2023.pdf [https://perma.cc/CAR7-KRVS] [hereinafter *Letter from Seven Colorado Basin States*]. The motivation for the basin states to agree was the threat that the federal government would make deeper cuts in water use under federal power created by the Supreme Court case *Arizona v. California*, 373 U.S. 546 (1963). Christopher Flavelle, *A Breakthrough Deal to Keep the Colorado River from Going Dry, for Now*, N.Y. TIMES (May 25, 2023), https://www.nytimes.com/2023/05/22/climate/colorado-river-deal.html [on file with the Journal].

21. Western urban centers have grown explosively in the past two decades and continue to burgeon as U.S. population centers shift toward the sunbelt and western United States. In the West, 88.9% of the population lives in urban areas. U.S. Census Bureau, *Nation's Urban and Rural Populations Shift Following 2020 Census* (Dec. 29, 2022), https://www.census.gov/newsroom/press-releases/2022/urban-rural-populations.html#:~:text=Of%20the%20nation's%20four%20census,Northeast%20Region%2C%20at%2084.0%25 [https://perma.cc/TV6S-4JRE]. For an argument that the urban West is the "real" West, *see* A. Dan Tarlock, *The "Empty" West as Urban Hinterland*, 56 IDAHO L. REV. 27, 32–36 (2020). Moving away from the tradition of not poaching agricultural water, Western municipalities are aggressively buying water rights from farmers and water investment companies. Jedidiah Brewer et al., *Transferring Water in the American West: 1987-2005*, 40 U. MICH. J. REFORM, 1021, 1040–41, 1053 (2007); Ian James & Geoff Hing, *Investors are Buying up Rural Arizona Farmland to Sell the Water to Urban Homebuilders*, AZ CENT. (Nov. 26, 2021), https://www.azcentral.com/story/news/local/arizona-environment/2021/11/25/investors-buying-up-arizona-farmland-valuable-water-rights/8655703002/ [https://perma.cc/68NE-HSVA].

22. *See* Stern & Tarlock, *supra* note 2.

23. *See, e.g.*, Neil S. Grigg, *The 2011–2012 Drought in the United States: New Lessons From a Record Event*, 30 INT'L J. WATER RES. DEV. 183, 191–92 (2014) (describing billions of dollars in losses from drought, increased food prices, and reduced livestock).

24. Stern & Tarlock, *supra* note 2.

retreat policy designed to produce water conservation and environmental benefits. The government should purchase agricultural water rights from farmers, on a voluntary basis, and allocate them to instream flows. Notably, the federal government held western water rights prior to ceding them to the states and private owners during the western settlement period.[25] Our proposal reasserts a federal role in western water that has been dormant for over a century.

This Article intertwines history and policy to make the case for managed retreat of agricultural water rights. Part II discusses the historic roots of western water's misallocation to farming the desert. Part III describes original federal water rights in western water, a history that contests the assumption that western water rights must be held by state governments and private parties. Part IV evaluates the slate of existing legal and market options to reallocate water in response to the megadrought water crisis and finds them lacking. Part V introduces our proposal for managed retreat of water rights and discusses how science can inform the selection of water rights. Part VI describes policy precedents for managed retreat and government reallocation of water, and signs of increasing interest by state and federal governments in acquiring water rights for conservation.

## II. THE MISALLOCATION OF WESTERN WATER

From the seventeenth century onward, most of United States agricultural settlement proceeded, as it always has, in search of the natural advantages of soil, water and climate.[26] However, western agricultural settlement west of the 100th meridian has proceeded in areas without many of these natural advantages. Western agriculture is an artificial construct largely supported by massive amounts of federal and state investment in water storage and delivery and continuing financial support.[27] With the exception of the Pacific

25. *See* discussion *infra* Part III.

26. For an example of the importance of location and the disruption that climate change brings, *see* Catherine Porter, *The Rigid World of French Cheese Making Unbound by Climate Change*, N.Y. TIMES (Oct. 29, 2023), https://www.nytimes.com/2023/10/29/world/europe/french-cheese-climate-change.html [on file with the Journal]. The article describes the problems that cheese makers in southern France face in trying to keep their valuable terroir designation as climate change makes it difficult if not impossible to comply with current regulations.

27. The story has been told many times. *See, e.g.,* DONALD WORSTER, RIVERS OF EMPIRE, WATER ARIDITY, AND THE GROWTH OF THE AMERICAN WEST (1985); MARC REISNER, CADILLAC DESERT: THE AMERICAN WEST AND ITS DISAPPEARING WATER (1986).

Coast, Native American settlements in Arizona and New Mexico, and the Mormon settlement of Utah, agriculture was Plan C for the West. After the mining and cattle empires waned after the Civil War, the newly constructed transcontinental railways promoted agricultural settlement of the West from the Missouri River to the Rocky Mountains and later in the Snake River Plane and the Columbia Basin with the fake science slogan, "rain follows the plow."[28]

It took two disastrous droughts, in the 1890s and 1930s, to prove the opposite—drought follows the plow. Nonetheless, the federal government made a conscious decision to support agriculture in the water-short West through massive federal subsidies and dams. It did this in the face of persistent doubts of whether large portions of land west of the 100th meridian were suitable for large-scale settlement. First, the Reclamation Act of 1902 tried to build a West of family farms.[29] Then, after the Dust Bowl, the federal government built multi-purpose reservoirs on the Colorado, Missouri and Columbia basins as well as in California to backstop state water rights.[30] These interventions allowed farmers to ignore John Wesley Powell's warning that the arid West demanded small-scale agriculture as practiced by the Church of Jesus Christ of Latter Day Saints in Utah.[31]

The result of the promotion of agriculture in the face of drought risk is that agriculture controls about 80% of western water.[32] The West is now the most urbanized region of the country.[33] Increasing urban demands as well as excluded uses, primarily environmental

28. *See* WALTER PRESCOTT WEBB, THE GREAT PLAINS 340, 377 (1931); Henry Nash Smith, *Rain Follows the Plow: The Notion of Increased Rainfall for the Great Plains, 1844–1880,* 10 HUNTINGTON LIBR. Q. 169, 175 n.15, 174–81 (1947).

29. DONALD PISANI, FROM FAMILY FARM TO AGRIBUSINESS: THE IRRIGATION CRUSADE IN CALIFORNIA AND THE WEST 206, 301 (1st ed. 1984).

30. DONALD J. PISANI, WATER AND AMERICAN GOVERNMENT: THE RECLAMATION BUREAU, NATIONAL WATER POLICY, AND THE WEST 229–57 (1st ed. 2002).

31. U.S. GEOLOGIC SURVEY, REPORT ON THE LANDS OF THE ARID REGIONS OF THE UNITED STATES: WITH A MORE DETAILED ACCOUNT OF THE LANDS OF UTAH, WITH MAPS 5-7, 9, 23, 28 (1878); *see generally* DONALD WORSTER, RIVER RUNNING WEST: THE LIFE OF JOHN WESLEY POWELL (2005) (chronicling Powell's unsuccessful efforts to convince Congress to develop a sustainable western settlement policy). Our article extends Powell's relevance to the modern, largely urban West and applies his belief that Western natural resources management should be science-based to climate change and the western megadrought. *See* VISION AND PLACE: JOHN WESLEY POWELL & REIMAGINING THE COLORADO BASIN 142-43 (Jason Robison et al. eds., 2020) (describing Powell's belief that science should guide western expansion and irrigation).

32. Schaible & Aillery, *supra* note 17.

33. Press Release, U.S. Census Bureau, Nation's Urban and Rural Populations Shift Following 2020 Census (last updated Mar. 1, 2023), https://www.census.gov/newsroom/press-releases/2022/urban-rural-populations.html [https://perma.cc/6SPM-MAHH].

and Native American, compete with agriculture.[34] Economists and others have long considered the amount of water devoted to agriculture use as a misallocation because so much water is dedicated to low-value uses.[35] This, of course, is a contested term and agricultural interests reject the characterization.[36] But reallocation has been taking place for several decades within the framework of state water rights. Water markets have emerged, and substantial amounts of water have been reallocated to urban areas.[37]

Now, the megadrought is creating a pool of water, from western farmers retreating from drought, that could be purchased by the federal government and reallocated to environmental uses. Thus, drought retreat presents an opportunity to continue the process of reallocation in a manner more consistent with a climate-changed, urban West. We contend that the federal government has a legitimate role to play in the post-settlement West.

## III. MINERAL AND WATER RIGHTS: FROM FEDERAL GOVERNMENT OWNERSHIP TO PRIVATE AND STATE CONTROL

Western water rights rest on the assumption that the federal government divested itself of its ownership of western waters and ceded control to the states. When the federal government assembled the western two-thirds of the nation from purchases, settlements,

34. *See* CTR. FOR NAT. RES. & ENV'T POL'Y, THE STATUS OF TRIBAL WATER RIGHTS IN THE COLORADO RIVER BASIN 1–7 (2021); *see also* Jessie A. Boyd, *Hip Deep: A Survey of State Instream Flow Law from the Rocky Mountains to the Pacific Ocean*, 43 NAT. RES. J. 1151, 1153–211 (2003).

35. RICHARD W. WAHL, MARKETS FOR FEDERAL WATER: SUBSIDIES, PROPERTY RIGHTS, AND THE BUREAU OF RECLAMATION 24–25 (1985); *see* Brewer et al., *supra* note 21, at 1021–24 (describing economists' criticisms of western water misallocation to low-value crops). Alfalfa production is often cited as a classic example of misallocation because it uses large amounts of water, the market value is relatively low, and much of the crop is exported. But the issue is complicated. For example, alfalfa feeds cows and cows produce cheese, the main ingredient in most pizzas and yogurt that America craves. In the Idaho Falls, Idaho area alfalfa production is now competing with potatoes, long the main crop in the state. Christopher Flavelle et al., *How America's Diet is Feeding the Groundwater Crisis*, N.Y. TIMES (Dec. 26, 2023), https://www.nytimes.com/interactive/2023/12/24/climate/groundwater-crisis-chicken-cheese.html [on file with the Journal]; *see generally* DAN PUTNAM ET AL., THE IMPORTANCE OF WESTERN ALFALFA PRODUCTION (2001) (surveying alfalfa production and importance across the western states).

36. *See, e.g.*, Ayman Mostafa, *Commentary: Why Alfalfa is Ideal for California and the Southwest*, AGALERT (Aug. 2, 2023), https://www.agalert.com/california-ag-news/archives/august-2-2023/commentary-why-alfalfa-is-ideal-for-california-and-the-southwest [https://perma.cc/8YF8-8KHG] (endorsing value of crop often maligned as low-value).

37. TERRY L. ANDERSON, BRANDON SCARBOROUGH & LAWRENCE R. WATSON, TAPPING WATER MARKETS 24 (2012).

and cessions from France, Great Britain, Mexico, and Spain, it became a common law riparian owner (i.e., of water rights) as well as owner of all minerals.[38] Prior to the discovery of gold and silver, the West was seen as a great desert unlikely to sustain substantial settlement. The settlement of the Willamette Valley of Oregon beginning in 1830 and the Gold Rush of 1849 began to change this perception.[39] However, prior to the Civil War, no effort was made to assert federal water and mineral ownership rights as the miners trespassed on public land after California entered the Union in 1850.[40] The federal government lacked the administrative structure and incentive to do so. Its primary focus was on attempting to hold the Union together.[41]

The miners who flocked to the West after the discovery of gold in California in 1849 first trespassed on Mexican land and then on federal land.[42] They ushered in the first Western economic boom after California entered the Union in 1850. Miners were free to claim customary mining locations and water use rules based on the concept of "first in time, first in right."[43] This custom became the basis of the modern law of prior appropriation. The right to obtain a prior right by putting water to use on non-riparian land was first recognized by the California Supreme Court in 1855.[44] However, the opinion carefully pointed out that neither federal nor state public lands were involved and did not decide the issues of federal or state rights, holding only that the "right" to appropriate water comes from the "privilege" to mine.[45]

The privilege to mine, and the water rights necessary to mine, soon became statutory rights, after an unsuccessful attempt to seize the mines to finance the Civil War.[46] The war was financed largely through domestic bonds and a radical new idea: the issuance of a

38. PAUL W. GATES, HISTORY OF PUBLIC LAND LAW DEVELOPMENT 55, 75-86 (1968) (describing acquisitions by U.S. government of lands in public domain).

