COMMENT

ALIGNING VISIONS FOR THE BAY-DELTA: MARKET-BASED ECOSYSTEM RESTORATION THROUGH AGRICULTURAL EFFICIENCY IMPROVEMENTS

I. INTRODUCTION

The Sacramento and San Joaquin Rivers are the main arteries of California's water supply.[1] They are fed with rain and snow from the Cascade and Klamath Mountain ranges of the north, the Sierra Nevada ranges of the east, and the Coastal Mountains to the west. Water navigates through the extensive foothills of the Central Valley and funnels into what some call the "inland sea," the waterway of the Sacramento-San Joaquin Delta ("Bay-Delta").[2] This "sea" eventually mixes with the saline San Francisco Bay, forming the largest estuary on the West Coast.[3] Biodiversity flourishes in this confluence of aquatic habitats.[4]

Over 700 native plant and animal species make up this critical ecosystem.[5] Over the years, the natural hydraulic system was modified

[1] The San Francisco Estuary Partnership, http://sfep.abag.ca.gov/abouttheestuary.html (last visited Apr. 8, 2009).

[2] *See* NASA Visible Earth, Sacramento River Delta (2006), http://visibleearth.nasa.gov/view_rec.php?id=17383.

[3] The San Francisco Estuary Partnership, http://sfep.abag.ca.gov/ (last visited Apr. 8, 2009).

[4] CAL. REG'L WATER QUALITY CONTROL BD., SAN FRANCISCO BAY BASIN (REGION 2) WATER QUALITY CONTROL PLAN § 1.1 (2007), *available at* www.swrcb.ca.gov/rwqcb2/water_issues/programs/planningtmdls/basinplan/bp_ch1withcover.pdf.

[5] HEATHER COOLEY ET AL., PAC. INST., MORE WITH LESS: AGRICULTURAL WATER CONSERVATION AND EFFICIENCY IN CALIFORNIA, A SPECIAL FOCUS ON THE DELTA 17 (2008),

by a complex system of levees and canals created to supply California's rich agricultural industry and large metropolitan population with fresh water.[6] Excessive water withdrawals and unnatural diversions severely imperil native fish populations; several now face extinction.[7]

Nearly two thirds of all Californians rely on the water supplied by the Bay-Delta for agriculture or personal consumption.[8] While California's growing population puts immense pressure on a static water supply, the state is failing to capitalize on the enormous potential for water conservation.[9] A recent study conducted by the Pacific Institute, an independent nonprofit research group, concluded that agricultural efficiency improvements could conserve as much as 3.4 million acre-feet of water annually.[10] California agriculture uses approximately 80% of all water withdrawn in the state,[11] and approximately half (22.2 million acre-feet) comes from the Bay-Delta.[12] Water savings from conservation and efficiency improvements are as effective and often less expensive than new centralized water storage.[13] Conservation measures could yield as much water as twenty new dams.[14]

The fish, the farmers, and the population of California require a solution to drought and other supply problems affecting the Bay-Delta.[15] Modification of the current water management system is both prudent and necessary in order to ease pressures to meet growing demand, as well as to restore the region's ecological health.[16] The state's new Delta Vision Strategic Plan ("Strategic Plan") is a big step in the right direction, but to be as effective as possible, the Strategic Plan should

available at www.pacinst.org/reports/more_with_less_delta/more_with_less.pdf.

[6] *See id.* at 5.

[7] *See id.* at 15-18 ("A key common finding of recent court decisions, scientific assessments, and the Delta Vision Blue Ribbon Task Force is that the absolute volume of water exported from the Delta is too high."); *see* Natural Res. Def. Council v. Kempthorne, 506 F. Supp. 2d 322, 370-74 (E.D. Cal. 2007).

[8] The San Francisco Estuary Partnership, *supra* note 1.

[9] *See* Press Release, State of Cal. Res. Agency, Task Force Unveils Statewide Blueprint for a Sustainable Delta (Oct. 17, 2008), *available at* www.calwater.ca.gov/content/documents/newsroom/Delta_Vision_Release_10-17-08.pdf.

[10] COOLEY ET AL., *supra* note 5, at 4, 6. An acre-foot is the amount of water needed to fill one acre of land to a depth of one foot, or 325,853 gallons. *Id.*

[11] *Id.* at 14.

[12] *Id.* at 17.

[13] *Id.* at 6.

[14] *Id.* (assuming a new dam or equivalent water storage system yields 174,000 acre-feet of "new" water).

[15] Press Release, State of Cal. Res. Agency, *supra* note 9.

[16] *Id.*

focus on the enormous potential for increased conservation in the agricultural sector.

Fully implementing a conservation strategy could increase instream flows to levels necessary to support natural aquatic life, reduce pumping that kills fish, and secure a more reliable water supply for the future.[17] Creating a government-run water bank and an educational outreach program to facilitate efficiency and conservation improvements in the agricultural sector could help to avoid further decline and potential collapse of the Bay-Delta ecosystem. State agencies should renegotiate existing water contracts to purchase and store conserved water for environmental restoration or transfer for future consumption. By creating a low-risk opportunity to transfer water rights and by cooperating directly with agricultural water users, the program would respect established water rights while also creating market incentives to use less water, thus benefiting the public, the ecosystem, and water-rights holders.[18]

This Comment proposes a comprehensive solution that could generate enormous water savings by increasing the efficiency of agriculture. Part II outlines the basics of California water law, specifically focusing on laws pertaining to water conservation and transfer. Part III analyzes the systems used in three other states to deal with water shortages and declining ecosystems. Part IV presents a proposal for conserving agricultural water, promoting irrigation efficiency through an educational outreach program, and using the water-transfer market as an economic incentive for efficiency. This proposal supplements the recommendations of the Strategic Plan with practical implementation analysis and achievable goals.

II. CALIFORNIA WATER LAW: THE LEGAL FRAMEWORK FOR CONSERVATION IS IN PLACE

Beginning with Governor Edmund G. "Jerry" Brown Jr.'s Commission to Review California's Water Rights Law in 1977, California water law has inched toward a more sustainable approach to the Bay-Delta.[19] Such an approach to water-supply issues is necessary because a finite water resource will eventually fail to meet a

[17] *See* Gregory A. Thomas, *Conserving Aquatic Biodiversity: A Critical Comparison of Legal Tools for Augmenting Streamflows in California,* 15 STAN. ENVTL. L.J. 3, 8-10 (1996).

[18] *Id.* at 45-47.

[19] Caitlin S. Dyckman, *A Dynastic Disruption: The Use Efficiency and Conservation Legacy of the Governor's Commission to Review California Water Rights Law Recommendations,* 36 MCGEORGE L. REV. 175, 176-77 (2005).

continuously growing demand. Constructing barriers and diverting water from the Sacramento-San Joaquin River systems has taken a significant toll on the entire Bay-Delta region.[20] Native fish are experiencing rapid decline (five species are listed as endangered or threatened under the Endangered Species Act (ESA)), pumps are being shut down to protect fish, aging levees are inadequate to protect low-lying farming islands, and the water-supply system of California is becoming less reliable.[21] The basic legal framework for sustainable water management is in place, but ecosystem restoration and securing a more reliable water supply will require, at least in part, more direct and effective water-conservation efforts.

Legislative and agency declarations expressly convey the need for agencies to facilitate water conservation directly. The California Constitution prohibits unreasonable water uses and waste.[22] Users who fail to implement available and practical conservation measures "cannot maintain a right to divert and use a quantity of water which is needed only if unreasonable practices are followed."[23] Legislative findings in the California Water Code encourage voluntary water transfers between users and declare it "in the public interest to conserve all available water resources."[24] The California legislature also directs the State Water Resources Control Board (SWRCB) and other appropriate agencies to be involved in improving efficiency, "including, but not limited to, providing technical assistance . . . to identify and implement water conservation measures which will make additional water available for transfer."[25] California law states:

> It is the intent of the Legislature in enacting this chapter to encourage local agencies and private enterprise to implement potential water conservation and reclamation projects by establishing a state program to finance or assist in financing projects which meet state criteria and

[20] Thomas, *supra* note 17, at 8.

