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Paying for Water in California

Technical Appendices

Contents

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Technical Appendix A: The Legal Framework

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Summary

Over the past four decades, California voters have passed a series of initiatives that amend the California Constitution to limit the power of the state legislature and local governments to enact taxes and to restrict their authority to adopt fees and other charges to fund government programs. Three of these initiatives—Proposition 13 (enacted in 1978), Proposition 218 (passed in 1996), and Proposition 26 (approved in 2010)—have placed significant constraints on the funding of water resources projects. Although each of these laws has enhanced the transparency and accountability of the decisionmaking process, the funding constraints now jeopardize an array of vital water supply, management, and regulatory functions. These include funding for the development of new water supplies, integrated water management, protection of groundwater resources, development of alternative water sources (including recycled and conserved water programs), control of stormwater discharges, and regulation of water extraction and water use to protect water rights, water quality, aquatic species, and other beneficial uses of the state's water systems.

This appendix is a companion to the report *Paying for Water in California* and focuses on the legal aspects of water financing. It begins with an overview of the traditional sources of funding for water development, management, and regulation and proceeds to a detailed study of the effects of the constitutional constraints (especially of Propositions 218 and 26) on these essential governmental programs. Topics include: (i) analysis of the effects of Proposition 218 on water rates and fees charged by public retail water agencies for water service and integrated, portfolio-based water management; (ii) consideration of the special problems of Proposition 218 for groundwater regulation and stormwater discharge programs; (iii) predictions about the effects of Proposition 26 on wholesale water rates, water stewardship charges, and regulatory fees; and (iv) suggestions for harmonizing the fiscal strictures of Propositions 218 and 26 with the reasonable use mandates of Article X, Section 2, of the California Constitution, which form the foundation of the state's water law and policy.

Our key conclusions are that: (1) Propositions 218 and 26 have created significant impediments to economically rational and sustainable funding of California's most important water service, management , and regulatory programs; (2) judicial interpretations of the constitutional restrictions generally have compounded these impediments; and (3) reform of the law is needed. The report concludes with recommendations for water agencies, the legislature, the courts, and the voters to consider as a means of correcting (or at least ameliorating) those aspects of the law that are inconsistent with sound and creative water resources administration.

Introduction

Better is it that thou shouldest not vow, than that thou shouldest vow and not pay.

—Ecclesiastes 5:5 (King James Bible)

The development and management of water resources are vital to California's economic and social well-being. This water service includes a variety of interrelated activities:

- Supplying water for drinking and household purposes, commercial and industrial uses, agriculture, landscaping, firefighting, and other beneficial uses;
- Developing new sources, including imported, recycled, and desalinated water and water purchased through transfers;
- Managing surface water impoundment, transportation, distribution, and use;
- Promoting conservation and efficient use to reduce demands on freshwater sources;
- Managing groundwater by regulating pumping, and replenishing groundwater supplies and protecting aquifers from overdraft, saltwater intrusion, and pollution from surface sources;
- Managing stormwater and stormwater discharges though collection of surface runoff, treatment of sewage, reduction of debris, and protection of surface permeability;
- Managing floodwaters through levees, channelization, catchment basins, and protection of wetlands;
- Regulating water rights and resolving disputes over water use;
- Protecting water quality through regulation of water rights, discharges, and land use;
- Protecting aquatic ecosystems that both provide essential habitat for fish and wildlife and serve as the sources of the state's developed water supplies.

These functions often overlap. For example, stormwater that is collected and allowed to percolate into managed groundwater basins can augment water supplies. Discharges of treated sewage and polluted runoff may harm water quality, but also may be blended with other surface water and groundwater supplies to serve industrial and agricultural users. Regulation of groundwater withdrawals may be necessary to ensure the achievement of overall water service by allowing for coordinated (or "conjunctive") management of surface and groundwater supplies. Protection of aquatic ecosystems is necessary, not only to comply with the federal and state Endangered Species Acts, but also to allow for sustainable and reliable diversions to supply water to households, farms, and non-farm businesses. Indeed, integrated and conjunctive management of surface and groundwater resources is a hallmark of contemporary water resources policy (Hanak et al. 2011).

An array of governmental structures and financing arrangements pays for these water services.[1] The state and federal governments provide water on a large scale through the State Water Project and Central Valley Project, and also build and maintain various flood works. Cities and counties provide water supply and groundwater management, as well as sewer, stormwater, and other water-related services. Many different

[1] Private water purveyors also play an important role, supplying approximately 20 percent of California's urban (non-farm) water demand. Because this appendix focuses on the legal context for raising funds by public agencies, we will discuss the investor-owned utilities only in passing. The California Public Utilities Commission regulates the rates charged by these utilities.

kinds of special districts also provide water supply, sewage treatment, stormwater management, flood protection, groundwater replenishment, and other water-related services within their geographic boundaries. Joint powers authorities, consisting of ad hoc assortments of cities, counties, and districts, have been formed to facilitate integrated water services or to achieve economies of scale. Federal, state, and local agencies also regulate the tens of thousands of water diverters, dischargers, and land users whose actions may adversely affect California's water resources.

These diverse water service providers, water managers, and regulatory agencies have developed a variety of methods to pay for their services.[2] For example:

- The state has authorized $19.6 billion in general obligation (GO) bonds since 2000 to provide grants and other contributions to fund water projects. These bonds are repaid from state general fund revenues, mostly from income and sales taxes paid by people and corporations in California.3 The state also pays some of the costs of the Department of Water Resources, the State Water Resources Control Board, the Department of Fish and Wildlife, and other state agencies that manage water resources, either with state general revenues or sometimes with revenues from fees.
- The federal government covers part of the cost of the Central Valley Project by charging water service rates. It also pays for some of California's flood control investments, as well as for water quality, wetlands, and fisheries protection through agencies such as the Army Corps of Engineers, the Environmental Protection Agency, the U.S. Fish and Wildlife Service, and the National Marine Fisheries Service.
- Most of the costs of providing water in California are paid with funds raised by cities, counties, and special districts. Each relies on some or all of the following basic income sources:[4]
    - Property taxes. Owners of real property pay an annual tax of approximately 1 percent of the value of their property at the time of its purchase. Before passage of Proposition 13 in 1978, cities, counties, and districts were allowed to levy property tax percentage rates to fund their operations; and the combined property tax percentage was usually considerably higher than the current 1 percent. Revenue from the 1 percent rate is divided among cities, counties, school districts, and other special districts, including those that provide water services.
    - Other general revenue. Cities and counties have other general fund revenue sources, which can be used for any lawful purpose, including water service and administration. The sales tax is the most important "other" general revenue source, followed by taxes on business licenses, utility users, and tourists.
    - Water fees. Local agencies also levy fees for water services. For example, most homeowners and businesses receive a monthly water bill (which usually combines a flat monthly rate and a charge for metered use, and sometimes includes rate tiers that increase with the amounts of water used). Water bills also frequently include charges for sewer service (often based on the volume of water used). Agricultural users may pay similar fees. Cities, counties, and other local water supply agencies may levy a standby charge for water service that is available but not used, such as for a lot on which a house has not yet been built. Some impose fees to discourage excess pumping and to acquire water to recharge groundwater basins that contribute to overall water service.

[2] For a summary of expenditures on various components of California's water system by local, state, and federal agencies, see Table 1 of the main report. Appendix B provides additional details.
[3] For details on bond spending and repayment, see Appendix C.
[4] For details on local revenues, see Appendix B.

- Special assessments and taxes. Many local agencies also levy special parcel assessments and parcel taxes for water services (often for flood control and in some cases for stormwater programs). Assessments are supposed to be proportional to the special benefit received by each parcel for the specific services provided, whereas parcel taxes can be used for any voter-approved purposes. These charges are usually included on property tax bills.[5]
- The costs of water resources regulation are paid by tax revenues or fees. For example, the State Water Resources Control Board and the California Department of Fish and Wildlife obtain some revenues through permit fees, and some local groundwater management agencies in California collect fees from groundwater users to manage the aquifers.

[5] See Box 2 in the main report.

Constitutional Complications

Nearly all of these revenue sources have been constrained, or at least complicated, by a series of amendments to California's Constitution approved by the state's voters that began in 1978 with the landmark Proposition 13, followed by Proposition 218 in 1996 and Proposition 26 in 2010. Judicial interpretations have clarified many aspects of these laws, often in ways that further complicate the funding of water management and administration. Yet, there remain significant unanswered legal questions; and water agencies, property owners, and water users continue to grapple with the complexities and uncertainties of the constitutional constraints on the sources of funding for water service and water resources regulation. As a guide to this discussion, Table A1 summarizes the key changes in state and local water-related finance resulting from these reforms.

TABLE A1
Impacts of Propositions 13, 218, and 26 on state and local revenue rules

		Pre-1978	Proposition 13 (1978)	Proposition 218 (1996)	Proposition 26 (2010)
State	**Taxes**	50% of legislature	**Two-thirds of legislature**	→	→
	Regulatory fees	50% of legislature	50% of legislature	50% of legislature	**Stricter requirements (more likely to be a tax)**
	GO bonds	50% of state voters	50% of state voters	50% of state voters	50% of state voters
Local	**General taxes**	Flexible	Flexible	**Simple majority for cities and counties, not available to special districts**	→
	GO bonds[a]	Two-thirds of local voters	Two-thirds of local voters	Two-thirds of local voters	Two-thirds of local voters
	Special taxes	Undefined	**Two-thirds of local voters**	→	→
	Property taxes	Flexible	**1% of purchase price +2% annual increases**[b]	→	→
	Property-related fees and assessments	Flexible	Flexible	**1) All water-related services: Strict cost-of-service requirements 2) All water-related services: Property-owner protest hearing 3) Floods and stormwater: 50% of property owners or two-thirds popular vote**[d]	→
	Non-property-related fees	Flexible	Flexible	Flexible	**Stricter requirements (more likely to be a tax)**
	Wholesale fees	Flexible	Flexible	Flexible[c]	**Stricter cost-of-service requirements**[c]

NOTES: Bolded text shows the changes resulting from each constitutional reform. The arrows indicate that the rules from the earlier proposition remain in place. "Flexible" typically means that rate decisions could be made by governing boards. Before Proposition 218, there was variation in voting requirements for different types of general taxes.

[a] In 2000, voters passed Proposition 39, which lowered the voter threshold to 55 percent for school bonds.

[b] Property taxes may be increased to repay GO bonds with two-thirds local voter approval (or 55 percent for schools).

[c] As described in the text, water wholesale agencies have assumed that they are exempt from Proposition 218 because they do not deliver services directly to properties, but this issue has not been decided by the courts. Proposition 26 may require public wholesale water agencies to adhere to stricter, proportional allocation of costs.

[d] The popular vote option is only available for fees, not assessments.

Proposition 13 (enacted June 6, 1978)

California's most famous tax initiative, Proposition 13, arose as a protest against the rapid increases in property taxes that accompanied California's booming real estate markets in the 1960s and 1970s. It limited the property tax that local governments may levy to 1 percent of each parcel's estimated value, and it provided that local governments could increase the assessed (i.e., taxable) value of each parcel by no more than 2 percent annually (California Constitution article XIIIA, §§ 1 & 2). This change immediately reduced local property tax revenue by more than $5 billion, or slightly over 50 percent (California Board of Equalization, 2012). Previously, cities, counties, school districts, and other local agencies, including water, sewer, and flood control districts, levied their own property tax rates, usually without voter approval. The revenue from the 1 percent levy is divided among these agencies, more or less in proportion to each agency's pre-Proposition 13 share of revenues. Many water-related agencies continue to receive this money.[6]

Proposition 13 also changed the approval process for other taxes. It required that all changes in state taxes be approved by a two-thirds vote of the legislature (*id.* § 3), and it introduced a new requirement that local special taxes be approved by two-thirds of local voters (*id.* § 4).[7]

Proposition 218 (enacted November 5, 1996)

Many local governments responded to the reduction in revenues caused by Proposition 13 by increasing their use of fees, charges, and special assessments, including those for water services. Some special districts levied non-property-related "general" taxes (which were not addressed by Proposition 13) after approval by a majority of their local voters, especially for transportation purposes.

Proposition 218 amended the California Constitution to restrain many of these local government practices.[8] Among other changes, the law:

- Clarifies that local general taxes always require majority voter approval and local special taxes require approval by a two-thirds vote of the local electorate (California Constitution article XIIIC, § 2(b) & (d)).[9]
- Prohibits special districts from levying general taxes (*id.*, § 2(a)).
- Makes it more difficult to levy special benefit parcel assessments, which were sometimes used to fund water supply and flood protection projects and other water programs (California Constitution article XIIID, § 4).
- Places the burden of proof on local agencies to demonstrate that assessments are proportional to the special benefit that each parcel receives from the facility or service (*id.* § 4(f)).

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[6] For recent property tax revenues of water-related special districts in California, see Appendix B (Table B3).
[7] As described below, Proposition 26 amended the language of this limitation, but it did not alter the two-thirds majority requirement.
[8] Indeed, the law included a finding that "Proposition 13 was intended to provide effective tax relief and to require voter approval of tax increases. However, local governments have subjected taxpayers to excessive tax, assessment, fee and charge increases that not only frustrate the purposes of voter approval for tax increases, but also threaten the economic security of all Californians and the California economy itself." Proposition 218 then declared that its purpose was to protect taxpayers "by limiting the methods by which local governments exact revenue from taxpayers without their consent" (Proposition 218, § 2).
[9] "General tax" means any tax imposed for general governmental purposes (California Constitution article XIIIC, § 1(a)). Cities, counties, and other local entities that exercise general governmental powers may levy general taxes with approval by a majority of the electorate (*id.*, § 2(b)). Special purpose districts and agencies do not have authority to levy general taxes (*id.*, § 2(a)). "Special tax" means any tax imposed for specific purposes, including a tax imposed for specific purposes the proceeds of which are placed into a general fund (*id.*, § 1(d)). As noted in the text, special taxes require approval of two-thirds of the electorate (*id.*, § 2(d)).

- Requires that proposed assessments be approved through an election in which votes are weighted by the amount of assessment each parcel owner would have to pay (*id.* § 4(g)).

Before the enactment of Proposition 218, the courts largely accepted local agency determinations that the fees, assessments, and other charges that they levied on property within their jurisdiction benefitted from the charges in a manner that was fairly proportionate to their share of the services funded by the charge. Proposition 218 now requires local agencies to prove that they have complied with the substantive standards of the law, including the requirement that each parcel benefit in proportion to the share of the assessment levied against it and that the assessment not exceed the cost of the property-related service provided to each parcel. Many local agencies have found it difficult to satisfy these criteria.

In addition, Proposition 218 established new substantive standards for fees and charges levied "as an incident of property ownership" or for a "property-related service." The meaning of these standards caused considerable confusion for a time, with several courts concluding that the law did not cover water rates and fees because they were charged for water service to property rather than imposed as an incident of property ownership. In two cases, however, the California Supreme Court held that, except for the initial utility connection, water supply is a "property-related service" and therefore is subject to Proposition 218 (California Supreme Court, *Richmond v. Shasta Community Services District* 2004; California Supreme Court, *Bighorn-Desert View Water Agency v. Verjil* 2006). "[O]nce a property owner or resident has paid the connection charges and has become a customer of a public water agency," the court reasoned, "all charges for water delivery incurred thereafter are charges for a property-related service, whether the charge is calculated on the basis of consumption or is imposed as a fixed monthly fee" (*Bighorn* 2006).

Proposition 218 imposes five substantive standards with which public retail water agencies must comply before they increase water rates or fees or make changes in their rate structures. The law states:

> [A] fee or charge shall not be extended, imposed, or increased by any agency unless it meets all of the following requirements:
>
> 1. Revenues derived from the fee or charge shall not exceed the funds required to provide the property-related service.
> 2. Revenues derived from the fee or charge shall not be used for any purpose other than that for which the fee or charge was imposed.
> 3. The amount of a fee or charge imposed upon any parcel or person as an incident of property ownership shall not exceed the proportional cost of the service attributable to the parcel.
> 4. No fee or charge may be imposed for a service unless that service is actually used by, or immediately available to, the owner of the property in question. Fees or charges based on potential or future use of a service are not permitted.
> 5. No fee or charge may be imposed for general governmental services … where the service is available to the public at large in substantially the same manner as it is to property owners. (California Constitution article XIIID, § 6(b))

If an affected property owner challenges a fee or charge in court, the agency has the burden of proving that it has complied with these requirements (*id.*, § 6(b)(5)).

Proposition 218 also created two procedural requirements that public retail water agencies must fulfill before they may adopt a property-related fee or charge. First, the agency must conduct a public hearing on the

proposed change in rates, fees, or rate structure. "If written protests against the proposed fee or charge are presented by a majority of owners of the identified parcels, the agency shall not impose the fee or charge" (*id.*, § 6(a)(2)).[10] Second, property-related fees and charges, except those for "water, sewer, or refuse collection services," must be approved by local voters. For these elections, the agency has two options. It can seek approval by a majority of the property owners who would be subject to the fee or charge, or from two-thirds of the registered voters in the same area (*id.* § 6(c)).

Proposition 218's election options create an odd and perhaps unexpected choice. If the agency takes the seemingly easier path of seeking approval from a majority of the property owners who would be subject to the fee, it risks being accused of using an "undemocratic" approval procedure.[11] But if the agency believes that it can obtain approval from two-thirds of local voters, it is likely to ask them to approve the measure as a special tax rather than as property-related fee, because the agency can thereby avoid Proposition 218's substantive standards and protest requirements.

With a few exceptions not relevant here, assessments, fees, charges, and rates that were enacted before July 1, 1997, do not have to comply with the procedural and substantive requirements of Proposition 218 (*id.* §§ 5 & 6(d)).

Finally, Proposition 218 makes it unlawful for water agencies to use the proceeds of water rates and other charges for projects and programs that are unrelated to water service. Before Proposition 218, for example, it was common for municipal water departments to transfer surplus water revenues to the city's general fund. This practice would now violate the law's express directive that "[n]o fee or charge may be imposed for general governmental services … where the service is available to the public at large in substantially the same manner as it is to property owners" (California Constitution article XIIID, § 6(b)(5); *In re City of San Bernardino* 2013).

Proposition 26 (enacted November 2, 2010)

The most recently enacted constitutional amendment in this trilogy of financing reforms, Proposition 26, applies to both the state and local governments. Its stated purpose was to redefine the term "tax" so that neither the legislature nor local governments "can circumvent [the Proposition 13 and 218] restrictions on increasing taxes by simply defining new or expanded taxes as 'fees'" (Proposition 26 §1(f)). Indeed, the law was based on the "finding" that the legislature and local governments "have disguised new taxes as 'fees' in order to extract even more revenue from California taxpayers without having to abide by these constitutional voting requirements. Fees couched as 'regulatory' but which exceed the reasonable costs of actual regulation or are simply imposed to raise revenue for a new program and are not part of any licensing or permitting program are actually taxes and should be subject to the limitations applicable to the imposition of taxes" (*id.* § 1(e)).

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[10] The Court of Appeal recently held that Proposition 218 does not require water agencies to conduct individual protest hearings and votes for each class of customers or each type of rate increase. Rather, water agencies may conduct a single "omnibus" hearing in which all of its customers vote. (California Court of Appeal, *Morgan v. IID* 2014). As the court explained: "Given the goals of section 6 [of Proposition 218] to minimize water rates and promote dialog between rate payers and rate makers, public agencies must be permitted to reasonably structure their revenues to cover costs and meet customer needs using a rate setting process that includes notice and hearing requirements sufficient to allow meaningful public participation, but tolerably administrable and flexible to avoid needless expense and delay…. The individual protest procedure… would create an almost unworkable system, where a minority of voters could frustrate the purposes of section 6" (*Id.*).

[11] This occurred in Los Angeles County and Contra Costa County elections for stormwater fees (Lakewood Accountability Action Group 2013; Vorderbrueggen, 2012). As shown in Appendix E, property owner ballot measures have had relatively low pass rates (68%) as compared with general tax measures mentioning water that require a simple majority vote of the general public (100%). They have done no better on average than special tax measures including water that require a two-thirds majority vote of the general public (65%).

Proposition 26 amended Proposition 13 by requiring that any change in state law that "results in any taxpayer paying a higher tax" must be enacted by a two-thirds vote of the legislature (California Constitution article XIIIA, § 3(a)).[12] This represents an important change, because previously the legislature—by simple majority vote—could enact or authorize taxes or fees that were "revenue-neutral" overall, even if they raised levies on some individuals.

Local taxes remain subject to the requirements of approval by majority vote of the electorate for "general taxes" and approval by two-thirds of the voters for "special taxes." But Proposition 26 defines "tax" broadly to mean "any levy, charge, or exaction of any kind" imposed by the state or local governments, except:

1. A charge imposed for a specific benefit conferred or privilege granted directly to the payor that is not provided to those not charged, and which does not exceed the reasonable costs to the State [or local government] of conferring the benefit or granting the privilege to the payor.
2. A charge imposed for a specific government service or product provided directly to the payor that is not provided to those not charged, and which does not exceed the reasonable costs to the State [or local government] of providing the service or product to the payor.
3. A charge imposed for the reasonable regulatory costs to the State [or local government] incident to issuing licenses and permits, performing investigations, inspections, and audits, enforcing agricultural marketing orders, and the administrative enforcement and adjudication thereof.

* * *

5. A fine, penalty, or other monetary charge imposed by the judicial branch of government or the State [or a local government], as a result of a violation of law.

(id. § 3(b); California Constitution article XIIIC, § 1(e))

For local governments, Proposition 26 also excludes from the definition of tax:

6. A charge imposed as a condition of property development.
7. Assessments and property-related fees imposed in accordance with the provisions of Article XIII D [i.e., Proposition 218]. (id.)

In addition, Proposition 26 states that the state or local government "bears the burden of proving by a preponderance of the evidence that a levy, charge, or other exaction is not a tax, that the amount is no more than necessary to cover the reasonable costs of the governmental activity, and that the manner in which those costs are allocated to a payor bear a fair or reasonable relationship to the payor's burdens on, or benefits received from, the governmental activity" (California Constitution article XIIIA, § 3(d); *id.* article XIIC, § 1(e)).

[12] As defined by Proposition 13, the two-thirds legislative approval requirement was applicable to "any changes in state taxes enacted for the purpose of increasing revenues collected pursuant thereto whether by increased rates or changes in methods of computation" (California Constitution article XIIIA, § 3 [prior version]). The new supermajority vote requirement of Proposition 26 was a response to several statutes by which the legislature increased taxes for some people and lowered them for others, with an overall "revenue neutral" effect designed to avoid Proposition 13's two-thirds vote requirement.

Proposition 26 became law on November 2, 2010, and does not apply to fees and other charges that were in effect on that date. It does apply, however, to any subsequent changes in existing fees and charges.[13]

One of the most important unresolved questions under Proposition 26 is whether it includes "regulatory fees" in its definition of taxes. Regulatory fees are charges levied for the purpose of deterring certain activities (such as the discharge of pollutants or excessive groundwater pumping) or of requiring land and water users to bear the full costs of their activities, including external costs (such as loss of wetlands or harm to endangered species). Before the enactment of Proposition 26, it was well-settled California law that these types of regulatory fees were valid (i.e., did not have to be enacted as a tax) if they met two criteria: First, the fee did not "exceed the reasonable cost of providing services necessary to the activity for which the fee is charged and which are not levied for unrelated revenue purposes" (California Supreme Court, *California Farm Bureau Federation v. State Water Resources Control Board* 2011 (internal quotation marks omitted)). Second, the fee "was 'imposed… to mitigate the actual or anticipated adverse effects of the fee payers' operations'" (*id.*). (For more on this case, see Box 1.)

Although the courts will ultimately have to decide this question, we believe that Proposition 26 did not overturn this long-standing definition of regulatory fees. Rather, the new law had a narrower purpose—viz., to prohibit the enactment of environmental mitigation fees that are designed to raise funds to compensate victims of past environmental harm or to remediate existing environmental degradation that stems from actions and resource management decisions (e.g., water and land use) that have already taken place. These types of broader environmental mitigation fees may only be enacted as taxes. We reach this conclusion for several reasons.

First, as noted above, Proposition 26 candidly describes what it covers and does not cover, prohibiting only those fees that are (1) "couched as 'regulatory' but which exceed the reasonable costs of actual regulation"; (2) fees that "are simply imposed to raise revenue for a new program"; and (3) fees that "are not part of any licensing or permitting program" (Proposition 26 §1(e)). In contrast, regulatory fees are (as their name connotes) regulatory in nature—i.e., they apply prospectively to activities that are governed by permitting and licensing requirements and they are tailored to help achieve the goals of deterring potentially harmful activities and of forcing the individuals or entities who are subject to the fee to pay the full costs of their activities—including the external costs that they otherwise would impose upon other land and water users or the general public. Regulatory fees therefore do not conflict with any of the articulated purposes of Proposition 26.

Second, Proposition 26 expressly states that a fee is not a tax if it is "imposed for a specific benefit conferred or privilege granted directly to the payor" (such as the right to discharge stormwater or to pump groundwater) and "does not exceed the reasonable costs to the [government] of conferring the benefit or granting the privilege to the payor" (California Constitution article XIIIA, § 3(b)(1), and *id.* art. XIIIC, § 1(e)(1)). The law then explains this latter criterion in more detail, stating that a fee is not a tax if the government proves that the amount of the fee "is no more than necessary to cover the reasonable costs of the governmental activity"— e.g., protecting water quality, regulating stormwater discharges, and managing groundwater resources—and "the manner in which those costs are allocated to a payor *bear a fair or reasonable relationship to the payor's burdens on*, or benefits received from, *the governmental activity*"

[13] In addition, Proposition 26 states that any state tax "adopted after January 1, 2010, but prior to the effective date of this act, that was not adopted in compliance with [its] requirements… is void 12 months after the effective date of this act unless the tax is reenacted by the Legislature and signed into law by the Governor in compliance with the [new] requirements" (California Constitution article XIIIA, § 3(c)).

(California Constitution article XIIIA, § 3(d), and *id.* art. XIIIC, § 1(e) (emphasis added)). This language indicates that Proposition 26 continues to allow the state and local agencies to adopt fees that are designed to deter activities (such as excessive pumping that in the aggregate may cause groundwater overdraft) or to compel land and water users to pay for the negative externalities that they impose on neighboring landowners, downstream water users, or the environment.

That the fee may also raise money to fund the governmental program does not render it a tax. The California Supreme Court has held that "if regulation is the primary purpose of [a] fee measure, the mere fact that the measure also generates revenue does not make the imposition a tax" (California Supreme Court, *Sinclair Paint Co. v. SBE*, 1997). Again, Proposition 26 does not alter this principle as its "findings and declaration of purposes" states that it was enacted to address "[f]ees couched as 'regulatory' but which exceed the reasonable costs of actual regulation *or are simply imposed to raise revenue for a new program and are not part of any licensing or permitting program*" (Proposition 26, § 1(e) (emphasis added)).

Proposition 26 does change the substantive law governing regulatory fees in one significant respect: It prohibits the use of fees that require resource users to compensate for harm that they may have caused by past activities or for harm caused by others. In this respect, the new law overturns part of the California Supreme Court's decision in *Sinclair Paint* in which the Court upheld the Childhood Lead Poisoning Prevention Act of 1991 against claims that it was a "special tax" that must be approved by a two-thirds majority of the legislature under Proposition 13. The Act requires paint manufacturers and others who produce or distribute products that contain lead to pay a fee to fund medical services for children who are at risk of lead poisoning. It states that the fee shall be assessed on the basis of each individual contributor's "past and present responsibility for environmental lead contamination" and "'market share' responsibility for environmental lead contamination" (California Health & Safety Code § 105310(b)).[14]

The Court concluded that "the police power is broad enough to include mandatory remedial measures to mitigate the *past, present, or future* adverse impact of the fee payer's operations, at least where, as here, the measure requires a causal connection or nexus between the product and its adverse effects" (*Sinclair Paint Co. v. SBE* 1997). Section 105310 "imposes *bona fide* regulatory fees, it reasoned, because the statute "requires manufacturers and other persons whose products have exposed children to lead contamination to bear a fair share of the cost of mitigating the adverse health effects their products created in the community… . From the viewpoint of general police power authority, we see no reason why statutes or ordinances calling on polluters or producers of contaminating products to help in mitigation or cleanup efforts should be deemed less 'regulatory' in nature than the initial permit or licensing programs that allowed them to operate" (*id.*).

This part of the *Sinclair Paint* holding is no longer good law. Proposition 26 expressly limits the use of regulatory fees to mitigation of *prospective* environmental harm likely to be caused by the payor's actions.

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[14] As noted above, Proposition 26 also changed the burden of proof applicable to judicial review of regulatory fees. Before Proposition 26, the plaintiffs challenging a fee had "the burden of proof to establish a prima facie case showing that the fee is invalid" (California Supreme Court, *California Farm Bureau Federation v. State Water Resources Control Board* 2011). "[O]nce plaintiffs have made their prima facie case, the state bears the burden of [producing evidence] and must show '(1) the estimated costs of the service or regulatory activity, and (2) the basis for determining the manner in which the costs are apportioned, so that charges allocated to a payor bear a fair or reasonable relationship to the payor's burdens on or benefits from the regulatory activity'" (*id.,* quoting *Sinclair Paints*). Proposition 26 places the burden of proving compliance with its substantive standards on the government throughout the litigation (California Constitution article XIIIA, § 3(d); *id.* art. XIIIC, § 1(f)). As noted above, Proposition 218 similarly placed the burden of proving compliance with its substantive directives on local governments.

If enacted today, the Childhood Lead Poisoning Prevention Act's collection of a fee to redress harm from past contributions of lead would therefore have to be passed as a tax by a two-thirds vote of the legislature.[15]

The precise meaning and consequences of Proposition 26 will ultimately be decided by the California courts. A careful reading of the stated purposes and implementing sections of the initiative, however, should lead to the conclusion that prospective regulatory fees continue to be fees rather than taxes. Moreover, in the absence of explicit repealing language, the courts are likely to be wary of the conclusion that the new law completely eliminates regulatory fees, which are a long-standing and vital feature of environmental stewardship and regulation. As the United States Supreme Court recently emphasized: "Insisting that landowners internalize the negative externalities of their conduct is a hallmark of responsible land-use policy, and we have long sustained such regulations against constitutional attack" (U.S. Supreme Court, *Koontz v. St. Johns River Water Management District* 2013).

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[15] The Legislative Analyst's explanation of Proposition 26, which was published in the Official Voter Information Guide, also supports the interpretation that the initiative applies only to fees that fund remedial projects that are designed to compensate for or mitigate past environmental harm or that generate revenues that are allocated to unrelated governmental programs. According to the Legislative Analyst:

> Generally, the types of fees and charges that would become taxes under the measure are ones that government imposes to address health, environmental, or other societal or economic concerns. Figure 3 provides examples of some regulatory fees that could be considered taxes, in part or in whole, under the measure. *This is because these fees pay for many services that benefit the public broadly, rather than providing services directly to the fee payer.* The state currently uses these types of regulatory fees to pay for most of its environmental programs (California Secretary of State 2010).

In Figure 3, the Legislative Analyst briefly described three types of fees that could only be enacted as taxes if Proposition 26 were enacted: the Oil Recycling Fee, the Hazardous Materials Fee, and Fees on retail stores that sell tobacco products. All three resemble the lead contamination fee at issue in *Sinclair Paints*. (What would make these fees unlawful under Proposition 26 is the fact that the proceeds are used for things besides mitigation of prospective harm likely to be caused by the fee-payers' actions.) The principal argument in support of Proposition 26 that appeared in the official Voter Information Guide also confirms the interpretation that enactment of the initiative would not eliminate prospective environmental mitigation fees. "Don't be misled by opponents of Proposition 26," it urged the voters:

> California has some of the strongest environmental and consumer protection laws in the country. Proposition 26 preserves those laws and PROTECTS LEGITIMATE FEES SUCH AS THOSE TO CLEAN UP ENVIRONMENTAL OR OCEAN DAMAGE, FUND NECESSARY CONSUMER REGULATIONS, OR PUNISH WRONGDOING …. (*id.*)

The California Supreme Court has held that if the text of an initiative is "clear and unambiguous, the plain meaning governs. But if the language is ambiguous, we consider extrinsic evidence in determining voter intent, including the Legislative Analyst's analysis and ballot arguments for and against the initiative" (California Supreme Court, *Silicon Valley Taxpayers Association v. Santa Clara County Open Space Authority* 2008).

1

State Water Resources Control Board fee litigation

The California Supreme Court's most recent decision on regulatory fees came in *California Farm Bureau Federation v. State Water Resources Control Board* (2011). Since the creation of the first water rights regulatory system in the Water Commission Act of 1913, the Water Rights Division of the board (and its predecessor agencies) were supported by the state's general fund. In 2004, however, the legislature changed this funding system by enacting Senate Bill 1049, which directed the board to establish a schedule of annual fees and special application fees that would be charged to all appropriators of surface water that operate under permit or license issued by the SWRCB (California Water Code §§ 1525-1560). Riparians, pre-1914 appropriators, and pueblo water right holders are exempt from the fees. The fee schedules are set forth in the SWRCB's regulations (California Code of Regulations, Title 23, §§ 1061-1078).

The California Farm Bureau Federation and other water users sued, claiming that the annual fees are a tax that required a two-thirds vote of the legislature. Although Proposition 26 was enacted while the case was on appeal, none of the parties contended that the fees were subject to the new law; and the Supreme Court consequently did not address Proposition 26's substantive standards. The court's opinion is nevertheless important because it provides an instructive analysis of how the courts should evaluate regulatory fees.

The court rejected the claim that the fees are facially unconstitutional. It reasoned that the legislature had taken care to ensure that the fees would not be classified as a tax that would require a two-thirds majority vote under Proposition 13, because it did not authorize the Board to use the proceeds of the fees for activities other than regulation of permittees and licensees: "Section 1525 does not require the SWRCB to collect anything more than the administrative 'costs incurred' in carrying out the functions [covered by the fees…. Thus, the fees charged … are linked to the activities the Division performs" (California Supreme Court, *California Farm Bureau Federation v. SWRCB* 2011).

The Supreme Court remanded the case to the superior court, however, for resolution of the question of whether the Board fairly apportioned the 2003 annual fees among the various fee-payers' proportion to their respective burdens on California's water systems. It emphasized that the superior court should consider "whether the fees are reasonably related to the total budgeted cost of the Division's 'activity,' keeping in mind that *a government agency should be accorded some flexibility in calculating the amount and distribution of a regulatory fee*" (*id.,* emphasis added).

In November 2013, the Sacramento County Superior Court held that the 2003 annual fees violated these principles. It found that because of the statutory exemption of riparian, pueblo, and pre-1914 appropriative rights, the fees only covered approximately 62 percent of surface water right holders. Yet, the water rights administrative programs funded by the fees benefit all water right holders as well as the general public. Under these circumstances, the court concluded that the fees "do not provide a fair, reasonable, and substantially proportionate assessment of all costs related to the regulation of the affected payors." The court also ruled that the Board failed to justify the fees charged to the U.S. Bureau of Reclamation (California Superior Court, Northern California Water Association v. SWRCB 2013).

Although the superior court correctly decided that the annual water use fees should include all surface water right holders (not simply permittees and licensees), the court's conclusion that the fee is unconstitutional because it funds activities that benefit the general public is inconsistent with the Supreme Court's definition of a valid regulatory fee—viz., one that compels the affected water users to pay for the external costs of their activities, including the costs of regulation to resolve water rights disputes and to protect water quality, fish, and other aspects of the environment. We expect that the Board will raise this issue on appeal.

Implications of Propositions 218 and 26 for the Administration of California's Water Resources

Proposition 218 was enacted almost two decades ago; yet, its effects on water service and water resources management have only lately come to close public attention and debate. As a result of recent judicial interpretations, the law is likely to alter ratemaking and water administration in several important ways.

First, public retail water agencies will have to explain more carefully and clearly the relationship between their water rate structures and the cost of providing water service to their customers, link new fees and rates to the projects and programs they are designed to fund, and justify any differential treatment between or among classes of customers based on differences in the cost of providing services to those classes.

Second, they will have to justify water service charges that pay for water management activities that may not directly benefit some individual customers, but that provide indirect benefits to all customers by reducing either aggregate demand for freshwater supplies or the aggregate cost of providing water service.

Third, local groundwater and stormwater management agencies will have to explain how fees that they employ to address the external costs of their constituents' water and land use activities are consistent with Proposition 218's cost-based allocation scheme. Indeed, this may be the most challenging issue for agencies that are subject to the law's requirements.

Proposition 26 is relatively new. As discussed above, the courts have not yet had a chance to decide whether it applies to all regulatory fees or only those that address past environmental harm or provide funds for unrelated governmental programs. The effects of Proposition 26 on California water policy therefore remain more speculative. The law may require public *wholesale* water agencies—which deliver water to retail agencies but not to individual businesses and residences—to explain and justify their fees, charges, rates, and rate structures in a manner similar to Proposition 218's directives to retail water agencies.[16] This could include proof of compliance with Proposition 26's substantive standards—including evidence that water rates and fees do not exceed the reasonable costs of the specific service provided, and that rates and rate structures "bear a fair or reasonable relationship to the payor's burdens on, or benefits received from" the agency. The latter requirement also may make it more difficult for the state or local governments to raise funds to support environmental cleanup and habitat restoration programs because of the tighter burden of proof regarding the link between the fee and the burden caused by specific activities.

In addition, both water agencies and the courts will have to address the relationship between Propositions 218 and 26—especially as these laws may apply to water management programs that have some aspects of water service to property (and to the consumers who inhabit and use the property), but which are primarily designed to ensure that activities that take place on such property do not harm neighboring lands, public waters, or environmental quality. We believe that these types of regulatory fees are an uneasy fit within Proposition 218 and should be evaluated only under Proposition 26. There is also the potential for conflict between the cost-based allocation standards of Proposition 218 and the constitutional cornerstone of California water policy, Article X, Section 2, of the state constitution. Overly literal interpretation of the

[16] Most wholesale agencies have operated under the assumption that they are not subject to similar requirements under Proposition 218 because they do not deliver water directly to properties.

Proposition 218 standards could undermine a variety of water conservation and integrated management programs that are key features of contemporary water resources administration.

In the remainder of this appendix, we explore these issues and propose a set of constitutional reforms to these laws to enable sustainable funding of California's water system. We also suggest a variety of ways that water agencies, the courts, and the legislature can respond constructively to the challenges posed by these laws in their current form.

Proposition 218 and Retail Water Rates

Proposition 218 has already had significant effects on water rates and rate structures, and its influence is likely to expand as the courts continue to explicate its various restrictions and requirements. To date, these judicial decisions have been limited to retail water service. The law applies only to assessments on real property and to fees and charges levied "as an incident of property ownership" or for a "property-related service." Because fees and charges for wholesale water service are paid by the retail water supplier, they probably are not covered by Proposition 218.[17]

Although Proposition 218 expressly exempts "fees or charges for … water … services" from its *election* requirements (California Constitution article XIIID, § 6(c)), most water rates are nonetheless subject to its *substantive* standards.[18] To date, the California courts have interpreted these standards broadly to require public retail water agencies—those that provide water service directly to residential, commercial, and agricultural users—to justify their specific rates, ratemaking formulas, and rate disparities based on differences in the cost of providing service to different classes of customers. Two recent cases are illustrative.[19]

In *City of Palmdale v. Palmdale Water District* (2011), the California Court of Appeal struck down a tiered-rate structure that the Palmdale Water District (PWD) adopted to encourage conservation and efficient use and to reduce demand on its surface and groundwater sources of supply. The new rate structure imposed a fixed monthly service charge based on the size of the customer's meter and a variable commodity charge that increased in four tiers based on the level of each customer's exceedance of his or her base use allocation. The specific rates for each of the four tiers differed, however, depending on whether the customer's water use was for residential, commercial, or irrigation purposes.

The court concluded that this differential among classes of customers violated Proposition 218's third substantive standard—that the rate charged to individual parcels or customer "shall not exceed the proportional cost of the service attributable to the parcel":

> [A] review of the tier structure alone establishes that irrigation customers such as the City are charged disproportionate rates reaching tier 5 ($5.03/unit) rates at 130

[17] The courts have not yet decided this question. It is possible that a court would conclude that because the combined pricing decisions of retail and wholesale agencies make up the "cost" used to justify a property-related fee, both retail and wholesale ratemaking are subject to Proposition 218. The text of Proposition 218, however, does not compel this conclusion. Moreover, the legislature has declared that changes in wholesale rates that are passed along from a retail water supply agency to its customers are exempt from Proposition 218. See California Government Code § 53756 ("an agency providing water, wastewater, sewer, or refuse collection service may adopt a schedule of fees or charges authorizing automatic adjustments that pass through increases in wholesale charges for water, sewage treatment, or wastewater treatment or adjustments for inflation").

[18] According to the California Supreme Court, the only such water charges that are categorically exempt from Proposition 218 are those for new water service connections (*Richmond v. Shasta Community Services District* 2004; *Bighorn-Desert View Water Agency v. Verjil* 2006).

[19] The *Palmdale* case is a decision by the California Court of Appeal and is binding precedent on all courts of the state, except for the California Supreme Court. The *Capistrano* case was decided by the Orange County Superior Court, and it has no precedential value. The *Capistrano* decision is likely to be appealed.

> percent of their budgeted allocation as compared to other users who do not reach such high rates until they exceed 175 percent (SFR/MFR)[20] or 190 percent (commercial) without any showing by PWD of a corresponding disparity in the cost of providing water to these customers at such levels.

It also rejected the district's argument that the differential tiered-rate structure was authorized by Article X, Section 2, of the California Constitution and sections 370-374 of the Water Code (see Box 2) because the tiered rates were designed to prevent waste and unreasonable use and create incentives for conservation and more efficient use.[21] The court did not rule that these laws are irrelevant in a ratemaking context. Indeed, it emphasized their importance in promoting efficient water use and management. Rather, the court again focused on the lack of justification in the record for the disparities among the classes of customers subject to the differential tiered rates based on differences in the costs of providing water service to each customer class: "PWD fails to explain why [these other laws] cannot be harmonized with Proposition 218 and its mandate for proportionality. PWD fails to identify any support in the record for the inequality *between* tiers, depending on the category of user" (*Palmdale v. Palmdale Water District* 2011) (emphasis in original).

Capistrano Taxpayers Association v. City of San Juan Capistrano (2013) was a challenge to the city's changes to its tiered water rate structure and its adoption of a charge on all residential customers for recycled water that was made available only to other customers within the city. The Orange County Superior Court ruled that the new tiered rates violated Proposition 218 because the city "failed to carry its burden of establishing credible evidence that the rate increases were proportional to the costs of providing water services to its customers."[22]

The court also invalidated Capistrano's recycled water charge as levied on residential customers who do not have access to the recycled water. It rejected the city's argument that "it is appropriate to distribute the cost of recycled water to all ratepayers because they benefit from this practice in that by supplying recycled water to ratepayers who can use it, this displaces demand for local potable supplies that can thus be made available to other customers." The court held that this proffered justification was inconsistent with the third Proposition 218 standard, which requires that the "service is actually used by, or immediately available to, the owner of the property in question."

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[20] SFR is single-family residences and MFR is multifamily residences.

[21] The legislature enacted sections 370-374 as a means of effectuating Article X, Section 2's water conservation and reasonable use mandates. We discuss these mandates, as well the relationship between Article X, Section 2, and Propositions 218 and 26, in detail below.

[22] The city had simply added a new water tier to its existing three-tiered structure by holding Tier 1 constant, increasing that rate by 33.33 percent to create a new Tier 2, increasing old Tier 2 by 50 percent to create a new Tier 3, and increasing old Tier 3 by 83.33 percent to create a new Tier 4. The court concluded that these rate increases were illegal because there was no "specific financial cost data in the [administrative record] to support the substantial rate increases" and the city "failed to identify any support in the record for the inequality between tiers depending on the category of use."

2

Allocation-based conservation water pricing
(California Water Code §§ 370-374)

In 2008, the California Legislature expressly authorized public water supply agencies to use "allocation-based conservation water pricing." Under this type of pricing system, the water rate includes:

- A basic (or base) charge per volumetric unit of water service. The amount of water covered by the basic charge may vary by customer class or by individual water service connection. The factors that an agency may use to determine each customer 's (or class of customers') basic allocation may include "the number of occupants, the type or classification of use, the size of lot or irrigated area, and the local climate data for the billing period."
- A conservation charge per volumetric unit of water service that is in excess of the basic charge. The agency can choose to have one or more conservation charges. The increment between the basic charge and the conservation charges (and the increments between ascending conservation charges) may be fixed or variable; they also may ascend in uniform or non-uniform increments. The only legal requirement is that the "volumetric prices for the lowest through the highest priced increments shall be established in an ascending relationship that is economically structured to encourage conservation and reduce the inefficient use of water."

The legislature thus granted public water suppliers significant discretion to enact tiered water rates. Consistent with Proposition 218, the law does state that "[r]evenues derived from allocation-based conservation water pricing shall not exceed the reasonable cost of water service including basic costs and incremental costs." It also provides that the rates charged to individual customers or class of customers shall not exceed the reasonable cost of water service to them individually, taking into account their basic use allocations, meter size, metered volume of water consumed, and the goals of achieving conservation and efficient use. As noted in the text, the legislature expressly declared that allocation-based conservation water pricing "is one effective means by which waste or unreasonable use of water can be prevented and water can be saved in the interest of the people and for the public welfare, within the contemplation of Section 2 of Article X of the California Constitution."

"Allocation-based rate structures have been successful for several Southern California utilities since the early 1990s, including the City of Los Angeles and the Irvine Ranch Water District" (Hanak et al. 2011). The Eastern Municipal Water District, the Coachella Valley Water District, and the Rincon del Diablo Water District have also recently adopted allocation-based conservation pricing. For more information about these rate programs and other types of tiered water rate structures, see *id*., pp. 270–73.

Agencies with allocation-based tiers typically use revenues from the upper tiers to fund conservation programs within the service area. The Irvine Ranch Water District (IRWD) also uses some of these revenues to capture and treat polluted runoff that results from overwatering of outdoor landscapes. In Assembly Bill 810, enacted in 2001, the legislature granted IRWD and another Orange County water supplier, the Santa Margarita Water District, authority to include stormwater management among its mandates to be able to carry out this program (California Water Code §§ 35539.10-35539.16). However, this legislation did not authorize similar activities by other water districts in the state.

These decisions offer several valuable lessons for public retail water agencies, but they also present significant challenges to sound water resources management. The state has promoted the expanded use of recycled water since the early 2000s through grants and regulatory changes.[23] The Department of Water Resources estimates that the use of recycled water for industrial, agricultural, and landscaping purposes is likely to rise from about 500,000 acre-feet annually (afa) in 2005 to more than two million afa over the next two decades (California Department of Water Resources 2009). The blending of treated wastewater is an increasingly important part of groundwater replenishment in Southern California, and some agencies are now considering potable reuse as a way to improve water supply reliability.[24] In addition, tiered water rates are now a common feature of local retail water service as the linkage between higher water use and higher marginal pricing creates incentives for more efficient use and conservation. "By 2006, roughly half of California's population lived in a service area with tiered rates," and this practice has grown since then "as urban utilities have sought to change consumer behavior in response to drought conditions and restrictions on Delta pumping" (Hanak et al. 2011). In addition, following encouragement from the California Public Utilities Commission, all ten large investor-owned water utilities adopted tiered rate structures in the late 2000s as a means of promoting conservation (*Id.*).

To respond to the judicial decisions on water rate structures—and to help ensure that the strictures of Proposition 218 do not interfere with innovative and responsible water management—public retail water agencies will have to alter their administrative practices in two important ways.

First, water agencies will have to explain their ratemaking processes and decisions in a relatively simple way that will allow lay readers—interested members of the public and the judges who ultimately will review the agency's decision—to understand how and why the agency made the choices that it did. This explanation, of course, will include the water management studies, economic analyses, cost accounting, environmental review, and other materials that constitute the administrative record. But it also must include a narrative explanation that simplifies these details so that individuals who are not schooled in engineering, economics, accounting, and other technical disciplines may understand both the ratemaking process and the agency's final decision to adopt a particular fee, charge, or rate structure. To the extent that Proposition 218 and its judicial interpretations cause greater transparency in ratemaking, they will serve as positive contributions.

Second, water agencies will have to include in the administrative record detailed ratemaking studies that explain how proposed new fees, charges, and rate structures are consistent with the substantive standards of Proposition 218. Thus, an agency that seeks to create a fee or increase rates to pay for additional water supplies or a new conjunctive use program will have to prove that the charges do not exceed the capital and operating costs of the program and that it will use the revenues exclusively to fund construction and administration of the program. The agency also will have to prove that the new charges are proportional to the cost of providing service to each parcel (or class of parcels) and demonstrate how the program will benefit all of its customers who are subject to the new charges—for example, by providing greater security and reliability in water service. In addition, the agency will have to demonstrate that the charges do not distinguish between or among customers for reasons other than differences in cost of service. As the court of

[23] Several of the state bonds approved in the 2000s made matching funds available for recycled wastewater development (see Appendix C). More recently, the State Water Resources Control Board has adopted policies governing recharge groundwater basins with recycled water (California State Water Resources Control Board 2009, 2013). In addition, Governor Brown recently signed Senate Bill 322 (October 8, 2013), which directs the California Department of Public Health to develop uniform water recycling criteria for direct potable reuse.

[24] Water agencies in Orange and Los Angeles Counties infiltrate tertiary-treated wastewater into local aquifers (Orange County Water District 2013; West Basin Municipal Water District 2013), and the City of San Diego is considering blending highly treated wastewater into its potable water supplies (San Diego 2013).

appeal held in *Palmdale,* an agency may not justify a fee or rate differential between or among classes of customers based on type of water user or comparative ability to pay.[25]

Proposition 218's transparency requirements do not, in and of themselves, require any changes in rate structures. In contrast, the law's substantive standards may force public retail water agencies to make significant changes in how they structure their rates. For example, the *Palmdale* court's rejection of the district's tiered rate structure—because it created steeper tiered rates for irrigation and commercial uses than for residential uses—legitimately calls into question the social utility of allowing water rate structures (either expressly or inadvertently) to deviate significantly from the cost of providing the service to which they are attached.

Public retail water agencies therefore will have to explain why they charge some classes of customers (e.g., agricultural users) different rates than other customers. Lower rates for irrigation supplies (once a common practice for agricultural customers within water agencies that serve a diverse customer base) may still be justified based on differences in cost of service—for example, where agricultural users receive raw water while residential and commercial customers receive treated water, or where some lower-priced water is available only on an interruptible basis. An agency could easily justify such rate distinctions because raw water does not include the capital and operating costs of treating water for delivery to domestic customers, and interruptible service requires fewer capital costs because the agency does not have to build its infrastructure and water supply portfolio to the same size that it would have if it had to provide firm supplies to all customers.

The *Palmdale* decision also may cast doubt on a public retail water agency's authority to enact a less expensive "water lifeline" rate for guaranteed water supplies to low-income customers if the rates charged to these customers are less than those charged to other residential customers and the agency cannot explain the rate difference on the basis of differences in cost of service.[26] For example, agencies with a flat water rate structure—which either charge a fixed monthly fee per connection or a single volumetric rate for water service that does not increase with consumption—will have a difficult time justifying the lifeline rate because there is no cost of service difference between its lifeline customers and its general customers. In contrast, an agency that has tiered water rates could justify the rate difference by having a low base (i.e., "lifeline") rate that applies to all customers regardless of their income. (As noted above, however, these agencies may face Proposition 218 challenges in establishing the higher tiers for increased levels of water use if they cannot be justified by the costs of service.) The only unambiguously lawful way to provide lifeline services is to use other pre-existing revenue sources—such as property tax proceeds—to pay for subsidized lifeline rates or to enact a new special tax (with a two-thirds supermajority of local voter support) to fund the lifeline program.

