On Fish and Farms: The Future of Water in California's Central Valley after *San Luis & Delta-Mendota Water Authority v. Jewell*

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In the latest chapter of California's water wars between endangered species protection and agricultural interests, the Ninth Circuit held in San Luis & Delta-Mendota Water Authority v. Jewell *that the continued operation of the Central Valley Project and State Water Project was leading to jeopardy of the threatened delta smelt and its critical habitat in the San Joaquin Bay-Sacramento Delta. The court's decision will lead to substantial cuts in water delivery to the Central Valley of California, which is the most agriculturally productive area of the United States, to protect the delta smelt and force irrigation districts to adopt water conservation measures.*

This Note argues that procrastination acts as a significant behavioral barrier to effective environmental decision making. To prove this, this Note compares how irrigation districts in the Central Valley responded to three different conservation components of the groundbreaking California Water Conservation Act of 2009: the adoption of volumetric water pricing, investment in efficient irrigation technology, and mitigation measures against anthropogenic climate change. The results of the analysis provide strong evidence that those irrigation districts that have senior water rights are more likely to have inefficient irrigation systems and slower adoption of volumetric pricing than their junior counterparts. However, both junior and senior irrigation districts show procrastination in planning for the detrimental effects of climate change.

California must address the conservation of endangered species and the continued economic viability of the Central Valley against the backdrop of an uncertain future of water availability. Given the demonstrated tendency

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towards procrastination by irrigation districts, this Note concludes that it will be necessary for the state to implement mandatory regulations that force irrigation districts to adopt water conservation measures.

> *The history of California is written on its waters.*
> —Justice Ronald B. Robie[1]

1. State Water Res. Control Bd. Cases, 39 Cal. Rptr. 3d 189, 200 (Ct. App. 2006).

INTRODUCTION

The Endangered Species Act (ESA) is widely considered to be the most powerful legal tool for reform in water use and development in America and is implicated in nearly every new water infrastructure construction or operation in the West.[2] In *San Luis & Delta-Mendota Water Authority v. Jewell*, the Ninth Circuit demonstrated just how formidable the ESA could be by mandating that the Bureau of Reclamation substantially decrease water flow from the Central Valley Project (CVP) and State Water Project (SWP) to protect the threatened[3] delta smelt and its critical habitat[4] in the San Joaquin Bay-Sacramento Delta.[5] *San Luis* will substantially decrease water delivery from the CVP and SWP to vast swaths of California, including the Central Valley—one of America's most agriculturally productive areas.[6] These reductions are designed to mitigate harm to the delta smelt and avoid further adversely modifying its critical habitat.[7]

The irrigation districts of the Central Valley that parse out the agricultural sector's gargantuan share of California's water to individual growers will be forced to drastically cut their water usage in response to the Ninth Circuit's ruling in *San Luis*.[8] However, under California water law, senior irrigation districts have relatively little incentive to independently curtail their water usage or adopt water conservation measures given the certainty of their right to water. Cognitive barriers such as procrastination may further impede the organic adoption of water conservation measures by irrigation districts. In this latest chapter of the conflict between agricultural water use and endangered species conservation in California, it may be necessary to implement state or federal regulation to promote water conservation.

Part I of this Note begins by summarizing the facts of *San Luis*. It then provides a historical overview of various attempts by federal and state governments to mitigate conflicts between endangered species protection and agricultural water use through statutes and multistakeholder initiatives in California. It concludes with the Ninth Circuit's reasoning in *San Luis*,

2. *See* David H. Getches, *The Metamorphosis of Western Water Policy Have Federal Laws and Local Decisions Eclipsed the States' Role?*, 20 STAN. ENVTL. L.J. 3, 53 (2001).

3. Under the ESA, a species is threatened if it is "likely to become an endangered species in the foreseeable future throughout all or a significant portion of its range." 16 U.S.C. § 1532 (2012). When a species is listed as threatened, the ESA allows the FWS to "extend any or all of the Section 9 take prohibitions, as well as other necessary protective measures, to any threatened species." In re Polar Bear Endangered Species Act Listing & § 4(d) Rule Litigation, 818 F. Supp. 2d 214, 220 (D.C. Cir. 2011). The Secretary of the Interior issued an agency rule that extended the section 9 take prohibitions of the ESA to all threatened species as a baseline matter. 50 C.F.R. § 17.31(a) (2014).

4. Critical habitat under the ESA refers to "the specific areas within the geographical area occupied by the species, at the time it is listed . . . on which are found those physical or biological features . . . essential to the conservation of the species." 16 U.S.C. § 1532.

5. San Luis & Delta-Mendota Water Auth. v. Jewell, 747 F.3d 581, 599 (9th Cir. 2014).

6. *See id.* at 653.

7. *See infra* notes 108–129 and accompanying text.

8. *See id.*

focusing on the consequences of the ruling for irrigation districts in the Central Valley. Part II discusses the barriers to effective environmental decision making that arise when there is competition for scarce water resources between endangered species protection and agricultural interests. It begins with a brief overview of the California hybrid water law regime before using the Central Valley irrigation districts' response to the California Water Conservation Act of 2009 to analyze how senior and junior districts diverge in their water conservation efforts. This Part closes with a discussion of procrastination as a possible explanation for why irrigation districts have largely failed to independently adopt effective water conservation measures. The Note concludes with a discussion of why behavioral barriers such as procrastination will likely necessitate state and federal regulation mandating water conservation as California confronts water challenges in the future.

I. CONFLICTS OF CONFLUENCE BETWEEN THE ENDANGERED SPECIES ACT AND WATER MANAGEMENT IN CALIFORNIA

A. Factual Background of San Luis

The delta smelt (*Hypomesus transpacificus*) is a small three-inch fish species endemic to the San Joaquin Bay-Delta, an estuary located where the San Francisco Bay and Sacramento-San Joaquin Delta meet.[9] The delta smelt was once plentiful throughout the Bay-Delta, but despite the best efforts of state agencies and conservation groups, the most recent data available shows that the 2008 smelt population is less than 1.5 percent of its 1980 population.[10] The delta smelt has been listed as "threatened" under the ESA since 1993.[11] Its population had reached such low levels that in 2006 the U.S. Fish and Wildlife Service (FWS) announced that the smelt warranted being listed as an "endangered" species under the ESA, but noted that this reclassification was precluded by higher priority listings.[12] The delta smelt is widely considered to be an extremely important indicator species for the overall ecological health of the Bay-Delta, the largest estuary on the West Coast and a water source for both seven million acres of agricultural land[13] and twenty-two million California residents.[14]

The Central Valley Basin of California stretches over hundreds of miles and is one of the most agriculturally productive areas in the United States.[15] California agriculture is mostly concentrated in the Central Valley and uses a

9. *San Luis*, 747 F.3d at 594.
10. *Id.* at 594 & n.4.
11. *Id.* at 596.
12. *Id.*
13. *Id.* at 593.
14. Giorgos Kallis et al., *Collaborative Governance and Adaptive Management Lessons from California's CALFED Water Program*, 12 ENVTL. SCI. & POL'Y 631, 631 (2009).
15. *San Luis*, 747 F.3d at 593, 653.

total of thirty-four million acre-feet[16] of water per year, constituting nearly 80 percent of California's total water supply.[17] The water goes to producing over 90 percent of America's almonds, kiwis, lemons, nectarines, plums, and broccoli, as well as a majority of its dairy.[18] The groundwater basins underneath the Central Valley are California's largest reservoirs, but over the last forty years groundwater levels have been steadily declining as a result of overuse by agriculture.[19] This is leading to an average loss of 1.4 million acre-feet per year.[20]

Rainfall patterns in the Central Valley produce seasonal floods and droughts with a rain shortage in the summer and fall, the seasons when maturing crops need water most.[21] Furthermore, 70 percent of California's water originates north of Sacramento, while 70 percent of the state's demand lies south of Sacramento.[22] This "seasonal and geographic mal-distribution"[23] in California has been able to persist in the modern era largely due to the continued pumping of water to the Central Valley and Southern California by the CVP and SWP, "perhaps the two largest and most important water projects in the United States."[24]

The CVP and SWP pump water from the Bay-Delta to more than 20 million agricultural and domestic consumers in Central and Southern California.[25] These water projects are operated on a colossal scale. The CVP is the largest federal water management project in the United States.[26] The state-managed SWP is the largest state-built water project in the United States and provides water to two-thirds of domestic consumers in California.[27] There have been a number of competing demands on CVP and SWP water in recent years that have contributed to deteriorating ecological conditions in the Bay-Delta. For example, the 2003 Quantification Settlement Agreement was an interstate

16. An acre-foot of water is approximately 326,000 gallons. U.S. GOV'T ACCOUNTABILITY OFFICE, GAO/RCED-94-8, WATER SUBSIDIES: IMPACT OF HIGHER IRRIGATION RATES ON CENTRAL VALLEY PROJECT FARMERS 2 (1994), *available at* http://www.gao.gov/assets/160/154415.pdf.

17. HEATHER COOLEY ET AL., PAC. INST., CALIFORNIA'S NEXT MILLION ACRE-FEET: SAVING WATER, ENERGY, AND MONEY 15 (2010), *available at* http://www.pacinst.org/wp-content/uploads/sites/21/2013/02/next_million_acre_feet.pdf.

18. David Cay Johnston, *California Farms Are Slow to Adopt Water-Saving Technology*, NEWSWEEK (Feb. 13, 2014, 4:57 PM), http://www.newsweek.com/2014/02/14/california-farms-are-slow-adopt-water-saving-technology-245516.html.

19. JULIET CHRISTIAN-SMITH & CHRIS KAPHEIM, PAC. INST., VOLUMETRIC PRICING AND CONJUNCTIVE USE: ALTA IRRIGATION DISTRICT 4 (2011), *available at* http://www.pacinst.org/wp-content/uploads/sites/21/2013/02/volumetric_water_pricing_and_conjunctive_use3.pdf.

20. *Id.*

21. *Central Valley Project*, U.S. BUREAU RECLAMATION, http://www.usbr.gov/projects/Project.jsp?proj_Name=Central+Valley+Project (last updated Mar. 15, 2013).

22. San Luis & Delta-Mendota Water Auth. v. Jewell, 747 F.3d 581, 592 (9th Cir. 2014).

23. United States v. State Water Res. Control Bd., 227 Cal. Rptr. 161, 166 (Ct. App. 1986).

24. *San Luis*, 747 F.3d at 593.

25. *Id.* at 594.

26. *Id.* (quoting Cent. Delta Water Agency v. United States, 306 F.3d 938, 943 (9th Cir. 2002)).

27. *Id.*

agreement that reduced California's share of water from the Colorado River, which had historically been one of the state's major water supply sources.[28] After the Settlement Agreement there was an increase in the demand for water from the SWP.[29]

The Bay-Delta system depends on a fragile balance of fresh water flowing out of the Delta and saltwater seeping in from the San Francisco Bay to maintain its salinity levels.[30] As a result of water diverted from Bay-Delta tributaries to be pumped through the canals and aqueducts of the CVP and SWP, the Bay-Delta has seen major salinity increases that disrupt its delicate ecosystem and are the primary cause of deteriorated water quality for species including the delta smelt.[31]

On May 16, 2008, Reclamation requested a formal consultation[32] with FWS on how the long-term coordinated operation of the CVP and SWP[33] affected a number of ESA-listed species, including the delta smelt.[34] In response to Reclamation's request, FWS issued a BiOp[35] that included scientific and technical input from delta smelt experts in the FWS, California Department of Fish and Game, Environmental Protection Agency, Reclamation, and academia.[36] The delta smelt and the Bay-Delta have already been the subject of multiple litigation campaigns in recent years to overturn the "no jeopardy" finding in the biological opinions (BiOps) issued by the FWS in 2004 and 2005.[37]

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28. *Id.* at 595.

29. *Id.*

30. *Id.*

31. *Id.*

32. U.S. FISH & WILDLIFE SERV., FORMAL ENDANGERED SPECIES ACT CONSULTATION ON THE PROPOSED COORDINATED OPERATIONS OF THE CENTRAL VALLEY PROJECT (CVP) AND STATE WATER PROJECT (SWP), at i (2008) [hereinafter FORMAL ENDANGERED SPECIES ACT CONSULTATION], *available at* http://www.fws.gov/sfbaydelta/documents/SWP-CVP_OPs_BO_12-15_final_OCR.pdf. Under the ESA, if a federal agency determines that its action likely will adversely affect a listed species, it must request formal consultation with the designated federal agency. 50 C.F.R. § 402.14 (2014). This agency is the FWS for terrestrial and freshwater species and the National Marine Fisheries Service for marine species. U.S. FISH & WILDLIFE SERV., ESA BASICS: 40 YEARS OF CONSERVING ENDANGERED SPECIES, *available at* https://www.fws.gov/endangered/esa-library/pdf/ESA_basics.pdf. In response, the relevant agency is to create a BiOp that outlines and highlights the potential effects of the agency action on listed species. 50 C.F.R. § 402.14.

33. The operations of the state-operated SWP were included in Reclamation's request for consultation due to the "long-term operation of the CVP and its *coordinated operations* with state agencies of the SWP." *San Luis*, 747 F.3d at 597 (emphasis added).

34. *See* FORMAL ENDANGERED SPECIES ACT CONSULTATION, *supra* note 32, at i–ii.

35. A BiOp documents the FWS's opinion on whether an action is likely to jeopardize the continued existence of a species protected under the ESA or if the action could lead to adverse modification of the critical habitat of the species. 16 U.S.C. § 1536(b)(3)(A) (2012). The BiOp is intended to allow federal actions to proceed while also protecting listed species.