[21] JAY LUND ET AL., PUB. POLICY INST. OF CAL., COMPARING FUTURES FOR THE SACRAMENTO-SAN JOAQUIN DELTA iii, 8 (2008), *available at* www.ppic.org/content/pubs/report/R_708EHR.pdf ("The . . . most common misnomers are the terms "levees" and "islands." Levees are earthen embankments that hold back water during floods. The "levees" of the Delta are truly *dikes* that hold back water all the time. Similarly, islands are lands of positive relief surrounded by water. The Delta's "islands" are reclaimed lands that form topographic depressions surrounded by water. In this regard, they are *polders* instead of islands.").

[22] CAL. CONST. ART. X, § 2.

[23] Andrew Sawyer, *Improving Efficiency Incrementally: The Governor's Commission Attacks Waste and Unreasonable Use*, 36 MCGEORGE L. REV. 209, 241 (2005) (quoting S.W.R.C.B Order No. WR 88-20, at 34-35 (Sept. 7, 1988)).

[24] CAL. WATER CODE § 475 (Westlaw 2008).

[25] CAL. WATER CODE § 109(b) (Westlaw 2008).

will result in additional supplies of water for use in areas of need.[26]

Current state law supports water conservation, efficiency, and a cooperative approach to implementation. While the new Strategic Plan for the Bay-Delta (discussed in section III, below) recommends water conservation as one way to restore the ecology of the Bay-Delta,[27] it is not the first attempt to use conservation to improve water management in California. A brief historical overview of the development of California water law will be helpful in the more detailed discussion of recent conservation efforts.

A. ESSENTIAL BACKGROUND: APPROPRIATIVE RIGHTS AND WATER PROJECT MANAGEMENT IN CALIFORNIA

Water allocation in California is based on appropriation law, a system that allows a user to establish a surface-water right by permit and remove unlimited amounts of water for reasonable and beneficial use.[28] Priority goes to the first user who perfects the water right.[29] This doctrine creates an incentive to withdraw water early and excessively, but it discourages conservation because rights are lost if water is saved.[30] The inefficient system ignores ecological needs and accelerates overexploitation of resources.[31] Today, most individuals do not hold appropriative rights to their water allocation.[32]

Under the modern system, most consumers are supplied through water-allocation contracts made by government-run water projects or irrigation districts.[33] Irrigators contract for their water supply with a local irrigation district or with a federal or state reclamation project, run by the Bureau of Reclamation or the Department of Water Resources (DWR), respectively.[34] Generally, it is these irrigation districts or government reclamation projects that hold the appropriative rights, supplying

[26] CAL. WATER CODE § 11952(a) (Westlaw 2008).

[27] PHILIP ISENBERG ET AL., FINAL DELTA VISION STRATEGIC PLAN 23 (2008), *available at* http://deltavision.ca.gov/StrategicPlanningDocumentsandComments.shtml#FinalDraft (choose "Standard Resolution" or "High Resolution" hyperlink).

[28] Dave Owen, *Law, Environmental Dynamism, Reliability: The Rise and Fall of CALFED,* 37 ENVTL. L. 1145, 1176-77 (2007).

[29] *Id.* at 1177 ("[A]ppropriators are limited by priorities in time; their rights are subordinate to the rights of preexisting holders.").

[30] *Id.* at 1177.

[31] *Id.* at 1178.

[32] *Id.* at 1181.

[33] *Id.*

[34] *Id.*

irrigators under long-term contracts.[35] It is the common practice of both water projects to contract for a maximum allocation and allow for reduced delivery in times of drought or environmental need.[36] As a result, paper water allocation vastly exceeds actual water reserves.[37] Due to this over-allocation, long-term contracts are often partially fulfilled, if filled at all.[38] Effective resource management and water-use planning demand implementation of strategies for consistent efficient use and conservation over the long term.

B. PROMOTING WATER CONSERVATION AND EFFICIENCY

The 1977 Governor's Commission ("Commission") was the first significant attempt to promote efficiency and conservation through the use of regulatory, administrative, and market-based mechanisms.[39] The Commission made twelve water-use recommendations to this end; Assembly Bill 1147 enacted nine of them almost verbatim.[40] By clarifying water rights and making permitting and enforcement more efficient,[41] these recommendations fundamentally changed California water law. The Commission used market-based approaches to water-rights administration to encourage transfers to benefit the environment.[42] Assembly Bill 1147 marked the end to an era of water project expansion and ushered in a new and more comprehensive approach to regulating water use.[43]

The major achievements adopted into the California Water Code from the Governor's Commission include the modification of the rule of forfeiture for non-use or transfer and the adoption of clearer enforcement guidelines for reasonable or beneficial use.[44] The forfeiture rule allows water-rights holders who reduce water use through conservation (not just normal non-use) to retain transferable rights to that water.[45] Once

[35] *Id.*

[36] *Id.*

[37] *Id.*

[38] *See* Ari B. Bloomekatz, *Feds: Less Water for California Agriculture This Year,* L.A. TIMES, Feb. 20, 2009, *available at* http://latimesblogs.latimes.com/lanow/2009/02/calif-water.html (reporting an announcement that the Bureau of Reclamation will deliver no water to over 200 water districts for the first time in seventeen years).

[39] Sawyer, *supra* note 23, at 237-38.

[40] *Id.* at 210-12.

[41] *Id.*

[42] *Id.* at 210.

[43] *Id.*

[44] Dyckman, *supra* note 19, at 183-84.

[45] CAL. WATER CODE § 1011(a)-(c) (Westlaw 2008).

conserved, the rights may be leased, exchanged, or sold to another user and will automatically revert to the transferor at the end of an agreement term.[46] To deter waste the Water Code grants authority to the SWRCB to issue injunctions and cease-and-desist orders against unreasonable water diversions.[47] The SWRCB no longer gives full weight to local custom when determining reasonable or beneficial use; after the Commission it became only one factor in the overall determination of acceptable water use.[48]

Even though these additions to the California Water Code set the foundation for a more sustainable water market and created agency enforcement authority for improper water use, the ecosystem continued to suffer.[49] Ambitious restoration efforts continued under the CALFED Bay-Delta Program and the Environmental Water Account (EWA).[50]

C. CALFED - ENVIRONMENTAL WATER ACCOUNT

California faced severe droughts from 1987 to 1992, causing water quality to decline in the Bay-Delta and highlighting the need for long-term solutions.[51] In the early 1990s, the Fish and Wildlife Service and the National Marine Fisheries Service listed certain Bay-Delta fish species as threatened under the ESA.[52] This forced agencies to manage water assets for consumption without jeopardizing the survival of the listed species.[53]

In 1994, the federal government and California agreed to coordinate efforts to maintain water quality through coordinated management in the Bay-Delta, signing what is known as the "Bay-Delta Accord."[54] After many years of planning, CALFED emerged from this agreement as the long-term solution for restoration.[55] CALFED is a collaborative effort by twenty-three state and federal agencies to create a long-term regional

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[46] *Id.*

[47] CAL. WATER CODE §§ 275, 1831 (Westlaw 2008).

[48] Dyckman, *supra* note 19, at 184.

[49] *See* Thomas, *supra* note 17, at 8-9.

[50] *See generally* Gregory A. Thomas, *The Future of Water Law Reform in California a Quarter Century After the Governor's Commission*, 36 MCGEORGE L. REV. 495, 497 (2005) (detailing the many ambitious goals that remain unfulfilled).

[51] CALFED BAY-DELTA PROGRAM, HISTORY OF THE CALFED BAY-DELTA PROGRAM, http://calwater.ca.gov/calfed/about/History/Detailed.html (last visited Feb. 11, 2009).

[52] Alf W. Brandt, *An Environmental Water Account: The California Experience*, 5 U. DENV. WATER L. REV. 426, 430-32 (2002) (discussing the listing the winter-run Chinook salmon and the delta smelt).

[53] *Id.* at 434-35.

[54] CALFED BAY-DELTA PROGRAM, *supra* note 51.