39. *See* DAVID DARY, THE OREGON TRAIL: AN AMERICAN SAGA 68–72 (2001); J.S. HOLLIDAY, THE WORLD RUSHED IN: THE CALIFORNIA GOLD RUSH EXPERIENCE 44–56 (1981).

40. Joseph Ellison, *The Mineral Land Question in California, 1848-1866*, 30 SOUTHWESTERN HIST. Q. 34, 36–37, 49–53 (1926).

41. *Id*. at 40–43.

42. Gary D. Libecap, *Government Support of Private Claims to Public Minerals: Western Mineral Rights*, 53 BUS. HIST. REV. 364, 366–67 (1979) (gold rushers "technically trespassing" prior to Mining Act of 1866).

43. GEORGE P. COSTIGAN, JR., THE HANDBOOK OF AMERICAN MINING LAW 5–6 (1908).

44. Irwin v. Phillips, 5 Cal. 140, 147 (1855).

45. *Id*.

46. Ellison, *supra* note 40, at 52–55.

paper currency, called greenbacks, backed not by gold but by the full faith and credit of government.[47] Immediately after the Civil War ended, easterners in Congress proposed to seize the mines and to sell them to raise revenue to shore up the new currency.[48] However, western members of Congress led by Senator William M. Stewart of Nevada succeeded in validating the status quo and ended any legislation seizing the mines or charging royalties on the minerals, a situation that persists to this day.[49]

In a series of laws passed between 1866 and 1877, Congress recognized the customary practice of free access to valuable hard rock minerals and the West's scarce water resources. The first statute, the Act of 1866,[50] only confirmed vested appropriative rights, but the last, the Desert Land Act of 1877, increased the size of parcels available to homestead in an effort to attract settlers to arid areas and provided that "[a]ll surplus water over and above such actual appropriation and use, together with the water of all . . . sources of water supply upon the public lands and *not navigable*, shall remain and be held free for the appropriation and use of the public for irrigation, mining and manufacturing purposes subject to existing rights."[51] The Desert Land Act followed the precedent of the Mining Act of 1872, which ceded any federal interest in hard rock minerals to those who discovered and mined them, and appeared to allow private appropriation of water to flush out the gold and silver.[52]

These acts transformed the practice of forgoing federal government ejectment of the trespassing miners on the public domain and allowed states and private citizens to appropriate some of the formerly federal water rights, including the right to move water away

47. Wesley C. Mitchell, *Greenbacks and the Cost of the Civil War*, 5 J. OF POL. ECON. 117, 119–20, 124–26 (1897).

48. Carl J. Mayer, *The 1872 Mining Law: Historical Origins of the Discovery Rule*, 53 U. CHI. L. REV. 624, 644–45 (1986).

49. *Id*. at 645.

50. Act Granting Right of Way to Ditch and Canal Owners over Public Land, ch. 261, § 9, 14 Stat. 251 ("Whenever, by priority of possession, rights to the use of water for mining, agricultural, manufacturing, or other purposes have vested and accrued, and the same are recognized and acknowledged by the local customs, laws, and the decisions of courts, the possessors and owners of such vested rights shall be maintained and protected in the same; and the right-of-way for the construction of ditches and canals for the purposes herein specified is acknowledged and confirmed; but whenever any person, in the construction of any ditch or canal, injures or damages the possession of any settler on the public domain, the party committing such injury or damage shall be liable to the party injured for such injury or damage.").

51. 43 U.S.C. § 321 et seq. (emphasis added).

52. 30 U.S.C. §§22–54.

from land adjacent to streams without owning land abutting the water. Most miners and many early irrigators were technically non-riparian users and, as a result, previously lacked rights to use water away from the stream.[53] The acts allowed the states to control the allocation of western water. The federal government can also regulate state water use under the Constitution's Commerce Clause,[54] but apart from federally reserved rights for Indian tribes[55] and water-dependent public lands,[56] the federal government must acquire the water rights needed for federal projects under state law.[57]

Interestingly, the status of post-1866 prior appropriative water rights remained unsettled until 1935, when the Supreme Court interpreted the three acts not only to validate prior illegal acts but to cede all control over western water to the states.[58] *California Oregon Power v. Beaver Portland Cement* pitted a power company against a cement plant on the Rogue River.[59] Despite the forward-looking language in the Desert Land Act, the power company claimed that its 1885 Desert Land Act patent (a grant of title to federal land) carried with it riparian rights, while the cement company asserted an appropriative right under Oregon's 1909 Water Code which extinguished unused riparian rights. The Court did not discuss whether the 1909 Water Code was a taking of unused water rights and held that only the cement company had a valid water right because the Desert Land Act patent carried no water rights. Justice George Sutherland, raised in Utah where he built his legal and political career, justified his decision by stating that the "future growth and the well-

53. The common law of riparian rights was developed in England and the United States to allocate the current of a stream among adjacent water-wheel-driven mills. Thus, it limited the right to use water to lands that had contact with the stream. *See* JASON ANTHONY ROBISON, LAW OF WATER RIGHTS AND RESOURCES § 3:31 (2023).

54. Oklahoma *ex rel*. Phillips v. Guy F. Atkinson Co., 313 U.S. 508, 517 (1941).

55. Winters v. United States, 207 U.S. 564, 577 (1908).

56. Cappaert v. United States, 426 U.S. 128, 144 (1976).

57. In 1902 Congress passed the Reclamation Act which provided federal financing for irrigation projects. Section 8, 43 U.S.C. § 383 requires the Secretary of Interior to acquire any water rights necessary for the project under state law. *See* California v. United States, 438 U.S. 645, 675 (1978).

58. California Oregon Power Co. v. Beaver Portland Cement, 295 U.S. 142, 155 (1935). The Court did not mandate that all states adopted prior appropriation but held that each state adopt whatever after law it choose.

59. *Id*.

being" of the inner-Mountain West "depended on a complete adherence to the law of prior appropriation."[60]

The expectations created by *California Oregon Power* lie heavy over western water law and policy. It is too late to revisit state control, but it is not too late to recognize that the policy basis of the *California Oregon Power* opinion is no longer valid. State control of water is the product of a moment in time that no longer exists: the historical practice of giving away federal resources to promote settlement. It reflects the post-Civil War uncertainty whether, outside the Pacific Coast, the "Great American Desert" could sustain significant settlement. States have adapted prior appropriation to urban growth[61] and the need for environmental flows.[62] Our proposal for a federal managed retreat policy for western agricultural water rights is simply another step in the project of aligning western state water law with the real, modern West.

## IV. BAD OPTIONS FOR REALLOCATING WESTERN WATER

Today, the harsh, arid West has been settled and its future is as a series of powerful urban areas with patches of agriculture in its most fertile areas. The challenge is not to promote settlement by granting water rights to private users, but to sustain settlement in a region which will have more people but less water due to global climate change and megadrought. Climate adaptations such as more efficient irrigation technology or drought-resistant crops are important steps. But increasing the efficiency of agricultural water use, standing alone, is not enough to forestall the western water crisis or safeguard environmental interests.[63] Water policy must achieve a bal-

60. *Id*. at 157. Justice Sutherland was brought from England to Utah at age one by his parents, who had converted to the Church of Jesus Christ of Latter Day Saints. However, Justice Sutherland never became a member of the Church of Jesus Christ of Latter Day Saints, as his parents left the Church shortly after settling in Utah. Edward L. Carter & James C. Phillips, *The Mormon Education of a Gentile Justice: George Sutherland and Brigham Young Academy*, 33 J. SUP. CT. HIST. 322, 324–25 (2008).

61. *See* A. Dan Tarlock & Sarah B. Van de Wetering, *Western Growth and Sustainable Water Use: If There Are No "Natural Limits," Should We Worry About Water Supplies?*, 27 PUB. LAND & RES. L. REV. 33, 50-51 (2006).

62. *See e.g.*, Charlton H. Bonham, *Perspectives from the Field: A Review of Western Instream Flow Issues and Recommendations for a New Water Future*, 36 ENV'T L. 1205, 1208, 1216 (2006).

63. Stern & Tarlock, *supra* note 2 (describing how the challenges of aridity, climate change, urbanization, and competing claims on water are already prompting wester agriculture losses and relocations).

ance among four legitimate interests: (1) the smaller amount of agriculture which can survive climate change, (2) urban areas that continue to attract people and investment, (3) Native American homelands, and (4) environmental values, fragile as they are. This Article focuses on the fourth interest, environmental values, and considers how to reallocate water from the West's shrinking agricultural industry to instream flows.

Federal and state governments have few viable policy options for reallocating water in order to protect environmental interests and instream flows. Existing legal doctrines and water markets are unlikely to reallocate a significant volume of western water to instream flows. The lack of viable policy options supports our novel, and in some camps, controversial argument for federally funded managed retreat of western water rights.[64] To set the stage for that proposal, in this part we briefly survey the current alternatives for water reallocation—an overview that underscores the need for policy innovation.

First, the federal government could invoke the emergency exception to the Fifth Amendment and attempt to reallocate water through a government taking without compensating rights holders.[65] However, the case law on the emergency exception requires that there be an imminent emergency or disaster for it to be invoked, such as action to prevent further harm from a fire or flood or a wartime necessity.[66] The effects of megadrought are cumulative and ongoing.[67] The remedial action of reallocating water rights to instream flows will not provide an immediate cure, but rather steady improvements in the environmental health of waterways and riparian areas. Because these characteristics of megadrought do not square with precedents requiring that the emergency exception applies only to government action to prevent an imminent harm, it is exceedingly unlikely that courts will uphold an emergency exception to Fifth

64. Some farmers and farm trade organizations are likely to resist, at least inititally, managed retreat and to favor continued federal subsidies for arid farming.

65. *See, e.g.*, Note, *Necessity Taking in an Era of Climate Change*, 136 HARV. L. REV. 952, 957-60, 972-73 (2023) (suggesting that courts could extend the doctrine of uncompensated necessity takings to waters stressed by climate change). The Note does not suggest a justification for the extension of the narrow doctrine of necessity takings to long-term risks such as sharply decreased flows and aquifer levels.

66. Mitchell v. Harmony, 54 U.S. 115, 135 (1851) (war time); Bowditch v. Boston, 101 U.S. 16, 18 (1879) (fire).

67. Felix Kogan & Wei Guo, *2006–2015 Mega-drought in the Western USA and its Monitoring from Space Data*, 8 GEOMATICS, NATURAL HAZARDS AND RISK 651, 665–66 (2015).

