

7

Managing Water as a Public Commodity



CALIFORNIA DEPARTMENT OF WATER RESOURCES

[F]ew public interests are more obvious, indisputable and independent of particular theory than the interest of the public of a State to maintain the rivers that are wholly within it substantially undiminished, except by such drafts upon them as the guardian of the public welfare may permit for the purpose of turning them to a more perfect use. This public interest is omnipresent wherever there is a State, and grows more pressing as population grows.

Oliver Wendell Holmes, Jr., *Hudson Water Co. v. McCarter*, 1908

The preceding chapters highlight two central calls to action for California water policy. First, California must restore and strengthen the ecological functions of its watersheds, many of which are in serious decline and all of which face increasing risks from climate warming and other stressors. Second, California must improve its ability to respond and adapt to growing pressures on its water system from population growth, a changing economy, deteriorating infrastructure, rising costs of water pollution, deteriorating ecosystems, and shifts in precipitation and water availability with a changing climate.

To address these challenges, California must manage water comprehensively and in a way that recognizes both the public and private aspects of the resource. In some respects, water is a public good, with broadly shared benefits. Many environmental services provided by California's water resources are part of the state's collective heritage, owned by the public at large. The broad economic and environmental effects of storing, moving, and using water make it necessary to regulate these functions to protect public values. But water is also a commodity—an input into the production of goods and services, with a price and a market value—much like electricity or natural gas. Efficient use of water, for

both economic and environmental purposes, requires an ability to adjust water use to changing conditions.

In fulfilling these two roles, water can be considered a “public commodity,” the effective management of which must reconcile economic efficiency with protection of public values. In this chapter, we examine how California can better manage water as a public commodity to meet the needs of the economy and the environment. The overarching themes of this discussion are balance and flexibility. Striking a balance among competing uses and objectives is the core principle of managing water as a public commodity. Flexibility—or the ability to adapt—is essential for achieving this balance in the face of demographic, economic, and environmental changes.¹

In the following discussion, we first review the legal framework for managing water as a public commodity. At its core, California water law—especially the foundational doctrines of reasonable use and the public trust—embodies the capacity for balance and flexibility essential for successful adaptation.

Second, we suggest changes in California’s water rights system that would bring it into accord with hydrologic realities. These changes focus on two areas: (1) providing equal treatment for groundwater and surface water rights (particularly in areas where the current lack of formal groundwater management causes environmental harm or economic losses to other surface or groundwater users) and (2) providing incentives to incorporate riparian and pre-1914 appropriative surface rights-holders in the modern regulatory system. (Riparians, in particular, will have an interest in regularizing their rights with a warming climate.) These changes will need to be accompanied by better water accounting, which becomes increasingly important for improving management and reducing conflicts as water becomes scarcer.

Third, we examine mechanisms for strengthening the legal framework for water marketing. Although California’s water laws provide a framework for facilitating water transfers, the slowdown in water market transfers since the early 2000s reflects procedural obstacles and concerns about the law’s incomplete coverage of effects on groundwater users and the local economy in selling regions. We examine potential synergies between the reasonable use doctrine and water transfer law and suggest reforms of the environmental review process to streamline approvals while more broadly protecting public values.

1. Early notions for managing water in California along these lines can be found in Phelps et al. (1978).

Fourth, to address the problems of institutional fragmentation that hamper management of California’s water grid, we explore the potential for California to learn from successful reforms in the energy sector. In particular, we suggest that California consider creating an “independent system operator” to more effectively manage water conveyance and water market transactions.

Fifth, again drawing on the experience of the energy sector, we recommend a “public goods charge” on water uses and specific environmental mitigation fees on the users of dams and chemical contaminants to cover the costs of improving the efficiency and reliability of California’s water supply and distribution systems and the costs of ecosystem restoration, fish protection, and the other public benefits of the state’s water resources systems.

Water as a Public Commodity: The Legal Framework

Fundamentally, the laws governing the management of California’s water resources are more than capable of addressing the challenges identified in earlier chapters. The constitutional and common law bases of California water law, its overlay of regulatory statutes, and most aspects of water rights administration are compatible with the goal of managing water as a public commodity.

Putting the Reasonable Use and Public Trust Doctrines to Work

The foundations of California water law—the reasonable use mandate of Article X, § 2, of the state constitution and the public trust doctrine—both embody flexibility and responsiveness to change.

The doctrine of reasonable use requires that all water rights be exercised in a reasonable manner under contemporary conditions. As expounded by both the legislature and the courts, the doctrine evaluates not just the reasonableness of a particular use in isolation but also the broader public interest in efficient use and allocation of the state’s water resources and protection of the ecosystems that are sources of the state’s developed water supplies. The public trust doctrine complements the reasonable use directive by recognizing that navigation, protection of fisheries, commercial and recreational boating, and environmental protection and preservation are integral components of the reasonable use calculus and that the state has an obligation to preserve and protect these public trust uses in the administration of the water rights system to the extent feasible.

Both doctrines have deep roots in California water law. In a series of decisions dating back to the 19th century, the California Supreme Court recognized



Through the reasonable use and public trust doctrines, California's Supreme Court has consistently recognized that water law must be responsive to the needs of the state as a whole. Photo by Marc Moritsch/National Geographic Society/Corbis.

that the exercise of riparian, appropriative, and groundwater rights must conform to the requirements of reasonable use. In 1928, the voters enshrined the reasonable use doctrine in the California constitution (Box 1.4). The public trust in navigable waters was a component of English common law, which the legislature incorporated into California law in its first statute in 1850, although the Supreme Court did not expressly integrate the public trust into the state's water rights laws until its decision in the Mono Lake case in 1983 (*National Audubon Society v. Superior Court* 1983) (Box 1.2).

In defining and applying the reasonable use and public trust doctrines, the California Supreme Court has consistently recognized that the state's water laws must be responsive to the needs of the state as a whole, rather than favoring one set of water rights holders or water users over another. Moreover, efficient use and allocation of California's water resources must be consistent with contemporary demands, standards of use, hydrologic realities, and scientific understanding of the requirements of the ecosystems from which developed water supplies are taken. Indeed, the court has emphasized on numerous occasions that "[w]hat constitutes reasonable water use is dependent upon not only the entire circumstances presented but varies as the current situation changes" (*Barstow v. Mojave Water Agency* 2000).