36. *See generally* 16 U.S.C. § 1536(b)(3)(A) (2012) (basic background and overview of the BiOp).

37. MATT NOBRIEGA ET AL., U.S. FISH & WILDLIFE SERV., THE USFWS STATE & FEDERAL WATER PROJECTS BIOLOGICAL OPINION: AN OVERVIEW 29 (Jan. 23–24, 2013) (PowerPoint

The BiOp concluded that the ongoing coordinated activity of the CVP and SWP were leading to a "take"[38] of the delta smelt. The FWS thus issued "jeopardy" and "adverse modification" determinations.[39] The agency stated that the continued operations of the CVP and SWP jeopardized the smelt in a variety of ways, including direct mortality of smelt in the pumps of the water projects,[40] increased stressors such as contamination, and reduced flows into the Bay-Delta due to the pumping activities of the CVP and SWP.[41] Specifically, the BiOp found that the pumping stations of the CVP and SWP located in both distributaries of the San Joaquin River were leading to direct mortality of the delta smelt through entrainment, or trapping of the fish in the pumps.[42] Although each pumping plant has louvers that ostensibly prevent fish from entering the plant while allowing water flow, the louvers are not effective for fish smaller than 1.2 inches.[43] This led to larval and juvenile smelt being killed immediately in the pumps.[44] For those smelt that survive entrainment, few go on to also survive the salvage process, which consists of transporting the fish in oxygen-injected trucks for release at the Sacramento and San Joaquin rivers.[45] The BiOp also concluded that the water projects were leading to increased stressors for the smelt including increased aquatic macrophytes, contaminants such as excessive salinity, and disruptions in established predation and competition patterns.[46] Finally, the CVP and SWP were substantially reducing water flow into the Bay-Delta, leading to deteriorated habitat quality at crucial times of the smelt's life cycle such as spawning and adult migration.[47]

FWS issued a set of reasonable and prudent alternatives (RPAs)[48] to allow Reclamation to proceed with the operation of the CVP and SWP while ensuring

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presentation), *available at* http://www.fws.gov/sfbaydelta/documents/delta_smelt_water_projects_bo_briefing_jan_23-24-2013.pdf.

38. The ESA prohibits the "take" of a threatened or endangered species by any public or private actor with "take" defined as "[to] harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." 16 U.S.C. § 1532(19). No "take" of an endangered or threatened species can occur unless a BiOp or an incidental take permit is issued by the FWS or the National Marine Fisheries Service. *Id.* § 1536(c)(2).

39. San Luis & Delta-Mendota Water Auth. v. Jewell, 747 F.3d 581, 592 (9th Cir. 2014).

40. *Id.* at 594.

41. NOBRIEGA ET AL., *supra* note 37, at 27.

42. *Id.* at 5–7.

43. *See San Luis*, 747 F.3d at 595.

44. *Id.* at 594–95.

45. *Id.*

46. *See* FORMAL ENDANGERED SPECIES ACT CONSULTATION, *supra* note 32, at 182–86.

47. *See id.* at 34.

48. If the consulting agency concludes in the BiOp that an action will jeopardize the continued existence of a listed species or adversely modify its critical habitat, the ESA mandates that the BiOp also include "reasonable and prudent alternatives" (RPAs). 16 U.S.C. § 1536(b)(3)(A) (2012). The federal agency can require RPA implementation to allow the project to continue "without causing jeopardy to the species or adverse modification to its critical habitat." *See id*. The federal agency requesting consultation may either implement the RPAs or request an exemption from the Endangered Species Committee, although this is a remote possibility. *Id.* § 1536(e).

that the water projects would not continue to jeopardize the delta smelt or adversely modify its critical habitat. There were five major components of the RPAs: (1) protect adult smelt by reducing entrainment at the pumping stations; (2) protect larvae and juvenile smelt; (3) improve Bay-Delta habitat for smelt growth and rearing of larval and juvenile smelt; (4) restore Bay-Delta habitat so that juvenile smelt can become adults; and (5) increase monitoring and reporting of smelt abundance and distribution.[49] The FWS recommended that the combined flow from the Old and Middle Rivers[50] be reduced from 2500 cubic feet per second to 1250 cubic feet per second to decrease the number of smelt that are drawn into the pumps in the two southern channels in the South Delta.[51] The agency also recommended increasing the amount of water released to the Delta from the reservoirs of the SWP and CVP in the months of September and October of wet or above-normal water years to reduce salinity levels[52] in the Delta.[53] Implementation of the RPAs would lead to substantial cuts in water delivery from the water projects to the Central Valley and Southern California.[54]

To prevent Reclamation from implementing the RPAs, the San Luis & Delta-Mendota Water Authority and a collection of additional water districts, water contractors, and agricultural interests filed suit against the FWS claiming that the BiOp was "arbitrary and capricious" under the Administrative Procedure Act.[55] On appeal, the plaintiffs brought three additional claims in

49. NOBRIEGA ET AL., *supra* note 37, at 28.

50. The combined flow of the Old and Middle Rivers is used as a flow index that is representative of the hydrodynamics of the Bay-Delta region. *See* U.S. BUREAU OF RECLAMATION, USE OF AN INDEX FOR SOUTH DELTA FLOW REGULATIONS 21 (Oct. 19, 2012) (PowerPoint presentation), *available at* https://www.usbr.gov/mp/BayDeltaOffice/docs/CCWD_OMR_Index_RSEP_2012-10-19.pdf. The Old and Middle River channels are used to convey water to the Jones and Banks pumping facilities. *See* FORMAL ENDANGERED SPECIES ACT CONSULTATION, *supra* note 32, at 160.

51. CAL. NAT. RES. AGENCY, QUESTIONS AND ANSWERS ABOUT WATER DIVERSIONS AND DELTA SMELT PROTECTIONS 1–2 (2013), *available at* http://resources.ca.gov/docs/Smelt_QandA.pdf.

52. The maximum allowable salinity levels are measured by recording the location of the Delta estuary's salinity gradient from February to June. *See generally* RUSS T. BROWN AND ANNE HUBER, RELATIONSHIPS BETWEEN MEASURED X2 AND EQUIVALENT OUTFLOW (CFS) AND SALINITY (EC) DURING LOW-FLOW CONDITIONS (2015), *available at* http://baydeltaoffice.water.ca.gov/modeling/deltamodeling/DSM2UsersGroup/ICF_2014%20salinity%20intrusion_Feb%202015%20DSM2%20User%20Group.pdf.

53. BELRIDGE WATER STORAGE DIST., 2012 AGRICULTURAL WATER MANAGEMENT PLAN 46 (2013), *available at* http://www.water.ca.gov/wateruseefficiency/sb7/docs/2014/plans/Belridge%20WSD%202012%20AWMP%20-%20Final.pdf.

54. *See, e.g.*, San Luis & Delta-Mendota Water Auth. v. Jewell, 747 F.3d 581, 653 (9th Cir. 2014) ("We know that millions of people and vast areas of some of America's most productive farmland will be impacted by Reclamation's actions.").

55. *See* Delta Smelt Consol. Cases v. Salazar, 760 F. Supp. 2d 855, 867 (E.D. Cal. 2010), *aff'd in part, rev'd in part sub nom. San Luis*, 747 F.3d 581 (9th Cir. 2014). The Administrative Procedure Act allows for judicial review of an agency decision to determine if it was "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law." 5 U.S.C. § 706(2)(a) (2012). In making its decision, the reviewing court examines whether the agency "considered the relevant factors and articulated a rational connection between the facts found and the choices made" based on the administrative record that the agency possessed at the time it made its decision. *See* Nat'l Home

their suit. First, appellees claimed the FWS violated ESA section 7(a)(2) by not separating discretionary and nondiscretionary action[56] when setting the environmental baseline.[57] Second, appellees asserted Reclamation acted "arbitrarily and capriciously" under the Administrative Procedure Act by accepting the BiOp and implementing its RPAs.[58] And, third, appellees argued both FWS and Reclamation had failed to comply[59] with the National Environmental Policy Act (NEPA).[60]

In *Delta Smelt Consolidated Cases*, the District Court for the Eastern District of California ruled in favor of the plaintiffs, finding the BiOp "arbitrary and capricious" in part because it "ignor[ed] the best science available," and issued a preliminary injunction against enforcing any of the RPAs.[61] In a strongly worded opinion, the district court accused FWS of "showing no inclination to fully and honestly address water supply needs beyond the species."[62] The plaintiffs then appealed the case to the Ninth Circuit.[63]

B. Historical Response of Agencies and Irrigation Districts to Water Management for ESA-Listed Species and Agriculture

The ESA was enacted in 1973 to help protect plant and wildlife species in danger of extinction and to preserve their critical habitat.[64] It mandates federal agencies "insure that any action authorized, funded, or carried out by such agency . . . is not likely to jeopardize the continued existence of any endangered species . . . or cause the adverse modification of habitat of such

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Builders Ass'n v. Norton, 340 F.3d 835, 841 (9th Cir. 2003). By custom and precedent, courts usually give an extremely high degree of deference to agency decision making that involves scientific and technical information in rule making. *See generally* Emily Hammond, *Super Deference, the Science Obsession, and Judicial Review as Translation of Agency Science*, 109 MICH. L. REV. 733 (2011).

56. *See* Nat'l Home Builders Ass'n v. Defs. of Wildlife, 551 U.S. 644, 671 (2007) (finding that the Environmental Protection Agency's decision to transfer permitting authority to Arizona under the Clean Water Act did not require consultation with the FWS under the ESA because it was nondiscretionary and section 7(a)(2) of the ESA does not apply to nondiscretionary actions).

57. *San Luis*, 747 F.3d at 601. Section 7(a)(2) of the ESA states:

> Each Federal agency shall, in consultation with and with the assistance of the Secretary, insure that any action authorized, funded, or carried out by such agency . . . is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species.

16 U.S.C. § 1536(a)(2) (2012). This section of the ESA does not apply to nondiscretionary actions after the Supreme Court's ruling in *National Home Builders Ass'n v. Defenders of Wildlife*, 551 U.S. at 672.

58. *San Luis*, 747 F.3d at 601.

59. The appellees claimed that FWS failed to comply with NEPA by not filing an environmental impact statement (EIS) in the process of creating the BiOp, while Reclamation failed to comply by not filing an EIS when implementing the BiOp's RPAs. *See id.* at 641.

60. *Id.* at 601, 638.

61. *Id.* at 592.

62. *Id.*

63. *San Luis*, 747 F.3d 581.

64. 16 U.S.C. § 1531 (2012).

species."[65] Judicial interpretation of the statutory language of the ESA has been strictly textual, adhering to congressional intent that endangered species protection be an overarching national policy goal. For example, the Supreme Court halted the construction of a nearly complete, immense dam because it would have led to the annihilation of a three-inch fish called the snail darter in *Tennessee Valley Authority v. Hill*, stating that "the plain intent of Congress in enacting this statute was to halt and reverse the trend toward species extinction, whatever the cost."[66]

In California, conflict arises when a fish species is listed as threatened or endangered under the ESA,[67] pitting Central Valley agriculture against agencies against environmental groups in a bitter fight for the allocation of increasingly scarce water resources. In the early 1990s, California was faced with its worst drought in recent history, and conflicts between water diversions for agricultural purposes and ESA-listed species came to a head.[68] State leaders realized that it was imperative for water users to have a reliable water supply, but that it was also important to reserve enough water to halt the dramatic population declines of ESA-listed fish species.[69] Early agency responses to the conflicts revolved around the passage of the Central Valley Project Improvement Act (CVPIA) and the creation of the CALFED Bay-Delta Program, a massive collaborative effort by state and federal stakeholders to manage the Bay-Delta.[70] Neither has proven particularly successful, leading Central Valley irrigation districts to continue their long-standing practice of using the terms of their water contracts with Reclamation to combat the water diversions for endangered species purposes.[71]

1. CVPIA and CALFED

The Central Valley Project Act of 1933 authorized the construction of the CVP, a massive system of canals, aqueducts, and dams to transfer water from the Sacramento River to water-scarce areas of the Central Valley.[72] The language of the Central Valley Project Act made it clear that irrigators, usually farmers, were not expected to bear the brunt of paying the project costs that were attributable to irrigation, and that prices were to be set based on the irrigator's "ability to pay."[73] This led to irrigators receiving federally

65. § 1536(a)(2).

66. 437 U.S. 153, 184 (1978).

67. Alf W. Brandt, *An Environmental Water Account The California Experience*, 5 U. DENV. WATER L. REV. 426, 427 (2002).

68. *Id.*

69. *Id.*

70. *See infra* Part I.B.1.

71. *See infra* Part I.B.2.

72. San Luis & Delta-Mendota Water Auth. v. Jewell, 747 F.3d 581, 594 (9th Cir. 2014).

73. *See* Edson Abel, *The Central Valley Project and the Farmers*, 36 CALIF. L. REV. 653, 656 (1948). The farm prices from 1939–1944 for the CVP set Class I water—or supply that is reasonably

subsidized fixed-rate water delivery under forty-year contracts that did not cover even the baseline operation and maintenance costs of the CVP.[74] Such organization led to wasteful irrigation practices, with unforeseen environmental and water use costs.[75] California has subsequently sought to rectify this by enacting statutes such as the Reclamation Act of 1982, the 1986 statutory requirement that empowered the Secretary of the Interior to adjust water prices, and the 1992 CVPIA.