[55] Brandt, *supra* note 52, at 432-33.

plan to restore ecological health and improve water management in the Bay-Delta.[56] The EWA emerged from this planning process as a major part of the plan for effective water management.[57]

The EWA holds promise as an efficient and flexible mechanism to manage government-run dam operations to suit hydrology and fishery needs, despite its current short-term duration and limited scope.[58] The program seeks to restore fish populations through asset (water) acquisition and management, using acquired assets to replace undelivered water when species protection requires limited pumping.[59] EWA administrators use water acquisitions or operational adjustments to water projects to generate water assets for the account.[60] Reduced pumping lowers fish mortality rates, avoids exceeding incidental take limits,[61] and promotes species recovery.[62] The EWA attempts to maintain the baseline amount of water needed to protect endangered or threatened species; this baseline is known as the "zero point" when accounting for withdrawals and deposits of water.[63]

The EWA employs several methods to benefit suffering fish populations.[64] Administrators can use water acquisitions to benefit the environment directly, to increase instream flows, and to restore spawning, migration, and rearing habitats.[65] Higher outflows will also prevent saline Bay water from encroaching on the fresh-water habitats of the Bay-Delta.[66] Other methods include reduced pumping when fish are most at risk, and cross-channel gate closures to restore natural flow patterns and direct fish away from pumps.[67]

Despite the efforts of the purchasing program, the total amount of water acquired by the EWA does not meet the scientifically estimated

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[56] Andrea K. Gerlak & Tanya Heikkila, *Comparing Collaborative Mechanisms in Large Scale Ecosystem Governance*, 46 NAT. RESOURCES J. 657, 669 (2006).

[57] Brandt, *supra* note 52, at 432-33.

[58] *Id.* at 433.

[59] U.S. BUREAU OF RECLAMATION ET AL., ENVIRONMENTAL WATER ACCOUNT: DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT/ENVIRONMENTAL IMPACT REPORT--TO THE EWA FINAL EIS/EIR at ES-2 (2007), *available at* www.usbr.gov/mp/nepa/documentShow.cfm?Doc_ID=2889.

[60] Brandt, *supra* note 52, at 434-35.

[61] 16 U.S.C.A. § 1532(19) (Westlaw 2008) ("The term 'take' means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.").

[62] Brandt, *supra* note 52, at 434-35.

[63] *Id.* at 434-35.

[64] U.S. BUREAU OF RECLAMATION ET AL., *supra* note 59, at ES-3.

[65] *Id.*

[66] *Id.*

[67] *Id.*

fishery needs.[68] A typical year of acquisitions under the EWA yields 200,000 to 300,000 acre-feet of water.[69] However, necessary annual acquisitions for fisheries range from 400,000 to 600,000 acre-feet.[70] With acquisitions falling well short of ecosystem needs, the EWA is in debt.[71] Agricultural water conservation could eliminate this debt because there is an enormous potential for conserved water acquisitions.[72]

The EWA allows water projects to purchase unused water rights when land is left idle, or when water is conserved by switching to less water-intensive crops.[73] The administrators pay a preset consumptive-use value for water when otherwise productive land is not farmed.[74] This crop shifting/idling program and some groundwater purchase is the extent of coordinated efforts with the agricultural industry.[75] The program is beneficial but grossly inadequate, given that agriculture represents the largest beneficiary of Bay-Delta water resources.

California agencies have delayed the creation of a long-term EWA because of regulatory, judicial, and legislative uncertainties surrounding management of the Bay-Delta.[76] Various agencies share joint responsibility for the Bay-Delta, and upcoming decisions will modify restoration planning and management, impacting how an EWA functions.[77] The Strategic Plan recommended granting centralized authority to the California Delta Ecosystem and Water Council.[78] However, the legislative committee reviewing the Strategic Plan declined to act upon this recommendation.[79]

Another project creating uncertainty is the Bay-Delta Conservation Plan. This habitat-conservation project, which is currently under environmental review, seeks to protect endangered species while

[68] COOLEY ET AL., *supra* note 5, at 18.

[69] U.S. BUREAU OF RECLAMATION ET AL., *supra* note 59, at 2-23.

[70] *Id.*

[71] *Id.*

[72] COOLEY ET AL., *supra* note 5, at 6-7. (concluding conservation scenarios yielded from 600,000 to 3.4 million acre-feet of water annually).

[73] U.S. BUREAU OF RECLAMATION ET AL., *supra* note 59, at ES-3.

[74] *Id.* at 2-17.

[75] *Id.* at ES-3 to ES-4.

[76] *Id.* at 1-3 to 1-4.

[77] *See id.* at 1-3.

[78] ISENBERG ET AL., *supra* note 27, at 121.

[79] MIKE CHRISMAN ET AL., DELTA VISION COMMITTEE IMPLEMENTATION REPORT 18 (2008) (adopting every other recommendation proposed by the Strategic Plan; the implementation process began in early 2009), *available at* http://deltavision.ca.gov/DV_Committee/Jan2009/08-1231_Delta_Vision_Committee_Implementation_Report.pdf.

securing a reliable water supply.[80] It remains to be seen if the Bay-Delta Conservation Plan will use an EWA, or EWA-like methods, to protect endangered species while balancing consumption needs.[81]

Additionally, the U.S. Court of Appeals for the Ninth Circuit held that a biological opinion assessing the effect of long-term water-project operations in the Bay-Delta on the ESA was arbitrary and capricious[82] and required a new biological opinion by December 15, 2008.[83] The new biological opinion stated that the Bureau of Reclamation, the Fish and Wildlife Service, and the National Marine Fisheries Service all have congressional authorization to use an EWA through September 30, 2010, but further environmental review is under way to determine future use after the authorization expires.[84] Regardless of the present uncertainties surrounding the long-term continuation of an EWA program,[85] the fundamental water-acquisition model and environmental protection it envisions should remain intact.

A more comprehensive system to facilitate agricultural conservation would create significantly more water assets for acquisition.[86] A state-run water acquisition program (like the EWA) could purchase conserved water to maintain a scientifically established baseline to sustain aquatic ecosystems. Through assisted and voluntary irrigation improvements and efficient water-management plans, conservation will limit excessive withdrawals from the Bay-Delta.[87] There will be more water available for purchase to benefit the ecosystem or for transfer on the open market, both resulting in profits for the water-rights holder. Cooperating with

[80] CALIFORNIA NATURAL RESOURCES AGENCY, BAY DELTA CONSERVATION PLAN: UPDATE AND OVERVIEW 1 (2009), http://resources.ca.gov/bdcp/docs/BDCP_Exec_Sum_web_pages.pdf.

[81] U.S. BUREAU OF RECLAMATION ET AL., *supra* note 59, at 1-3.

[82] Natural Res. Def. Council v. Kempthorne, No. 1:05-CV-1207, 2008 WL 4462391, at 1-4 (9th Cir. Sept. 22, 2008) (holding the following: (1) Fish & Wildlife Service must complete a new biological opinion; (2) the prior biological opinion was not vacated (thus, continued operations of the Central Valley Project and State Water Project did not violate the Endangered Species Act); (3) surveys and monitoring of Delta Smelt would continue, with increased frequency; (4) the Court set limitations on flows to protect delta smelt, and among other measures, specifically addressed, (a) winter pulse flows, (b) pre-spawning periods, and (c) larval and juvenile Delta Smelt).

[83] Natural Res. Def. Council v. Kempthorne, No. 05-CV-01207, 2008 WL 4369308, at *1 (9th Cir. Sept. 22, 2008).

[84] DEPARTMENT OF THE INTERIOR, US FISH AND WILDLIFE SERVICE, FORMAL ENDANGERED SPECIES ACT CONSULTATION ON THE PROPOSED COORDINATED OPERATIONS OF THE CENTRAL VALLEY PROJECT (CVP) AND STATE WATER PROJECT (SWP) 34 (2008) (Congressional authorization "per the CALFED Bay-Delta Authorization Act (PL-108-361)"), *available at* www.fws.gov/sacramento/es/documents/SWP-CVP_OPs_BO_12-15_final_OCR.pdf.

[85] *See* U.S. BUREAU OF RECLAMATION ET AL., *supra* note 59, at 1-3.

[86] COOLEY ET AL., *supra* note 5, at 6-7 (concluding conservation scenarios yielded from 600,000 to 3.4 million acre-feet of water annually).

[87] *Id.* at 8-9.

agricultural water users to prevent withdrawals using a conservation program will reduce supply interruptions and improve instream flows to stop further ecosystem decline.[88] Implementation of an acquisition program must be coordinated with a functioning transfer market and a permanent water bank.