In addition to these changes in ratemaking and expenditure, the substantive standards of Proposition 218 may create significant difficulties for public retail water agencies that seek to diversify their water supply

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[25] In its recent decision in *Morgan v. Imperial Irrigation District* (2014), the court of appeal explained that the question whether an agency has adequately explained and justified increases in water rates based on the cost of service to individual parcels or customer classes is primarily a question of fact and that the trial courts must uphold the rates if they are supported by substantial evidence in the administrative record. The court also held that, although Proposition 218 requires the agency to produce reliable data on water use and cost of service, the law "does not require perfection."

[26] The argument against enactment of Proposition 218, set forth in the Official Voter Information Guide, stated that the initiative "[c]ould eliminate LifeLine utility support for SENIORS and disabled citizens." Proponents of the initiative responded that "'[l]ifeline' rates for elderly and disabled for telephone, gas, and electric services are NOT affected" (California Secretary of State 1996). They did not mention lifeline rates for water service. We are not aware of any Proposition 218 challenges to lifeline programs to date, but they are potentially vulnerable under the current law.

portfolios if the courts interpret them literally without regard to the realities of contemporary water resources management. The *Capistrano* case provides a useful illustration.

The superior court struck down the recycled water charge because it applied to all of the city's customers, while only some had access to the recycled water itself. Yet, the city offered a persuasive justification for the system-wide charge: The provision of recycled water to some customers (predominately irrigation users) reduces aggregate demand for more expensive imported potable supplies.[27] All customers therefore benefit from the recycled water charge because this enables the city: (1) to reduce its reliance on an increasingly unreliable source (imported Delta and Colorado River water supplied by the Metropolitan Water District through the Municipal Water District of Orange County); (2) to lower system-wide water rates; (3) to reduce its ocean discharges of treated wastewater; and (4) to enhance the reliability of its overall water supply portfolio.

The court's rejection of this justification for the recycled water charge—on the basis that it violates Proposition 218's requirement that the water service "is actually used by, or immediately available to, the owner of the property in question"—ignores the realities of contemporary integrated water resources management in which multiple sources (including native surface supplies, imported water, groundwater, recycled water, and in some cases desalinated water) constitute the agency's water supply portfolio. Indeed, if the *Capistrano* analysis were followed by other courts, the result would be a balkanization of water rates that would force agencies to "dis-integrate" the rates they charge to individual customers for integrated water service whenever some customers have different access to different sources of water.

Fortunately, the California Court of Appeal has recently issued a countervailing (and controlling) interpretation of Proposition 218. *Griffith v. Pajaro Valley Water Management Agency* (2013) addressed the legality of that agency's groundwater augmentation charge in light of Proposition 218's substantive standards, and we will therefore analyze the case in the section below on "Proposition 218 and Groundwater Management." For now we will simply note that the court of appeal in *Griffith* took a dramatically different view of water service than did the superior court in *Capistrano,* recognizing that water service is an integrated activity in which agencies draw from a portfolio of sources that include surface water, groundwater, recycled water, stormwater, and water conservation and other demand reduction programs. If other courts adopt this more realistic understanding, then they will avoid applications of Proposition 218 that risk stifling creative and prudent contemporary water resources management.

Proposition 26 and Wholesale Water Rates

Wholesale water agencies are important components of California's water delivery system. The State Water Project is a wholesale agency that delivers water from the Feather River and the Sacramento-San Joaquin River Delta to 27 public agencies in the Sacramento Valley, the Bay Area, the Central Valley, the Central Coast, and Southern California. The Metropolitan Water District of Southern California (MWD) supplies State Water Project and Colorado River water acquired from the U.S. Bureau of Reclamation to 26 agencies that serve 19 million customers throughout Southern California. The San Diego County Water Authority provides wholesale water service to 24 member agencies in San Diego County. The San Francisco Public Utilities Commission supplies water from the Tuolumne River system and local sources to 27 cities and other

[27] Recycled water is not yet available for direct potable use in California and therefore must be supplied through a parallel plumbing system for non-potable uses (e.g., irrigation and some industrial purposes).

retail water purveyors. The Kern County Water Agency delivers water to 13 predominantly agricultural water districts. Other wholesale suppliers are located around California.[28]

Proposition 26 may affect the wholesale ratemaking and wholesale water rates. In contrast to Proposition 218, Proposition 26 applies to *all* levies and charges—not just those that are imposed by local government agencies as an incident of property ownership or for a property-related service—and it defines these charges as taxes unless they fall within a specific statutory exemption. Those exemptions include "a charge imposed for a specific government service … provided directly to the payor that is not provided to those not charged, and which does not exceed the reasonable costs to the State [or local government] of providing the service" (California Constitution article XIIIA, § 3(b)(2); California Constitution article XIIIC, § 1(e)(2)).

Although this language probably does not allow retail customers to challenge wholesale water rates (because wholesale water service, by definition, is not "provided directly to" the retail ratepayer), it may allow retail water agencies who purchase directly from the wholesaler to claim that a fee or charge is unlawful because it exceeds the reasonable costs of providing the wholesale water service. Wholesale agencies have countered that Proposition 26 applies only to levies and charges that are "imposed" by government agencies. In the usual cases where wholesale water rates are negotiated rather than imposed, they argue, Proposition 26 does not apply.

These interpretations of Proposition 26 are being tested in on-going litigation between the San Diego County Water Authority (SDCWA) and MWD. SDCWA alleges that the wholesale water rates that MWD adopted for 2013 and 2014 violate Proposition 26 because the rates exceed the cost of service to SDCWA. San Diego also alleges that MWD failed to demonstrate that the rates bear a "fair and substantial relationship" to the burdens and benefits received by each member agency and unlawfully discriminate against SDCWA.[29] Accordingly, SDCWA claims that MWD's wholesale water service rates are a special tax, which must be approved by a two-thirds vote of the voters in MWD's service area (California Superior Court, *San Diego County Water Authority v. Metropolitan Water District of Southern California*, Petition for Writ of Mandate and Complaint, 2012).[30] The San Francisco County Superior Court conducted a five-day trial on these claims in December 2013. Its decision is expected in February 2014.

The Newhall County Water District (NCWD) also recently filed a Proposition 26 challenge to wholesale water rates. NCWD purchases water from the Castaic Lake Water Agency (CLWA), which sells imported State Water Project water to NCWD and three other retail water agencies in the Santa Clarita Valley. CLWA traditionally used a variable wholesale rate structure that charged each member agency based on the volume of imported water the agency purchased. In February 2013, however, CLWA changed its rate structure to

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[28] The Central Valley Project, which is owned and operated by the U.S. Bureau of Reclamation, delivers water from the Trinity, Sacramento, and San Joaquin River basins for irrigation and municipal and industrial uses in the Central Valley and portions of the Bay Area. The Bureau supplies most of this water on a wholesale basis to irrigation districts, water agencies, and cities. The rates for this water are set by federal law (Reclamation Reform Act (1986), 43 U.S.C. §§ 390aa-390zz1; Central Valley Project Improvement Act §§ 3404(c)(3), 3405(a) (1)(C), 3405(d), 3405(f), 3406(c)(1) & 3407(c)).

[29] The complaint specifically alleges: (1) MWD's "transportation rates" exceed the cost to MWD of conveying water to its customers because the rates include facilities owned and operated by the State Water Project. (2) The "wheeling rate" that MWD charges to SDCWA for water made available by the lining of the All-American Canal unlawfully charges SDCWA for water that SDCWA already owns. (3) MWD unlawfully defines the "water stewardship rate" that it charges member agencies as a transportation charge, even though it funds water conservation and regional water supply development within the MWD service area. (4) The water stewardship rate overcharges SDCWA because other member agencies receive most of the benefits of the program (California Superior Court, *San Diego County Water Authority v. Metropolitan Water District of Southern California*, Petition for Writ of Mandate and Complaint 2012).

[30] Information about the litigation, including links to legal documents, may be found on the SDCWA's "MWD Rate Challenges" web pages: www.sdcwa.org/mwdrate-challenge.

include three components: a fixed charge based on a three-year rolling average of each member agency's total water demand (including imported water and other sources), a variable charge based on each agency's actual purchases, and a volumetric reserve charge. The fixed charge will cover approximately 80 percent of CLWA's operating budget and thus will allow the agency to cover its fixed costs more reliably in the face of declining or variable demand.[31] NCWD contends that the new rate structure violates Proposition 26 because the fixed charge includes NCWD's use of groundwater and therefore exceeds the cost of imported water service provided by Castaic (California Superior Court, *Newhall County Water District v. Castaic Lake Water Agency*, Petition for Writ of Mandate and Complaint, 2013).

Although it is difficult to predict how the courts will decide these claims, the cases illustrate how Proposition 26 may affect wholesale water rates and ratemaking. If the courts determine that Proposition 26 applies to wholesale rates, then it is likely they will insist on clarity, transparency, and rigor in wholesale ratemaking decisions—just as they have in reviewing retail ratemaking under Proposition 218. The courts also would be likely to require wholesale water providers to justify specific charges on the basis of cost of service; and they probably will compel wholesale agencies to explain differences in rates among their member agencies, as well as the use of single or common rates where either water service or the cost of such service may differ among member agencies.

As in the case of Proposition 218, we hope that these courts will be mindful that ratemaking is a complex task involving the allocation of large fixed costs and that wholesale agencies must have discretion to decide how best to fund projects and programs that are part of their integrated water portfolios—and therefore benefit all of their member retail agencies—even though water from any specific source may not be available to all agencies. The risk of fragmentation and balkanization of water rates and water service is as great in the wholesale arena as it is for public retail water service.

The Special Challenges of Funding Stormwater Management

Proposition 218 has created special challenges for the funding of stormwater management programs. The courts have held that local stormwater discharge fees are subject to the law's voter approval and other procedural requirements. Proposition 218's substantive standards also may require many stormwater discharge fees to be enacted as "special taxes" that require a two-thirds vote of the electorate (California Constitution article XIIIC, § 2(d)).

The U.S. Environmental Protection Agency and California's Regional Water Quality Control Boards have recently tightened National Pollution Discharge Elimination System (NPDES) permit standards for stormwater discharges (California Regional Water Quality Control Board 2011). As a result, many cities and water agencies now must find ways to fund the necessary expenditures through rate increases, fees, property assessments, or special taxes. Proposition 218 has restricted most local stormwater agencies' ability to fund stormwater management through fees or assessments. Our interviews with stormwater managers in August and September 2013 (see main report) revealed that it has been challenging for agencies to gain the

[31] This is a challenge that many water service agencies face today (Hanak et al. 2012). As a result, many agencies have rate structures that gain a higher proportion of revenues through a fixed service charge, rather than variable volumetric rates. While this approach provides more fiscal certainty for the utilities, it does less to encourage conservation (an important statewide water management objective). In addition, high fixed service charges have adverse implications for social equity unless they are offset by lifeline rates for low-income households, as service charges are generally more regressive than volumetric fees, given the positive association of income and water use.

political support needed to gain property-owner or general voter approval of new funds to pay for stormwater programs.

In *Howard Jarvis Taxpayers Association v. City of Salinas* (2002), the California Court of Appeal ruled that the city's storm drainage fee was a "property-related" fee that required voter approval under Proposition 218. The city had imposed the fee on all parcels based on their percentage of impervious area—i.e., portions of the land with structures and pavement that prevent or diminish absorption of precipitation and runoff and thereby contribute water to the city's stormwater system. The city proposed to use the proceeds of the fee to finance improvements to storm and surface water management facilities as required by state and federal water quality and discharge standards.

The court rejected the city's argument that the fee was levied on the basis of the fee-payers' use of the stormwater system, rather than land ownership. It then invalidated the fee because the city had not complied with the voter approval requirements of Proposition 218. The court also rejected the city's contention that the stormwater drainage fee was a fee for water or sewer service under section 6(e) of Proposition 218 and thus was exempt from the election requirements. It reasoned that the voters who enacted the initiative probably understood the terms water and sewer service to embrace only water supply and removal of waste from homes and businesses and not as a "program that monitors storm water for pollutants, carries it away, and discharges it into the nearby creeks, river, and ocean."[32]

The *Salinas* decision thus requires agencies that seek to increase fees or to impose new charges to pay for capital improvements to separate stormwater systems—i.e., those that only carry stormwater—submit the proposed fees and charges to the affected property owners or voters for approval.[33] Municipal public works departments and other stormwater management agencies have found it difficult to persuade property owners within their jurisdiction to vote for fees and assessment to support new stormwater expenditures.[34] Stormwater pollution programs are designed to mitigate flooding and pollution caused or exacerbated by land use and other activities. Yet, property owners have few incentives to approve charges for these services, which do not directly benefit them or their property in proportion to their share of the costs of the fee. For these reasons, many independent stormwater agencies have continued to finance these programs through general fund revenues and grants.[35] As the costs of stormwater management increase with new pollution

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[32] The court's surmise of voter intent is reinforced by the reference in the assessments section of Proposition 218 to "sewers, water, flood control, drainage systems" (California Constitution article XIIID, § 5(a)). The drafters' separation of "flood control" and "drainage" from "water" and "sewer" in this section indicates that they did not intend that the exemption of "fees or charges for sewer [and] water" from the election requirements of section 6(c) would implicitly incorporate either of the two primary functions of stormwater management—*viz.*, flood control and drainage.

[33] All but two of California's stormwater systems are separate. San Francisco and Sacramento have combined systems that carry both treated sewage and stormwater. These combined systems probably fall within Proposition 218's election exemption for fees and charges for "water, sewer, or refuse collection services" (California Constitution article XIIID, § 6(c)).

[34] It appears that only 12 cities or counties have attempted property-owner ballot measures for stormwater assessments or fees since the enactment of Proposition 218. Measures passed in seven of these: San Clemente (2002, 2007, 2013), Palo Alto (2005, after a failed attempt in 2003), Rancho Palos Verdes (2005, then recalled and reduced in 2007), Ross Valley (2007, but later overturned by lawsuit), Solana Beach (2007), Burlingame (2009), and Santa Clarita (2009). Communities where elections have failed include: Carmel (2003), Encinitas (2005), Woodland (2007), Stockton (2009), and Contra Costa County (2012). (Author tabulations using information provided by SGI Consulting Group, see Appendix E). In 2012, Los Angeles County supervisors decided not to proceed with an election following protests at the rate hearing (the first part of the two-part Proposition 218 election process). As described in Appendix E, some localities have been successful passing other types of ballot measures. Notably, in 2004, Los Angeles City voters approved Measure O, a $500 million bond to support stormwater programs, funded by an increment on local property tax bills. As described in Box 3, San Mateo County voters approved transportation-related charges in 2005 to support stormwater programs by simple majority vote under special authorization from the legislature. A few communities have passed special taxes focused on stormwater (Ferndale and Corte Madera in 1997, Santa Monica in 2006, and Santa Cruz in 2008), and nine have passed special taxes or GO bonds for stormwater management along with local road improvements. Some communities have also enacted new general taxes that include stormwater among many other functions.

[35] Expenditures on stormwater and urban runoff management are usually embedded in the budgets of municipal public works departments, and it is not possible to separately identify the sources of funding for these activities (see Appendix B). Our discussions with stormwater managers in

prevention mandates, however, the existing funding pool is becoming increasingly inadequate. In addition to seeking funds from property owners (which requires a simple majority vote), alternatives include the enactment of new special taxes (which require the approval of two-thirds of the voters within the agency's jurisdiction) and state or local regulatory fees (which require majority approval by the legislature for state fees, or by local governing boards for local fees) (Table A1). Inasmuch as stormwater is collected and channeled by a variety of sources—including impervious private land, but also streets and highways and other sources of pollutants such as litter—multiple funding sources are appropriate (see Box 3).

Although the *Salinas* court did not address the substantive requirements of Proposition 218, these, too, may present obstacles to those agencies that choose to fund stormwater improvements through fees or assessments. For example, opponents of a stormwater fee such as the one at issue in *Salinas* could argue that the amount of the fee "exceed[s] the proportional cost of the service attributable to the parcel[s]" covered by the charge or that the stormwater services funded by the fee "is available to the public at large in substantially the same manner as it is to [the] property owners" who are subject to the fee (California Constitution article XIIID, § 6(b)(3) & (5)). Similarly, opponents of a stormwater assessment may question whether the properties subject to the assessment in fact "receive a special benefit over and above the benefits conferred on the public at large" and that the amount of the assessment "is proportional to, and no greater than, the benefits conferred on the [assessed] properties" (*id.* § 4(f)).

August and September 2013 revealed that these programs face serious funding challenges and are most commonly funded by a combination of general fund resources, grandfathered (pre Proposition 218) stormwater charges, and grants. See footnote 32 and Appendix E for some examples of successful new revenue measures.

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The San Mateo County motor vehicle license fee and funding for stormwater management

In the early 1990s, the cities and county government in San Mateo County decided to place responsibility for their stormwater programs under the management of the City/County Association of Governments of San Mateo County (CCAG), a joint powers authority with voting representatives of elected officials from the county and each city government which has responsibilities for traffic congestion management and several other functions. In 2004, the California Legislature authorized CCAG, by a vote of its members representing two-thirds of the county's population, to enact an annual $4 per vehicle registration fee surcharge to fund programs to reduce traffic congestion and stormwater pollution management from 2005-2009. Subsequent legislation extended the surcharge an additional four years (California Government Code §§ 65089.11-65089.15). One purpose of the law was to fund stormwater regulation and management so as to enable the San Mateo governments to comply with their regional NPDES permit for stormwater discharges under the federal Clean Water Act. The state law provided, however, that only "stormwater pollution prevention programs that directly address the negative impact on creeks, streams, bays, and the ocean caused by motor vehicles and the infrastructure supporting motor vehicle travel are eligible for funding" (*id.,* § 65089.12(d)).

The San Mateo governments enacted the fee in 2005, which was collected by the California Department of Motor Vehicles (California Motor Vehicle Code § 9250.5). During the eight years it was in effect, the fee raised approximately $20 million, of which half was allocated to stormwater regulation and management throughout the county. The legislature did not extend its authorization of the fee beyond January 1, 2013. It did pass a law in 2010, however, that authorized all congestion management agencies to levy a $10 surcharge on vehicle registrations to support stormwater and congestion management with a simple majority vote of the public (Government Code 65089.20). San Mateo County voters approved this new surcharge in the November 2010 election by a 55 percent majority. The surcharge generates about $6 million annually. Half of the revenues are allocated to local agencies and are used for stormwater or traffic congestion management. Another 12 percent goes to CCAG for countywide stormwater programs, while the remainder is assigned to various local transportation programs (e.g., mass transit and senior mobility). The San Mateo County motor vehicle stormwater fee is an important example of integrated management of stormwater, and it represents an effective way to ensure that road and highway users contribute to the costs of stormwater discharge prevention. The vehicle license fee does not fully resolve the funding problem, however, and CCAG is now evaluating a special tax or property-related fee to help fill the gap.

But these substantive standards of Proposition 218 also suggest that the "fee for services" theory of stormwater financing may be misguided. Instead, a better way to analyze stormwater discharge fees may be to view them as regulatory fees that are designed to compel all who contribute to stormwater collection and channelization to pay their fair share of the costs of addressing the flooding or pollution problems that they create or exacerbate. Regulatory fees are now governed by Proposition 26, and we will address the potential benefits of regulatory fees for stormwater discharges following an analysis of the effects of Propositions 218 and 26 on groundwater management.

Proposition 218 and Groundwater Management

As with stormwater discharges, groundwater management raises special problems under Proposition 218. Two cases—both involving the Pajaro Valley groundwater basin, a coastal aquifer in Santa Cruz Country—illustrate and largely define these challenges.

The legislature created the Pajaro Valley Water Management Agency in 1984 to address persistent problems of overdraft, well-lowering, and seawater intrusion in the coastal reaches of the freshwater aquifer. The agency responded to these problems by enacting a "groundwater augmentation charge" on the extraction of groundwater from the basin. One purpose of the charge was to create a financial disincentive to pump groundwater that, in the aggregate, would exceed the safe yield. A second purpose was to raise funds to support a variety of conjunctive water management programs that help to prevent overdraft and saltwater intrusion. These include creation of a water recycling program that treats wastewater for blending into the native waters of the aquifer, a program to capture stormwater to recharge the aquifer, and construction of a coastal distribution system to distribute this blended water to agricultural users along the coast both for direct water supply and for basin recharge to repel sea water intrusion.

The first groundwater augmentation charge, adopted in 2002, was $80 per acre-foot. The agency increased the charge in 2003 to $120 and again in 2004 to $180 per acre-foot. Because it believed that Proposition 218 did not apply to groundwater extraction fees, the agency adopted each of these charges without submitting the matter to the affected property owners and voters as required by that law.

In *Pajaro Valley Water Management Agency v. Amrhein* (2007), the California Court of Appeal held that the groundwater augmentation charge is a "property-related fee" and therefore is subject to Proposition 218. The court had previously concluded that the groundwater extraction fee was not related to the ownership of property "because it is imposed not on property owners as such, or even well owners as such, but on persons *extracting groundwater* from the basin." This was unquestionably true, as the fee applied both to groundwater extractors whose rights are based on their ownership of land overlying the aquifer and to appropriators whose water rights are based solely on the act of pumping the groundwater. Nevertheless, the court felt constrained by the California Supreme Court's decision in *Bighorn-Desert View Water Agency v. Verjil* (2006) to hold that groundwater pumping is an incident of property ownership and therefore the fee is subject to Proposition 218. The court of appeal also noted that "the charge here is not actually predicated upon the *use* of water but on its *extraction*, an activity in some ways more intimately connected with property ownership than is the mere receipt of delivered water." Because the agency had not complied with the public notice requirements of Proposition 218, the court invalidated the groundwater augmentation charge.

Following the *Amrhein* decision, the agency repealed the 2003 and 2004 charges and entered into a settlement agreement that paid $1.8 million to the plaintiffs who had brought that lawsuit and related litigation. In 2010, it enacted a new groundwater augmentation charge, this time attempting to follow Proposition 218's public notice and election requirements.[36] A group of landowners (many of whom were plaintiffs in the earlier

[36] The Agency held an election in addition to providing public notice, because the earlier case had not ruled on whether it was providing a water service that would have been exempt from Proposition 218's election requirements, only that the service was property-related. The 2010 charge is comprised of three categories: "$195 per acre-foot for metered wells inside the coastal delivered-water zone, $162 per acre-foot for metered wells outside the delivered-water zone (primarily municipal, industrial, and agricultural users), and $156 per acre-foot for unmetered wells (primarily rural residential)" (California Court of Appeal, *Griffith v. Pajaro Valley Water Management Agency* 2013). The agency also adopted a $306 per acre-foot charge for water that it delivered to customers.

litigation) sued, claiming *inter alia* that the weighted voting procedures adopted by the agency were unlawful and that the new charges violated the substantive standards of Proposition 218.

In *Griffith v. Pajaro Water Management Agency* (2013), the California Court of Appeal held that because the groundwater augmentation charges are "fees for water service" they are exempt from the voter approval requirements of Proposition 218 (California Constitution article XIIID, § 6(c)) (although like water and sewer services they are subject to the public hearing and notice requirements of the law). More importantly, the court also rejected the claims that the 2010 groundwater augmentation charge violated Proposition 218's substantive standards. In contrast to the *Capistrano* court's interpretation of these standards, the court of appeal applied the standards in a way that reflects an understanding of the realities of contemporary portfolio-based water resources management.

For example, the court rejected the plaintiffs' argument that, because they did not use the blended water produced by the recycled water program, they could not be charged a groundwater extraction fee that supported this program. The court responded that this argument "overlooks that 'the management of the water resources … for agricultural, municipal, industrial, and other beneficial uses is in the public interest'" and that the agency 'was created to manage the resources "for the common benefit of all water users.' It also overlooks that the augmentation charge pays for 'the activities required to prepare or implement any groundwater management program'" (*Griffith* 2013, quoting Pajaro Valley Water Management Agency Act).

The court also rejected the plaintiffs' contention that the trifurcated augmentation charge (see footnote 35) was not sufficiently tailored to the cost of service to each parcel. It reasoned:

> Given that Proposition 218 prescribes no particular method for apportioning a fee or charge other than the amount shall not exceed the proportional cost of the service attributable to the parcel, defendant's method of grouping similar users together for the same augmentation rate and charging the users according to usage is a reasonable way to apportion the cost of service. That there may be other methods favored by plaintiffs does not render defendant's method unconstitutional. Proposition 218 does not require a more finely calibrated apportion (*id.*).

Finally, the court dismissed the plaintiffs' claim that the groundwater augmentation charge violated Proposition 218 because its proceeds benefit everyone who uses water within the agency's purview, not simply those who extract groundwater. The agency "is not using money from the augmentation charge for general governmental service," the court concluded. "Rather, it is using the money to pay for the water service provided" (*id.*).

Griffith brings a much-needed realism to the judicial application of Proposition 218 to water resources management. The court recognized that water service is a multifaceted and integrated endeavor and that component activities—such as management of native surface and groundwater supplies, acquisition of imported water, recycled water programs, capture of stormwater for recharge, regulation of groundwater pumping and water use, and addressing threats to water resources from overdraft, saltwater intrusion, and pollution—cannot be segregated from one another. As such, it is lawful to charge individual property owners and water users a share of the costs, regardless of whether they use or benefit directly from each of

them, because it is the aggregate and integrated portfolio of water supply and demand reduction programs that makes possible the "water service" that the agency provides to each of its customers.[37]

The *Griffith* court correctly recognized that a groundwater extraction fee system that pays for sustainable conjunctive management, and assigns the costs based on the demands each groundwater user places on the system by pumping from the aquifer, does not exceed the proportional cost of integrated water service to any individual user. Yet, groundwater extraction charges are really a hybrid of two distinct types of fees. As the court did in *Griffith*, they may be fairly characterized as fees for the costs of the *service* of effective groundwater management. But they also are *regulatory* fees designed to protect against overdraft and to ensure long-term equilibrium in the aquifer by increasing the cost of groundwater extraction over and above the capital and electricity costs of the pumping itself. In this respect, the fees are less charges for water service than they are fees designed to deter individual actions that in the aggregate harm all users of water from the managed groundwater basin. It is therefore worth considering groundwater extraction fees, along with stormwater discharge fees, under the related—but conceptually different rubric—of Proposition 26.

Proposition 26 and Regulatory Fees

Although Proposition 26 may cover some types of water service charges (including wholesale water rates), a central purpose of the law was to place limits on the state and local governments' use of fees that are "couched as 'regulatory' but which exceed the reasonable costs of actual regulation or are simply imposed to raise revenue for a new program and are not part of any licensing or permitting program" (Proposition 26, § 1(e)). The law declares that these types of fees "are actually taxes and should be subject to the limitations applicable to the imposition of taxes" (*id.*).

Proposition 26 contains two substantive standards relevant to stormwater discharge and groundwater extraction fees. It states that the charge is not a tax if it is "imposed for the reasonable regulatory costs to a local government for issuing licenses and permits, performing investigations, inspections, and audits, enforcing agricultural marketing orders, and the administrative enforcement and adjudication thereof" (California Constitution article XIIIC, § 1(e)(3)). It also assigns to the state or local government "the burden of proving by a preponderance of the evidence that a levy, charge, or other exaction is not a tax, that the

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[37] Groundwater management agencies must explain and justify differences in the amount they charge to different classes of customers. In April 2013, for example, the Santa Barbara County Superior Court issued a tentative decision concluding that the United Water Conservation District (UWCD) failed to justify the differences between its groundwater extraction charge for agricultural use and the charge for municipal and industrial use. UWCD manages the surface water and groundwater resources of the Santa Clara watershed pursuant to a grant of authority from the legislature. For 2012-13, the district enacted an agricultural extraction charge of $39.75 per acre-foot and $119.25 per acre-foot for municipal and industrial (M&I) uses in Zone A, and charges of $18 and $54 respectively in Zone B. The City of San Buenaventura sued, claiming *inter alia* that these disparities violate Proposition 218 because the rate ratios are "not in proportion to the relative cost of agricultural water and M&I water" (California Superior Court, *San Buenaventura v. United Water Conservation District* 2013). The district defended the charges on the ground that, measured on a cost per parcel basis, agricultural users paid an average of $1,457.78 per parcel, while M&I users averaged $29.06 per parcel. UWCD also argued that the approximate 3:1 ratio between agricultural and M&I charges per acre-foot is authorized by Section 75594 of the Water Code, which provides that groundwater extraction charges "shall be established at a fixed and uniform rate for each acre-foot for water other than agricultural water which is not less than three times nor more than five times the fixed and uniform rate established for agricultural water (California Water Code § 75594).

The superior court concluded that "UWCD's differential rate between agricultural water and nonagricultural water was set because of the requirement of Water Code section 75594 and not because of a determination that the costs relating to agricultural water as compared with nonagricultural water support that differential" (*San Buenaventura v. UWCD*, 2013). Indeed, "the record is remarkable in its lack of factual discussion of the basis for the differential rate. Consequently the court must conclude that notwithstanding the statutory requirement of Water Code section 75594, UWCD has failed in its burden of proving compliance with [Proposition 218]" (*id.*). The superior court was careful to note that its decision did not mean that "differential rates between agricultural water and nonagricultural water can never be supported or that rates complying with Water Code section 75594 cannot comply with Proposition 218. The conclusion is only that UWCD … has not made the factual showing necessary to support its differential rates" (*id.*). The case is awaiting trial on the appropriate remedies.

amount is no more than necessary to cover the reasonable costs of the governmental activity, and *that the manner in which those costs are allocated to a payor bear a fair or reasonable relationship to the payor's burdens on, or benefits received from, the governmental activity*" (*id.*, § 1(e) (emphasis added)).

As analyzed in detail above, the last clause indicates that the proponents of Proposition 26 recognized the longstanding practice of government agencies charging regulatory fees that help to internalize the negative externalities imposed on public resources by a variety of uses of land and water, and that they did not intend to require agencies to enact such fees as special taxes. In other words, consistent with Proposition 26, stormwater management agencies may charge landowners and other members of the public stormwater discharge fees based on their respective contributions to stormwater collection and surface runoff; and groundwater replenishment agencies may impose extraction fees for the purpose of protecting against well-lowering, sea water intrusion, water quality degradation, and other pernicious effects of overdraft. To the extent that the fee charged to the property owner or resource user represents the costs of preventing or mitigating these adverse effects, the fee bears a "fair and reasonable" relationship to the burdens that the property owner or resource user imposes on the government activity of protecting and managing surface and ground water resources in the public interest.

This understanding of stormwater discharge and groundwater extraction fees does not necessarily mean that these charges are exempt from the procedural and substantive standards of Proposition 218, however. Indeed, the courts have held that they *are* covered by that law. But it does suggest that the characterization of these types of charges as fees for service is too circumscribed and may mislead agencies and reviewing courts into focusing exclusively on the question of how precisely the portion of the fee charged to any particular property or user relates to the cost of service to that parcel or user.

A broader, and more accurate, analysis should look both to the proportionality of the costs of the governmental service and to the question of how the fee works to internalize the external costs created by each property or user. Under such an analysis, a stormwater discharge fee would be fairly apportioned among property owners and land users based on their respective contributions to the loss of permeable land, because the construction and paving that reduces overall permeability concomitantly increases the amount of stormwater runoff that must be collected, treated, and discharged. Similarly, a groundwater extraction fee may be fairly allocated on the basis of each groundwater user's annual pumping, because each extractor contributes to the risk or reality of overdraft in proportion to that use. An integrated understanding of Propositions 218 and 26 is therefore essential, not just to harmonize the two laws, but also to ensure that both are implemented in a manner that comports with the realities of contemporary water resources management and regulation.

The Relationship between Proposition 218 and Proposition 26

The idea of addressing stormwater discharge fees, groundwater extraction charges, and other charges that protect the quality and sustainable use of California's water resources as regulatory fees under Proposition 26, rather than as fees for water service under Proposition 218, raises the question of whether this functional division between the two laws is constitutional. In other words, what is the relationship between the two propositions? Can fees for water resources regulation be governed exclusively by Proposition 26, or must these charges comply with the procedural and substantive requirements of both laws?

In the *Salinas* and *Amrhein* cases, the court of appeal concluded that stormwater fees and groundwater extraction charges are "property-related fees" and therefore are subject to the voter approval and other

procedural requirements of Proposition 218. These holdings necessarily imply that stormwater discharge fees and groundwater extraction charges are also governed by the substantive standards of Proposition 218. Following this precedent, the *Griffith* court evaluated the Pajaro Valley groundwater augmentation charge under these substantive standards. It concluded that, because the revenues produced by the charge funded water management programs that benefitted all landowners and groundwater users, the charge complied with the law's cost of service-based standards. Yet, the court did not address the fact that the groundwater augmentation charge is also a regulatory fee designed to create disincentives to pump groundwater that (in the aggregate) causes overdraft. Nor did it have occasion to consider the question of whether the proper legal framework for evaluating these types of regulatory fees should be Proposition 26, rather than Proposition 218.

As described above, the substantive standards of Proposition 218 make little sense in the case of stormwater discharge fees and apply only awkwardly to groundwater management charges, because these charges are not really fees for a service provided *to* property. Rather, they are fees imposed to influence or to regulate how property is used in order to protect the public against harm caused *by* that use.

The principal purposes of stormwater management—protection against flooding and reducing water pollution—do not represent the "cost of the service attributable to the parcel[s]" covered by the charge (California Constitution article XIIID, § 6(b)(3)). Nor do the parcels subject to stormwater discharge fees always "receive a special benefit over and above the benefits conferred on the public at large" (*id.* § 6(b)(5)). Rather, the fees are designed to force those who contribute to the production and channelization of stormwater runoff to bear their fair share of the societal costs of their actions. Thus, a comprehensive and inclusive stormwater program would embrace all of the major sources of polluted runoff, including land uses that reduce permeability and infiltration capacity *and* motor vehicles that use roads and highways from which surface runoff is diverted, channelized, and discharged (see Box 3). It also could include other sources, such as producers or consumers of goods that become street trash that ends up in storm drains (e.g., the fast-food, beverage, and cigarette industries), as well as important sources of herbicides, pesticides, fertilizers, and other harmful chemicals.

Groundwater extraction fees have some characteristics of property-related service fees and some features that are regulatory in nature. On the one hand, they are designed to deter excessive pumping that in the aggregate lowers the groundwater table. This may be described as a service provided *to* the property that is subject to the fee, because it protects each groundwater user's individual pumping right. Groundwater extraction fees also are frequently used to purchase imported water to augment native groundwater supplies and thus benefit all groundwater users. But groundwater extraction fees are primarily regulatory, because their main purpose is to require each user to pay for the negative externalities caused by his or her groundwater withdrawals, including the costs to other users from well-lowering, seawater intrusion, concentration of pollutants, and in some cases land subsidence.

As with stormwater discharge fees, the groundwater extraction charges that are designed to capture or "internalize" these external costs do not necessarily correspond to the cost of the services that the groundwater management district provides *to* parcels covered by the charge. Moreover, it is likely that some groundwater users will benefit more from the programs funded by the extraction charge than others. In a coastal aquifer, for example, those who pump groundwater nearer to the ocean will receive greater benefits from groundwater

management programs that use extraction fees to address the threat of seawater intrusion than will inland groundwater users.[38]

If stormwater discharge fees and groundwater extraction charges are best characterized as regulatory fees, rather than as charges for property-related services, the question then becomes: Can the courts choose to analyze these types of charges exclusively under Proposition 26? We believe that there is a plausible—though far from conclusive—argument to support this bifurcated approach to the two laws.

Unlike Proposition 218, which covers property-related services generally, Proposition 26 was enacted specifically to address regulatory fees—including those that apply to the use of land and water resources. Although there is overlap between the two laws, in cases of conflict the more specific, later-enacted law should take precedence. And there are significant conflicts between the two propositions.

Proposition 218's cost of service-based limitations are incongruous with regulatory fees, as they require courts to make tenuous links between the charges designed to influence or deter land and water use decisions with the costs and benefits of attendant services provided to the land or water user. In contrast, Proposition 26 applies directly to regulatory fees, asking whether the fee was "imposed for the reasonable regulatory costs to a local government for issuing licenses and permits" (California Constitution article XIIIC, § 1(e)(3)).

Moreover, Proposition 26 focuses on the central purpose of regulatory fees—internalization of the external costs of land and water uses on other users and the environment—by requiring that the charges that are assigned to each user "bear a fair or reasonable relationship to the payor's *burdens on, or benefits received from,* the governmental activity" (*id.* § 1(e) (emphasis added). In contrast, Proposition 218 requires a nexus between the charges and the costs of service to each parcel that is subject to the fee. A regulatory fee thus could comply with Proposition 26 because it fairly and reasonably charges each landowner or water user for the burdens (i.e., the external costs) that he or she creates, but be unlawful under Proposition 218 because the fee exceeds either the cost of government services *to* the landowner or water user or the benefits received *by* the landowner from the regulatory program.

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[38] The *Griffith* court briefly addressed this question, rejecting the claim that the Pajaro Valley Water Management Agency could not charge inland groundwater users a groundwater augmentation charge that paid for water used to supply coastal users with supplemental surface water as a means of preventing saltwater intrusion into the aquifer. The court stated that this claim failed "to acknowledge that the augmentation charge pays for the activities required to prepare or implement the groundwater management program for the common benefit of all water users" (California Court of Appeal, *Griffith v. Pajaro Valley Water Management Agency* 2013).

This claim also is the subject of litigation filed by a number of cities, water agencies, and individual groundwater users against the Water Replenishment District (WRD) of Southern California. As noted above, WRD manages the central and west groundwater basins in Los Angeles County, and currently charges all groundwater extractors within its jurisdiction a replenishment fee of $268 per acre-foot. The district uses the revenues to purchase imported surface water, recycled water, and stormwater to recharge the aquifers, to monitor and protect water quality, and to operate a series of injection wells along the coast to create a barrier against saltwater intrusion into the freshwater aquifer (California Court of Appeal, *Water Replenishment District of Southern California v. City of Cerritos* 2013). Groundwater users in the central basin, which is up-gradient from the west basin, have sued the district claiming *inter alia* that the replenishment fee violates Proposition 218 because it exceeds the cost of service attributable to their parcels. They allege specifically that they should not be subject to the same fee as the coast-side extractors, because they are not responsible for the saltwater intrusion and they do not benefit from the injection wells. The district has countered that pumping from the central basin diminishes the water that otherwise would move down-gradient into the west basin and that all extractors are responsible for contributing to the costs of preventing overdraft and its attendant costs (*id.*). To date, the Los Angeles County Superior Court has concluded that WRD violated Proposition 218 by enacting the groundwater extraction charge without complying with the voter approval and other procedural requirements. The court's decision on damages is forthcoming. It also has ruled that the cities of Cerritos, Downey, and Signal Hill, which are three of the plaintiffs, must pay the extraction charge pending final decision in the case. The court of appeal recently affirmed this order (*id.*). In a separate ruling, the superior court also directed the City of Pico Rivera to continue to pay the charge pending final decision (Sprague 2013b). Another plaintiff, the Central Basin Municipal Water District, voluntarily dismissed its claims against WRD in October 2013 (Sprague 2013a).

Finally, the text of Proposition 26 shows that its drafters (and perhaps the voters who enacted it) were aware that its new standards may overlap with those of Proposition 218, and it indicates that they intended that the two laws should be applied separately to avoid conflict. Proposition 26 excludes from the definition of "taxes" both assessments and other "property-related fees imposed in accordance with the provisions of Article XIIID"—i.e., Proposition 218 (California Constitution article XIIIC, § 1(e)(7)). This means that, if a property-related fee is adopted in accordance with Proposition 218 (including its substantive standards) then it is exempt from analysis under Proposition 26. It also suggests, however, that a "property-related fee" that fails under Proposition 218 could nonetheless be a valid fee (rather than a tax) under the different substantive criteria of Proposition 26. While this clause of Proposition 26 is far from conclusive, the express exemption of valid Proposition 218 fees from Proposition 26 does support the conclusion that the drafters and voters did not intend that *both* laws would apply simultaneously to the same fees and charges.

Proposition 26 did not expressly modify or repeal any aspect of Proposition 218. Yet, it is doubtful that its proponents (and the voters who approved the initiative) would have intended that the older law would frustrate the newer law's clear directives. Indeed, as just noted, the text of Proposition 26 reveals that they did intend to avoid conflict between the two laws. When confronted with two potentially applicable laws that are in conflict, the courts should choose the more specific over the general, the later enacted over the former, and the law that most accurately addresses the subject matter of the litigation. All three factors would favor a preference for Proposition 26 in cases involving regulatory fees.

Under this interpretation, the enactment of a stormwater discharge fee or groundwater extraction charge might be subject to Proposition 218's voter approval requirements (as the courts held in *Salinas* and *Amrhein*), but governed by the *substantive* standards of Proposition 26. Although this may appear to be an odd bifurcation, it would be better than an interpretation of the two laws that would allow one, Proposition 218, to override the more specific and germane provisions of the other, Proposition 26, whenever a "property-related" charge is also a regulatory fee.

We believe that this reading of the two initiatives is the one that best harmonizes their purposes and directives. Equally important, it is the interpretation that is most consonant with modern land and water management where the control of externalities is an essential means of ensuring that individual users do not undermine the protection of shared resources or unfairly shift the costs of their actions onto their neighbors or the public at large. Whether the courts will agree, however, is a separate question. For this reason, we include legislative clarification of the relationship between Proposition 218 and 26 and, if necessary, amendment of the laws themselves among our recommended policy responses.

Proposition 26 and Water Stewardship Fees

Proposition 26 also raises interesting questions about the funding of ecosystem protection and integrated regional water management: Under what circumstances can these programs be funded by fees and charges on water use, rather than special taxes? This is an important question, because some local and regional agencies now include environmental protection and watershed stewardship within their water supply responsibilities, and some regional agencies now collect fees to support conservation as part of their water service portfolios. Two examples are illustrative.

The Sonoma County Water Agency (SCWA) is a wholesale agency that supplies water from the Eel and Russian River watersheds to nine cities, as well as providing sanitation and flood protection services. It enacted a "Watershed Planning and Restoration Sub-Charge" in 2008. The charge helps fund habitat

restoration, dam improvements, and other water management programs that are needed to comply with the reasonable and prudent alternatives set forth in the Russian River biological opinion that protects coho salmon (National Marine Fisheries Service 2008). These investments improve water supply reliability for the SCWA and its member agencies because they reduce the risk that federal and state fisheries agencies may limit the impoundment and diversion of water to protect the salmon.

These programs include improvement of the Russian River estuary to facilitate fish passage to and from the ocean, regulation of stream flows, installation of fish ladders, and riparian habitat improvements on several tributaries (Sonoma County Water Agency 2013). The SCWA conducts this watershed protection and management in cooperation with the U.S. Army Corps of Engineers, which operates two of the dams in the watershed, and the Mendocino County Russian River Flood Control and Water Conservation Improvement District (*id.*). The Watershed Planning and Restoration Sub-Charge was $81.06 per acre-foot in 2012-13.

The Metropolitan Water District of Southern California includes in its wholesale rates a "Water Stewardship Rate." According to MWD, the purpose of the rate is to "recover the cost of Metropolitan's financial commitment to conservation, water recycling, groundwater clean-up and other local resource management programs" (Metropolitan Water District of Southern California 2012). MWD adopted the water stewardship rate in 2003. It has increased the rate several times from its original $23 per acre-foot to its current $41 per acre-foot. The water stewardship rate is but one of fifteen component rates for MWD's wholesale water service (*id.*).[39]

We believe that both types of water stewardship charges are consistent with Proposition 26's substantive standards and may be enacted as a fee, rather than as a tax. As described above, modern water service agencies manage their resources as a portfolio that includes imported water, local surface and groundwater, recycled water, recovered stormwater, acquisition of transferred water, and programs to encourage conservation and efficient use. The costs of any project that increases the quantity or reliability of the agency's water supplies or decreases demand on the system may be property charged to all customers. Water stewardship charges benefit all property and customers to which the water service is ultimately provided.

There are, of course, limits on the types and amount of water stewardship fees that an agency may charge. The fee must apply prospectively to mitigate the harm that the agency's water supply functions (and its customers' water use) may impose on other land and water users or the environment. As previously discussed, Proposition 26 requires that charges levied to remedy past environmental damages be enacted as a tax. The aggregate funds collected from the fee may not exceed the "reasonable costs" of administering the water stewardship programs funded by the fee (California Constitution article XIIIC, § 1(e)). The agency must explain how the fee benefits its customers by enhancing its system-wide water service and water management objectives.[40] And the agency may not use funds collected from the fee for other projects (*id.*).

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[39] The Sonoma County Water Agency has similar surcharges on its wholesale water sales to fund conservation ($32.85/af in 2012-13) and recycled water and local supply programs ($15.99/af).

[40] As described in footnote 27, the San Diego County Water Authority has challenged MWD's inclusion of the water stewardship rate as part of transportation charges. SDCWA claims that this rate structure violates Proposition 26 because the programs that MWD funds with the revenues from the water stewardship rate—conservation, recycling, groundwater management, and improvement of local sources of supply—are water supply functions, rather than water transportation costs. Inclusion of the water stewardship rate in the transportation rates, SDCWA argues, improperly charges it and its retail customers disproportionally because the transportation charges to San Diego are the highest in the MWD system. San Diego also alleges that the water stewardship rate overcharges SDCWA because other member agencies receive most of the benefits of the program (California Superior Court, *San Diego County Water Authority v. Metropolitan Water District*, Petition for Writ of Mandate and Complaint 2012). As described in the text, Proposition 26 requires MWD to show that it uses the funds raised by the water stewardship rate to improve water service for the benefit of all of its customers and that it fairly apportions the fee among its member agencies. Calculation of the water stewardship rate based on relative transportation costs raises a legitimate question under this standard. In evaluating this claim, however,

A water stewardship fee could not be used to fund recreational uses within the watershed, for example. But if an agency stays within these legal bounds, it may adopt a water stewardship fee as part of its overall water service portfolio.

The Sonoma County Watershed Planning and Restoration sub-charge may also be justified on two other grounds. It is a regulatory fee designed to charge water users within the Russian River watershed for the harm that the impoundment and diversion of water (for their benefit) inflict on coho salmon—including flow alteration and reduction, degradation of habitat, and loss of spawning grounds and other habitat. As such, the costs assigned to water consumers within the SCWA's service area "bear a fair or reasonable relationship to [each customer's] burdens on, or benefits received from, the governmental activity" (*id.*)—i.e., the federal, state, and local efforts to protect the coho salmon. In addition, the charge may be fairly described as a regulatory mandate because it was adopted to comply with the reasonable and prudent alternatives of the Russian River biological opinion. Just as Proposition 26 allows an agency to charge its customers for the required costs of acquiring and treating water in accordance with the governing water rights and water quality laws, so too may the agency include in its water rates a charge for the costs of complying with the Endangered Species Act.

The Relationship Between Article X, Section 2, of the California Constitution and Propositions 218 and 26

Article X, Section 2, of the California Constitution, enacted by initiative in 1928, is the foundation of California water rights and water administration (Hanak et al. 2011). It provides, in relevant part, that:

> because of the conditions prevailing in this State the 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 waste or unreasonable use or unreasonable method of use of water be prevented, 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. The right to water or to the use or flow of water in or from any natural stream or water course in this State is and shall be limited to such water as shall be reasonably required for the beneficial use to be served, and such right does not and shall not extend to the waste or unreasonable use or unreasonable method of use or unreasonable method of diversion of water.

The California Supreme Court has held that "reasonable use of water depends on the circumstances of each case, [and] such an inquiry cannot be resolved *in vacuo* isolated from statewide considerations of transcendent importance. Paramount among these we see the ever increasing need for the conservation of **water** in this state, an inescapable reality of life quite apart from its express recognition in the 1928 amendment'" (California Supreme Court, *Barstow v. Mojave Water Agency*, 2000). These directives apply to all water rights—surface and groundwater—and to all agencies that regulate and manage the state's water resources.

Article X, Section 2, expressly grants the legislature the power to pass laws in furtherance of its policies. Pursuant to this authority, the legislature has enacted statutes to encourage conservation and efficient use, to create incentives to use recycled water, to meter and report on water use, to promote water transfers, and to monitor and report on groundwater levels (*See* Water Code §§ 460-465; 500-535; 1700-1745.11; 10920-10936).

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the court should recognize that there is seldom a precise fit between water charges and benefits received by individual customers and component agencies.

It has authorized counties and local agencies to conjunctively manage surface and groundwater supplies, and it has required urban and agricultural water agencies to adopt best management practices to promote conservation and efficient use (*id.* §§ 10608-10608.64; 10610-10656; 10750-10783.2; 10800-10853). In addition, the legislature has granted public water agencies authority to use "allocation-based conservation water pricing" (i*d*. § 370-374), which it identified as "one effective means by which waste or unreasonable use of water can be prevented and water can be saved in the interest of the people and for the public welfare, within the contemplation of Section 2 of Article X of the California Constitution" (*id.* § 370(a); *see* Box 2).

All of these programs require funding—usually from water rates or fees charged to their beneficiaries. For example, recycling facilities may be a component of a retail agency's rate base because the reclaimed water contributes to the agency's overall water supplies. Many agencies acquire water from willing sellers (both on long- and short-term bases), and the cost of this transferred water is included in the agency's water rates. The costs of water use monitoring, conservation incentives, and conjunctive use programs also are commonly charged to the agencies' customers as part of the costs of the agency's water supply and management portfolio. Until the enactment of Propositions 218 and 26 (and the judicial decisions applying these laws to water service and water management), the general assignment of the costs of these programs to water consumers raised no significant constitutional questions. Indeed, as noted above, these programs were founded on the constitutional mandate of reasonable use.

Following the enactment of Propositions 218 and 26, however, both the relationship between the conservation and reasonable use directives of Article X, Section 2, and the authority of the state and local agencies to use fees to support efficient water use and management have become important open questions. In *Palmdale,* the court of appeal briefly considered one facet of this relationship, concluding that the tiered rate structure adopted by the district—though enacted pursuant to the allocation-based conservation water pricing authority of Water Code §§ 370-374—nonetheless must comply with the procedural and substantive standards of Proposition 218. The court held that "California Constitution, article X, section 2 is not at odds with article XIIID [i.e., Proposition 218] so long as, for example, conservation is attained in a manner that 'shall not exceed the proportional cost of the service attributable to the parcel'" (California Court of Appeal, *Palmdale v. Palmdale Water District* 2011).

The *Palmdale* decision is not necessarily incorrect. The court did not hold that allocation-based conservation pricing is now unconstitutional. Rather, it struck down the tiered rate structure because the district failed to explain why the higher-tiered rates applied to irrigation users at volumetric consumption levels that were lower than those for residential and commercial users. For the reasons described above, the absence of a cogent explanation for differential rates is a legitimate basis for invalidation under Proposition 218.

We are concerned, however, with the *Palmdale* court's suggestion that the conservation and reasonable use mandates of Article X, Section 2 must conform to the general requirements of Proposition 218. Simply put, if the courts strictly apply the "cost of service" standards of Proposition 218, they risk undermining both the essential directives of Article X, Section 2 and many of the salutary features of contemporary California water policy.