The CVPIA was passed in 1992 and amended the original Central Valley Project Act of 1933 to establish "mitigation, protection, and restoration of fish and wildlife" as a principal purpose of the CVP.[76] The CVPIA directed Reclamation to dedicate some CVP water for the purpose of fish, wildlife, and habitat restoration measures.[77] It also required that irrigation districts pay fees on each acre-foot of CVP water delivered into an Environmental Restoration Fund to mitigate the alleged environmental damage created by the CVP.[78] Specific statutory provisions of the CVPIA require the Secretary of the Interior to complete programmatic environmental impact statements[79] before renewing existing water service contracts[80] and obtain permits before reallocating water.[81] The CVPIA also established tiered water pricing for any new or renewed water contracts with irrigation districts and a provision for water transfers.[82]

Courts have been relatively strict in implementing the CVPIA, even when its mandates challenge the terms of existing long-term water contracts between

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dependable during the irrigation season every year—at an average of $2.70 per acre-foot and Class II water—available only at high stream flow times—at $1.45. *Id.*

74. U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 16, at 2.

75. *Id.*

76. *See* California Valley Project Improvement Act, Pub. L. No. 102-575, § 3406(a)(1)–(2), 106 Stat. 4600, 4714 (1992); *see also* § 3402(f), 106 Stat. at 4706 ("[A]chieve a reasonable balance among competing demands for use of Central Valley Project water, including the requirements of fish and wildlife, agricultural, municipal and industrial and power contractors."); O'Neill v. United States, 50 F.3d 677, 686 (9th Cir. 1995) ("CVPIA marks a shift in reclamation law modifying the priority of water uses.").

77. § 3406(b)(2), 106 Stat. at 4714 (requiring that 800,000 acre-feet of water be dedicated annually to fish, wildlife, and habitat restoration).

78. *Restoration Fund Charges*, U.S. BUREAU OF RECLAMATION, http://www.usbr.gov/mp/cvpwaterrates/rest_fund/ (last updated Aug. 21, 2014).

79. NEPA mandates that a federal agency file an EIS whenever it engages in "major federal actions significantly affecting the quality of the human environment." 42 U.S.C. § 4332(2)(C) (2012). An EIS is a detailed evaluation that must include: the environmental impact of the proposed action, any adverse environmental effects that cannot be avoided if the proposed action were to be implemented, the reasonable alternatives to the proposed action, the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and any irreversible and irretrievable commitments of resources that would be involved in the proposed action should it be implemented. *Id.*

80. Reclamation Projects Authorization and Adjustment Act, Pub. L. No. 102-575, § 3404(c)(1), 106 Stat. 4600, 4708–09 (1992).

81. § 3411(a), 106 Stat. at 4731.

82. *Central Valley Project Improvement Act (CVPIA)*, U.S. BUREAU RECLAMATION, http://www.usbr.gov/mp/cvpia/index.html (last updated July 21, 2014).

the CVP and irrigation districts.[83] Agencies continue to have some discretion[84] in contradicting the Act when making water diversion decisions, especially on issues of diverting water for endangered species conservation.[85] However, in the more than twenty years since the passage of the Act, federal and state agencies have halfheartedly enforced key CVPIA provisions, and excessive pumping from the Bay-Delta for Central Valley agriculture continues.[86]

Like the CVPIA, the CALFED Bay-Delta Program was heralded as the end to California's water wars, which had deepened North-South and urban-rural divides in the state for years.[87] CALFED arose from a consortium of state and federal government agencies working together to end environmental and water management conflicts.[88] Deemed by some as "the most ambitious experiment in collaborative environmental policy and adaptive management the world has seen to date,"[89] CALFED brought the Bay-Delta's major stakeholders together to work towards a sustainable future for the Delta with projects like the Environmental Water Account, which would allow for conflict resolution among major stakeholders while working towards the recovery of ESA-listed species.[90] However, despite the billions of dollars spent,[91] CALFED disbanded after its final report in 2007.[92] CALFED's failure was due in part to two major absences: a consistent source of funding, and the ability to

83. *See, e.g.*, O'Neill v. United States, 50 F.3d 677 (9th Cir. 1995). The implementation of the CVPIA required Reclamation to reduce the amount of water delivered to Westlands Water District by 50 percent from the 1963 long-term service contract between the United States and Westlands. *Id.* at 680–81. The Ninth Circuit held that the 1963 contract did not obligate the government to give Westlands the full contractual amount of water if delivering the full amount of water violated the requirements of the ESA and the CVPIA. *Id.* at 680.

84. *See* Cent. Delta Water Agency v. Bureau of Reclamation, 452 F.3d 1021 (9th Cir. 2006). In *Central Delta Water Agency*, Delta water districts sued Reclamation, claiming that Reclamation was violating the CVPIA by operating the CVP in a manner that violated the Vernalis Salinity Standard, which the state uses to ensure that Reclamation complies with the Act in its operation of the CVP. *Id.* at 1023. The Ninth Circuit ruled that Reclamation was required to violate the Act if necessary to provide water flow sufficient to lower the salinity of the water to state standards. *Id.* at 1027.

85. *See* San Luis & Delta-Mendota Water Auth. v. United States, 672 F.3d 676 (9th Cir. 2012). Water districts in the Central Valley and Southern California filed suit against Department of the Interior for not classifying 9000 acre-feet of surplus water from the Nimbus and New Melones reservoirs in the CVP for fish, wildlife, and habitat restoration under section 3406(b)(2) of the Act. *Id.* at 681. The Ninth Circuit held that even though the accounting measures used by Interior would lead to reduced water delivery for the districts, there was no abuse of discretion by the agency in its water accounting. *Id.* at 681, 704.

86. Press Release, Nat. Res. Def. Council, New Index Shows Federal Agencies Fail to Meet Salmon Restoration Goal (Dec. 19, 2014), *available at* http://www.nrdc.org/media/2012/121113.asp.

87. Kallis et al., *supra* note 14, at 632.

88. Brandt, *supra* note 67, at 427.

89. Kallis et al., *supra* note 14, at 631.

90. Brandt, *supra* note 67, at 427.

91. Wyatt Buchanan, *New State Agency Tries to Revive Delta*, SFGATE (June 27, 2010, 4:00 AM), http://www.sfgate.com/green/article/New-state-agency-tries-to-revive-delta-3183808.php ("Over the past 10 years, California spent more than $3.5 billion on an agency that failed to solve the water crisis in the Sacramento-San Joaquin River Delta.").

92. Kallis et al., *supra* note 14, at 634.

back its decisions with the force of law.[93] Moreover, mismanagement of the massive water management program and failure to reach even its short-term goals contributed to its waning political popularity.[94]

2. Water Contracts between Irrigation Districts and the Bureau of Reclamation

Irrigation districts in the Central Valley have historically fought water diversions for endangered species in court by insisting on strict adherence to the terms of their water contracts with Reclamation.[95] However, the Ninth Circuit has been particularly strict in applying the procedural restrictions of the ESA's section 7 formal consultation[96] requirement to both the issuance of new water contracts and the renewal of existing water contracts.[97] Similarly, other courts in the West have held that the terms of existing water delivery contracts do not preclude the diversion of already appropriated water.[98] There seems to be a consensus that as long as the federal agency has some discretion[99] to take action for the benefit of a listed species, the agency must consult with FWS or the National Marine Fisheries Service before taking any agency action that could jeopardize a listed species or adversely modify its critical habitat.[100]

In response to California's recurrent water scarcity issues, there has also been substantial change in the water contracts between Reclamation and irrigation districts. As mentioned above, irrigation districts now pay additional fees for water delivery, including a cost recovery charge and an environmental restoration charge.[101] There are two primary categories of Reclamation contracts, the first for irrigation water and the second for nonirrigation uses.

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93. Buchanan, *supra* note 91.

94. Kallis et al., *supra* note 14, at 632.

95. *See, e.g.*, *supra* note 83; *infra* note 98.

96. The ESA directs all federal agencies to consult with the FWS for terrestrial species and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service for marine species to "insure that any action authorized, funded, or carried out by [a federal agency] is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species." 16 U.S.C. § 1536(a)(2) (2012).

97. *See* Nat. Res. Def. Council v. Houston, 146 F.3d 1118 (9th Cir. 1998). Environmental groups challenged Reclamation for failing to consult with the FWS before renewing a set of CVP irrigation contracts. *See id.* at 1123. The Ninth Circuit held that the ESA applies to water contract renewals and Reclamation violated ESA section 7 by renewing water contracts before consulting with FWS. *See id.* at 1127–28; *see also* Nat. Res. Def. Council v. Jewell, 749 F.3d 776 (9th Cir. 2014) (holding that section 7(a)(2) required Reclamation to consult FWS before renewing water contracts because it retained discretion to act to benefit the delta smelt).

98. *See* Rio Grande Silvery Minnow v. Bureau of Reclamation, 601 F.3d 1096 (10th Cir. 2010) (holding that Reclamation had discretion to reduce water delivery to amounts below contractually agreed upon amounts for habitat restoration of the endangered silvery minnow).

99. *See* Nat'l Ass'n of Home Builders v. Defs. of Wildlife, 551 U.S. 644 (2007) (applying ESA section 7 to only discretionary federal actions).

100. *Houston*, 146 F.3d at 1125.

101. ORG. FOR ECON. CO-OPERATION & DEV., AGRICULTURAL WATER PRICING: UNITED STATES 15–16 (2010), *available at* http://www.oecd.org/unitedstates/45016437.pdf.

The first type of water contract is between Reclamation and water users organized into an irrigation district or a similar group that has separate contracts for water delivery to individual users within its jurisdiction.[102] Irrigation districts sign initial contracts with Reclamation for water delivery from the CVP for a fixed term of forty years, with the fixed contract rate reflecting repayment without interest of the capital costs as well as operation and maintenance costs of the CVP facilities.[103] Once irrigation districts renew their contract with Reclamation, they are subject to cost of service rates that include annual operation and maintenance costs, repayment of capital costs without interest, and operation and maintenance deficits with interest payments.[104] Most of these contracts contain a provision that absolves Reclamation of any liability if the full supply of water in the contract is not delivered.[105] Reclamation also has another type of contracts for water that is delivered or diverted by any Reclamation project for nonirrigation use, deemed "project water" by Reclamation.[106]

In some western river basins, agencies and water users have come together to reallocate existing water rights among existing stakeholders to mitigate the habitat destruction of endangered fish species from depleted water flow.[107] In California, these attempts have been largely fruitless. Both the CVPIA and CALFED were crafted with input from agriculture and conservation groups but have been largely ineffectual in practice. The failure of CVPIA and CALFED to mitigate harm to endangered species and promote water conservation by irrigation districts set the stage for yet another conflict between fish and farms.

C. The San Luis *Opinion*

In *San Luis v. Jewell*, the Ninth Circuit held that the FWS was not "arbitrary and capricious" under the Administrative Procedure Act in issuing its 2008 BiOp, which concluded that the continued operation of the CVP and SWP both jeopardized the continued existence of the delta smelt and adversely modified its critical habitat in the Bay-Delta.[108] In a 170-page opinion, the Ninth Circuit ruled that neither the BiOp nor the implementation of its proposed RPAs were "arbitrary or capricious," even though the proposed RPAs would significantly reduce water delivery to Central California's agricultural

102. *See* U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-14-764, BUREAU OF RECLAMATION: AVAILABILITY OF INFORMATION ON REPAYMENT OF WATER PROJECT CONSTRUCTION COSTS COULD BE BETTER PROMOTED 8–9 (2014), *available at* http://gao.gov/assets/670/665588.pdf.

103. *Id.* at 15.

104. *Id.* at 15–16.

105. Reed D. Benson, *Dams, Duties, and Discretion Bureau of Reclamation Water Project Operations and the Endangered Species Act*, 33 COLUM. J. ENVTL. L. 1, 8 (2008).

106. *Id.*

107. Melissa K. Estes, *The Effect of the Federal Endangered Species Act on State Water Rights*, 22 ENVTL. L. 1027, 1031 (1992).