The public trust doctrine similarly recognizes that existing uses and allocations of water are subject to reevaluation in light of contemporary knowledge

about their effects on the ecosystems from which the water is taken. Thus, in *National Audubon Society v. Superior Court*, the court declared that in “exercising its sovereign power to allocate water resources in the public interest, the state is not confined by past allocation decisions which may be incorrect in light of current knowledge or inconsistent with current needs. The state accordingly has the power to reconsider allocation decisions even though those decisions were made after due consideration of their effect on the public trust” (*National Audubon Society v. Superior Court* 1983).

The flexibilities of the reasonable use and public trust doctrines vest significant authority in all levels of government to ensure that water rights are exercised in a manner that is reasonably efficient under contemporary conditions and does not cause significant negative spillover effects for other water users or the environment. This does not mean that environmental needs always take precedence over competing economic uses of water. As the Supreme Court made clear in *National Audubon Society v. Superior Court*, under Article X, § 2, “all uses of water, including public trust uses, must now conform to the standard of reasonable use.” But as long as water planning, management, and regulatory decisions are the product of reasoned decisionmaking, based on a sound scientific analysis of ecosystem needs and due consideration of the needs of competing water users, the reasonable use and public trust doctrines afford water administrators broad and flexible authority to ensure that water use practices keep pace with changing conditions and that the allocation of water adequately protects water quality, fish, and other environmental uses.

Reallocating Water for the Environment

The reasonable use and public trust doctrines also address the potential of water rights to constrain the allocation of water to environmental purposes.

The California legislature has declared that “[a]ll water within the State is the property of the people of the State,” but “the right to the use of water may be acquired by appropriation in the manner provided by law” (Water Code § 102). State and federal courts have long held that water rights, as well as derivative contract rights for water, are property rights within the meaning of the U.S. and California constitutions (Gray 2002a). One consequence of these decisions is that the government may not take or significantly impair existing water or contract rights without paying just compensation.

In several recent cases, federal courts have concluded that the United States may not implement the Endangered Species Act and other environmental laws

without compensating water users for resulting water shortages. Although the courts found that the government had taken the water rights of the affected users (or breached its contractual obligations), each of these courts failed to consider the limitations imposed on all California water rights by the reasonable use and public trust doctrines. Some commentators have therefore argued that the cases were incorrectly decided and that the decisions do not provide useful precedent for future cases challenging the environmental regulation of California water rights (Box 7.1).

7.1

Recent takings and breach of contract cases in federal courts

Three recent federal court cases concluded that governmental restrictions on water rights constituted takings under the federal constitution, but they failed to consider the limitations that the reasonable use and public trust doctrines place on water rights and derivative rights to water use in California.

In *Tulare Lake Basin Water Storage District v. United States* (2001), the federal court held that restrictions on State Water Project (SWP) operations required by the Endangered Species Act, which caused shortages for some SWP contractors, constituted a taking of their property. The federal court ordered the government to pay the contractors approximately \$26 million in damages. Although the court noted that California water rights law might itself preclude the appropriation of water under conditions that would imperil endangered species of fish, it declined to consider either the reasonable use or public trust doctrine as part of its analysis.

In *Casitas Municipal Water District v. United States* (2008), the federal court ruled that the U.S. directive that a local water district allow water to pass through a fish ladder was a taking of property. The releases of water were needed to support migration of steelhead, which are protected under the Endangered Species Act. The court reasoned that the United States had physically diverted the plaintiff's water for its own purposes—protection of the endangered fish. The court never addressed the question of whether California's reasonable use and public trust doctrines might limit the plaintiff's exercise of its water rights in a manner that could harm the protected fish.

In *Stockton East Water District v. United States* (2009), a breach of contract case brought by contractors within the New Melones Unit of the Central Valley Project (CVP), the federal court acknowledged that under California law it might be unreasonable or in breach of the public trust for the U.S. Bureau of Reclamation to operate the CVP in a manner that degraded water quality or endangered protected fish. The court refused to consider the effects of state law on the contractors' claims, however, because the federal government failed to establish a causal connection between the particular state mandates and the Bureau of Reclamation's inability to meet its obligations under the contracts.

As both human and environmental demands for water continue to rise relative to usable supplies, more such cases are likely in the future. Yet the reasonable use and public trust doctrines are likely to limit the ability of existing water users to successfully challenge regulatory actions that reallocate water to protect water quality, fish, and other environmental uses.

The California Supreme Court has long held that, under Article X, § 2, “no one can acquire a vested right to the unreasonable use of water” (*National Audubon Society v. Superior Court* 1983). The public trust doctrine similarly “serves the function in [California’s] integrated [water rights] system of preserving the continuing sovereign power of the state to protect public trust uses, a power which precludes anyone from acquiring a vested right to harm the public trust, and imposes a continuing duty on the state to take such uses into account in allocating water resources” (*National Audubon Society v. Superior Court* 1983). Moreover, court or agency determination of whether a particular exercise of water rights is reasonable must consider the effects on the natural environment, and this determination may change over time as conditions vary in terms of hydrology, water demands, and species listed for protection and as scientific understanding of ecological functions and needs develops. The Court of Appeal stated this principle succinctly in describing the scope of the State Water Resources Control Board’s (SWRCB’s) authority over the Central Valley Project and the State Water Project in the Delta Water Cases (*United States v. State Water Resources Control Board [Racanelli]* 1986): “Here, the Board determined that changed circumstances revealed in new information about the adverse effects of the projects upon the Delta necessitated revised water quality standards. Accordingly, the Board had the authority to modify the projects’ permits to curtail their use of water on the ground that the projects’ use and diversion of the water *had become unreasonable*” (emphasis added).