Judicial insistence that public water agencies establish a tight fit between the aggregate costs and benefits of their water supply portfolios and how they allocate those costs and benefits to individual water users and property owners would place an impossible burden on the agencies. In particular, the molecular-level accounting standard articulated by the superior court in the *Capistrano* litigation—by which the city must prove that the water produced by its recycling program be physically available to all of its customers—is

both unduly burdensome as a matter of administrative law and unrealistic in the context of modern water resources management. So, too, would be a standard of judicial review that required water agencies to prove precisely how responsive different categories of demand are likely to be to pricing differentials embodied in a tiered-rate structure.

An exacting standard of judicial review of these types of decisions under Proposition 218 would also pose a risk of unintended consequences. For example, the *Capistrano* court's invalidation of the recycled water charge to those customers and landowners who do not physically receive the recycled water may threaten the city's ability to fund its recycled water program. This, in turn, may reduce the quantity and reliability of the city's water supplies for all of its customers; or it may increase the price of water to all customers if the city either needs to acquire additional imported water to make up for the deficiency or must extend its water delivery system to allow it to send recycled water molecules throughout its service area.

In other words, heightened judicial review under the auspices of Proposition 218 may insert the courts into areas beyond their technical competency. Moreover, to the extent that judicial applications of Proposition 218 make it impossible (or unnecessarily expensive) to fund water management programs that agencies have adopted pursuant to the statutes described above, the courts risk interfering with the legislature's prerogative to enact laws in furtherance of the water conservation and reasonable use mandates of Article X, Section 2.

Similarly, continuing judicial applications of Proposition 218's cost-based allocation requirements to fees and charges that effectuate stormwater management and groundwater administration threaten to turn these regulatory fees into special taxes that require a two-thirds vote of the electorate. As discussed above, this would not only conflict with Proposition 26's more relevant and realistic standards, but would also jeopardize regulatory and resource management programs that are now vital components of water conservation and reasonable use as required by Article X, Section 2.

Thus, rather than asking whether Article X, Section 2 can be implemented in a manner that fits into the strictures of Proposition 218, the courts should seek to ensure that their interpretation of Proposition 218 does not undermine the essential purposes of Article X, Section 2 (see Box 4). An informed and nuanced understanding of modern water resources administration—and of the complexities of the charges, rates, and regulatory fees that both fund and effectuate these myriad programs—will help the courts come to a working accommodation of these important constitutional laws.

4

Constitutional Tensions

One important case has addressed the tensions between the constitutional mandate of reasonable use and the constitutional limits on taxes and fees. Although this decision predates Propositions 218 and 26, it nonetheless illustrates how the courts should evaluate the relationship between Article X, Section 2 and the newer constitutional requirements.

In response to water shortages caused by the 1986-92 drought, the East Bay Municipal Utility District adopted a tiered-rate pricing structure for residential water service. The base rate was $0.91 per unit and increased in three blocks based on each household's consumption to a top rate of $3.94 per unit. Customers in the inland portions of EBMUD's service area (which use relatively large amounts of water) sued, alleging that the tiered rate structure was a special tax that required approval of a two-thirds majority of the electorate under Proposition 13. The California Court of Appeal rejected this claim. It held that the

> inclining block rate structure bears none of the indicia of taxation which [Proposition 13] purported to address. The rate structure was not designed to replace property tax monies lost in consequence of the enactment of [Proposition 13]. The rates were levied against water consumers in accordance with patterns of usage, and at no cost to taxpayers generally. The incremental rate was not compulsory to the extent that any consumer had the option of reducing his or her consumption.

The court also addressed the interplay between Article X, Section 2 and Proposition 13:

> [I]n the present context the constitutional mandate of water conservation … is at least as compelling as the objectives of [Proposition 13]. Indeed, even if [Proposition 13] is applicable to the instant rate structure … shifting the costs of environmental degradation from the general public to those most responsible is consistent with the objectives of Proposition 13. The inclining block rate structure is a reasonable reflection of the fact that it is in part the profligate usage of water which compels the initiation of regulated conservation measures including those public education programs designed to encourage conservation. (California Court of Appeal, *Brydon v. East Bay Municipal Utility District* 1994).

In 1993, while the litigation was pending, the legislature amended the Water Code to allow public water agencies to "adopt and enforce a water conservation program to reduce the quantity of water used by [its customers] for the purpose of conserving the water supplies of the public entity" (California Water Code § 375(a)). It followed-up in 2008 by adding sections 370-374 and expressly authorizing "allocation-based conservation water pricing" described in Box 2.

For the reasons discussed in the text, the courts should interpret Propositions 218 and 26 in such a way as to effectuate the important reasonable use and conservation mandates of Article X, Section 2 and these more specific implementing statutes.

Recommended Policy Responses and Legal Reforms

Propositions 218 and 26 were enacted for the laudable purpose of limiting the ability of local agencies (and for Proposition 26, also the state) to use fees and other charges to raise revenues to pay for general government programs, rather than to support the specific services for which the fee is charged. These laws also require greater transparency and accountability whenever governments increase rates and fees for such services. But the two constitutional amendments have also produced some unfortunate—and likely unintended—consequences for the management of water services that are vital for California's economy, environment, and society. To enable the state's water suppliers and administrators to continue to provide clean, reliable, and environmentally responsible water services, the state's voters should consider amending Propositions 218 and 26 to address these unanticipated (and undesirable) fiscal constraints. In this final section, we outline these proposed constitutional amendments. We begin, however, by describing other actions that water agencies, courts, and the legislature can take to help ensure that the strictures of Propositions 218 and 26 do not deter or prohibit sound water resources administration.

Agency Actions

As discussed above, public retail water agencies can and should improve the administrative records they develop to support proposed new fees and charges and changes to their rate structures. This will require greater clarity in the ratemaking process, including a simplified and accessible narrative explanation to inform the public and guide the courts on judicial review. Water agencies also must link fee and rate changes to the new projects and water management programs that they are designed to fund. In addition, they must provide cost-based justifications of rates and fees and explain why the allocation of these charges among customers complies with Proposition 218's substantive standard. Proposition 26 is likely to require wholesale agencies to make similar changes to their ratemaking processes.

Water agencies should take advantage of the significant authority afforded by Article X, Section 2 of the California Constitution, sections 370-374 of the Water Code, and other laws to use fees, water rates, and rate structures to create incentives for water conservation and efficient use. As the legislature recognized when it enacted section 372, allocation-based tiered water pricing is an "effective means by which waste or unreasonable use of water can be prevented and water can be saved in the interest of the people and for the public welfare" (California Water Code § 370(a)).

Water agencies must take seriously, however, the judicial warnings that they may not simply assert that tiered rates and water surcharges will deter waste and profligate use. Although ratemaking is not a precise science, and agencies should be afforded significant leeway in setting rates and fees that they believe will create incentives for conservation and efficient use, agencies must nonetheless explain how their water pricing decisions are likely to achieve the constitutional and statutory goals of promoting efficient water management and use.

Stormwater and groundwater management agencies also can enhance their ability to use fees and charges to pay for the costs of stormwater discharge, treatment, infiltration, and conjunctive use programs if they are able to integrate the programs funded by these fees into their (or another agency's) water supply system. Where stormwater is managed and recaptured as part of an agency's water supply portfolio—e.g., replenishment of

groundwater and reuse of treated stormwater discharges—the portion of the cost of the stormwater program attributable to that water supply function may be defined as a cost of water service. The same is true for groundwater extraction fees that protect against overdraft and help pay for the cost of imported water that is used to recharge the aquifer for the benefit of all groundwater users. It is appropriate to charge each user a fee based on actual pumping, because that apportionment reflects both the costs that each user places on the aquifer and the individual benefits of groundwater replenishment.

Propositions 218 and 26 thus create incentives for combined stormwater/water supply agencies to account for their stormwater reuse just as they do for their imported water, local surface and groundwater supplies, and other water supply functions that constitute their rate bases. These laws also may create incentives for independent stormwater or groundwater management agencies to enter into a joint powers agreement (or perhaps to merge) with a water supply agency so that they can gain the same benefits of integrated, portfolio-based water management and financing.

The Role of the Courts

The courts can help to ensure that Propositions 218 and 26 do not impede prudent and creative administration of California's water resources systems by developing a more realistic understanding of integrated water portfolio management. Water service cannot be segmented by source of supply as in *Capistrano,* where the court focused on where the water molecules produced by the city's recycled water program flowed in relation to imported water and local groundwater supplies. Rather, as practiced by modern water utilities, water service is an integrated and unified product.

Thus, the guiding principles for judicial review of system-wide fees or rates that fund specific water development, management, or conservation programs should be:

> If the program augments the agency's water supply portfolio, reduces demand from freshwater sources, enhances water supply reliability, improves overall water quality, or enables the agency to comply with environmental and other regulatory requirements, then the costs of the program may be imposed on all of the agency's customers, not just on those customers who have direct access to the water produced or conserved by the program. The agency shall apportion the costs of the program based on the proportional cost of aggregate water service attributable to each customer.

This is essentially the standard of judicial review that the court of appeal applied in *Griffith.* A similar standard would apply to judicial review of fees and charges for other types of water management actions that benefit all customers, such as conjunctive ground and surface water management, integration of stormwater and water supply operations, and demand reduction programs, including financial incentives for improvements in irrigation efficiency, low-water landscaping, plumbing improvements, and surcharges on excessive use (e.g., higher tiers in tiered-rate systems). Consistent with Article X, Section 2, the courts should also give significant deference to water agency decisions designed to improve overall water management, encourage conservation and efficient use, and comply with environmental standards and other regulatory requirements.

Propositions 218 and 26 assign to the government the burden of proving that fees, charges, and rate structures are consistent with the law's substantive standards. The *Palmdale* court held that the purpose of this provision of Proposition 218 was to grant the courts authority to apply a "more rigorous standard of

review" than that used in other administrative law cases, and that courts must exercise "independent judgment" in determining whether fees, charges, and rate structures comply with Proposition 218.[41] This does not mean, however, that the court must micromanage water ratemaking decisions.

Questions about the need for a particular water management program and accompanying fee, charge, or water rate needed to fund it should remain the primary responsibility of the agencies. The proper role for the courts is to ensure that the agency's decision to impose a groundwater augmentation fee or recycled water charge, for example, is supported by substantial evidence in the administrative record. The courts then should exercise their "independent judgment" to determine whether such programs actually serve their stated purposes and benefit all customers—including those that do not themselves use the blended water in question—by enhancing water supply reliability or lowering system-wide water rates. But the courts should not require agencies to demonstrate a precise fit between ends and means—e.g., by requiring the agency to prove that each customer will incur the exact same benefits and costs from such programs. Any such higher level of judicial scrutiny would insert the courts into questions of water management that go well beyond their relative expertise and would place a burden of proof on the agencies that they could not meet in most cases, as there are always differences in the costs and benefits of water services that vary among even similarly situated parcels and customers.

The courts should also carefully consider the relationship between Propositions 218 and 26, especially as applied to stormwater discharge fees, groundwater extraction charges, and other regulatory fees. For the reasons discussed in detail above, we urge the courts to interpret Proposition 26 as displacing the substantive standards of Proposition 218 in cases of conflict between the two. Finally, the courts should interpret both of these revenue provisions of the California Constitution in light of Article X, Section 2 (the section of the constitution that most specifically addresses water use and water resources management). The courts must ensure that their interpretations of Propositions 218 and 26 do not undermine the essential water conservation and reasonable use directives of their constitutional counterpart.

Legislative Responses

The legislature can play a constructive role in clarifying the requirements of Propositions 218 and 26 for water management and regulation, as it did with the "Proposition 218 Omnibus Implementation Act of 1997" (California Government Code §§ 53750-53756). Although most of this statute addresses assessments, Section 53756 authorizes public retail water agencies (along with wastewater, sewer, and refuse collection agencies) to "adopt a schedule of fees or charges authorizing automatic adjustments that pass through increases in wholesale charges for water" if the agency complies with four relatively simple criteria. This "pass-though" exemption to the procedural and substantive standards of Proposition 218 has become an important feature of ratemaking.

To address the challenges presented by Propositions 218 and 26 for water service rates and rate structures, stormwater and runoff management funding, and groundwater extraction fees, the legislature could

[41] The *Palmdale* court based this decision on the California Supreme Court's interpretation of another section of Proposition 218 that assigns the burden of proving compliance with the standards governing assessments (California Constitution article XIIID, § 4(f)). The court held that this section requires the courts to use their "independent judgment" and review agency assessments with a higher level of scrutiny than they do other types of administrative and local governmental decisions (California Supreme Court, *Silicon Valley Taxpayers' Association v. Santa Clara County Open Space Authority* 2007).

articulate several unifying principles of water resources management, regulation, and funding policy that would guide agencies and reviewing courts. These principles should include:

1. Clarification that water development projects (including imported water, acquisitions of transferred water, recycled water, desalinated water, and stormwater capture), conjunctive surface and ground water management projects, conservation and efficiency incentive programs, and environmental and regulatory compliance benefit all parcels and customers served by local public water agencies. Therefore, the costs of such projects and programs may be assigned to all parcels and customers within the service area, consistent with Proposition 218.
2. A declaration that fees and charges designed to regulate a use of land, water, or other resources for the purpose of creating financial incentives for conservation or more efficient use, or for the purpose of ensuring that each property or resource user subject to the fee pays for the external costs of the regulated activity, are exempt from Proposition 218's substantive standards as long as the fee or charge complies with the substantive standards of Proposition 26.
3. Reiteration that "allocation-based conservation water pricing," as authorized by sections 370-374 of the California Water Code, is an important means of encouraging the efficient use of water consistent with the prohibition of waste and reasonable use mandate of Article X, Section 2, of the California Constitution. This would be accompanied by a legislative statement of policy that the courts therefore should give substantial deference to a water agency's decision to adopt tiered-rates, unit fees, conservation charges, and other economic incentives that encourage conservation and efficient use. Because these fees, charges, and rate structures benefit all parcels and customers served by the agency, they may be applied to all parcels as long as the fees, charges, and rates do not discriminate among parcels or customers based on type of water use or other factors not related to cost of service.
4. Authorization for local water agencies to use revenues from upper rate tiers to support water conservation programs. As the legislature has done for the Irvine Ranch Water District and the Santa Margarita Water District (see Box 2), this should include authority to capture and treat polluted runoff that results from overwatering.
5. A declaration that water agencies, water regulators, and the courts should interpret and implement Propositions 218 and 26 consistent with the water conservation and reasonable use mandates of Article X, Section 2.

These legislative determinations would not be binding on the courts because Propositions 218 and 26 were enacted as constitutional amendments, and the California Supreme Court has made it clear that the judiciary has final authority to interpret and ensure the proper implementation of their terms (California Supreme Court, *Silicon Valley Taxpayers Association v. Santa Clara County Open Space Authority* 2007). Nevertheless, the legislature's interpretation of the law should carry significant weight with the courts. This is especially true for the clarifications and declarations just listed, because each of them addresses the sound management of California's water resources and Article X, Section 2 of the Constitution expressly grants the legislature authority to pass laws to implement its reasonable use mandates.[42]

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[42] The legislature may also want to consider making two other changes to protect the solvency of water agencies in the face of Proposition 218 challenges. First, it also would be useful for the legislature to enact a statute of limitation on lawsuits brought to challenge increases in rates, fees, and other charges under Propositions 218 and 26. The 120-day statute of limitations for judicial challenges to water and sewer connection fees and capacity charges (California Government Code § 66022) could serve as a model. Second, it would be useful for the legislature to extend to all public agencies providing water services the provisions in the California Water Code §31007 that require county water districts (a particular type of special district) to establish fees and charges at rates sufficient cover their costs. In *Mission Springs Water District v. Verjil* (2013), the California Court of Appeal held that the local electorate "does not have the power by initiative to set water rates so low that they are inadequate to pay the costs of the water district."

Constitutional Changes

Several of the interpretations and reforms that we recommend may not be consistent with the terms of Propositions 218 and 26. One example is our interpretation of Proposition 26 as not changing the law governing regulatory fees that apply prospectively to deter harmful activities (such as excessive groundwater pumping that contributes to overdraft) or that force land and water users to pay for the negative externalities of their activities. Another is our suggestion that these types of regulatory fees should be governed only by the substantive standards of Proposition 26. Even a court that agrees with our conclusion that Proposition 218 is ill-suited to regulatory fees—and that this interpretation better harmonizes the two propositions—might be reluctant to construe one provision of the constitution as taking precedence over another without clear guidance from the electorate, which has final authority over these aspects of California's constitutional law.

It therefore may be preferable—even necessary—to ask the voters to amend the constitution to correct the problems created by Propositions 218 and 26 for effective water resources management. Indeed, it is doubtful that anyone involved in the sequential enactment of these two initiatives—the drafters, sponsors, or the voters—carefully thought through the consequences of these laws for programs such as tiered water pricing, water recycling, stormwater discharge fees, conjunctive surface and ground water management, or lifeline rates for low-income households. Nor is it likely that any of these groups considered the interplay between Propositions 218 and 26 and Article X, Section 2.

The following package of amendments would be consistent with the conclusions of our analysis: [43]

1. Amend Proposition 218 to allow public water agencies to adopt fees, charges, and rates that fund water acquisition, water development, and water resources management programs that benefit their customers by increasing water supplies, reducing demand, or otherwise enhancing the reliability of water service—even though not all customers may receive or have access to the water that is physically produced or saved by these programs.
2. Amend Proposition 26 to state clearly that prospective regulatory fees enacted to deter land and water use activities that harm other resource users or the environment, or that compel land and water users to internalize the external costs of their actions, may be enacted as fees (rather than taxes).
3. Amend Proposition 218 to exempt these types of regulatory fees from its substantive standards, as they would be governed exclusively by the substantive standards of Proposition 26.
4. Amend Proposition 218 to incorporate the provisions of Government Code § 53756 by stating that public water agencies may adopt schedules of fees, charges, or rates that automatically "pass through increases in wholesale charges for water, sewage treatment, or wastewater treatment" without being subject to their procedural and substantive standards.
5. Amend Proposition 218 to exempt "water lifeline rates"—i.e., subsidized rates for low-income customers—from the cost of service-based standards of that law.
6. Amend Proposition 218 to add stormwater discharge fees to the list of charges (currently, sewer, water, and refuse collection services) that are exempt from voter approval requirements. [44]

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[43] For the reasons described in the main report, we also recommend that the voters amend Proposition 13 to allow local special taxes enacted for the purpose of funding water supply, water service, water management, stormwater management, and ecosystem improvement and management to be enacted by a simple majority vote of the electorate. This would be consistent with the voter threshold for the passage of local general taxes and all fiscal measures that appear on statewide ballots.

[44] This change would not be needed if our second and third proposed constitutional amendments, which would exempt stormwater fees from Proposition 218 altogether, were enacted.

7. Amend Propositions 218 and 26 to state that, although the burden remains on the public water agency to prove that it has complied with their substantive standards, the reviewing courts must defer to the agency's determination of the need for, amount, and allocation of a rate or fee, and uphold the charge if there is substantial evidence in the administrative ratemaking record to support the agency's decision.

8. Amend Propositions 218 and 26 to state that public water agencies and reviewing courts shall interpret their provisions in a manner that is consistent with and promotes the water conservation and reasonable use directives of Article X, Section 2. This should include, but not be limited to, a statement that tiered rates and fees adopted to promote conservation and efficient use are constitutional, even if they are not strictly apportioned among property owners and water users on the basis of cost of service.

9. Finally, a central purpose of Propositions 218 and 26 was to ensure that the funds collected from water service rates, water management charges, and regulatory fees are not used for unrelated programs or activities. Thus, we also recommend that both laws be amended to state that neither the legislature nor local governments have authority to divert the proceeds of these fees and charges to purposes other than the programs that are the sources of the fees and charges. This would reinforce Proposition 218's declaration that "[n]o fee or charge may be imposed for general governmental services … where the service is available to the public at large in substantially the same manner as it is to property owners" (California Constitution Article XIIID, § 6(b)(5), as well as Proposition 26's directive that fees and charges not exceed the amount "necessary to cover the reasonable costs of the governmental activity" and that they "bear a fair or reasonable relationship to the payor's burdens on, or benefits received from, the governmental activity (California Constitution Article XIIIA, § 3(d) & art. XIIIC, § 1(d)).

Conclusion

The amendments to the California Constitution that began with Proposition 13 in 1978 and continued with Propositions 218 and 26 have fundamentally changed water ratemaking, management, financing, and regulation. These laws were understandable responses to accumulating voter frustration with the rising costs of land ownership and utility service, as well as with state and local government decisions that some members of the public perceived as opaque, unaccountable, and unjustified. Although these laws have enhanced the transparency and accountability of governmental decisionmaking, the substantive standards of Propositions 218 and 26 have placed serious constraints on the ability of the state and local governments to raise funds for essential water supply, watershed protection, groundwater management, and pollution control programs—at least through the use of water rates, fees, and other charges.

We have taken a close look at many of these constraints on ratemaking, water management, and land and water use regulation. We have also considered the interactions among Propositions 218 and 26, as well as the effects of these newer laws on some of the most important statutory and constitutional directives that govern the use and management of California's water resources—most notably, the reasonable use mandates of Article X, Section 2. Based on our analysis, we have offered a variety of recommendations for water administrators, legislators, judges, and the voting public to address some of the constraints and misunderstandings of these important initiatives. We hope that some of our legal analyses and recommendations may serve as a guide to constructive policy reforms that will assist the state and its diverse array of public water agencies in fulfilling their water service and stewardship obligations in an accountable, responsible, and reliable manner. At the very least, we hope that the attention that we may bring to these topics will facilitate a better understanding of the ambiguities and problematic features of Propositions 218 and 26 and will engender a much-needed public debate about the efficacy and wisdom of these laws for the future administration of California's most vital water systems.

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Paying for Water in California

Technical Appendix B:
Estimates of Water Sector Expenditures, Revenues, and Needs

Contents

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Summary

This appendix provides information on data sources and methods used to estimate recent expenditures and revenue sources and projected spending needs in California's water sector, as summarized in the main report.

Abbreviations

State Agencies	
CPUC	California Public Utilities Commission
DBW	Department of Boating and Waterways
DFW	Department of Fish and Wildlife
DPH	Department of Public Health
DPR	Department of Pesticide Regulation
DWR	Department of Water Resources
SCO	State Controller's Office
SWRCB	State Water Resources Control Board
WCB	Wildlife Conservation Board
Federal Agencies	
FEMA	Federal Emergency Management Agency
NOAA	National Oceanic and Atmospheric Administration
NMFS	National Marine Fisheries Service
USACE	U.S. Army Corps of Engineers
USBR	U.S. Bureau of Reclamation
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
Other	
AB	Assembly Bill
ASCE	American Society of Civil Engineers
BDCP	Bay Delta Conservation Plan
CASQA	California Association of Stormwater Quality Agencies
CVFPP	Central Valley Flood Protection Plan
CVP	Central Valley Project
CWA	Clean Water Act
DRMS	Delta Risk Management Strategy
DWSRF	Drinking Water State Revolving Fund
HCP	Habitat Conservation Plan
MCL	Maximum Contaminant Level
NCCP	Natural Community Conservation Plan
NGO	Non-Governmental Organization
SB	Senate Bill
SDWA	Safe Drinking Water Act
SWP	State Water Project
TMDL	Total Maximum Daily Load

Water Sector Expenditures and Revenues

Overview

Our goal was to present an overview of recent annual expenditures for the range of local, state, and federal entities involved in managing water supply, wastewater, floods, and aquatic ecosystems (Tables B1 and B2) and to highlight revenue sources used by local government agencies (Table B3). To minimize the effects of anomalies in individual years, we present a four-year average for 2008–2011 (unless stated otherwise). We relied on a variety of data sources, including published information, a detailed database on local government expenditures and revenues from the California State Controller's Office (SCO), unpublished estimates provided by state and federal agency officials, and our own estimates for some missing entries, as documented in the table notes. The tables exclude some types of expenditures and revenues for which information was unavailable, as described below.

TABLE B1
California's water sector expenditures, 2008–11 average ($ millions, 2012$)

	Operating	Investment	Total
Water supply	**12,911**	**6,520**	**19,431**
Local: Publicly owned utilities [a/]	10,552	5,806	16,358
Local: Privately owned utilities [b/]	870	435	1,304
State: State Water Project (DWR)	968	254	1,222
State: Water supply planning (DWR)	110	–	110
State: Water rights management (SWRCB)	12	–	12
State: Private utility oversight (CPUC) [c/]	85	–	85
State: Drinking water quality (CDPH)	97	–	97
Federal: Central Valley Project, other (USBR) [d/]	217	25	242
Water pollution management	**5,949**	**3,664**	**9,613**
Local: Wastewater utilities [e/]	5,487	3,664	9,151
State: Water pollution oversight (SWRCB, DPR)	454	–	454
Federal: Water pollution oversight (USEPA)[f/]	8	–	8
Flood protection	**1,470**	**682**	**2,152**
Local: Flood management agencies [g/]	1,010	338	1,348
Local: Flood insurance premiums (private residents and businesses)	204		204
State: Flood management (DWR)	181	164	346
Federal: Flood management (USACE)	60	180	239
Federal: Floodplain mapping (FEMA)	14	–	14
Aquatic ecosystems [h/]	**591**	**80**	**671**
Local: Resource conservation districts and others [i/]	79	11	91
State: Species management (DFW, WCB, DBW)	170	1	171
State: Coastal, Delta management agencies	52	67	119
State: Other resource conservation	65	–	65

	Operating	Investment	Total
Federal: Species management (NMFS, USFWS, USBR)	225		225
General	**–**	**689**	**689**
State: Water-related general obligation debt service [j/]	–	689	689
TOTAL	**20,921**	**11,635**	**32,556**

SOURCE: Authors' estimates using SCO local government data files (local public water, wastewater, and special district expenditures) and data from the CPUC (local private agencies), the governor's budgets (state agency expenditures), and individual federal agencies (federal agency expenditures).

NOTES:

Investment expenditures generally include capital outlays, interest payments on debt, and losses on sale of assets. Operating expenditures generally cover all other expenditures. To avoid double counting, the table excludes local assistance from state and federal agencies (see Table B2 for details). Unless otherwise noted, expenditures are an average of 2007–08 through 2010–11 fiscal years.

a/ Capital outlays for water special districts are calculated as the change in the value of fixed assets (see the appendix to *Understanding Infrastructure Financing for California*, deAlth and Rueben, 2005). Capital outlays constituted 73 percent of investment expenditures for public water agencies.

b/ For private water utilities, data are for 2010–12. Data on private water companies exclude those with fewer than 500 connections (smaller systems are included if they are part of a larger investor-owned company). Investment expenditures are estimated as 50 percent of operating costs (a slightly lower ratio than for public water utilities).

c/ Water-related expenditures were estimated by pro-rating the proportion of total agency expenditures by the share of employees working on water-related issues.

d/ The California share of multistate and bureau-wide programs is approximated.

e/ Capital outlays for wastewater special districts are calculated as the change in fixed assets. Capital outlays constituted 76 percent of investment expenditures for wastewater agencies. Local agencies (mainly city and county governments) also have permits to control pollution from stormwater and other urban runoff. Stormwater management expenditures are not available unless this task is covered by the wastewater utility (San Francisco) or county flood control agencies (as is the case for some programs in southern California; the latter are included here under flood protection). Most municipal stormwater programs are handled by local departments of public works.

f/ USEPA also provides some oversight for drinking water quality (categorized in this table as water supply). Expenditures are estimated by applying an average cost per employee to the number of employees working on California water issues in Region 9.

g/ The vast majority of flood control expenditures are by flood control special districts, which typically operate over entire counties. Some expenditures are also included by levee maintenance and stormwater drainage special districts and county governments. (For example, the Sacramento Stormwater Utility District, which averages $26 million a year in expenditures, is included here.) Some cities engage in some flood management expenditures as well, which cannot be separated from general public works budgets.

h/ Estimates of annual expenditures and investments for state agencies with some ecosystem functions are based on the approximate proportion of their mission devoted to aquatic species and habitat:

- For species management agencies, DFW and WCB, 50 percent of expenditures are included;10 percent of operating expenditures for the DBW are included for invasive species management programs.
- For coastal and Delta-focused agencies, 100 percent of agency expenditures are reported. This includes the State Coastal Conservancy, the Coastal Commission, the Sacramento- San Joaquin Delta Conservancy, the Delta Stewardship Council, the Delta Protection Commission, and the Bay Conservation and Development Commission.
- "Other resource conservation" includes 25 percent of the expenditures of the Department of Conservation and 50 percent of the expenditures of the remaining state conservancies (Baldwin Hills, Tahoe, Coachella Valley, Delta, San Diego River, San Joaquin River, Santa Monica Mountains, San Gabriel/Lower Los Angeles River).
- For USFWS and NMFS, operational expenditures are estimated based on USEPA average employee costs (see note f). As in the case of the DFW, 50 percent of USFWS expenditures are assumed to be allocated to aquatic species. USBR ecosystem expenditures are based on the expenditures of special programs such as the CVP ecosystem restoration fund (paid for by a surcharge on CVP water and power sales).

i/ To account for local ecosystem spending that is not part of resource conservation district expenditures (the only such expenditures which are available in the SCO data), this value is the sum of the resource conservation district expenditures raised locally (50%) and the total amount of ecosystem-focused local assistance from state and federal agencies.

j/ For a list of bonds, see Table C1 in Appendix C, and for trends in debt service, see Figure C8. In addition, DWR repaid an annual average of $420 million during this period on debt incurred for the SWP. This total is excluded from the table because it is repaid by local agencies (and included under local expenditures). In recent years, general obligation bond repayments have been increasing and SWP debt repayments have been falling.

To avoid double-counting, Table B1 does not include "local assistance" grants from state and federal agencies to lower levels of government in state and federal spending. These "local assistance" programs are shown in Table B2. Most of these grants are provided to local entities, with the exception of federal grants to support the state's revolving fund programs for safe drinking water (DPH) and water pollution prevention (SWRCB); these state agencies in turn use these funds to provide below-interest loans and grants to local entities. Table 1 in the main

report subtracts these local assistance sums from the local and state spending totals (to isolate the ultimate source of the funds).[1]

TABLE B2
Annual local assistance from state and federal agencies, 2008–11 average

Local assistance	$ Millions (2012$)
Water supply	
State (DWR, DPH)	265
Federal (USBR, USDA, USEPA)	234
Water pollution prevention	
State (DPH)	168
Federal (USDA, USEPA)	214
Flood protection	
State (DWR)	228
Aquatic ecosystem management	
State	50
Federal (USDA)	15
Total state local assistance	**711**
Net state local assistance [a]	**334**
Total federal local assistance	**464**

SOURCE: Authors' estimates using governor's budgets and federal agency sources.

NOTES:

[a] USEPA local assistance is assumed to be passed directly to state, rather than local, agencies, primarily for use in the revolving fund programs for safe drinking water and for water pollution prevention. As a result, net state local assistance amounts are commensurately lower. The totals reported in Table 1 in the main report present total federal and net state local assistance. We assume that federal grants from USEPA are evenly split between state safe drinking water and water pollution prevention programs.

Table 1 in the main report nets out these state and federal grants and shows that local water supply, wastewater, and flood protection entities still play the largest role in water sector expenditures, accounting for 84 percent of total spending. To understand how local governments raise funds to support these levels of expenditures, we looked at the share of the revenue sources relied on by cities, counties, and special districts (Table B3). The reporting methods in the SCO data vary by type of agency, and in some cases the data include many potentially overlapping revenue categories. To provide information as consistently as possible, we grouped revenue sources into the following broad categories:

1. **Sales and other service charges**: Includes all revenue from water sales, both direct and wholesale, as well as service charges (wastewater, flood control), connection fees, permit fees, and standby/availability charges.
2. **Property taxes**: Includes revenue from Proposition 13-authorized property taxes plus redevelopment funds passed through to special districts. (For city and county departments, property tax revenues are part of general government revenues and are not reported separately.)

[1] This procedure provides a rough approximation of total sums originating from local and state sources. Local revenue data from the SCO also include state and federal grants; however, due to spending lags and reporting differences, these sums do not always match the totals in state and federal budget records.

3. **Assessments and special taxes**: Includes all revenues from voter-approved special taxes and property assessments, plus a relatively small share of penalties and costs from delinquent taxes and assessments. As with property taxes, this information is only available for special districts.
4. **Government grants**: Includes state, federal, and local (i.e., county or regional agency) grants for construction aid and other programs. Because of lags in reporting and other factors, the total does not necessarily sum to the total reported in Table B2. This information is only available for special districts and city departments.
5. **Other:** Includes revenue from interest, property rentals, property sales, penalties, and a catchall "other" category that includes a broader range of revenue for city and especially county agencies.

Table B3 reports both total revenues and total expenditures for each category of local agency. For a variety of reasons, local governments' revenues do not equate with expenditures. The majority of the gap is likely due to the financing of capital investments through borrowing (using local revenue bonds) and capital reserves, neither of which are recognized as a revenue source in the SCO data. Both sources, and particularly reserves, may have been relied on to a larger extent than usual during this period, which included a severe economic recession.

TABLE B3
Revenue sources for local water-related public agencies (2008–11 average)

	Share of Revenue Sources						
	Sales and service charges [b/] (%)	Property taxes [c/] (%)	Assessments and special taxes (%)	Gov't grants: federal, state, local (%)	Other (%)	Total revenues ($ millions, 2012$)	Total expenditures ($ millions, 2012$)
Water supply							
County	64	n/a	n/a	0	36	1	3
City	90	n/a	n/a	1	9	4,358	5,198
Special districts	80	5	6	2	8	8,375	11,156
Total	83	3	4	2	8	**12,734**	**16,358**
Wastewater							
County	94	n/a	n/a	1	5	9	8
City	87	n/a	n/a	1	12	3,645	3,953
Special districts	80	8	2	2	8	3,639	5,189
Total	84	4	1	1	10	**7,292**	**9,151**
Flood protection[a]							
Special districts	21	36	8	20	15	1,365	1,335
Total	21	36	8	20	15	**1,365**	**1,335**

SOURCE: Authors' calculations using SCO data for cities, counties, and special districts.

NOTES: Values are an average of 2008–11. Special districts are the only entities with property tax and special tax and assessment revenue variables reported in the SCO data. N/A refers to categories for which the information was not available (in such cases, the revenue source may be included in the "other" category). Capital expenditures for special water and wastewater districts are calculated as the change in the value of fixed assets (see deAlth and Rueben 2005, appendix). Revenue sources for these expenditures are not included in the SCO data.

[a] Revenue sources were not available for county flood agencies.
[b] Water supply sales include roughly $2.5 billion/year in revenues from resale to other agencies rather than end-users.
[c] Property tax revenues includes funding from redevelopment funds, which averaged about $25 million/year for water supply, $8 million/year for water pollution prevention, and $17 million/year for flood protection.

In the case of water supply and wastewater management, most local agency spending reported in Table B1 is generated from customer bills in the form of sales or service charges (more than 80 percent of revenues).

Property taxes and assessments play a smaller role (together, about 10 percent of special district revenues). In flood protection districts, property taxes represent the largest single source of revenues (36%), with service charges and government grants each providing around 20 percent of revenues. Voter-approved assessments and special taxes account for less than 10 percent of flood district revenues.

Expenditure Estimates: Caveats

Although the information shown here provides a good general sense of spending on water management in California, it is important to bear in mind several caveats regarding data gaps and how to interpret what is included in various expenditure categories.

Underestimates

Table B1 is missing some water-related expenditures. For instance, it does not include most local expenditures involved in managing polluted stormwater and urban runoff. Although some stormwater management may be included in the local flood control budgets shown in the table, this function is usually undertaken by public works departments, and this information is not presented separately in local budgets.[2] Several sources suggest that local agencies are currently spending at least $500 million annually on this function.[3] (We have added this amount to the local spending on water pollution prevention in Table 1 of the main report.)

Likewise, our estimates in Table B1 do not include city expenditures on flood management. Although special districts, often operating at the county level, serve as the main local flood management agencies, some cities also have programs—again as part of their public works programs. However, it is likely that most of their efforts are focused on prevention of local drainage problems rather than larger flood protection efforts and thus might be more appropriately considered as an activity within citywide stormwater management.[4] Our estimates in Table B1 also do not include expenditures of private power companies on dedicated hydroelectric dam maintenance and upgrades (spending on multipurpose dams is included under water supply or flood protection). Finally, our estimates generally exclude California-related expenditures at federal agency headquarters in Washington, D.C., as well as spending by private individuals and firms that pump their own groundwater, and industries that treat their own water for specific industrial uses.

Overestimates

Although we have attempted to avoid double-counting of federal and state grants spent at the local level by netting these out of the expenditure totals, our estimates for water supply expenditures in Table B1 may involve some double-counting. This is because the table includes both wholesale and retail agency expenditures on supplies. Many retail water utilities purchase some supplies from wholesalers, and the amounts charged by

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[2] In San Francisco, which has a combined sewer and stormdrain collection system, stormwater management is handled as part of the wastewater program.

[3] A recent study prepared for the Natural Resource Defense Council by Kier Associates (2013) estimates that California municipalities spend more than $428 million annually on stormwater-related trash clean-up, a key feature in many stormwater management programs. Similar spending levels were obtained by Currier et al. (2005) pertaining to compliance with stormwater permits. That study, conducted for the SWRCB, examined expenditures in six municipalities and metro areas and estimated that cities and counties statewide were spending $29 to $46 per household annually to comply with National Pollutant Discharge Elimination System (NPDES) permits—corresponding to roughly $350 to $550 million/year. Spending is likely to have increased since then, given the tightening of stormwater permit requirements.

[4] Based on several case studies of small and large municipalities, a recent report by the DWR and USACE (*California's Flood Future: Recommendations for Managing the State's Flood Risk*, 2013) estimates that these expenditures (considered jointly for flood and stormwater management) account for 20 percent of all expenditures on local streets and roads, or $800-$900 million annually (See Attachment I of the report). We believe this estimate is unrealistically high for flood management functions, and likely too high statewide for stormwater management as well. (The highest estimates from case studies were from small, highly flood-prone areas such as Napa and Eureka; for the City of Los Angeles, the estimate was only 4 percent of the total streets and roads budget).

wholesalers are passed through to retail customers.[5] This does not affect investment expenditures (which are recorded at the level within the water supply chain at which they occur), but it may result in some double-counting of operational expenses. The revenue data from the SCO show roughly $2.5 billion/year in wholesale revenues, suggesting that *net* operational expenditures for local water suppliers might be overstated by this amount. Table 1 in the main report deducts this amount from local spending on water supplies.

Special Challenges in Estimating Aquatic Ecosystem Expenditures

Estimating expenditures on aquatic ecosystem management was particularly challenging. In Tables B1 and B2, this function includes direct expenditures by agencies responsible for species management (state and federal wildlife regulatory agencies that administer the state and federal Endangered Species Acts; the state DBW, which runs invasive species control programs; and the USBR, which has some funding dedicated to aquatic ecosystem restoration and protection as part of its responsibilities under the CVP). We also include the expenditures of some state agencies that focus on the Delta and coastal management programs, as well as local, state, and federal funds devoted to resource conservation more broadly. We applied rules of thumb to try to gauge the share of total expenditures devoted to aquatic ecosystems (defined broadly to include instream, riparian, wetland, and coastal habitat and species), as indicated in the notes to Table B1.

It is important to note, however, that some additional aquatic ecosystem expenditures are embedded in other water-related spending reported in Table B1. For instance, some agencies that do not have a direct environmental mission, such as DWR, participate in environmental stewardship as part of their other program functions. Using employment information, we estimate that nearly 10 percent of DWR's total staff work on ecosystem-related issues.[6] Similarly, some water and flood expenditures include watershed protection efforts. This is the case, for instance, in Santa Clara County, where the local water and flood control agency (the Santa Clara Valley Water District) also has a watershed mandate. As another example, San Francisco's water system supports the "Watershed and Environmental Improvement Program," funding projects designed to proactively manage environmental resources in the Tuolumne River watershed and within local watersheds in the Bay Area.

Additionally, a particularly large volume of expenditures—perhaps $500 million to $1 billion annually—is devoted to environmental mitigation for new capital projects in water, wastewater, and flood management areas. Case studies suggest that these expenditures typically fall in the range of about 3 to 10 percent of total capital project costs.[7] The environmental review and permitting process that requires this mitigation is primarily intended to prevent new ecosystem harm. But the funds dedicated to these actions, used well, could likely also make significant contributions to ecosystem recovery if the current geographically and institutionally

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[5] California has roughly 40 water utilities that operate as wholesale suppliers, selling water to retail water utilities that directly serve businesses and residences. About half of these wholesalers—such as the Metropolitan Water District of Southern California, the San Diego County Water Authority, and the Sonoma County Water Agency—are pure wholesalers. The other half provide both wholesale and retail services (e.g., the San Francisco Public Utilities Commission). Both the SWP and the CVP are also wholesale water providers.

[6] Using employment data provided by DWR, we counted as ecosystem-focused staff all DWR employees with the title of environmental scientist or who were working in the following areas: Floodway Ecosystem Sustainability, Conservation Strategy, Environmental Restoration and Enhancement, DHCCP, Special Restoration Projects, Delta Ecosystem Enhancement, Riverine Ecosystem, Office of Environmental Compliance, Environmental Compliance and Evaluation Branch, Ecological Studies Branch, Mitigation and Restoration Branch, Environmental Planning and Information Branch, Environmental Water Quality and Estuarine Studies Branch, Northern Regional Office Environmental Assessment Branch, South Central Regional Office River Investigations and Environmental Compliance Branches, and Southern Region Office Recreation and Environmental Studies Section.

[7] For instance, environmental mitigation for the San Diego County Water Authority's new emergency storage project accounted for about 3 percent of total project costs of $1.5 billion; environmental mitigation for the Carlsbad Desalination Plant is estimated to be 5 percent of the total project costs of nearly $540 million (personal communication, Ken Weinberg, SDCWA, October 2013). Mitigation accounted for about 9 percent of the $400 million Natomas Levee Improvement Project implemented by the Sacramento Area Flood Control Agency (personal communication, Tim Washburn, Sacramento Area Flood Control Agency, August 2013). These mitigation costs do not include environmental review and permitting, which can also involve a substantial price tag.

fragmented regulatory system is improved. Unfortunately, mitigation is often undertaken on a project-by-project basis, with unclear benefits to overall ecosystem function. However, by pooling these resources into larger efforts that consider broader ecosystem and species needs, mitigation has the potential to help protect and improve the most valuable environmental resources at the least cost. There have been some targeted efforts to achieve such coordination in California. In particular, habitat mitigation and conservation banks have been developed to rationalize the acquisition and management of habitat required as offsets for the destruction of wetlands or other sensitive habitat (Gray et al. 2013). Yet more could be done to use these large sums of money in a better way.

Water Sector Funding Needs

This section provides more detail on estimates of funding needs and gaps presented in the main report.

Water Supply and Water Pollution Prevention

Under the auspices of the Safe Drinking Water Act (SDWA) and the Clean Water Act (CWA), the U.S. Environmental Protection Agency conducts nationwide assessments every four years of the public water supply, wastewater, and stormwater systems. These assessments use surveys to gather information from local agencies on their estimated capital needs for the next 20 years, using information in their capital improvement plans for activities such as upgrading or expanding treatment plants, storage facilities, and underground pipes. USEPA uses these surveys to inform its distribution of grants to states for the operation of two state-revolving funds (the drinking water state revolving fund and the clean water state revolving fund), which make available low-interest loans to local agencies. A small portion of the federal grant (20%) can be used for grants rather than loans, focused on economically disadvantaged communities.

The results from these surveys are commonly misinterpreted as reflecting *unfunded* capital needs, rather than *total* capital needs. In the early 2000s, methodological adjustments were made to address concerns that the surveys underestimated needs, and the surveys now attempt to systematically adjust for missing data and underreporting of capital needs for system maintenance. The Drinking Water Infrastructure Needs Survey aims to exclude capital needs for system expansions where the explicit purpose is to accommodate population growth within the service area (e.g., facilities to serve new subdivisions), and it also excludes activities related to source protection, likely to be a relatively small share of most agencies' expenditures. In contrast, the Clean Watershed Survey explicitly includes many investments designed at least in part to accommodate population growth (U.S. Environmental Protection Agency 2008).

The Drinking Water Infrastructure Needs Survey, last conducted in 2011 and released in 2013, assesses the capital investment needs of public water systems eligible to receive Drinking Water State Revolving Fund (DWSRF) dollars by focusing on needs that are required to protect public health and ensure compliance with the SDWA (U.S. Environmental Protection Agency 2013). The survey methods rely on individual agencies completing a questionnaire and submitting supporting documents. Survey sampling is stratified across different size agencies by water supply source (surface versus groundwater). Large water systems (serving more than 100,000 people) all receive a questionnaire, while medium-size systems (serving between 3,300 and 100,000 people) are randomly sampled. The survey includes both publicly and privately owned agencies and both retail and wholesale providers. The 2011 survey had a national response rate of 98.6 percent for large systems and 96 percent for medium-size systems. In 2007, a field survey of small systems (fewer than 3,300 people served) was conducted with high confidence, so these results were used again in the 2011 assessment.

The estimated 20-year capital need for California's water supply system is $46.4 billion (Table B4), representing the highest capital need among all of the states and 12 percent of the national need. But when state population is considered, California actually falls in the middle of the pack, with a per capita need that ranks 21st in the nation. The survey also distinguishes between components of needs: transmission and distribution (conveyance), source, treatment, storage, and "other" capital needs. In California and nationally, "transmission and distribution" represents the majority of capital needs (in the case of California, 60%) which is consistent with the fact that it is the piece of the system with the largest footprint.

TABLE B4
Drinking water infrastructure needs ($ millions, 2012$)

	1995	1999	2003	2007	2011
National					
–20-year need	239,494	235,784	391,364	397,847	400,899
–annual need	11,975	11,789	19,568	19,892	20,045
California					
–20-year need	32,557	27,327	39,413	46,399	46,448
–annual need	1,628	1,366	1,971	2,320	2,322

SOURCE: U.S. Environmental Protection Agency (2013)

NOTE: Costs are converted to 2012 dollars using the construction cost index in the Engineering News-Record.

The Clean Watersheds survey, which surveys needs for capital costs of controlling water pollution by public wastewater and stormwater agencies, was last published in 2008, using 2007 data (U.S. Environmental Protection Agency 2008). A new report is due to Congress within the next year, including results from a 2012 survey. The methods are slightly different from the drinking water survey in that each state or territory submits a list of projects, costs, and supporting documents with input from local communities. As with the drinking water survey, California has one of the highest needs estimates in the nation, at a total of $34 billion over 20 years (Table B5). Yet, on a per-capita basis, California's capital needs are lower than the national average. The Clean Watersheds survey provides separate needs assessments for different parts of the system, including sewage (which is disaggregated into treatment, distribution, etc.), stormwater, non-point source control, and recycled water. Sewage system needs make up the largest share, at nearly $28 billion or $1.4 billion annually. For California and the country, overall estimated needs have been increasing over the last several iterations of the survey. From 1996 to 2008, California's estimated sewage system needs increased by nearly 77 percent in real terms, while the state's population increased by only 13 percent.

TABLE B5
Wastewater and water pollution control infrastructure needs ($ millions, 2012$)

	1996	2000	2004	2008
National				
–20-year need	234,942	275,752	269,403	339,615
–annual need	11,747	13,788	13,470	16,981
California				
–20-year need	19,342	21,917	28,713	34,196
–annual need	967	1,096	1,436	1,710
California - Sewage				
–20-year need	16,458	20,164	24,180	27,838
–annual need	823	1,008	1,209	1,392
California - Stormwater				
–20-year need	2,021	536	520	4,294
–annual need	101	27	26	215

	1996	2000	2004	2008
California - Non-point source				
–20-year need	862	1,217	1,432	121
–annual need	43	61	72	6
California - Recycled water				
–20-year need			2,581	1,944
–annual need			129	97

SOURCE: U.S. Environmental Protection Agency (2008)

NOTE: Costs from earlier plans are converted to 2012 dollars using the construction cost index in the Engineering News-Record. In 2004 the methods of the survey changed to include recycled water needs estimates.

Special Challenges in Estimating Stormwater Needs

The latest USEPA survey estimates capital needs of roughly $215 million a year for stormwater pollution management (Table B5). But in contrast to the estimate for wastewater systems, there are reasons to believe this is an underestimate. Our conversations with several managers in California suggest that many of these agencies do not have a good sense of the capital and operational costs of meeting their regulatory obligations. The revenue constraints on stormwater programs imposed by Proposition 218 (discussed in the main report and Appendix A) have forced many of these programs to be absorbed into other municipal efforts, further compounding the difficulties of quantifying either current or future needs. However, it is clear that the costs have been increasing considerably.

The USEPA did not start to focus on stormwater and non-point runoff until the early 1990s. Initially only the largest urban areas (populations over 100,000) were required to obtain pollution management permits for urban stormwater. However, since the 2000s, smaller municipalities and unincorporated areas of counties (populations over 50,000) have also been subject to the law, which also includes separate permitting requirements for a number of high-impact sectors and activities (e.g., general construction, industries, and Caltrans for highways). Since the last USEPA survey was conducted (2007), regulation of stormwater has become more stringent. Urban stormwater permits are reissued every five years, and the most recent generation of permits includes stricter requirements. In coastal areas, requirements now typically include high levels of onsite retention of storm runoff for new and redeveloped properties and a variety of water quality targets for water bodies receiving runoff relating to trash, bacteria levels, and various chemical pollutants. When new pollutants are included in stormwater regulations, it is typically on a pilot basis, allowing agencies time to experiment with the least expensive ways to manage the problem. We heard concerns that total costs of meeting the regulatory requirements would increase substantially in subsequent permit rounds, when agencies would be expected to move beyond the pilot phase to full implementation. This is currently of particular concern when it comes to managing PCBs and other chemicals from old industrial sites.

Attempts have been made to estimate the costs of modern stormwater management, but they vary greatly by location, pollutants, permit requirements, and approaches used to reach compliance. Source prevention is often a more cost-effective alternative than treatment for highly toxic chemical pollutants. For example, new handling instructions are being used to reduce over-applications of harmful pyrethroid pesticides (used primarily to keep ants out of buildings) at a fraction of the cost of treatment of stormwater from urban stormdrains (Medellín-Azuara et al. 2013). Similarly, rather than attempt prohibitively expensive (and not fully effective) treatment to remove highly

toxic copper from run-off in some areas, efforts have focused on removing the problem at the source by changing the composition of brakepads.[8]

Permit costs also vary by the standard of compliance. The Los Angeles River has been designated as impaired due to the large volume of trash it receives from the watershed. To address this problem, a Total Maximum Daily Load (TMDL), which establishes baseline trash loads to the river from the watershed, is included in Los Angeles County's regional stormwater permit. The permit requires implementation of trash reduction measures and requires discharges to reach zero by 2016. Studies estimating the costs to reach this goal arrive at very different conclusions. Gordon (2002) estimated that full compliance could cost as much as $284 billion in capital investments, assuming the installation of 65 regional treatment plants with the capacity to capture and treat runoff from 97 percent of historic annual storm events. They estimated that costs would be considerably lower, though still quite high ($44 billion in investments), for a program aiming to capture and treat runoff from only 70 percent of storms. In present value terms, and including both operations and maintenance costs and the net impacts of this spending on regional employment, the annual costs to households in Los Angeles County would range from $333 to $2,088 per year for twenty years. Another study that looked at alternative approaches, including less capital-intensive treatment and more "non-structural" methods to reduce pollution from entering storm drains including education, anti-littering enforcement, and improved street cleaning, found that total incremental costs associated with compliance could be much lower still, ranging from $2.8 to $7.4 billion, or $27 to $71 per household annually (Devinny et al. 2005).[9]

Some local agencies in California have analyzed spending needs for stormwater programs in the context of efforts to obtain new funding sources. As part of the process to place a stormwater fee on the ballot in 2012, Contra Costa County analyzed future stormwater expenditures by asking local municipalities to provide their current expenditures along with estimates of the additional costs likely to be incurred in the implementation of their regional stormwater permit. Contra Costa currently raises around $18 million a year from a stormwater utility assessment that has been in place since 1992. County officials estimated an annual need of about $20 million beyond their current stormwater revenues to fully fund programs countywide and reach compliance with the regional permit (Contra Costa Clean Water Program 2011). Another Bay Area agency has engaged in a similar analysis of their permit requirements and estimated a need of at least $15 million a year in unfunded expenses (beyond current revenues of around $10 million a year). Using the estimates of these local agencies, and the corresponding populations, we extrapolated the estimated costs up to the state level. We estimate that the total annual costs of meeting urban stormwater permit requirements are currently in the range of $1 billion to $1.5 billion, with costs likely to continue to rise as new permit requirements come due. Agencies are likely to have stable funding for no more than half that amount, leaving a gap of $500 million to $800 million per year, or $40 to $65 per household.[10]

Although raising even this level of funding will be challenging in the fiscal environment facing stormwater agencies, the gap could be even higher unless regulatory and management approaches are employed that help contain costs. As the discussion above suggests, it will be essential to examine alternatives to simply capturing

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[8] SB 346, enacted in 2010, established a program that will lead to the near elimination of copper (down to 0.5%) in brake pads by 2025. The law grew out of a collaborative effort among brake pad manufacturers, government agencies, environmental organizations, and the California Association of Stormwater Quality Agencies (CASQA). To avoid replacing one problem with another, manufacturers are required to examine new formulations carefully and select alternatives that pose less public and environmental health risks (California Association of Stormwater Quality Agencies 2010).