108. San Luis & Delta-Mendota Water Auth. v. Jewell, 747 F.3d 581, 581 (9th Cir. 2014).

interests and Southern California's domestic consumers.[109] In a panel decision, the Ninth Circuit affirmed in part and reversed in part the district court decision and remanded the case to the lower court.[110]

The bulk of the Ninth Circuit opinion revolved around the claim that the FWS's decision making was "arbitrary and capricious" in creating its 2008 BiOp, which, if true, would have invalidated the implementation of the BiOp's RPAs.[111] In its opinion, the Ninth Circuit disagreed with plaintiffs and the district court and upheld the BiOp, stating that FWS utilized the "best [available] scientific and commercial data" when creating the BiOp.[112] The court thus validated the models that FWS used in predicting the location of X2[113] and the take limits for the adult and juvenile smelt.[114] Furthermore, the court stated that although the ESA requires recommendations of alternatives to be based on "best available data," it is the agency that gets to determine what "best" entails.[115] As such, the agency was "not required to support its finding . . . with anything approaching [the] scientific certainty" that the district court indicated in *Delta Smelt Consolidated Cases*.[116] In doing so, the court emphasized that the appropriate standard of review is to be "most deferential" when reviewing a scientific determination made by an expert agency, in order to prevent the court from substituting its own judgment for that of the agency.[117]

The Ninth Circuit rejected the plaintiffs' additional claims concerning the failure of FWS and Reclamation to differentiate between discretionary and nondiscretionary actions when setting the environmental baseline, and that NEPA was triggered by the FWS's issuance of the BiOp. The first claim was that FWS violated NEPA by not completing an EIS before issuing the BiOp and that Reclamation violated NEPA by not competing an EIS before implementing the recommendations outlined in the BiOp.[118] The Ninth Circuit ruled that FWS did not need to complete an EIS because the creation of the BiOp was not in itself a "major federal action[] significantly affecting the quality of the human environment" as defined by NEPA.[119] However, the circuit court affirmed the lower court's ruling that Reclamation's adoption and

109. *Id.* at 592.
110. *Id.* at 655.
111. *See id.* at 592–93, 600.
112. *Id.* at 592.
113. X2 is the location in the Delta where the salinity of the water is 2 parts per thousand. *See* BELRIDGE WATER STORAGE DIST., *supra* note 53, at 47. It is used as a proxy measure of the overall ecosystem health of the Delta. *Id.* For the five month period of February through June, X2 must be located downstream of Collinsville in the Delta. *Id.* This restriction on Delta outflow means that there is a limit on the amount of water that the SWP can pump from the Banks Pumping Plant in the Delta. *Id.*
114. *See San Luis*, 747 F.3d at 624–25.
115. *Id.* at 601.
116. *Id.* at 592.
117. *Id.*
118. *Id.* at 641.
119. *Id.* at 643–44.

implementation of the RPAs in the BiOp was a major federal action that triggered NEPA compliance.[120] According to the court, Reclamation would be required to file an EIS before implementing the alternatives set forth by the FWS in the BiOp.[121]

Secondly, plaintiffs claimed that Reclamation was "arbitrary and capricious" in its decision to adopt the RPAs.[122] The Ninth Circuit ruled that since the BiOp itself was not an "arbitrary and capricious" agency document, Reclamation's plans to implement the RPAs were valid.[123] Finally, appellees claimed that the FWS violated the ESA by not "separating out nondiscretionary actions from discretionary actions . . . so that only the discretionary actions are considered as effects of the agency action."[124] The Ninth Circuit ruled that in line with the precedent set forth by the Supreme Court in *National Ass'n of Home Builders v. Defenders of Wildlife*, the FWS was not required to separate discretionary and nondiscretionary actions when it determined what the environmental baseline[125] would be.[126]

Resolving that the statutory language of the ESA reflects congressional intent that "these species . . . are of aesthetic, ecological, educational, historical, recreational, and scientific value to the Nation and its people,"[127] the Ninth Circuit determined that the ESA does not allow for any sort of balancing act of interests between "the smelt's interests [and] the interests of the citizens of California."[128] The court acknowledged the potential economic hardship that its decision would bring for the state but determined that the statutory language of the ESA did not allow for the discretion of courts or the consideration of economic barriers in implementation of the RPAs.[129] The court concluded that if the ESA needed amendments to account for the type of economic hardship that its decision would bring to the Central Valley, any changes should be made not by courts but by legislators or via public referendum.[130]

120. *Id.* at 655.
121. *Id.* at 653.
122. *Id.* at 601.
123. *Id.* at 640.
124. *Id.* at 601.
125. The environmental baseline is the "baseline for determining the effects of the action on the species or critical habitat" and "does not include the effects of the action under review." *Id.* at 638. It includes "all prior actions, contemporaneous non-federal actions, and proposed federal actions that have already undergone consultation." *See* Holly Doremus, *Water, Population Growth, and Endangered Species in the West*, 72 U. COLO. L. REV. 361, 407 (2001).
126. *San Luis*, 747 F.3d at 638–39 (quoting Nat'l Ass'n of Home Builders v. Defs. of Wildlife, 551 U.S. 644, 665 (2007)).
127. 16 U.S.C. § 1531(a)(3) (2012).
128. *San Luis*, 747 F.3d at 593.
129. *Id.*
130. *See also id.* (recognizing the enormous practical implications of the ruling, but finding the outcome statutorily mandated).

II. ENVIRONMENTAL DECISION MAKING IN CALIFORNIA'S CENTRAL VALLEY AFTER *SAN LUIS*

By upholding the FWS's BiOp, *San Luis* will result in severe cuts in the water supply to the Central Valley and Southern California from the SWP and CVP in order to protect the delta smelt. The FWS estimated that implementation of the RPAs would lead to reductions in Bay-Delta exports from the SWP and CVP of 5 to 7 percent.[131] It remains to be seen if these water cuts will lead to a sustained change in how Central Valley irrigation districts manage water, although historical evidence proves that occasional crises such as droughts and ESA-mandated cuts have failed to trigger a long-term change in water management by California farms.

The 2014 water year was California's driest in over five hundred years, and partially as a result of the state's ongoing drought, food prices across America have increased substantially.[132] Experts agree that innovations in the residential and commercial sectors will mean little in mitigating the impacts of the current drought and planning for a sustainable future in water management policy if agriculture does not substantially decrease its share of water consumption.[133] Accomplishing this immense task is complicated by California's water rights system, where senior water users have greater certainty than junior water users over the amount of water that they will receive even in times of drought and other cuts to water availability. California water law, created during a time of abundance, has yet to be substantially overhauled even as it leads to waste and mismanagement, especially among senior irrigators.[134]

In an effort to encourage efficiency in water use, the California Water Conservation Act was enacted in November 2009 as the most significant and overarching piece of water legislation in the state in more than fifty years.[135] It includes regulations on efficiency measures for urban, industrial, and agricultural users.[136] It requires all irrigation districts that encompass more than 25,000 irrigation acres to change their water rate structure to be based at least

131. *See* U.S. BUREAU OF RECLAMATION, NOTICE OF INTENT AND SCOPING UNDER NEPA ON REMANDED BIOLOGICAL OPINIONS ON THE COORDINATED LONG-TERM OPERATION OF THE CENTRAL VALLEY PROJECT AND STATE WATER PROJECT 8 (2012), *available at* http://www.usbr.gov/mp/BayDeltaOffice/docs/Long-Term_Op/San%20Luis%20Delta%20Mendota%20WA%20State%20Water%20Contractors%20Westlands%20WD%20062812.pdf.

132. Johnston, *supra* note 18.

133. Matt Weiser, *Flood Irrigation Still Common, but Drip Method Is Gaining Ground*, MERCED SUN-STAR (Feb. 16, 2014), http://www.mercedsunstar.com/2014/02/16/3499228/flood-irrigation-still-common.html.

134. Steven J. Shupe, *Waste in Western Water Law A Blueprint for Change*, 61 OR. L. REV. 483, 496 (1982).

135. Josh Patashnik, *All Groundwater Is Local California's New Groundwater Monitoring Law*, 22 STAN. L. & POL'Y REV. 317, 317 (2011).

136. Water Conservation Act of 2009, CAL. WATER CODE § 10608.4 (West 2015).

in part on a volumetric water pricing structure.[137] The Act also encourages on-farm capital improvements such as implementing more efficient methods of irrigation.[138] To ensure timely compliance with its mandates, the Act requires all irrigation districts to submit agricultural water management plans to the California Department of Water Resources every five years.[139]

This discussion uses data drawn from the agricultural water management plans[140] of a sample of irrigation districts under the Act's jurisdiction to test the hypothesis that there is a difference between how senior and junior irrigation districts are complying with two major components of the bill: (1) agricultural water suppliers must adopt a pricing structure based at least in part on quantity delivered; and (2) agricultural water suppliers are to "implement additional efficient management practices" including "facilitat[ing] the financing of capital improvements for on-farm irrigation systems."[141] The first component, adopting a pricing structure based at least in part on quantity delivered, must be implemented. The second component, facilitating financing of capital improvements for on-farm irrigation systems, must be implemented by irrigation districts if it is technically feasible and locally cost-effective.[142]

Every irrigation district that submitted an agricultural water management plan Type X7-7[143] to the California Department of Water Resources in response to the Act was included in the sample, with the date of district formation used as a proxy for assignation to senior or junior district. Irrigation districts formed after 1914 are considered to be "junior water users," while those districts formed before 1914 are "senior water users."[144] The demarcation year was set at 1914 because it is the year that California adopted a permitting

137. WATER § 10853.

138. "[A]gricultural water suppliers shall implement all of the following critical efficient management practices: (1) Measure the volume of water delivered to customers with sufficient accuracy . . . (2) Adopt a pricing structure for water customers based at least in part on quantity delivered." WATER § 10608.48(b).

139. NAT. RES. DEF. COUNCIL, IMPLEMENTATION OF THE AGRICULTURAL WATER MANAGEMENT PLANNING ACT: A REVIEW OF AGRICULTURAL WATER MANAGEMENT PLANS 3, 9 (2013) [hereinafter A REVIEW OF AGRICULTURAL WATER MANAGEMENT PLANS], *available at* http://www.nrdc.org/water/files/ca-agricultural-water-planning-IP.pdf.

140. The irrigation districts were selected from those districts that had submitted agricultural water management plans to the California Department of Water Resources in response to the Act as of October 16, 2014. Irrigation districts that were included in the Feather River Regional Agricultural Water Management Plan and/or Sacramento Regional Plan were not included. *See* CAL. DEP'T OF WATER RES., 2012 AGRICULTURAL WATER MANAGEMENT PLANS RECEIVED (2014), *available at* http://www.water.ca.gov/wateruseefficiency/sb7/docs/2014/2012_AWMPs_Received_17Oct2014.pdf.

141. WATER § 10608.48.

142. A REVIEW OF AGRICULTURAL WATER MANAGEMENT PLANS, *supra* note 139, at 4, 7.

143. The Type X7-7 of agricultural water management plan is specifically in response to the California Water Conservation Act and directly addresses progress on the Act's mandates. 3 CAL. DEP'T OF WATER RES., CALIFORNIA WATER PLAN: UPDATE 2013 2-8, 2-12–13 (2013), *available at* http://www.waterplan.water.ca.gov/docs/cwpu2013/Final/Vol3_Ch02_AgWUE.pdf.

144. *See* Matt Weiser, *California Orders Hundreds of Water Users in San Joaquin Valley to Stop Drawing from Rivers and Streams*, SACRAMENTO BEE (May 30, 2014), http://www.sacbee.com/news/local/article2600193.html.

system to regulate the direct diversion of water from a stream. All water rights for diversions that were in place before 1914 are considered to be "senior" in California and regulated by the common law correlative rights doctrine instead of the permitting system.[145] Each irrigation district may have a combination of junior and senior water rights, but the districts are classified as "junior" and "senior" water users for simplicity.

The California Water Conservation Act applies to seventy-nine agricultural water districts in the state, all of which were required to hold public hearings among their agricultural customers and elections via mail ballot to implement volumetric water rates into their pricing structure.[146] The Act set a deadline of July 31, 2012, for agricultural water suppliers to adopt a pricing structure that included a volumetric component.[147] Studies of residential communities that switch to metered consumption with a volumetric rate have shown significant water savings, even where the initial volumetric water rate is low.[148] This downward trend in water consumption is what lawmakers hoped to see paralleled in the agricultural sector from the shift to volumetric pricing. Agricultural economists widely believe that higher water prices increase irrigation efficiency and decrease environmental degradation,[149] and evidence from past droughts in California suggests that the effect of higher rates for irrigation water is not especially severe on the overall agricultural economy of the state.[150]

This discussion begins with an overview of California water law and then uses data drawn from the agricultural water management plans of various Central Valley irrigation districts to examine decision making. It assesses the differences between senior and junior irrigation districts in implementing volumetric water pricing, installing physical on-farm irrigation systems, and crafting mitigation measures in response to the threat of anthropogenic climate change. As a possible explanation for why irrigation districts have largely failed in effective environmental decision making, the Note ends with an

145. GARY W. SAWYERS, A PRIMER ON CALIFORNIA WATER RIGHTS 2 (n.d.), *available at* http://aic.ucdavis.edu/events/outlook05/Sawyer_primer.pdf.

146. A REVIEW OF AGRICULTURAL WATER MANAGEMENT PLANS, *supra* note 139, at 3; *see also Water Rate Planning and Strategy*, *in* GLENN-COLUSA IRRIGATION DIST., WATER FOCUS 4 (Dec. 10, 2013), *available at* http://www.gcid.net/documents/Newsletters/2013/Water%20Focus%20December%202013.pdf.

147. CAL. DEP'T OF WATER RES., AGRICULTURAL AND URBAN WATER SUPPLIER'S SBX7-7 DEADLINES AND REQUIREMENTS (n.d.), *available at* http://www.water.ca.gov/wateruseefficiency/sb7/docs/AgUrbanDeadlinesRequirements.pdf.

148. *See generally* R. Peter Terrebonne, *Residential Water Demand Management Programs A Selected Review of the Literature* (Ga. State Univ., Water Policy Working Paper No. 2005-002, 2005), *available at* http://ayspsprodweb.gsu.edu/drupal/sites/default/files/documents/WP2005-002residentialwaterdeman.pdf.

149. U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 16, at 2.

150. "[D]ata on California farms during the 6-year drought from 1987 through 1992 indicate that the effect of increased irrigation rates on California's overall farm economy is not likely to be severe. These data indicate that the effect of water price increases on farm viability is likely to be small relative to other factors." *See id.*

examination of the role of procrastination in hampering effective decision making.

A. California's Hybrid Water Rights Regime

California operates under a hybrid water rights regime with three major components: a correlative rights doctrine governing groundwater,[151] both the riparian rights and appropriative rights doctrines governing surface water rights,[152] and the public trust doctrine as a guiding policy consideration. This hybrid system of water rights was recognized by California courts beginning in the late nineteenth century[153] and allowed farmers to obtain low-price water while negating any need for them to invest in expensive irrigation water diversion infrastructure.[154]

The appropriative rights portion of California's water rights regime is based primarily on the notion of first-in-time, first-in-right.[155] Landowners allocated water rights depending on the date that they began to divert water, with few restrictions on the amount of water that is diverted.[156] The only legal requirements for a landowner to be awarded rights to water is that there be a physical water diversion, intent to use the water, and that the water be used for a beneficial purpose.[157] Yet, because the appropriative right requires continuity of use, it can be lost by nonuse.[158] Indeed, the water right is only a use right and does not promise landowners any set amount of water flow,[159] although it does ensure that senior water rights will be enforceable against any future more junior water diverters.[160] This doctrine encouraged exploitation of the arid West's natural resources and expedited intensive water uses,[161] with senior water users having priority access to their water rights over junior users.[162] In 1914 California established a permit system for new appropriative uses, dividing appropriative rights into pre-1914 appropriative rights governed by the common law prior appropriations doctrine and post-1914 appropriative rights

151. The correlative rights doctrine applies only to percolating groundwater, but after *Katz v. Walkinshaw* there is an established legal presumption that all groundwater is percolating. *See generally* 70 P. 663, 772 (Cal. 1903).