Nevertheless, significant limits remain on the power of the state to encroach on existing water rights for environmental protection or other purposes. The California Supreme Court has held, for example, that neither the board nor the courts can ignore water right priorities in pursuit of other important objectives, including the allocation of water to correct conditions of aggregate overdraft or overuse of groundwater basins (*Barstow v. Mojave Water Agency* 2000). And the courts have recognized that water contracts create enforceable rights that the state and federal governments must honor unless conditions exist that either excuse nonperformance of the contract or render water service illegal or impossible (*O’Neill v. United States* 1995).

In all cases, water administrators must make individualized determinations of unreasonable use and base such determinations on evidence of inefficient use; wasteful or excessive use in relation to both supplies and alternative demands; degradation of water quality; or harm to fish, aquatic habitat, and other values protected by the public trust or other laws. But if the state has appropriately applied this principle of California water rights law to allocate additional water to environmental uses, neither water rights nor water contracts and other interests based on those water rights can block the necessary changes.

These overriding constraints on California water rights are central to the effective functioning and adaptation of California's water rights system. If the water rights laws are rigidly administered and enforced inconsistently with the more flexible directives of reasonable use and the public trust, the opportunities for responsive adaptation to changing conditions and corresponding institutional reform may be undercut.

Harmonizing Water Rights Administration

Although the foundations of California water rights law embody the adaptive flexibility needed for effective state water policy, two legal anachronisms could hamper efficient and sustainable water management and use: the disjunction between groundwater and surface water administration and the exemption of riparian, and pre-1914 appropriative rights from the permit and license jurisdiction of the State Water Resources Control Board. As described in Chapter 1, both anomalies result from decisions the legislature made when crafting the state's modern water code, the Water Commission Act of 1913. The legislature created a distinction between ground and surface water that is hydrologically inaccurate, and it decided to apply the regulatory jurisdiction of the Water Commission (predecessor to the SWRCB) only to nonriparian surface water uses commenced after the effective date of the statute in 1914.² These decisions were misguided at the time, and neither is justified today, when integrated water management under changing conditions requires greater consistency with hydrologic reality.

2. Two other categories of exempted rights are pueblo rights (established by some towns before statehood—see Chapter 1) and federal reserved rights (the authority of the United States and Indian tribes to claim water independent of the state water rights system to fulfill the purposes of national parks, national forests, and Indian reservations, and other federal lands that are reserved for specific uses (*Arizona v. California* 1963; *United States v. New Mexico* 1978)). We focus this discussion on riparian and pre-1914 appropriative rights, as these are most significant in terms of volumes.

Equal Treatment for Groundwater

When the legislature enacted the Water Commission Act, it was well understood by geologists, policymakers, and courts that groundwater and surface water were usually hydrologically connected. In *Katz v. Walkinshaw* (1903), the California Supreme Court acknowledged that groundwater pumping may cause “an exhaustion of the underground sources from which the surface streams and other supplies previously used have been fed and supported. . . . The danger of exhaustion in this way threatens surface streams as well as underground percolations and reservoirs.” The legislature’s exemption of groundwater extraction (other than pumping from “subterranean streams flowing through known and definite channels”) was a political choice, rather than a decision based on current scientific knowledge or sound water rights administration. Although there is evidence that the legislature intended to grant the Water Commission regulatory jurisdiction over the “pumping of groundwater that appreciably and directly affected surface stream flows” (Sax 2003), the statute has been consistently interpreted as not applying to “percolating” groundwater (which infiltrates from the surface)—regardless of the hydrologic relationship between such groundwater and surface water resources.

The legal divide between ground and surface water rights has contributed to a variety of water supply and water management problems. Expanded irrigation in the San Joaquin Valley and Tulare Basin in the late 19th century depleted rivers flowing from the Sierra Nevada, which in turn reduced recharge of aquifers and caused farmers without access to surface water to drill more and deeper wells. By the mid-20th century, these aquifers were in severe overdraft, with groundwater lowered by more than 400 feet in some places. The plummeting groundwater table caused some aquifers to compact, and in some areas of the San Joaquin Valley and the Tulare Basin, land elevations sank by more than 60 feet. Yet, there was no direct means to regulate surface water users to protect the groundwater or to regulate the aquifer mining caused by groundwater withdrawals (Chapter 1; Hundley 2001).

In Southern California, unregulated groundwater pumping depleted aquifers that supported the basins’ meager streams and led to overdraft, legal conflicts, and saltwater intrusion as coastal aquifers fell below sea level (Blomquist 1992). Later in the 20th century, conflicts among surface and groundwater users appeared in regions as diverse as the Scott River on the North Coast and the Mojave River Basin in the high Southern California desert. During the



Vineyard management in Sonoma County will need to adapt to reduce the harmful effects of groundwater pumping on salmon and steelhead in the Russian River. Photo by Sonoma County Water Agency.

1988–1992 drought, groundwater users in Yolo County complained that transfers of surface water to the 1991 and 1992 drought water banks overdrafted local aquifers, as sellers of surface water pumped additional groundwater (Carter, Vaux, and Scheuring 1994).

Groundwater–surface water conflicts continue today in many coastal and inland stream systems, including the Russian and Santa Clara River Basins, where groundwater pumping has diminished stream flows to the detriment of surface water users and salmon and steelhead (Box 7.2). Similar problems exist on several inland rivers, including the Shasta River, where groundwater withdrawals threaten cold water springs that feed promising coho habitat, and the Cosumnes, where groundwater extractions have dewatered wetlands and riparian habitat (Hall 2010; Howard and Merrifield 2010). The lack of integrated rules for groundwater and surface water management also impedes more effective water marketing in parts of the Sacramento Valley (Chapter 6; Hanak 2003).

In addition, excessive pumping in many basins is creating acute management conflicts among groundwater users (e.g., Tulare Basin, Salinas Basin, Pajaro Basin), and overdraft has the potential to become a more serious problem in additional areas (including the San Joaquin Basin) with reduced water exports from the Delta (Chapters 3, 6). The lack of groundwater regulation is also an impediment to groundwater banking (Chapter 6). The lack of formal groundwater management could have dire consequences for future water supply

7.2**Groundwater use and river flow in the Russian River Valley**

The Russian River occupies a large valley that supports numerous vineyards on its floodplains, hill slopes, and tributaries. Most water for these vineyards comes from either direct stream diversions or shallow groundwater wells. These wells take advantage of large alluvial deposits that store groundwater derived directly from stream channels and adjacent hill slopes. Given this close connection between the river and groundwater in the basin, high rates of groundwater pumping directly affect flows in the river and its tributaries.