[9] See Currier et al. (2005) for a succinct presentation of these cost estimates on a per household basis.

[10] This estimate is much lower than that provided in the most recent infrastructure report card for California from the American Society of Civil Engineers (2012), which suggests an *annual* spending need of $6.7 billion over the next ten years, or roughly $500 per household per year. The ASCE estimate is based on a misinterpretation of the results from the two Los Angeles studies cited above (Gordon 2002; Devinny et al. 2005); it assumes the 20-year costs per household are *annual* costs, not costs to be spread out over two decades.

and treating all stormwater before it is discharged into water bodies. Some of the most cost-effective approaches—involving source control—may require action at the state level rather than at the level of the municipal authorities who now have the permitted responsibility for stormwater pollution prevention.

Safe Drinking Water in Small, Rural Systems

Small water systems commonly have higher unit costs and additional difficulties in providing safe drinking water. Being small means having less formal organization and expertise, and little ability to spread costs. Poor rural communities suffer more from these high costs and lack of organization. Recent reports have highlighted serious lack of access problems for safe drinking water and high costs in areas relying on contaminated groundwater, especially in poor rural communities (Harter et al. 2012; State Water Resources Control Board 2013a and 2013b; California Department of Public Health 2013). The state has no comprehensive estimates of the scale of this problem because it does not monitor water quality in the smallest systems (i.e., those serving fewer than 15 households), which collectively serve about 1 percent of the population. Extrapolating from available information, we estimate that between 80,000 and 160,000 people live in small, disadvantaged communities that have difficulties providing safe drinking water (0.2 to 0.4 percent of California's population).[11]

Current Expenditures and Funding Sources

Residents in these communities often pay twice for their drinking water: once through their water bills to cover the operations of the local water systems and then again to purchase bottled water or pay for point-of-use treatment. Numerous funding sources are potentially available to support small communities, from over 18 state-administered programs, three federal programs, and three programs implemented by non-governmental organizations (Harter et al. 2012). Small and large systems compete for some of these funds, but some programs specifically target small systems, particularly the small system grants program managed by the California DPH (with about $25 million/year available through the Safe Drinking Water State Revolving Fund, supported by the USEPA),[12] and the USDA's Rural Utilities Service Water and Waste Disposal program (with about $10 to $15 million/year available), which supports water infrastructure in rural areas.

Recent legislation (AB 685 and AB 2334) may have implications for the provision and pricing of drinking water supplies in these communities. AB 685 (enacted in 2012) establishes that "every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption." AB 2334 (proposed) deals with the affordability of drinking water and wastewater services, and it would require DWR to analyze and propose how water could be made more affordable in "high-cost communities."[13] Additionally, a governor's task force recently focused on identifying new or expanding current funding sources to address the needs of rural disadvantaged communities that lack safe drinking water. The recommendations of this task force consider the promise of some of the funding sources discussed below, but also offer other recommendations including

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[11] This estimate roughly doubles the CDPH and SWRCB estimates of populations in small systems regulated by the Safe Drinking Water Act that have had violations (discussed below) and assumes that about 80 percent of small systems have economically disadvantaged populations, based on results from Harter et al. (2012) for Tulare and Salinas (discussed below).

[12] Generally, USEPA makes available $100 to $150 million a year for the Safe Drinking Water Revolving Fund, with 20 percent of these funds available for grants.

[13] This bill, proposed in 2012, defines water systems serving disadvantaged communities as serving: (1) "communities with a median household income at or below 80 percent of the state median household income, where water rates are more than 2 percent of the median household income"; (2) "communities with a median household income no higher than 120 percent of the state median household income and where more than 10 percent of the population spends more than 2 percent of their income on water"; or (3) "other communities as determined to be appropriate [by the Department of Water Resources]." Although the appropriateness of AB 2334's affordability guidelines for California remains an open question, the state will clearly need to consider affordability issues for lower income households in a range of communities, not just in small rural systems. As discussed in the main report, low- and even some moderate-income households in communities across California likely have water bills exceeding this 2 percent threshold. Given restrictions on the use of lifeline rates under Proposition 218, the likely continued increase in real costs of water supply, and the impracticality of raising large sums from state or federal taxpayers to address this problem, California will need to consider local options for addressing this issue.

creating a "transitional funding program" and increasing the coordination of disadvantaged community representation (Governor's Drinking Water Stakeholder Group 2013). These recommendations may inform ongoing policy deliberations regarding drinking water funding and agency reorganization.

Identification of Gaps

Quantifying the financial needs of small systems—or even conducting an inventory of small systems—is difficult. The Safe Drinking Water Act (SDWA) requires regular monitoring of drinking water quality, but it only applies to community water systems with at least 15 connections. California DPH officials estimate that roughly 99 percent of California's population is served by such systems. The DPH small systems program focuses on the 2,300 systems with 15 to 999 connections (estimated as serving from 50 to 3,300 individuals). These "small community water systems" serve about 1 percent of the population. Roughly 92 percent of these small systems are in compliance with the SDWA—i.e., they have no annual violations of maximum contaminant levels (MCLs)—compared to 95 percent compliance for large community water suppliers. This suggests that the vast majority of small community water systems can provide safe drinking water, although on average less effectively than their large counterparts (Department of Public Health 2013). Given that small systems tend to serve rural areas and/or disadvantaged communities, this compliance disparity becomes a public health equity issue; thus, raising compliance rates in small communities has become a priority funding issue for DPH.

According to the DPH (2013), over 58,000 individuals are served by 185 small community water systems with drinking water that fails one or more of the health-based MCLs. The State Water Resources Control Board (2013b), which has oversight responsibility for groundwater quality, estimates that a somewhat larger number of small systems and individuals are susceptible to drinking water quality problems. The SWRCB estimates that over 95,000 individuals served by 215 small systems rely on at least one contaminated groundwater well and experienced at least one drinking water contaminant violation between 2002 and 2010 (Figure B1). (Another 50 larger systems, serving nearly 2.1 million individuals, were similarly affected.) Nitrate (principally from farm runoff) and arsenic (naturally occurring) were the most frequently violated MCLs, accounting for almost 80 percent of drinking water violations for small community systems. Such systems are especially prevalent in the Tulare Basin and Salinas Valley, but there are significant quality problems in many other regions. Small water systems are also particularly susceptible to high costs due to more stringent drinking water standards.

FIGURE B1
Small systems with contaminated groundwater are located across the state

SOURCE: Authors' calculations using data from State Water Resources Control Board (2013b).

NOTE: For population figures by county and region, see Table 4 State Water Resources Control Board (2013b).

Another one percent of California's population has access to water supplies that are not regulated under the federal SDWA because their water systems have fewer than 15 connections. These include populations served by domestic wells known as "local smalls" or "self-supplied households" (2 to 5 connections) or "state smalls" (5 to 14 connections). County departments of environmental health regulate the "state smalls" (of which there are at least 1,200 systems statewide), but without the benefit of consistent statewide monitoring programs. The state lacks legal authority and does not collect information from these systems (or from their county regulators), making it difficult to assess drinking water quality in these areas. Recent work on nitrate contamination of groundwater in Tulare Lake and Salinas Valley did collect some data on populations served by domestic wells and these smaller systems and

estimated these individuals were at least as susceptible to nitrate contamination as the populations served by the state-regulated small systems (Harter et al. 2012).

High Contamination Rates, High Costs

In general, small system problems stem from a combination of high levels of groundwater contamination and high per capita costs of supplying safe, piped drinking water to households. For instance, the Tulare Lake Basin and Salinas Valley have significant and sustained nitrate groundwater contamination, primarily from fertilizer and animal manure on agricultural lands. Together, these regions are served by 371 state-regulated community water systems and at least 30 county-regulated "state smalls" that together serve 2.4 million people, plus an additional 74,400 domestic and self-supplied wells that supply water to roughly 250,000 people (Honeycutt et al. 2012). In all, approximately 254,000 people in the two regions—or roughly 10 percent of the regional populations—have drinking water supplies susceptible or potentially susceptible to nitrate contamination. Of the 51 community public water systems in the study area with raw water exceeding the nitrate MCL, 80 percent were in economically disadvantaged communities; however, these communities only accounted for 53 percent of the total population in these systems, suggesting that smaller systems on average were more likely to have low-income populations (Honeycutt et al. 2012, pp. 43–44).[14]

The per capita cost of the capital infrastructure for safe drinking water in these systems is high because the populations are small and dispersed. Honeycutt et al. (2012) estimate the cost of providing safe drinking water to all communities in areas that are highly susceptible to nitrate contamination would be $20 million per year in the near term and $36 million per year over the longer term if a mixture of cost-effective solutions were deployed. This includes consolidating small systems into larger neighboring systems where practical, blending water sources, drilling of new or deeper wells and using treatment at the point-of-use (individual taps within the home) and point-of-entry (at the point where the water system connects to the home).[15] Over the longer term, as nitrate contamination migrates deeper into aquifers, costs increase because digging new wells will be a less viable option for providing safe supplies, and public health officials disfavor long-term point-of-use treatment.

The least expensive option largely depends on the size of the system and the proximity of a susceptible system to a larger system (Honeycutt et al. 2012). The least-cost option in providing alternative drinking water supplies varies across self-supplied systems (fewer than five connections) and small systems (any system serving fewer than 1,000 households, including "state smalls" and "small community water systems"). For systems serving less than 500 people, the least expensive option tends to be installing ion exchange treatment. For self-supplied users, the regional cost ranges from $2.5 million annually for point-of-use treatment (e.g., filters on household kitchen taps) to $4 million annually for point-of-entry treatment for all indoor uses. The least-cost option for systems serving 500 to 3,300 people tends to be reverse osmosis treatment. However, depending on the distance to the nearest large system, another economical solution can be connection to a larger existing system.[16] For systems serving over 2,330 people (roughly 700 service connections), installing a community treatment facility is often the least-cost option, although the construction of a new well may also be economical. Larger systems have economies of scale that enable them to connect to a surface water source (which, unlike groundwater, always requires treatment).

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[14] Disadvantaged communities are those with a median household income at or below 80 percent of statewide median household income.

[15] This estimate includes populations served by larger systems (1,000 connections or more) as well as smaller systems. It excludes the City of Fresno, which also is susceptible to nitrates, but which also benefits from significant economies of scale.

[16] In the Salinas Valley and Tulare Lake Basin, roughly 15 percent and 50 percent of the systems serving less than 10,000 people are within five miles of a larger system, respectively (between 88% and 97% are within 12.5 miles of a larger system). This makes consolidation, which presents a permanent solution to address nitrate contamination in groundwater, a potentially viable and cost-effective option for a significant minority of small systems.

Using cost information from the nitrate study and information on systems with groundwater quality problems from the SWRCB reported above, we can provide a coarse estimate of the costs of providing safe drinking water supplies to affected small communities in California. Of the 265 community systems with at least one contaminated groundwater well and at least one violation of public health standards for drinking water between 2002 and 2010, 119 systems (serving 41 percent of the 2,175,000 people affected statewide) are in the Salinas Valley or Tulare Lake Basin. If the Tulare and Salinas basin systems represent roughly 40 percent of those affected statewide, the costs of addressing nitrate contamination of drinking water systems (including some systems with 1,000 or more connections) would be roughly $50 to $100 million/year. Assuming that 50 to 80 percent of these costs would be for smaller, economically disadvantaged communities (again based on Honeycutt et al. 2012), the costs of addressing this problem for small, disadvantaged communities might be $25 to $80 million/year. Because arsenic and other contaminants also trouble small water systems, the total costs for providing safe drinking water to small, disadvantaged communities may be even higher—likely between $30 and $160 million/year.

More Than a Cost Problem

A more nuanced gap between expenditure and needs arises from the structure of the existing funding system, both in the diversity of funding sources and in the restrictions placed on current funds. In principle, the sums needed could be largely mobilized from existing sources, including grant programs for small systems run by DPH, USDA's rural community grants, and other programs. Yet the requirements placed on existing funding sources either exclude operation and maintenance costs or make it difficult for small and often disorganized systems to compete for funding. Most programs limit their funding to capital improvements or construction. Each funding source typically has its own funding application, which places a large administrative burden on small systems. Small systems also generally lack the organizational capacity of large systems (e.g., fewer personnel) which makes it difficult for them to be aware of funding opportunities or have the capacity to apply for them. The smallest systems (those not regulated by the SDWA) are ineligible for many of the funding programs (State Water Resources Control Board 2013b). Similar challenges are present for accessing grants to support wastewater infrastructure, also a common gap in these systems.

Some of the funding gaps for small, disadvantaged systems could be addressed by improving the organization of existing funding programs. Recent drinking water legislation, signed by the governor in October 2013, establishes (AB 21) and extends (AB 30) water supply funding for small disadvantaged water systems and helps governmental agencies prepare applications on behalf of public water systems serving disadvantaged communities (AB 115). Some desirable further actions include:

- **Consolidation of funding applications**: The administrative consolidation of the numerous funding programs into a single application would reduce the application burdens for small systems.
- **Consolidation of water quality data:** Approximately one percent of the population is served by smaller water suppliers or domestic wells that escape the jurisdiction of the SDWA. Drinking water quality data for these systems are not collected or stored by the state, making it difficult to assess drinking water problems for smaller systems. Counties collect these data for water systems serving 5 to 14 connections, so it should be possible to pool them in a common format at little additional cost. Where monitoring and collection of drinking water quality data for small systems currently exists, the state should provide a single repository for these data.
- **Physical consolidation**: Where practical, funding should support physical consolidation of systems. Physical consolidation is most viable if small systems are close to large and well-run systems; in the Tulare and Salinas basins, roughly 20 to 30 percent of nitrate-affected systems fell into this category

(Harter et al. 2012). To encourage consolidation, the state may need to indemnify the acquiring utility of liability for past water quality issues.[17]

- **Administrative consolidation of utilities**: Even where physical consolidation is impractical, some economies of scale might be achieved through administrative consolidation of small districts. Administrative consolidation may include the pooling of personnel, water quality monitoring, and billing into a single organization. This would make small systems more competitive for existing grants, improve water quality monitoring, and reduce per-capita administrative and billing costs. Non-governmental organizations, private water companies, county departments, and other local governments sometimes provide such services. For example, the Rural Community Assistance Corporation, a federally funded agency, focuses on providing technical assistance and managing/implementing state funds for systems that may otherwise lack the expertise to apply for state funds.
- **Interim solutions as possible long-term options:** Today, some stopgap funding is provided for interim solutions, particularly the trucking in of safe drinking water to susceptible communities. Trucking and bottled water deliveries are usually more expensive than many other options. There is some potential and economic advantages to long-term use of point-of-use or point-of-entry treatment at the household level, notwithstanding some current reliability-related public health concerns.[18]
- **County public health and public works oversight**: Drinking water infrastructure is not the only challenge small, disadvantaged communities face. Other public health, education, transportation, and social service concerns are also often severe in such communities. County public health and public works departments are in the best positions to oversee these local problems, but they require financial support from the state, as these counties often have more limited resources than those located in wealthier parts of the state.

Flood Protection

Many communities across California face risks to loss of life and property from riverine and coastal flooding. In recent years, recognition has grown that the state's flood protection systems are inadequate to meet either the minimal standards of protection established under federal law (protection against a "100-year flood" or a flood large enough that it has a one percent chance of occurring in any given year) or more protective standards that many experts deem prudent for more urbanized areas. Several recent large-scale efforts to quantify flood protection investment needs have been undertaken by DWR, the USACE, and the Central Valley Flood Protection Board. We combine this information here with estimates of county-level flood protection spending and estimates of asset values and population exposed to flooding to assess potential spending needs and gaps at the regional and county level. Some of these data are available for both the 100-year floodplain and the larger "500-year floodplain" (the area susceptible to a flood large enough that it has just a 0.2 % chance of flooding the area in any given year). When presenting information on these two areas, we treat them as mutually exclusive (i.e., the 500-year floodplain excludes the area that is within the 100-year floodplain).

Population and Assets Exposed to Flooding

The 2013 report, *California's Flood Future: Recommendations for Managing the State's Flood Risk*, prepared by DWR and USACE, provides estimates of the population and acres exposed in the 100- and 500-year floodplains (Table B5).[19]

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[17] Senate Bill 772 (Emmerson), proposed in 2013, would provide such immunity for two water districts in Riverside County considering the acquisition of a small system with drinking water safety problems.

[18] To date there is reluctance to consider supporting point-of-use treatment solutions because of safety concerns if these home-based systems are not regularly maintained and monitored. Technological advances such as remote monitoring systems—now in pilot development—may make this alternative increasingly attractive (Cohen and Rahardianto 2013).

[19] In this study, we used detailed data tables in the public draft of the *Flood Future* report, released in April 2013; the numbers in the final report, released in November 2013, do not appear to have changed from those shown here.

These estimates used 2000 census tract files and 2012 floodplain maps to determine that roughly 25 percent of the state's population and 16 percent of the land area lies in a floodplain. Four percent of the state's population reside in the most vulnerable areas with less than the minimal standard of protection under federal law (i.e., areas subject to inundation by a 100-year flood) and another 21 percent live in areas protected from a 100-year flood but not from larger and less frequent events such as a 200-year or 500-year flood (i.e., floods with a 0.5 and 0.2 percent chance of occurring in a given year, respectively). Since the late 1970s, new construction has generally been restricted nationwide in areas that lie within the 100-year floodplain.[20] Construction in areas deemed to have at least 100-year protection (but still susceptible to larger and less frequent floods) has generally not been regulated. However, a recent state law now requires Central Valley communities to provide proof of protection from a 200-year flood for new construction in urbanized areas.[21]

TABLE B5
California acres and population in flood-prone areas

	100-yr		500-yr		Total exposure	
Acres	7,169,396	7%	8,991,825	9%	16,161,221	16%
Population	1,422,762	4%	7,274,737	21%	8,697,499	26%

SOURCE: Department of Water Resources and U.S. Army Corps of Engineers (2013).

It bears noting that the boundaries of these floodplain designations are not fixed indefinitely. Floodplain remapping—reflecting changing understanding of hydrologic conditions and the levels of protection afforded by reservoirs, levees, bypasses, and other protective structures—is resulting in the reclassification of some neighborhoods and communities as more susceptible than previously thought. Standards for levees that can be certified as providing 100-year protection have also recently increased, making it more costly for communities to bring themselves to this minimum federal standard.

The DWR and USACE study also estimated the replacement value of buildings (and their contents) in exposed areas. The estimated replacement value of buildings located within these floodplains is more than $430 billion, with their contents-replacement value estimated to be an additional $282 billion; these areas also include roughly $13 billion in crops (Table B6). These estimates do not account for the potential for flooding to cause significant damage to public infrastructure (several major airports, roads, rail-lines, hospitals, etc.), lost revenues from business interruption, and possible loss of human life.

The method used by DWR and USACE to calculate the replacement value for buildings may introduce downward bias in the exposure estimates. Replacement value is based on the depreciated value of the building relative to its construction date, without acknowledging that many buildings undergo renovations that maintain their market value. On average, the replacement values per structure appear reasonable, varying from roughly $85,000 per building in the Lahontan region to $245,000 in the Bay Area, and averaging around $160,000 to $170,000 statewide. It is also worth noting that buildings are not usually destroyed by flooding (often, only the ground floor requires repairs), so the replacement values may overstate the repair costs to structures from flooding. The estimated replacement value for contents seems high, with an average of $105,000 per building.

[20] The land use restrictions are tied to community eligibility for the National Flood Insurance Program. Local governments (cities and counties) must abide by certain restrictions when authorizing new construction in floodplains in order for local residents to be eligible for flood insurance. The restrictions typically require new construction within 100-year floodplains to provide onsite mitigation (e.g., building on stilts or with no living space at ground level), which can be quite costly.

[21] This requirement was introduced in Senate Bill 5 as part of a 2007 legislative package focusing on flood policy and became effective with the adoption of the Central Valley Flood Protection Plan in 2012.

For our calculations of the benefits of flood investments, described below, we instead use 20 percent of the value of the structure as an estimate of exposed contents, a ratio similar to that used in private policies for multihazard insurance and content coverage in flood insurance premiums by California residents.[22]

TABLE B6
Replacement value of buildings and contents and potential crop losses in exposed flood plains ($ billions, 2010 $)

	100-yr	500-yr	Total
Buildings	81.8	351.1	432.9
Contents [a/]	55.0	226.7	281.7
Crops	5.4	7.4	12.8

SOURCE: Department of Water Resources and U.S. Army Corps of Engineers (2013)

NOTE: [a/] As described in the text, we use an alternative estimate of content replacement value (20% of the value of buildings) in our calculations of the benefits of flood protection investments.

Estimated Capital Needs

Table B7 presents estimates of investment needs to reduce flood exposure in California; the estimates are from the DWR and USACE report (2013), with several updates and adjustments. The report provides estimates from several sources, including (i) the Army Corps of Engineers (for projects that have gone through enough screening to potentially qualify for federal cost shares); (ii) the Central Valley Flood Protection Plan (CVFPP)—a planning effort focused on flood protection needs for the Sacramento and San Joaquin River regions for the federally authorized flood control project in that region; (iii) Delta levees not included in that effort; and (iv) other local projects. We augmented the total for USACE-approved projects with the cost of the Corps' preferred strategy for restoration of the Los Angeles River ($456 million), which was approved after the *California's Flood Future* draft was issued. We substituted the report's estimates for Delta levee investments, which were based on the Delta Risk Management Strategy (DRMS)—an effort focused on the reliability of water supply exports through the Delta rather than local flood risks—with estimates for upgrading "non-project" levees, based on upgrade costs from the Delta Protection Commission's *Economic Sustainability Plan* (2012).[23] Summing all these cost components, the lower bound estimate, including only projects for which cost estimates already exist, is over $34 billion.

[22] In 2006, California flood insurance holders took out content insurance valued at 16 percent of the value of covered structures (authors' calculations using detailed information from the National Flood Insurance Program).

[23] The DRMS study was primarily concerned with risks to the state's water supplies from Delta levee failures, and the upper range of cost estimates ($17 billion) includes the costs of building new water supply conveyance for Delta exports. This is more properly viewed as a water supply reliability investment, and discussed as such in the main report.

TABLE B7
Statewide flood investment needs ($ millions, 2011 $)

Source	$
USACE-approved projects ($2010) [a/]	7,499
Local projects ($2010) [b/]	11,106
CVFPP projects ($2011)[c/]	13,919–16,912
Delta levees ($2012) [d/]	1,630–2,444
Total	**34,154–37,961**

SOURCES: Department of Water Resources and U.S. Army Corps of Engineers (2013), Department of Water Resources (2012), and authors' calculations using information from the Delta Protection Commission (2012).

NOTES:

a/. The USACE projects include the total project cost as USACE submitted them for funding appropriations from Congress; they have undergone a cost-benefit analysis and have a "Chief's Report." Cost estimates include only the portion of projects that have been approved through this process (I.e., they may only include the planning phase or first phase of some larger projects). We included the USACE preferred strategy ($456 million) for Los Angeles River restoration, which became available after the *California's Flood Future* report was issued.

b/ These projects were submitted to DWR by the counties and may have been submitted to USACE and rejected or still pending approval for federal funding.

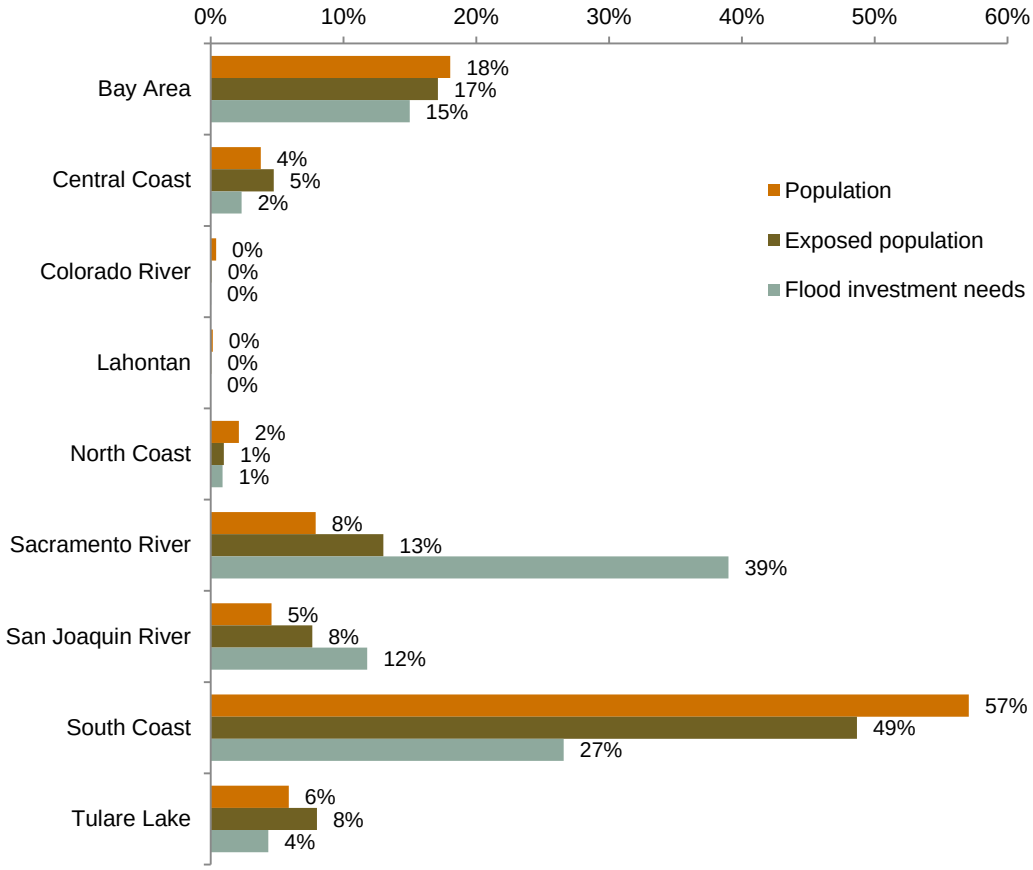
c/ The CVFPP cost estimates are comprised of four categories: (1) urban improvements achieving 200-year protection; (2) rural and agricultural improvements addressing hazard factors for non-urban levees and providing 100-year protection for small communities; (3) residual risk management, including enhanced flood emergency response, enhanced operations and maintenance, and floodplain management; and (4) system improvements such as flood corridor expansion, including bypasses and levee setbacks (Department of Water Resources 2012, Table 3–5)

d/ This range includes $2 million to $3 million per levee mile to upgrade "non-project" levees (i.e., levees not covered under the federally authorized flood protection project for the Sacramento and San Joaquin River regions, which are covered under the CVFPP).

Figure B2 shows how hydrologic regions compare in terms of overall population (orange bar), population exposed to flood risk (100- and 500-year floodplains – brown bar), and estimated flood investment needs (light blue bar).[24] The South Coast (which here includes Riverside San Bernardino, Ventura, Los Angeles, Orange, and San Diego Counties) has the highest share of exposed population (49%), although this is lower than its share of population (57%). Regions with higher than proportional exposed populations include the Sacramento River, San Joaquin River, Tulare Lake, and the Central Coast. The first two of these also have a disproportionately high share of flood investment needs, relative to both their total populations and their populations living in the floodplain.

[24] We calculated flood investment needs by hydrologic region and by county. The *California's Flood Future* report provided estimates of Army Corps-approved projects and local projects at the county level. For the CVFPP projects, we determined a rough approximation of county-level costs by apportioning project costs from the six sub-regions—Feather River, Upper and Middle Sacramento River, Lower Sacramento River/Delta North, Lower San Joaquin River/Delta South, Middle San Joaquin River, and Upper San Joaquin River—to each county in proportion to county area within the sub-region. Delta levee costs were apportioned by assigning a county to each reclamation district and summing the miles of non-project levees and costs per Delta county.

FIGURE B2
How regions compare on some key flood metrics



SOURCE: Authors' calculations using information from the *California's Flood Future* report, modified as described in the text.

NOTE: Hydrologic region data include entire counties, with counties assigned to the region where most of their population resides. See Appendix D for a list of county assignments.

Flood Protection Spending Gaps

Taking the lower estimate of flood investment needs ($34.2 billion) and assuming that investments are spread over 25 years, California would need to make annual investments of nearly $1.4 billion toward flood protection, more than twice the combined recent investment spending of local, state, and federal agencies of $632 million (Table B8).[25] The gap is actually larger because most state spending on flood protection is now funded by state general obligation bonds that will soon be depleted. To fill the investment gap and replace current state spending on flood protection, California needs to raise over $1 billion dollars of new funds a year. This total assumes that these new investments would not increase operational expenses beyond their current levels (a reasonable assumption, in that the investments would result in a better system with a similar overall footprint) and that federal contributions remain constant (an optimistic assumption). In this scenario, annual capital spending would more than double (+116%) and total flood spending would increase by 43 percent.

[25] This level of spending is also consistent with an annualized rate of capital spending at a 4 percent discount rate.

TABLE B8
Current (2011) flood expenditures and future investment needs ($ millions, 2012$)

	Operating	Capital	Total
Current flood protection expenditures (2011)	**1,069**	**632**	**1,701**
Locally-sourced flood spending [a/]	840	283	1,123
State flood spending (DWR) [b/]	179	178	357
Federal flood spending (USACE)	50	171	221
Future spending needs and gap			
Annual investment need [c/]		1,366	1,366
Additional revenue needed (gap) [d/]		1,083	1,083
Future annual spending [e/]	1,069	1,366	2,435
Increase over current spending (%)		116	43
NFIP insurance premiums (2011)	212		212

SOURCE: Authors' calculations, using information from Tables B1, B7, and other sources as noted.

NOTES: Expenditures are for fiscal year 2011 and are slightly lower than the average expenditures reported in Table B1 for 2008–2011. Expenditures are converted to 2012 dollars using the construction cost index in the Engineering News-Record.

a/ This total includes flood expenditures from local sources, netting out state and federal funds. Local capital spending includes some interest payment ($63M) on debt (SCO).

b/ Includes $72M in local assistance ($33M for operations and $39M in capital funding). Excludes state debt service on General Obligation bonds (governor's budget).

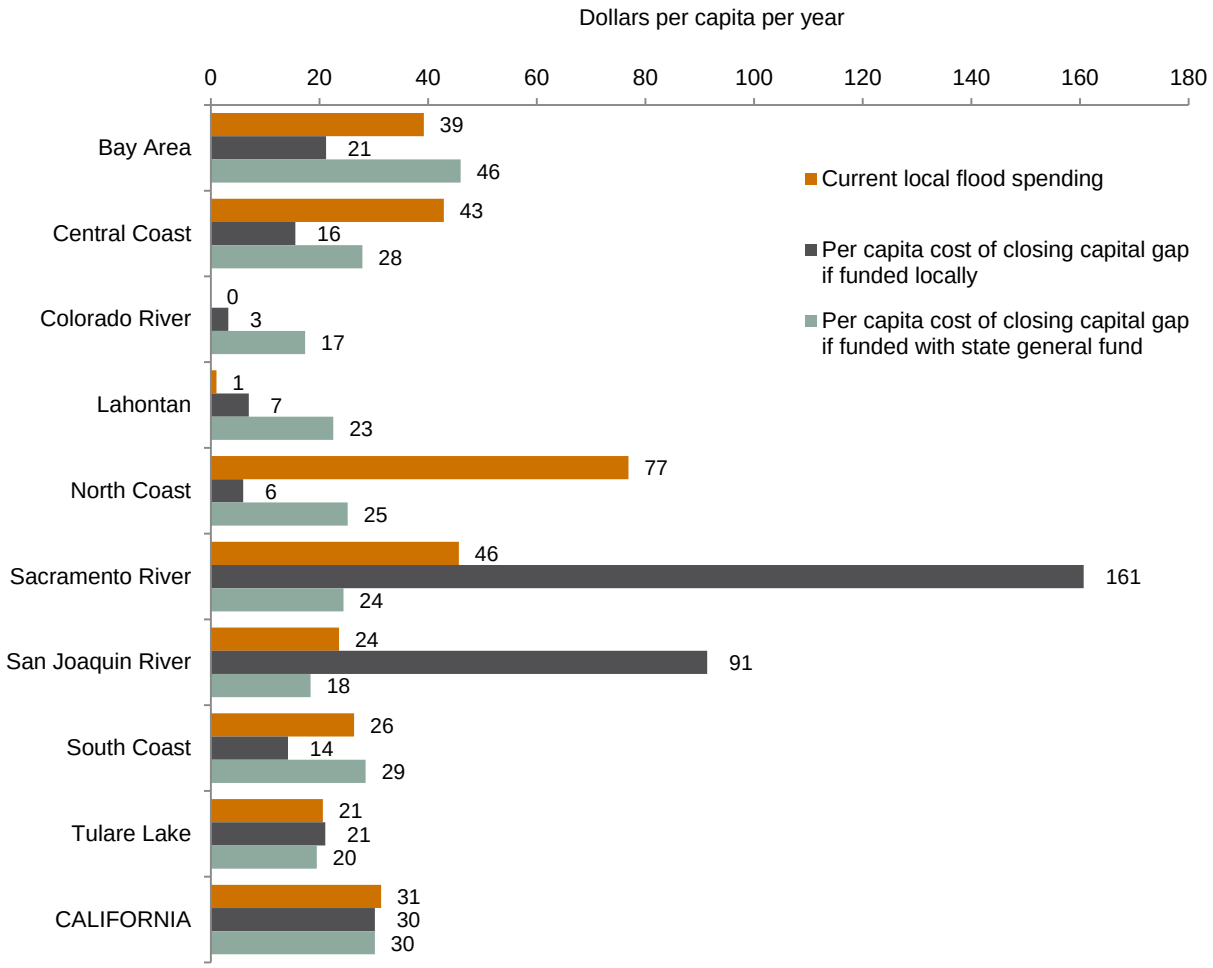
c/ Capital need from Table B7 (low estimate), assuming spending over 25 years (or annualized costs in perpetuity at 4%).

d/ This total is the annual investment need minus current local capital spending. Since federal capital spending roughly equals state operational spending, this is equivalent to assuming that current local and federal spending will be maintained but that all state spending will require a new funding source.

e/ This total is the current annual operating expenditures plus the estimated annual capital need.

Statewide, filling this gap would mean doubling the sums currently spent by local residents on flood management. This may not seem large, on average: In 2011, Californians spent $31 per person (see top bar for "CALIFORNIA" at the bottom of Figure B3), and it would cost another $30 per person per year to fill this gap (middle and bottom "CALIFORNIA" bars in same figure). But as the figure also shows, estimated needs vary greatly by region, implying much larger burdens in some regions if the funds had to be raised locally rather than through state general fund taxes. To see this, compare the middle bars showing additional costs to regional residents if the gap is funded with local taxes and fees to the bottom bars showing additional costs to residents if the gap is instead paid for by state general fund taxes. If only local funding is available, additional per capita costs would be especially high in the Sacramento and San Joaquin River regions, which together account for half of the total estimated needs. If state general fund taxes are available, residents in coastal areas, and especially the San Francisco Bay Area, would pay a much higher share of the costs because the state's general fund relies heavily on progressive income taxes, and incomes are generally higher in the coastal regions (see discussion in main report and Appendix D).

FIGURE B3
Costs to local residents could vary widely, depending on whether the flood funding gap were paid for with local fees and taxes or state general fund taxes



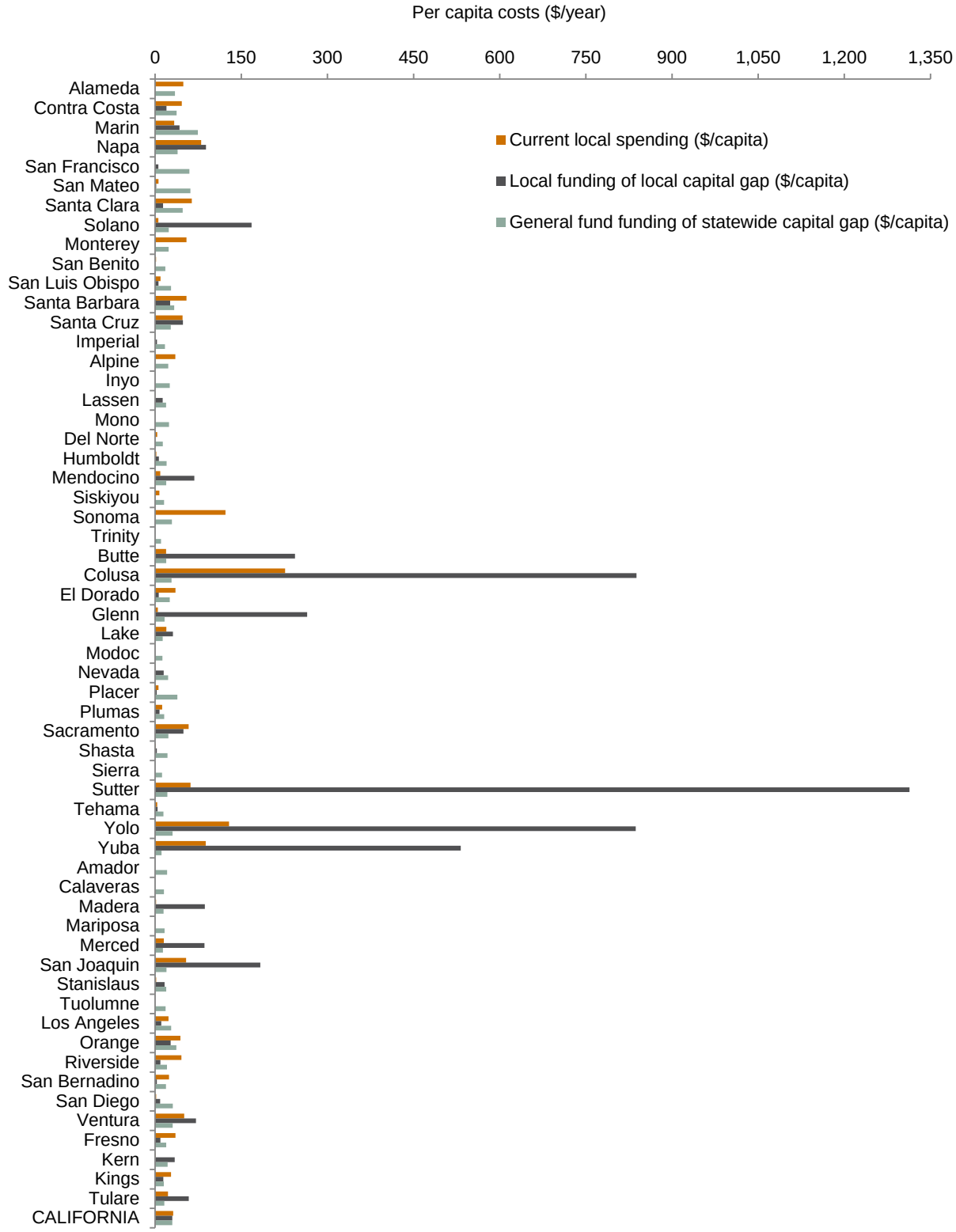
SOURCE: Authors' calculations; Appendix D (regional contributions to the general fund).

NOTE: Current local spending includes locally-generated flood protection expenditures (see Table B8). The capital gap is calculated as in Table B8. Population estimates are for 2005 (35.8 million statewide).

Figure B4 displays this same information at the county level (with counties grouped by hydrologic region). For some of the more rural counties in the Sacramento River region (Colusa, Sutter, Yuba, Yolo), the per capita costs of locally funding the new investments would be particularly high.[26]

[26] Although the county-level distribution of costs is approximate within this region, a different distribution across counties would not fundamentally change the distribution of costs among the counties.

FIGURE B4
For some rural counties, locally funding the investment gap would result in very high per capita costs



SOURCE: Authors' calculations.

NOTE: See notes to Figure B4.

Estimated Value of Flood Protection Investments

Given the magnitude of the potential spending gap, California must consider whether the new investments are "worth it" in the sense of providing benefits at least as large as the costs. Among the investment needs estimates shown here, only those from the USACE-approved projects have undergone a systematic cost-benefit analysis. As the *California's Flood Future* report notes, California should be considering the value of flood expenditures in a risk-based framework, which considers the expected benefits of added protection relative to the costs.

Figure B5 presents a rough estimate of the expected benefits of new flood protection by region and statewide in terms of reduced risk of private losses of buildings and contents (top bar) and compares this with two measures of spending: (i) current local flood control and flood insurance spending (middle bar); and (ii) total spending, including current spending and additional sums, needed to fill the investment gap (bottom bar). The value of protection is calculated as the expected losses from flooding (using property and content values), with an average 1/70 annual probability of loss for all properties in the 100-year floodplain and an average 1/200 annual probability of loss for all properties in the 500-year floodplain.[27] These estimates likely overstate the value of protection for private structures and content because they assume that flooding would entirely destroy this property and that flood investments would remove all residual risk (i.e., that the areas would no longer be exposed to any appreciable likelihood of flooding). On the other hand, they may understate these benefits somewhat insofar as the new investments protect against flood events of smaller magnitude as well as the 1/70 and 1/200 year events assumed here.[28]

All three measures are expressed in terms of costs per exposed population (those living in the 100- and 500-year floodplains), on the assumption that this population would be most directly affected by property loss and would be the population targeted in any benefit assessment financing structure (as opposed to more general local funding through parcel or sales taxes).[29] The numbers would be smaller, but the ratios similarly positive or negative, if we scaled by the total population.

Statewide, the higher level of annual spending required to cover current and new investments appears (marginally) worth it: $263 per exposed resident versus $381 in expected losses for buildings and contents (see the CALIFORNIA bars at the bottom of Figure B5). In the North Coast, current spending already exceeds the value of flood protection spending for protecting property. In the Sacramento River region, the costs of filling the investment gap will exceed the value of protection. In the San Joaquin River region, the investment effort would essentially be a wash. Of course, there are other reasons to provide additional flood protection, including protection of public infrastructure, prevention of business interruption, and of course the prevention of physical harm to residents. Moreover, many of the investment projects would provide greater ecosystem benefits than current flood protection structures (or even reverse the negative environmental effects of some current infrastructure).[30] Some of these more eco-friendly projects might also provide the system with more flexible capacity to cope with the increased hydrologic variability anticipated with climate change. Thus, the overall value of this level of flood protection may be higher than suggested by our analysis. However, many of these

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[27] This is probably a conservative estimate of the probability of flooding in the 100-year floodplain, and likely a fairly accurate estimate in the 500-year floodplain (personal communication with PPIC senior fellow Jeffrey Mount, September 2013).The calculation is as follows: Expected benefits of new protection = 1/70*property values in 100-year floodplain + 1/200*property values in 500-year floodplain.

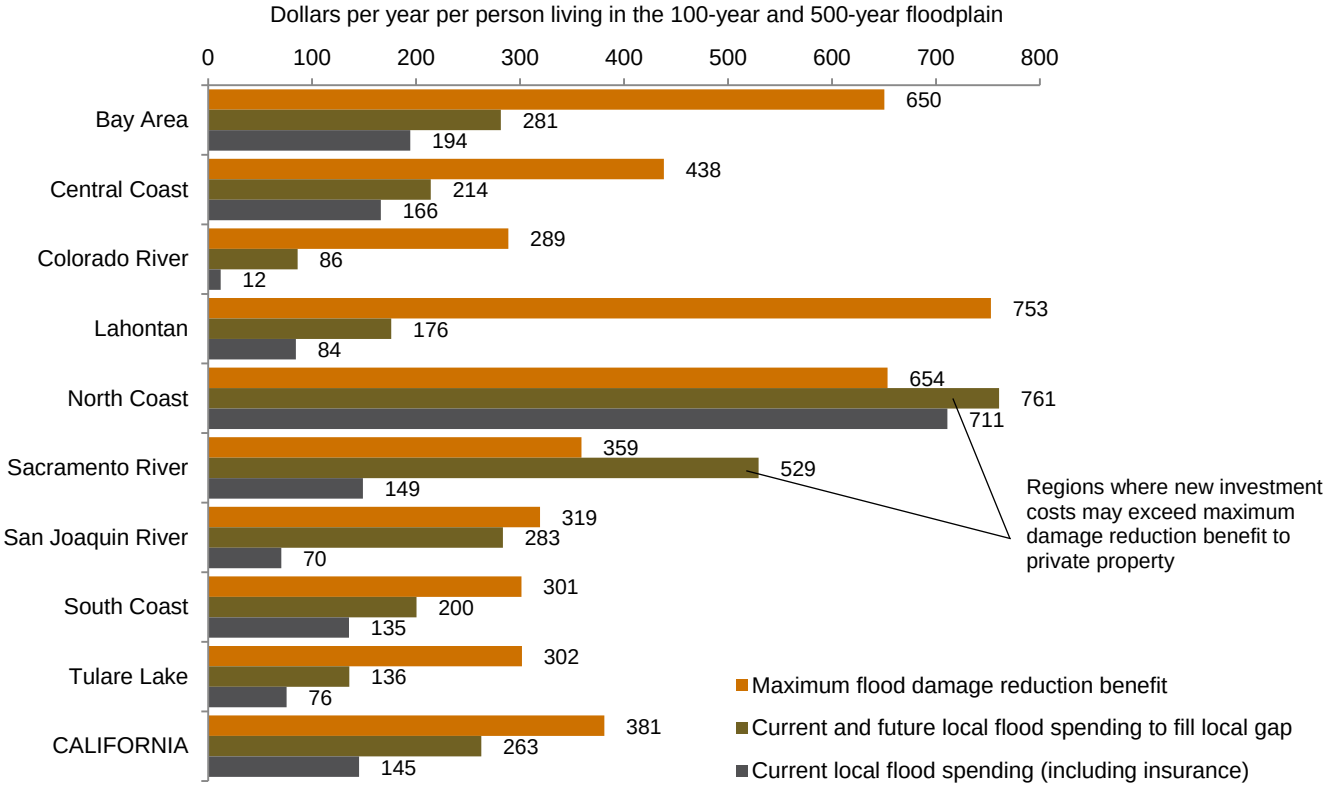
[28] The total benefit is the sum of avoided losses for all events up to the level of protection provided by the flood control investments. Our estimates thus capture the largest portion of the benefit (for structures and content) but not the entire benefit.

[29] See the discussion in the main report and Appendix A on the legal requirements for these local funding options.

[30] One example is using setback levees (i.e., levees "set back" some distance from the river's edge) that can provide better flood protection while improving riparian habitat. Based on project descriptions, we estimate that between 20 and 30 percent of the total costs of the USACE-approved and local projects shown in Table B8 were intended for projects with multiple benefits in addition to flood protection, including ecosystem enhancements and recreation. In the case of the CVFPP, between 2 and 11 percent of the total costs shown could contribute to ecosystem restoration.

benefits also accrue to the broader population at the county, regional, or statewide level, and other investors besides the exposed population will likely need to play a major funding role.

FIGURE B5
The ratio of additional investments in flood protection to the benefits for local floodplain residents vary dramatically across regions

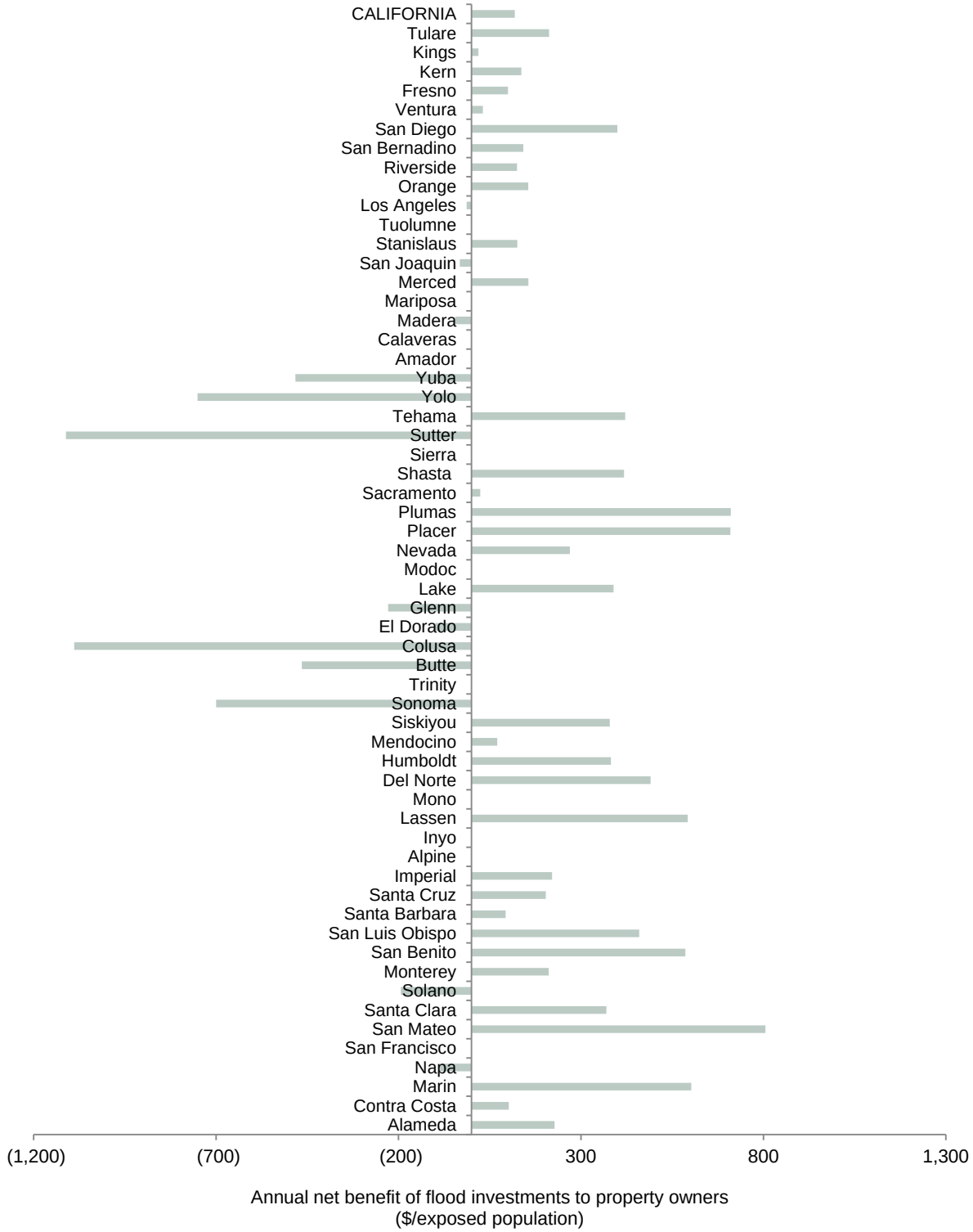


SOURCE: Authors' calculations.