152. GARY W. SAWYERS, A PRIMER ON CALIFORNIA WATER RIGHTS 1–3 (n.d.), *available at* http://aic.ucdavis.edu/events/outlook05/Sawyer_primer.pdf.

153. Mark T. Kanazawa, *Efficiency in Western Water Law The Development of the California Doctrine, 1850-1911*, 27 J. LEGAL STUD. 159, 159 (1998).

154. David Zilberman et al., *Changes in Water Allocation Mechanisms for California Agriculture*, 12 CONTEMP. ECON. POL'Y 122, 124 (1994).

155. Getches, *supra* note 2, at 7.

156. Zilberman et al., *supra* note 154, at 123.

157. Shupe, *supra* note 134, at 486.

158. SAWYERS, *supra* note 152, at 2.

159. Shupe, *supra* note 134, at 494, 496.

160. *Id.* at 486.

161. *Id.*

162. SAWYERS, *supra* note 152, at 2.

granted through the issuance of permits by the State Water Resources Control Board.[163]

Under the riparian rights doctrine, landowners receive water rights based on the location of their land,[164] with landowners entitled to water rights for the water flow of the portion of the lake or stream that their land adjoins.[165] Riparian rights are tied to the land adjacent to the water body and cannot be transferred to any other parcel of land.[166] Although riparian rights can be "explicitly severed from otherwise riparian land,"[167] they are not lost due to nonuse like appropriative rights.[168]

Groundwater is allocated between landowners in "a fair and just proportion" under the correlative rights doctrine.[169] Landowners are able to divert water as long as it is put to "beneficial use."[170] If a groundwater supply becomes insufficient and adjoining landowners are competing for scarce water supply, courts can require all users to proportionally reduce their use until overdraft of the aquifer ceases.[171]

In recent decades courts have modified California water law by incorporating the public trust doctrine, a common law doctrine that historically protects the recreational and economic value of navigable waterways, as a public policy guideline.[172] Under the public trust doctrine, the State of California owns all navigable waterways in its state as a trustee for the benefit

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163. *Id.* at 2–3.

164. *See* Title Ins. & Trust Co. v. Miller & Lux, 190 P. 433, 437 (Cal. 1920) (ruling that the riparian right is "part and parcel" of the contiguous land and confined to the initial parcel of land that established the original water right); *see also* Hill v. Newman, 5 Cal. 445, 446 (1855) (holding that while the riparian right "runs with the land," the landowner has no real property in the water itself).

165. Wells A. Hutchins, *California Ground Water Legal Problems*, 45 CALIF. L. REV. 688, 689 (1957).

166. U.S. FISH & WILDLIFE SERV., SUMMARY OF CALIFORNIA WATER RIGHTS 1-2 (n.d.) [hereinafter SUMMARY OF CALIFORNIA WATER RIGHTS], *available at* http://www.fws.gov/cno/fisheries/docs/section1summaryofcawaterrights.pdf.

167. SAWYERS, *supra* note 152, at 1.

168. *Id.* at 2.

169. *See* Katz v. Walkinshaw, 70 P. 663, 772 (Cal. 1903) (establishing the rules of reasonable use and correlative rights in California, where groundwater is allocated between landowners in "a fair and just proportion").

170. The California Constitution states:

> [T]he general welfare requires that the water resources of the State be put to beneficial use to the fullest extent of which they are capable . . . and that the conservation of such waters is to be exercised with a view to the reasonable and beneficial use thereof in the interest of the people and for the public welfare.

CAL. CONST. art. X, § 2; *see also* Smith v. Hawkins, 52 P. 139 (Cal. 1898) ("[N]o matter how great in extent the original quantity may have been, an appropriator can [claim] only the maximum quantity of water which he shall have devoted to a beneficial use.").

171. Pasadena v. Alhambra, 207 P.2d 17 (Cal. 1949) (ordering all parties to restrict their pumping proportionally to a safe yield).

172. *See, e.g.*, Ill. Cent. R.R. v. Illinois, 146 U.S. 387 (1892) (holding that, under the common law public trust doctrine, the government cannot separate the public right over lands under navigable waters from the land itself).

of the people of California.[173] In 1971, the seminal *Mono Lake* case extended the public trust doctrine to protect ecological values of tidelands and navigable waterways as well, adding an obligation that the state must consider the public trust when allocating water resources, and must preserve trust uses whenever feasible.[174] The doctrine allows for courts and agencies to reevaluate even long-term water rights if they unduly interfere with public uses of fish, wildlife, and recreation.[175]

A recent trial court decision extended the public trust doctrine to groundwater pumping that affected the flow of a navigable waterway.[176] In *Environmental Law Foundation v. State Water Resources Control Board*, the trial court held that "the public trust doctrine protects navigable waters from harm caused by extraction of groundwater, where the groundwater is so connected to the navigable water that its extraction adversely affects public trust uses."[177] Although the trial court did not rule that groundwater itself was a resource covered by the public trust, the decision nevertheless allows the public trust doctrine to be used as a constraint on groundwater pumping when the pumping reduces flow from a navigable waterway.[178]

Although the California hybrid rights regime has yet to be completely abandoned, there have been significant changes in the past century. In 1913, California created a permitting system for surface water rights that is now controlled by the California State Water Resources Control Board.[179] A 1928 amendment to the state constitution restricted the use of all water to only the amount that was reasonable for beneficial use under reasonable methods of diversion and use.[180] A recent set of bills signed by Governor Jerry Brown will

173. *See* Colberg, Inc. v. State, 432 P.2d 3, 8 (Cal. 1967) (finding that California holds title to all navigable waterways within its borders as a trustee of the public trust for the people of California); *see also* Joseph L. Sax, *The Public Trust Doctrine in Natural Resource Law Effective Judicial Intervention*, 68 MICH. L. REV. 471 (1969) (discussing the history of the public trust doctrine).

174. *See* Nat'l Audubon Soc'y v. Superior Court, 658 P.2d 709, 728 (Cal. 1983) ("The state has an affirmative duty to take the public trust into account in the planning and allocation of water resources, and to protect public trust uses whenever feasible.").

175. Getches, *supra* note 2, at 34–35.

176. Holly Doremus, *Groundwater and the Public Trust Doctrine, California Style*, LEGAL PLANET (July 21, 2014), http://legal-planet.org/2014/07/21/groundwater-and-the-public-trust-doctrine-california-style.

177. Envtl. Law Found. v. State Water Res. Control Bd., No. 34-2010-80000583, 2011 WL 10944740, at *8 (Cal. Super. Ct. Jan. 21, 2011).

178. Doremus, *supra* note 176.

179. The jurisdiction of the State Water Resources Control Board is limited to "subterranean streams flowing through known and definite channels" under section 100 of the California Water Code. SUMMARY OF CALIFORNIA WATER RIGHTS, *supra* note 166, at 1-1. It does not extend to "water percolating through a groundwater basin" or any other underground water that does not flow in a "subterranean stream." *Id.* at 1-2; *see also* Christian L. Marsh & Peter S. Prows, *California's New Water Legislation A Bucket of Reform or But a Drop?*, 25 NAT. RESOURCES & ENV'T 37, 38 (2010).

180. *See* CAL. CONST. art. X, § 2; SAWYERS, *supra* note 152, at 2 n.1.

establish statewide regulation for groundwater resources.[181] Although much of the planning and enforcement will be delegated to local agencies, the state will retain the ability to intervene if the local Agricultural Water Management Plans are insufficient.[182]

The persistence of California's hybrid water rights system continues to frustrate many common goals of water reform including efficiency, protection of rivers and aquifers, and endangered species conservation.[183] It has proven especially debilitating to effective environmental decision making by providing perverse incentives for senior irrigation districts to continue water consumption at an unfettered pace, which may compel the state to implement regulations specifically tailored to combat these detrimental consequences.

B. Adoption of Volumetric Pricing

1. Water Rates Overview

There are two major categories of water rates: (1) fixed charge water rates issued in terms of area alone, where the fee for water delivery is fixed solely on the acreage of the farm; and (2) volumetric water pricing measured in acre-feet and charged based on the actual volume of water used.[184] Volumetric pricing further varies, as summarized in Table 1 below. Uniform rates are when the unit price for water is constant across varying consumption levels.[185] For increasing block rates, as consumption volume increases, the unit price increases up a series of price blocks.[186] Low or average volume users of water are charged relatively low prices per acre-foot of water, while users consuming volumes of water above a designated cut-off pay higher prices per acre-foot.[187] Conversely, for decreasing block rates, the unit price decreases as consumption increases.[188] Seasonal rates have differing unit prices based on the season; summer water rates tend to be higher than winter water rates because water is scarcer in the summer.[189]

181. Melanie Mason, *Gov. Jerry Brown Signs Historic Groundwater Management Legislation*, L.A. TIMES (Sept. 16, 2014, 12:29 PM), http://www.latimes.com/local/political/la-me-pc-groundwater-regulation-bills-20140916-story.html.

182. *Id.*

183. *See* Getches, *supra* note 2, at 61–63.

184. *See* CHRISTIAN-SMITH & KAPHEIM, *supra* note 19, at 2.

185. *Id.*

186. *Id.* at 3.

187. *See id.*

188. *Id.*

189. *See id.*

TABLE 1: CATEGORIES OF WATER RATE STRUCTURES

Type of Rate	**Description**	**Rate Subcategories**		**Unit of Measurement**
Fixed charge rate	Fee for water delivery based solely on the acreage of the farm			Dollars-per-acre
Volumetric rate	Fee for water delivery is a per unit charge based on actual volume of water delivered	Uniform rate	Constant unit price across varying consumption levels	Dollars-per-acre-foot
		Increasing block rate	Unit price increase up a series of price blocks as consumption volume increases	
		Decreasing block rate	Unit price decreases as volume of consumption increases	
		Seasonal rates	Unit price differs based on season	

2. Adoption of Volumetric Pricing under the California Water Conservation Act

The following table takes data from all of the agricultural water management plans submitted to the California Department of Water Resources by Central Valley irrigation districts to analyze the adoption of volumetric water pricing in response to the California Water Conservation Act of 2009. The sample includes both junior (post-1914) and senior (pre-1914) irrigation districts in the Central Valley.

TABLE 2: ADOPTION OF VOLUMETRIC PRICING BY CENTRAL VALLEY IRRIGATION DISTRICTS IN COMPLIANCE WITH THE CALIFORNIA WATER CONSERVATION ACT OF 2009

Irrigation districts adopting volumetric pricing before the act (BEFORE ACT)	12	Senior irrigation districts: 2
		Junior irrigation districts: 10
Irrigation districts adopting volumetric pricing after the act's deadline (AFTER DEADLINE)	5	Senior irrigation districts: 3
		Junior irrigation districts: 2
Irrigation districts yet to adopt volumetric pricing (NOT YET)	3	Senior irrigation districts: 2
		Junior irrigation districts: 1

As is evident from the table, most senior irrigation districts adopted volumetric pricing only after the Act's mandate. Some still have yet to adopt it. As of August 2014, the senior Oakdale Irrigation District had not even approved a new water pricing structure that incorporated volumetric pricing, which would only be implemented starting January 2015.[190] The Oakdale Irrigation District proposal would institute a tiered pricing system with a volumetric surcharge of $3.15 for the first 3 acre-feet of water and increasing surcharges for each successive level.[191] As of 2014, the senior Modesto Irrigation District had also not yet implemented volumetric pricing.[192] There are, however, a few notable exceptions to this trend of inertia by senior irrigation districts. Alta Irrigation District had passed a volumetric surcharge on to its constituents in 2005, well before the passage of the Act.[193] However,

190. Press Release, Oakdale Irrigation Dist., Oakdale Irrigation District Directors Move Ahead with Study to Raise Water Rates (Aug. 19, 2014), *available at* http://www.oakdaleirrigation.com/files/OID%20board%20meeting%20release%2008-19-14.pdf.

191. *Id.*

192. MODESTO IRRIGATION DIST., DRAFT AGRICULTURAL WATER MANAGEMENT PLAN FOR 2012, at 47 (2012), *available at* http://www.mid.org/water/irrigation/DraftAgWMP_2012.pdf.

193. ALTA IRRIGATION DIST., WATER MANAGEMENT PLAN UPDATE FOR ALTA IRRIGATION DISTRICT 1 (2012), *available at* http://www.water.ca.gov/wateruseefficiency/sb7/docs/2014/plans/Water%20Management%20Plan%20Volume%203%20of%203.pdf.

these experiments in innovation by senior irrigation districts are the exception rather than the rule.