D. THE CALIFORNIA WATER-TRANSFER MARKET

Before any increase in water transfers is considered, there must be an effective transfer market. State water law allows short- and long-term transfers without risk of forfeiture of an established right.[89] Transfers are not evidence of waste or unreasonable use.[90] However, the challenges of gaining SWRCB approval limit market use.[91]

Agencies agree that a major barrier to the use of the entire transfer market is that the petition process is often too time-consuming to be worth the effort.[92] A Water Transfer Workgroup Report created by the SWRCB details many recommendations for streamlining the process.[93] The most important recommendation is to expedite some predefined types of transfers.[94] Conserved water transfers should be subject to an expedited transfer process.[95]

Water can be transferred solely to preserve or enhance wetland habitats and wildlife resources.[96] Section 1707 of the California Water Code allows private water-rights transfers to instream flows, promoting ecosystem restoration.[97] There is considerable room to increase participation under this section in the California water-transfer market. These are transfers that stem from conservation efforts and transfers intended to benefit the environment.[98] Between 1997 and 2001, the

[88] *Id.* at 6-7.

[89] CAL. WATER CODE §§ 1011(a)-(c), 1014 (Westlaw 2008).

[90] CAL. WATER CODE § 1244 (Westlaw 2008).

[91] *See* Brian E. Gray, *The Shape of Things to Come: A Model Water Transfer Act for California*, 14 HASTINGS W.-N.W. J. ENVTL. L. & POL'Y 623, 636-37 (2008).

[92] *See* WATER TRANSFER WORKGROUP, WATER TRANSFER ISSUES IN CALIFORNIA: FINAL REPORT TO THE SWRCB 13 (2002), *available at* www.waterrights.ca.gov/watertransfer/Final%20Report%20-%20Water%20Transfer%20Group.pdf.

[93] *Id.* at 13-19.

[94] *Id.* at 13.

[95] *See id.*, app. 3 at 2 ("Conserved water: According to SWRCB Order No. WR 99-012, all of the substantive requirements of a standard water transfer apply to a conserved water transfer under Water Code § 1011.").

[96] CAL. WATER CODE § 1707(a)(1) (Westlaw 2008).

[97] *Id.*; *see also* Gregory A. Thomas, *The Future of Water Law Reform in California a Quarter Century After the Governor's Commission*, 36 MCGEORGE L. REV. 495, 498 (2005).

[98] *See* Jedidiah Brewer et al., *Law and the New Institutional Economics: Water Markets and*

SWRCB reviewed only forty petitions for short-term (less than a year) transfers, and thirty-six were approved, two were withdrawn, one was rejected for inadequate information on basis of right, and one was still pending at the time of the data's publication.[99] Of these short-term transfers, six were purchases by the EWA, and only seven came from water conservation.[100] Restructuring the market transfer system to facilitate conservation transfers could increase participation in the market.

The lack of transfers based on conservation indicates that statutory authority alone will not create the necessary incentives for users to transfer water rights. There must be an efficient system with limited risk and adequate economic incentive to increase market participation.

III. OTHER EXISTING STATE WATER CONSERVATION PROGRAMS

California is not the only state that must combat water-supply problems with regulation or voluntary programs. Arizona, Washington, and Oregon have used various techniques and programs to promote water conservation.[101] While no program is directly applicable to California, together they provide comparisons for analysis and warnings of potential pitfalls as California plans a new water-management system.

A. ARIZONA GROUNDWATER MANAGEMENT ACT

Arizona's regulatory approach to water management acknowledges agricultural water conservation as a tool to increase water resources.[102] Some states confront water scarcity by resorting to police powers that authorize the use of command-and-control techniques.[103] Arizona reviews its conservation goals every ten years and—unlike California—focuses on reductions in agricultural water use.[104] The Arizona Department of Water Resources determines the reasonable potential for water-use reductions assuming conservation in the agricultural sector and requires a similar per-acre reduction.[105] Additional conservation is

Legal Change in California, 1987-2005, 26 WASH. U. J.L. & POL'Y 183, 197 (2008).

[99] WATER TRANSFER WORKGROUP, *supra* note 92, at 10.

[100] *Id.* at 11.

[101] *See* Lawrence J. MacDonnell & Teresa A. Rice, *Moving Agricultural Water to Cities: The Search for Smarter Approaches*, 14 HASTINGS W.-N.W. J. ENVTL. L. & POL'Y 105, 127-36 (2008).

[102] *See id.* at 110.

[103] *Id.* at 127.

[104] *Id.* at 127-28.

[105] *Id.* at 127.

required with each new ten-year interval of the program.[106] Pumping fees offset administrative costs and generate revenues to purchase and retire water rights.[107]

The Arizona system relies on a regulatory approach to water management, failing to employ any market incentives.[108] Arizona's agricultural conservation program is an effective way to combat water scarcity; however, in California direct command and control regulation is less feasible due to a history of entrenched economic agriculture interests.[109] Arizona also illustrates that savings from conservation are economically determinable, with ascertainable risks and predictable transaction costs.[110] Providing informational assistance and encouraging financial investment is much easier when costs and risks are predictable. California can benefit from Arizona's experience by incorporating water-savings predictions and transactional accounting into the management of its existing transfer market, thereby assuring would-be transferors of the safety and soundness of the program.

B. WASHINGTON TRUST WATER RIGHTS

In 1991, the Washington State Legislature directed the Department of Ecology (DOE) to develop a trust for water rights.[111] The program is designed to facilitate voluntary transfers of water to a state-run water trust without relinquishment or forfeiture of water rights.[112] The DOE is authorized to issue grants and loans for improvements that save water without taking land out of production, to negotiate contracts, and to transfer conserved water all or in part to the trust.[113] Grant money is available to make efficiency improvements, but the amount is limited to 30% of the total costs.[114] Similar to California's EWA, the trust program will also directly compensate for relinquishment of water rights in order to leave water in the ecosystem and in the state's trust.[115] Although not expressly authorized by the trust program, participants could possibly

[106] *Id.* at 127-28.

[107] *Id.* at 128.

[108] *Id.* at 127-28.

[109] *See* Brian E. Gray, *Dividing the Waters: The California Experience*, 10 HASTINGS W.-N.W. J. ENVTL. L. & POL'Y 141, 141-42 (2004).

[110] *See* MacDonnell & Rice, *supra* note 101, at 127-28.

[111] *Id.* at 131.

[112] *Id.*

[113] WASH. REV. CODE § 90.42.030(1), (2) (Westlaw 2008), *cited in* MacDonnell & Rice, *supra* note 101, at 132.

[114] MacDonnell & Rice, *supra* note 101, at 132-33.

[115] *Id.* at 133.

retain some rights to the conserved water and use this water to expand their irrigated acreage or to transfer these rights on the open market.[116]

Notably, Washington has not facilitated a single transfer into the water trust program.[117] For one thing, there is a natural reluctance to transfer water rights to the state without assured compensation beyond grant money for only a portion of the improvement costs.[118] Another impediment is the state constitution, which prohibits state loans to individuals, companies, associations, or corporations.[119] Therefore, only irrigation districts or other public entities are eligible for the available public funds.[120] Furthermore, the trust regulations impose a higher-than-usual standard for the protection of downstream users, hindering transfer approval and processing.[121]

California's approach must avoid similar pitfalls. Washington could create economic incentives to encourage transfers to its trust by expressly allowing the water-rights holder to retain a portion of the conserved water for transfer to the market or expanding operations.[122] A more streamline approval process is also very important, as an inability to transfer water in a timely and predictable manner will create economic disincentives for participation.[123] Lastly, Washington could increase the potential for water conservation improvements by giving nonpublic entities access to the direct financing program.[124]

C. OREGON'S WATER CONSERVATION LAWS

Oregon uses public financing incentives to promote voluntary conservation with automatic percentage dedications to the state for instream or consumptive uses and to the water-rights holder for market transfer or instream banking.[125] Conservation plans are submitted to the State Water Resources Commission (SWRC) for approval prospectively, or after implementation (if within five years).[126] The proposal indicates

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[116] *Id.*

[117] *Id.* at 134.

[118] *Id.*

[119] WASH. CONST. art. VIII, § 5, *cited in* MacDonnell & Rice, *supra* note 101, at 134.