The Russian River has three fish listed for protection under the federal Endangered Species Act: coho salmon, Chinook salmon, and steelhead. Juveniles of all three species rear in the main stem of the Russian River, particularly when dry conditions exclude them from the river's tributaries. Coho and steelhead spawn mainly in perennial tributaries.

The vines of the Russian River Valley bud in early spring and are highly susceptible to frost damage. Because wine grapes freeze at approximately 28°F, during severe cold periods, farmers spray a fine mist of water on the vines, which coats the grapes in ice, creates a protective temperature of 32°F, and thereby reduces frost damage. Heavy pumping of wells lowers local groundwater tables and abruptly reduces flows in adjacent channels.

In 2008, there were reports of stranded fish caused by rapid drops in flow during frost protection efforts. In 2009, the National Marine Fisheries Service and several other parties filed a complaint with the State Water Resources Control Board, arguing that although the frost protection actions may be legal under current water rights, they were harming listed species.

Acting under its authority to enforce Article X, § 2, the board has proposed to find the current methods of frost protection to be unreasonable (State Water Resources Control Board 2010c). The board has directed that a water demand management program be implemented that ensures that cumulative diversions do not lower flows to the level that harms fish.

Notably, the board has identified the pumping of closely connected groundwater as unreasonable use in its proposed regulations. This includes areas where wells pump water from "subterranean streams," from active channel sediments, and from what the board's consultant termed "Potential Stream Depletion Areas." The significance of these regulations is that they explicitly address a well-established hydrologic relationship between groundwater use and river flow.

management as the effects of climate warming become manifest. Reduced snowpack coupled with more frequent and intensive spring flooding will make water banking and conjunctive use more sought-after (Chapter 6; Connell 2009). Aquifer storage in the lower Sacramento River, in the San Joaquin and Tulare Basins, and in Southern California are likely to be especially valuable for such conjunctive management.

The most direct solution to these problems would be for the legislature to pass a statute that extends SWRCB jurisdiction to all groundwater extraction. The administrative costs of this transition would be substantial if the board were to exercise this authority directly. It would have to adjudicate (or readjudicate) each basin to determine hydrologically integrated surface water and groundwater rights, define the relative priorities, and then issue new water rights permits. A less costly alternative is for the board to use this authority to require that local water users establish effective management protocols. The board would set overall goals and a deadline for compliance and step in only if locals do not comply. This type of reform, where a higher level of government sets mandates for a lower level of government, is known as “cooperative federalism” (Chapter 9). It has the advantage of providing local users with more flexibility to establish cost-effective local rules.

This approach could be implemented incrementally, focusing first on basins where groundwater overdraft is impairing surface water uses or otherwise causing serious management problems. One model for local management is special water management districts with authority to quantify water rights, to regulate surface and groundwater extractions, and to impose pumping charges to reduce economic incentives to overdraft and to pay the costs of imported surface water supplies. The legislature has created these types of entities in several areas of California with mixed urban and agricultural use, including Orange, Santa Clara, and Ventura Counties, in response to local requests (Chapter 6; Schneider 1977).

Of course, political resistance to such reforms is likely from the beneficiaries of the regulatory status quo and groundwater users who fear or distrust government regulation. The difficulty of simply including mandatory well-level reporting in the 2009 water legislation suggests that significant legislative changes to regulate groundwater rights may be years away. If the legislature fails to act, the alternative is for the courts to step into the breach where possible. The courts have long exercised their common law authority over groundwater rights to adjudicate groundwater use and restrict the overdrafting of groundwater (*Katz v. Walkinshaw* 1903; Chapter 1). However, the expense of adjudications

has deterred many groundwater users from filing suit. Article X, § 2, also provides authority for the courts to declare groundwater extraction unreasonable when it impairs surface water rights or harms public trust uses such as fish, water quality, and aquatic habitat. Thus, where evidence exists of groundwater pumping depleting surface streams (as in the Shasta River Basin), lowering the groundwater table that supports a surface river (as in the Santa Clara River Basin), or causing harm to other groundwater users (as in the Tulare Basin), courts have the power to regulate groundwater use to ensure that pumping does not cause unreasonable harm to other legal water users or to the public trust.

There are numerous precedents for the integrated management of ground and surface water rights under Article X, § 2, by the courts. Extensive monitoring of wells, regulation of withdrawals, and coordinated management of groundwater use occur in the 22 groundwater basins that have been adjudicated to date (Blomquist 1992; for a map, see Figure 4.1).³ These adjudications include examples with explicit legislative direction, as with the Scott River system, and without, as with Los Angeles groundwater adjudication and the Mojave River.⁴ The SWRCB's recent action to limit environmental damage from groundwater pumping in the Russian River Basin is also under existing authority, without explicit legislative direction (Box 7.2).

The reasonable use doctrine (and in some cases the public trust) thus can bridge the legal gap between surface water and groundwater rights systems in basins where combined surface and groundwater withdrawals harm water rights holders or the environment. This application of the reasonable use doctrine would build on the numerous cases in which the courts have already applied the reasonable use doctrine to limit individual or aggregate groundwater rights in basins where excessive pumping is harming other groundwater users (*Barstow v. Mojave Water Agency* 2000; Littleworth and Garner 2007). This case-by-case, basin-specific approach is not ideal, but it is often better than the consequences and conflicts of disintegrated water management. Legislation setting direction for integrated management would be preferable, but without legislative action the courts and, in some cases, the SWRCB may need to take the lead. Indeed, a series of basinwide integrated adjudications of ground and surface water rights may provide the impetus needed for legislative reform. Unless the legislature acts, courts may wish to consider how they might streamline basin

3. For a list of adjudicated basins, see www.water.ca.gov/groundwater/gwmanagement/court_adjudications.cfm.

4. On the Scott River, see Water Code § 2500.5, Schneider 1977, and California Department of Water Resources 2003. On Los Angeles, see *Los Angeles v. San Fernando* 1975; and on the Mojave River, see *Barstow v. Mojave Water Agency* 2000.