Before the Act it had been decades since many senior irrigation districts had last changed their water rates. For instance, Oakdale Irrigation District had not raised its water rate in over thirty years, with water delivery consistently priced at $19.50 per acre[194] even through crises such as the California drought of the early 1990s and ESA-mandated cuts to water delivery. Glenn-Colusa Irrigation District incorporated volumetric pricing in January 2014 to comply with the Act;[195] before this, water rates were assessed on a per-acre basis and had not been changed for ten years.[196] Further, the South San Joaquin Irrigation District historically charged for water delivery on a per-acre basis, but a pricing structure was developed in response to the Act that would add a $3 per-acre volumetric surcharge to water delivered.[197]

Junior irrigation districts were significantly more likely to have implemented volumetric water pricing before the Act, although few had water rate structures that included tiered pricing to further water conservation. For example, Belridge Irrigation District has volumetric fixed unit pricing for all water users that received SWP water, which comprised 65 percent of the District's water supply.[198] However, Belridge did not implement a tiered water pricing system that would have further encouraged water conservation by users because "the water charge is already sufficiently high to encourage the water users to conserve water without imposing additional penalties such as those that might be incurred from a tiered water pricing program."[199] The junior Berrenda Mesa Irrigation District has volumetric pricing for 100 percent of its water delivery, with a per-acre fixed charge and an incremental volumetric surcharge that is calculated per acre-foot.[200] Lost Hills Water District landowners currently pay the relatively high price of $125.27 per acre-foot of SWP contract

194. J.N. Sbranti, *Oakdale Irrigation District's Irrigation Water Rates to Rise*, MODESTO BEE (Aug. 19, 2014, 6:28 PM), http://www.modbee.com/news/local/article3170152.html.

195. Letter from Glenn-Colusa Irrigation Dist., to GCJD Landowners and Water Users (April 16, 2015), http://www.gcid.net/Water%20Documents/2015/2015%20Water%20Allocation%20and%20Application%20Materials.pdf; GLENN-COLUSA IRRIGATION DIST., SBX7-7 WATER MEASUREMENT COMPLIANCE PROGRAM (2012), *available at* http://www.water.ca.gov/wateruseefficiency/sb7/docs/2014/plans/GCID%20SBX7-7%20Water%20Measurement%20Compliance%20Program.pdf.

196. *Water Rate Planning and Strategy*, *supra* note 146, at 4 ("One of the first steps was to hire Davids Engineering to study the applied water rates that the District has been using for the last 10 years.").

197. SOUTH SAN JOAQUIN IRRIGATION DIST., 2012 AGRICULTURAL WATER MANAGEMENT PLAN 3-23 (2012), *available at* http://www.ssjid.com/assets/pdf/2012-Ag-Water-Management-Plan.pdf.

198. BELRIDGE WATER STORAGE DIST., *supra* note 53, at 51.

199. *Id.*

200. BERRENDA MESA WATER DIST., 2012 AGRICULTURAL WATER MANAGEMENT PLAN 46 (2013), *available at* http://www.water.ca.gov/wateruseefficiency/sb7/docs/2014/plans/Berrenda%20Mesa%20WD%202012%20AWMP%20-%20Final.pdf.

water; this uniform volumetric rate was instituted in 1999.[201] In contrast, the junior Buena Vista Water District only began charging its water users based on the volume of water delivery in 2013 after the mandate from the Act.[202] Some junior irrigation districts have instituted further variances in their volumetric pricing; in the junior Cawelo Water District, all water delivery is priced on a volumetric basis and priced higher in dry years than in wet years.[203]

The demonstrated trend of inertia from this analysis indicates that senior irrigation districts are less likely than junior irrigation districts to make structural changes to long-standing practices of water rate formation and irrigation infrastructure without explicit mandates. As a result of the California hybrid water rights doctrine, senior water users have stronger rights to their share of the irrigation water than junior water users, which seems to contribute to the lack of incentive for senior irrigation districts to independently adopt water conservation measures. Although this trend of inertia against adopting higher water rates and volumetric pricing is more apparent among senior irrigation districts, based on this analysis it seems clear that all irrigation districts need external pressure, such as regulation, in order to innovate further to include aspects of tiered and inverted block pricing in their water rate structures.

C. Adoption of Efficient Irrigation Technology

The Act requires agricultural water suppliers to "implement additional efficient management practices" including "facilitat[ing] the financing of capital improvements for on-farm irrigation systems" which could help overcome the cost barrier to installing drip irrigation infrastructure.[204] As explained below, efficient irrigation technology is one method irrigation districts can employ to mitigate the effects of higher water costs and ESA-mandated cuts to water delivery.[205] However, it seems to be neglected in the long-term agricultural water management plans of irrigation districts.

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201. LOST HILLS WATER DIST., 2012 AGRICULTURAL WATER MANAGEMENT PLAN 19 (2013), *available at* http://www.water.ca.gov/wateruseefficiency/sb7/docs/2014/plans/Lost%20Hills%20WD%202012%20AWMP%20-%20Final.pdf.

202. BUENA VISTA WATER STORAGE DIST., AGRICULTURAL WATER MANAGEMENT PLAN 31 (2014), *available at* http://www.water.ca.gov/wateruseefficiency/sb7/docs/2014/plans/Beuna_Vista_WSD.pdf.

203. CAWELO WATER DIST., AGRICULTURAL WATER MANAGEMENT PLAN 77 (2014), *available at* http://www.water.ca.gov/wateruseefficiency/sb7/docs/2014/plans/Cawelo%20Final%202012%20AWMP.pdf.

204. Agricultural water suppliers are allowed to consider cost effectiveness and technical feasibility when determining what water management practices to promote to their users under this bill. *See* Water Conservation Act of 2009, CAL. WATER CODE § 10608.48(c)(3) (West 2015).

205. U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 16, at 7.

1. Gravity and Drip Irrigation Systems

Gravity irrigation includes furrow irrigation, where water from a ditch or pipe runs the length of furrows carved between rows of crops and runs off at the lower end of the field.[206] The conveyance systems for gravity irrigation can be lined or unlined open ditches, with excess water seeping back into aquifers.[207] According to the California Department of Water Resources, 43 percent of farmland in California uses a form of gravity irrigation such as flood or furrow irrigation.[208] For example, most farms that receive CVP water currently use gravity-flow surface irrigation systems instead of more efficient pressurized systems such as drip or sprinkler irrigation.[209]

Forms of irrigation technology such as drip irrigation use far less water than gravity irrigation[210] and could help California withstand the effects of future drought.[211] Implementing drip irrigation leads to less water lost due to runoff, evaporation, or to the ground below the level that is usable by crops.[212] It also allows farmers to irrigate more frequently than traditional gravity irrigation and improves the uniformity of irrigation, improving crop yields and reducing overall losses of irrigation water.[213]

TABLE 3: COMPARISON OF WATER EFFICIENCIES FOR DIFFERENT IRRIGATION SYSTEMS[214]

Type of irrigation system	**Maximum attainable efficiency**	**Water used per acre (in acre-feet)**[215]	**Water saving over furrow irrigation (as a percent)**	**Cost (in dollars per acre)**[216]
Furrow	60–75%	3.69–4.17	0 (baseline)	$17
Sprinkler	65–90%	2.79–3.13	13.8–14.4	$100–500
Drip	75–90%	2.41–2.63	34.7–36.9	$250–1500

206. *Id.* at 33 n.1.
207. *See* BUENA VISTA WATER STORAGE DIST., *supra* note 202, at 65.
208. Weiser, *supra* note 133.
209. U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 16, at 33.
210. Weiser, *supra* note 133.
211. *See* Zilberman et al., *supra* note 154, at 124, 128.
212. U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 16, at 34.
213. *Id.*
214. This table is adapted from data in Tables 3.1 and 3.2 of a Government Accountability Office report on water subsidies prepared for the U.S. Senate Committee on Energy and Natural Resources. *See id.* The report is based on research in the San Joaquin Valley by the California State University at Fresno. *Id.*
215. Based on comparison of water requirements for growing cotton. *See id.*
216. *Id.*

There are multiple barriers to implementing more efficient irrigation systems. The cost of installation can be prohibitive—drip irrigation ranges from $250 to over $1500 per acre and movable sprinkler systems cost $100 up to $500 per acre.[217] This compares poorly to the $17 per acre for the furrows of gravity irrigation.[218] Thus while drip irrigation saves money on water expenses in the long term, the upfront installation cost can act as a barrier. In addition, many irrigation districts deliver water by opening a valve or gate to divert surface water to a particular farm, not by the pressurized pipes that are necessary for drip irrigation to deliver water in lower volumes.[219] Site-specific conditions such as the type of soil and the topography of the farm can also affect profitability for farmers to install drip irrigation.[220] However, the cost of implementing more efficient irrigation systems can be offset by improved crop yields and reduced costs of irrigation labor and total water usage.[221]

2. Comparing Irrigation Systems of Junior and Senior Irrigation Districts in the Central Valley

To determine if there was a difference in the irrigation technology systems, I analyzed data on the current irrigation infrastructure of junior and senior irrigation districts from the agricultural water management plans filed by Central Valley irrigation districts. There was a clear trend of senior irrigation districts maintaining gravity irrigation systems. For example, the distribution system of the senior Glenn-Colusa Irrigation District consists of open canals and pipelines.[222] Similarly, the primary irrigation method in the senior Turlock Irrigation District is basin-check flood irrigation.[223]

In contrast to these senior irrigation districts, many junior irrigation districts utilized more efficient irrigation systems including drip and sprinkler irrigation. The junior Berrenda Mesa Irrigation District uses pressurized irrigation systems such as drip and fan-jet systems for all of its irrigated permanent crop acreage and the "highest attainable efficiency on all the permanent crop acreage . . . accounts for 99.8 [percent] of the irrigated land in the District."[224] The majority of Berrenda Mesa's technology shift from furrow and gravity irrigation to micro-irrigation systems was done in the 1980s.[225] Rancho California Water District delivers water to all of its customers through a pressurized pipeline system, with micro-irrigation systems of low-flow micro-

217. *Id.*
218. *Id.*
219. Weiser, *supra* note 133.
220. U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 16, at 35.
221. *Id.*
222. *See* GLENN-COLUSA IRRIGATION DIST., *supra* note 195, at 11–12.
223. TURLOCK IRRIGATION DIST., 2012 AGRICULTURAL WATER MANAGEMENT PLAN 17 (2012), *available at* http://www.tid.org/sites/default/files/documents/tidweb_content/Final-TID-AWMP.pdf.
224. BERRENDA MESA WATER DIST., *supra* note 200, at 48.
225. *Id.* at 8.

spinning and drip emitters delivering water to crops.[226] All of the on-farm irrigation systems for permanent crops in Dudley Ridge Water District are low-volume drip or micro-sprinkler systems, with most of the infrastructure improvements financed by landowners through independent funding or from private lending institutions.[227] In Lost Hills Water District, the permanent crop acreage that was irrigated with micro-irrigation systems increased from 21 percent in 1990 to 99.8 percent in 2012 in response to reduced SWP water supply and high water costs.[228]

However, not all junior irrigation districts have instituted efficient irrigation systems for their growers. The junior Buena Vista Water District distributes most of its irrigation water through a system of open ditches, although it plans to apply for grants to assist its growers to "evaluate and improve" the operation of irrigation systems.[229] Cawelo Water District has lined conveyance systems and no plans to make further capital investments for more efficient irrigation distribution systems, rationalizing instead that its current water rate structure which increases water prices for dry years "may be among the factors that lead water users to convert from flood irrigation to low-volume irrigation systems."[230]

A report submitted to the Senate Committee on Energy and Natural Resources by the Government Accountability Office after the passage of the 1992 CVPIA shows that policy makers are aware of the disparity between the irrigation systems of junior and senior irrigation districts.[231] The report found that the Central California Irrigation District, where water was $8 per acre-foot, used unlined canals and ditches to deliver water through gravity irrigation, including furrow and flood irrigation.[232] Tranquility Irrigation District is the second-oldest irrigation district in Fresno County and its conveyance system was mostly canals and pipelines.[233] The district did not collect information on the irrigation methods of its farmers but estimated that at least 70 percent of the farms irrigated using furrow irrigation.[234] In contrast, the more junior Arvin-Edison Water Storage District charged from $47 to $129 per acre-foot of water and its irrigation system consisted of lined canals and ditches as wells as

226. RANCHO CAL. WATER DIST., 2012 AGRICULTURAL WATER MANAGEMENT PLAN 6–15 (2012), *available at* http://www.water.ca.gov/wateruseefficiency/sb7/docs/2014/plans/Rancho%20California%20WD%20AWMP%20Final%2012%2013%202012.pdf.

227. DUDLEY RIDGE WATER DIST., 2012 AGRICULTURAL WATER MANAGEMENT PLAN 23 (2012), *available at* http://www.water.ca.gov/wateruseefficiency/sb7/docs/2014/plans/Dudley%20Ridge%20WD%202012%20AWMP.pdf.

228. LOST HILLS WATER DIST., *supra* note 201, at 9–10.

229. BUENA VISTA WATER STORAGE DIST., *supra* note 202, at 6.

230. CAWELO WATER DIST., *supra* note 203, at 77.

231. *See* U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 16, at 35–36.

232. *Id.*

233. U.S. BUREAU OF RECLAMATION, TRANQUILITY IRRIGATION DISTRICT AGRICULTURAL WATER MANAGEMENT PLAN 2 (2011), *available at* http://www.usbr.gov/mp/watershare/wcplans/2011/tranquillity_id_wmp_6-3-11.pdf.