[120] MacDonnell & Rice, *supra* note 101, at 134.

[121] *Id.* at 134-35.

[122] *See id.* at 133.

[123] *See* WATER TRANSFER WORKGROUP, *supra* note 92, at 13.

[124] WASH. CONST. art. VIII, § 5, *cited in* MacDonnell & Rice, *supra* note 101, at 134.

[125] OR. REV. STAT. § 537.465 (Westlaw 2008), *cited in* MacDonnell & Rice, *supra* note 101, at 135.

[126] MacDonnell & Rice, *supra* note 101, at 135.

the expected quantity of conserved water, the conservation methods, the amount of water needed after improvements, and the intended use of the remaining water.[127] A conservation plan requires the solicitation of public comment, a feasibility assessment, an estimate of the volume of conserved water, and a showing of the absence of injury to other users.[128] After submitting a conservation plan, the SWRC appropriates 25% of the conserved water to the state, and the right to 75% of the water is available to the applicant for transfer or instream banking and future use.[129] When more than 25% of the funding for conservation measures comes from the public, and the money is not subject to repayment, the percentage of water allocated to the state will equal the share of public money used to implement the improvements.[130]

Assuring a reasonable return on investment instead of requiring an automatic dedication to the state whenever water is conserved would make investing in conservation much more appealing financially and therefore more likely.[131] The water-rights holder does retain the right to transfer up to 75% of its conserved water on the market, yet slow participation growth indicates a lack of initial financially motivated investment.[132] Again, economic incentives are necessary to spur participation and ultimately conserve water.[133] The program does reflect a thoughtful cooperative approach to water management between private and public entities.[134] The percentage water allocation based on government funding could be a very effective tool if information and money are distributed and utilized effectively. Effective water management enfranchises stakeholders, encouraging participation; it creates opportunities for financial gain through structured incentive programs; and it avoids environmental deterioration through preventive

[127] *Id.*

[128] *Id.* at 136.

[129] OR. REV. STAT. § 537.485, 537.490 (Westlaw 2008), *cited in* MacDonnell & Rice, *supra* note 101, at 136.

[130] OR. REV. STAT. § 537.485 (Westlaw 2008), *cited in* MacDonnell & Rice, *supra* note 101, at 136.

[131] *See* Paul R. Williams & Stephen J. McHugh, *Water Marketing and Instream Flows: The Next Step in Protecting California's Instream Values*, 9 STAN. ENVTL. L.J. 132, 177 (1990).

[132] *See* Or. Water Res. Dep't, Allocation of Conserved Water, www.wrd.state.or.us/OWRD/mgmt_conserved_water.shtml (last visited Feb. 10, 2009) ("Prior to 2000, the Department had received only 10 applications. Since then, interest in the program has grown considerably. By 2005, 30 new applications had been submitted as water users have sought to expand supplies and support for streamflow restoration has increased.").

[133] Williams & McHugh, *supra* note 131, at 177.

[134] *See* MacDonnell & Rice, *supra* note 101, at 128-30.

action.[135]

IV. CALIFORNIA'S CURRENT WATER-MANAGEMENT PROGRAM NEEDS A COMPREHENSIVE AGRICULTURAL CONSERVATION PLAN WITH INCENTIVES TO IMPLEMENT EFFICIENT PRACTICES

Scientific data confirms the immense potential for conservation in the agricultural sector by improving upon current irrigation practices through modest crop shifting, effective management, technology improvements, and efficient scheduling.[136] This Comment proposes modifications to California's water-management system and describes how each recommendation can be aligned with the goals established in the Delta Vision Strategic Plan (the "Strategic Plan").

First, the SWRCB and the DWR should implement an effective educational outreach program to explain proven water-conservation techniques.[137] The program should focus on the economic benefits of efficient irrigation and conservation, as well as how to get through the transfer process. Second, the SWRCB and DWR, in conjunction with a state water bank, should contract to purchase conserved water directly from agricultural users to provide security for financing investments. Third, an EWA-like program would maintain the environmental baseline, implement protective management methods for threatened/endangered species, and act as the purchasing authority for the state. Fourth, increased water accountability is required in order to redefine and enforce reasonable use. Lastly, there must be a permanent state water bank to assist in accounting and banking functions for the effective transfer of conserved water. Monitoring deposits and withdrawals from the Bay-Delta will result in improved environmental stewardship and consistent water management.[138] This proposal encourages practical conservation techniques in order to secure a reliable water supply for the future and increase the water available for ecosystem restoration or market transfer.

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[135] *See* Williams & McHugh, *supra* note 131, at 167-77.

[136] COOLEY ET AL., *supra* note 5, at 39.

[137] *See* ISENBERG ET AL., *supra* note 27, at 94.

[138] *See* MICHAEL HEALEY ET AL., THE STATE OF BAY DELTA SCIENCE, 2008 122-23, 151-52 (2008), *available at* www.science.calwater.ca.gov/pdf/publications/sbds/sbds_final_update_122408.pdf.

A. ALIGNING TWO VISIONS FOR AGRICULTURAL CONSERVATION AND EFFICIENCY

The Strategic Plan establishes aggressive goals and proposes serious action to protect the future of the Bay-Delta.[139] Restoring the ecosystem and securing a reliable water supply will be legally enforceable co-equal goals.[140] By reducing agricultural consumption, more water could be available for purchase by a state purchasing authority (or nongovernmental conservancy groups) for the benefit of the environment or by urban water districts for municipal uses.[141]

This Comment, like the Strategic Plan, advocates sustainable water practices with a focus on conservation and efficiency improvements.[142] DWR and SWRCB will make conservation and efficiency improvements their first priority.[143] Support and leadership will continue to come from the Agricultural Water Management Council, which determines efficiency practices by water suppliers.[144] The DWR is the educational messenger of water-efficiency information, with the goal of promoting "aggressive water conservation."[145] Funds are available for entities that create Agricultural Water Management Plans.[146] Grants and loans from DWR and SWRCB will supplement private financing and other current government-funded programs, enabling implementation of efficiency improvements in the agricultural industry.[147]

The Strategic Plan also calls for the establishment of a conservation target (reviewed every five years) and a baseline for efficient water-management practices.[148] The conservation target, which will be set by 2010, will start at 800,000 acre-feet of conserved water for the agricultural industry as a whole.[149] Creating agricultural industry best-management practices will help to meet the use-reduction goal.[150]

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[139] *See* ISENBERG ET AL., *supra* note 27, at 1-169.

[140] *See* CHRISMAN ET AL., *supra* note 79, at 16.

[141] *See* Williams & McHugh, *supra* note 131, at 189.

[142] ISENBERG ET AL., *supra* note 27, at 32.

[143] *See id.* at 17-18.

[144] *Id.* at 94.

[145] *Id.*

[146] *Id.*

[147] ISENBERG ET AL., *supra* note 27, at 133-34.

[148] *Id.* at 95.

[149] *Id.*

[150] *Id.* ("The Plans should address projected agricultural water demands, availability of supplies, and implementation of Efficient Water Management Practices. DWR's criteria would embody the analysis currently required by members of the Agricultural Water Management Council (AWMC). Efficient Water Management Practices, developed by DWR and the AWMC, should be

Ultimately, economically rational and feasible incentives for users must be established for conservation to be successful.

This Comment, while aligned with the Strategic Plan's goals, calls for a much greater focus on educational outreach, facilitating physical improvements, and redefining reasonable use to enforce best-management practices. The Strategic Plan, a 169-page report, mentions conservation and efficiency "education" only once.[151] There needs to be a broader approach to educating irrigators. Facilitating physical implementation of proven water-management practices, encouraging transfer market participation, and promoting the use of government funding opportunities will best achieve the stated goals of conservation and efficiency.[152] Lastly, redefining reasonable use to include efficient management practices will create liability to encourage cooperation with these market-based programs.[153]

Fixing the problems that persist in the Bay-Delta is an immense, multi-faceted task.[154] The new efforts to manage the Bay-Delta consistently, under a modified legal framework, hold great promise.[155] This Comment suggests that additional ingredients, targeted at conservation, water transfer, and agricultural accountability, would help California realize the water-related goals that are vital to its future.