NOTE: See text for a description of methods and data.

Figure B6 presents the same information on a county basis, summarized as the value of protecting buildings and contents minus the costs (current spending + new investments) per exposed resident. There are big deficits in some counties, especially in Sonoma (where current spending is already higher than expected private losses), as well as in many Sacramento River region counties and the other Delta counties (Contra Costa, San Joaquin, and Solano). These calculations—rough as they are—underscore the importance of doing a detailed risk-based analysis of proposed investments, especially given the size of the potential funding gap facing the state.

FIGURE B6
For some counties, new flood investments would cost far more than the benefits that would accrue to private property owners



SOURCE: Authors' calculations.

Aquatic Ecosystems

Although it is well-recognized that many of California's aquatic, riparian, and wetland species are under stress,[31] there are no global estimates of the potential financial costs of improving aquatic ecosystem outcomes in the state. Table B9 presents cost information gathered from multiple sources. The annual cost figures assume that the total costs are spread out evenly over the lifetime of the projects—often for as long as 50 years. Costs would be higher if the investments were front-loaded.

TABLE B9
Ecosystem investment needs ($ millions, 2012$)

Ecosystem investment efforts	Ecosystem/species covered	Estimate of total cost	Annual cost [a/] (low estimate)	Annual cost [a/] (high estimate)
Recovery Plans [b/]				
–NMFS Recovery Plans	Central Valley salmonids	10,207	204	204
	Coastal salmon and steelhead	7,360	182	207
–USFWS Recovery Plans	Various freshwater species (non-Delta)	2,589	52	54
	Tidal marsh ecosystems (including San Francisco Bay and coast)	1,242	25	25
	Santa Ana sucker	In development		
NCCPS/ HCPs				
Approved plans	Seven approved plans covering 3.8 million acres	3,980	75	80
Bay Delta Conservation Plan [c/]	Sacramento-San Joaquin Delta	6,933	139	139
Other pending plans	14 plans covering 30 million acres			
Other Efforts				
	Klamath River dam removal [d/]	200	8	10
	Southern California Wetlands	485	10	16
	Migratory Birds in Central Valley	470	9	16
	- non Delta components only	*375*	7	12
Total		33,466	703	750
Total unfunded (excluding funded NCCPs) [e/]		29,486	629	671
Total unfunded (excluding Delta overlap and funded NCCPs) [f/]		22,458	488	529

SOURCES: Authors' calculations using information from various federal and state agencies.

NOTES: Costs of older projects are converted to 2012 dollars using the consumer price index (CPI-U).

a/ Annualized costs are calculated as an equal share of total costs divided by the number of years the program is expected to be in operation. The range between low and high costs sometimes reflects a range of potential duration rather than a range of total costs.
b/ Totals include low-end costs for NMFS projects; USFWS has had only five costed plans since 2004 (earlier plans have generally expired).
c/ This number includes total cost for "Natural Community and Restoration Measures" and "Multiple Stressor Measures" but excludes costs of administration and monitoring.
d/ This number includes the California public's share of the expected costs; other costs would be borne by power customers located primarily in Oregon.
e/ Funded NCCPs are the seven approved and costed plans listed earlier in the table.
f/ Delta overlap is calculated assuming that the NFMS Central Valley salmonids recovery plan and the Delta components of the Central Valley Migratory Birds program overlap entirely with the BDCP, which likely overstates their substitutability.

[31] For details on the condition of native fish species, see Moyle et al. 2011 and 2013.

Recovery Plans for Listed Species

As the name suggests, these plans—prepared by federal wildlife agencies—identify a suite of actions to promote recovery of species listed as threatened or endangered under the Endangered Species Act. These plans sometimes attribute costs to actions outlined in the plans, although they do not necessarily reflect the most cost-effective ways to achieve their goals, and they do not come with detailed funding or implementation plans. For our analysis of cost estimates, we reviewed recovery plans focusing on aquatic species and ecosystems with aquatic habitat. Different agencies are responsible for developing the plans, depending on the species involved. For example, NMFS creates plans relating to anadromous fish species (in addition to species that spend their entire lives in the ocean) while USFWS creates the plans for freshwater aquatic species (in addition to terrestrial species). Some recovery plans focus on individual species, while others may look at regions or ecosystems. For example, a recent USFWS recovery plan focuses on northern and central California tidal marsh habitats along the coast and in the San Francisco Bay. The NMFS plans are generally more recent and cover a large part of the state (reflecting the habitat range for migratory salmon and steelhead trout, see Figure B7); some of the USFWS plans are dated (for instance, the recovery plan for Delta fish species was drafted in the early 1990s and anticipated to be completed within five years).

Total annual implementation costs of the available plans are in the range of $460 million to $490 million (Table B9).[32] Although this estimate covers many of California's endangered native fish species (and especially salmon and steelhead trout), as well as some other species dependent on tidal marshes, it does not include all of the state's endangered fish, most notably the Santa Ana sucker, for which the plan is still in development. Some of the NMFS recovery plans include overlapping activities with other planning processes, including restoration efforts in the Delta (described below), as well as some of the flood protection investments noted earlier.

[32] This estimate excludes USFWS plans developed before 2004, which generally had much lower cost estimates and shorter implementation time frames.

FIGURE B7
Geographic scope of NMFS recovery planning efforts for anadromous fish

SOURCE: Central California Coast Coho Salmon Evolutionarily Significant Unit Recovery Plan (2012).

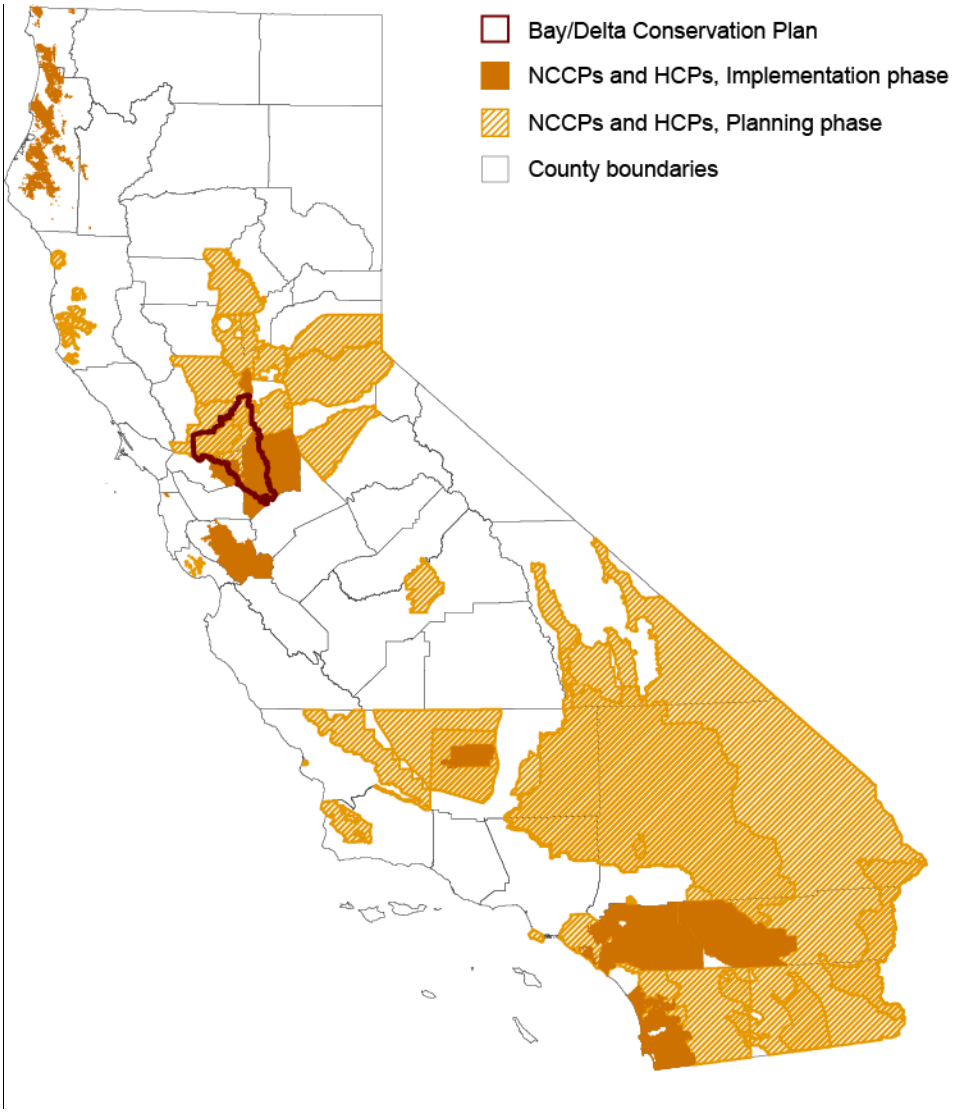
NOTE: Table B11 provides cost estimates from the recovery plans displayed here. NMFS is also known as NOAA Fisheries.

State and Federal Habitat Conservation Plans

These plans, known in California as "natural community conservation plans" (NCCPs), promote the recovery of species in conjunction with the permitting of an economic activity that otherwise compromises listed species. Unlike the NMFS and USFWS recovery plans, these plans are designed with the objective of full implementation. There are currently 23 NCCPs being planned or implemented in California, covering more than 35 million acres in the state (Figure B8).[33] Nine of these plans are already approved and under way. Cost estimates were available for seven of these plans, with combined annual costs of about $75 million. The approved plans have focused on land acquisition and terrestrial species but also involve some aquatic or wetland components. Costs vary greatly across plans. Some include specifics on activities that can be implemented immediately (e.g., large-scale land acquisition), while others only provide cost estimates for annual operation and management. Developer fees and other local resources provide most of the funding.

[33] The Desert Renewable Energy Conservation Plan, still in its planning phase, covers the majority of these acres with a planning area of 23.4 million acres.

FIGURE B8
California's regional conservation plans (NCCPs and HCPs)



SOURCE: California Department of Fish and Wildlife (www.dfg.ca.gov/habcon/nccp/)

NOTE: Areas shaded in gray are HCPs but not NCCPs. Plans designated with yellow circles are in the implementation phase, and plans with white circles are in the planning stage.

Fourteen NCCPs, covering over 30 million acres, are still in development, and most do not yet include cost information. One major exception is the Bay Delta Conservation Plan, which foresees $6.9 billion in ecosystem expenses over a 50-year time frame. The BDCP focuses on many listed aquatic species as well as some terrestrial species. Project planners are assuming that most of the costs will be paid for by the general public, but this funding is not yet secured. If costs are spread out evenly over the full 50-year time frame, annual expenditures would be about $140 million a year; frontloading these costs, as is currently being discussed, would increase annual spending by about a third.[34]

[34] In BDCP's administrative review draft, annual costs are assumed to be roughly 50 percent higher in years 1-15 than in years 16-50. Using these methods, and including only the costs for habitat restoration and other stressor conservation measures (i.e., excluding the costs of monitoring, research, and program administration) they estimate annual costs of closer to $190 million /year. For details, see Tables 8-37 and 8-38 in the administrative review draft (Bay Delta Conservation Plan 2013).

Other Restoration Projects

The above estimates do not include the costs of all regulatory programs under consideration. For instance, dam removal on the Klamath River is being pursued to comply with the requirements of the Federal Energy Regulatory Commission to improve fish passage in that watershed, and the current agreement expects California taxpayers to supply $200 million (or roughly $10 million per year) to fund California's share of the costs.[35] There are also some non-regulatory programs that benefit aquatic species, including the Southern California wetlands recovery project and the Central Valley Joint Venture for migratory birds. Together, these programs have annualized costs of about $20 million to $30 million per year. Some of the migratory birds program activities have begun with grant support, but neither program is stably funded. Other potential programs for which costs are not available include upper watershed management in the Northern Sierras—e.g., forest clearing for fire management to generate both species and water quality benefits. Across California, there are other examples of efforts for ecosystem restoration by state agencies and NGOs. One example is the restoration on the Los Angeles River, which is included in our estimates of flood protection investment needs in the preceding section.

Taken together, these plans suggest a range from about $490 to $670 million annually for aquatic ecosystem investments that currently lack a funding source, depending on the degree of overlap among plans that address the Delta watershed (compare the last two rows in Table B9). About half of the total cost is for the Delta and the greater Sacramento-San Joaquin watershed, and about half for coastal ecosystems. There is likely some additional overlap between the flood investments described above (e.g., for floodplain habitat in the Central Valley),[36] and there may also be ways to reduce the costs of these efforts without losing their core effectiveness. For instance, there are questions about whether the vast habitat expansions planned as part of the BDCP will have enough environmental payoff to warrant the expense (Mount et al. 2013); similar questions are being posed about the ecological value of removing some upstream dams as part of the Central Valley salmonid recovery plan.[37] But these cost estimates are also missing key pieces that are likely to be important for water management in some regions, such as a recovery plan for the endangered Santa Ana sucker and restoration of the Salton Sea.[38] Additionally, many of the plans included in these estimates rely heavily on habitat restoration, without much attention to the mitigation of other environmental stressors such as water quality and invasive species that could further increase costs, particularly under a changing climate.

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[35] Dam removal efforts on the Klamath River are mentioned as beneficial to salmon in the NMFS recovery plan for that area, but they are not included in the plan's costs estimates.

[36] Many of the state's preferred choices in the CVFPP focus on more expensive projects (including some in the higher cost range not included in our calculations) because they provide ecosystem benefits and more resiliency.

[37] Englebright Dam, for example, has been considered for removal, but the benefit to the status of existing salmonid populations is not clear due to already high concentrations of fine sediment in the Yuba River and the large volume of mercury-tainted sediment that would be released upon the dam's removal. The benefit could be greatly increased if a viable method is found to deal with the mercury-laden sediment stored in the reservoir prior to dam removal and if releases from upstream dams can be adjusted to benefit the restored salmonid populations (Personal communication with Rebecca Quinones, UC Davis Center for Watershed Sciences, October 2013).

[38] The Salton Sea is a terminal saline lake that relies primarily on agricultural drainage water for replenishment. The state's most recent plan for the Salton Sea (California Resources Agency 2007) projects the cost of restoration efforts to be as high as $9 billion to address the combined effects of higher salinity (which will make the Sea unable to support aquatic life and the migratory birds that depend on it) and reduced area (which will cause major air quality problems in the region). It might be more cost-effective and environmentally beneficial to address the first issue by rewatering parts of the Colorado River delta.

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Paying for Water in California

Technical Appendix C:
State General Obligation Bond Spending on Water

Contents

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with research support from Emma Freeman and Elizabeth Stryjewski

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Summary

Over the past several decades, California has been using general obligation (GO) bonds to support its water-related activities. Total bond authorizations rose significantly in the 2000s. To better understand the role GO bonds have played in addressing funding gaps in the water sector and the role they could continue to play, we quantified how recent bond funds are being spent across the state to improve California's water sector. This appendix discusses the methods and results of this spending analysis. For more detail on the projects awarded funds from the four most recent water bonds, please see the online data set State General Obligation Bond Spending on Water.

Introduction

Over the past several decades, California has been using general obligation (GO) bonds to support its water-related activities. Between 1970 and 2006, voters approved more than 20 "water bonds," authorizing a total of over $36 billion (2012 $) in spending (Table C1).

The six "water" bonds passed in the 2000's authorized nearly $20 billion (nominal dollars) to be spent on various activities. While this total includes significant funding for the water sector, some bonds also contained funding for other natural resource management purposes, primarily parks. The process of building and passing a bond includes identifying what types of projects the money should be spent on, and often who will be in charge of spending or disbursing the funds. Using the original bond language, we categorized how the funds were intended to be spent, either by using the specific authorization language or by identifying the agency in charge of the funds (Table C2). (If the authorization language named several functions, we split the funding amount among these evenly.) Over one-fifth (22%) of the $20 billion dollars was authorized to be spent on parks and public access and other functions, leaving a total of $15.3 billion for water-related purposes (Figure C1).

TABLE C1
State general obligation bonds for water, 1970–2013

Year	Bond title	Amount authorized ($ millions)		Pass rate (%)
		Current $	2012 $	
1970	Clean Water Bond Law of 1970 (Proposition 1)	250	1,685	65.4
1974	Clean Water Bond Law of 1974 (Proposition 2)	250	1,152	70.5
1976	California Safe Drinking Water Bond Law of 1976 (Proposition 3)	175	678	62.6
1978	Clean Water and Water Conservation Bond Law of 1978 (Proposition 2)	375	1,257	53.5
1982	Lake Tahoe Acquisitions Bond Act (Proposition 4)	85	207	52.9
1984	California Safe Drinking Water Bond Law of 1984 (Proposition 2)	75	168	72.9
1984	Clean Water Bond Law of 1984 (Proposition 28)	325	729	73.5
1984	Fish and Wildlife Habitat Enhancement Act of 1984 (Proposition 19)	85	191	64.0
1986	Water Conservation and Water Quality Bond Law of 1986 (Proposition 44)	150	334	74.1
1986	California Safe Drinking Water Bond Law of 1986 (Proposition 55)	100	217	78.7
1988	California Safe Drinking Water Bond Law of 1988 (Proposition 8)	75	154	71.7
1988	California Wildlife, Coastal, and Park Land Conservation Act (Proposition 70)	776	1,598	65.2
1988	Water Conservation Bond Law of 1988 (Proposition 82)	60	124	62.4
1988	Clean Water and Water Reclamation Bond Law of 1988 (Proposition 83)	65	134	64.4
1996	Safe, Clean, Reliable Water Supply Act (Proposition 204)	995	1,648	62.9
2000	Safe Drinking Water, Clean Water, Watershed Protection, and Flood Protection Act (Proposition 13)	1,970	2,947	64.8
2000	Safe Neighborhood Parks, Clean Water, Clean Air, and Coastal Protection Bond Act of 2000 (Proposition 12)	2,100	3,142	63.2
2002	California Clean Water, Clean Air, Safe Neighborhood Parks, and Coastal Protection Act of 2002 (Proposition 40)	2,600	3,701	56.9
2002	Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002 (Proposition 50)	3,440	4,897	55.4
2006	Disaster Preparedness and Flood Protection Bond Act of 2006 (Proposition 1E)	4,090	4,911	64.0
2006	Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006 (Proposition 84)	5,388	6,470	53.8
	Total	**23,429**	**36,347**	

SOURCE: Hanak et al. (2011), Table 2.9.

NOTE: To allow comparisons across decades, nominal values were converted to 2012 dollars using the Engineering News Record Construction Cost Index for the year the bond was approved by voters. Because bond spending typically extends over five or more years, the 2012$ totals somewhat overstate the real value of spending. During this period, voters rejected one water supply-oriented bond for $380 million ($747 million in 2012 $) in November 1990.

TABLE C2
Authorized bond funds by intended function, since 2000 ($ millions)

Proposition	Year	Total	Ecosystem [b]	Drinking water quality	Flood protection	Integrated management [a]	Parks and public access [b]	Stormwater and runoff [c]	Water supply	Other [d]
84	2006	5,388	1,501	525	800	1,065	1,318	180	0	0
1E	2006	4,090	0	0	3,790	0	0	300	0	0
40	2002	2,600	830	0	0	0	1,420	300	0	50
50	2002	3,440	1,560	485	70	450	120	100	655	0
12	2000	2,100	727	0	0	0	1,374	0	0	0
13	2000	1,970	738	333	270	0	3	190	438	0
TOTAL		**19,588**	**5,355**	**1,343**	**4,930**	**1,515**	**4,234**	**1,070**	**1,093**	**50**
Share of total (%)			**27**	**7**	**25**	**8**	**22**	**5**	**6**	**0.3**

SOURCE: Authors' calculations, using bond act authorization language.

NOTES:

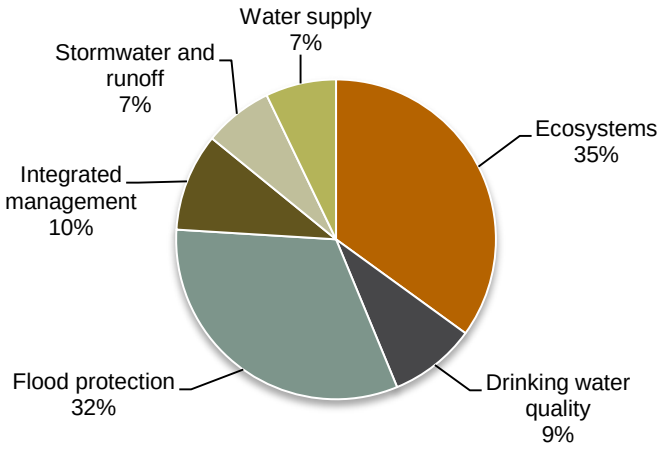
[a] This category is referred to as "integrated regional water management" in the bond language; it includes $65 million for statewide planning under Proposition 84.

[b] Conservation Corps funding was evenly split between ecosystem and parks & public access. Expenditures under the CALFED Bay-Delta program were considered ecosystem expenditures. All conservancy funds were classified under Ecosystem, even though some of the expenditures overlapped with parks. Parkways and watershed authorizations were split between Ecosystem and Parks.

[c] This category includes $300 million in stormwater-focused funding under Proposition 1E that is also considered to be used for integrated regional water management.

[d] "Other" includes funding for air quality improvements.

FIGURE C1
Distribution of authorized bond funds for water-related purposes since 2000



SOURCE: Table C2.

NOTE: The figure shows authorized spending for water-related purposes totaling $15.3 billion in nominal dollars, excluding "Parks and Public Access" and "Other" categories from Table C2.

Awarded Bond Funds

Bonds pass through several stages before actually being spent. When a bond is passed, an initial amount is *authorized* (as shown in Table C2 for the bonds in question). Next, the funds are *appropriated* in the annual state budget and committed to state agencies, either for use in their own programs or for distribution to local agencies or non-profits. Finally, bond funds are actually *awarded* to projects and the dollars are spent on the projects. Table C3 reports the status of spending for the six bonds passed since 2000, as of mid-October 2013. All but $1.4 billion of the $19.6 billion authorized in these bond acts had been appropriated by this time. Information on sums awarded was only available for a portion of the appropriated funds (designated as "Awarded" in Table C3, with the remainder labeled "Not yet accounted for in awards"). This gap reflects several factors: (1) programs that have recently been appropriated funding but have not yet made awards to individual projects, (2) projects that have been awarded funding but have not yet been added to the state's database, and (3) projects that have multiple phases, where the database only includes the dollars from one or two of the phases. Based on estimated total spending on these six bonds from 2001 to 2013 reported in the governor's budgets, we estimate that roughly sixty percent of the funds in the last column ($3.16 billion out of $5.469 billion) were not yet spent as of June 30th, 2013, leaving a total of roughly $4.5 billion unspent ($3.16 billion plus the $1.375 billion not yet appropriated).[1]

TABLE C3
Status of bond spending ($ millions)

Proposition	Year passed	Authorized	Not yet appropriated	Appropriated	Awarded	Not yet accounted for in awards
84	2006	5,388	824	4,564	2,581	1,983
1E	2006	4,090	66	4,024	3,007	1,017
40	2002	2,600	100	2,500	1,964	536
50	2002	3,440	57	3,383	2,001	1,382
12	2000	2,100	1	2,099	1,841	258
13	2000	1,970	327	1,643	1,350	293
Total		**19,588**	**1,375**	**18,213**	**12,744**	**5,469**

SOURCE: Authors' tabulations.

NOTE: Status of bond appropriations and awards as of October 15, 2013. For Propositions 84 and 1E, appropriated values are from the state's bond accountability website (Natural Resource Agencies 2013). Awards data were gathered from state agencies responsible for various bond components. For the earlier bonds, both appropriated and awarded data were assembled from individual state agencies. See text for an explanation of the gap between appropriated values and awards.

To better understand how the bond funds have been spent, we analyzed the $9.6 billion in project-level awards for the four most recent bonds (Propositions 84, 1E, 40, 50) by hydrologic region and function. For more detail on the projects awarded funds from the four most recent water bonds, please see the online data set State General Obligation Bond Spending on Water.

[1] For estimates of total bond spending, see Figure C8 (the calculation represented in the figure assumes that bond spending from 2001-2012 came almost entirely from the six bonds passed since 2000).

Regional Spending Patterns

Hydrologic region was determined using the project location information (when available) or the project name description. Projects lacking location information or with spending in multiple regions or statewide were grouped as "multiple or none." North and South Lahonton were combined into one hydrologic region (Lahontons). More generally, we use "fiscal hydrologic regions," allocating spending in counties that lie within more than one hydrologic region to the region where most of the county population lives (see Figure C2).[2]

FIGURE C2
Overlap of county boundaries with hydrologic regions

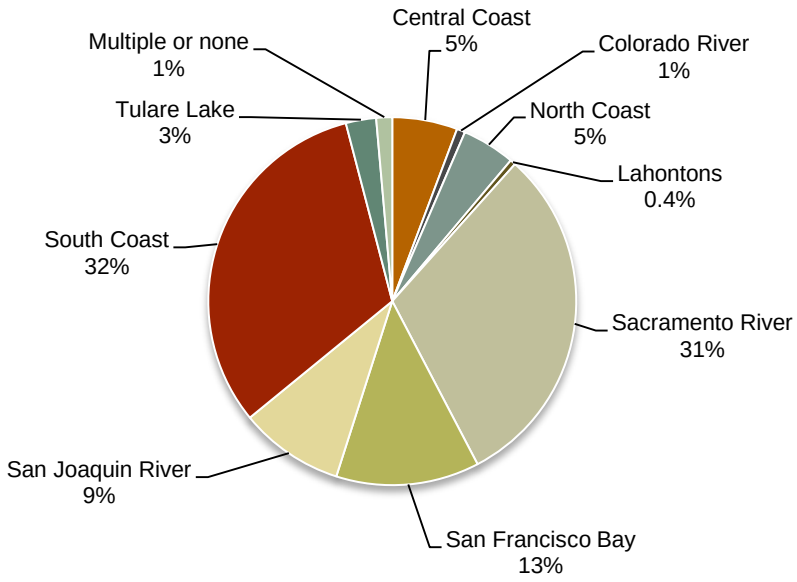
SOURCE: California Department of Water Resources.

NOTES: For a list of county assignments to hydrologic regions, see the methods section of Appendix D. In our calculations, the South Coast includes Riverside and San Bernardino Counties, along with Ventura, Los Angeles, Orange, and San Diego Counties.

[2] Funds awarded to support the Central Valley Flood Protection Plan (CVFPP) development and related efforts were split between the Sacramento River and San Joaquin River regions in proportion to the share of investment needs anticipated for these two regions in the CVFPP (85% for the Sacramento River region and 15% for the San Joaquin River region).

Figure C3 shows the regional breakdown for the $9.6 billion in awarded projects. The South Coast and Sacramento River hydrologic regions each received just under a third of the total, and the San Francisco Bay region received 13 percent, with the rest of the regions each receiving less than ten percent of the total funds awarded.

FIGURE C3
Regional distribution of awarded projects from the four most recent GO bonds



SOURCE: Table C4.

NOTE: The figure shows the distribution of $9.6 billion in awards from Propositions 84, 1E, 40, and 50.

Some bonds have been more regionally focused than others (Table C4). In particular, 67 percent of awards from Proposition 1E—a bond focused on flood protection in the Central Valley—went to the Sacramento River region. Proposition 84's intentions were more geographically varied; the bond language allocated about half of its funds to specific hydrologic regions and watersheds across the state for integrated regional water management (IRWM) and ecosystem-related purposes. Relative to the state's population, the bond awards have tended to be allocated in higher proportion to regions other than the state's two main urbanized areas—the South Coast and the San Francisco Bay Area. The Tulare Lake region and two smaller regions (the Lahontans and Colorado River) also appear to have received less in awards than their share of the state's population, while the Central Coast, the North Coast, the San Joaquin River, and especially the Sacramento River regions have received considerably more funds. As discussed in the main report and Appendix D, the repayment of GO bonds with general fund revenues means that they are funded disproportionately by higher income residents. Given regional disparities in income and spending, this means that San Francisco Bay Area residents, and to a more limited extent South Coast residents, disproportionately pay for GO bonds. This would be true even if the bonds were allocated evenly across regions based on population shares. The regional patterns of awards shown here compound this transfer income from the two coastal regions to the more rural and inland parts of the state.

TABLE C4
Share of population and share of bond funds awarded by hydrologic region

	State population (% of total) [a]	Proposition				Total (four bonds)	
		84 (% of total)	1E (% of total)	40 (% of total)	50 (% of total)	%	$ millions
Central Coast	4	6	0	7	9	5	508
Colorado River	0	1	0	0	2	1	70
Lahontons	0	1	0	0	0	0	40
North Coast	2	7	1	8	5	5	446
Sacramento River	8	15	67	11	16	31	2,927
San Francisco Bay	18	14	9	17	14	13	1,270
San Joaquin River	5	15	10	4	4	9	851
South Coast	57	34	12	46	46	32	3,064
Tulare Lake	6	5	0	4	1	3	254
Multiple or none		2	0	1	2	1	121

SOURCE: Authors' calculations using bond project data provided by the Natural Resources Agency and the Department of Water Resources.

NOTE: For totals awarded by bond, see Table C3.

a/ Population in 2005 as reported in the *California Water Plan Update (Bulletin 160-09)* issued by the California Department of Water Resources (2009); statewide total: 35,834,265. Population shares by hydrologic region are based on fiscal hydrologic regions, which allocate entire populations in counties that lie within more than one hydrologic region to the region where most of the county population lives. See Appendix D for additional details.

Functional Spending Patterns

Using the project-level awarded bond data, we were able to assign each project to a functional category based on the project name, description, and managing entity. The following criteria were used to categorize projects:

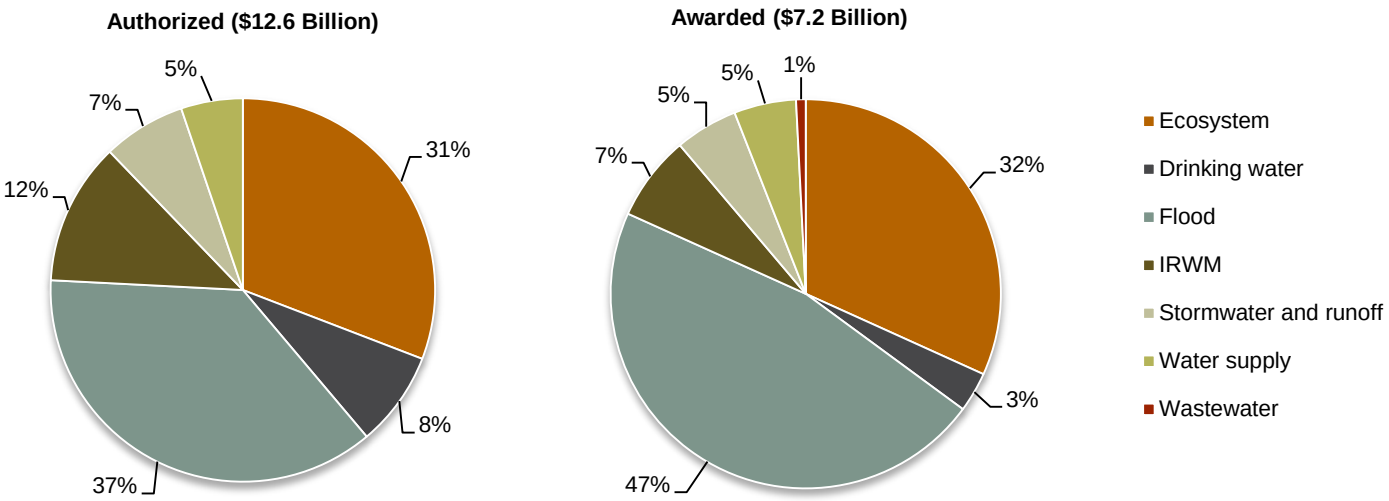
1. **Ecosystems.** Projects that include habitat restoration and conservation (for both terrestrial and aquatic ecosystems and species), watershed planning, forest improvement and management (fuel reduction, prescribed burns, erosion control), and invasive species removal.
   Example: *"The Dutch Slough Tidal Marsh Restoration Project will restore tidal marsh habitats on 1,166 acres of land in the western Delta to provide habitat for native fish species and improve the health of the Delta ecosystem."*
2. **Flood protection.** Projects with the goal of improving flood protection, including levee management, increasing flood capacity of systems, and some multibenefit projects that use ecosystem improvements to increase flood protection. Example: *"The Guadalupe River project consists of approximately 2.6 miles of channel improvements along the Guadalupe River between Interstate Highways 280 and 880 in downtown San Jose. Project provides 100-year flood protection, fish and wildlife mitigation, and recreation features as part of the larger flood protection plan for the entire watershed and the Guadalupe River Park plan being developed by the Santa Clara Valley Water District and the City of San Jose."*
3. **Integrated management.** Projects involving both integrated regional water management (IRWM) planning and project implementation (if the project description did not provide enough information to place it in another category). Example: *"The Central Sierra Resource Conservation and Development, Inc. is the entity ensuring the implementation of 7 components identified in the Inyo-Mono Integrated Regional Water Management Plan."* This category also includes a small amount of spending ($63 million) on statewide planning and operations (notably for the 2009 *California Water Plan Update*).

4. **Parks and public access.** Projects relating to trails, public access, education, camps, urban forestry, state park maintenance, and river parkways. Includes land acquisitions that do not mention habitat benefits or restoration.
5. **Stormwater and runoff.** Projects that focus on stormwater and runoff management for the purpose of improving water quality, including low-impact-development projects, development of permeable surfaces, and management of agriculture runoff and pollution.
6. **Wastewater.** Projects that relate to sewer system improvements and/or expansions.
7. **Drinking water quality.** Projects that focus on drinking water clean-up, mainly related to health code violations. Example: *"Construct treatment plant to remove arsenic from drinking water."*
8. **Water supply.** Projects relating to increasing or maintaining water supply infrastructure (includes aqueducts, pipelines, reservoirs, etc.) as well as groundwater planning[3] and management projects and recycling water projects. Example: "*This is the third phase of the project which will further expand the District's existing non-domestic water system, providing an additional 870 acre-feet per year of recycled water to users and sites within five communities."*
9. **Other or unknown.** Projects that have no description or do not fit into another category, including Sustainable Communities planning to comply with Senate Bill 375[4] (Proposition 84 funds) and transportation and air quality projects (Proposition 40).

The division by function of the total awarded funds from these four bonds is broadly similar to how the funds were originally authorized, with 24 percent being spent on Parks and Public Access (versus 22% authorized), leaving $7.2 billion directly awarded to the water sector (Figure C4). As the figure shows, spending has been somewhat faster for flood protection than the other areas (47% of awarded funds, versus 37% of authorized funds). The spending on IRWM-related projects appears slower than average (7% of awards versus 12% of authorized funds), but this may also reflect the fact that we have categorized some IRWM projects in other functional areas when they appeared to have a specific functional focus.

[3] Proposition 50 explicitly included $50 million for mapping, research, and planning related to groundwater basins.
[4] This law, passed and signed in 2008, requires California's metropolitan planning organizations (responsible for regional transportation planning) to develop plans to reduce greenhouse gas emissions by reducing the amount of passenger vehicle use. "Sustainable Communities Strategies" are the vehicle for considering transportation and land use planning in concert to help achieve this goal (Bedsworth et al. 2011).

FIGURE C4
Functional distribution of the water-related components of the four most recent GO bonds, authorized versus awarded



SOURCE: Authors' calculations based on bond authorization language and project-level data provided by the Natural Resources Agency and the Department of Water Resources.

NOTE: For details, see the online data set State General Obligation Bond Spending on Water.

Project-level data also highlight how the functional focus has varied across individual bonds (Table C5). For example:

- Eighty-three percent of the funding for flood protection projects were awarded from Proposition 1E;
- Seventy percent of the funding for water supply projects were awarded from Proposition 50;
- IRWM planning and implementation is being funded by Propositions 50 and 84;
- Ecosystem projects are being funded by all four recent bonds, but especially Propositions 50 and 84.

Further breakdown of the spending categories by hydrologic region (Table C6) enables a more fine-grained analysis of where the bond funds are heading. Over 20 percent of total funding (including parks and public access projects) has been awarded to ecosystem projects, and 38 percent of that total has gone to the South Coast hydrologic region ($876 million). The South Coast has also received 37 percent of the funding for water supply projects, 34 percent of the funding for IRWM projects, and 49 percent of the funding for stormwater and runoff projects.

TABLE C5
Awarded funds by bond and function, $ millions

Proposition	Total		Ecosystem		Drinking water		Flood protection		Integrated management		Parks and public access		Stormwater and runoff		Wastewater		Water supply		Other	
	$	%	$	%	$	%	$	%	$	%	$	%	$	%	$	%	$	%	$	%
84	2,581	27	705	31	75	31	553	16	209	41	821	36	73	19	13	23	103	28	28	58
1E	3,007	31	106	5	15	6	2,789	83	-	0	-	0	73	20	24	42	-	0	-	0
40	1,964	21	468	20	25	11	1	0	2	0	1,382	60	55	15	3	5	6	2	21	42
50	2,001	21	1,006	44	124	52	13	0	298	58	108	5	174	46	17	30	261	70	-	0
Total	9,553		2,286	24	239	2	3,356	35	510	5	2,311	24	375	4	57	1	370	4	49	1

SOURCE: Authors' calculations using bond project data provided by the Natural Resources Agency and the Department of Water Resources.

NOTE: For details, see the online data set State General Obligation Bond Spending on Water.

TABLE C6
Awarded bond funds by hydrologic region and function, $ millions

	Total		Ecosystem		Drinking water		Flood protection		Integrated management		Parks and public access		Stormwater and runoff		Wastewater		Water supply		Other	
	$	%	$	%	$	%	$	%	$	%	$	%	$	%	$	%	$	%	$	%
Central Coast	508	5	172	8	4	2	19	1	95	19	171	7	33	9	5	9	6	2	3	7
Colorado River	70	1	18	1	0	-	-	-	1	0	8	0	3	1	-	-	40	11	-	-
Lahontons	40	0	16	1	1	1	-	-	3	0	17	1	0	0	1	2	0	0	1	2
North Coast	446	5	267	12	4	1	9	0	3	1	116	5	37	10	5	9	5	1	1	2
Sacramento River	2,927	31	372	16	10	4	2,057	61	101	20	279	12	48	13	8	14	41	11	11	23
San Francisco Bay	1,270	13	330	14	11	5	342	10	63	12	404	17	33	9	25	44	56	15	6	12
San Joaquin River	851	9	158	7	19	8	451	13	9	2	111	5	23	6	0	1	78	21	2	4
South Coast	3,064	32	876	38	149	62	447	13	171	34	1,076	47	184	49	11	20	136	37	12	25
Tulare Lake	254	3	53	2	24	10	14	0	24	5	121	5	4	1	0	1	6	2	8	15
Multiple or none	121	1	23	1	17	7	17	1	40	8	7	0	11	3	0	1	0	0	6	12
Total	**9,553**		**2,286**		**239**		**3,356**		**510**		**2,311**		**375**		**57**		**370**		**49**	

SOURCE: Authors' calculations using bond project data provided by the Natural Resources Agency and the Department of Water Resources.

NOTE: For details, see the online data set State General Obligation Bond Spending on Water.

Table C7 shows the total project count and average project size for water-related bond awards. On average, projects cost slightly less than $2 million each ($1.81 million); regions with smaller populations tended to have smaller projects.

TABLE C7
Water-related funds awarded and project size by hydrologic region

Hydrologic region	Total bond funds awarded ($ millions)	Share of total funds awarded (%)	Share of state population (%)	Project count	Average project size ($ millions)	Relative to state average (%)
Central Coast	334	5	4	307	1.09	60
Colorado River	62	1	0	25	2.50	138
Lahontons	22	0	0	517	0.04	2
North Coast	329	5	2	87	3.79	209
Sacramento River	2,637	37	8	891	2.96	164
San Francisco Bay	861	12	18	621	1.39	77
San Joaquin River	738	10	5	465	1.59	88
South Coast	1,975	27	57	799	2.47	137
Tulare Lake	126	2	6	201	0.62	35
Multiple or none	108	2		65	1.67	92
Total	**7,193**			**3,978**	**1.81**	

SOURCE: Authors' calculations using bond project data provided by the Natural Resources Agency and the Department of Water Resources.

NOTE: This table excludes projects categorized as "parks and public access" and "other". For details, see the online data set State General Obligation Bond Spending on Water.

Ecosystem Spending

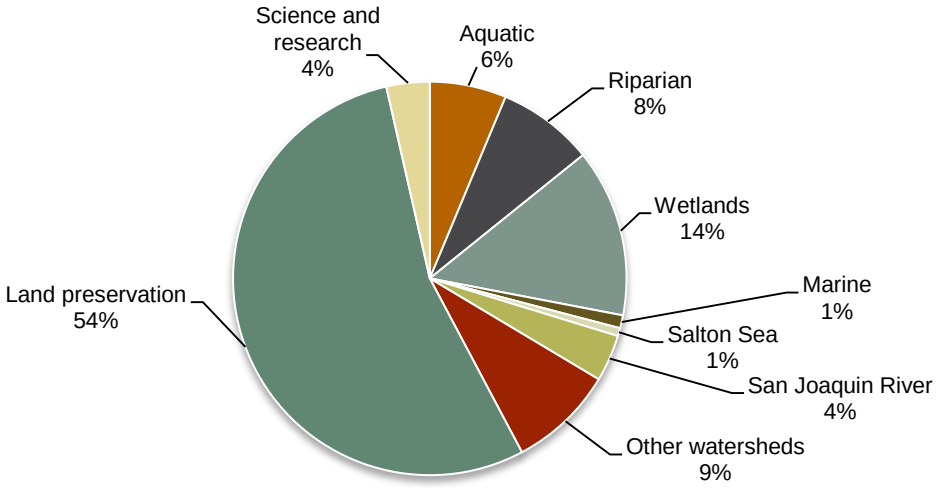
Recent bonds have devoted a considerable amount of funds to ecosystem purposes, an area with critical funding gaps (see main report and Appendix B). We categorized the ecosystem projects awarded bond funds ($2.29 billion) into subcategories to better understand how the funds are being used to improve conditions for the state's aquatic species and habitat (Figure C5), using the following criteria:

1. **Aquatic and instream improvements.** Projects that focus on improving instream flows, habitat, and fish passage (barrier removal, fish screens, etc.).
2. **Riparian restoration.** Projects that restore or improve riparian habitat (excluding large-scale restoration of the San Joaquin River, which we placed in a separate category).
3. **Wetland restoration.** Projects that restore or improve wetland habitat, including tidal marsh and floodplains.
4. **Marine and coastal watershed improvements.** Projects that focus on marine or coastal ecosystems, including beaches, sand dunes, islands, and habitat within the San Francisco Bay.
5. **Salton Sea.** Funding devoted to the management of the Salton Sea.
6. **San Joaquin River.** A project focusing on large-scale restoration of the San Joaquin River.
7. **Other watershed improvements.** Projects that improve the health of other watersheds, either through erosion control, forest improvement (clearing, thinning, tree planting), fire prevention, or the removal of invasive species.

8. **Land preservation.** Projects focusing on land acquisitions and preservation through conservation easements of various types of habitat. This category excludes acquisitions carried out as components of aquatic habitat restoration (i.e., projects included in categories 1 to 5 above). This category focuses on more-general land conservation projects, although some of the projects may benefit aquatic, riparian, and wetland species through land acquisitions near a river or within a watershed.
9. **Science and research.** Environmental research projects, including monitoring, surveys, and scientific experiments.

Of the nearly $2.3 billion dollars that has been awarded for ecosystem-oriented projects, more than half (54%) has been spent on land preservation, versus 42% percent on habitat restoration and improvement (aquatic, wetland, riparian, and various watershed projects). About one-third (31%) of the funds awarded to land preservation projects reference aquatic habitat in their project descriptions. These include acquisitions that lie near or along a river or body of water, that are described as being within a watershed, or that include some type of aquatic habitat.[5] Finally, about $80 million (4%) has been awarded for science and research purposes benefitting a range of ecosystems. Tables C8 and C9 display this information by bond and region, respectively.

FIGURE C5
Ecosystem-related bond funds awarded by function (total $2,286 million)



SOURCE: Table C9.

NOTE: The figure displays awards from the four most recent water-related GO bonds. For details, see the online data set State General Obligation Bond Spending on Water.

[5] We conducted a search for the following words in project names and descriptions: water, river, wetland, riparian, lake, marsh, stream, creek. See the online data set State General Obligation Bond Spending on Water.

TABLE C8
Ecosystem awards by bond ($ millions)

Proposition	Total		Aquatic		Riparian		Wetland		Marine		Salton Sea		San Joaquin River		Other watersheds		Land preservation		Science and research	
	$	%	$	%	$	%	$	%	$	%	$	%	$	%	$	%	$	%	$	%
84	705	31	53	37	141	78	44	14	14	51	12	81	80	92	41	21	293	24	27	34
1E	106	5	3	2	4	2	16	5	0	0	0	0	0	0	23	12	60	5	0	0
40	468	20	14	10	9	5	81	26	14	47	0	0	7	8	44	22	299	24	2	3
50	1,006	44	75	52	27	15	174	55	1	2	3	19	0	0	90	46	587	47	51	63
Total	**2,286**		**143**	**6**	**180**	**8**	**314**	**14**	**29**	**1**	**15**	**1**	**87**	**4**	**198**	**9**	**1,238**	**54**	**81**	**4**

SOURCE: Authors' calculations using bond project data provided by the Natural Resources Agency and the Department of Water Resources.

NOTE: For details, see the online data set State General Obligation Bond Spending on Water.

TABLE C9
Ecosystem awards by hydrologic region ($ millions)

	Total		Aquatic		Riparian		Wetland		Marine		Salton Sea		San Joaquin River		Other watersheds		Land preservation		Science and Research	
	$	%	$	%	$	%	$	%	$	%	$	%	$	%	$	%	$	%	$	%
Central Coast	172	8	19	13	11	6	21	7	2	7	0	0	0	0	9	4	110	9	1	1
Colorado River	18	1	0	0	0	0	1	0	0	0	15	100	0	0	2	1	0	0	0	0
Lahontons	16	1	0	0	1	0	0	0	0	0	0	0	0	0	5	3	9	1	0	0
North Coast	267	12	11	8	22	12	5	2	2	7	0	0	0	0	28	14	196	16	2	3
Sacramento River	372	16	88	61	30	17	7	2	0	1	0	0	0	0	71	36	150	12	26	32
San Francisco Bay	330	14	3	2	15	8	190	61	18	62	0	0	0	0	30	15	60	5	14	17
San Joaquin River	158	7	6	4	17	9	5	2	0	0	0	0	80	92	8	4	34	3	8	10
South Coast	876	38	15	10	78	43	84	27	5	19	0	0	0	0	41	21	644	52	9	11
Tulare Lake	53	2	1	1	7	4	0	0	0	0	0	0	7	8	3	2	34	3	1	1
Multiple or none	23	1	1	0	0	0	0	0	1	3	0	0	0	0	1	0	0	0	20	25
Total	**2,286**		**143**	**6**	**180**	**8**	**314**	**14**	**29**	**1**	**15**	**1**	**87**	**4**	**198**	**9**	**1,238**	**54**	**81**	**4**

SOURCE: Author calculations using bond project data provided by the Natural Resources Agency and the Department of Water Resources.

NOTE: For details, see the online data set State General Obligation Bond Spending on Water.

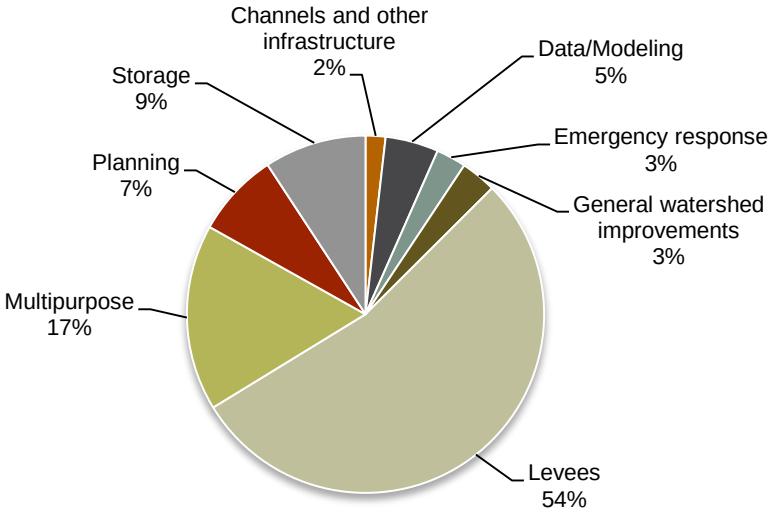
Flood-Focused Bond Spending

Flood management featured prominently in the two most recent bonds, and it was the primary focus of Proposition 1E. The $3.36 billion dollars awarded to date have supported a broad spectrum of investments (see Figure C6 and Table C10):

1. **Levees.** Projects that evaluate, improve, maintain, or construct levees. This category also includes some funding for reclamation districts to create five-year levee repair and maintenance plans.
2. **Storage.** Projects that improve or construct dams, reservoirs, or off-channel transitory storage.
3. **Channels and other infrastructure.** Projects that directly improve flood control channels through sediment removal or other manipulations to channel beds, or that improve upon other controlling infrastructure like gates, seawalls, and pumps.
4. **General watershed improvements.** Projects that combine various flood management tools and focus on general flood protection improvements for a given watershed.
5. **Emergency response.** Projects that improve the ability to respond when flooding occurs, including the construction of a new emergency response training center and the design of facilities for stockpiling flood response and recovery materials.
6. **Data and modeling.** Projects that focus on improving the ability to plan for and appropriately react to floods, including floodplain mapping, reservoir operations, reporting real-time conditions, and forecasting.
7. **Planning.** State, regional, or local flood planning, including smaller feasibility studies and broader efforts such as the Central Valley Flood Protection Plan.
8. **Multipurpose.** Projects that focus on improving ecosystem or recreational conditions while also achieving higher levels of flood protection.

More than half of the total awards (54%) has been spent on levees; the next largest category is multipurpose projects (17%). Just under 10 percent of bond funds were awarded to planning and storage-related projects. All of the other areas of flood management (channels, emergency response, data/modeling, and general watershed improvements) received less than 4 percent each of the total funding awarded to date. General watershed improvements and multipurpose projects were concentrated in the South Coast area, while the other areas of flood management occurred primarily in the Central Valley and especially the Sacramento River region (Table C11).

FIGURE C6
Flood management bond awards by function ($3,356 million)



SOURCE: Table C10.

NOTE: The figure displays awards from the four most recent water-related GO bonds—in this case, mostly Propositions 1E and 84. For details, see the online data set State General Obligation Bond Spending on Water.