Amendment compensation for agricultural water rights.[68] Thus, if the government uses eminent domain (which we counsel against because of the likelihood of overwhelming public disapproval), it will need to pay farmers for their water rights.[69] Our voluntary managed retreat proposal has similar acquisition costs for water rights, but will produce less friction, public outrage, and litigation than large-scale eminent domain. There also appears to be little hope of using the public trust doctrine to reallocate water rights without compensation. With the notable exception of the California Supreme Court's famous holding in *National Audubon Society v. Superior Court of Alpine County* (often referred to as the *Mono Lake* case), courts have generally rejected the use of the public trust doctrine to transfer water rights from consumptive use to instream flows absent government compensation.[70]

Second, state or federal governments could seek to reallocate vested water rights in court based on the common law doctrine of prior appropriation.[71] An appropriative water right is a usufructuary rather than a fee simple property right and must be put to continuous, beneficial use.[72] Otherwise, it can be abandoned or forfeited by non-use. When the beneficial use ceases or is curtailed, the basic rule is that the water becomes public again, if there are no private junior rights holders in line.[73] Both law and the circumstances of drought impose substantial hurdles to creating a pool of water rights through prior appropriation suits for lack of beneficial use.

68. *Mitchell v. Harmony*, 54 U.S. at 135; *Bowditch v. Boston*, 101 U.S. at 18.

69. *See infra* Part VI(A).

70. Nat'l Audubon Soc'y v. Superior Ct. of Alpine Cnty., 658 P. 2d 709, 727-29 (Cal. 1983), *cert. denied*, 464 U.S. 977 (1983). However, this holding has not had interstate reach, and has had limited impact on even California courts and on water rights outside of the Mono Lake Basin. David Owen, *The Mono Lake Case, the Public Trust Doctrine, and the Administrative State,* 45 U.C. DAVIS L. REV. 1099, 1122–29 (2012); Erin Ryan, *The Public Trust Doctrine, Private Water Allocation, and Mono Lake: The Historic Saga of* National Audubon Society v. Superior Court, 45 ENV'T L. 561, 611–12 (2015).

71. The federal government does hold water rights that they acquired under state law. See *supra* notes 50–60 and accompanying text.

72. JASON ANTHONY ROBISON, LAW OF WATER RIGHTS AND RESOURCES §§ 5:90–5:94 (2023).

73. Almost all western states have constitutional provisions that declare water is owned by the state in trust for the people. However, state ownership is a fiction; it is simply an assertion of state power to regulate the use of water among competing claimants. Frank J. Trelease, *Government Ownership and Trusteeship of Water*, 57 CAL. L. REV. 638, 643-44 (1957) remains the classic exposition of the meaning of state ownership in trust. The beneficial rule has been criticized because it discourages water conservation. A few states have amended their waters codes to allow saved water to be sold, leased, or exchanged. CAL. WATER CODE §§ 1010–11 (1995); OR. REV. STAT. §537.470 (2017).

Many streams are over-appropriated (*i.e.*, have private rights holders in excess of available water) so it is unlikely that the state would receive any unused water rights because there would be private junior rights holders with higher priority than the state. Any surplus water would be allocated to those existing rights holders, in order of priority. Suffice it to say that the transaction costs of proving non-use in court are high because the risk of legal or pragmatic failure is high.

Third, governments could step back and allow private water markets to reallocate western water. Certainly, markets will transfer water from agriculture to other private users and to municipalities. But markets are unlikely to reallocate water to instream flows absent interventions by government or nonprofit organizations, such as managed retreat or other acquisition policies. Rivers, streams, and fish do not buy and sell water. Although instream flows provide a variety of ecosystem services that benefit humans, such as clean drinking water, most markets fail to account for these values.[74] This occurs in part because most ecosystem services created by adequate water flow are full or partial public goods, meaning that many people benefit and there is no way to confine the benefits to the water rights holder.[75] For example, adequate instream flows reduce water pollution, but that benefit is shared by many users of the water source and even by non-users who value the existence of clean water that they do not personally use. Because of these dynamics, market-based retreat of western agricultural water rights, absent government or nonprofit participation in the market, would fail environmental interests such as river habitat recovery, water quality, and biodiversity.[76]

Instead, the likely result of an unfettered free market approach would be that cities would acquire most of the agricultural water for

74. Thomas C. Brown, *Water for Wilderness Areas: Instream Flow Needs, Protection, and Economic Value*, 2 RIVERS 311, 317–322 (1991); John B. Loomis, *Estimating the Public's Values for Instream Flow: Economic Techniques and Dollar Values*, 34 J. AM. WATER RES. ASS'N 1007, 1008–09 (1998).

75. Brown, *supra* note 74, at 317 (observing that "the nature of instream flow as a public good makes it difficult for interested parties to participate in [a water market] transaction (and easy for others to obtain a free ride)").

76. *See* Robert M. Beyer et al., *Relocating Croplands Could Drastically Reduce the Environmental Impacts of Global Food Production*, COMMC'NS EARTH & ENV'T, Mar. 10, 2022, at 2 (modeling magnitude of relocation necessary for water, carbon, and environmental improvement). For an overview of groundbreaking research advocating valuing "ecosystem services" in policy, see James Salzman & J.B. Ruhl, *The Law and Policy Beginnings of Ecosystem Services*, 22 J. LAND USE & ENV'T L. 157, 161–67 (2007).

sale.[77] Cities have proven to be incredibly industrious, and successful, at navigating the U.S.'s patchwork private water market to buy rights directly from farmers.[78] These private water sales to western urban centers support development but also create what Michael Pappas and Victor B. Flatt term "adjustment failure costs" to climate change by under-allocating water to instream flows and dulling urban incentives to conserve water.[79] A solely market-based approach would allow western cities to buy water without making the necessary hard choices about how much growth and what kind of development urban centers can sustain long-term with climate change.

A targeted federal acquisition program of managed retreat is a more rational way of dealing with climate-induced drought than the options we have discussed. The next Part turns to our proposal for the federal government to manage the retreat of western agricultural water rights.

## V. MANAGED RETREAT OF WESTERN AGRICULTURAL WATER RIGHTS

In view of the limited options available to reallocate water, the federal government should adopt a "managed retreat" policy for agricultural water rights. Managed retreat is a climate adaptation policy that strategically relocates people or structures to manage the risk to humans from climate change or natural disasters.[80] In a managed retreat, government, or, less commonly, a nonprofit or community organization, buys homes or funds infrastructure relocation in order to move people and development away from severely climate-

77. In the absence of state or federal government action, it is possible that nonprofit organizations might buy water rights, similar to the sizable land acquisitions made by nonprofits such as the Nature Conservancy. However, it appears unlikely that nonprofits standing alone can make a major dent in protecting instream flows; environmental interests would be better served by nonprofits acquiring water rights in tandem with our proposed federal managed retreat policy.

78. *See infra* note 125; *see also* James & Hing, *supra* note 21; Daniel Gligich, *Kings Co. Wants to Block Selling Groundwater to Southern California. Will a New Measure Solve the Problem?*, SAN JOAQUIN VALLEY SUN (Nov. 30, 2022), https://sjvsun.com/ag/kings-co-wants-to-block-selling-groundwater-to-southern-california-will-a-new-measure-solve-the-problem [https://perma.cc/9LRT-V74H].

79. Michael Pappas & Victor B. Flatt, *Climate Changes Property: Disasters, Decommodification, and Retreat*, 82 OHIO ST. L.J. 331, 350–72 (2021) (discussing mal-adaptations and externalities arising from responses to climate change as adjustment failure costs).

80. Miyuki Hino et al., *Managed Retreat as a Response to Natural Hazard Risk*, 7 NATURE CLIMATE CHANGE 364, 364 (2017); Stephanie M. Stern, *Climate Transition Relief: Federal Buyouts for Underwater Homes*, 72 DUKE L.J. 161, 169–71 (2022).

impacted areas, such as flood zones.[81] Managed retreat has been a human-centric policy, focusing on reducing the harms from climate change to people and human infrastructure.[82] In our proposal, we expand the concept of managed retreat to encompass climate and natural hazard risk to the environment, specifically to western rivers and aquatic ecosystems. To safeguard these environmental interests, we propose that the federal government retreat western *water rights*, not people or development.

### A. A Proposal for Managed Retreat of Western Agricultural Water Rights

To date, the federal government has focused on adaptation in place for western agriculture (e.g., irrigation technology, switching to drought-resistant drops) and eschewed a managed retreat program for agricultural land or water rights.[83] By contrast, the U.S. has a longstanding managed retreat policy in place for residential property, one that offers lessons for agricultural managed retreat. In residential managed retreat, the federal government funds buyouts of selected homes to enable their owners to relocate from climate risk zones.[84] The programs, which are discreetly termed emergency "disaster relief" acquisitions and funded by Congressional disaster appropriations, span multiple federal agencies. The Federal Emergency Management Agency (FEMA) administers the largest federal

81. Katharine J. Mach et al., *Managed Retreat Through Voluntary Buyouts of Flood-Prone Properties*, SCI. ADVANCES, Oct. 2019, at 1; A.R. Siders, *Managed Retreat in the United States*, 1 ONE EARTH 216, 217 (2019).

82. Leah A. Dundon & Mark Abkowitz, *Climate-Induced Managed Retreat in the U.S.: A Review of the Current Research*, 33 CLIMATE RISK MGMT., June 2021, at 2–6 (describing meaning, practice, and policy of managed retreat).

83. *See infra* notes 172–175 and accompanying text.

84. 42 U.S.C. § 5170c(b)(2); Helen J.P. Wiley & Carolyn Kousky, *Speeding Up Post-Disaster Housing Buyouts*, 11 SOLUTIONS J. 59, 59 (2020) (HMGP is largest source of buyout funding). The HUD buyout program (CDBG-DR) arises under Title I of the Housing and Community Development Act of 1974 but can fund only residential disaster recovery. 42 U.S.C. § 5306(c); *Community Development Block Grant Disaster Recovery Program*, U.S. DEP'T OF HOUS. & URB. DEV. (2022), https://www.hud.gov/program_offices/comm_planning/cdbg-dr [https://perma.cc/Q55Q-9A3H]. The other FEMA programs that fund residential buyouts are the FMA and the Building Resilient Infrastructure and Communities ("BRIC") program (formerly the Pre-Disaster Mitigation Program), both of which receive annual appropriations. 42 U.S.C. § 4104c(a); Flood Mitigation Assistance Program, 44 C.F.R. § 78 (2020); *Building Resilient Infrastructure and Communities*, FED. EMERGENCY MGMT. AGENCY (Apr. 25, 2022), https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities [https://perma.cc/X5ZB-R7TM].

home buyout program, the Hazard Mitigation Grant Program; the Department of Housing and Urban Development (HUD) offers a similar Community Development Block Grant-Disaster Relief program aimed at lower-income communities.[85]

In a residential buyout, the federal government funds most of the cost of buying out a residential home from a willing owner so that the household can relocate to a safer area.[86] In many cases, a smaller cost-share is paid by state or local government.[87] The buyouts must satisfy a cost-benefit analysis, which requires that the anticipated flood damage to the home and the ecosystem services from the acquisition (e.g., better stormwater management, improved water quality, and recreation in the newly created open space) exceed the costs of the buyout.[88] The government usually acquires the home at its pre-disaster fair market value, which inflates program cost but allows the household to move to comparable housing.[89] Pursuant to federal regulations, the retreated residential lot is permanently dedicated as open space with no future construction permitted.[90]

Our proposal in this Article is for a federal managed retreat policy to address climate-induced water shortage and environmental harm by funding federal purchases of water rights, primarily from western agriculture. Specifically, we suggest that the federal government acquire the surface water and groundwater rights that will increasingly come available as more western farmers abandon farming in response to climate change. Managed retreat would insert the federal government (and environmental values such as instream flows) as

85. *See supra* note 84; Kelsey Peterson et al., *A Review of Funding Mechanisms for US Floodplain Buyouts*, SUSTAINABILITY, 2020, at 3 (2020) (federal buyout funding mechanisms).