234. *Id.* at 5.

sprinkler and drip irrigation systems.[235] This trend could prove problematic for the CVPIA's goals of "mitigation, protection, and restoration of fish and wildlife."[236]

History proves that California farmers can change their irrigation methods in the face of drought. In 1991, during California's most recent major drought, nearly 70 percent of farms utilized forms of water-wasting gravity irrigation.[237] By 2010, that percentage had fallen to 43 percent.[238] In the period from 1972 to 1995, usage of gravity irrigation systems decreased by 20 percent while sprinkler irrigation increased by 8 percent.[239] The junior Belridge Water Storage District transitioned from having only 5400 acres irrigated with drip irrigation in 1990 to nearly 100 percent of its permanent crop acreage irrigated with micro-irrigation systems in 2012.[240] Furrow irrigation was completely phased out of Belridge's distribution system because higher water costs and the topography of the district made it prohibitively inefficient.[241] Some farmers who did not completely revamp their irrigation systems to a drip irrigation system after the 1991 drought instead made modulated improvements in their gravity irrigation systems by shortening their furrow lengths.[242]

The gravity irrigation method of irrigation was used universally thousands of years ago in Mesopotamia and Egypt[243] and continues to flourish in California today, largely due to the role of federal subsidies for irrigation water priced well below its actual value.[244] More efficient irrigation systems such as drip irrigation could lead to annual savings of more than two hundred thousand acre-feet in California,[245] water the state desperately needs for endangered species habitat restoration and agricultural use. However, it is clear from the data drawn from the agricultural water management plans that upgrades in irrigation infrastructure are often neglected in long-term water management proposals.[246]

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235. U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 16, at 35–36.

236. *Section 3406. Fish, Wildlife, Improved Water Management & Conservation*, U.S. BUREAU RECLAMATION, http://www.usbr.gov/projects/Project.jsp?proj_Name=Central+Valley+Project (last updated Mar. 15, 2013).

237. Weiser, *supra* note 133.

238. *Id.*

239. Susan Edinger-Marshall & John Letey, *Irrigation Shifts toward Sprinklers, Drip and Microsprinklers*, 51 CAL. AGRIC. 38, 39 (1997).

240. BELRIDGE WATER STORAGE DIST., *supra* note 53, at 9.

241. *Id.*

242. "Of the 223 respondents . . . 120 (54 [percent]) gave a response about their 'most recent' change in irrigation systems . . . . The number of acres affected by these changes could not be determined from the data." Edinger-Marshall & Letey, *supra* note 239, at 39.

243. Johnston, *supra* note 18.

244. *Id.*

245. COOLEY ET AL., *supra* note 17, at 16.

246. *See supra* notes 204–245 and accompanying text (reviewing this issue).

D. Mitigation Measures for Anthropogenic Climate Change

A final factor that will force water conservation to the forefront of irrigation districts' decision making is the impending threat of climate change. Anthropogenic climate change will intensify farmers' uncertainty about future water supply by reducing long-term availability and varying short-term availability.[247] Although there is a firm consensus that human activity is leading to changes in the climate, there continues to be high uncertainty about what the specific distributional impacts of climate change will be for individual users.[248] Although the effects of climate change will likely necessitate short-term policy changes in the coming decades, irrigation districts could implement mitigation measures to plan for climate change now.

The California Department of Water Resources estimates that by 2050 climate change will significantly reduce the Sierra Nevada snowpack, which is the source of 65 percent of the state's water supply.[249] Specifically, climate change will cause precipitation to fall as rain instead of snow, reducing the snow pack, and thus preventing storage in the reservoirs of the state's water system.[250] It will also reduce overall snowfall and shift spring runoff to earlier in the year.[251] The changing climatic conditions may also adversely affect the current makeup of permanent crops, necessitating a shift to alternative crops and requiring a longer irrigation season.[252] The projected rise in sea level will lead to increased salinity in the Bay-Delta and reduce water delivery over time.[253] Further, exporting water from a Delta with increased salinity will need more infrastructure than what is currently in place.[254]

The many possible detrimental effects of climate change are recorded in the agricultural water management plans that districts file with the California Department of Water Resources.[255] Wheeler Ridge-Maricopa Water Storage District acknowledged that the "[effects of climate change include] creating an increase in agricultural water demand for irrigation purposes and greater year-to-year variability of such demand."[256] The 2013 Agricultural Water Management Plan for the Buena Vista Water District states that "[f]or all

247. *See generally* Michelle Baddeley, *Energy, the Environment and Behaviour Change A Survey of Insights from Behavioural Economics*, 1120 CAMBRIDGE WORKING PAPERS ECON. 1 (2011) (describing impacts to personal water usage from anthropogenic climate change).

248. Kjell Arne Brekke & Olof Johansson-Stenman, *The Behavioural Economics of Climate Change*, 24 OXFORD REV. ECON. POL'Y 280, 282 (2008).

249. BELRIDGE WATER STORAGE DIST., *supra* note 53, at 48.

250. *Id.*

251. *Id.*

252. *Id.* at 49.

253. *Id.*

254. *Id.*

255. *See supra* note 139 and accompanying text.

256. WHEELER RIDGE-MARICOPA WATER STORAGE DIST., 2015 AGRICULTURAL WATER MANAGEMENT PLAN 63 (2012), *available at* http://www.wrmwsd.com/WRMWSD_AWMP_01_09_2015%20DRAFT.pdf.

climate projections studied, the reliability, and thus volume of water delivered, by the SWP and CVP water supply systems is expected to be reduced."[257] Cawelo Water District recognized that "the long-term reliability of surface water supplies to Southern California from the Delta is expected to average 60 percent of the contractual amounts" as a result of climate change.[258] This indicates that the districts are well aware of the dangers that climate change poses to the health of their constituent farms and California's water supply. Nevertheless, the plans had few if any mentions of active mitigation measures that irrigation districts were implementing to adapt to the effects of climate change.

In nearly every five-year agricultural water management plan surveyed, irrigation districts mentioned that the lack of reliability of water delivery from the SWP and CVP was a more pressing concern than climate change for irrigation districts.[259] For example, the 2012 Agricultural Water Management Plan for Belridge Water District states, "Within the five year horizon of this Plan, the District is *much more* concerned regarding the current reliability (or lack thereof) of the State Water Project (SWP) than it is about climate change."[260] There is identical language in the 2012 Agricultural Water Management Plans for both the Dudley Ridge and Lost Hills Water Districts.[261]

E. Procrastination as a Barrier to Effective Environmental Decision Making

Economists frequently typify environmental problems as the quintessential "wicked problem" because they are rife with market failures, and few policy interventions seem to be effective in preventing them.[262] Recent literature from the fields of behavioral economics and psychology highlights how cognitive

257. BUENA VISTA WATER STORAGE DIST., *supra* note 202, at 62. "For all climate projections studied, the reliability, and thus volume of water delivered, by the SWP and CVP water supply systems is expected to be reduced" and "[the effects of climate change include] creating an increase in agricultural water demand for irrigation purposes and greater year-to-year variability of such demand." CAWELO WATER DIST., *supra* note 203, at 72–73.

258. "[T]he long-term reliability of surface water supplies to Southern California from the Delta is expected to average 60 percent of the contractual amounts." CAWELO WATER DIST., *supra* note 203, at 70.

259. *See, e.g.*, BELRIDGE WATER STORAGE DIST., *supra* note 53, at 48; DUDLEY RIDGE WATER DIST , *supra* note 227, at 32 ("Within the two year horizon of this Plan, the District is much more concerned regarding the current reliability (or lack thereof) of the SWP than it is about climate change.").

260. *See* BELRIDGE WATER STORAGE DIST., *supra* note 53, at 48 (emphasis in original).

261. *Compare* DUDLEY RIDGE WATER DIST., *supra* note 227, at 32 ("Within the two year horizon of this Plan, the District is much more concerned regarding the current reliability (or lack thereof) of the SWP than it is about climate change."), *with* LOST HILLS WATER DIST., *supra* note 201, at 48 ("Within the five year horizon of this Plan, the District is *much more* concerned regarding the current reliability (or lack thereof) of the State Water Project than it is about climate change.") (emphasis in original).

262. Weiser, *supra* note 133.

limitations such as procrastination contribute to decisions that vary from what a rational model of human behavior and conventional economics would predict.[263] Although much of the literature centers on individual decision making, this discussion imputes these findings onto the collective decision making that irrigation districts engage in.

Under the rational agent model used in conventional economics, people will make long-term decisions incrementally discounting for near-term consumption and future consumption.[264] However, the tendency to take steps that will have small short-term costs to reach greater long-term gains is not as great as the rational agent model predicts.[265] In reality people tend to weigh current consumption costs more than future rewards and do not properly apply discount rates, a trend with the familiar label "procrastination."[266] Procrastination problems are common when there is a small short-term gain and a large long-term loss,[267] and even when procrastinators realize the extent of the problem there is a demonstrated tendency towards long-term inertia.[268] There are numerous empirical studies on the clear effects of procrastination in such diverse fields as savings in retirement plans,[269] household investments in energy-efficient products,[270] and using cost-saving fertilizer.[271] In all of these examples, people fail to make economically rational choices that would have small but not negligible short-term costs but much larger long-term benefits.[272]

When making decisions, people demonstrate significant "present bias."[273] Studies of brain activity show that people tend to maintain the status quo instead of making the choice that involves risk and complicated trade-offs.[274] The effort that is expended to make a difficult decision leads to people either

263. *See, e.g.*, Daniel Kahneman, *Maps of Bounded Rationality Psychology for Behavioral Economics*, 93 AM. ECON. REV. 1449 (2003).

264. *See generally* Richard H. Thaler & Shlomo Benartzi, *Save More Tomorrow Using Behavioral Economics to Increase Employee Saving*, 112 J. POL. ECON. S164 (2004).

265. Cass R. Sunstein, *Empirically Informed Regulation*, 78 U. CHI. L. REV. 1349, 1352 (2011).

266. *See generally* Thaler & Benartzi, *supra* note 264.

267. Sunstein, *supra* note 265, at 1352.

268. Thaler & Benartzi, *supra* note 264, at S168.

269. "Status quo bias is prevalent in the retirement savings domain . . . . [A]nalysis reveals that the *median* number of changes in the asset allocation over the *lifetime* was zero." *Id.* (emphasis in original).

270. "[S]ome people fail to make choices that have short-term net costs but long-term benefits (as is the case, for some, with choosing more energy-efficient products)." *See* Sunstein, *supra* note 265, at 1352.

271. "[F]armers may procrastinate, postponing fertilizer purchases until later periods, when they may be too impatient to purchase fertilizer." Esther Duflo et al., *Nudging Farmers to Use Fertilizer Theory and Experimental Evidence from Kenya*, 101 AM. ECON. REV. 2350, 2350 (2011).

272. *See* Sunstein, *supra* note 265, at 1352.

273. L. Venkatachalam, *Behavioral Economics for Environmental Policy*, 67 ECOLOGICAL ECON. 640, 642 (2008).

274. Cass R. Sunstein & Lucia A. Reisch, *Automatically Green Behavioral Economics and Environmental Protection*, 38 HARV. ENVTL. L. REV. 127, 142 (2014).

putting off the decision or not making it at all.[275] The status quo bias can be deepened further by a large degree of uncertainty.[276]

It is often the case that complicated environmental issues require the consideration of complex economic and environmental variables, with those people making the decisions having less than a desirable amount of information available.[277] Environmental risks such as losing entire species to extinction operate on long time scales and are often the result of numerous incremental steps by people who are uncertain about much of the information they use to make decisions.[278] The status quo bias in environmental decision making leads to people preferring their current levels of commodity consumption to changes in commodity provision,[279] even when shifting exogenous variables like drought and climate change provide strong evidence for the change. This bias defeats even seemingly commonsense environmental initiatives, such as when households in developing countries use existing water facilities with poor water quality instead of more efficient alternatives, or polluters continue to use more costly pollution-abatement technology even when market-based pollution mitigation options are available.[280]

When asked to make judgments with evidence that had substantial amounts of uncertainty, "people rely on a limited number of . . . principles which reduce the complex tasks . . . to simpler judgmental operations . . . [which can] lead to severe and systematic errors."[281] When long-term procrastination inertia plays a significant role in decision making, the result can be significant environmental harm.[282] For example, in the case of water conservation, irrigation districts procrastinate on water conservation measures, believing they will save water in later years. As a result of irrigation districts year after year failing to conserve water, there is overdraw of aquifers, decline of ESA-listed fish species, and increased water scarcity.

Conclusions drawn from the literature provide evidence that procrastination could be playing a large role in the unwillingness of Central Valley irrigation districts, especially senior irrigation districts, to adopt volumetric water pricing, more efficient irrigation technology, and climate change mitigation measures before the mandates of the California Water Conservation Act of 2009. There is a convincing story here that procrastination

275. *Id.* at 141.

276. *See* Venkatachalam, *supra* note 273, at 643.

277. *See* G.A. Bradshaw & Jeffrey G. Borchers, *Uncertainty as Information Narrowing the Science-Policy Gap*, 4 CONSERVATION ECOLOGY, no. 1, 2000, at 1, 1, *available at* http://www.ecologyandsociety.org/vol4/iss1/art7/.

278. Christian Gollier & Nicolas Treich, *Decision-Making under Scientific Uncertainty The Economics of the Precautionary Principle*, 27 J. RISK & UNCERTAINTY 77, 79 (2003).

279. Venkatachalam, *supra* note 273, at 643.

280. *Id.*

281. Amos Tversky & Daniel Kahneman, *Judgment under Uncertainty Heuristics and Biases*, 185 SCIENCE 1124, 1124 (1974).

282. *See* Sunstein & Reisch, *supra* note 274, at 157.

is why irrigation districts have failed to make long-term water management changes even after numerous droughts and ESA-mandated cuts to water delivery. If this is true, then it will fall upon state and federal governments to pass sweeping regulations like the California Water Conservation Act to ensure a reliable future of water for California.