B. EDUCATIONAL OUTREACH: CONSERVATION THROUGH IRRIGATION IMPROVEMENTS

Agricultural water users supplied by the Bay-Delta should know of at least four proven conservation techniques: modest crop shifting, advanced irrigation management, efficient irrigation technology, and smart irrigation scheduling.[156] These techniques would serve as the foundation for the outreach curriculum.

i. Modest Crop Shifting

Replacing highly water-intensive crops with those that are less water-intensive will result in substantial water savings.[157] On average,

treated as the "floor level" of conservation, and updated every 5 years.").

[151] *Id.* at 94.

[152] *See* Williams & McHugh, *supra* note 131, at 189.

[153] *See* MacDonnell & Rice, *supra* note 101, at 122.

[154] *See* CHRISMAN ET AL., *supra* note 79, at 1-2.

[155] *See id.*

[156] COOLEY ET AL., *supra* note 5, at 6.

[157] *Id.* at 39.

field crops (including hay and pastureland) are more water-intensive and generate a lower value per acre than other crops, such as vegetables.[158] Planned crop shifting can conserve water while increasing revenue per acre with a higher-yield crop.[159] This is not a recommendation to abandon all field crops.[160] Field crops provide some important benefits, such as price stability, nitrogen fixation, lower fertilizer inputs, and sometimes wildlife habitat.[161] The recommendation is to shift 25% of irrigated land from field crops to vegetables, or other less water-intensive crops, without reducing the total irrigated acreage.[162]

When modeled in the three hydrologic regions of the Bay-Delta water system, a study concluded that modest crop shifting potentially conserves 1.2 million acre-feet of water and adds $5.1 billion to production value without a reduction in the total acreage farmed.[163] This study proved that by apportioning 25% of acreage farmed to a less water-intensive crop, staggering amounts of water can be conserved, reducing Bay-Delta withdrawals and producing marketable water rights.[164] Obviously, other market or climate considerations may also dictate what crop farmers grow.[165] Nevertheless, vegetables generally have a higher profit per acre than field crops, resulting in more money earned and less water used—both of which improve a farm's bottom line.[166]

ii. Deficit Irrigation

Crops require different amounts of water at different times during crop cycles; by irrigating according to the crops' varying needs, water can be conserved.[167] For example, "deficit irrigation" can reduce water

[158] *Id.* at 12, 26, 43 ("Field crops include: alfalfa, pasture, grain, rice, cotton, sugar beets, corn, beans, and safflower. Vegetable crops include: tomatoes, melons, cucurbits, onions, garlic, potatoes, and other truck crops.").

[159] *Id.* at 12, 26 ("Field crops, for example, currently account for 56% of total irrigated acreage. Field crops use 63% of the applied water but generate only 17% of California's crop revenue. Vegetables, however, produce substantially more revenue per unit land or water: vegetables account for only 16% of the irrigated acreage but use 10% of the applied water and generate 39% of California's crop revenue.").

[160] *Id*.

[161] *Id.* at 12, 26.

[162] *Id.*

[163] *Id.* at 22-27 ("The Department of Water Resources used a model developed by David Groves to evaluate future water-demand scenarios. The model was implemented in a graphically-based computer environment called Analytica.").

[164] *See id.* at 26-27.

[165] *Id.* at 48.

[166] *Id.* at 27.

[167] *Id.* at 29.

usage in vineyards and orchards without reducing overall crop production.[168] Applicability of this tactic will vary by crop; vine and tree crops tolerate deficit irrigation better than field crops.[169] In a 2005 DWR study, regulated deficit irrigation reduced water use by 1 to 1.5 million acre-feet when applied to wine grapes and tree crops in California.[170] Such benefits indicate that a well-run outreach program would highlight deficit irrigation.

iii. Efficient Irrigation Technology

Of the three main irrigation methods—flood irrigation, sprinklers, and drip systems[171]—drip irrigation systems are the most efficient because they only supply water where and when it is needed.[172] Flood irrigation requires very little energy and capital investment, but it is the least efficient.[173] Sprinkler systems are more efficient than flood irrigation because they result in less runoff, reduce erosion, lower the potential for downstream pollution, and lower the economic costs of field drainage.[174] There is an expensive upfront investment for sprinklers of $1000 to $1500 per acre for the installation of PVC pipes and $3500 per acre for portable aluminum sprinklers.[175] Unlike other irrigation methods, sprinkler efficiency is lower in windy, hot, or dry conditions.[176]

Drip systems are the best overall option, providing a precise application of water and fertilizer to meet crop needs and improving quality and quantity of yields.[177] Better water and chemical management improves drained water quality, reduces runoff, and reduces leaching of nutrients.[178] Drip irrigation would also result in higher quality and quantity crop yields, reduce labor costs over the long run, and operate on average at an 89% efficiency rate (defined as the percentage of water put to beneficial use).[179] In addition, automatic drip systems reduce labor costs over the long run.[180] The investment for installation is $500 to

[168] *Id.*
[169] *Id.*
[170] *Id.*
[171] *Id.* at 31.
[172] *Id.*
[173] *Id.* at 32.
[174] *Id.* at 32-33.
[175] *Id.* at 33.
[176] *Id.*
[177] *Id.* at 34.
[178] *Id.*
[179] *Id.* at 35-36.
[180] *Id.* at 34.

$2000 per acre.[181]

Nearly 50% of growers in California still use traditional flood irrigation.[182] There is a potential for conserving 643,000 acre-feet of water annually by transitioning half of the flood irrigators to sprinkler or drip systems.[183] Further adoption of drip systems would yield even greater benefits.

iv. Smarter Irrigation Scheduling

As noted, crops require different amounts of water at different times during crop cycles.[184] Careful scheduling, in tandem with deficit irrigation, will provide the right amount of water at the right time, thus increasing the efficiency of water usage.[185] Such scheduling may increase or decrease the amount of water needed for irrigation at any given time, but when properly done it will increase the quality of crop yields.[186] The California Irrigation Management Information System is an established integrated network of automated weather stations throughout the state that estimates water requirements for crops on a given day.[187] This method requires consistent water delivery to operate effectively, so district-wide infrastructure improvements may be needed to make the use of this management option feasible.[188] Farmers would need to shift their irrigation planning from a personal inspection method to a schedule based on daily remote computerized scientific measurements.[189]

v. Implementation

The outreach program would target all agriculture in California. These techniques and any new methods will be the subject of educational seminars for agricultural water users.[190] Providing the industry with information achieves a significant step toward promoting conservation. Another important step is ensuring that compensation is available in the

[181] *Id.*

[182] *Id.*at 37-38 (flood irrigation is popular because minimal labor and capital are required to divert canals and fill the low-lying farmland with water).

[183] *Id.* at 37-38.

[184] *Id.* at 27.

[185] *Id.* at 27-28.

[186] *Id.* at 27.

[187] *Id.*

[188] *Id.* at 28-29.

[189] *Id.* at 28.

[190] *Id.* at 25-40.

form of easily accessible market transfers of conserved water. A streamlined transfer system incorporated during the outreach program will promote these ends.

C. STREAMLINING THE PROCESS FOR WATER TRANSFERS DURING THE EDUCATIONAL OUTREACH

The paperwork and process required for water transfers is overly burdensome.[191] In 2002, an advisory committee for the SWRCB made a series of specific recommendations for improving the system.[192] The Water Transfer Workgroup made streamlining transfers a top priority and sought to ensure that streamlining could be implemented in the near future without much controversy.[193] A main recommendation was making certain predefined transfers subject to an easier process.[194] Water conserved through efficiency improvements should get this recommended streamlined treatment.[195] Making the process faster will encourage participation in the educational outreach program.[196]

The Strategic Plan makes a broad recommendation for DWR and the SWRCB to implement an educational program.[197] Since agricultural users will be subject to new aggressive conservation targets, the program should detail the techniques discussed above to promote efficiency improvements.[198] The SWRCB is the current permitting authority for water transfers, so it would be able to create a pre-approval process for transfers resulting from water conservation.[199] As DWR educates agricultural users regarding conservation techniques, it should also educate participants in the transfer-approval process. Streamlining conservation transfers would require a close cooperative relationship between the agricultural community and water agencies.[200] Participants

[191] Telephone Interview with Thomas Birmingham, General Manager and General Counsel, Westlands Water District, in Fresno, Cal. (Feb. 23, 2009) (agreeing that streamlining would be helpful to relieve paperwork burdens on water transfer system).