86. Fed. Emergency Mgmt. Agency, *Fact Sheet: Acquistion of Property After a Flood Event* (Nov. 13, 2018), https://www.fema.gov/press-release/20230502/fact-sheet-acquisition-property-after-flood-event [https://perma.cc/S9HJ-QYKV].

87. *See, e.g.*, 42 U.S.C. § 5170c(a) (cost-share for FEMA Hazard Mitigation Grant Program, the largest residential managed retreat funding source).

88. 44 C.F.R. § 206.434(c)(5) (2022).

89. The jurisdiction applying for funding can opt to pay current market value or preflood market value but usually chooses the latter. *See* FED. EMERGENCY MGMT. AGENCY, HAZARD MITIGATION ASSISTANCE 315–16 (Mar. 23, 2023), https://www.fema.gov/sites/default/files/documents/fema_hma_guide_08232023_v1.pdf [https://perma.cc/Q89V-MP65].

90. Elise Gout, *Are Buyouts a Viable Tool for Climate Adaptation?*, COLUM. CLIMATE SCH. (June 29, 2021), https://news.climate.columbia.edu/2021/06/29/are-buyouts-a-viable-tool-for-climate-adaptation [https://perma.cc/QLE3-Z7LX]; Katharine J. Mach & A.R. Siders, *Reframing Strategic, Managed Retreat for Transformative Climate Adaptation*, 372 SCI. 1294, 1294, 1299 (2021); A.R. Siders, *Social Justice Implications of US Managed Retreat Buyout Programs*, 152 CLIMATIC CHANGE 239, 240 (2019).

players in the robust water transfer activity already occurring as municipalities and private investment firms seek to purchase farmers' water rights.[91] This newly acquired federal pool of water rights would be dedicated to maintaining instream flows.[92] Notably, we do not propose mass buying or wholesale federal ownership of western water rights, but rather a targeted and limited federal acquisition program to increase instream flows. Our proposal is novel to modern agricultural law, which lacks a concept of managed retreat, as well as to managed retreat policy, which, as previously noted, has not explored retreating rights in natural resources.

More sophisticated versions of our basic model of water rights acquisition are possible, and in many circumstances, desirable. For example, rather than purchasing the water rights in full and immediately, the federal government could buy an option to purchase water rights from a farmer. An option gives the holder, here the federal government, the right to buy the water rights at a specified price within a set time period.[93] This allows the government flexibility to deploy the option to buy and may reduce the cost of water rights for the government compared to immediate purchase. In a similar vein, the government could purchase water rights under certain conditions or contingencies or, relatedly, purchase contractual limitations on water use. For example, the federal government could index the amount of water rights a farmer could use to the severity of drought, Colorado River water levels, or other environmental factors.[94] The federal government could also rent water rights from farmers, similar to the rental contracts for conservation (fallowing fields) that the federal government now offers farmers under the Conservation Reserve Program (CRP).[95] However, in light of the anticipated duration of the megadrought and climate change, it will likely be more cost-effective and provide more stable protection to water ecosystems for

91. For accounts of the growing number of purchases and rise of water investment farms, see *supra* note 78.

92. Ideally, this dedication would be formalized but also have some flexibility to be used for tribal instream flows.

93. For the seminal work on options in property law, *see* Lee Anne Fennell, *Revealing Options*, 118 HARV. L. REV. 1399 (2005) (discussing how different areas of property law can employ options to increase efficiency).

94. Stern & Tarlock, *supra* note 2.

95. 16 U.S.C. § 3831; *Conservation Reserve Program*, U.S. DEP'T OF AGRIC., https://www.fsa.usda.gov/programs-and-services/conservation-programs/conservation-reserve-program [https://perma.cc/9GWV-8R2U] (last visited Feb. 18, 2023).

the federal government to buy, rather than lease, agricultural water rights.

Groundwater rights in some western states are not severable from the rights to the land above it, while surface water rights can generally be severed.[96] In states where groundwater rights attach to land and are not severable, the federal government will need to purchase the land in order to acquire the groundwater rights or contract with the farmer to restrict their water consumption. Another alternative is for the government to purchase a conservation easement from the landowner that allows the farmer to own and reside on the land but grants to the government the groundwater use and development rights.[97] A conservation easement could specify that the landowner ceded the property right to use the groundwater in certain ways or above specified volumes.[98] With a conservation easement, the landowner receives valuable property tax benefits because the easement reduces the land's value and, if the owner donates the groundwater easement to the government or a nonprofit land trust, the landowner also receives federal tax credits.[99] There appears to be growing interest in groundwater easements. Recently, three western senators introduced a bill for a conservation easement program for groundwater, administered by the U.S. Department of Agriculture (USDA), that would compensate farmers for voluntarily reducing groundwater use.[100]

Our proposal for managed retreat envisions voluntary purchases from willing farmers, not eminent domain. Consistent with our prior work and with federal residential managed retreat, we eschew coercive appropriation of water rights as politically incendiary and policy-killing.[101] Political backlash would be particularly fierce in the

96. James L. Huffman et al., *Constitutional Protections of Property Interests in Western Water*, 41 PUB. LAND & RES. L. REV. 27, 31 & n.18 (2019) (alienability of surface water); A. Dan Tarlock, *Prior Appropriation: Rule, Principle, or Rhetoric?*, 76 N.D. L. REV. 881, 900–901 (2000) (law of groundwater).

97. Conservation easements have a long history of use for ecosystem and wildlife preservation. *See* Federico Cheever & Nancy A. McLaughlin, *An Introduction to Conservation Easements in the United States: A Simple Concept and a Complicated Mosaic of Law*, 1 J. LAW, PROP. & SOC'Y 108, 111–15 (2015).

98. Water restrictions presently occur in land-based conservation easement donations and purchases. *See* Nancy A. McLaughlin, *Conservation Easements: Why and How*, MINERAL L. INST., 2005, at 23.

99. *Id*. at 29–31.

100. Voluntary Groundwater Conservation Act, H.R. 4902, 118th Cong. (2023).

101. Federal regulations explicitly prohibit the implementing entity, usually a locality or state, from involuntarily taking property through eminent domain. 44 C.F.R. § 80.13(a)(4)

West, a region with a strong history of prizing land independence and farming.[102] There are of course shortcomings to our voluntary approach. Selecting water rights based solely on sound scientific and hydrological criteria, without the limiting factor of landowner agreement, more efficiently produces water savings and environmental gains. Without the constraint of owner consent, the government can select water rights based on powerful geospatial models and machine learning and can respond more rapidly to water or environmental changes.[103] Also, eminent domain avoids adverse selection where farmers with less valuable or environmentally useful water rights may disproportionately offer them to the federal government; holders of more valuable water rights are more likely to continue to use them or to sell to municipalities or water investment companies.[104] While recognizing these benefits, we nonetheless believe that voluntary acquisition is politically necessary to actualize a federal policy of water rights retreat. We also note that the government taking water rights via eminent domain would raise legitimate concerns about fairness, the appropriate limits of government power, and potential racial or other biases in the government's selection of rights for coercive takings.[105]

We suggest structuring the pricing and negotiation of water rights purchases as procurement auctions, where many sellers (farmers) compete for government purchase by bidding within a specified timeframe. The government would then determine which rights to

(2022). We have also argued against involuntary appropriation as a political non-starter in most western states. Stern & Tarlock, *supra* note 2.

102. Michael A. Baakman, *The Home Frontier: Households, Gender and National Expansion in the Early Republic*, 39 J. EARLY REPUBLIC 149, 151 (2019) (the family-sized farm would grant its head of household economic independence and a stake in community decision-making. Property ownership in the form of the western family farm "undergirded both citizenship and manhood"); Robin Rotman & Sophie Mendelson, *Food, Freedom, Fairness, and the Family Farm*, 125 W. VA. L. REV. 1, 7–9 (2022).

103. *See* Part VI(B), *infra*.

104. Adverse selection refers to situations where bargaining parties have unequal information. The party with more information generally receives greater benefits from the transaction by exploiting their informational advantage. *See* George A. Akerlof, *The Market for "Lemons": Quality Uncertainty and the Market Mechanism*, 84 Q.J. OF ECON. 488, 488–89 (1970). We thank Michael Pappas for his comments on adverse selection in water rights retreat policy.

105. *See* Michael A. Heller & James E. Krier, *Deterrence and Distribution in the Law of Takings*, 112 HARV. L. REV. 997, 998–99 (1999) (describing fairness and distributional justice as major considerations in takings analysis); David H. Harris, Jr., *The Battle for Black Land: Fighting Eminent Domain*, NAT'L BAR ASS'N MAG., Mar./Apr. 1995, at 12; Josh Blackman, *Equal Protection from Eminent Domain: Protecting the Home of Olech's Class of One*, 55 LOY. L. REV. 697, 701–09 (2009).

purchase based on an analysis of hydrological and environmental benefits versus acquisition cost. This bidding could borrow from the bidding regulations in the CRP, a federal program that pays farmers rent to fallow their land to produce environmental benefits.[106] The CRP has a competitive bidding process that allows farmers to offer CRP rental contracts for less than the maximum rental value calculated by the government.[107] Of course, the federal acquisition price will need to hew to fair market value for farmers to agree to sell. We do not recommend the common practice in residential managed retreat of paying pre-disaster market value in light of the competitive market for water rights and the fact that water rights retreat does not require farmers to physically relocate.[108] Also, in some cases, water rights are now more valuable than they were prior to the drought due to shortage.[109]

Following government acquisition of water rights, we advocate dedicating these rights permanently to instream flows and other non-consumptive, environmentally beneficial uses. This parallels the bargain struck in residential managed retreat where taxpayer funded property acquisitions produce a public benefit in the form of open space for recreation or flood control.[110] In agricultural water rights retreat, the dedication of water rights to instream flows provides an array of environmental benefits to riparian areas, aquatic species, pollution control and water quality, as well as to human recreation and drinking water. Instream flows support populations of aquatic species, help rivers to resist invasions from alien species, and increase riparian diversity and resilience.[111] Rivers and wetlands with adequate flow also purify water that runs off the land.[112] There

106. *See supra* note 95.

107. 7 C.F.R. § 1410.31(a).

108. In residential buyouts, the state or locality implementing the federally funded buyout can choose to pay current market value or preflood fair market value, but typically opts for the latter. *See* FED. EMERGENCY MGMT. AGENCY, *supra* note 89, at 315–16; *cf.* Caroline M. Kraan, et al., Katharine J. Mach, *Promoting Equity in Retreat Through Voluntary Property Buyout* Programs, 11 J. ENV'T STUD. & SCI. 481, 484 (2021) (describing factors that can undercompensate lower-income households).

109. Thomas C. Brown, *Trends in Water Market Activity and Price in the Western United States*, 42 WATER RES. RSCH. 1, 9–10 (2006).

110. 42 U.S.C. § 5170c(b)(2)(B)(i); 44 C.F.R. § 206.434(d)(2)(i) (2022).

111. D. Jorda-Capdevila & B. Rodríguez-Labarjos, *Socioeconomic Value(s) of Restoring Environmental Flows: Systematic Review and Guidance for Assessment*, 33 RIVER RES. APPLICATIONS 305, 305–06 (2016) (overview of harms from loss of instream flows).

112. Peter J. Whiting, *Streamflow Necessary for Environmental Maintenance*, 30 ANN. REV. EARTH PLANET SCI. 181, 181 (2002); *id*. at 305.

is now a scientific consensus that healthy freshwater ecosystems require preserving or restoring natural instream flows.[113] To avoid states reducing protections for instream flows in response to new federal rights in instream flows (i.e., cancelling the gains from federal managed retreat), federal policy should condition federal acquisition of agricultural water rights on the state maintaining its existing instream flows.