TABLE C10
Flood management awards by bond ($ millions)

Proposition	Total		Channels and other infrastructure		Data and modeling		Emergency response		General watershed improvements		Levees		Multipurpose		Planning		Storage	
	$	%	$	%	$	%	$	%	$	%	$	%	$	%	$	%	$	%
84	553	16	7	11	66	41	1	1	108	100	293	16	16	3	63	24	0	0
1E	2,789	83	50	83	96	59	90	99	0	0	1,503	83	546	97	193	75	310	100
40	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
50	13	0	3	6	0	0	0	0	0	0	7	0	3	1	0	0	0	0
Total	**3356**		**61**	**2**	**161**	**5**	**91**	**3**	**108**	**3**	**1803**	**54**	**566**	**17**	**257**	**8**	**310**	**9**

SOURCE: Authors' calculations using bond project data provided by the Natural Resources Agency and the Department of Water Resources.

NOTE: For details, see the online data set State General Obligation Bond Spending on Water.

TABLE C11
Flood management awards by hydrologic region ($ millions)

	Total		Channels and other infrastructure		Data and modeling		Emergency response		General watershed improvements		Levees		Multipurpose		Planning		Storage	
	$	%	$	%	$	%	$	%	$	%	$	%	$	%	$	%	$	%
Central Coast	19	1	0	0	0	0	0	0	0	0	6	0	7	1	5	2	0	0
Colorado River	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lahontons	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North Coast	9	0	0	0	0	0	0	0	0	0	1	0	7	1	0	0	0	0
Sacramento River	2,057	61	52	86	81	50	77	84	0	0	1,334	74	33	6	190	74	290	93
San Francisco Bay	342	10	4	7	0	0	1	1	1	1	120	7	216	38	0	0	0	0
San Joaquin River	451	13	2	4	80	50	14	15	0	0	298	17	0	0	57	22	0	0
South Coast	447	13	1	2	0	0	0	0	107	99	27	2	296	52	0	0	16	5
Tulare Lake	14	0	0	0	0	0	0	0	0	0	2	0	6	1	1	1	5	1
Multiple or none	17	1	0	0	0	0	0	0	0	0	14	1	0	0	3	1	0	0
Total	**3,356**		**61**	**2**	**161**	**5**	**91**	**3**	**108**	**3**	**1,803**	**54**	**566**	**17**	**257**	**8**	**310**	**9**

SOURCE: Authors' calculations using bond project data provided by the Natural Resources Agency and the Department of Water Resources.

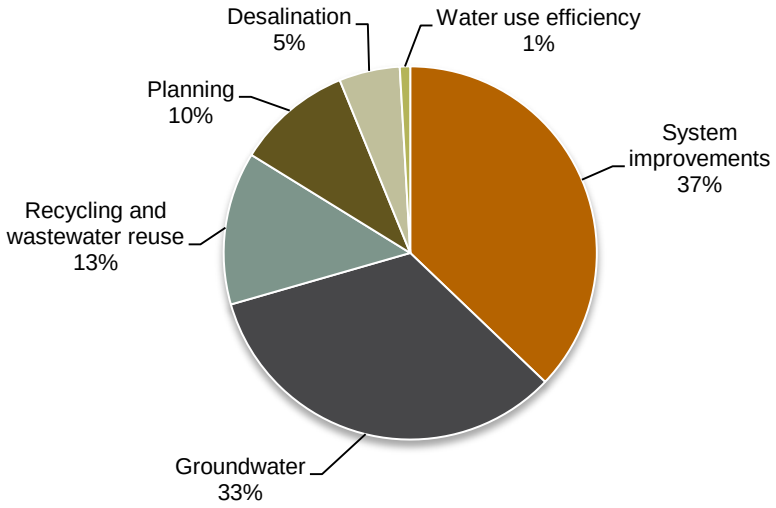
NOTE: For details, see the online data set State General Obligation Bond Spending on Water.

Water Supply-Focused Bond Spending

Improvements in water delivery, supplies, conservation, and/or reliability accounted for a smaller percentage of state bond spending, with most investments in this sector supplied instead by various sources of local funding (See Table 1 in main report and Appendix B). However $370 million dollars of recent bond funds, particularly from Proposition 50, did go toward supply-focused projects. We created the following subcategories to facilitate understanding of how these funds were spent (Figure C7, Tables C12 and C13):

1. **System improvements**. Projects that improve the supply system by updating or expanding existing facilities to increase flexibility, provide source protection, or in the interest of general maintenance, including investments in interties, intakes, reservoir improvements, real-time decisionmaking, canal lining, storage tank replacements, improvements to treatment facilities, and monitoring.
2. **Groundwater**. Projects that seek to improve access to groundwater through investments in pumps, wells, or conjunctive use. Some of these projects also focused on improving groundwater monitoring and planning.
3. **Planning**. State, regional, or local planning efforts seeking to improve water supply availability and reliability.
4. **Recycling and/or wastewater reuse.** Projects that improve local governments' or utilities' abilities to recycle water through investments in new or improved treatment and distribution infrastructure.
5. **Desalination**. Projects designed to expand supplies through desalination of brackish groundwater or ocean water. Stages of project development range from research and development and feasibility studies to facility construction.
6. **Water use efficiency**. Projects focused on improving the efficiency of agricultural or urban water use.

Figure C7
Water-supply-focused bond funds awarded by function (total $370 million)



SOURCE: Table C12.

NOTE: The figure displays awards from the four most recent water-related GO bonds. For details, see the online data set State General Obligation Bond Spending on Water.

System improvements and groundwater projects have received the largest percentage of water supply bond funds (37 and 33% respectively). In the system improvements category, a handful of large projects that focused on moving or improving intakes or lining canals received a substantial portion of the funds.[6] The funds for groundwater are split between a few large conjunctive use and replenishment projects and over a hundred groundwater management planning efforts. Smaller proportions of funds have gone to projects that expand non-traditional supply sources, including recycling and wastewater reuse (13%) and desalination (5%). A majority of the water supply-oriented awards have focused on two regions: the South Coast (37%) and the San Joaquin River (21%) (Table C13).

[6] For example, $29 million was awarded for a new Contra Costa Water District screened water intake located on the Middle River, and almost $10 million was awarded for lining the Coachella and All American canals.

Table C12
Water supply awards by bond

Proposition	Total		System improvements		Groundwater		Recycling and wastewater reuse		Planning		Desalination		Water use efficiency	
	$	%	$	%	$	%	$	%	$	%	$	%	$	%
84	103	28	50	36	50	41	2	4	1	2	0	0	1	21
1E	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	6	2	6	4	0	0	0	0	0	1	0	0	0	0
50	261	70	82	60	73	59	47	96	36	97	19	100	3	79
Total	**370**		**137**	**37**	**124**	**33**	**49**	**13**	**37**	**10**	**19**	**5**	**3**	**1**

SOURCE: Authors' calculations using bond project data provided by the Natural Resources Agency and the Department of Water Resources.

NOTE: For details, see the online data set State General Obligation Bond Spending on Water.

TABLE C13
Water supply awards by region

	Total		System improvements		Groundwater		Recycling and wastewater reuse		Planning		Desalination		Water use efficiency	
	$	%	$	%	$	%	$	%	$	%	$	%	$	%
Central Coast	6	2	0	0	2	2	0	1	0	1	3	15	0	7
Colorado River	40	11	19	14	0	0	0	0	20	53	1	7	0	0
Lahontons	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North Coast	5	1	4	3	1	1	0	0	0	0	0	0	0	0
Sacramento River	41	11	13	9	19	15	0	0	8	21	0	0	2	72
San Francisco Bay	56	15	28	20	3	2	16	32	6	16	4	22	0	0
San Joaquin River	78	21	47	35	28	23	0	0	2	6	0	0	0	1
South Coast	136	37	24	18	67	54	33	67	1	2	11	56	1	20
Tulare Lake	6	2	1	1	4	4	0	0	1	2	0	0	0	0
Multiple or none	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**370**		**137**	**37**	**124**	**33**	**49**	**13**	**37**	**10**	**19**	**5**	**3**	**1**

SOURCE: Authors' calculations using bond project data provided by the Natural Resources Agency and the Department of Water Resources.

NOTE: For details, see the online data set State General Obligation Bond Spending on Water.

State Agency Reliance on Bond Funds

With the increase in water-related bond funds in the 2000s, some agencies have come to rely on bonds as a source of funding for more than just grant programs to local agencies and non-profits (Table C14). The Department of Water Resources, for example, has used bond awards to support specific programs such as updating the California Water Plan. Overall, GO bond revenues covered 9 percent of DWR's operating expenses between 2008 and 2012 and 44 percent (or $144 million/year) of its capital expenditures. Some agencies relied even more heavily on bonds to cover operational expenses, including the Department of Fish and Wildlife (11%), the Delta Stewardship Council (64%), the State Coastal Conservancy (64%), and the Wildlife Conservation Board (59%). In contrast, the State Water Resources Control Board used bond funds solely to support local assistance programs. Table C14 also highlights the significant role of these bonds in local grant programs. Only the Department of Public Health relied more heavily on other sources (including federal grants under the Safe Drinking Water Revolving Fund program).

TABLE C14
State agency reliance on GO bonds for operating expenses and local assistance, 2008–2012 ($ millions, 2012 $)

	Annual operating expenses			Annual local assistance grants		
	All funds	Bond funded		All funds	Bond funded	
	$	$	%	$	$	%
Department of Water Resources [a/]	1,210	104	9	345	326	94
Water Resources Control Board	477	1	0	147	99	67
Department of Fish and Wildlife	349	38	11	10	-	0
Department of Public Health	108	4	4	198	66	33
Wildlife Conservation Board	3	2	59	41	32	79
Department of Conservation	4	2	45	15	14	98
State Coastal Conservancy	31	20	64	20	14	71
Delta Stewardship Council [b/]	16	10	64	-	-	-
Total (all agencies)	**2,198**	**181**	**8**	**776**	**551**	**71**

SOURCE: Authors' calculations using governor's budgets.

NOTE: Table presents average of 2008-2012; spending is adjusted to 2012 $ using the consumer price index.

a/ DWR also received an average of $144 million (or 44 percent of its capital budget) for capital expenditures (mostly for flood protection) during this period.

b/ The Delta Stewardship Council entries include funds received through reimbursements of bond funds received through an interagency agreement with another state agency and only include values since 2010 (when the Council began operations).

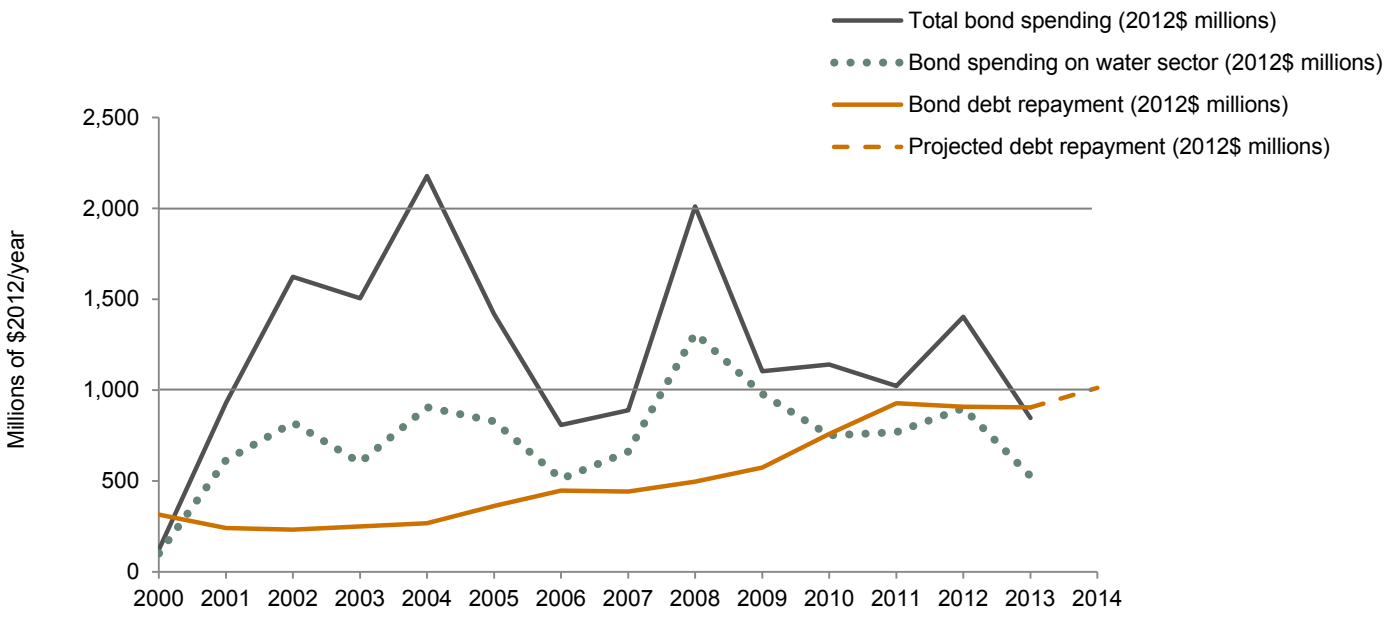
Trends in Bond Spending and Debt Service

Each year the state uses water bond funds for various state agency activities and grant programs, while at the same time paying service on the debt incurred by past bond expenditures. Since 2000, nearly $20 billion (nominal dollars) have been authorized in water bonds (see Table C1 for a list of bonds) to be spent on various activities. As shown in Table C2, about 22 percent of these funds were authorized for parks and recreation-oriented activities not directly related to water (and not included in our accounting of water-related expenditures in Table 1 of the main report and Table B1 in Appendix B). Figure C8 uses state budget information to display trends in overall natural resource-related bond spending (including water and other activities such as parks), water-related bond spending, and the annual debt service on bonds devoted to water and other natural resources. "Total bond spending" is estimated as all GO-bond spending by the Natural Resources Agency and the Environmental Protection Agency and the departments under their jurisdictions. These values may slightly overestimate spending from water and natural resource bonds, since they could include some funds authorized under other bonds (e.g., a transportation bond). "Bond spending on the water sector" is estimated by summing bond expenditures by state agencies included in our water system expenditure analysis (see Appendix B, Table B1), including local assistance grants. For agencies with only a partial focus on water-related activities, we have applied the same ratios here as in Table B1 (e.g., 50 percent of the expenditures of the Department of Fish and Wildlife). "Bond debt repayment" includes debt service on all natural-resource related GO bonds, including those authorized in earlier decades (see Table C1).

Since 2000, total natural resource-related bond spending has increased, with peaks occurring in 2002, 2004, and 2008 (two years after the passage of new water bonds). The large difference in overall bond spending and water-related bond spending in the early 2000s reflects the fact that earlier bonds had a larger focus on parks (Table C2). For example, in 2004, 37 percent of the total bond funds used by the Natural Resources Agency were spent by the Department of Parks and Recreation, versus only 6 percent in 2008. Bond debt repayment on water bonds has also been increasing since 2000 and is expected to reach over $1 billion annually by 2014. We estimate there are enough bond funds remaining to maintain recent spending levels for several years.[7] However, in 2013, debt service on water and natural resource bonds surpassed new expenditures in this sector.

[7] The exact amount of unspent funds is unknown because it includes funds not yet appropriated plus some portion of appropriated funds not yet accounted for in the awards data (see Table C3 and related discussion). As of June 30th, 2013, we estimate that approximately $4.5 billion were unspent.

FIGURE C8
Annual water bond spending and bond debt repayment has increased since 2000



SOURCE: Authors' calculations using governor's budgets.

NOTES: "Total bond spending" includes all spending from bond funds by the Natural Resources Agency and the Environmental Protection Agency, including operations, local assistance, and capital outlay. "Bond spending on water sector" includes bond funds used by agencies with water sector expenditures (see Appendix B, Table B1). In the case of the Natural Resources Agency, this excludes the Secretary of Resources, California Conservation Corps, Energy Resource Conservation and Development Commission, Renewable Resources Investment Program, Department of Forestry and Fire Protection, Native American Heritage Commission, and Department of Parks and Recreation. In the case of the Environmental Protection Agency, this excludes the Air Resources Board, Integrated Waste Management Board, and Department of Toxic Substances Control. For agencies with only a partial focus on the water sector, only a proportion of spending is included, as reported in Appendix B. Debt repayment applies to all GO water bonds approved since 1970 with a balance remaining (see Table C1 for a list of bonds).

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Paying for Water in California

Technical Appendix D:
Using the Water Fee Model to Assess Funding Alternatives

Contents

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Summary

This appendix uses a model developed for the California Water Foundation (M.Cubed, 2012) to assess how fees or taxes established at a regional level to fund Integrated Regional Water Management (IRWM) investment would compare to funding these investments through state general obligation bonds, the approach the state has relied on thus far. We consider how payment incidence would change relative to a general obligation bond baseline if regions had not received IRWM funding from the most recent water bond, Proposition 84, but instead had raised an equivalent amount regionally using the following five different approaches: (1) a fee on municipal and industrial (M&I) water connections; (2) a fee on M&I water use; (3) a combination of a fee on M&I water use and a per acre fee on irrigated agricultural land; (4) a parcel tax on nonagricultural land; and (5) an increment to the regional sales tax rate. These examples can also be used to compare the incidence of these different funding sources across income groups if they were applied uniformly statewide, as shown in the main report. Details of the model and data used are presented at the end of this appendix.

Introduction

Integrated regional water management (IRWM), as defined by the California Department of Water Resources, is a collaborative process to manage all aspects of water resources in a region. The goal of IRWM is to bring together and prioritize in a systematic way regional investments in water and wastewater infrastructure, water quality protection, and environmental restoration and enhancement in a way that accounts for and capitalizes on opportunities for synergy.

Funding these strategies can be challenging because they typically involve multiple beneficiaries as well as multiple jurisdictional, watershed, and political boundaries. Since 2002 the state has incentivized investment in IRWM at the regional level by providing state funding to regions that have adopted IRWM implementation plans consistent with state guidelines. State funding for IRWM has come from the sale of state general obligation bonds, including bonds issued under Propositions 50 and 84. Together, these two bond measures have provided $1.5 billion for IRWM planning and implementation grants.[1]

In late 2009, the California Legislature enacted the Safe, Clean, and Reliable Drinking Water Supply Act of 2010 which would, among other things, provide an additional $1.4 billion in state IRWM funding. The bond proposal is currently slated to go before voters on the November 2014 ballot. Whether this will happen is uncertain. The legislature has twice delayed placing the bond proposal on the ballot due to unfavorable odds of passage. It is now considering changes that could alter the composition, size, and timing of the bond proposal.

Both the delay in submitting the bond measure to the voters and the continuing less-than-favorable odds of passage have resulted in alternative proposals for funding investments in IRWM. For example, Senate Bill (SB) 34, introduced by Senator Simitian in December 2010, proposed to "impose on each retail water supplier in the state an annual charge based on the volume of water provided in its service area that is provided for nonagricultural uses and an annual charge based on each acre of land within its service area that is irrigated for agricultural purposes" (Simitian, 2011). Half of the revenue from the annual charges would be deposited in regional accounts for disbursement to regions in proportion to the amount of revenue collected in each of the regions, while the other half would be deposited to a state investment account to fund public benefits of water-related projects and programs. In another example, the Legislative Analyst's Office (LAO) issued a briefing in April 2011 entitled "Funding Public-Purpose Water-Related Activities" that considered a range of alternative funding mechanisms for water-related investment, including general assessments not tied to water use, assessments directly tied to water use, and property-related assessments indirectly tied to water use (Legislative Analyst's Office, 2011).[2]

In this appendix, we use a model developed for the California Water Foundation (M.Cubed, 2012) to assess how fees or taxes established at a regional level to fund IRWM investment would compare to funding these investments through state general obligation bonds, the approach the state has relied on thus far. (Details of the model and data used are presented at the end of this appendix.) In making these comparisons we are only considering alternative sources of revenue for the portion of IRWM funding coming from the state. The

[1] In addition, $300 million earmarked for stormwater management in Proposition 1E is intended to support management efforts using IRWM approaches.
[2] Financing is also being explored in the latest update of the California Water Plan (Department of Water Resources 2013), but the draft plan does not offer specific recommendations.

regions themselves provide a cost match that is equal to or in excess of the state's contribution, often from revenue from utility fees or local taxes similar in nature to those we consider in this analysis (see Appendix B). Additionally, we do not address here the legal and political aspects of alternative funding approaches. We analyze those issues in Appendix A. Rather, our goal in this appendix is to quantitatively evaluate how different funding approaches would change the incidence of payment for IRWM programs, both geographically and by household income level. We do this by considering how payment incidence would change relative to a general obligation bond baseline if regions had not received IRWM funding from Proposition 84 but instead had raised an equivalent amount regionally using the following five different approaches: (1) a fee on municipal and industrial (M&I) water connections; (2) a fee on M&I water use; (3) a combination of a fee on M&I water use and a per acre fee on irrigated agricultural land; (4) a parcel tax on nonagricultural land; and (5) an increment to the regional sales tax rate.[3]

The fees and taxes in these examples are constructed so that each example generates the same amount of annual revenue for the region in which it is implemented. This amount is set at $200 million annually, which is one-fifth of the amount of IRWM funding authorized under Proposition 84 that we estimate will ultimately go to each IRWM region. The fees are not intended to annually generate the full amount of IRWM funding authorized under Proposition 84 because this funding is meted out to each region over several years. Our choice of one-fifth is meant to roughly approximate the annual amount of funding for IRWM from the state under Proposition 84.[4]

[3] While we focus on each alternative separately, they could also be implemented in combination, in which case the payment incidence would reflect the mix of instruments being used. Indeed, alternative (3) represents a combination of a water use fee on M&I water use and an acreage fee on irrigated agricultural land.

[4] This, of course, is not the only way in which revenue from fees or taxes could be harnessed for IRWM investment. For example, they could be used to collateralize revenue bonds, which would enable a region to accelerate infrastructure investment if this was needed.

Summary of Findings

The analysis that follows focuses on three questions: (1) how would a shift to regional fees and taxes affect regions in terms of dollars received versus dollars paid for IRWM; (2) how would a shift to regional fees and taxes affect the distribution of payments for IRWM among households; and (3) how would a shift to regional fees and taxes affect the alignment between household payments for IRWM and water use. We use a model developed for the California Water Foundation to evaluate each of the five alternatives relative to what we call the state general obligation bond baseline. The principal findings of our analysis are as follows:

- There are significant disparities between the regions in terms of funding received from general obligation bonds versus payments made to the general fund to repay those bonds (Figure D2).[5] In essence, the urbanized coastal populations that comprise the San Francisco Bay Area and South Coast regions provide a not insignificant subsidy to the other regions for IRWM implementation under the general obligation bond funding approach implemented by the state to date. If regions instead were to fund IRWM solely through regional fees or taxes, these regional differences would be eliminated. Each region would in essence pay its own way without help from or assistance to any other region. The analysis shows that the San Francisco Bay Area stands to gain most from shifting away from state general obligation bond funding. The South Coast region would gain as well, but to a lesser degree. All other regions would have to contribute more to IRWM funding than is the case under the state's current funding strategy.
- In absolute terms, the surcharge amounts and tax increments that would be needed to raise annual IRWM revenue comparable to that authorized under Proposition 84 are quite small. We estimate that a connection or volume surcharge would increase baseline household water bills by less than 1.5 percent in the urban coastal regions and by less than 4 percent in the Central Valley regions, where baseline water costs are much lower to start with. The required sales tax increment would be less than 0.05 percent, meaning a sales tax of 8.5 percent would not need to increase to more than 8.55 percent. Required increases in parcel taxes are similarly modest. The magnitude of the required increases, of course, are predicated on our initial assumption of an annual revenue target of $200 million. Higher funding targets would obviously entail larger assessments.
- The analysis shows that funding IRWM with state general obligation bonds creates a very progressive repayment structure due to the progressivity of the state's personal income tax rates (Figure D4). All of the alternatives considered in this analysis would result in a less progressive repayment structure—i.e., relative to the state's current funding strategy, repayment burden would shift more to low and middle income households and away from high income households. Among the alternatives examined, the approaches that rely on a parcel tax or sales tax increment are the least progressive, followed by the connection surcharge approach. Because water use generally increases with household income level, a volume surcharge would result in the most progressive alternative considered, though it would still be much less progressive than the state's current funding approach.
- All five alternatives would align household water use shares much more closely with payment incidence than the state's current reliance on general obligation bonds. Only a volumetric fee on water use would actually create incentives to reduce water use, thus directly contributing to more sustainable water management.

[5] This disparity appears even greater for water bond allocations more generally, as described in Appendix B.

Establishing the State General Obligation Bond Baseline

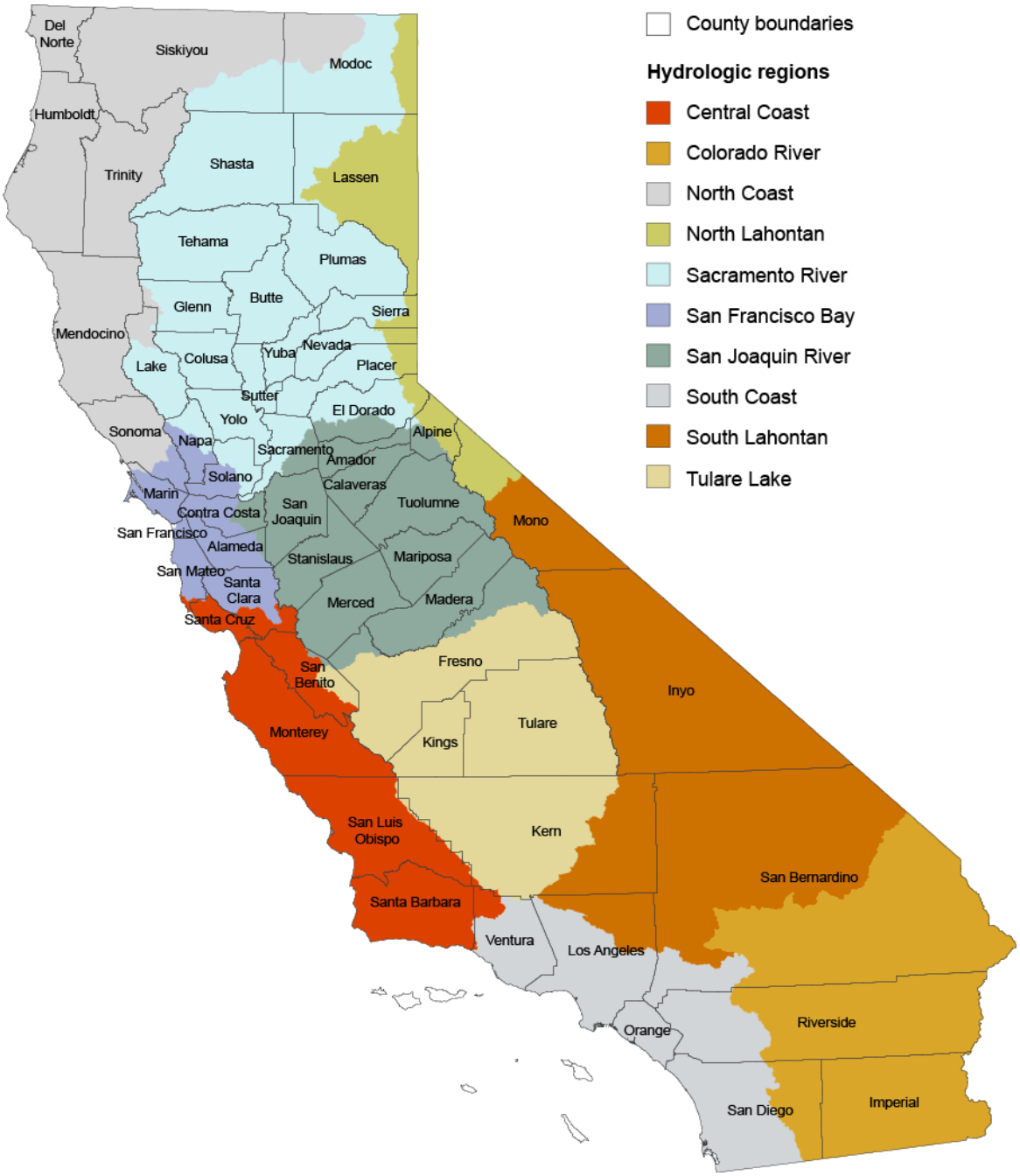
What we are calling in this analysis the state general obligation bond baseline establishes two key metrics. First, it determines the amount of revenue each fee alternative would need to generate in each region in order to replace the funding provided by Proposition 84. Second, it establishes the distribution of repayment of these revenues across regions and across households under the state's current IRWM funding strategy. This will serve as the reference case from which other funding alternatives can be compared.

Proposition 84 authorized $1 billion for IRWM planning and implementation. A regional allocation of $900 million of the total authorization was specified in the enabling legislation. The state can direct the remaining $100 million to any of the regions. For this analysis we have assumed the unallocated $100 million will go to the IRWM regions in proportion to their shares of state population. Figure D1 shows the hydrologic regions and their overlap with county boundaries.[6] The resulting allocation to each region is shown in Table D1.[7]

[6] Note that while there are ten hydrologic regions shown in Figure D1, we have combined North and South Lahontan into one region—as the Department of Water Resources (DWR) sometimes does for analytical purposes—and thus in our following discussion, we refer to only nine regions.

[7] There are differences in the fee model's and DWR's population estimates for the hydrologic regions. These differences occur because the fee model does not split county populations between hydrologic regions, whereas in reality some counties span more than one region (see Figure D1). Thus in the fee model, population estimates are biased upward for some regions (e.g., South Coast) and downward for other regions (e.g., Colorado River). To account for this, the IRWM dollar amounts allocated to each region shown in Table D1 have been re-scaled in the model so that the ratios of funding share to population share shown in Table D2 are maintained. In this way, we keep the model's regional population estimates from biasing the regional payment incidence results shown in Figure D2.

Figure D1
Overlap of county boundaries with hydrologic regions



SOURCE: California Department of Water Resources.

TABLE D1
IRWM regional funding allocations in relation to regional population

Region	Share of state population (%) [1/]	Regional allocation (in $millions)		
		Allocated by authorization	Unallocated [2/]	Total to region
North Coast	2	37	2	39
San Francisco Bay	17	138	17	155
Central Coast	4	52	4	56
South Coast	53	420	53	473
Sacramento River	8	73	8	81
San Joaquin River	5	57	5	62
Tulare Lake	6	60	6	66
North/South Lahontan	3	27	3	30
Colorado River	2	36	2	38
Total	100	900	100	1,000

SOURCE: Authors' calculations.

NOTES:
1. Regional population in 2005 as reported in Volume 3 of *California Water Plan Update* (Department of Water Resources 2009) In our calculations, we adjust for the fact that we are using hydrologic regions that include entire counties (see footnote 7). Appendix B and the main report show population shares by these "fiscal hydrologic regions." For a side-by-side comparison, see Table D9 in the technical note at the end of this appendix.

2. Ten percent of Proposition 84 IRWM funds were not specifically allocated to a region by the authorizing legislation. In the table this portion of IRWM funding is allocated in proportion to regional population.

It is frequently asserted that the funding for IRWM raised or proposed to be raised by state general obligation bond measures has been allocated among the state's IRWM regions roughly in proportion to the their populations. However, this is not quite true. Looking at the prior two bond measures (Proposition 84 and the 2010 water bond act), we see the allocations made by the legislature have tended to put disproportionately more of the funding into the more rural coastal and inland regions and disproportionately less of the funding into the more urbanized coastal regions, as shown in Table D2. For example, the share of IRWM funding going to the North Coast and Colorado River regions is about twice their share of state population, while the share of IRWM funding going to the San Francisco Bay and South Coast regions is 10 to 20 percent less than their respective shares of state population. As we discuss later in the appendix, this has important regional implications in terms of the amount received from the state for IRWM planning and implementation versus the amount repaid to the state general fund by the residents in these regions to cover the costs of the general obligation bonds.

TABLE D2
IRWM regional funding allocations in relation to regional population

	Proposition 84			2010 Bond proposal	
	Share of state population (%) [1/]	Share of funding (%) [2/]	Ratio of funding share to population share	Share of funding (%) [3/]	Ratio of funding share to population share
North Coast	2	4	2.05	4	2.24
San Francisco Bay	17	16	0.90	14	0.81
Central Coast	4	6	1.37	6	1.39
South Coast	53	47	0.89	43	0.81
Sacramento River	8	8	1.02	9	1.08
San Joaquin River	5	6	1.16	7	1.32
Tulare Lake	6	7	1.15	8	1.34
North/South Lahontan	3	3	1.18	5	2.10
Colorado River	2	4	1.99	4	2.30

SOURCE: Authors' calculations

NOTES:
1/ Regional population in 2005 as reported in Volume 3 of the California Water Plan Update (Department of Water Resources 2009).

2/ Ten percent of Proposition 84 IRWM funds were not specifically allocated to a region. In the table, this portion of IRWM funding is allocated in proportion to regional population.

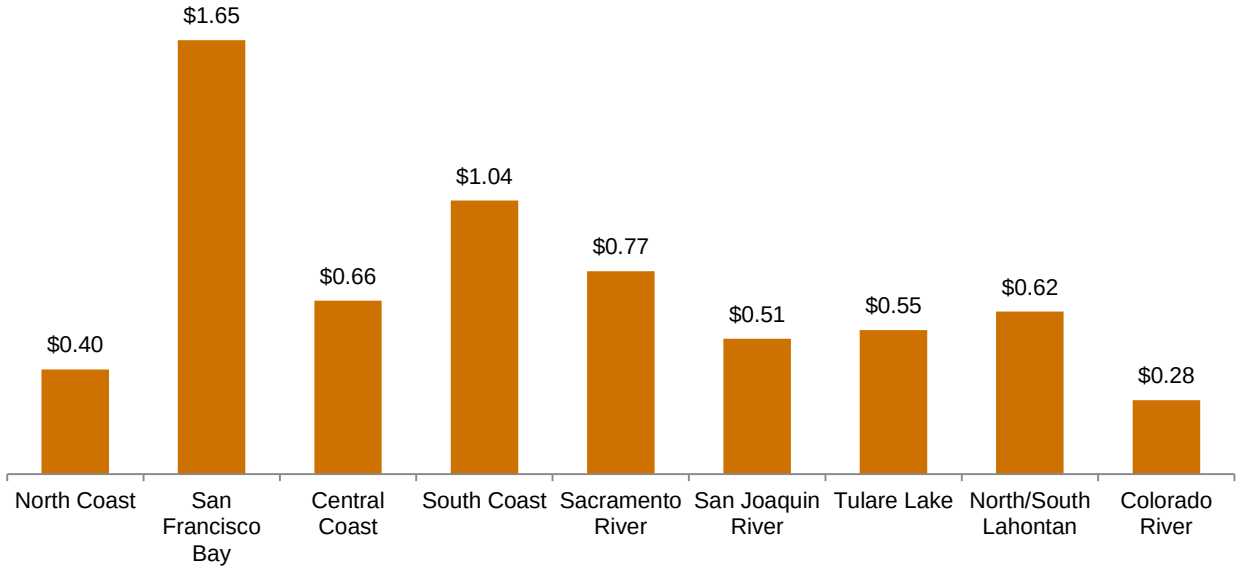
3/ 28.5 percent of the IRWM funds in the 2010 bond proposal can be used in any region. In the table, this portion of IRWM funding is allocated in proportion to regional population. Additionally, $44 million is set aside for mountain counties. In the table, this funding is split evenly between the Sacramento River, San Joaquin River, Tulare Lake, and Lahontan regions.

Because personal income and taxable sales—by wide margins the two largest sources of state general fund revenue—are not distributed proportionally to regional populations, it follows that neither are regional payments to the state general fund. Both personal income and taxable sales are concentrated in the state's urban coastal regions, which means the San Francisco Bay and South Coast regions contribute proportionately more to the general fund than other regions. As already discussed, these two regions also tend to receive proportionately less IRWM funding. This has the effect of amplifying the regional disparities in dollars received versus dollars repaid under a general obligation funding approach. Thus, in the case of the Bay Area, we estimate that for every IRWM dollar received under Proposition 84, it will pay $1.65 to the state general fund. In the Colorado River Region the situation is reversed: For every IRWM dollar received under Proposition 84, it will pay $0.28 to the state general fund.[8]

Figure D2 presents our estimates of regional incidence of general fund repayment per dollar of IRWM funding received under Proposition 84.[9] It is clear that in the case of IRWM funding, as in the case of many state and regional programs paid for by the general fund, there are sharp differences across regions between dollars received and dollars repaid. In essence, the urbanized coastal populations that comprise the San Francisco Bay and South Coast Regions provide a not insignificant subsidy to the other regions for IRWM implementation.

[8] These regional disparities between money *received from* versus *paid into* the state general fund are not unique to funding for water infrastructure and have been noted in other contexts See, for example, Theriault (2010).
[9] IRWM is just one of many programs funded by Proposition 84. Other programs can be expected to have different repayment distributions than those shown in Figures D2 and D3. For information on the regional distribution of recent water bond funds more generally, see Appendix C.

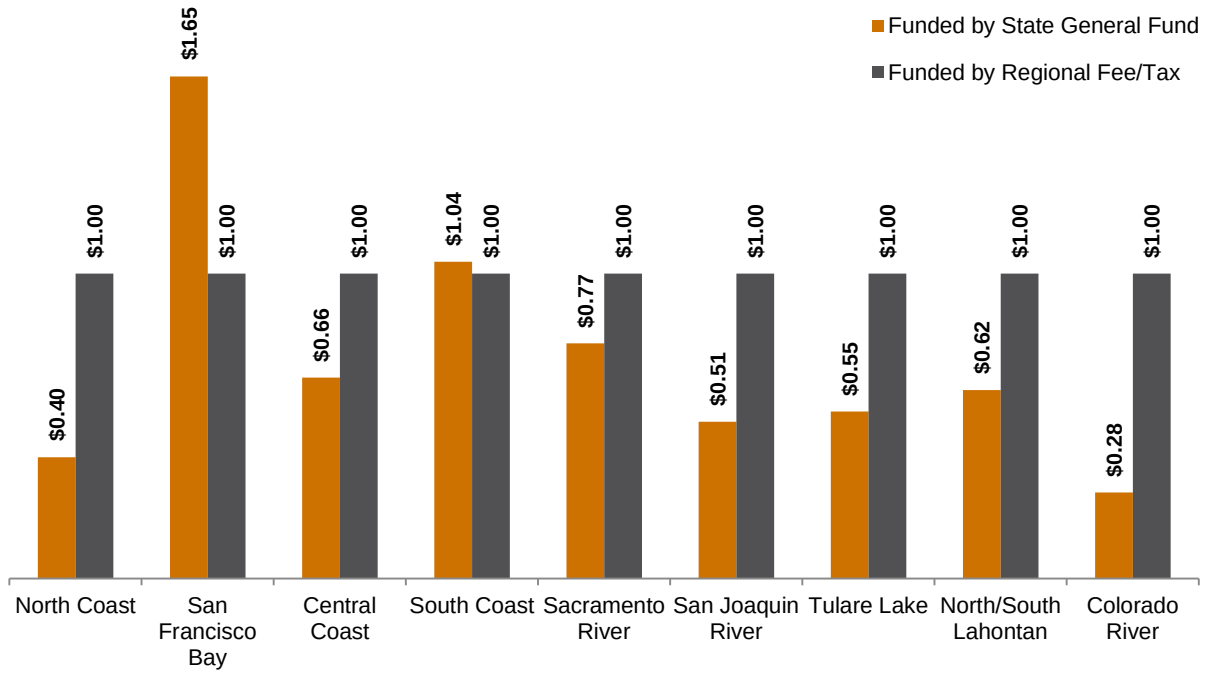
FIGURE D2
Proposition 84 IRWM funding allocation: Dollars paid to state general fund per dollar of IRWM funding received



SOURCE: Authors' calculations. See Fee Model Technical Specification at end of appendix for data sources and model specification.

If regions were to instead fund these programs through regional fees or taxes, these regional differences would be eliminated. Each region would in essence pay its own way without help from or assistance to any other region. How this compares to the current approach to funding IRWM with general obligation bonds is illustrated in Figure D3. The San Francisco Bay Area would gain most by funding IRWM programs through regional fees or taxes. The South Coast Region would see a much smaller gain. All other regions would have to contribute more to IRWM funding than is the case with general obligation bonds.

FIGURE D3
Proposition 84 IRWM funding allocation: Dollars paid per dollar received



SOURCE: Author calculations. See Fee Model Technical Specification at end of appendix for data sources and model specification.

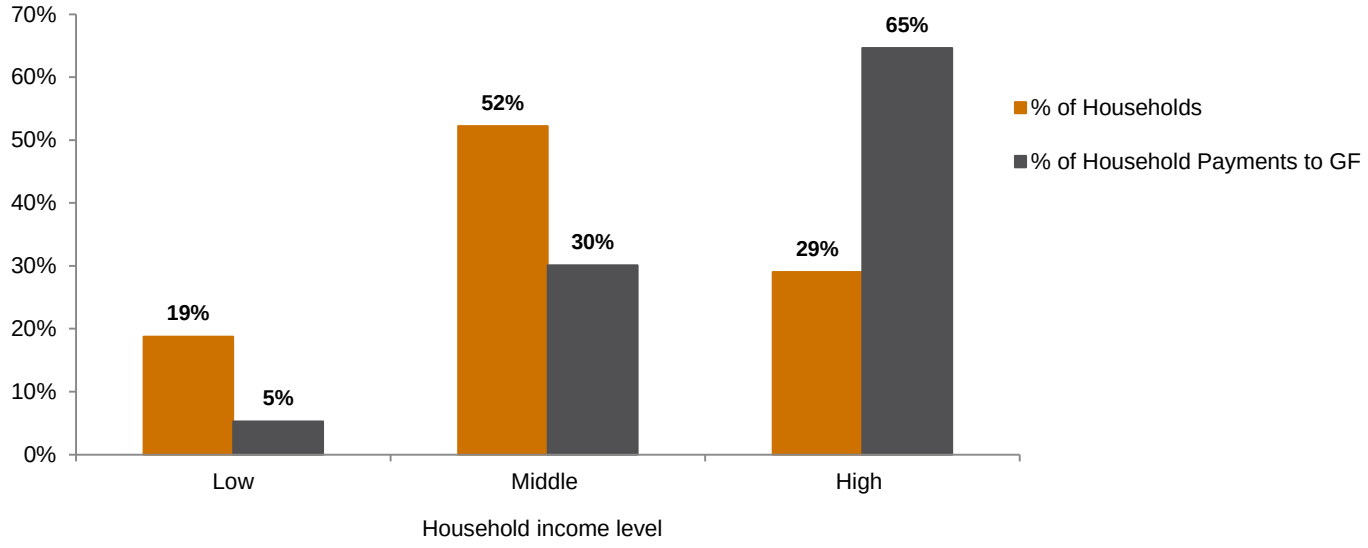
Another important question is: How are payments to the general fund distributed across households? In particular, how are payments distributed in relation to household income? General fund revenue comes from three primary sources: personal income taxes, retail sales and use taxes, and corporate income taxes. The first two comprised 87 percent of general fund revenue in FY2009/10. Personal income taxes are paid by individuals—and thus households. While sales taxes are paid by both individuals and businesses, research suggests that businesses are generally successful in passing this cost on to consumers in higher prices (Besley and Rosen 1999; Cole 2009).[10] Thus households contribute the lion's share of sales tax revenue as well. As was the case for regions, these payments are not distributed uniformly across households. The share contributed differs significantly by income level.

California's personal income tax structure is progressive, meaning individuals pay a larger percentage of their income to the state as their income increases. Marginal tax rates range from 1 percent to 12.3 percent, depending on level of income. For example, under California's current structure, a married couple with taxable income of about $36,000 would face a marginal tax rate of 2 percent, whereas a couple with taxable income of about $100,000 would face a marginal rate of 9.3 percent. On the other hand, sales taxes are regressive, meaning individuals pay a smaller percentage of their income to the state as their income increases. Sales taxes are regressive both because a single tax rate applies to all sales (at least within a given region) and because taxable consumption does not generally increase proportionally with income. Lower income households use a larger share of their income on taxable sales relative to higher income households and thus pay a greater share of their income to the state in the form of sales taxes.

[10] Some of these consumers are out-of-state residents, which is one reason why we do not assume payment incidence falls entirely on California households.

On balance, the progressivity of the state's personal income tax structure dominates, resulting in high-income households contributing far more to the state's general fund than low-income households, as shown in Figure D4. In the figure, we define low-income households as those with incomes of $25,000 or less, middle-income households as those with incomes between $25,000 and $100,000, and high-income households as those with incomes in excess of $100,000. Figure D4 indicates that funding water-related infrastructure through general obligation bonds, which will be repaid through general fund revenue, places the largest share of repayment on the highest income households in the state. As we will show, other approaches to funding can be expected to result in a much less progressive distribution of payment across households. The percentages in Figure D4 are for the state overall. These shares vary by region, which is taken into account when we make comparisons between the four regional funding alternatives and state general obligation bonds. It is also important to note that general obligation bond repayment might come in part from cuts to general fund programs that disproportionately hurt lower income households. Thus, the progressivity of general obligation bond repayment incidence shown in Figure D4 could be overstated under a more complete accounting of general fund revenues and expenditures.

FIGURE D4
Relative share of household payments to state general fund by income level



SOURCE: Authors' calculations. See Fee Model Technical Specification at end of appendix for data sources and model specification.

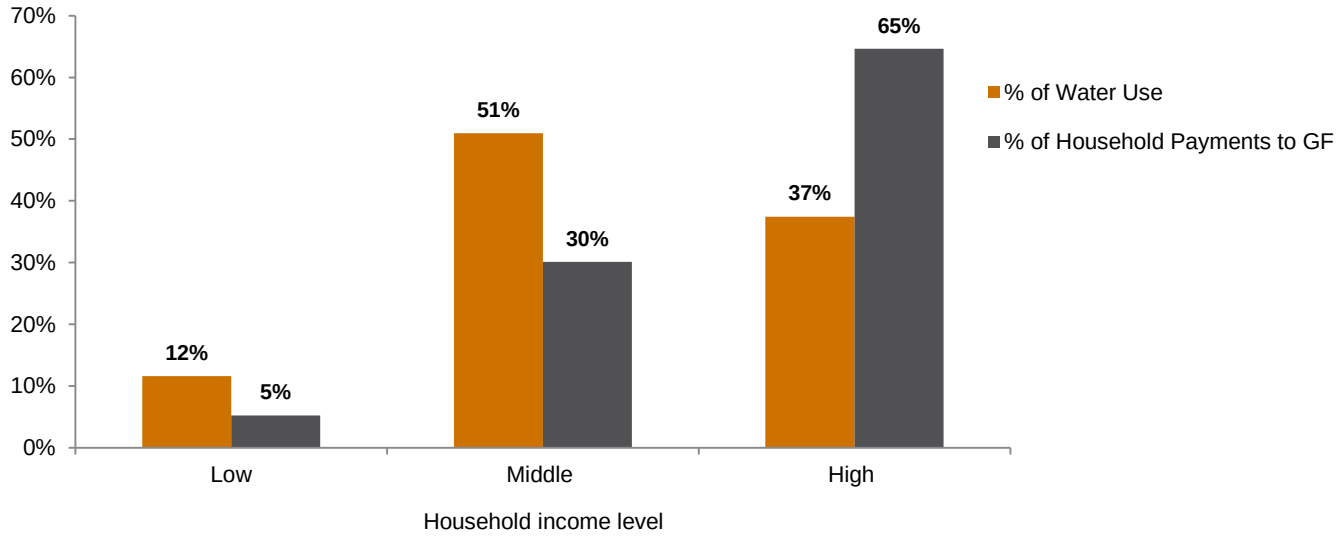
NOTE: Household Income Levels: Low= $25k or less, Middle= $25k to $100k, High= $100k or more.

A final consideration is the degree of correspondence between household water use and general fund payments, as shown in Figure D5 for the state as a whole.[11] As with Figure D4, these proportions vary by region, which is taken into account when we make comparisons between the four regional funding alternatives and state general obligation bonds. Overall, however, the data do not show a strong correspondence between water use and general fund payments when households are sorted by income level. This is the case even though water use is positively correlated with income level, which can be seen by

[11] This is especially relevant when considering the use of general obligation bond financing for water infrastructure projects where there is a strong nexus between cost incidence and water use. Of course, general obligation bonds are used to finance many services, such as flood protection, where no such strong nexus exists. For more on this question, see the discussion in the main report.

comparing Figures D4 and D5. However, the progressivity of the income tax structure dominates. The resulting share of payments to the general fund is 1.75 times the share of water use for high-income households, whereas it is between 0.4 and 0.6 times the share of water use for low- and middle-income households. Thus, despite the correlation between water use and income level, general obligation bond financing does not align payment incidence with household water use very closely.

FIGURE D5
Water use relative to general fund payment incidence



SOURCE: Author calculations. See Fee Model Technical Specification at end of appendix for data sources and model specification.

NOTES: Household Income Levels: Low= $25k or less, Middle= $25k to $100k, High= $100k or more.

To summarize the state general obligation bond baseline:

- The regional allocation of IRWM funds from Proposition 84 is only very roughly proportionate to population. Relative to regional population, the legislature has tended to put disproportionately more of the funding into the more rural coastal and inland regions and disproportionately less of the funding into the more urbanized coastal regions (Table D1).
- This, coupled with the fact that both personal income and taxable sales are concentrated in the state's urban coastal regions, results in significant disparities between the regions in terms of funding received from general obligation bonds versus payments made to the general fund to repay those bonds (Figure D2). If regions were to instead fund these programs through regional fees or taxes, these regional differences would be eliminated.
- Funding IRWM with state general obligation bonds creates a very progressive repayment structure due to the progressivity of the state's personal income tax rates (Figure D4). Moving away from general obligation bond financing can be expected to shift more of the repayment obligation to middle- and low-income households.
- Funding IRWM with state general obligation bonds does not align payment incidence very closely with water use (Figure D5).

In the remainder of this appendix, we analyze five alternatives to state general obligation bonds for funding IRWM programs.

Alternative 1: Municipal and Industrial Connection Surcharge

One alternative to general obligation bonds would be to levy a regional surcharge fee on retail M&I water connections. Nearly all retail water utilities in California already use monthly or bi-monthly connection charges to recover a portion of utility operating and capital costs. Connection charges vary by utility but are typically in the $10 to $30 per month range for single-family customers (Black and Veatch 2006). Monthly connection charges usually increase with meter size, the rationale being that customers with larger meters have the potential to place more instantaneous and seasonal demand on the water system, which drives sizing of pipes and other system components, and hence cost. Standard practice is to express meter charges in terms of single-family meter equivalents (American Water Works Association, 2012). Meter equivalents are typically based on the ratio of maximum flow rate through the meter to that for a 5/8" or 3/4" meter. A 4" meter, for example, usually equates to 25 meter equivalents, though this can vary by utility.

In calculating connection surcharges, we assume the distributions of meter sizes for multifamily, commercial, and industrial connections involve class-average meter equivalents of 3, 6, and 12, respectively.[12] The calculated connection surcharge on a multifamily account is therefore set to be 3 times the charge on a single-family account. For commercial and industrial accounts, the surcharges are set to be 6 and 12 times the single-family charge, respectively.

Our estimates for the regional surcharges are shown in Table D3. They are set so as to generate one-fifth of the amount of IRWM funding authorized under Proposition 84 that we estimate will go to each IRWM region per the last column of Table D1. Thus, over a five-year period the fees would generate $1 billion statewide, the same amount authorized for IRWM under Proposition 84. The last row of Table D3 shows what the surcharges would be if they were set uniformly across the state rather than set individually for each IRWM region. The monthly surcharge on single-family connections would range from a low of $0.82 (Lahontan) to a high of $2.06 (Colorado River). A statewide monthly surcharge on single-family connections would be just shy of one dollar.