[192] WATER TRANSFER WORKGROUP, *supra* note 92, at 13.

[193] *Id.*

[194] *Id.* at 13-14.

[195] *Id.* at 13-14, 19.

[196] *Id.* at 19.

[197] ISENBERG ET AL., *supra* note 27, at 94.

[198] *Id.* at 95.

[199] Telephone Interview with Thomas Birmingham, General Manager and General Counsel, Westlands Water District, in Fresno, Cal. (Feb. 23, 2009) (explaining an existing pre-approval process used by SWRCB for long-term transfers).

[200] Telephone Interview with Thomas Birmingham, General Manager and General Counsel, Westlands Water District, in Fresno, Cal. (Feb. 23, 2009) (describing Westlands Water District as

would work with an assigned agency contact to discuss transfer possibilities, coordinate negotiations with state purchasing authorities, and provide information on potential financing opportunities for irrigation improvements.

D. THE STATE SHOULD PRESERVE AN EWA-LIKE PURCHASING AUTHORITY TO MAINTAIN ADEQUATE INSTREAM FLOWS AND FACILITATE FINANCING

Bay-Delta water management should include an EWA-like program for maintaining an adequate instream baseline by purchasing water assets created through conservation. Allocation of funds to this purchasing authority would be necessary to ignite the market for conserved water transfer for two reasons:[201] one, creating low-interest financing options would further motivate conservation and efficiency upgrades; and two, the purchasing authority would create a risk-free market for selling conserved water to the state, encouraging irrigators to invest in improvements in order to sell excess water rights. The available services would be publicized by the educational outreach program, which would refer growers to the state purchasing authority in order to secure low-interest financing and to arrange the sale of conserved water.

Financing would follow a general revolving fund model. The purchasing authority would manage a financing pool created exclusively to fund efficiency improvements. Money would be lent to irrigators to install water-saving technology on their farms at an interest rate that, while low, would sufficiently cover the program's administrative costs. Loan repayments would go directly back to the revolving general fund. This model of financing improvements is currently functioning on a smaller scale in the Westlands Agricultural Water District.[202] The program is well-received by irrigators in this Central Valley farming community that—similar to the rest of California—suffers from water shortages.[203] These farmers use the financing to improve overall efficiency; for example, they implement run-off management programs, install new drip or sprinkler irrigation systems, or implement

being at the forefront of the water-transfer market and using transfers to address shortfalls in supply on a regular basis; with the high cost of water, low supply, and constant demand, farmers are very receptive to cooperative efforts to improve water use efficiency in Westlands).

[201] *See* ISENBERG ET AL., *supra* note 27, at 134-36 (discussing the potential financing options for Bay-Delta restoration).

[202] Telephone Interview with Thomas Birmingham, General Manager and General Counsel, Westlands Water District, in Fresno, Cal. (Feb. 23, 2009).

[203] *Id.*

sophisticated moisture-monitoring technology to reduce water needs.[204]

The overarching goal is to reduce demand, thereby enabling the state to renegotiate contracts and purchase excess water rights. Water rights could simply be sold directly back to the state, or a conditional purchase and sale agreement could be created with more flexibility. Under the second arrangement, the state would reserve the right to purchase any excess water generated annually. This option would also account for fluctuations in precipitation and put the state in a contractual position to acquire and store water in years of excess. This approach would ultimately ensure that growers have a right to enough water during each year and that the state is first in line to purchase any excess. Overall pumping needs would be reduced with the decline in total water demand, while the purchasing authority would ensure ecosystem needs could be met through the purchase of excess water rights.

The expected reduction in use from negotiated transfers before and during the conservation improvements will allow for proper planning and prevent unnecessary diversions of water from the Bay-Delta. Planning could reduce the risk pumping imposes on fish and limit rushed diversions across fragile ecosystems. Hastily shifting water supplies has great potential for harming water quality, a problem seen during the Emergency Drought Water Bank of the early '90s.[205]

E. CALIFORNIA NEEDS A PERMANENT WATER BANK

Regardless of the amount of water conserved, it will not benefit the ecosystem or users unless it can be accounted for, stored, and easily transferred. California should establish a permanent water bank that will "save" and track water resources available in all Bay-Delta water projects (expanding to other water projects if the 2009 pilot project discussed in iii, *infra*, is successful). This will aid in the transfer of water while helping to maintain a biologically recommended instream baseline.

i. The Successes of the Emergency Drought Water Bank

The severe drought suffered by California in the early '90s led to the establishment of an emergency water bank when the state purchased excess water from agricultural users and transferred it to other, higher-

[204] *Id.*

[205] Brian E. Gray, *The Market and the Community: Lessons From the Drought Water Bank*, 14 HASTINGS W.-N.W. J. ENVTL. L. & POL'Y 41, 55 (2008) (discussing the negative impacts on fish because of hurried movement of water through Bay-Delta channels during the severe droughts of the early '90s).

priority uses.[206] A committee determined the sale price,[207] and DWR negotiated with owners of water rights to obtain transfer contracts.[208] Growers agreed to sell the water and let their land go unfarmed, or lie "fallow"; 50% of the contracts were land-fallowing agreements.[209] Sellers conveyed 821,000 acre-feet of water to the DWR, who sold 390,000 acre-feet to twelve water districts and stored 266,000 acre-feet.[210]

Overall, the Emergency Drought Water Bank was a success because it secured a water supply during drought years and provided fish and wildlife with increased instream flows. It was able to effectively transfer over 800,000 acre-feet of water in a short period by purchasing surplus water and allocating it according to prioritized needs across the state.[211]

However, it was not without problems. While fish and wildlife did benefit from the increase in water flow, water quality suffered due to the increased pumping and hurried diversion of water resources across habitats.[212] Some land-fallowing caused shortages in certain crops and lost wages for farm labor.[213] A permanent water bank could avoid these negative consequences with a preventive approach to water banking. The approach proposed here would encourage conservation without a reduction in acreage farmed and would transfer water without waiting for emergency conditions to arise, resulting in less chance of habitat disruptions.

Although the Drought Water Bank was temporary, it significantly sparked further increases in overall water transfers in California.[214] In 1980, users had transferred only 50,000 acre-feet of water between one another, while in 1991, transfers totaled 1.1 million acre-feet, mostly because of the water bank.[215] In 1992, the Central Valley Project Improvement Act expanded the market further by allowing the Federal Central Valley Project to transfer water to the State Water Project.[216] In 2000, when the EWA began purchasing water for the benefit of the

[206] *See id.* at 41-54.

[207] *Id.* at 49.

[208] *Id.* at 51-52.

[209] *Id.* at 50-51.

[210] Sarah P. Hollinshead, *Water is Not Liquid: Securitization, Transaction Costs, and California's Water Market*, 33 COLUM. J. ENVTL. L. 323, 336 (2008).

[211] Gray, *supra* note 205, at 56.

[212] *Id.* at 55.

[213] *Id.* at 87.

[214] Hollinshead, *supra* note 210, at 337-38.

[215] *Id.* at 337.

[216] *Id.* (*citing* Pub. L. No. 102-575, § 3405, 106 Stat. 4600, 4709 (1992)).

ecosystem, total transfers increased to 1.2 million acre-feet of water without a state-run water bank facilitating the exchanges.[217] The pattern strongly suggests that a permanent water bank would continuously stimulate water transfers, increasing reserves to prepare for inevitable droughts.

ii. California Water Market Forces

The disproportionate allocation of water rights to agricultural uses reinforces the need to focus on agricultural conservation. The agricultural sector consumes, on average, 34.2 million acre-feet annually, while total urban consumption is 8.9 million acre-feet.[218] The potential for conservation is larger in the agricultural sector. Currently, however, agricultural water users are only as efficient as is economically justified.[219]

As long as the market price for water remains lower than the irrigation price of water, farmers will have little incentive to spend money improving irrigation systems. Selling inefficiently irrigated crops currently brings a higher return than selling conserved water. A state-run water bank acting as a clearinghouse could reverse these economic incentives in the water market.[220] Farmers participated in the Drought Water Bank of the early 1990s because water was scarce, demand was high, and the bank offered to purchase water at a price higher than the irrigation value of the water.[221] A permanent water bank could stabilize the price at which the state will purchase conserved water. This price would reflect the estimated cost of improvements to irrigation infrastructure per acre-foot as well as transactional costs. Environmental needs and the particular effects of water supply shortages would dictate water allocation.