Limiting the use of acquired water rights to instream flows will reduce federal government flexibility to correct future misallocations (e.g., a municipal water shortage). However, as discussed above, there are strong countervailing environmental benefits of dedicating acquired water rights to instream flows.[114] There are also market mechanisms and alternative water sources to correct future shortage or oversupply in the agricultural, municipal, or industrial sectors.[115] But fish, riparian ecosystems, and soil cannot buy water on the free market. In addition, in cases of emergency or severe need, Congress could legislate exceptions to water rights managed retreat policy to allow water rights for instream flows to be put to consumptive use for the duration of the emergency.[116]

Western tribes are also potential beneficiaries of our proposal, though they may not need retreated federal water rights if they can successfully obtain water through other legal avenues. Tribes have two options to secure instream flows and water rights on reservations that states and private parties lack (despite the Supreme Court's documented hostility to tribal rights generally).[117] First, they

113. DAVID KATZ, *Going With the Flow: Preserving and Restoring Instream Water Allocations*, *in* THE WORLD'S WATER: 2006-2007, 29, 29–31 (P. Gleick ed., 2006). Natural flow is variable with differences daily and across time. *See id.* at 30–31.

114. *See supra* notes 111–113.

115. B. Jiménez-Cisneros, *Water Reuse and Recycling*, *in* COMPREHENSIVE WATER QUALITY AND PURIFICATION 296, 299–309 (Satinder Ahuja ed., 2014); R. Aaron Hrozencik & Marcel Aillery, *Trends in U.S. Irrigated Agriculture: Increasing Resilience Under Water Supply Scarcity,* U.S. Dep't of Agric. Econ. Information Bulletin No. 229, 19–20 (Dec. 2021).

116. Congress has created flexibility in other agricultural conservation programs. For example, the Conservation Reserve Program allows for emergency haying and grazing on enrolled land, which is normally left fallow during the rental contract period, in a county that is designated as D2 or higher on the U.S. drought monitor or where there is 40% or more loss of forage production. *See Emergency Haying and Grazing*, U.S. DEP'T OF AGRIC., https://www.fsa.usda.gov/programs-and-services/conservation-programs/conservation-reserve-program/emergency-haying-and-grazing/index [https://perma.cc/8VPD-BU66] (last visited Feb. 18, 2024).

117. *See* David H. Getches, *Conquering the Cultural Frontier: The New Subjectivism of the Supreme Court in Indian Law*, 84 CALIF. L. REV. 1573 (1996). Consistent with Professor Getches' assessment of the Supreme Court's Indian law jurisprudence, the Supreme Court recently held

have a mixed appropriative-riparian reserved water right that is superior to almost all state water rights under the 1908 Supreme Court holding in *Winters v. United States*.[118] Indian reserved rights were long thought to be confined to water for agriculture, but they can now be asserted for traditional non-consumption uses such as fishery flows.[119] Second, tribes have been successful in securing instream flows in congressional water rights settlements.[120] Currently, there are new water settlement proposals before Congress to secure additional water rights for tribes.[121] If these options fail to provide adequate water rights for tribes, our hope is that a federal pool of rights from managed retreat will be available to support tribal instream flows.[122]

### 1. Other Benefits of Retreating Agricultural Water Rights for Instream Flows

In addition to the environmental benefits discussed above, managed retreat of agricultural water rights for instream flows has efficiency and distributive payoffs. First, compared to relocating farmers or acquiring western farmlands, managed retreat of water rights lowers transaction costs and increases efficiency. When the goal is to safeguard water supply and produce environmental benefits, purchasing land in order to reduce water consumption adds unnecessary acquisition costs for government and dislocation costs for farm-

in *Arizona v. Navajo Nation* that the federal government had not violated its fiduciary duty to the reservations by failing to plan for the effects of climate change on tribal water. 599 U.S. 555, 565–570 (2023).

118. Winters v. United States, 207 U.S. 564, 577 (1908) (holding that Indian reserved water rights have a priority, which date to the creation of the reservation or time immemorial, but, as in the case with riparian rights, Indian water rights can be asserted at any time).

119. United States v. Adair, 723 F.2d 1394, 1411 (9th Cir. 1984); Baley v. United States, 942 F.3d 1312 (Fed. Cir. 2019), *cert. denied*, 140 S. Ct. 133 (2020) (holding that the Klamath Tribe had a reserved right to support lake levels sufficient to support a listed threatened species central to tribe's culture).

120. *See, e.g.*, The Nez Perce Adjudication, Pub. L. 108-447, 108 Stat. 4431 (2004); Ann R. Klee & Duane Mecham, *The Nez Perce Indian Water Right Settlement-Federal Perspective*, 42 IDAHO L. REV. 595, 602 (2006); *see generally* CHARLES V. STERN, CONG. RSCH. SERV., R44148, INDIAN WATER RIGHTS SETTLEMENTS 16–19 (Oct. 13, 2023), https://crsreports.congress.gov/product/pdf/R/R44148 (describing Indian water rights settlement history and process) [on file with the Journal].

121. *See* STERN *supra* note 120, at 17.

122. Notably, the Supreme Court appears bent on limiting the tribes' water rights, as evidenced by its decision in *Arizona v. Navajo Nation*. *See supra* note 117.

ers.[123] Acquiring water rights also may be less costly for the government than monitoring compliance with regulations or providing subsidies for specific climate adaptation practices in farming.[124]

Another advantage to our proposal is that dedicating water to instream and environmental uses may promote water efficiency for municipalities. Federal acquisition of water for instream flows will restrain, at least partially, a more recent misallocation in western water: overuse of water by urban centers.[125] Dan Tarlock and Sarah Bates have described how western cities usually win "water fights" with other users, either via legal rules that favor their interests or by purchasing water rights in markets.[126] As a result, cities have faced fewer constraints on water than other users, which has delayed western urban transition to water planning and sustainability practices.[127] If faced with more competition from the federal government for water rights purchases, municipalities will have a greater incentive to adopt water saving measures. Municipalities have been responsive to water shortages in the past, with Las Vegas adopting restrictions on lawn watering and incentives for installing low-flow toilets following federal restrictions on Colorado River water consumption.[128]

There are also benefits to retreating water rights used for irrigated agriculture specifically, rather than water rights used for other pur-

123. In our work on climate transition policies to aid farmers, we suggested that the federal government could acquire land or offer relocation assistance, in addition to the option of acquiring water. The goal in that policy is to provide adequate funds to farmers to move operations or develop nonagricultural revenue streams on their land. *See* Stern & Tarlock, *supra* note 2.

124. Daniel Henstra, *The Tools of Climate Adaptation Policy: Analysing Instruments and Instrument Selection*, 16 CLIMATE POL'Y 496, 506–07 (2016).

125. *See* A. Dan Tarlock & Sarah Bates, *Western Growth and Sustainable Water Use: If There are No Natural Limits, Should We Worry About Water Supplies*, 38 ENV'T L. REP. 33, 35, 39 (2008); *see also* Richard G. Luthy, Jordyn M. Wolfand, & Jonathan L. Bradshaw, *Urban Water Revolution: Sustainable Water Futures for California Cities*, J. ENV'T ENG'G, Jul. 2020, at 3–4 (2020).

126. Tarlock & Bates, *supra* note 125, at 48 (noting that "in major water fights, cities almost always win.").

127. *Id.* at 34–38.

128. A.B. 356, 2021 Leg., 81st Sess. (Nev. 2021); *Water Smart Landscapes Rebate*, LAS VEGAS VALLEY WATER DIST., https://www.lvvwd.com/conservation/rebates/index.html#:~:text=Upgrade%20existing%20grass%20to%20water,at%20702%2D258%2DSAVE [https://perma.cc/V967-AAK6] (last visited July 29, 2023); *see also Incentives & Rebates*, NID, https://www.nidwater.com/incentives-rebates#:~:text=Toilet%20Rebate%20Program%3A%20The%20Nevada,gallons%20per%20flush%20or%20less [https://perma.cc/W26L-7GTL] (last visited Feb. 18, 2023).

poses. Acquiring water rights from non-agricultural rights holders might modestly reduce the costs of managed retreat or, at times, secure water rights with greater environmental value. Nonetheless, we suggest focusing federal acquisitions at least primarily, if not solely, on agricultural water rights for a number of reasons. Acquiring water rights from farmers reduces the magnitude of western water misallocation by shifting some water rights from agriculture to instream flows. It also creates multiple, possibly synergistic, environmental benefits for the climate-pummeled West by increasing western water supply while decreasing arid agriculture and its environmental impacts.[129] With respect to climate transition, managed retreat of water rights can benefit farmers who might otherwise not be able to sell their water rights—and generally increases demand for agricultural water rights by adding government to the market as buyers.[130] Also, in practice the water rights available to the government to buy are likely to be agricultural. The lion's share of water rights and water consumption is agricultural (and the other large category of water rights holders, municipalities, now seek to buy water rights, not to sell them).[131]

### 2. Funding Managed Retreat of Western Water Rights

Retreating water rights will entail sizable federal expenditures. However, the federal government is already expending massive sums in an attempt to remedy the effects of drought and climate change on western agriculture. The government has spent billions in disaster relief, Farm Bill appropriations, and most recently a 1.2 billion payoff to the western basin states to accept restrictions on their Colorado River consumption.[132] These vast sums have not yet secured a long-term improvement in western water allocation or ade-

129. For a description of the environmental impacts of farming the desert, *see* John L. Cloudsley-Thompson, *Desertification or Sustainable Yields from Arid Environments*, 15 ENV'T CONSERVATION 197, 198–201 (1988).

130. In some cases, the ability to sell water rights can enable a farmer to remain on their land and convert it to non-agriculture use or shift to dryland farming (farming without irrigated water) if feasible.

131. *See supra* notes 78 and 125.

132. *See supra* note 20; Agricultural Improvement Act of 2018, Pub. L. No. 115-334. In 2017–2022 there were appropriations of more than $19 billion for crop and livestock losses from natural disasters, including drought. MEGAN STUBBS, CONG. RSCH. SERV., RS21212, AGRICULTURAL DISASTER ASSISTANCE SUMMARY (last updated Dec. 12, 2023), https://crsreports.congress.gov/product/pdf/RS/RS21212 [on file with the Journal].

quate protection of environmental interests. However, these expenditures do point to potential funding sources for agricultural managed retreat.

The two major sources of federal funding for managed retreat of western water rights are the Farm Bill and disaster relief appropriations. Every five years, agriculture receives enormous subsidies through the Farm Bill, with the 2018–2023 appropriations for nutrition programs and agriculture totaling $428 billion.[133] The Farm Bill also funds programs such as the CRP that advance conservation and improve ecosystems on private farmland. As discussed previously, the CRP pays farmers rent to fallow land, which provides environmental benefits such as reducing soil erosion or preserving plant or animal biodiversity.[134] The program is substantial, with 24.8 million acres in total enrolled in CRP contracts in 2023.[135]

In addition, disaster relief funds could fund water rights acquisitions, just as they currently fund buyouts of homes in residential managed retreat.[136] The Stafford Act includes drought as a category of major disaster eligible for Congressional disaster appropriations.[137] Recently, the USDA began a $3.7 billion Emergency Relief Program (ERP) to compensate farmers and ranchers for losses from disasters, including drought.[138] Some of these funds could be used to acquire western agricultural water rights. Federal agricultural managed retreat programs could also require states (or, alternatively, non profit groups or individual farmers) to contribute a cost-share to managed retreat of water rights.[139] States may be willing to contrib-

133. *Farm Bill Spending*, U.S. DEP'T OF AGRIC. (last updated Feb. 7, 2023), https://www.ers.usda.gov/topics/farm-economy/farm-commodity-policy/farm-bill-spending/ [https://perma.cc/BD9P-32D4].