adjudications to make them a less expensive, more timely, and more effective procedure for addressing groundwater and integrated groundwater–surface water issues. The recent adjudication in the Beaumont Basin, located in a rapidly growing part of Riverside County, also provides a promising model for achieving speedy, low-cost adjudications through a nonadversarial process.⁵

Article X, § 2, also may be asserted to encourage more efficient local management of groundwater, including the establishment of groundwater banks. Local governments have jurisdiction to regulate groundwater extraction and use as part of their general police power (*Baldwin v. County of Tehama* 1994), and local water agencies have similar authority under Assembly Bill (AB) 3030. To date, most local governments and water agencies have exercised their authority over groundwater only to prohibit or restrict exports (Hanak 2003). Although legitimate local and regional interests are at stake—including protection of water rights holders, water quality, and prevention of overdraft and land subsidence—local interests should not trump statewide considerations. Given the importance of further development of groundwater banking to cope with scarcity and respond to a warming climate in California, it would be unreasonable for local groundwater restrictions to impede the statewide objectives of maximizing the efficient use and distribution of usable water resources. If the legislature fails to address this problem, the board, DWR, groundwater management agencies, or individuals acting through the courts may assert Article X, § 2, to pressure local governments and water agencies to take a more statewide perspective and in particular to allow the establishment of public and private groundwater banks—subject to local regulation but only such regulation as needed to protect legitimate local interests.

More Effective Regulation of Riparian and Pre-1914 Water Rights

The second anachronism of the Water Commission Act is the exemption of riparian rights and pre-1914 appropriations in the modern regulatory system. These water rights do not require a water rights permit, are largely unregulated, and represent a significant portion of California's surface water use.⁶ As with

5. In this case, five water districts and 20 large overlying landowners reached a negotiated agreement, which the court then validated. The process took only 18 months and cost less than \$700,000. Three newly elected members of the Borrego Water and Sewer District in the Borrego Springs area of San Diego County recently ran on a platform of pursuing a similar type of adjudication (www.smartvoter.org/2010/11/02/ca/sd/vote/brecht_1/paper2.html).

6. As discussed below, the exact volumes of diversions are not known because of incomplete and inaccurate reporting. We do not include pueblo rights in the text discussion because they are limited to a few cities and account for only a minute percentage of surface water use in California. Moreover, the pueblo water rights (both surface and groundwater)

groundwater regulation, incorporation of these rights into a modern water rights system also would ideally be accomplished through legislation. Yet, legislation compelling riparians and pre-1914 appropriators to obtain permits and licenses for their water rights is also unlikely to pass (or even to be seriously considered) for the foreseeable future. However, there may be ways short of compulsion to bring these long-exempted water users into the modern regulatory system.

Climate change will pose a substantial risk to riparian rights. As described in Chapter 3, natural stream flows in California will be higher in winter and lower in spring and summer as a result of climate warming. This shift is likely to diminish riparian rights, which are based on natural flow. Riparian water rights holders are entitled to divert only the natural flow of the river and cannot store water for more than 30 days, so winter flows are unavailable to them during the irrigation season.

One response to this dilemma would be to change the definition of natural flow to account for the predicted changes in runoff. But this response would be fraught with risks to California's overall water policies, as it would protect riparians from the effects of climate change at the expense of appropriators, which include California's major cities, most of its industrial and commercial uses, and much of its irrigated agriculture.

Another response would be to use the specter of the gradual loss of rights as an incentive to bring riparians into the modern regulatory system. The legislature could authorize willing riparians to petition the SWRCB to quantify their rights based on the board's assessment of reasonable present and future demands, taking into account not just the riparian's uses but also the available (shrinking) water supply available for all uses (consumptive and environmental). Once quantified, this would become each participating riparian's permitted or licensed water right, and the riparian would have all of the rights and privileges of other permittees and licensees. These would include the right to store water for later use, the right to use water on nonriparian lands, and the right to transfer water within or outside the watershed of origin. The converted riparian right likely would have greater economic value than the common law riparian right both because it would have greater certainty in the face of climate change and because of these expanded privileges of use and transfer.

of the largest pueblo, the City of Los Angeles, have been quantified and are subject to regulation under the final judgment in the *Los Angeles v. San Fernando* litigation.

Pre-1914 appropriators do not face the same threats from climate change, primarily because they may store water for later use, and so have less incentive to convert to a permit and license system. Nevertheless, pre-1914 appropriators could protect themselves by seeking clarity and quantification of their rights. The records of many pre-1914 appropriations are sketchy, as they are based only on notices of intent to appropriate, filed in county records offices, and on rates of actual (and continuous) diversion and use that are not always well documented. Pre-1914 water rights are therefore vulnerable to legal challenges that the quantity of the stated right may vastly exceed the quantity of right established by water use practice. Moreover, pre-1914 appropriators are subject to claims that their water use is wasteful, unreasonable, and perhaps in violation of the public trust, and the appropriators cannot rely on SWRCB evaluation and authorization to counter these claims. So, some pre-1914 appropriators may find it advantageous to join the regulatory system to enhance the security of their water rights relative to that of other permittees and licensees. This incentive may increase as California's available surface supplies diminish over time.

Better Water Accounting

The state's fragmented water rights system has contributed to serious gaps in water measurement and accounting. Most groundwater users have not been required to report water use to the state.⁷ Although riparian and pre-1914 appropriative rights holders are required to report their diversions, there was no legal sanction for failure to file an annual statement of diversion and use until the legislature amended the Water Code in 2009 to establish civil penalties for failure to report (Water Code § 5107). Many did not report, and those who did tended to substantially overstate their diversions and use.⁸ These gaps have led to difficulties in tracking water use trends, and they impede more effective management of water resources for economic and environmental purposes (Chapter 2; Little Hoover Commission 2010).