[12] Naturally, class average meter equivalents will vary for specific utilities. The averages we use are for sake of example.

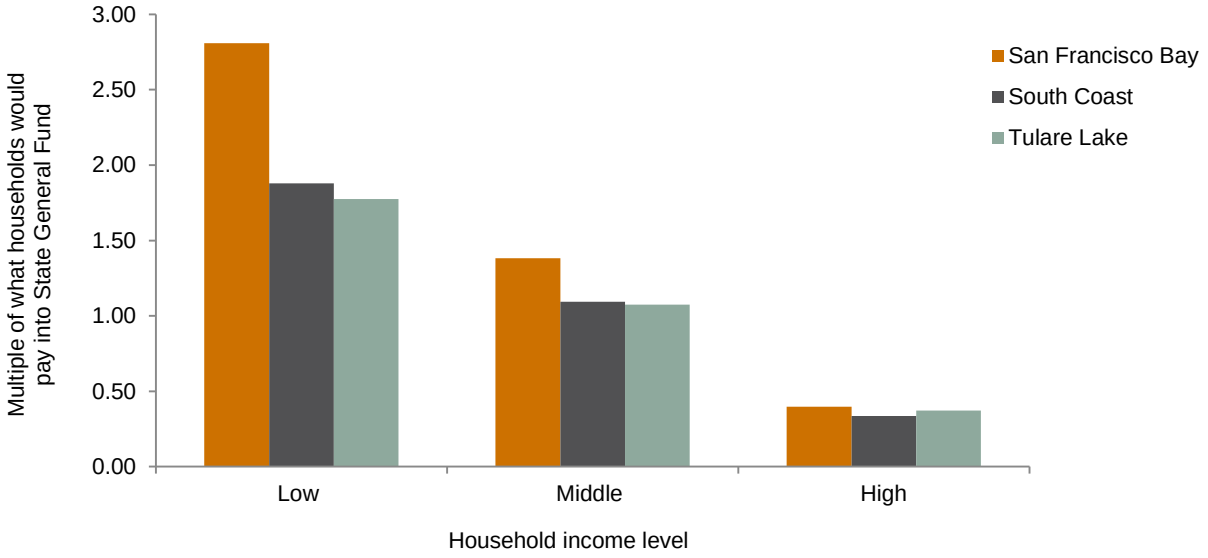
TABLE D3
Monthly surcharge on M&I water connections

Region	IRWM annual revenue goal ($millions)	Monthly connection surcharge by class of service ($/month)			
		Single-family residential	Multifamily residential	Commercial	Industrial
North Coast	7.8	1.51	4.53	9.07	18.13
San Francisco Bay	31.0	0.85	2.56	5.11	10.22
Central Coast	11.2	1.19	3.57	7.15	14.29
South Coast	94.7	0.92	2.77	5.53	11.07
Sacramento River	16.2	0.91	2.72	5.45	10.89
San Joaquin River	12.5	1.25	3.76	7.52	15.04
Tulare Lake	13.1	1.35	4.05	8.09	16.19
North/South Lahontan	5.9	0.82	2.47	4.94	9.87
Colorado River	7.6	2.06	6.17	12.34	24.68
Statewide	**200.0**	**0.98**	**2.93**	**5.86**	**11.71**

SOURCE: Authors' calculations. See Fee Model Technical Specification at end of appendix for data sources and model specification.

Because the residential connection charges are not graduated by household income level, the distribution of household payments by income level would be very different from that for the state general fund. This is shown in Figure D6 for three sample regions: San Francisco Bay, South Coast, and Tulare Lake. It shows what households would pay in surcharges as a multiple of what they would have had to pay into the state general fund to generate the same amount of revenue. Thus costs for low-income households would increase by more than 50 percent in the South Coast and Tulare Lake regions and by more than 150 percent in the San Francisco Bay region. For middle-income households, payments would be about the same in the South Coast and Tulare Lake regions. In the San Francisco Bay region they would be somewhat higher. In all three regions, high-income households would pay less than half what they would have had to pay into the state general fund. Overall we can conclude that regional connection surcharges would be a more regressive funding strategy than general obligation bonds.

FIGURE D6
Regional connection surcharge change in household payment relative to state general fund



SOURCE: Authors' calculations. See Fee Model Technical Specification at end of appendix for data sources and model specification.

NOTE: Household income levels: Low = $25k or less, Middle = $25k to $100k, High = $100k or more.

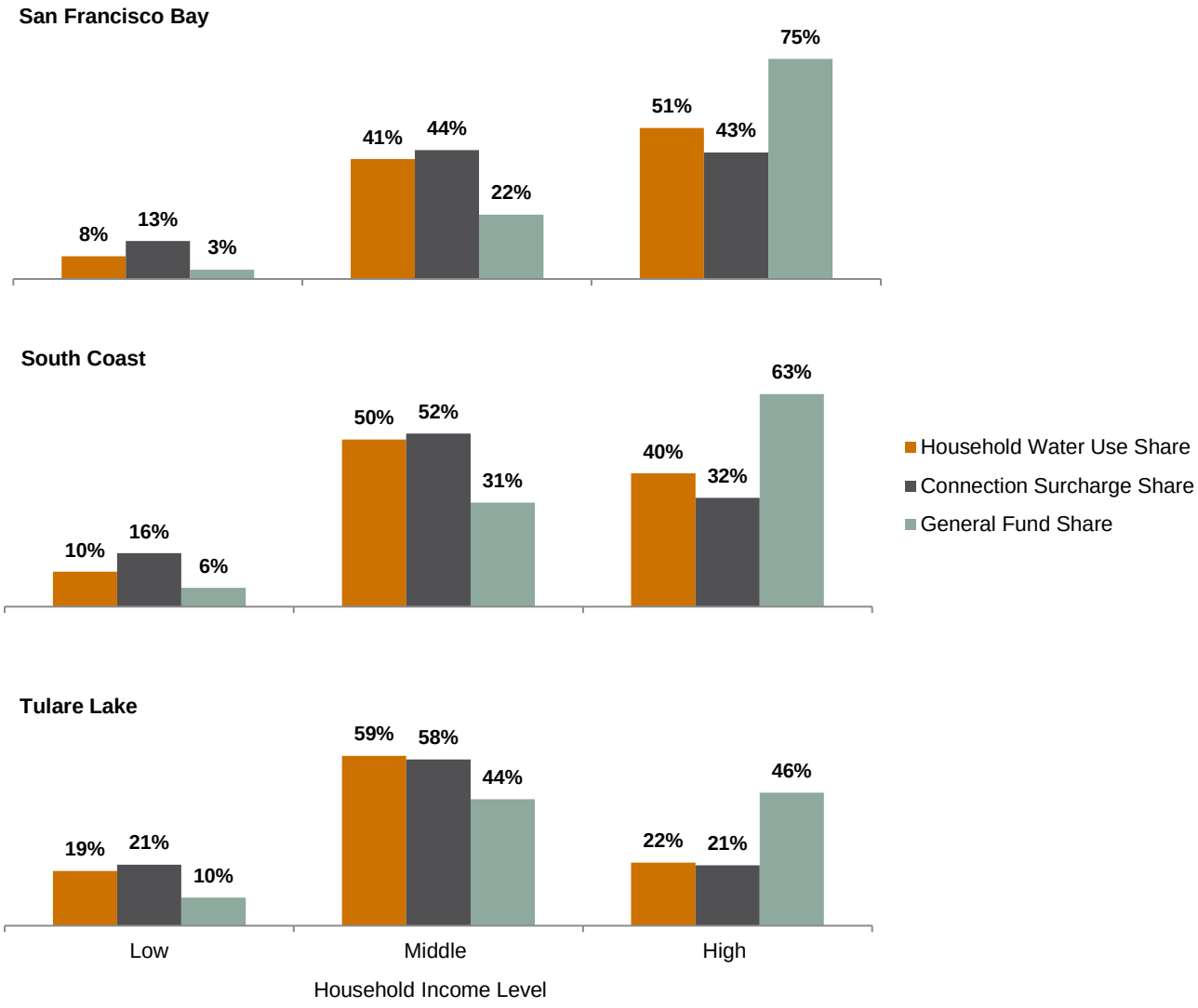
The comparisons in Figure D6 take into account that the share of total revenue coming from households would differ under the two funding alternatives.[13] For general obligation bond financing, we estimate revenue from households would account for 85 percent of total revenue, whereas for the connection surcharge we estimate the contribution from households would range between 55 and 70 percent, depending on the region.[14] The fact that less revenue overall would come from households under the connection surcharge alternative dampens the regressivity of this alternative. If there were no differential in the share of total revenue coming from households, then low-income households would pay approximately four times more under the connection surcharge alternative than under general obligation bond financing.

It is important to keep in mind that the differences in payment incidence illustrated in Figure D6 are relative. In absolute terms, the amounts are quite small. Households in the Bay Area and South Coast would see a monthly increase in water bills of less than a dollar. In the Tulare Lake region, the increase would be less than a dollar fifty. We estimate the surcharges would increase baseline household water bills by less than 1.5 percent in the San Francisco Bay and South Coast regions and by no more than 3.5 percent in the Tulare Lake region, where baseline residential water costs are much lower to start with.

Relative to general obligation bond financing, a connection surcharge would align payment incidence much more closely to share of water use, as shown in Figure D7 for the three sample regions. Thus, if a policy goal was to establish a closer nexus between share of water use and share of payment, a surcharge on connections would perform better than reliance on the general fund.

[13] This is true for the payment incidence comparisons of the other funding alternatives to the general fund as well.
[14] Although it is also likely that at least some of these costs to businesses would be passed on to households, we lack studies that estimate the extent of this pass-through except for the sales tax alternative presented below.

FIGURE D7
Regional connection surcharge water use share relative to payment incidence



SOURCE: Author calculations. See Fee Model Technical Specification at end of appendix for data sources and model specification.

NOTE: Household Income Levels: Low= $25k or less, Middle= $25k to $100k, High= $100k or more

Alternative 2: M&I Volume Surcharge

Another alternative would be to levy a surcharge on M&I retail water sales. Such a surcharge could be applied directly to water customers or to retail water utilities (which could then pass it through to their customers). The latter approach would avoid the problem of utilities serving unmetered customers.[15] In our discussion of this alternative, we express the surcharge in "dollars per hundred cubic feet" ($/CCF), the most common unit of measurement used by California M&I water utilities for stating volumetric prices.[16] We assume that the amount of the surcharge would not be differentiated by M&I customer class, but rather that a single surcharge would apply to all M&I water users.

Our estimates for the regional volume surcharges are shown in Table D4. As in the case of our previous discussion of a *connection* surcharge, the last row of Table D4 shows what the *volume* surcharge would be if it was set uniformly across the state rather than individually for each IRWM region. The fee spread between the different IRWM regions is fairly wide—a low of $0.026/CCF in the Lahontan region and a high of $0.117/CCF in the North Coast region—but for most regions the fee would be between $0.04/CCF and $0.07/CCF. Retail water rates vary considerably across the state, but an average rate of $2.00/CCF is fairly typical.[17] Surcharges in the range shown in Table D4 would thus increase the typical volume charge for water by approximately 2 to 4 percent, and monthly water bills by 1.5 to 3 percent, depending on region.[18]

[15] Historically, many communities in the Central Valley (and some elsewhere) did not meter individual customers' water use, but instead only charged flat monthly service fees. These utilities are now transitioning to metering to meet the requirements of state law (which requires metering of all customers by 2024). The utility would need to determine an appropriate way of apportioning the cost among unmetered customers.
[16] One CCF contains 748 gallons.
[17] Many M&I retail water utilities in California use increasing block rates where the rate increases with quantity consumed. For example, a customer in Stockton is charged $1.94/CCF for up to 9 units of use; $2.11/CCF for the next 11 units; and $2.48/CCF for any consumption over 20 units of use. In such cases, the typical average rate would represent what the typical customer subject to block rates pays on average for a unit of water.
[18] The overall bill increase under this alternative would be slightly less than under the connection surcharge because water users would respond to the higher water rate by using slightly less water. Under the connection surcharge, water users would not face the same incentive to curb consumption.

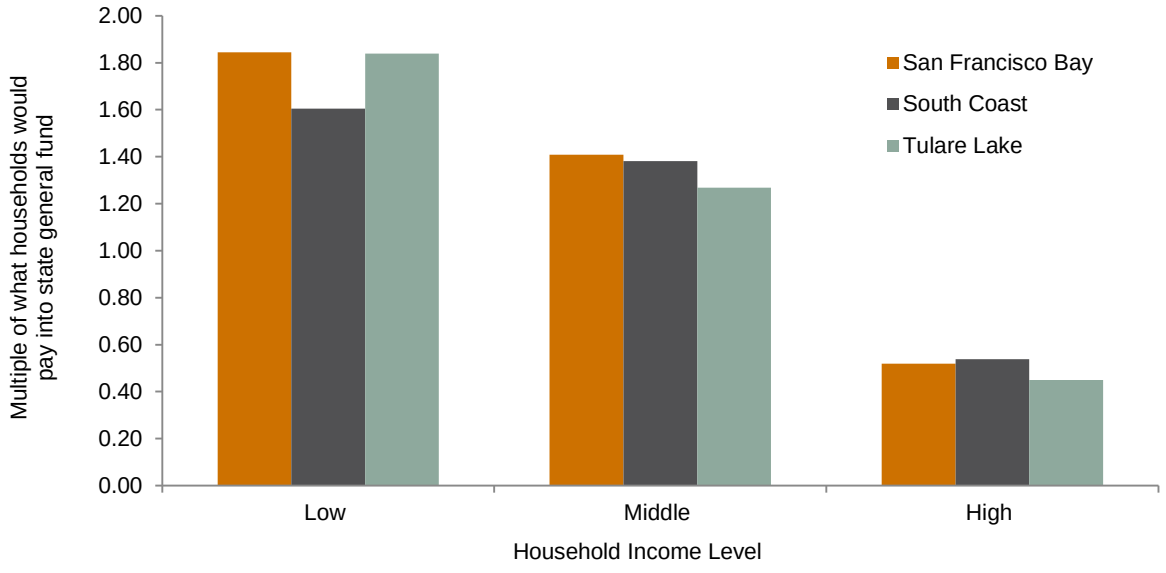
TABLE D4
Alternative 2: Volume surcharge on M&I water use

Region	IRWM Annual revenue goal ($millions)	Surcharge amount ($/CCF)
North Coast	7.78	0.117
San Francisco Bay	31.04	0.066
Central Coast	11.22	0.101
South Coast	94.68	0.053
Sacramento River	16.18	0.047
San Joaquin River	12.48	0.047
Tulare Lake	13.14	0.044
Lahontan	5.90	0.026
Colorado River	7.58	0.092
Statewide	**200.00**	**0.056**

SOURCE: Authors' calculations. See Fee Model Technical Specification at end of appendix for data sources and model specification.

Relative to state general obligation bonds, a volume surcharge would shift more of the payment burden to middle- and low-income households, as shown in Figure D8. However, in most instances the shift would not be as great as under a connection surcharge approach because residential water use is positively correlated with income (Renzetti, 2002). Thus a volumetric surcharge will be somewhat more progressive than a connection surcharge, as can be seen by comparing Figures D6 and D8. For example, under a connection surcharge low-income households in the San Francisco Bay Region would pay about 2.8 times more than they would under a general obligation bond approach (Figure D6). With a volumetric surcharge, this multiple decreases to about 1.8 (Figure D8).

FIGURE D8
Regional volume surcharge: Change in household payment relative to state general fund



SOURCE: Author calculations. See Fee Model Technical Specification at end of appendix for data sources and model specification.

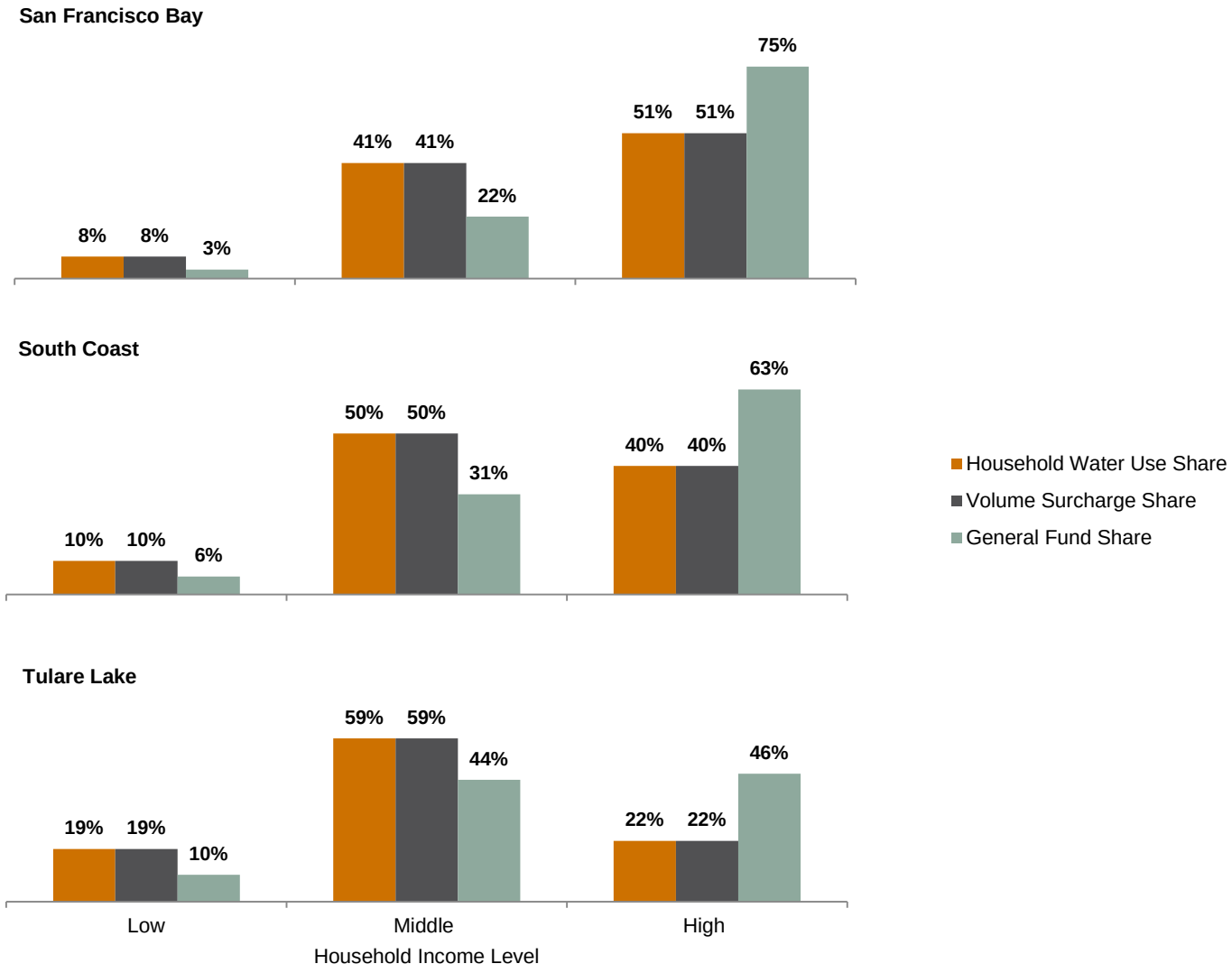
NOTE: Household Income Levels: Low= $25k or less, Middle= $25k to $100k, High= $100k or more

Since there is a one-to-one correspondence between water use and surcharge payment, the volumetric surcharge would exactly align payment incidence with water use, as shown in Figure D8. Thus if a policy goal was to establish an exact nexus between share of M&I water use and share of payment, a surcharge on water use would perform better than reliance on the general fund or any of the other alternatives under consideration. Since water use generally increases with income, this is a relatively progressive means of collecting revenues, though less so than the general fund (Figure D9).

Additionally, because a volume surcharge would increase the marginal cost of water it would influence consumptions decisions. While the responsiveness (or elasticity) of water demand to changes in the marginal price is not large, neither is it zero. For residential customers, estimates of price elasticity typically are in the range of -0.15 to -0.35, meaning a 10 percent increase in the marginal price of water might be expected to reduce demand by 1.5 to 3.5 percent (Renzetti, 2002). In the present example, the effect of the volume surcharge on the marginal price for water would vary from region to region (and from utility to utility) but would increase the marginal price for most M&I water users from 2 to 4 percent. The effect on demand might therefore be in the range of -0.3 to -1.4 percent.[19] Given current levels of M&I demands, this might be expected to reduce annual M&I water use by 25,000 to 116,000 acre-feet per year statewide, a not inconsequential volume of water.[20] Of the alternatives considered, this is the only one that would provide a disincentive for wasteful water use.

[19] The lower bound is set to -0.15 x 2 percent and the upper bound is set to -0.35 x 4 percent.
[20] This estimate is based on 2005 M&I water use of 8.276 million acre-feet, as estimated by DWR for the 2009 State Water Plan Update. A breakdown of M&I (and agricultural) water use by region is provided in the technical note at the end of this appendix.

FIGURE D9
Regional volume surcharge: Water use share relative to payment incidence



SOURCE: Author calculations. See Fee Model Technical Specification at end of appendix for data sources and model specification.

NOTE: Household Income Levels: Low= $25k or less, Middle= $25k to $100k, High= $100k or more

Alternative 3: Combination M&I Volume Surcharge and Per-Acre Fee on Irrigated Agricultural Land

The third alternative is similar to the fee structure proposed in 2010 by Senator Simitian (SB 34): a volumetric surcharge on retail M&I water use and a per-acre fee on irrigated agricultural land. While a charge on agricultural water use would incentivize more efficient irrigation practices, issues associated with measurement of agricultural water use, especially groundwater use, make a volumetric fee problematic. In looking at this issue, the LAO concluded a per-acre fee on irrigated agricultural land, which can be readily identified and billed, would provide a practical alternative (Legislative Analyst's Office, 2011).

While SB 34 only considered a statewide set of fees, we consider fees set independently for each region. As with the other examples, fee amounts are set to generate each region's share of IRWM funding authorized under Proposition 84. For this example, we assume not less than 80 percent of target revenue would come from M&I water users and up to 20 percent would come from agricultural landowners.[21] We set the per-acre fee on irrigated agricultural land to the lesser of a per-acre fee that would generate 20 percent of the regional funding target or $2/acre. This keeps the per-acre fees on irrigated agricultural lands within a similar range across all the regions. (Without this rule, the fees on irrigated agricultural land in some regions would be an order of magnitude or more greater than for other regions.) Shortfalls created by the cap are then made up by adjusting the M&I surcharge. The fees and taxes thus calculated are shown in Table D5.

[21] The 80/20 split between M&I water users and agricultural landowners was arbitrarily chosen by the authors for sake of example and is not based on any existing state or local policy or proposals to our knowledge.

TABLE D5
Alternative 3: Volume surcharge on M&I water use and per-acre fee on irrigated agricultural land

Region	IRWM annual revenue goal ($millions)			M&I surcharge amount ($/CCF)	Parcel tax on irrigated land ($/Acre/Yr)*
	Total	M&I	Ag		
North Coast	7.78	6.67	1.11	0.100	2.00**
San Francisco Bay	31.04	30.31	0.73	0.065	2.00**
Central Coast	11.22	9.67	1.55	0.087	2.00**
South Coast	94.68	93.64	1.04	0.052	2.00**
Sacramento River	16.18	12.94	3.24	0.038	1.37
San Joaquin River	12.48	9.98	2.50	0.037	1.17
Tulare Lake	13.14	10.51	2.63	0.035	1.17
Lahontan	5.90	4.72	1.18	0.020	0.39
Colorado River	7.58	6.06	1.52	0.073	1.30
Statewide* **	**200.00**	**160.00**	**40.00**	**0.045**	**4.22**

SOURCE: Authors' calculations. See Fee Model Technical Specification at end of appendix for data sources and model specification.

NOTES:

* Set to lesser of a per acre fee that would generate 20 percent of the regional funding target or $2/acre.

** Per-acre fee capped at $2/acre.

*** Per-acre fee set to recover 20 percent of statewide annual revenue target.

The rule capping the agricultural per acre fee at $2/acre causes four of the nine regions—those with relatively small agricultural sectors—to allocate less than 20 percent of the annual revenue target to irrigated agricultural land. About 14 percent is allocated to agriculture in the North Coast and Central Coast regions. In the San Francisco Bay and South Coast regions, less than 3 percent is allocated to agriculture. In all other regions, 20 percent is allocated to agriculture. While the capping rule we have employed is in many respects ad hoc, the resulting allocations between M&I and agriculture across the regions are broadly consistent with the relative importance of the agricultural sector to each region. That is, under the allocation rule we have employed, the agricultural sector is assigned a larger share in those regions where it is a larger part of the region's economy and where it is likely to more directly benefit from IRWM projects.

The last row of Table D5 shows the results for a statewide set of fees. In this case, we have allocated 80 percent of the revenue target to M&I water users and 20 percent to irrigated agriculture, and the fee is not capped. This causes the results for the statewide fee to diverge from the fees set separately for each region. The per-acre fee on irrigated agricultural land is higher for the statewide fee because it is designed to recover 20 percent of the total revenue requirement, whereas the regionally determined per-acre fees collectively recover only about 8 percent of the total revenue because of the fee cap employed in four of the regions.

Payment incidence by household income level is the same in relative terms as that of Alternative 2, and these data therefore are not repeated. Of course, households would pay less overall under this alternative since up to 20 percent of the cost would be borne by the agricultural sector. This is the main difference between this alternative and Alternative 2.

Alternative 4:
Uniform Parcel Tax on Nonagricultural Land

This alternative would place a parcel tax on nonagricultural land. We assume the tax is not differentiated by land use, but applies equally to all nonagricultural parcels. Our estimates of the number of parcels in each region are based on the count of water connections in each region and therefore only roughly approximate actual values. This alternative is equivalent to a uniform connection charge on M&I connections. In this respect it is similar to Alternative 1, except that the fee does not vary by customer class or meter capacity.

Our estimates for the regional parcel tax rates are shown in Table D6. Tax rates range from a low of $16.70/parcel/year (Lahontan) to a high of $41.61 (Colorado River). For most regions, the parcel tax rate is in the $18 to $25 range. We estimate a uniform parcel tax of about $20/parcel/year applied statewide would generate $200 million annually. As of 2011, the median real estate taxes paid on residential properties in California was $2,907.[22] Thus, the parcel tax in this example would increase the median tax payment by roughly 0.7 percent.

TABLE D6
Alternative 4: Uniform parcel tax on nonagricultural land

Region	IRWM annual revenue goal ($millions)	Parcel tax ($/Parcel/Year)
North Coast	7.78	30.36
San Francisco Bay	31.04	18.00
Central Coast	11.22	24.38
South Coast	94.68	19.71
Sacramento River	16.18	17.13
San Joaquin River	12.48	21.65
Tulare Lake	13.14	23.65
Lahontan	5.90	16.70
Colorado River	7.58	41.61
Statewide	**200.00**	**20.07**

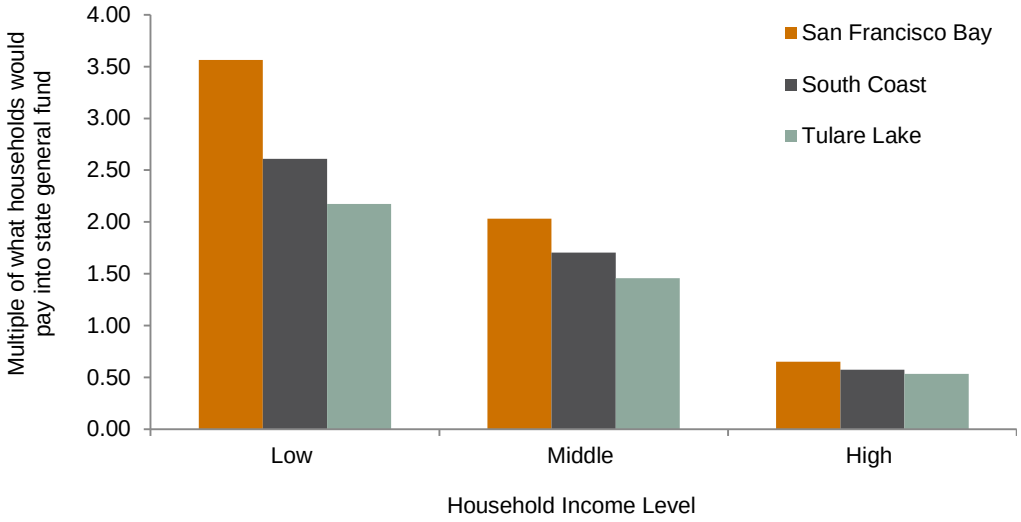
SOURCE: Authors' calculations. See Fee Model Technical Specification at end of appendix for data sources and model specification.

Like the connection surcharge, the parcel tax is not assumed to scale with income. Unlike the connection surcharge, however, the parcel tax also would not vary by type of land use.[23] As noted above, the connection surcharge for multifamily, commercial, and industrial connections were set as multiples of the charge on single-family connections. This had the effect of shifting more of the payment burden to commercial and industrial land uses than otherwise would be the case. In the parcel tax example, this shift to nonresidential

[22] One-year estimates from the 2011 American Community Survey.
[23] In practice, parcel taxes do sometimes vary by types of land use. In such a case, the parcel tax might look similar to the connection surcharge examined above.

land uses does not occur. Hence the payment burden on households is greater. This can be seen by comparing the results in Figure D10 to those in Figure D6. Under a parcel tax approach, low-income households in the San Francisco Bay region, for example, pay about three and a half times what they would pay to the state general fund, whereas under the graduated connection surcharge approach, they pay about three-quarters of this amount. Thus, the parcel tax approach is more regressive compared to either the connection surcharge or volume surcharge approaches.[24]

FIGURE D10
Uniform parcel tax on nonagricultural land: Change in household payment relative to state general fund



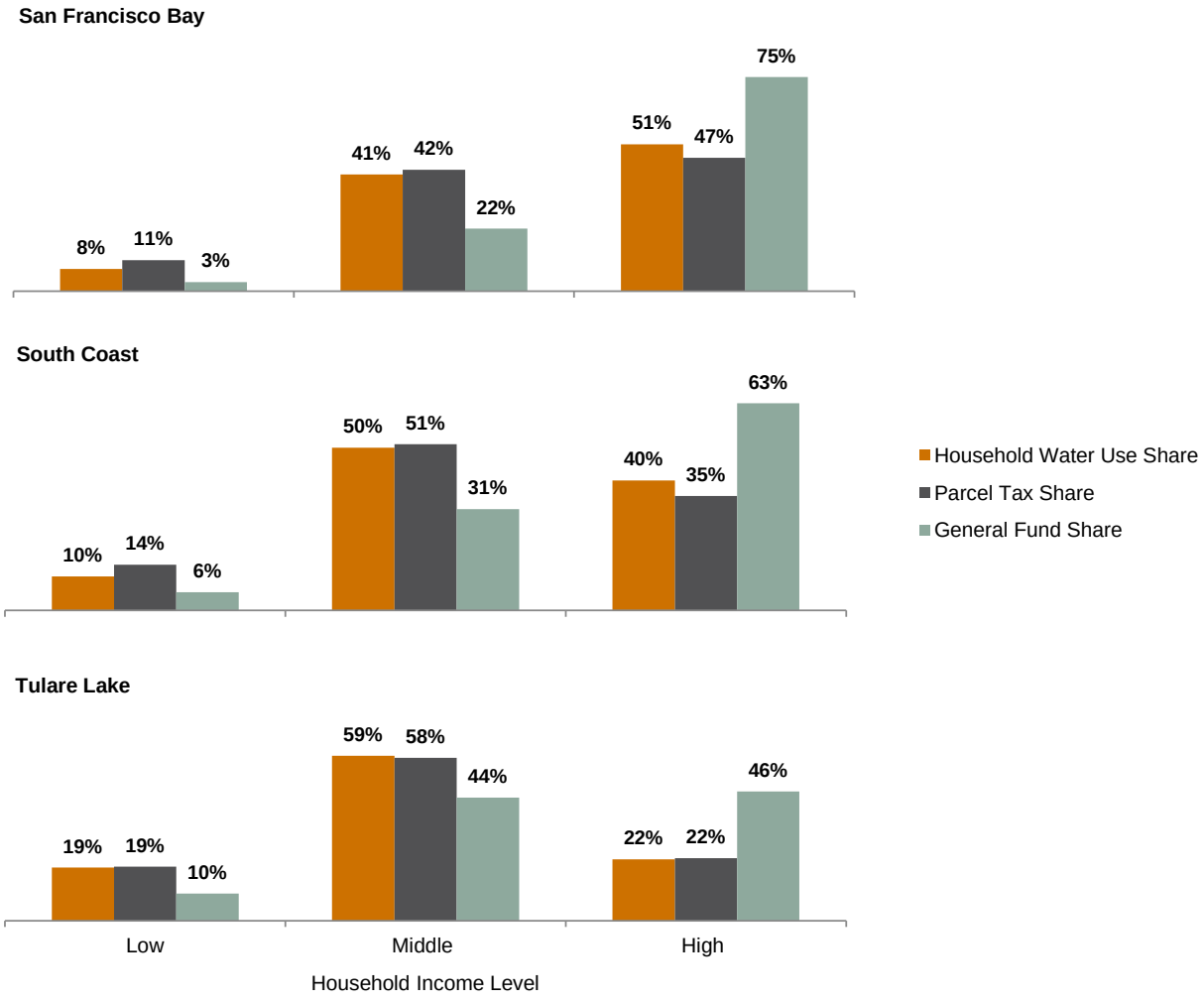
SOURCE: Author calculations. See Fee Model Technical Specification at end of appendix for data sources and model specification.

NOTE: Household Income Levels: Low= $25k or less, Middle= $25k to $100k, High= $100k or more

The incidence of parcel tax payment relative to household water use is shown in Figure D11. It is very similar to that for the connection surcharge (see Figure D7). Both alternatives align household share of payment to share of water use much more closely than the state general fund.

[24] The parcel tax is more regressive than the graduated connection surcharge for the reasons just stated. Since the graduated connection surcharge is more regressive than the volume surcharge, it follows that the volume surcharge is the least regressive of the three.

FIGURE D11
Region parcel tax on nonagricultural land: Water use share relative to payment incidence



SOURCE: Authors' calculations. See Fee Model Technical Specification at end of appendix for data sources and model specification.

NOTE: Household Income Levels: Low = $25k or less, Middle = $25k to $100k, High = $100k or more

Alternative 5: Sales Tax Increment

The last alternative is an increment in regional sales tax rates. Our estimates of increments that would generate each region's IRWM revenue goal are shown in Table D7. These increments range from 0.037 percent (San Francisco Bay) to 0.052 percent (San Joaquin River). They are generally very low relative to current sales tax rates. For example, in the Sacramento River region, the sales tax rate in the City of Sacramento is 8.5 percent. The sales tax increment for the Sacramento River region in Table D7 would increase this to 8.544 percent.

TABLE D7
Alternative 5: Regional sales tax increments

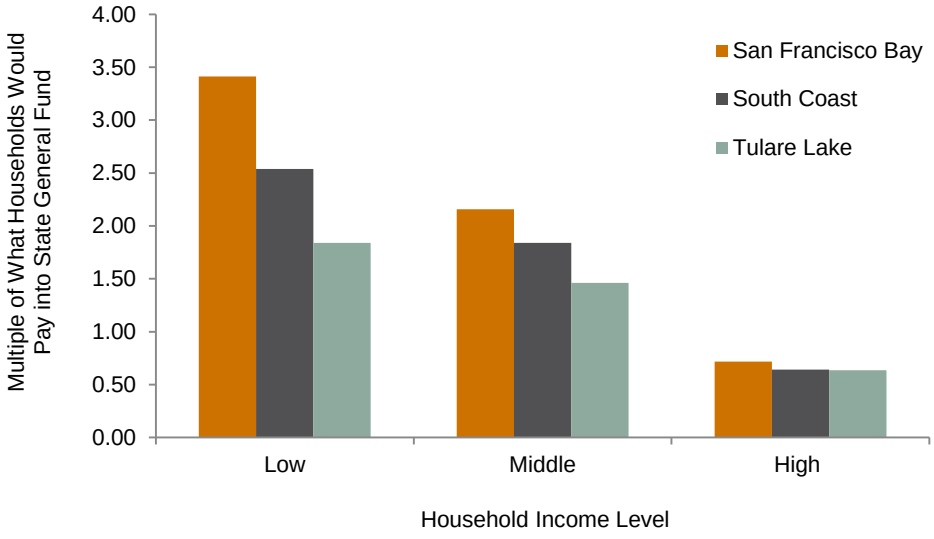
Region	IRWM annual revenue goal ($millions)	Sales tax increment (ad valorem) (%)
North Coast	7.78	0.044
San Francisco Bay	31.04	0.037
Central Coast	11.22	0.046
South Coast	94.68	0.044
Sacramento River	16.18	0.044
San Joaquin River	12.48	0.052
Tulare Lake	13.14	0.046
Lahontan	5.90	0.044
Colorado River	7.58	0.045
Statewide	**200.00**	**0.043**

SOURCE: Authors' calculations. See Fee Model Technical Specification at end of appendix for data sources and model specification.

As discussed earlier, sales taxes are regressive, meaning individuals pay a smaller percentage of their income to the state as their income increases.[25] This means that replacing general obligation bond financing with sales tax revenue would put more of the cost of IRWM on low- and middle-income households, as seen in Figure D12. Household payment incidence under this alternative is similar to that for the parcel tax (Figure D10).

[25] Sales taxes are regressive because taxable consumption does not generally increase proportionally with income and sales tax rates do not scale with income to compensate for this fact.

FIGURE D12
Sales tax increment: Change in household payment relative to state general fund

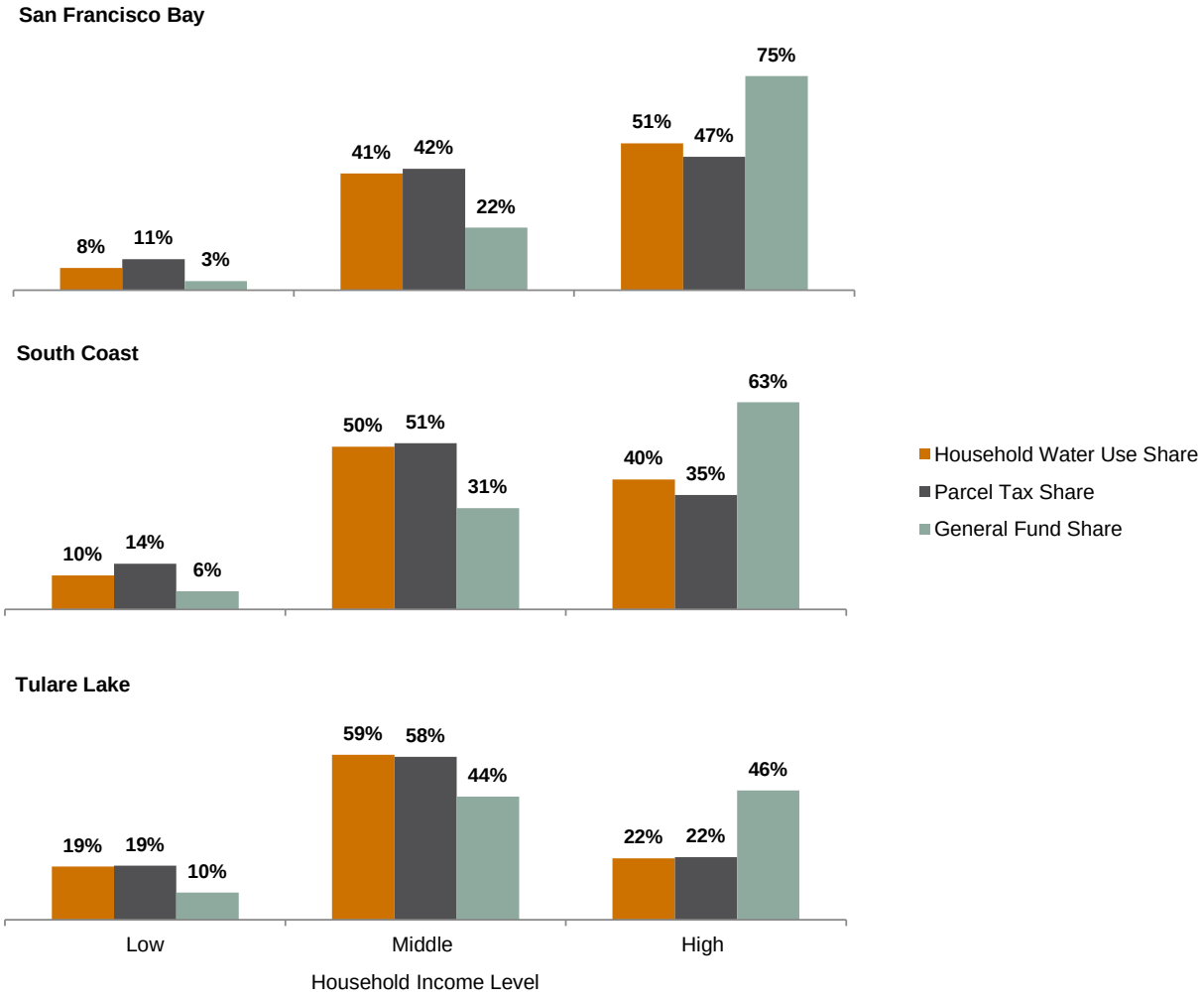


SOURCE: Authors' calculations. See Fee Model Technical Specification at end of appendix for data sources and model specification.

NOTE: Household Income Levels: Low = $25k or less, Middle = $25k to $100k, High = $100k or more

Although payment of sales taxes bears no direct relationship to household water use, it nonetheless results in a surprisingly close correspondence between share of water use and share of payment among low-, middle-, and high-income households, as shown in Figure D13.

FIGURE D13
Sales tax increment: Water use share relative to payment incidence



SOURCE: Authors' calculations. See Fee Model Technical Specification at end of appendix for data sources and model specification.

NOTE: Household Income Levels: Low = $25k or less, Middle = $25k to $100k, High = $100k or more

Technical Note: Fee Model Technical Specification

This section provides the technical specifications for the M&I and agricultural fee models.

County Population and Housing Estimates

The residential fee models are based on California Department of Finance (DOF) E-5 county population and housing unit estimates for 2005.

Aggregation to Hydrologic Regions

Model calculations are performed at the county level. County results are then aggregated to hydrologic regions according to Table D8.

TABLE D8
County allocation to hydrologic regions

County	Hydrologic Region	County	Hydrologic Region
Alameda	San Francisco Bay	Orange	South Coast
Alpine	North/South Lahontan	Placer	Sacramento River
Amador	San Joaquin River	Plumas	Sacramento River
Butte	Sacramento River	Riverside	South Coast
Calaveras	San Joaquin River	Sacramento	Sacramento River
Colusa	Sacramento River	San Benito	Central Coast
Contra Costa	San Francisco Bay	San Bernardino	South Coast
Del Norte	North Coast	San Diego	South Coast
El Dorado	Sacramento River	San Francisco	San Francisco Bay
Fresno	Tulare Lake	San Joaquin	San Joaquin River
Glenn	Sacramento River	San Luis Obispo	Central Coast
Humboldt	North Coast	San Mateo	San Francisco Bay
Imperial	Colorado River	Santa Barbara	Central Coast
Inyo	North/South Lahontan	Santa Clara	San Francisco Bay
Kern	Tulare Lake	Santa Cruz	Central Coast
Kings	Tulare Lake	Shasta	Sacramento River
Lake	Sacramento River	Sierra	Sacramento River
Lassen	North/South Lahontan	Siskiyou	North Coast
Los Angeles	South Coast	Solano	San Francisco Bay
Madera	San Joaquin River	Sonoma	North Coast
Marin	San Francisco Bay	Stanislaus	San Joaquin River
Mariposa	San Joaquin River	Sutter	Sacramento River
Mendocino	North Coast	Tehama	Sacramento River
Merced	San Joaquin River	Trinity	North Coast
Modoc	Sacramento River	Tulare	Tulare Lake
Mono	North/South Lahontan	Tuolumne	San Joaquin River
Monterey	Central Coast	Ventura	South Coast
Napa	San Francisco Bay	Yolo	Sacramento River
Nevada	Sacramento River	Yuba	Sacramento River

There are differences in the fee model's and DWR's population estimates for the hydrologic regions. These differences occur because the fee model does not split county populations between hydrologic regions, whereas in reality some counties span more than one region (see Figure D1). Thus, in the fee model, population estimates are biased upward for some regions (e.g., South Coast) and downward for other regions (e.g., Colorado River). The extent of this bias is shown in Table D9. Note that these biases are not present for county-level results. They are an artifact of the way in which the model aggregates county results to the hydrologic regions. The biases are most severe for the North/South Lahontan and Colorado River regions. These two regions account for less than 5 percent of state population according to DWR estimates.

To account for this in the comparative analyses of Proposition 84 IRWM funding alternatives, the IRWM dollar amounts allocated to each region shown in Table D1 were re-scaled in the model to maintain the ratios of funding share to population share shown in Table D2. In this way, the model's regional population estimates are kept from biasing the regional payment incidence results.

TABLE D9
Population, income, general fund revenue, and water use by hydrologic region

Hydrologic region	% of 2005 state population		Fee model shares (% of state total)				
	2009 state water plan	Fee model	House-hold income	State general fund revenue	M&I water use	Agricultural water use	M&I + ag water use
North Coast	1.9	2.1	2.28	1.77	2.14	3.71	3.35
San Francisco Bay	17.2	18.0	22.93	27.48	14.01	3.35	5.81
Central Coast	4.1	3.8	4.00	3.49	2.92	3.74	3.55
South Coast	53.4	57.1	53.76	53.90	54.72	6.64	17.72
Sacramento River	7.9	7.9	8.19	6.40	9.90	30.26	25.57
San Joaquin River	5.4	4.6	3.95	2.79	6.48	20.65	17.38
Tulare Lake	5.7	5.9	4.48	3.80	8.88	24.51	20.90
North/South Lahontan	2.5	0.2	0.16	0.12	0.42	2.75	2.21
Colorado River	1.9	0.4	0.26	0.24	0.52	4.41	3.51
State Totals	35.8	35.8	1,000	85.10	8,276	27,641	35,917
Units	Million	Million	Billion	Billion	Thousand	Thousand	Thousand
	People	People	Dollars	Dollars	Acre-Feet	Acre-Feet	Acre-Feet

Residential Water Use

Imputation of Residential Population by Housing Type

Department of Finance E-5 divides population between residential and group quarters. It does not, however, split residential population between single-family and multifamily households, which is needed for calculating residential water use. Population and housing data from Census 2000 were used to impute the E-5 residential population estimate to single-family and multifamily categories, as follows.

First, a population adjustment factor for each county in California was constructed.

$$\theta_i = \frac{P_i}{\sum_j PPH_{ij} HU_{ij}} \quad (1)$$

where

P_i = E-5 residential population estimate for county i

PPH_{ij} = Census 2000 estimate of persons per household in county i for housing type j

HU_{ij} = E-5 housing unit estimate for county i and housing type j

Second, the residential population in county i and housing type j was estimated.

$$P_{ij} = \theta_i PPH_{ij} HU_{ij} \quad (2)$$

Note that by construction

$$P_i = \sum_j P_{ij} \quad (3)$$

Consolidation of Housing Types

Two housing categories—single-family and multifamily—are used in the residential fee models. This requires consolidating the housing types used by DOF E-5 into these two categories. The E-5 housing and population estimates are mapped to the two housing categories as shown in Table D10.

TABLE D10
Housing type mapping for population and households

Model housing category	Sum of DOF E-5 housing types
Single-family	Single-family detached, single-family attached, mobile home
Multifamily	Multifamily 2 to 4 units, multifamily 5 plus units

Number of Residential Bills

The number of residential bills is assumed to equal the number of residential structures. For the single-family housing category, this is simply equal to the DOF E-5 count of single-family housing units. For the multifamily housing category, DOF E-5 does not provide an estimate of structures, only total housing units, so the number of structures is estimated by dividing the count of multifamily housing units by an estimate of the average number of housing units per structure. The average number of housing units per multifamily housing structure is estimated with Census 2000 data as follows.

First, the Census categorizes housing count data by the number of units per structure. The first column of Table D11 shows the Census categories. The second column shows the average units per structure assumed for each category.

TABLE D11
Assumed units per structure for multifamily housing classes

Census multifamily structure classification	Assumed average units per structure
2 unit structure	2.0
3-4 unit structure	3.5
5-9 unit structure	7.0
10-19 unit structure	14.5
20-49 unit structure	34.5
50-plus unit structure	75.0

Second, the total number of multifamily structures in county i is estimated using Census 2000 data.

$$structures_i = \sum_j \frac{totalHousingUnits_{ij}}{avgUnits_j} \quad (4)$$

where

$structures_i$ = Estimated number of multifamily structures in county i, based on Census 2000 data

$totalHousingUnits_{ij}$ = Number of multifamily housing units in county i and structure classification j, based on Census 2000 data

$avgUnits_j$ = Average number of housing units per structure for structure classification j, based on table above

Third, the average number of multifamily housing units per structure is calculated as:

$$avgUnitsPerStructure_i = \frac{\sum_j totalHousingUnits_{ij}}{structures_i} \quad (5)$$

where

$structures_i$ = Estimated number of multifamily structures in county i, based on Census 2000 data

$totalHousingUnits_{ij}$ = Number of multifamily housing units in county i and structure classification j, based on Census 2000 data

$avgUnitsPerStructure_i$ = Estimated average number of housing units per multifamily structure in county i

The number of multifamily bills is then given as:

$$bills_{iMF} = \frac{HU_{i,MF}}{avgUnitsPerStructure_i} \quad (6)$$

where

$bills_{i,MF}$ = Estimated number of multifamily bills in county i

$HU_{i,MF}$ = DOF E-5 estimated number of multifamily housing units in county i

$avgUnitsPerStructure_i$ = Estimated average number of housing units per multifamily structure in county i

Household Income by Housing Category

Census data do not disaggregate household income by housing category. However, they do provide household income by housing tenure (i.e., owner or renter). We use the owner and renter tenure categories as proxies for single and multifamily households, since the vast majority of multifamily households are renters and most single-family households are owners. We use county level household income data from the 2005-09 American Community Survey (ACS) to estimate the percentage of households in the following six income categories (Table D12).