134. *See Conservation Reserve Program*, *supra* note 95.

135. *Id.*

136. 42 U.S.C. 5170c(b); BRUCE R. LINDSAY & JUSTIN MURRAY, CONG. RSCH. SERV., R40708, DISASTER RELIEF FUNDING AND EMERGENCY SUPPLEMENTAL APPROPRIATIONS, at 5–21 (Jan. 26, 2010) (data on high dollar federal funding and emergency supplemental relief following disaster declarations).

137. 42 U.S.C. § 5122(2).

138. *Emergency Relief,* U.S. DEP'T. OF AGRIC. https://www.fsa.usda.gov/programs-and-services/emergency-relief/index#:~:text=The%20first%20phase%20of%20ERP,Assistance%20Program%20(NAP)%20data%20already [https://perma.cc/GY6A-MMQR] (last visited Feb. 17, 2024); *see also* U.S. DEP'T. OF AGRIC., FARM SERV. AGENCY, DISASTER ASSISTANCE: EMERGENCY DISASTER DESIGNATION AND DECLARATION PROCESS 1 (n.d.).

139. Residential managed retreat under the Hazard Mitigation Grant Program has a cost-sharing requirement where state or local government, the homeowner, or other contributor must pay a percentage of the cost. *See, e.g.,* 42 U.S.C. § 5170c(a) (authorizing the President to "contribute up to 75% of the cost of hazard mitigation measures").

ute in order to meet federal or inter-state water curtailment agreements or to restore beloved, and often heavily touristed, rivers and streams.

Even with agricultural and disaster relief funding, the federal government faces capital constraints. In addition to using competitive bidding to reduce costs, the federal agencies will need to strategically select water rights in order to produce the greatest environmental gains at the least cost. The next Section considers how science can guide the selection of water rights in managed retreat.

### B. Science-Informed Managed Retreat

The question of which water rights to retreat raises a combination of geographic and hydrologic questions that federal agencies will need to address. Areas of the West differ in the severity of drought and its impacts on the environment, hydrologic conditions, preexisting protections by states of instream flows, as well as the cost of water rights and the willingness of farmers to sell. This Section seeks to establish the important role for science in selecting water rights to retreat in order to secure environmental benefits. We do not propose a specific approach or algorithm for selecting water rights; we leave the development of these tools to hydrologists and environmental scientists. Instead, we discuss the rationales for science-informed managed retreat and the kinds of scientific information that could guide water rights selection.

Managed retreat of water rights requires a science-informed approach to create environmental benefits and improve western water allocation. Finding the intersection of water rights acquisition costs and hydrological and environmental benefits will be a major task of the federal agency implementing managed retreat (likely the USDA).[140] We use the term "science-informed" rather than "science-based" because managed retreat of water rights cannot function in a technocratic vacuum and consideration of non-scientific criteria will be necessary. The federal government will need to navigate factors such as cost, the distribution of willing sellers, area-specific political and cultural sentiments, and the needs of under-represented groups

140. In other managed retreat programs, such as for residential homes in flood or other disaster zones, there are often more applicants than funds. *Hazard Mitigation Grant Program,* FED. EMERGENCY MGMT. AGENCY, https://www.fema.gov/grants/mitigation/guide/part-2/a [https://perma.cc/2Z34-HGAK] (last updated Dec. 12, 2023).

in managed retreat of agricultural water rights. As a result of these competing considerations and the voluntary nature of the acquisitions, science-informed managed retreat of water rights will not be fully environmentally efficient. In addition, water science itself is imperfect and still progressing. On balance, however, a science-informed approach should deliver significant environmental benefits compared to other methods of selecting water rights.

In addition to advancing environmental rationality, a science-informed approach offers another benefit: a modest layer of insulation from regulatory capture.[141] Agriculture has always been a paradigmatic example of interest group jockeying for subsidies.[142] A science-informed metric asserts neutral criteria into the selection process, essentially shrinking the amount of government discretion for interest groups to capture. Of course, a science-informed approach is far from politically impenetrable by determined interest groups.[143] We should anticipate political contestation by interest groups about which scientific metrics or selection tools to utilize. Even then, however, science raises the cost of capture for interest groups by requiring them to develop scientific expertise and hire experts to refute the existing science and lobby for a different scientific approach.

What science could be useful to select water rights for managed retreat? We trace here three approaches, non-exclusive in our view, that offer starting places for federal agencies to consider. First, the CRP has long utilized an Environmental Benefits Index (EBI) to select applications.[144] As discussed previously, the CRP enters into ten- to fifteen-year rental contracts with farmers to leave certain fields fallow in order to benefit soil and water quality and biodiversity. Using the EBI, the USDA ranks farmland based on a scoring matrix that includes point values for wildlife, water quality, erosion, air quality, and a cost factor based on the rent a farmer will accept.[145] The point

141. Kishore Gawande & Bernard Hoekman, *Lobbying and Agricultural Trade Policy in the United States*, 60 INT'L ORG. 527, 556 (2006) (describing interest group politics in agricultural subsidy).

142. *Id.*; Gordon C. Rausser, *Predatory Versus Productive Government: The Case of U.S. Agricultural Policies*, 6 J. ECON. PERSP. 133, 139–41, 149–52 (1992).

143. Large lobbying groups for agriclture include the American Farm Bureau Federation, specialty groups such as the National Cattlemen's Beef Association, and state-based lobbying groups.

144. 84 Fed. Reg. § 66813.

145. U.S. DEP'T OF AGRIC., FARM SERV. AGENCY, CONSERVATION RESERVE PROGRAM FACT SHEET 2–3 (Jan. 2021).

values are based on site-specific factors, for example location in a wildlife priority area and the slope of fields for erosion and pollution runoff.[146] A managed retreat program could develop a comparable metric based on the benefits from retiring specific agricultural water rights to riparian areas, biodiversity, and water quantity and quality. This calculation could include not only the benefit of the federal government dedicating the acquired water rights to instream flows or groundwater, but also the environmental benefits from reducing or ceasing irrigated agriculture on that land (i.e., by buying the water rights).

Second, a new analytic approach based on the concept of ecological drought can inform managed retreat of water rights. Ecological drought is an "episodic deficit in water availability that drives ecosystems beyond thresholds of vulnerability, impacts ecosystem services, and triggers feedbacks in natural and/or human systems."[147] Compared to other definitions of drought, ecological drought moves beyond the traditional focus on humans to compare the water needs of specific ecosystems and multiple species (including humans) to their water supplies.[148] Researchers have created indices of ecological drought that measure when water supply exceeds the resilience of different types of ecosystems and species and validated them in drought-stricken areas.[149] This tool sheds light on ecosystem sensitivity, tipping points, and marginal harms to ecosystem services (the benefits that ecosystems provide to humans).[150] An ecological drought index is most useful at evaluating river basins; it is not sufficiently fine-grained to address smaller areas or individual parcels of land.[151] With respect to water rights managed retreat, an ecological drought analysis could help the federal government to target par-

146. ROBERT JOHANSSON, U.S. DEP'T OF AGRIC., EB-3, CONSERVATION PROGRAM DESIGN: PARTICIPANT BIDDING ENHANCES COST EFFECTIVENESS 2 (2006).

147. The concept of environmental drought was defined in a 2017 paper. *See* Shelley D. Crausby et al., *Defining Ecological Drought for the Twenty-first Century*, 98 BULL. AM. METEOROLOGICAL SOC'Y 2543, 2544–45 (2017). Ecological drought is also called environmental drought. Some researchers position environmental drought as focusing more on human-ecosystem interactions than ecological drought. Aman Srivastava & Rajib Maity, *Unveiling an Environmental Drought Index and Its Applicability in the Perspective of Drought Recognition Amidst Climate Change*, J. OF HYDROLOGY, Dec. 2023, at 2 (2023).

148. *See* Srivastava & Maity, *supra* note 147.

149. Crausby et al., *supra* note 147, at 2545–57; Srivastava & Maity, *supra* note 147, at 13–22.

150. Srivastava & Maity, *supra* note 147, at 2.

151. *Id*.

ticularly vulnerable areas and to determine the volume of water rights to acquire to produce ecosystem resilience and hydrological benefits.[152] Ideally, this analysis would include not only present conditions, but projections of environmental impacts and tipping points in the future as climate change progresses.

Third, a growing number of sophisticated crop-switching models calculate the benefits of relocating agriculture to freshwater, carbon, and biodiversity, as well as to crop yields. For example, the Potsdam Institute for Climate Impact Research found that relocating major crops nationally brought freshwater use to virtually zero, as well as decreasing carbon sink losses by 59% and biodiversity loss by 77%.[153] There are also substantial benefits to crops, with crop movement to water-rich and temperate regions predicted to reduce climate change-related crop losses by half.[154] Of course, water rights managed retreat will not secure all of the gains from full crop switching models because under our proposal the government buys water rights on a voluntary basis for instream flows and does not select new locations for agriculture. However, the retirement of western water rights from agricultural use to instream flows will tend to shift agriculture east, to locations more suitable for major crops such as wheat or corn.[155] An agency implementing a water rights managed retreat could calculate the benefits of retirement of certain water rights to include the benefits from predicted agricultural movement eastward. The crop-switching models are instructive on how federal scientists can integrate hydrology, geography, agriculture, and other factors to model environmental benefits from water rights retreat.

### C. Challenges and Concerns

Federal managed retreat of water rights will be controversial in western states accustomed to state and private water rights, as well

152. Another tool, already used by the federal government, is the U.S. Drought Monitor map, which provides a weekly assessment of drought conditions across the country. *What is the USDM?*, U.S. DROUGHT MONITOR https://droughtmonitor.unl.edu/About/WhatistheUSDM.aspx [https://perma.cc/5EHS-V7YY] (last visited Feb. 22, 2024).

153. Robert M. Beyer et al., *Relocating Croplands Could Drastically Reduce the Environmental Impacts of Global Food Production*, COMMC'N. EARTH & ENV'T, Mar. 2022, at 3.

154. James Rising & Naresh Devineni, *Crop Switching Reduces Agricultural Losses from Climate Change in the United States by Half Under RCP 8.5*, NATURE COMMC'N., Oct. 5, 2020, at 2–3 (Grantham Research Institute on Climate Change and the Environment at the London School of Economics model of major U.S. crops of barley, corn, cotton, soybeans, rice, and wheat).

155. *See supra* notes 153 & 154.

as among farmers who prefer subsidies to farm in place despite the megadrought. In this Section, we briefly discuss some of the challenges and objections to federal managed retreat of western agricultural water rights. Our proposal is both novel and politically sensitive, factors which will generate a variety of challenges. We cannot address all of these potential issues in this Article, and instead focus this Section on some of the chief concerns.

The first line of objection is that managed retreat is politically infeasible and will falter under opposition from westerners and state governments. While we believe there will be controversy, it should be tempered by the reality that western farmers are already abandoning farms and selling water rights.[156] Managed retreat is not causing western agriculture to dwindle, it is responding to the ongoing reality of agricultural loss due to climate change. Farmers who wish to sell water rights and suspect they may struggle to find buyers in the private market may support, rather than oppose, federal acquisitions.[157] The option to sell water rights may be particularly attractive if it enables farmers to remain on their land.