As water becomes increasingly scarce, it will become ever more important to measure and keep track of physical stocks and flows and their uses. Improved water accounting is essential for the effective administration of water rights, a key element of public commodity policy. In addition to better reporting, improved

7. Reporting is required in only four Southern California counties.

8. According to the State Water Resources Control Board (2003), the total water diversion and use indicated by reports submitted by riparian and pre-1914 users adds up to about five times current estimates of all urban and agricultural water use diversions, including groundwater, under all bases of right.



As supplies become scarcer, California must better track water use and flows, including groundwater. Photo by Bob Rowan/Progressive Image/Corbis.

accounting will require better quantitative representation of water flows and uses throughout California, in terms of both field data and hydrologic modeling. New technologies are improving estimates of net water uses from land surfaces and are making flow measurements in the field easier, but there will always be locations and times where water flows and uses are not or cannot be measured. Hydrologic modeling will be needed for such occasions. Better water accounting also requires real-time synthesis of water availability and delivery commitments to determine shortages to users and suggest improvements to operations. Periodic strategic synthesis also is needed to inform policymakers and system operators about longer-term issues and opportunities for water management.

In addition to strengthening water diversion and use reporting requirements for all surface water rights holders, the 2009 water legislation now requires that groundwater users report the elevation of their wells as a means of monitoring groundwater levels (Water Code §§ 5100–5107 and 10927–10936). These are but first steps toward the type of comprehensive measurement and accounting of water stocks, flows, and use that will be essential for improving water management.

Strengthening Water Transfer Law

Water transfers use voluntary market mechanisms to reallocate water in line with economic incentives. The state's water market is supported by a series of

statutes introduced by the California legislature beginning in the early 1980s (Table 2.7) as well as the federal Central Valley Project Improvement Act of 1992, which encourages transfers by CVP contractors (Gray 1994a; Thompson 1993). Short-term (annual or seasonal) water transfers have become important for California's response to droughts and other acute water shortages, as they allow for the temporary movement of water from areas of relative abundance to areas of critical need. Long-term and permanent transfers from existing users reduce pressure to develop new water supplies, often a more financially costly and environmentally harmful alternative. Such transfers have grown in importance over the past decade, particularly for urban uses (Figures 6.5, 6.6).

Water transfers are consistent with the reasonable use doctrine. An important innovation of modern water transfer laws in California is that existing users may profit from conserved net water use. This allows water users to lease water to others without facing the "use it or lose it" provisions that normally apply to appropriative water rights. These financial incentives improve the efficiency of developed water allocation by encouraging transfers from relatively inefficient or lower-value uses to higher-value uses. Water transfers also can contribute to protecting the public trust by allowing users to transfer water directly to wetlands, water quality, fish, recreation, and other environmental uses (Gray 1996).

Although a market in both short- and long-term transfers has developed since the early 1990s, legal and institutional obstacles now appear to be limiting market growth (Chapter 6). Providing equal treatment for groundwater, as recommended above, would lessen some of these barriers. In addition, two areas of water transfer law would benefit from greater regulatory attention or legislative reform. The first involves the interplay between the regulation of water rights and water transfers, and the second is the relationship between water transfers and environmental review.

Water Transfers and Reasonable Use

There is an underappreciated synergy between water transfers and the reasonable use doctrine. Properly administered, the reasonable use doctrine can place constructive pressure on existing water users and encourage the profitable transfer of water from potentially unreasonable uses. One of California's earliest large water transfers resulted from this interplay between reasonable use and the market (Gray 1994a).

In 1986, the Imperial Irrigation District (IID) decided to conserve and transfer water following an unreasonable use determination by the state government.



Sacramento Valley rice farms can be an important source of water transfers during droughts. Photo by California Department of Water Resources.

This application of the reasonable use doctrine induced IID to use water more efficiently, but the state also allowed the district to capture the economic benefits of these improvements by selling the conserved water to the Metropolitan Water District (MWD) for a 35-year period. This decision allowed IID to retain the value of its full water rights while maintaining reasonable use. MWD gained additional long-term water supplies at a lower price than alternative sources. And the state recognized that it is often better to achieve improvements in water use efficiency rather than to quibble over the financial equities of the case.

Although the government can use the reasonable use doctrine to help encourage water transfers by intransigent water users, the reasonable use doctrine can also undermine water transfers if not used carefully. Water markets (which encourage conservation through the incentive of being able to sell the conserved water) are in potential conflict with the reasonable use doctrine (which encourages conservation through command regulation). Rather than paying for conservation through the market, cities may be tempted to bring unreasonable use claims against other water users. More important, water users may worry about putting water up for sale if they may attract an unreasonable use claim as a result.

Water Transfers and Environmental Review

The legislature has exempted short-term transfers subject to the jurisdiction of the SWRCB (i.e., those lasting one year or less) from environmental review

under the California Environmental Quality Act (CEQA) (Water Code § 1729). This exemption allows water to be moved quickly in response to acute shortages caused by drought, regulatory restrictions, or other contingencies. The exemption also recognizes that any potential harm to “third parties” (those who are not buyers or sellers in the transaction) from a short-term transfer will itself be short-lived. In contrast, long-term transfers must be preceded by CEQA review (usually in an environmental impact report [EIR]), because they often involve large quantities of water and their effects on the rivers and lands from which the water is transferred may last for many years.

Although the principle of streamlining environmental approvals for some transfers is sound, the practical distinction between short- and long-term transfers is not as clear-cut as implied by statute. The CEQA exemption for short-term transfers in the water code applies only to transfers subject to review by the SWRCB. Yet, many transfers can be accomplished without the board’s approval, either because the transferor’s water rights are not subject to board jurisdiction (e.g., pre-1914 appropriative rights) or because the transfer does not require a change in the transferor’s permit or license (e.g., transfers between CVP contractors or between SWP contractors) (Gray 1994b). These short-term transfers are not categorically exempt from CEQA and therefore must be preceded by an EIR where the potential environmental effects may be significant. This has been true for the short-term transfers of water that the state has acquired for drought relief and environmental uses over the past decade, for instance.