A uniform accounting authority could manage total water assets and reduce market risks. Inconsistent seasonal water supply is inevitable and creates a market risk for contracted water users. Generally, water supply is higher in the winter and spring months, while demand is higher in the spring and fall months, requiring storage and increased pumping and

[217] *Id.* at 337-38.

[218] *Id.* at 331.

[219] *See* Gregory A. Thomas, *The Future of Water Law Reform in California a Quarter Century After the Governor's Commission*, 36 MCGEORGE L. REV. 495, 518-19 (2005).

[220] *See id.*

[221] *See* Brian E. Gray, *The Market and Community Lessons from California's Drought Water Bank*, 1 WEST-N.W. 17, 21 (1994).

delivery.[222] Because of these seasonal fluctuations, any reductions in storage capacity or pumping will pose significant market risks for contract-bound water users if there are inadequate water reserves.[223] Water-rights holders do not always receive all of their contracted rights because each water project announces how much it can deliver to each district for the next year based on weather projections and total contracted water rights in that district.[224] In fact, in 2009 DWR delivered only 15% of water requested by the California water districts—the second-lowest level since delivery began in 1962.[225] This is due to extremely low water levels in reservoirs and a court-ordered reduction in pumping to protect endangered species in the Bay-Delta.[226] A water bank would not be able to increase natural water deposits, but it could stabilize market risks through uniform accounting for transfers and the potential for "banking" conserved water.

iii. The 2009 Drought Water Bank Should Be Expanded, Improved, and Made Permanent

A permanent water bank is a necessary tool for the long-term sustainability of the Bay-Delta. A Drought Water Bank operated during 2009 during California's declared drought.[227] If the bank is successful, it should be extended to form a permanent bank under a centralized state authority with some modifications.

Unfortunately, while the 2009 Drought Water Bank policy incorporates water conservation as a tool to meet water shortages,[228] it largely fails to address agricultural water conservation. Instead of specifically targeting agricultural users, the 2009 Drought Water Bank generally required transfer recipients to implement a water-management plan to reduce water use by at least 20%.[229] Conservation under a permanent water bank should include a more comprehensive approach incorporating the techniques of this proposal and coordinated agency

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[222] Hollinshead, *supra* note 210, at 328.

[223] *Id.* at 328-31.

[224] *Id.* at 329-31.

[225] Samantha Young, *California to Cut Water Deliveries to Cities, Farms,* S.F. CHRON., Oct. 30, 2008, *available at* www.sfgate.com/cgi-bin/article.cgi?file=/n/a/2008/10/30/financial/f104642D40.DTL.

[226] *Id.*

[227] CAL. DEP'T OF WATER RES., 2009 DROUGHT WATER BANK OVERVIEW 1 (2008), www.water.ca.gov/drought/docs/2009water_bank.pdf.

[228] *Id.*

[229] *Id.* at 3.

efforts to reduce overall agricultural water consumption.

The success of such a program depends greatly on seller participation. A permanent bank would need to work closely with the educational outreach program to provide information to potential sellers. A permanent water bank would be able to "save" the water acquired by state purchasing authorities or water awaiting market transfers and to provide secure water transfers. Proper accounting would help to maintain instream baselines for ecosystem needs and to track water available for transfer from each water project.

The 2009 Drought Water Bank worked closely with the SWRCB to make efforts to streamline transfers. However, if the 2009 Drought Water Bank were to become permanent, it will have to use more than crop idling and substitution to create transferable water.[230] It should be closely coordinated with implementation of the educational outreach program to encourage the efficiency improvements described above. This will prevent the problem of reduced farm yields and farm job losses that come with idling land. A permanent water bank is a vital tool to avoid the need for emergency drought water banks in the future because reservoirs and streams would be able to fill once again. Thus, the permanent water bank would reflect the co-equal goals of the Strategic Plan and create a powerful model of agency/industry cooperation.

F. REDEFINE REASONABLE USE AND DETER WASTEFUL PRACTICES WITH WATER-USE ACCOUNTABILITY

Market-based incentives for voluntary conservation are the focus of this proposal. Nevertheless, clarifying legal liability is another effective means of shifting away from inefficient irrigation practices. In the past, actual enforcement actions or the threat of enforcement have forced a change in water use practices.[231]

Water rights in California can be maintained only through a "reasonable use."[232] There is no vested right in any unreasonable use of water.[233] The definition of reasonable use is subject to regulatory change, depending on the totality of the circumstances and the current water situation.[234] Defining "reasonable use" with the Efficient Water

[230] *Id.* at 5. ("Every effort will be made to expedite the process. DWR will coordinate with local governments as such proposals are developed.").

[231] Owen, *supra* note 28, at 1179.

[232] CAL. CONST. art. X, § 2.

[233] Nat'l Audubon Soc'y v. Superior Court, 658 P.2d 709, 725 n.23 (1983).

[234] Envtl. Def. Fund v. E. Bay Mun. Util. Dist., 20 Cal. 3d 327, 344 (1977) (vacated); *but see also* Envtl. Def. Fund v. E. Bay Mun. Util. Dist., 26 Cal. 3d 183, 194 (1980).

Management Practices established by the Agricultural Water Management Council will ensure cooperation with government programs and increase participation in the transfer markets.[235]

Enforcement must begin with increased accountability for irrigators. Some irrigation districts concerned with efficiency and faced with water shortages currently meter water use.[236] Requiring all irrigators to meter water use and report crops grown per acre farmed will highlight the potential for efficiency improvements, beneficial transfers, or enforcement action.[237] This could be easily integrated into the new process for Agricultural Water Management Plans recommended by the Strategic Plan.[238] Imposing greater liability pursuant to a stricter reasonable-use baseline will compel irrigators to change current practices.[239]

V. CONCLUSION

Environmental needs in the Bay-Delta are becoming more critical each day, and the current drought conditions are causing a growing water shortage.[240] Fish need adequate water flows to swim, spawn, and survive, while humans need adequate water reserves to irrigate crops and satisfy the thirst of a growing population. It is important not to view these as mutually exclusive. Water conservation in the agriculture sector has the largest potential to increase water reserves and instream flows. Educating growers would increase conservation and create opportunities for cooperation with state agencies. Improving the current method of transferring water will further increase participation. Setting a fair market price above the cost of improvements will create an economic incentive to invest, while connecting willing buyers and sellers prior to efficiency improvements will reduce investment risks. The creation of a permanent

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[235] ISENBERG ET AL., *supra* note 27, at 95 ("Efficient Water Management Practices, developed by DWR and the AWMC, should be treated as the 'floor level' of conservation, and updated every 5 years.").

[236] Telephone Interview with Thomas Birmingham, General Manager and General Counsel, Westlands Water District, in Fresno, Cal. (Feb. 23, 2009) (stating that Westlands was the first to require irrigators to meter water use).

[237] *See* CHRISMAN ET AL., *supra* note 79, at 10.

[238] ISENBERG ET AL., *supra* note 27, at 95 ("The Plans should address projected agricultural water demands, availability of supplies, and implementation of Efficient Water Management Practices.").

[239] *See* Robert A. Pulver, *Liability Rules as a Solution to the Problem of Waste in Western Water Law: An Economic Analysis,* 76 CAL. L. REV. 671 (1988).

[240] Bloomekatz, *supra* note 38 (reporting an announcement that the Bureau of Reclamation will deliver no water to over 200 water districts for the first time in seventeen years).

water bank will lead to a more effective system for water transfer, storage, and accounting. Finally, redefining reasonable use and using enforcement to deter wasteful practices will ensure water-use accountability and cooperation from irrigators. California should incorporate this proposal to curb ecosystem decline in the Bay-Delta and to create a cooperative market-based water-management system.

DEREK ADRIAN HOYE[*]

[*] J.D. with Specialization in Environmental Law, 2009, Golden Gate University School of Law, San Francisco.