CONCLUSION

Attempts to weaken the power of the storied ESA have gained renewed vigor as California enters another chapter of its prolific water wars, with the Ninth Circuit's ruling in *San Luis* and another year of its historic drought. New bills such as HR 1837, the Sacramento-San Joaquin Valley Water Reliability Act, would limit the legal impact of the ESA on water deliveries to San Joaquin Valley farmers.[283] The Act would bring millions of extra acre-feet of water to Central Valley farms even as the waning ecological health of the Bay-Delta will need more water diversions to support its fish populations.[284] HR 1837 would require Reclamation to provide water deliveries "without regard" to the ESA, the CVPIA, and any possible future attempts by state agencies to pursue comprehensive Delta management.[285]

Other efforts to undermine conservation in the Bay-Delta include new support among Governor Brown's administration for the euphemistically dubbed Peripheral Canal, which would divert more than one million acre-feet of water through the SWP from the Bay-Delta to Central and Southern California.[286] The original Proposition 9 referendum on the Peripheral Canal was defeated in 1982, exposing deep-rooted tensions between Northern and Southern California over the future of the Bay-Delta.[287] Governor Brown has promised to ease Southern and Central California's water worries, but it remains to be seen if this will be at the expense of ESA-listed species such as the Delta smelt.[288]

The California Water Conservation Act was a laudable attempt at state-level comprehensive water reform regulations. The original version of the Act would have led to significant reforms in the way that California monitors and

283. Matt Weiser, *Farmers Gain Ground in California Water Wars as Bill Passes House*, SACRAMENTO BEE (Mar. 15, 2012), *available at* http://www.theterranews.com/content/?p=52238.

284. *See id.*

285. "The bill, HR 1837 . . . would guarantee San Joaquin Valley farmers far more north state water than they can now expect. It would limit the Endangered Species Act from interfering in those water deliveries." *See id.*

286. Jim Newton, *Newton Water Ethics and a Peripheral Canal*, L.A. TIMES (June 25, 2012), http://articles.latimes.com/2012/jun/25/opinion/la-oe-newton-column-peripheral-canal-brown-20120625.

287. *Id.*

288. Adam Nagourney, *California Imposes First Mandatory Water Restrictions to Deal With Drought*, N.Y. TIMES (April 1, 2015), http://www.nytimes.com/2015/04/02/us/california-imposes-first-ever-water-restrictions-to-deal-with-drought.html.

enforces its water rights,[289] but powerful agricultural interests surpassed conservation concerns in state politics once again. Even after the Act, the California water rights system persists with the principles of reasonable and beneficial use, prior appropriation, and the correlative rights doctrine left intact. To be truly effective, the Act will need to survive administrations changes, a constantly changing state hydrologic landscape, and countless millions spent in lobbying against its timely implementation. It must also include strict monitoring to ensure compliance of irrigation districts to the Act's mandates on adopting volumetric water rates and innovative irrigation infrastructure as well as effective sanctions for noncomplying irrigation districts. It is possible that the Act's structural mandates will trigger long-term policy changes that succeed in resolving conflicts between agricultural water use and endangered species conservation where CALFED, the CVPIA, and ESA-mandated cuts to water delivery have not.

Procrastination in the face of an uncertain future water supply by irrigation districts, especially senior irrigation districts, has presented significant barriers to effective water management for California irrigation and the fish of the Bay-Delta. There are various manifestations of procrastination scattered throughout the agricultural water management plans that Central Valley irrigation districts filed with the Department of Water Resources, including the prevalence of gravity irrigation systems and slow adoption of volumetric pricing among senior irrigation districts. Procrastination by both junior and senior irrigation districts is also evident in assessing how the irrigation districts respond to anthropogenic climate change.

California must address conservation efforts of ESA-listed species such as the delta smelt and the continued viability of the Central Valley in an integrated manner. In the face of a tenuous future of water supply and acknowledging the barriers presented by procrastination, it may be necessary for state and federal governments to craft mandatory regulations specifically designed to ensure a dependable future of water for both California fish and farms.

289. Richard M. Frank, *A New Dawn for the Sacramento-San Joaquin Delta? Assessing the 2009 California Delta/Water Legislation*, 37 ECOLOGY L. CURRENTS 17, 23 (2010).

APPENDIX TABLE 1: WATER RATES AND IRRIGATION SYSTEMS OF CENTRAL VALLEY IRRIGATION DISTRICTS[290]

Irrigation District	Junior or Senior Water User?[291]	Water from CVP or SWP?	Irrigation Water Rates	Water Rate Measurement	Volumetric Pricing in Response to the Act? (BEFORE ACT, BEFORE DEADLINE, AFTER DEADLINE,	Irrigation Technology (GRAVITY, SPRINKLER, DRIP)	Change in Irrigation Technology in Response to the Act?
Alta Irrigation District[292]	Senior	No CVP water	Per-acre fee of $19 95 + $4 75 volumetric surcharge per acre-foot	Volume	BEFORE ACT	Gravity	NO
Belridge Water Storage District[293]	Junior	SWP	Variable with a base water rate of $95–$100 per acre-foot	Volume	BEFORE ACT	Sprinkler	NO
Berrenda Mesa Water District[294]	Junior	SWP	$144 92 per acre-foot	Volume	BEFORE ACT	Drip	NO
Buena Vista Water Storage District[295]	Junior	CVP	$35 per acre base rate + $17 50 per acre-foot	Volume	AFTER DEADLINE	Gravity	YES
Cawelo Water District[296]	Junior	SWP	$24–$74 per acre-foot	Volume	AFTER DEADLINE	Gravity	NO
Dudley Ridge Water District[297]	Junior	SWP	N/A	Volume	BEFORE ACT	Drip	NO
Glenn-Colusa	Senior	CVP &	$16 45 per acre-foot (2014 water rate)	Volume	AFTER DEADLINE	Gravity	NO

290. Unless stated otherwise, all data is drawn from each irrigation district's 2012 agricultural water management plan. July 31, 2012, was the deadline for implementation of the California Water Conservation Act's mandates about volumetric pricing adoption and capital investment in irrigation technology. These plans can be found at http://www.water.ca.gov/wateruseefficiency/sb7/planlist.cfm.

291. The date that each irrigation district was established is used as a proxy for classifying the district as a junior or senior water user.

292. *See generally* ALTA IRRIGATION DIST., WATER MANAGEMENT PLAN UPDATE FOR ALTA IRRIGATION DISTRICT (2012), *available at* http://www.water.ca.gov/wateruseefficiency/sb7/docs/2014/plans/Water%20Management%20Plan%20Volume%203%20of%203.pdf.

293. *See generally* BELRIDGE WATER STORAGE DIST., 2012 AGRICULTURAL WATER MANAGEMENT PLAN (2013), *available at* http://www.water.ca.gov/wateruseefficiency/sb7/docs/2014/plans/Belridge%20WSD%202012%20AWMP%20-%20Final.pdf.

294. *See generally* BERRENDA MESA WATER DIST., 2012 AGRICULTURAL WATER MANAGEMENT PLAN (2013), *available at* http://www.water.ca.gov/wateruseefficiency/sb7/docs/2014/plans/Berrenda%20Mesa%20WD%202012%20AWMP%20-%20Final.pdf.

295. *See generally* BUENA VISTA WATER STORAGE DIST., AGRICULTURAL WATER MANAGEMENT PLAN (2014), *available at* http://www.water.ca.gov/wateruseefficiency/sb7/docs/2014/plans/Beuna_Vista_WSD.pdf.

296. *See generally* CAWELO WATER DIST., AGRICULTURAL WATER MANAGEMENT PLAN (2014), *available at* http://www.water.ca.gov/wateruseefficiency/sb7/docs/2014/plans/Cawelo%20Final%202012%20AWMP.pdf.

297. *See generally* DUDLEY RIDGE WATER DIST., 2012 AGRICULTURAL WATER MANAGEMENT PLAN (2012), *available at* http://www.water.ca.gov/wateruseefficiency/sb7/docs/2014/plans/Dudley%20Ridge%20WD%202012%20AWMP.pdf.

Irrigation District[298]		SWP	with 4 1 acre-feet allocated per deeded acre				
Laguna Irrigation District[299]	Junior	No	$24 50 per acre	Acre (water is allocated to growers by acreage)	NOT YET	Gravity	NO
Lost Hills Water District[300]	Junior	SWP	Variable; $125 27 per acre-foot for SA 1	Volume	BEFORE ACT	Drip	NO
Merced Irrigation District[301]	Junior	No	$24 per acre + $23 25 per acre-foot	Volume	BEFORE ACT	Drip	NO
Modesto Irrigation District[302]	Senior	No	$32 50 per irrigated acre (with a minimum charge regardless of acreage of $162 50) + acre-foot water charge for usage above base allocation of 3 acre-feet Drought surcharge of $11 91 per irrigated acre	Acre (unless above base allocation of 3 acre-feet, then a volumetric charge of $14 75 per acre-foot for additional water)	NOT YET	Gravity	NO
North Kern Water Storage District[303]	Junior	No	$115 00 per acre-foot for Class 1 water and $185 00 per acre-foot for Class 2 water	Volume	BEFORE ACT	Gravity	NO
Oakdale Irrigation District[304]	Senior	No	Historically $19 50 per acre	Area (as of August 2014)	NOT YET	Gravity	YES
Rancho California Water District[305]	Junior	SWP	$280 76 per acre-foot	Volume	BEFORE ACT	Drip	NO
Semitropic Water	Junior	SWP	$85 40 per acre-foot of contract water	Volume	BEFORE ACT	Gravity	NO

298. GLENN-COLUSA IRRIGATION DIST., SBX7-7 WATER MEASUREMENT COMPLIANCE PROGRAM, *available at* http://www.water.ca.gov/wateruseefficiency/sb7/docs/2014/plans/GCID%20SBX7-7%20Water%20Measurement%20Compliance%20Program.pdf.

299. *See generally* LAGUNA IRRIGATION DIST., 2012 AGRICULTURAL WATER MANAGEMENT PLAN (2013), *available at* http://www.water.ca.gov/wateruseefficiency/sb7/docs/2014/plans/Laguna%20Irrigation%20District%20Final%20012813.pdf.

300. *See generally* LOST HILLS WATER DIST., 2012 AGRICULTURAL WATER MANAGEMENT PLAN (2013), *available at* http://www.water.ca.gov/wateruseefficiency/sb7/docs/2014/plans/Lost%20Hills%20WD%202012%20AWMP%20-%20Final.pdf.

301. *See generally* MERCED IRRIGATION DIST., AGRICULTURAL WATER MANAGEMENT PLAN (2013), *available at* http://www.mercedid.com/index.cfm/water/ag-water-management-plan/.

302. *See generally* MODESTO IRRIGATION DIST., AGRICULTURAL WATER MANAGEMENT PLAN FOR 2012 (2012), *available at* http://www.mid.org/water/irrigation/DraftAgWMP_2012.pdf.

303. *See generally* N. KERN WATER STORAGE DIST., AGRICULTURAL WATER MANAGEMENT PLAN (2014), *available at* http://www.water.ca.gov/wateruseefficiency/sb7/docs/2014/SBX%207-7%20Plans/NKWSD%20AgWMP%20Complete%20FINAL.pdf.

304. *See generally* OAKDALE IRRIGATION DIST., AGRICULTURAL WATER MANAGEMENT PLAN (2012), *available at* http://www.oakdaleirrigation.com/files/OID%202012%20AWMP%20-%20OID%20Web%20Version.pdf.

305. *See generally* RANCHO CAL. WATER DIST., 2012 AGRICULTURAL WATER MANAGEMENT PLAN (2012), *available at* http://www.water.ca.gov/wateruseefficiency/sb7/docs/2014/plans/Rancho%20California%20WD%20AWMP%20Final%2012%2013%202012.pdf.

Storage District[306]							
South San Joaquin Irrigation District[307]	Senior	No	The water rate for 2011 was $24 per acre with a $50 minimum charge	Volume (planned to be impleme nted as of 2014)	BEFORE DEADLINE	Gravity	YES
Turlock Irrigation District[308]	Senior	No	$23 per acre + variable rates per acre-foot ($2–$20 depending on the tier)	Volume	BEFORE DEADLINE	Gravity	NO
Westlands Water District[309]	Junior	Yes	$220 55 per acre-foot	Volume	BEFORE ACT	Drip	NO
Yolo County Flood Control and Water Conservati on District[310]	Junior	No	$24 00 per acre-foot	Volume	BEFORE ACT	Gravity	YES

306. *See generally* SEMITROPIC WATER STORAGE DIST., AGRICULTURAL WATER MANAGEMENT PLAN: DECEMBER 2013 PLAN UPDATE (2013), *available at* http://www.water.ca.gov/wateruseefficiency/sb7/docs/2014/plans/Semitropic%20WSD%202013%20AWMP%20Final.pdf.

307. *See generally* S. SAN JOAQUIN IRRIGATION DIST., 2012 AGRICULTURAL WATER MANAGEMENT PLAN (2012), *available at* http://www.ssjid.com/assets/pdf/2012-Ag-Water-Management-Plan.pdf.

308. *See generally* TURLOCK IRRIGATION DIST., 2012 AGRICULTURAL WATER MANAGEMENT PLAN (2012), *available at* http://www.tid.org/sites/default/files/documents/tidweb_content/Final-TID-AWMP.pdf.

309. *See generally* WESTLANDS WATER DIST., WATER MANAGEMENT PLAN (2013), *available at* http://wwd.ca.gov/wp-content/uploads/2014/06/Water-Management-Plan-2012.pdf.

310. *See generally* YOLO CNTY. FLOOD CONTROL & WATER CONSERVATION DIST., WATER MANAGEMENT PLAN 2013 (2013), *available at* http://www.water.ca.gov/wateruseefficiency/sb7/docs/2014/plans/Yolo%20Co%20Flood%20Control%20WCD%20AWMP%202013.pdf.

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