TABLE D12
Household income categories and average incomes

Income category (k)	Household income range	Average income in category ($householdinc_k$)
1	< 25 k	15.0 k
2	25 – 50 k	37.5 k
3	50 – 75 k	62.5 k
4	75 – 100 k	87.5 k
5	100 – 150 k	125.0 k
6	> 150 k	200.0 k

The percentage of households in each income category is given by:

$$pctHouseholdsByInc_{ijk} = \frac{households_{ijk}}{\sum_k households_{ijk}} \quad (7)$$

where

$pctHouseholdsByInc_{ijk}$ = Percent of county i housing units of type j in income category k

$Households_{ijk}$ = ACS 2005-09 count of county i housing units of type j in income category k

The assumed average household income in income category k ($householdInc_k$) is shown in the last column of the table above. For modeling purposes, these amounts are expressed in terms of median household income for households of type j (i.e., single and multifamily households) as follows.

$$pctMedianInc_{ijk} = \frac{householdInc_k}{medianHouseholdInc_{ij}} \quad (8)$$

where

$pctMedianInc_{ijk}$ = Average household income for county i housing units of type j in income category k, expressed as a percent of median household income for type j households

$householdInc_k$ = Assumed average household income for income category k

$medianHouseholdInc_{ij}$ = Median household income for county i housing units of type j, from the 2005-09 ACS

- **Household Water Use by Housing Type and Income Category**

Monthly billed water use by housing type and income category is calculated as:

$$monthlyHouseholdUse_{ijk} = \omega_{ij}\bar{W}_{ij}\left(pctMedianInc_{ijk}\right)^{\delta_j}\left(pctMedianHouseSize_{ijk}\right)^{\varepsilon_j} \quad (9)$$

where

$monthlyHouseholdUse_{ijk}$	=	Average monthly water use in ccf for county i households of type j and income category k
ω_{ij}	=	Scalar to ensure that residential water use by income category sums to DWR Water Plan estimate of residential water use in county i and housing type j
$\bar{W}_{ij}$	=	Average residential water use in county i for households of type j derived from DWR Water Plan data
$pctMedianInc_{ijk}$	=	Average household income for county i housing units of type j in income category k, expressed as a percent of median household income for type j households
$pctMedianHouseSize_{ijk}$	=	Average county i house square footage for housing units of type j in income category k, expressed as a percent of average county i house size of type j with median household income (note: this parameter only applies to single-family housing units)
δ_j	=	Elasticity of residential water demand for households of type j with respect to income
ε_j	=	Elasticity of residential water demand for households of type j with respect to house size (note: this is set to 0 for multifamily households)

The structural form of the household water use model and values for the elasticity parameters are taken from Renwick and Green (2000).[26]

- **Derivation of Average Applied Water Use by Housing Type**

Average applied water use by county and type of housing is derived from DWR Water Plan data as follows.

$$\bar{W}_{ij} = \left(\frac{totalAppliedWater_{ij}}{bills_{ij}}\right)\left(\frac{1000}{1}\frac{AF}{TAF}\right)\left(\frac{435.6}{1}\frac{ccf}{AF}\right)\left(\frac{1}{12}\frac{Yr}{Month}\right) \quad (10)$$

where

$\bar{W}_{ij}$	=	Average monthly water use in ccf for county i households of type j
$totalAppliedWater_{ij}$	=	DWR Water Plan estimate of total applied water use in county i by households of type j, in thousands of acre feet
$bills_{ij}$	=	Total number of water bills in county i going to services to households of type j

[26] Note, in equation (9) it is being implicitly assumed that $\bar{W}_{ij} \approx \alpha I^{\delta} A^{\varepsilon}$, where I is median income and A is median house size. Thus, inclusion of $\bar{W}_{ij}$ converts pctMedianInc and pctMedianHouseSize to the proper units with respect to their elasticity parameters.

DWR estimates applied water use by Planning Area and Detailed Analysis Unit, but not by county. However, it does estimate the fraction of Planning Area population residing in each county. We used these population shares to allocate the Planning Area residential applied water use to the 58 counties.

- **Derivation of Average Household Size by Income Category**

The average size of a single-family housing unit in income category k is calculated as follows. First, the following relationship between house size and deviation from median household income water is estimated.

$$houseSize = \alpha + \beta \times pctDeviationMedianInc \quad (11)$$

where

$houseSize$ = House size in square feet

$pctDeviationMedianInc$ = Percent deviation of household income from median

α = Average house size in square feet for median income household

β = Average change in house size in square feet for a 1% increase/decrease in income (relative to the median)

Weighted Least Squares was used with micro data from the ACS for 1998, 2002, and 2004 to estimate (0-11) for counties in California for which data were available. The results from these counties were then used as proxies for the remaining counties. Table D13 shows how estimating counties were paired with the remaining counties in the state.

TABLE D13
County proxies for counties without American Community Survey micro-data

GEO_ID	COUNTY_NAME	COUNTY_PROXY	α	β
06001	Alameda	Alameda	1,751	387
06003	Alpine	El Dorado	2,086	485
06005	Amador	El Dorado	2,086	485
06007	Butte	Placer	1,982	448
06009	Calaveras	El Dorado	2,086	485
06011	Colusa	Sacramento	1,942	35
06013	Contra Costa	Contra Costa	1,865	397
06015	Del Norte	Placer	1,982	448
06017	El Dorado	El Dorado	2,086	485
06019	Fresno	Sacramento	1,942	35
06021	Glenn	Sacramento	1,942	35
06023	Humboldt	Placer	1,982	448
06025	Imperial	Riverside	1,832	321
06027	Inyo	San Bernardino	1,746	241
06029	Kern	Sacramento	1,942	35
06031	Kings	Sacramento	1,942	35
06033	Lake	Marin	1,965	381
06035	Lassen	Placer	1,982	448

GEO_ID	COUNTY_NAME	COUNTY_PROXY	α	β
06037	Los Angeles	Orange	2,036	227
06039	Madera	Sacramento	1,942	35
06041	Marin	Marin	1,965	381
06043	Mariposa	Placer	1,982	448
06045	Mendocino	Marin	1,965	381
06047	Merced	Placer	1,982	448
06049	Modoc	Placer	1,982	448
06051	Mono	San Bernardino	1,746	241
06053	Monterey	Santa Clara	1,772	289
06055	Napa	Marin	1,965	381
06057	Nevada	Placer	1,982	448
06059	Orange	Orange	2,036	227
06061	Placer	Placer	1,982	448
06063	Plumas	Placer	1,982	448
06065	Riverside	Riverside	1,832	321
06067	Sacramento	Sacramento	1,942	35
06069	San Benito	Santa Clara	1,772	289
06071	San Bernardino	San Bernardino	1,746	241
06073	San Diego	San Diego	1,829	267
06075	San Francisco	San Francisco	1,575	276
06077	San Joaquin	Contra Costa	1,865	397
06079	San Luis Obispo	San Mateo	1,799	372
06081	San Mateo	San Mateo	1,799	372
06083	Santa Barbara	San Mateo	1,799	372
06085	Santa Clara	Santa Clara	1,772	289
06087	Santa Cruz	Santa Clara	1,772	289
06089	Shasta	Placer	1,982	448
06091	Sierra	Placer	1,982	448
06093	Siskiyou	Placer	1,982	448
06095	Solano	Contra Costa	1,865	397
06097	Sonoma	Marin	1,965	381
06099	Stanislaus	Contra Costa	1,865	397
06101	Sutter	Sacramento	1,942	35
06103	Tehama	Sacramento	1,942	35
06105	Trinity	Sacramento	1,942	35
06107	Tulare	Sacramento	1,942	35
06109	Tuolumne	El Dorado	2,086	485
06111	Ventura	Orange	2,036	227
06113	Yolo	Contra Costa	1,865	397
06115	Yuba	Placer	1,982	448

Second, the percent deviation of average category k income from median household income was calculated for each county, and combined with the intercept and slope parameters in the above table, to calculate average house size for category k income level.

$$houseSize_{ik} = \alpha_i + \beta_i \times pctDeviationMedianInc_{ik} \quad (12)$$

where

$houseSize_{ik}$	=	Estimated size in square feet of a single-family house in county i and category k household income
$pctDeviationMedianInc_{ik}$	=	Percent deviation of category k household income from median in county i
α_i	=	Average house size in square feet for median income household in county i
β_i	=	Average change in house size in square feet for a 1% increase/decrease in income (relative to the median) in county i

Third, the ratio of the average house size for category k household income to the average house size for a median income household was calculated for each county.

$$pctMedianHouseSize_{ik} = \frac{houseSize_{ik}}{\alpha_i} \quad (13)$$

- **Derivation of Residential Water Use Scalars**

In equation (9), monthly household water use is scaled to ensure that residential water use by income category sums to the DWR Water Plan estimate of residential water use in county i and housing type j. These scalars are derived as follows:

$$\omega_{ij} = \frac{\bar{W}_{ij}}{\sum_k pctHouseholdsByInc_{ijk}\bar{W}_{ij}\left(pctMedianInc_{ijk}\right)^{\delta_j}\left(pctMedianHouseSize_{ijk}\right)^{\varepsilon_j}} \quad (14)$$

where all variables are as previously defined.
This ensures that

$$\bar{W}_{ij} = \sum_k pctHouseholdsByInc_{ijk} \times monthlyHouseholdUse_{ijk} \quad (15)$$

The derived scalars for single and multifamily housing types are shown in Table D14. The unscaled model is typically within 1 or 2 percent of Water Plan residential sector water use estimates for single-family households and 5 to 6 percent for multifamily households.

TABLE D14
County scalars for residential water use estimates

COUNTY_ID	Single Family	Multifamily	COUNTY_ID	Single Family	Multifamily
06001	1.0111	0.9584	06059	1.0187	0.9676
06003	0.9945	0.9566	06061	1.0087	0.9692
06005	1.0031	0.9811	06063	0.9992	0.9988
06007	1.0190	0.9298	06065	1.0228	0.9549
06009	1.0125	0.9899	06067	1.0122	0.9538
06011	1.0180	0.9545	06069	1.0132	0.9627
06013	1.0092	0.9506	06071	1.0116	0.9533
06015	1.0328	1.0000	06073	1.0154	0.9577
06017	1.0056	0.9637	06075	1.0123	0.9560
06019	1.0140	0.9259	06077	1.0017	0.9458
06021	1.0161	0.9327	06079	1.0201	0.9446
06023	1.0015	0.9049	06081	1.0171	0.9654
06025	1.0159	0.8818	06083	1.0053	0.9536
06027	1.0467	0.9688	06085	1.0290	0.9728
06029	1.0193	0.9284	06087	1.0234	0.9473
06031	1.0067	0.9455	06089	1.0095	0.9209
06033	1.0368	0.9087	06091	1.0303	1.0268
06035	1.0311	0.9901	06093	1.0031	0.8998
06037	1.0024	0.9413	06095	1.0087	0.9700
06039	1.0056	0.9507	06097	1.0143	0.9673
06041	1.0196	0.9596	06099	1.0005	0.9394
06043	1.0361	0.9822	06101	1.0120	0.9521
06045	1.0031	0.9582	06103	1.0267	0.9505
06047	0.9988	0.9226	06105	1.0102	0.8866
06049	0.9803	0.9083	06107	1.0103	0.9302
06051	1.0052	1.0075	06109	1.0034	0.9281
06053	1.0074	0.9636	06111	1.0202	0.9657
06055	1.0178	0.9466	06113	1.0122	0.9487
06057	1.0016	0.9596	06115	1.0261	0.9389

Commercial Water Use

The total number of commercial bills in a county is assumed to equal the number of commercial establishments in the county. The number of commercial establishments is taken from 2005 County Business Patterns data.

Average commercial water use per bill is derived from Water Plan estimates of commercial applied water use:

$$monthlyComUse_i = \left(\frac{totalAppliedWater_i}{bills_i}\right)\left(\frac{1000}{1}\frac{AF}{TAF}\right)\left(\frac{435.6}{1}\frac{ccf}{AF}\right)\left(\frac{1}{12}\frac{Yr}{Month}\right) \quad (16)$$

where

$monthlyComUse_i$ = Average monthly commercial water use in ccf for county i

$totalAppliedWater_i$ = Water Plan estimate of commercial applied water use in county i, in thousands of acre feet

$bills_i$ = Total number of commercial water bills in county i

Industrial Water Use

Industrial water bills and use are derived in exactly the same as commercial bills and use.

The total number of industrial bills in county is assumed to equal the number of industrial establishments in the county. The number of industrial establishments is taken from 2005 County Business Patterns data.

Average industrial water use per bill is derived from Water Plan estimates of industrial applied water use:

$$monthlyIndUse_i = \left(\frac{totalAppliedWater_i}{bills_i}\right)\left(\frac{1000}{1}\frac{AF}{TAF}\right)\left(\frac{435.6}{1}\frac{ccf}{AF}\right)\left(\frac{1}{12}\frac{Yr}{Month}\right) \quad (17)$$

where

$monthlyIndUse_i$ = Average monthly industrial water use in ccf for county i

$totalAppliedWater_i$ = Water Plan estimate of industrial applied water use in county i, in thousands of acre feet

$bills_i$ = Total number of industrial water bills in county i

Agricultural Water Use

Irrigated acreage and applied water use by county are estimated with data from the 2007 Agricultural Census and 2005 U.S. Geological Survey (USGS) irrigation water use estimates.

- **Farm Counts**

Data from the 2007 Agricultural Census are used to estimate the number of farms by size of farm in each county. Farms are grouped into 12 size-categories as shown in Table D15.

TABLE D15
Average farm size by farm categories

Farm-size category in acres	Assumed average farm size (acres)
1 – 9.9	5
10 – 49.9	30
50 – 69.9	60
70 – 99.9	85
100 – 139	119.5
140 – 179	159.5
180 – 219	199.5
220 – 259	239.5
260 – 499	379.5
500 – 999	749.5
1000 – 1999	1100
2000 plus	2000

- **Irrigated Acreage**

Irrigated acreage by county is estimated as follows:

$$irrigatedAcres_i = \sum_j numFarms_{ij} \times avgFarmSize_j \quad (18)$$

where

$irrigatedAcres_i$ = Number of irrigated farm acres in county i

$numFarms_{ij}$ = Number of farms in size category j in county i

$avgFarmSize_j$ = Average farm size in acres of farms in category j, per above table

Statewide irrigated acreage is:

$$totalIrrigatedAcres = \sum_i irrigatedAcres_i \quad (19)$$

This totals to 9.47 million acres, which for practical purposes exactly matches the USGS's 2005 estimate of 9.5 million acres.

- **Applied Irrigation Water**

Average applied irrigation water per acre by county is estimated with 2005 USGS estimates of applied irrigation water and acreage as follows:

$$waterUsePerAcre_i = \frac{totalWaterUse_i}{irrigatedLandArea_i} \quad (20)$$

where

$waterUsePerAcre_i$ = Average irrigation water use per acre in county i

$totalWaterUse_i$ = USGS 2005 estimate of irrigation water use in county i

$irrigatedLandArea_i$ = USGS 2005 estimate of irrigated acreage in county i

Total applied water use in county is:

$$appliedWaterUse_i = irrigatedAcres_i \times waterUsePerAcre_i \quad (21)$$

Total applied water use statewide is:

$$totalAppliedWaterUse = \sum_i appliedWaterUse_i \quad (22)$$

This totals to 27.6 MAF, which is within 0.4% of the Water Plan's estimate of 27.5 MAF for 2005.

Calculation of Fee Revenue

M&I Fees

- **Bill Surcharge**

Revenue from a bill surcharge is the product of the monthly surcharge set by the user and the count of water bills. For the residential sector, this is:

$$residentialFeeRevenue_{ij} = 12 \sum_k residentialBills_{ijk} \times residentialBillSurcharge_j \quad (23)$$

where

$residentialFeeRevenue_{ij}$ = Annual fee revenue generated by housing category j in county i

$residentialBills_{ijk}$ = Number of water bills in county i for housing category j and income level k. If low-income households are exempted from the fee, the bills for households with income less than $25,000 are excluded from the calculation.

$residentialBillSurcharge_j$ = Bill surcharge in $/month for housing category j set by the user

For the commercial and industrial sectors, this is:

$$comFeeRevenue_i = 12 \times comBills_i \times comBillSurcharge \quad (24)$$

$$indFeeRevenue_i = 12 \times indBills_i \times indBillSurcharge \quad (25)$$

where

$comFeeRevenue_i$	=	Annual fee revenue generated by commercial sector in county i
$indFeeRevenue_i$	=	Annual fee revenue generated by industrial sector in county i
$comBills_i$	=	Number of commercial water bills in county i
$indBills_i$	=	Number of industrial water bills in county i
$comBillSurcharge$	=	Bill surcharge in $/month for commercial water users
$indBillSurcharge$	=	Bill surcharge in $/month for industrial water users

- **Volume Fee**

Revenue from a volume fee is the product of three quantities: (1) the fee, (2) adjusted average monthly water use, and (3) the number of bills. Monthly water use is adjusted using the demand elasticity set by the user on the Fee Design worksheet. In the model, the maximum adjustment is limited to 10%.

For the residential sector, this is:

$$residentialFeeRevenue_{ij} = 12 \sum_k residentialBills_{ijk} \times residentialVolFee_j \times monthlyHouseholdUse_{ijk} \times \left(1 + residentialElast_j \left(\frac{residentialVolFee_j}{waterRate_i}\right)\right) \quad (26)$$

where

$residentialFeeRevenue_{ij}$	=	Annual fee revenue generated by housing category j in county i
$residentialBills_{ijk}$	=	Number of water bills in county i for housing category j and income level k. If low-income households are exempted from the fee, the bills for households with income less than $25,000 are excluded from the calculation.
$residentialVolFee_j$	=	Volumetric fee set by user for type j households, in $/ccf
$monthlyHouseholdUse_{ijk}$	=	Average monthly water use in ccf for county i households of type j and income category k
$residentialElast_j$	=	Demand elasticity for type j households set by user on Fee Design worksheet
$waterRate_i$	=	Average M&I water rate in county i in $/ccf, as derived from 2006 Black & Veatch Water Rate Survey data

For the commercial and industrial sectors, this is:

$$comFeeRevenue_i = 12 \times comBills_i \times comVolFee \times monthlyComUse_i \times \left(1 + comElast \left(\frac{comVolFee}{waterRate_i}\right)\right) \quad (27)$$

$$indFeeRevenue_i = 12 \times indBills_i \times indVolFee \times monthlyIndUse_i \times \left(1 + indElast \left(\frac{indVolFee}{waterRate_i}\right)\right) \quad (28)$$

where

$comFeeRevenue_i$ = Annual fee revenue generated by commercial sector in county i

$indFeeRevenue_i$ = Annual fee revenue generated by industrial sector in county i

$comBills_i$ = Number of commercial water bills in county i

$indBills_i$ = Number of industrial water bills in county i

$comVolFee$ = Volumetric fee set by user for commercial water users in $/ccf

$indVolFee$ = Volumetric fee set by user for industrial water users in $/ccf

$monthlyComUse_i$ = Average monthly commercial water use in ccf for county i

$monthlyIndUse_i$ = Average monthly industrial water use in ccf for county i

$comElast$ = Demand elasticity for commercial water use set by user on Fee Design worksheet

$indElast$ = Demand elasticity for industrial water use set by user on Fee Design worksheet

$waterRate_i$ = Average M&I water rate in county i in $/ccf, as derived from 2006 Black & Veatch Water Rate Survey data

Agricultural Fees

- **Per Irrigated Acre**

Revenue from a surcharge per irrigated acre is the product of the surcharge set by the user and the count of irrigated acres in each farm size category. Total irrigated acreage is stratified by farm size in the model, which gives the model the ability to exclude farms below user specified size thresholds from a fee scenario. In the model, farm size is consolidated into five size categories: less than 100 acres, 100-500 acres, 500-1000 acres, 1000-2000 acres, and more than 2000 acres. Total annual fee revenue is:

$$agFeeRevenue_i = \sum_j numFarms_{ij} \times avgFarmSize_j \times feePerAcre_j \quad (29)$$

where

$agFeeRevenue_i$ = Annual revenue generated by the fee in county i

$numFarms_{ij}$ = Number of farms in county i in size category j

$avgFarmSize_j$ = Average farm size in acres for farms in size category j

$feePerAcre_j$ = Annual fee per acre for farms in size category j set by the user

- **Per acre-foot**

Revenue from a surcharge per acre-foot is the product of the surcharge set by the user and the volume of applied water. Total annual fee revenue is:

$$agFeeRevenue_i = \sum_j numFarms_{ij} \times avgFarmSize_j \times waterUsePerAcre_i \times feePerAF_j \quad (30)$$

where

$agFeeRevenue_i$ = Annual revenue generated by the fee in county i

$irrigatedAcres_{ij}$ = Number of irrigated acres in county i for farms in size category j

$waterUsePerAcre_i$ = Average applied water use per acre in county i

$feePerAF_j$ = Annual fee per acre-foot of applied water for farms in size category j set by the user

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Paying for Water in California

Technical Appendix E: Local Ballot Measures to Fund the Water System

Contents

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Summary

This appendix summarizes data compiled on local water funding ballot measures in California since 1995. These measures include general taxes, general obligation bonds, special taxes, property-related fees and assessments, non-property related fees, and water rate adjustments (including revenue bonds). We examined characteristics of these measures including whether they focus exclusively on water-related activities or are more general, what type of water functions they are intended to fund, frequency of ballots by hydrologic region, and pass rates. For more details on the trends described here, please see the online data set Local Water-Funding Ballot Measures.

Introduction

As discussed in the main report, the vast majority of annual spending in the water sector occurs at the local level. In some instances, local governments (cities, counties, and special districts) need to go to local voters (either property owners or the general electorate) to gain explicit approval before introducing or increasing a revenue source. The precise voting rules depend on provisions in the California Constitution, and they have changed over time following the passage of Proposition 13 (1978), Proposition 218 (1996), and Proposition 26 (2010).[1] Local entities sometimes also go to voters to get their approval even if not required to do so by the state constitution. Ballot measures can also appear by initiative, if proponents gather enough signatures from registered voters. To shed light on how often, and with what success, ballot measures are used to fund water management, we assembled data available on these measures since 1995 from a variety of sources. This appendix summarizes the results of our analysis. For more details, please see the online data set Local Water-Funding Ballot Measures.

Overall there have been relatively few ballot measures proposed for new water funding since 1995: only 116 measures, by 86 local governments, over a span of nearly two decades. To set this in context, California has 58 counties, 482 incorporated cities and towns, and several thousand special districts with water management responsibilities. Although most water supply and wastewater funding can be approved without placing a measure on the ballot, local voter approval is required for most new funding for stormwater, flood protection, and most types of ecosystem and watershed improvements. Not surprisingly, then, most measures have focused on these three areas (94 out of 116), with the remainder supporting water supply and wastewater management. Overall, only 72 percent of all measures passed. General tax measures, which require only a simple majority vote to pass, were most successful (100% passing), followed by special tax and general obligation bond measures requiring a two-thirds supermajority that supported water alongside other activities like transportation (86%). Water-focused measures were the least successful, whether requiring approval by a simple majority of property owners (68%) or two-thirds of all voters (61%). With an across-the-board simple majority passage threshold for all measures – comparable to the requirement for statewide ballot measures – another nine measures would have passed, bringing the total pass rate up to 80 percent. A lower passage threshold would likely also have encouraged more local governments to propose ballot measures to fund water.

[1] See the main report, especially Table 2; and for further details, see Appendix A.

Types of Revenue Measures

The majority of local spending in the water sector is done by water supply and wastewater agencies, with monthly service charges representing their largest single source of revenue (Appendix B, Table B3). Local agencies can increase these charges without direct voter approval, although they must provide public notice and the opportunity for property owners to protest rate changes. If a majority of affected property owners protest, the rate changes are disallowed.[2] Occasionally, water and wastewater agencies place rate increases (or revenue bonds, which typically commit the community to future rate increases) on the ballot as a way of confirming public support for new spending.[3] If a water or wastewater agency uses another funding mechanism, such as a special tax or general obligation (GO) bond, the same voting rules apply as described below for other local entities.

In the case of other water-related services, including flood protection, stormwater management, and ecosystem management, local agencies are required to obtain voter approval for most new revenue sources.[4] The voting rules vary depending on the type of local entity and fiscal mechanism.

- **Local general taxes.** Taxes proposed for a variety of purposes and destined for the local general fund can be levied by cities and counties if they obtain simple majority approval from the general electorate. Under Proposition 218, general taxes are not available to special districts (which by definition can only levy "special taxes").
- **Local GO bonds.** These bonds, relatively rare in the water sector, require the approval of two-thirds of the general electorate.
- **Local special taxes.** Special taxes, such as parcel taxes and sales tax add-ons, are earmarked for specific uses and, since the passage of Proposition 13, require a two-thirds approval of the general electorate.
- **Property-related assessments.** Especially common among flood management programs, these assessments require a simple weighted majority vote of affected property owners, where the weighting is determined by the amount each property owner would pay under Proposition 218. Property-related assessments must be proportional to the benefits received by the property.
- **Property-related fees for functions other than water, wastewater, and trash collection.** Under the rules established by Proposition 218, these fees require a simple majority approval from affected property owners. Local agencies can alternatively seek approval for property-related fees from two-thirds of the general electorate, but this process is rarely (if ever) undertaken. Property-related fees must be proportional to the cost of service to the property.
- **Local non-property-related fees.** These charges (e.g., a surcharge on chemicals) can generally be approved by local governing boards without the approval of local voters. However, in 2010 Proposition 26 created stricter requirements for a charge to be considered a fee rather than a tax, and

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[2] We are not aware of any successful protests where more than half of property owners objected, but in several cases in small rural communities, boards have not gone forward with the increases following a large share of property owner protests. For instance, this occurred in 2009 in La Mel Heights, Amador County Water Agency following a 43 percent protest (http://amadorwatchdog.org/success.html#cawp). Another example is Tuolumne Unities District (2011) (www.mymotherlode.com/news/local/1406727/Upset-Over-Water-Rates.html).

[3] This can also be required under local statutes. For instance, until 2002, when voters approved a change in the city's charter, San Francisco's water and wastewater utility (the San Francisco Public Utilities Commission) was required to go to voters to get simple majority approval of revenue bonds.

[4] A key exception is developer fees, levied on new construction. These fees must have a reasonable nexus to the activity and must be roughly proportional to the cost attributable to the development project, but they do not require a vote.

charges that are determined to be taxes are subject to voter approval according to the voting rules outlined above (a simple majority for general taxes, and a two-thirds majority for special taxes).

The main report provides many illustrations of these different types of local revenue sources. See in particular Box 2 for a description of the difference between a parcel tax and property-related fees and assessments.

Building a Ballot Dataset

We drew upon a variety of sources to construct our dataset of local ballot measures. The California Elections Data Archive (CEDA) at Sacramento State University (www.csus.edu/calst/cal_studies/CEDA.html) houses data going back to 1995 on city and county elections, but it does not include measures for special districts other than school districts. To supplement the CEDA data, we used Ballotpedia (http://ballotpedia.org) which does include special district ballot measures, although the data before 2010 are less comprehensive. The California Local Government Finance Almanac (www.californiacityfinance.com/) also allowed us to fill in some gaps on local elections; but, overall, this source had less specific data on the measures (for example, the number of votes) and only included data since 2002. We also supplemented these sources with information from city and county websites, but online records of local elections are irregular. Finally, with regard to balloting on flood and stormwater fees and assessments by property-owners—which is generally not recorded by county election offices nor included in any of the above sources—the SCI Consulting Group provided us with a list of measures they have tracked, which they consider comprehensive (or nearly so) for stormwater but incomplete for flood control. Finally, we added information on other property-owner ballot measures that we were aware of based on conversations with practitioners and news reports. Within the property-owner ballot category, we were unable to distinguish between measures that were proposed as fees versus assessments.

Given data limitations, we expect the dataset is missing some local funding measures, especially for special districts before 2010 and more generally for property-owner balloting for flood control. Since stormwater is mostly managed by city and county governments, our information is likely to be the most complete for this sector. Conversely, since flood control is mostly managed by special districts (for which both our regular and property-owner ballot data may be incomplete), our information on this sector may have more gaps.

Water-Specific and More General Ballot Measures

Measures to Increase Funding

One useful way to characterize the measures is as either "water specific" (i.e., measures that explicitly name one or more water functions as the sole purpose of raising funds) or "non-water specific" (i.e., more general measures that are raising funds for a variety of activities including some water-related purposes). Water-specific measures can be property fees or assessments, special taxes, or bonds. Non-water-specific measures can be general taxes (if the intended uses are broad and the tax is levied by a city or county government), special taxes (if the uses are more narrow and/or the tax is levied by a special district), or bonds. Within these categories, the number of intended uses for the funds can vary greatly, with some measures mentioning just a few uses, and others mentioning over a dozen uses. For instance:

- Water-specific (property fee/assessment)

  To improve, upgrade and maintain the deteriorated storm drain system, protect water quality, further reduce pollutants flowing into our creeks and San Francisco Bay, prevent street flooding that impedes residents and police/fire, emergency access, and improve local drainage, shall the City of Burlingame enact a storm drainage fee at the rate of 4.192 cents per impervious square foot, adjusted for inflation not exceeding 2% annually, with independent audits, citizen's oversight, and requiring all funds expended only on storm drains?
  Burlingame (5/5/2009)

- Water-specific (special tax)

  Shall the People approve Ordinance No. 1(NCFPWIA), to provide countywide flood protection by increasing the sales/use tax by one-half percent?
  Napa (3/3/1998)

- Water-specific (GO bond)

  To protect public health by cleaning up polluted storm water; keeping pollution, trash, toxic chemicals, dangerous bacteria from rivers, beaches; preserving clean drinking water by protecting groundwater quality; reducing flooding; increasing water conservation; protecting bays, rivers, lakes from storm water contamination; shall the City of Los Angeles incur bonded indebtedness totaling $500,000,000 for storm water projects, with independent financial audits and citizen oversight?
  City of Los Angeles (11/2/2004)

- Non-water-specific (general tax)

  To maintain the high quality of life in Emeryville and fund essential services including police, fire, 9-1-1, park maintenance, litter abatement, graffiti removal, flood protection, street maintenance, accessibility improvements, child care, senior and recreation programs, shall an ordinance be adopted that increases the limit on the maximum annual business tax that businesses pay?
  Emeryville (11/8/2011)

- Non-water-specific (special tax)

  Do you approve a Street Paving and Storm Drain Facility Improvement Parcel Tax in the amount of $96.00 per Equivalent Residential Unit to raise revenue for city wide street paving and storm drain facility repairs and improvements, as is specifically set forth in the proposed Ordinance that appears in the voter pamphlet?
  Albany (6/6/2006)

- Non-water-specific (GO bond)

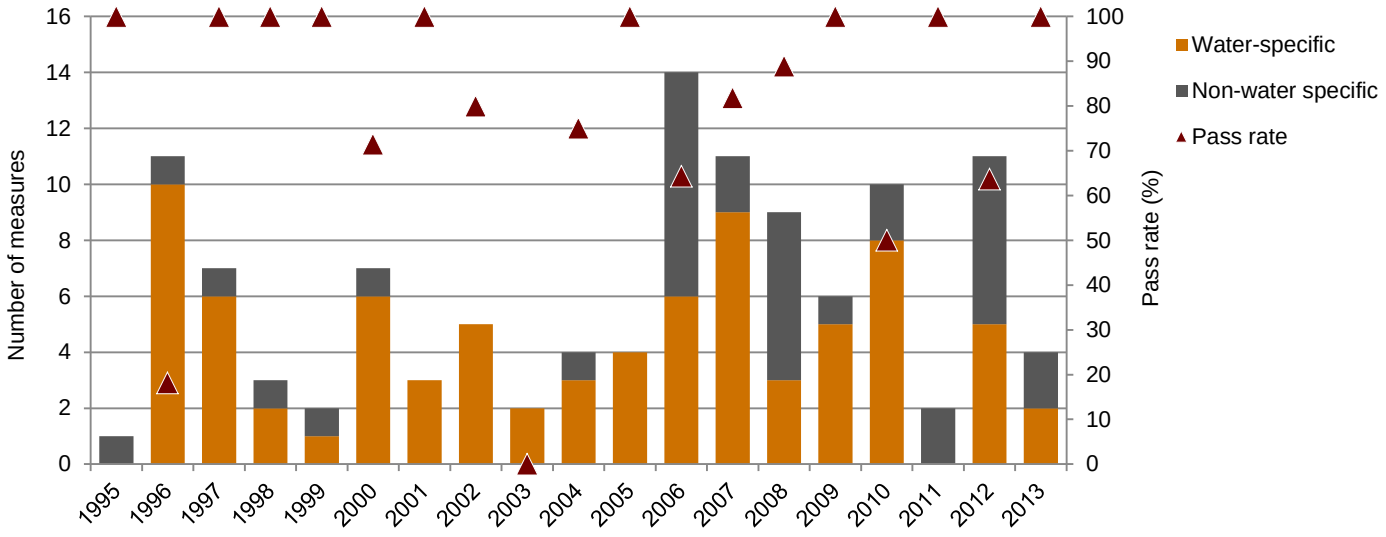
  To repair damaged roads; fix potholes; improve driver and pedestrian safety; improve children's safety near schools; replace fire hydrants and pipes, ensuring adequate water flow for firefighting; and repair collapsing storm drains to prevent flooding; shall the City of Orinda issue $59.1 million in bonds for the improvement of roadways, storm drains and water mains, with annual financial audits and no money for new City staff?
  Orinda (11/7/2006)

Some measures never make it to the voters because initial polling shows them to be unpopular and unlikely to pass. Thus, the data we gathered do not reflect all attempts to increase revenues, only the ones that made it to the final stage of balloting.

Since 1995 (a year before the enactment of Proposition 218, which increased the likelihood that local entities would need to address the voters for many taxes and fees), we found 116 water-related local funding measures proposed in 86 localities. Figure E1 shows the number of measures per year. Overall, roughly two-thirds of the measures have been water-specific, but the share of non-water-specific measures appears to have grown considerably since the mid-2000s.[5] Before 2006 non-water-specific measures made up only about 15% of all ballot measures, while almost half (43%) of the total since 2006 were non-water-specific.

[5] Since missing observations are more likely to be water-specific (i.e., property assessments/fees and other measures proposed by special districts), this trend toward broader measures may be understated in the data shown here.

FIGURE E1
Local water-funding ballot measures per year



SOURCE: Authors' calculations using various sources described in the text.

NOTE: Water-specific measures are intended to raise funds only for water-related purposes, whereas non-water –specific measures could include funding for activities such as transportation, police, fire, etc. Property-owner balloting and pre- 2010 data for special districts are incomplete. See text for discussion of data limitations. In 1996, nine of the 11 measures depicted by the bar were for flood control assessments in different parts of Santa Barbara County; only one of these passed.

Initiatives to Repeal or Reduce Funding

In addition to measures seeking funding for water activities, some initiatives were aimed at reducing or repealing funding. We did not include these in our overall calculations, but summarize this information here.[6] We found nine such measures, all from city elections, which sought to repeal or reduce taxes, fees, or water rates. Five (56%) of these measures passed. Five of the nine measures were water-specific; four of the measures concerned stormwater, three concerned wastewater, and two concerned water rates. Finally, these measures were evenly divided among property assessments and fees, rate adjustments, and utility taxes. In one case, there were two competing measures on the same ballot, one to repeal a storm drain fee and one to shorten the duration of the fee and establish a resident oversight committee.[7] The former failed while the latter passed.

[6] These measures appear in the online data set Local Water-Funding Ballot Measures as "repeal initiatives."
[7] Rancho Palos Verdes, Los Angeles County (November 6, 2007), Measures C and D.

Water Sector Functions of Ballot Measures

We assigned a specific function for each measure placed on the ballot since 1995, based on the ballot language, to categorize how the funds would be spent if the measure passed. We used the following categories, to match as far as possible the water services discussed in the main report:

1. **Flood protection (44 measures):** Any measure that includes flood control or prevention, drainage services, maintaining and repairing levees and pump stations, or the creation of a new flood control district, but that does not also include stormwater management.[8] For example:

   > Shall a special tax of $252.29, applicable to all taxable parcels (excluding legal parcels that are entirely underwater) within Bethel Island, be approved for each of ten fiscal years, beginning July 1, 2011, for purposes of maintaining and improving levees and drainage?
   > *Bethel Island Municipal Improvement District (11/2/2010)*

2. **Stormwater (40 measures):** Any measure that includes storm drain maintenance, repair, or construction; prevention of pollution and runoff from streets to waterways/beaches; or protection of water quality. Five of these measures also mentioned flood management benefits. For example:

   > In order to: Protect local sources of clean drinking water from contamination and pollution; Remove harmful and dangerous pollutants and toxic chemicals from our local creeks, reservoirs, lakes, and the Delta and the Bay; Capture, clean and use rainwater to irrigate local parks and landscaping; Prevent illegal or toxic discharges from industrial and commercial properties; Keep trash and pollution off our shorelines and out of our local creeks, reservoirs, lakes, and the Delta and the Bay; Provide other clean water and pollution control services and facilities required by Federal and State regulations; Do you approve the proposed annual Clean Water fee for your property(s) listed on the other side of this ballot?
   > *Contra Costa County (4/6/2012)*

3. **Water supply (18 measures):** Ballot measures to fund capital improvements in the water system, allow utilities to increase rates for water provision, and protect drinking water supplies. For example:

   > Shall a special tax be levied to fund water services and improvements within County Service Area 70, Improvement Zone L (Pinon Hills) in the maximum amount of $66.00 per year per parcel of real property within the District for a period of five (5) years?
   > *San Bernardino County (11/7/2000)*

4. **Ecosystem-plus (10 measures):** Ballot measures that include funding to preserve, protect, and restore aquatic systems and water quality. Such measures often include a recreational component such as funding for parks and open spaces. Some also include other water-related functions such as flood protection, stormwater management, and protection of water supply, but the primary focus is to improve functioning of the ecosystem. For example:

   > To preserve natural lands from development; protect working farms and ranches; protect drinking water sources; improve water quality in lakes,

[8] In one case (Arvin, 11/04/08), we counted a measure mentioning storm drain repair as flood-focused because the storm drain repair work was explicitly described as a flood control measure (and nothing else). In 1996, the Santa Barbara County Flood Control and Water Conservation District sponsored nine separate property assessment ballots for different parts of the county, only one of which passed.

rivers and streams; create and improve parks and trails; and preserve the coastline and beaches, shall the current quarter-cent sales tax, funding the Sonoma County Agricultural Preservation & Open Space District, be continued for twenty years, and bonds authorized to finance projects, with required independent audits and citizen oversight without increasing taxes? *Sonoma County (11/7/2006)*

5. **Wastewater (4 measures):** Ballot measures to fund wastewater treatment, including improvements to wastewater treatment and collection systems. For example:

> To help pay for the State-mandated Wastewater Plant upgrade debt and water and sewer line replacements, which would help reduce water and/or sewer rates in the City, shall the City of Placerville adopt an add-on sales tax (transactions and use tax) of one-quarter percent (.25%) for 30 years, with all proceeds going only to local water and/or wastewater debt service and water and/or wastewater construction projects, with annual oversight? *Placerville (11/2/2010)*

Flood protection had the most ballot measures overall (44), as well as the most ballot measures without non-water activities (33). Stormwater was the second highest (40), with a nearly-even split between specific funding and more general funding measures (Table E1).

TABLE E1
Local water-funding ballot measures since 1995 by intended function

	All			Water-specific			Non-water specific		
	Total	**Passed**	**%**	**Total**	**Passed**	**%**	**Total**	**Passed**	**%**
Flood Protection	44	30	68	33	21	64	11	9	82
Stormwater	40	32	80	21	14	67	19	18	95
Water Supply	18	12	67	15	9	60	3	3	100
Ecosystem-plus	10	8	80	7	6	86	3	2	67
Wastewater	4	2	50	4	2	50	0	0	-
Total	**116**	**84**	**72**	**80**	**52**	**65**	**36**	**32**	**89**

SOURCE: Authors' calculations using various sources described in the text.

NOTE: Water-specific measures sought to raise funds only for water-related functions, whereas non-water-specific measures included funding for non-water activities such as transportation, police, fire, etc.

Passage Rates

Figure E1 above shows the passage rates of measures in each year since 1995. It depicts generally high pass rates (with 72 percent of all measures passing), tempered by occasional years with less success. There is no upward trend in passage rates over time. Table E1 shows that general, non-water-specific measures had a higher passage rate (89%) than water-specific measures (65%), and this difference is statistically significant.[9]

However, because the required passage rates differ for different types of measures, it is instructive to consider these thresholds when comparing election outcomes (Table E2). Overall, measures subject to a simple majority had a higher passage rate (78%) than those subject to two-thirds super-majority rules (65%), although this difference is not statistically significant. Roughly equal shares (59% and 56%, respectively) of both the water-specific and non-water-specific measures required a simple majority vote to pass, but the pass rate on the non-water-specific measures was higher (100% versus 68%). This suggests that local governments have been more successful floating general tax measures that include water among a host of other things, and that are voted on by the general electorate, than property-owner ballot measures dedicated to specific purposes (especially flooding and stormwater). The pass rate for non-water-specific measures requiring a two-thirds supermajority was also higher (75%, versus 61% for the water-specific measures), again suggesting that broader packages of activities may be more appealing to voters.[10] This may help explain the pattern observed in Figure 1, which illustrates an increasingly common practice of including water within broader ballot measures.

TABLE E2
Local water-funding ballot measures since 1995 by voter approval threshold

	All			Water-specific			Non-water specific		
	Total	Passed	%	Total	Passed	%	Total	Passed	%
Simple majority rule	67	52	78	47	32	68	20	20	100
Super majority rule	49	32	65	33	20	61	16	12	75
Total	**116**	**84**	**71**	**80**	**52**	**64**	**36**	**32**	**88**

SOURCE: Authors' calculations using various sources described in the text.

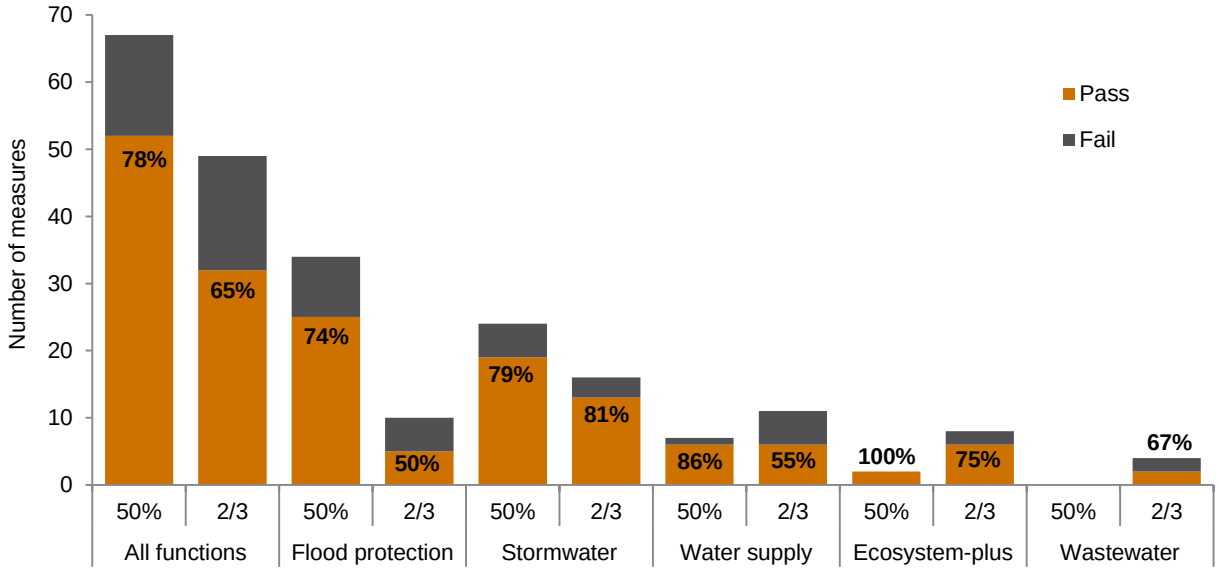
NOTE: Water-specific measures sought to raise funds only for water-related functions, whereas non-water-specific measures included funding for non-water activities such as transportation, police, fire, etc. Simple majority rules could apply to property owners (for some water-specific fees and assessments) or to the general electorate (for local general taxes).

Across different water sectors, passage rates are generally higher when the voting threshold is lower (Figure E2). Although this might seem to be true by definition, voting thresholds can affect whether agencies propose ballot measures in the first place. (In particular, agencies might be less likely to propose measures if they are polling poorly relative to the majority rules in place.) It is nevertheless useful to

[9] In a simple bivariate regression, water-specific measures had a P-value of 0.007 and were negatively correlated with passage rates, with a 24 percent lower likelihood of passing. When we conducted a multivariate regression of passage rates with three characteristics (water-specific or non-water specific, property-owner or non-property-owner votes, and simple or supermajority requirements), majority requirement appeared as the most significant variable with a P-value of 0.041 and a 22 percent higher likelihood of passing for simple majority measures. Water-specific had a P-value of 0.107, indicating that it is marginally significant, even when controlling for these other characteristics.
[10] This difference is not significant at conventional levels.

consider the outcomes of these elections if passage rates had been different. If the measures subject to a supermajority vote had only required a 50 percent pass rate, nine more would have passed, bringing the passage rate up from 65 to 84 percent (slightly higher than the pass rate for measures requiring only a simple majority). These failed measures would have supported a wide range of water activities (three for floods, two each for ecosystems and stormwater, and one each for water supply and wastewater). Conversely, 20 of the successful measures subject to a simple majority would have failed if a two-thirds vote had been required, bringing the passage rate down from 78 percent to 48 percent. Most of the measures that would have failed with a higher threshold support stormwater programs (11), with the remainder split across flood control (4), water supply (3), and ecosystems (2).

FIGURE E2
Water-funding ballot measures and passage rates by function



SOURCE: Authors' calculations using various sources described in the text.

NOTE: Percentages on bars indicate the pass rate for each type of measure.

Table E3 and Figure E3 show ballot measure frequency and pass rates by type of fiscal mechanism. Special taxes are the most prevalent (41% of all measures), followed by property-owner fees and assessments (35%), GO bonds (10%), and general taxes (8%). There were only a few non-property-related fees and water rate/revenue bond measures, sources that have not generally required a vote. The voter threshold does seem to matter for passage rates of measures that go before all voters: general tax measures were more successful (100% pass rates) than special taxes and GO bonds (with 73% and 67% pass rates, respectively). Property-related fees and assessments were relatively unpopular with property owners, with just a 66 percent passage rate despite falling under a simple majority rule.[11]

[11] These rates were similar for flood-focused measures (16 passed out of 24) and stormwater-focused measures (9 passed out of 15). One assessment was for ecosystem-oriented purposes, and it passed.

TABLE E3
Local water-funding ballot measures since 1995 by fiscal mechanism

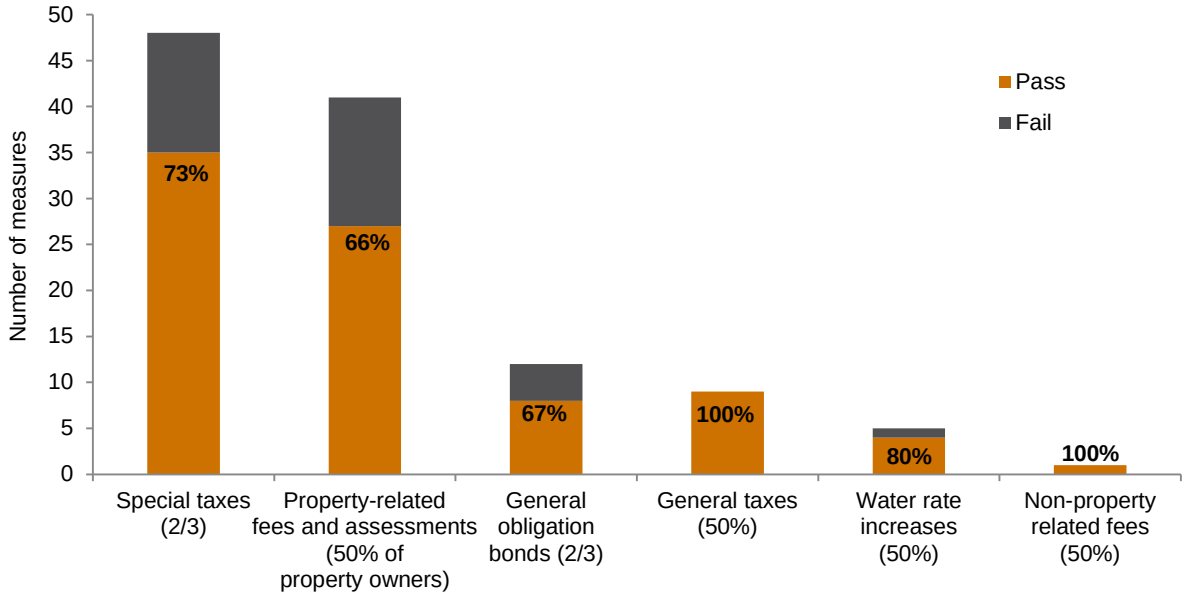
	Total	Passed	%
General taxes (simple majority)	**9**	**9**	**100**
Transient occupancy taxes	1	1	100
Utility taxes	6	6	100
Business taxes	2	2	100
General obligation bonds (2/3 majority)	**12**	**8**	**67**
Special taxes (2/3 majority)	**48**	**35**	**73**
Parcel taxes	27	16	59
Sales taxes	21	19	90
Property-related fees and assessments (simple majority of property owners)	**41**	**27**	**66**
Non-property related fees	**1**	**1**	**100**
Vehicle fees[a/]	1	1	100
Water rate increases[b/]	**5**	**4**	**80**
Rate adjustments	1	1	100
Revenue bonds	4	3	75

SOURCE: Authors' calculations using various sources described in the text.

NOTES:
a/ We found only one example of a non-property related fee that went before voters, the 2010 San Mateo County Vehicle License Fee, which was authorized by specific legislation and only needed a simple majority voter approval to pass (See Appendix A, Box 2).

b/ All five measures were listed as requiring only a simple majority pass rate. These elections are not required by the state constitution, so the required threshold is set locally.

FIGURE E3
Water-funding ballot measures by fiscal mechanism



SOURCE: Authors' calculations using various sources described in the text.

NOTE: Voting thresholds are shown in parentheses after each fiscal mechanism in the horizontal access. Percentages on bars indicate the pass rate for each type of measure.

Agency Type

In addition to type of fiscal mechanism, we categorized the ballot measures by the type of entity proposing the measure: city, county, or special district. Cities proposed the largest share of measures (59%), followed by special districts (35%) and counties (6%). Passage rates among the three types of entities were similar (53% for cities, 57% for counties, and 61% for special districts).

Geographic Patterns

Table E4 shows the frequency and passage rates of ballot measures by "fiscal" hydrological region, whereby counties are assigned to the hydrologic region where the majority of their population lives.[12] The Bay Area had by far the highest number of measures at 46, and the second-highest passage rate (83%). The Bay Area's share of all measures (40%) was more than twice its share of the state's population in 2005 (18%). The higher prevalence of water-related ballot measures in the Bay Area is reminiscent of patterns in local education funding measures, although in education the Bay Area stands out to a much greater degree (McGhee and Weston 2013).[13]

TABLE E4
Water funding ballot measures by hydrologic region

	Total measures	Overall pass rate (%)	Share of ballot measures (%)	2005 Share of state population (%)
Bay Area	46	83	40	18
Central Coast	18	44	16	4
Colorado River	0	-	0	0
Lahontan	1	0	1	0
North Coast	4	100	3	2
Sacramento River	16	81	14	8
San Joaquin River	4	75	3	5
South Coast	23	74	20	57
Tulare Lake	4	25	3	6

SOURCE: Authors' calculations using various sources described in the text.

NOTE: The calculations use "fiscal" hydrologic regions, as described in the text. For details see Appendix D.

The Central Coast and the Sacramento River were the only other regions with a much higher share of ballot measures relative to population, but in the Central Coast pass rates were lower than most other regions, reflecting a suite of nine mostly unsuccessful flood control assessments in Santa Barbara County in 1996. Flood measures were also a focus in the Sacramento River region (10 of the 16 measures), but to greater success.

[12] We use this term to refer to hydrologic regions in which counties whose boundaries overlie more than one hydrologic region are assigned to the region where most of their population lives. See Appendix D for details.
[13] In 2010-11, the Bay Area was home to more than 80 percent of school districts that had access to local parcel tax revenue in 2010-11 (McGhee and Weston 2013).

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