To address these inconsistencies, to ensure that *all* major water transfers are subject to some environmental analysis, and to expedite and improve the quality of most environmental reviews, it would be desirable for the legislature to direct the SWRCB to conduct a comprehensive study and programmatic EIR for major sources of water transfers. This exercise could be done regionally, focusing on major river and stream systems most likely to sell water. As an alternative to conducting the analysis itself, the SWRCB could establish procedures or guidelines for such a programmatic EIR to be prepared by local water agencies interested in selling or purchasing water. The EIR (or set of region-specific EIRs) would examine the potential environmental impacts of transfers under a variety of hydrologic conditions, to enable the preapproval of a range of transfer volumes, depending on market conditions. Several recent long-term transfers provide useful models for such an approach, including the Vernalis Adaptive Management Plan along the San Joaquin and its tributaries, which involves the transfer of environmental water by six senior water rights–holding entities, and

the Yuba Accord, which governs transfers from the Yuba County Water Agency to the Environmental Water Account and a pool of SWP and CVP contractors.

The analysis would assess the potential effects of transfers that currently require mitigation under state law (e.g., effects on other legal users of surface water, including fish and wildlife) as well as those currently excluded or only partially covered by state legal protections (e.g., effects on groundwater users and on the local economy) (Box 7.3). The following types of effects would be considered:

- ▷ **Surface water effects.** From what areas and in what amounts could water be transferred without significantly harming water quality, stream flows, and water supplies for other legal water users (including fish and wildlife)? (Mitigation is already legally required.)
- ▷ **Groundwater effects.** From what areas could water be transferred without significantly reducing groundwater recharge or exacerbating groundwater pollution? What limits and conditions should be placed on groundwater extraction to avoid or minimize these problems? (Mitigation should be legally required, to put groundwater on an equal footing with surface water.)
- ▷ **Fallowing effects on habitat.** In what areas could agricultural land be fallowed to make water available for transfer without jeopardizing the habitat for wildlife and waterfowl? (Mitigation is already legally required.)
- ▷ **Fallowing effects on the local economy.** In what areas could land be fallowed without significant long-term disruption of local economies and without imposing unreasonable social services costs on local governments? (Mitigation should remain optional, but buyers and sellers should be encouraged to develop funds to support the local economy when transfers cause significant unemployment and a loss in local tax receipts.)

The study and programmatic EIR would provide a consistent, more reliable, and less time-consuming basis for assessing surface water and groundwater effects (for which mitigation would be required), and to flag potential problems to the local economy in source regions (for which mitigation would be optional). Once completed, the state would have a hydrologic and ecologic map of regions likely to contribute to, or be affected by, future water transfers and all levels of government would be better prepared for managing such transfers.

7.3**Incomplete “no injury” protections under California water law**

Current state law requires that water transfers avoid injury to other legal users of surface water, including fish and wildlife, which might be caused by a change in the place or purpose of use. These no injury protections are an important guarantee that transfers do not unreasonably harm other water users. Because of limitations on state authority over groundwater, these no injury protections do not extend to groundwater users—an unfortunate omission, which has led many counties to ban groundwater-related transfers (Hanak 2003). In addition, state law does not protect against the potential negative effects on local economies in water-selling regions when transfers are made possible by fallowing farmland, although it does call for public review of such transfers involving more than 20 percent of local water supplies (Water Code § 1745.05). To level the playing field and facilitate the development of California’s water market, no injury protections should be extended to groundwater users. Parties involved in water transfers that cause significant unemployment and loss of local tax receipts from land fallowing should be encouraged to develop mitigation options to support the local economy in the selling region, as in the recent long-term transfers from the Imperial Irrigation District and the Palo Verde Irrigation District to urban agencies in Southern California (Chapter 6).

This template then could be applied both to transfers subject to review by the SWRCB and to those that are not. Transfers consistent with the analysis and findings of the programmatic EIR would be exempt from additional analysis under CEQA, except under extraordinary circumstances. For transfers requiring the board’s approval, the information produced by the study would help to expedite the board’s determination whether the proposed transfer would be likely to “injure any legal user of the water” or “unreasonably affect fish, wildlife, or other instream beneficial uses” (Water Code §§ 1725 and 1736). Transfers that could violate the limitations and conditions established in the study and programmatic EIR to protect third-party interests, as well as transfers to or from areas not covered by the study, would be permissible only following CEQA review (and, where required, approval by the board).

In addition to these changes, more comprehensive reforms in the management of California’s water grid could reduce institutional barriers to water marketing and more flexible use of groundwater basins for storage, as described next.

Modernizing California's Water Grid

One of California's major assets is its extensive network of interconnected reservoirs, aquifers, rivers, and aqueducts, which makes it possible for water users in most of the state to access a wide range of portfolio management tools, including water transfers, surface storage, and groundwater banking. Current management of this system is an accident of history: Numerous vertically integrated independent water projects rely largely on their own supplies and conveyance infrastructure to meet demands of users within their service areas. Some improvements over the past few decades have helped to integrate the system. Notably, the Coordinated Operating Agreement between the CVP and the SWP has improved the joint operating efficiencies of the two largest projects. In addition, some local agencies have developed emergency sharing agreements. And the "wheeling" statute adopted in 1986 allows buyers and sellers to use water conveyance facilities owned by others to accomplish water transfers. Nevertheless, California's highly interconnected water system still functions in a fragmented manner.

Management of California's statewide water grid should be modernized to meet 21st century challenges. If it were possible to start from scratch today, with future needs in mind, California would create a more integrated system, with coordinated operation of major water storage and delivery infrastructure and nondiscriminatory access to supplies by human and environmental water users. To ensure unbiased protection of environmental values, the system would be operated by an independent and impartial entity, not beholden to any water utility.

We propose something short of full integration but well beyond current arrangements: to create an independent system operator (ISO) for the water grid that would focus, at least initially, on the backbone of California's water system—the CVP and SWP. Consistent with the policy of managing water as a public commodity, the purpose of this new system is to improve the efficiency of the distribution of the state's water resources while ensuring protection of public values.