We suspect state governments will be ambivalent. On the one hand, states may resist federal control over even a modest amount of western water rights, which have been the province of states and private users for over a century.[158] On the other hand, arid states now confront severe water shortages, dying fish, and lost tourism revenue; some western states face water curtailments and the looming threat of more reductions to Colorado River consumption in the future.[159] These states have incentives to support federal acquisitions of water rights for instream flows that improve state waterways, especially when all or most of the funding comes from federal coffers.

The political sticking point is likely not federal water rights acquisitions, at least at the scale that we propose, but rather the potential for managed retreat to displace existing farming subsidies. Farmers and states will worry that managed retreat will divert funds from agricultural and climate adaptation subsidies to continue western farming. This is not a specious objection. As discussed in Part V(A)(2), we envision funding managed retreat by shifting some

156. For an overview of the farmer drought retreat, *see* Stern & Tarlock, *supra* note 2.
157. *See supra* notes 2 & 78.
158. *See* discussion *supra* Part III.
159. *See supra* notes 11–20.

money from subsidies for farming in place to acquiring water rights. This reallocation of government funding is undesirable to many western agricultural interests and state governments, but in our view it is inevitable. It is not possible for western agriculture to survive climate change at its current scale.[160] Agricultural policy cannot outspend the duration or intensity of climate change with subsidies for adapting agriculture in its existing locations. Notably, government spending is beginning to recognize this with the recent federal payments to some of the basin states to curtail their water consumption, as discussed previously.[161]

Another concern is that managed retreat of water rights will lead to the loss of the western farming tradition and culture, or displacement of certain minority groups of farmers. In our view, the megadrought, climate change, and the acute spatial misallocation of agriculture to the western states are the causes of farmland loss in the west, not managed retreat. It is possible that managed retreat of water rights may accelerate the timing of farmland losses, and thus cultural losses. But these losses will occur regardless as aridity and temperature continue to increase.[162] A bigger concern may be whether federal acquisitions will disproportionately affect certain groups. For example, Black farmers in the West may disproportionately sell water rights to the federal government as a result of greater vulnerability to drought or even federal agencies targeting them. However, less access to water rights retreat or lower participation by members of these groups could also be inequitable.[163] In the context of climate change and a protracted megadrought, government water rights retreat offers a potentially desirable and valuable option to farmers to mitigate their losses,

The dynamism of water, environmental conditions, and drought is another challenge to water rights retreat. We advocate permanently dedicating acquired water rights to instream flows. However, at some future point in time, instream flows may be sufficient in one location that has dedicated water rights and needed in another location. We suggest that the federal government retain some flexibility to shift water, but not to decrease the total volume of acquired water

160. *See, e.g.*, Beyer et al., *supra* note 153.

161. *See supra* notes 19 & 20.

162. Stern & Tarlock, *supra* note 2 (describing in detail the third wave of agricultural drought retreat).

163. For a similar argument with respect to equity concerns in residential retreat, *see* Stern, *supra* note 80, at 219–23.

rights dedicated to instream flows. For example, if water levels recover in one area, the federal government could utilize a special approval process to sell some water rights in order to purchase water rights in an area with higher environmental need. In some cases, it may be possible to physically transfer water (e.g., via conduits) to another location in greater need of flows; however, we suggest safeguards for physical transfers in view of the environmental damage caused by federal waterway intervention with dams.[164]

Most generally, the federal government will need to overcome distrust. Federal intervention in western water may arouse concerns about federal overreach or abuse (despite the federal government's history as the original holder of western water rights discussed in Part III). The federal government must also overcome the historic memory of damaging property acquisitions in the past, such as misguided urban renewal programs funded by the federal government in the 1950s and 60s.[165] On the other hand, there are precedents for federal intervention in agricultural property rights that could increase comfort levels with water rights managed retreat. Specifically, the CRP is an accepted and successful federal agricultural program where the federal government leases fields from farmers for lengthy terms.[166] The next Section considers additional precedents for agricultural retreat and water reallocation.

## VI. PRECEDENTS FOR AGRICULTURAL MANAGED RETREAT AND WATER REALLOCATION

Federal agricultural policy has focused on subsidizing climate adaptation for western farms, not on retreating agricultural water or land. Limited government experience in agricultural managed retreat and reallocating water rights is a challenge to realizing a federal managed retreat policy for agricultural water rights. This Part de-

164. *See* ERIC KUHN & JOHN FLECK, SCIENCE BE DAMMED: HOW IGNORING INCONVENIENT SCIENCE DRAINED THE COLORADO RIVER 23–25 (2019) (examining harms from dams in desert West); Christine A. Klein, *On Dams and Democracy*, 78 OR. L. REV. 642, 641–44, 659–65 (1999) (describing the social costs of damming rivers for agriculture).

165. William J. Collins & Katharine L. Shester, *Slum Clearance and Urban Renewal in the United States*, 5 AM. ECON. J. 239, 241–42, 265 (2013) (urban renewal imposed high dislocation costs, but also had positive effects on income, property values, and population in participating cities). For tribes, the comparisons are even worse: the relocations they face from climate change will be second moves (or more) following the U.S. government's involuntary relocation of tribes to reservations.

166. *See supra* note 95.

scribes historic federal policies, policy proposals, and academic scholarship that serve as partial precedents for managed retreat of agriculture and agricultural water rights, as well as one example of state reallocation of agricultural water rights in Hawai'i.

### A. Precedents for Federal Agricultural Managed Retreat

While residential managed retreat has generated policies around the globe and a voluminous literature, agricultural retreat scarcely exists as a concept.[167] There is one precedent in U.S. history for managed retreat of farmers and farmland (not of water rights). During the New Deal era, the federal government created the Resettlement Administration to address the devastation to small farms from the Dust Bowl.[168] The Resettlement Administration acquired farms, provided loans and assistance to farm owners and tenants devastated by the Dust Bowl, and built camps to house migratory farm workers left without homes or work.[169] The program was controversial and, as a result, not well funded, because Congress perceived that resettlement amounted to "socialism."[170] In total, the Resettlement Administration (later renamed the Farm Security Administration) relocated a few thousand farmers, falling short of its ambitious goals to acquire ten million acres of deteriorated farmland, convert it to parks and forests, and resettle 20,000 farm families.[171] There has not been another federal managed retreat program for farmers since.

Today, Congress and the executive branch fund climate adaptation technologies and subsidies to sustain agriculture in place, without

167. For overviews of this burgeoning literature, see Dundon & Abkowitz, *supra* note 82, at 2. *See also* Gerald Taylor Aiken & Leslie Mabon, *Where Next for Managed Retreat: Bringing in History, Community, and Under Researched Places*, AREA, Mar. 2021, at 1–2 (2021) (describing explosion of policy and academic interest in managed retreat and detailing future directions).

168. REXFORD G. TUGWELL, THE RESETTLEMENT ADMINISTRATION PROGRAM 9 (1936); U.S. DEP'T. OF AGRIC., *History of USDA's Farm Service Agency*, https://www.fsa.usda.gov/about-fsa/history-and-mission/agency-history/index [https://perma.cc/UJ2Q-KDJS] (last visited Feb. 22, 2023).

169. *Id.*; Charles Kenneth Roberts, *Client Failures and Supervised Credit in the Farm Security Administration*, 87 AG. HIST. SOC'Y 368, 371 (2013).

170. NAT'L ARCHIVES, THE FARM SECURITY ADMINISTRATION PHOTO PROJECT 1, https://www.archives.gov/files/atlanta/education/depression-curriculum/section-2.pdf [https://perma.cc/M75V-AV5R] ("Conservative critics attacked the FSA and its predecessor, the Resettlement Administration (RA) as "socialistic.").

171. SIDNEY BALDWIN, POVERTY AND POLITICS: THE RISE AND DECLINE OF THE FARM SECURITY ADMINISTRATION 105 (1968).

serious consideration of agricultural managed retreat.[172] Climate adaptation in place is an important component of federal climate strategy for agriculture, but it cannot address the full scale of the western water crisis. The omission of agricultural managed retreat from federal policy has occurred despite the USDA and other federal agencies producing reams of guidance, regulations, and announcements about agricultural climate adaptation.[173] Some of these documents contain brief nods to retreat as a potential strategy for agriculture but no policy proposals or plans. There is a small reference in the 2023 General Accounting Office (GAO) report on resiliency options for the U.S. Department of Agriculture about the need for regional resiliency planning, which could be interpreted to include shifts in the amount and type of agriculture in arid regions.[174] In addition, the federal Fifth National Climate Assessment signaled briefly that crop relocation may be a future option when it noted that "fundamentally reimagining how and where crops are produced" may be more effective than "cheaper and easier incremental changes like improved irrigation."[175]

In the academic scholarship, the only proposal for a managed retreat policy for agriculture that we are aware of is our prior work on just climate transition for small farmers.[176] In that article, we sought to extend the concept of managed retreat to agriculture—a new approach in a sector glutted with subsidies incentivizing farming in its existing locations. We advocated easing the pain of climate transition for stranded small farmers by offering buyouts of farmland and

172. An act to provide for reconciliation pursuant to title II of S. Con. Res. 14, 136 Stat. 1818; *Fact Sheet: Biden-Harris Administration Makes Historic Investments to Build Community Climate Resilience*, WHITE HOUSE (June 19, 2023), https://www.whitehouse.gov/briefing-room/statements-releases/2023/06/19/fact-sheet-biden-harris-administration-makes-historic-investments-to-build-community-climate-resilience/ [https://perma.cc/U5UZ-ZUEW] [hereinafter *Biden-Harris Climate Resilience*].

173. *See generally* U.S. DEP'T OF AGRIC., ACTION PLAN FOR CLIMATE ADAPTATION AND RESILIENCE (Aug. 2021); U.S. GOV'T ACCOUNTABILITY OFF., GAO-23-104557, CLIMATE CHANGE OPTIONS TO ENHANCE RESILIENCE OF AGRICULTURAL PRODUCERS TO REDUCE FEDERAL FISCAL EXPOSURE (2023) [hereinafter GAO-23-104557].

174. See GAO-23-104557, supra note 173, at 31 ("Several experts told us that a robust regional strategic planning process that is inclusive could help build consensus and facilitate participant buy-in to climate resilience policies . . . drive research priorities or technical assistance initiatives to address region-specific vulnerabilities . . . [and] identify gaps in available information and on climate resilience good practices, or gaps in the technical assistance available to producers in different regions.").

175. E. Wasley et al., *Ch. 31 Adaptation*, in FIFTH NATIONAL CLIMATE ASSESSMENT (2023) (emphasis added).

176. *See* Stern & Tarlock, *supra* note 2.

other forms of relocation assistance.[177] We also recommended that the government adopt "economic retreat" policies to help farmers convert land to profitable non-agricultural uses and for job retraining for farm workers.[178]

For managed retreat of agricultural water rights, there are promising signs of interest by policymakers and elected officials in acquiring western water rights or paying on a short-term basis to dedicate them to instream flows. In 2022, Democratic state senators in California proposed, but did not successfully enact, a state water trust to buy land with senior water rights to high priority, at risk water.[179] The proposal explicitly noted the need for water reallocation by the government, stating that acquisitions by the state water trust would "realign demand, supply, and the flexibility of the [water] system."[180] It was not confined to farmers, but California farmers hold a large volume of senior water rights.[181] At the federal level, a 2023 bill proposed paying farmers to restrict their groundwater use. Senators from New Mexico, Colorado, and Kansas introduced the Voluntary Groundwater Conservation Act to compensate farmers at fair market value for conservation easements that would limit use of their groundwater rights.[182] The program, if enacted, would be administered by the USDA.[183]

Perhaps the most significant step taken in the direction of managed retreat is the federal government's short-term agreement with the Western basin states to compensate them for reductions in Colo-

177. *Id*.

178. *Id*.

179. *See* CAL. S. BUDGET AND FISCAL REVIEW SUBCOMM. NO. 2, AGENDA 6-9 (May 10, 2022), https://sbud.senate.ca.gov/sites/sbud.senate.ca.gov/files/Agenda_Sub_2_May_10_Final.pdf [https://perma.cc/B6JW-EKX2]; CAL. S. DEMOCRATS, PUTTING CALIFORNIA'S WEALTH TO WORK FOR A MORE EQUITABLE ECONOMY (n.d.), https://sbud.senate.ca.gov/sites/sbud.senate.ca.gov/files/Putting%20Wealth%20to%20Work%20Senate%20Budget%20Plan.pdf [https://perma.cc/5CTZ-668C]. The water rights purchase plan was not enacted in the 2022–23 budget. *See generally* DEP'T OF WATER RES., 2022–23 STATE BUDGET—RES 1, https://ebudget.ca.gov/2022-23/pdf/Enacted/GovernorsBudget/3000/3860.pdf [https://perma.cc/USY7-XM4N]. However, in 2023 a bill was introduced that sought to amend the water code to allow the water board to verify senior water rights claims, possibly with an eye toward state government acquisition of those water rights in the future. *See* Cal. Water Code § 1051 (West).

180. Stephanie Elam, *Property Owners and Officials Find Ways Around Century-Old Laws as the West Runs Out of Water*, CNN (July 10, 2022), https://www.cnn.com/2022/07/10/us/west-water-crisis-property-rights-climate/index.html [https://perma.cc/GA8N-JZTH].

181. *Id*.

182. Voluntary Groundwater Conservation Act, H.R. 4902, 118th Cong. (2023).

183. *Id*.

rado River water consumption.[184] This funding pays irrigation districts, tribes, and cities approximately $521 for each acre-foot of water conserved, totaling 1.2 billion over three years.[185] The federal government's goal was to improve the extremely low water level of the Colorado River and the consequent environmental damage and water insecurity. Absent renewal, this federal funding expires at the end of 2026.[186] The agreement offers a potential policy springboard for the federal government to move to permanent managed retreat of water rights. In 2026, the government could seek to renew payments for longer periods of time, or, we suggest, invest these federal dollars in outright purchases of western agricultural water rights.

### B. Hawai'i's Experience Reallocating Water Rights

One of the problems that must be addressed in deciding how to reallocate a federal pool of water rights is that neither the federal government nor the states have substantial experience in the reallocation of water. The objective of water law and management has been to squeeze as much blood from the turnip as possible. Since many rivers are over-allocated and aquifers mined, the West has increasingly turned to conservation and alternative sources of water such as desalinization and treated sewage, rather than reallocation.[187]

There is one state, Hawai'i, that has had experience in reallocating significant water. From the first sugar plantation in 1835 to the 1970s, Hawai'i's agriculture was based on pineapple and sugar plantations.[188] These plantations were the major users of agricultural water.[189] In anticipation of the end of the plantation economy, in 1994 the legislature created the Agribusiness Development Corpora-

184. *See supra* note 20.

185. Grayson Zulauf, *Colorado River Deal Forever Changes the Price of Water in the West*, CAL MATTERS, (June 6, 2023), https://calmatters.org/commentary/2023/06/colorado-river-deal-west-water [https://perma.cc/KE4D-TNCQ].

186. Flavelle, *supra* note 20.

187. R. Aaron Hrozencik & Marcel Aillery, *supra* note 115, at 119–20.

188. *See* WILLIAM DORRANCE, SUGAR ISLANDS: THE 165-YEAR STORY OF SUGAR IN HAWAII (2000); CAROL WILCOX, SUGAR WATER: HAWAII'S PLANTATION DITCHES (1990). Hawai'i's planation economy began to collapse in the 1990s as pineapple production was shifted to Thailand. L.W. Boyd, *The End of Hawaii's Plantations: Back to the Future?,* 554 ANNALS OF THE AM. ACAD. OF POL. AND SOC. SCI. 95, 96 (1996). The last sugar plantation shut down in 2016. Anita Hofschneider, *Say Goodbye to Hawaii's Last Sugar Plantation*, HONOLULU CIV. BEAT, (Jan. 6, 2016) https://www.civilbeat.org/2016/01/say-goodbye-to-hawaiis-last-sugar-plantation/ [https://perma.cc/5S2Y-MGZH].

189. *See* WILCOX, *supra* note 188.

tion (ADC).[190] The ADC has the power to acquire lands and water rights and lease them to both small and large farmers.[191] The ADC's purchase of a ditch on Oʻahu led to a Hawaiʻi Supreme Court decision that has shaped the reallocation of plantation water.

The Waiāhole Ditch case, *In Re Water Use Permit Applications*, arose when an Oʻahu irrigation company filed water rights applications in excess of the capacity of the ditch that fed the former Oʻahu Sugar Company.[192] In response, the Hawaiʻi Water Rights Commission ordered the current claimant to stop disposing wastewater in the ditch and required it to release surplus flows to restore depleted windward streams.[193] The Commission reasoned that it had a public duty to establish interim instream flow standards; it further concluded that it should do so by applying the precautionary principle until sufficient monitoring data was available to set permanent instream flow standards.[194]

Following the Commission decision, multiple parties appealed to the Hawaiʻi Supreme Court, with some claims challenging the Commission's decision on the public trust doctrine. The much-celebrated California Supreme Court case *National Audubon Society v. Superior Court of Alpine County* (the *Mono Lake* case) had already applied the public trust doctrine to water rights in navigable streams and lakes.[195] It was easier for the Hawaiʻi Supreme Court to apply the public trust doctrine in the Hawaiʻi Water Rights Commission's decision than for the California courts in the *Mono Lake* case for three reasons. Article XI, section 1 of the Hawaiʻi Constitution establishes an affirmative public trust duty to protect the state's waters,[196] and the Commission applied the trust to unallocated water rather than to

190. Haw. Dep't of Agric., Agrobusiness Development Corporation (last visited March 24, 2024), https://www.hawaiiag.org/hdoa/adc.htm [https://perma.cc/Z79M-XQY4].

191. *See* SUMNER LA CROIX & JAMES MAK, THE ECON. RSCH. ORG. AT THE UNIV. OF HAWAIʻI, REVIVING AGRICULTURE TO DIVERSIFY HAWAII'S ECONOMY, https://uhero.hawaii.edu/wp-content/uploads/2021/07/RevivingAgriculturetoDiversifyHawaiisEconomy.pdf [https://perma.cc/63NH-2Z8Y] (Jan 21, 2021).

192. *In re* Water Use Permit Applications, 9 P.3d 409 (Haw. 2000); McBryde Sugar Co. v. Robinson, 504 P.2d 1330 (Haw. 1973), *adhered to on reh'g*, 517 P.2d 26 (Haw. 1973) (explaining how plantations were able to acquire the rights to substantial amounts of Hawaiʻi's waters); *see generally* WILCOX, *supra* note 188.

193. *In re Water Use Permit Applications*, 9 P.3d at 424–26.

194. *Id*. at 426.

195. *National Audubon Society*, *supra* note 70.

196. *See* HAW. CONST. art. XI, § 1.

vested state water rights, as was the case in *Mono Lake*.[197] Equally important, the trust supported the state's tradition of protecting, however imperfectly, customary native water uses.[198] The Hawai'i Supreme Court affirmed that the state public trust doctrine applies to all water resources, including groundwater.[199] The Court concluded that the public trust requires the protection of rights "separate from, and superior to . . . prevailing private interests."[200]

The Hawai'i Supreme Court's interpretation of the public trust doctrine remains central to water resource planning and administration in Hawai'i. The Hawai'i Water Resource Protection Plan adheres to the state's constitutional public trust doctrine and the Hawai'i Supreme Court's decision in *In Re Water Use Permit Applications*. It states:

> The Hawai'i State Constitution recognizes that water resources are part of the public trust. The Hawai'i Supreme Court further established the following four public trust purposes: (1) maintenance of waters in their natural state; (2) domestic water use of the public, particularly drinking water; (3) the exercise of Native Hawaiian and traditional and customary rights, including appurtenant rights; and (4) reservations of water for Hawaiian Home Land allotments.[201]

Hawai'i water management faces many challenges, but there are two lessons that apply to the West. First, the protection of water supply and aquatic biodiversity must play a central role in water and natural resources management. For example, a forest management plan for the county of Hawai'i proposes to reduce the impact of feral animals in the forest in order "to increase the reliability of water supply for ecological values, as well as human uses."[202] Important stream restoration settlements have been reached in Commission

197. *National Audubon Society*, *supra* note 70, at 727–29 (holding on public trust limits vested rights when the rights harm interests protected by the public trust).

198. *See* D. Kapua'ala Sproat, *An Indigenous People's Right to Environmental Self-Determination: Native Hawaiians and the Struggle Against Climate Change Devastation*, 35 STAN. ENV'L. L. J. 157, 203–04 (2016).

199. *In re Water Use Permit Applications*, 9 P.3d at 445.

200. *Id*. at 450.

201. STATE OF HAW. COMM'N ON WATER RS. MGMT., WATER RESOURCE PROTECTION PLAN 2019 UPDATE, at 17 (2019).

202. WATERSMART ENVIRONMENTAL WATER RESOURCES PROJECT GRANT APPLICATION: PROTECTING FORESTS FOR WATER SUPPLY SUSTAINABILITY IN KOHALA, HAWAI'I 7 (2022), https://www.usbr.gov/watersmart/ewrp/docs/2022/EWRP-004_StateofHawaiiDLNR DivisionForestryWildlife_508.pdf [https://perma.cc/J7EV-C6WC].

proceedings.[203] Second, Hawai'i's water resource plans recognize that climate change is central to all aspects of water management.[204]

Hawai'i's policies underscore the importance of prioritizing environmental interests and responding to climate change in a federal government policy for reallocation, or managed retreat, of western water rights. Although the public trust doctrine does not apply directly to our proposal for a federal role in western water rights retreat, the concerns that animate the public trust doctrine are in full view in this Article. The Hawai'i experience also suggests that the unknowns of climate change may necessitate precautionary approaches to water that align with our proposal to create a federal pool of water rights for instream flows.

## VII. CONCLUSION

The megadrought and climate change will inevitably shrink agriculture in the West, an industry which has never suited its arid location. Climate adaptation, such as water-conserving irrigation and drought-resistant crops, will enable some agriculture to remain, but cannot support western agriculture at its present scale. Farmers are already retreating from drought, shuttering operations and selling their water rights to municipalities and private investment firms. The megadrought presents a crisis for the West, but also an opportunity to correct the historic misallocation of western water that has robbed waterways of instream flows and harmed riparian areas. In this Article, we propose that the federal government adopt a managed retreat policy to acquire water rights on a voluntary basis from western farmers. We advocate dedicating this new pool of federal rights to instream flows in order to improve the severe and longstanding under-allocation of western water to the environment. There is precedent in the residential sector for managed retreat of households by the federal government in response to climate change. Our proposal breaks new ground in modern agricultural law by extending managed retreat to agricultural water rights, as well as in the managed retreat field by expanding the concept of managed retreat from land, people, and infrastructure to include retreating water rights.

203. *E.g.*, *Restore Stream Flow*, EARTHJUSTICE (Apr. 10, 2014), https://earthjustice.org/feature/restore-stream-flow/ [https://perma.cc/V263-GPLS].

204. STATE OF HAW. COMM'N ON WATER RES. MGMT., *supra* note 201.