This proposal builds on recent suggestions for changes in water governance, including removing SWP operations from the Department of Water Resources (DWR) and merging the operations of the SWP and the CVP (Little Hoover Commission 2010; Bates 2010b; King Moon 2009). Such proposals are commonly made to improve the operational efficiency of these projects (now

encumbered by bureaucratic employment and contracting rules), with the side benefit of allowing the leaner DWR to become an impartial resource management agency.⁹ Our proposal would achieve these goals but go further in considering the potential for a system overhaul that better incorporates market signals. Specifically, we endorse the Little Hoover Commission's proposal that the state create an independent wholesale water utility as a public benefit corporation to hold the water rights and assets of the SWP and to operate the project facilities. (In Chapter 8, we discuss related governance reforms for the non-SWP functions of DWR.) In addition, we propose the creation of an independent system operator to serve as a water market clearinghouse for the SWP, the CVP, and locally owned projects.

The model for this water ISO is California's existing electricity ISO, created in the mid-1990s as part of energy deregulation. Although some initial aspects of California's energy deregulation model worked poorly, contributing to the energy crisis in 2000–2001, the ISO has emerged as a successful new structure for electricity management in the state. The ISO is a nonprofit public benefit corporation, which operates—but does not own—most of California's high-voltage wholesale power grid (www.caiso.com). The ISO was created to accommodate a structural shift in electricity management, which separated generation and distribution facilities and introduced a market-based system of supply management. Before this shift, power utilities (much like today's water utilities) were vertically integrated and procured most supplies for their customers from their own generating facilities and transmission lines. California's three large investor-owned utilities (PG&E, Southern California Edison, and San Diego Gas & Electric), which together serve roughly two-thirds of the market, were required to divest themselves of some of their generating capacity and to participate in the ISO. The state's municipal power agencies (e.g., the Los Angeles Department of Water and Power, Sacramento Municipal Utilities District, Modesto Irrigation District), which serve roughly one-quarter of the market, were given the option to join.¹⁰

In the new ISO system, electric utilities buy and sell power produced by utilities and independent generators within and outside California through

9. The Department of Water Resources has had difficulties adequately remunerating and retaining staff, purchasing supplies, and contracting for services, particularly given state budget difficulties since the recent economic downturn.

10. In 2008, the investor-owned utilities provided 68 percent of retail electricity, the public agencies provided 24 percent, and nonutility service providers supplied the remaining 8 percent, primarily to large industrial customers. (California Energy Commission data, as reported in Griffin, Leventis, and McDonald 2010).

a combination of long-term and spot market contracts.¹¹ The ISO ensures the integrity of the grid—maintaining the minimum flows needed to avoid unwanted flow reversals, avoiding supply spikes that would exceed transmission capacity, and facilitating the ability of utilities to meet customer demands (i.e., avoiding brownouts or blackouts). It acts as a clearinghouse for purchases and sales, much as a bank does for deposits and loans. The ISO operates a set of short-term markets (day-ahead, hour-ahead, and five-minutes ahead), fulfills long-term contracts, and oversees industry plans to develop transmission infrastructure for the grid. The owners of generating and distribution capacity—not the ISO—are responsible for meeting the environmental regulations on facility siting and operations, including compliance with air emissions standards and environmental flow requirements for hydroelectric projects.

Independent grid operators similar to California's ISO, though nonexistent before the mid-1990s, now provide two-thirds of U.S. electricity deliveries (www.caiso.com). This model of management through organized, competitive wholesale energy markets generates consumer benefits through optimized use of the transmission system and lower wholesale prices (NERA Economic Consulting 2008). California's ISO also has become important for meeting the state's goals for demand management and clean energy through improved market access to new providers.

The ISO appears to be a successful model for maintaining independence while soliciting meaningful input from stakeholders. The ISO maintains stakeholder advisory groups on key operational and policy issues, and stakeholders are invited to weigh in on candidate lists for the ISO board. The lists—including at least four nonstakeholder professionals for each position—are drawn up by an independent recruiting firm, with final selection made by California's governor. The ISO's public benefit corporation status allows a flexible pay scale and rewards for meeting performance goals, factors that contribute to staff professionalism and cost efficiencies.

The proposed water ISO would be similar to the electricity ISO in several key respects: It would be a nonprofit public benefit corporation, with an independent board and comparable mechanisms for seeking stakeholder input, and would operate the water network without taking ownership. The water ISO would begin with the two major water projects—the SWP and the CVP—giving

11. A greater emphasis was placed on long-term contracts and capacity planning following the energy crisis, as exclusive reliance on spot markets left the system vulnerable to price spikes and market manipulation (Pechman 2007).

other local projects the option to join the system. As with the electricity ISO, facility owners would continue to assure maintenance and investment in the facilities, either directly or under contract with third parties. (For the SWP, the facility owner would be the new public utility, noted above.)

The scope of ISO market operations could be extensive or limited, depending on the extent of the state's willingness to revisit the underlying water rights and long-term water service contracts. In the limited alternative, the ISO would act as a central market (and perhaps operations coordinator) for voluntary water transfers employing any unused system capacity, after existing water rights and contract entitlements of water users, which would remain with their current owners. This could include forward markets for water purchases several months or years in advance, in addition to a daily or monthly spot market. Over time, a market might also develop for storage and quality attributes (e.g., a higher price for water with lower salinity). The advantages of this system would include operational efficiencies in grid management plus the ability of parties to transact through an impartial, arm's-length brokerage, which would establish market-clearing prices for water entering the market over several planning horizons. This might look something like the water market in Australia's Murray-Darling Basin, where private brokers operate through an electronic exchange. However, California's market would include important environmental safeguards that were excluded from the Australian market design but that are already part of California water transfer law, including protections of environmental flows and a requirement that only "real" physically available water—not "paper" legally available water—can be transferred to other parties (Box 7.4). Indeed, these protections would be strengthened by extending them to cover groundwater, as proposed above.

The second, more ambitious, alternative would make the water ISO much more like California's electricity ISO, which finds market clearing prices for *all* electricity that moves through the grid. Under this model, the ISO would not simply operate the CVP and SWP systems and a voluntary market; it would have authority to change how water is priced and allocated among the contractors, by establishing a market clearing price for the use of conveyance. Each year, the ISO would set the amount of water available for distribution after environmental requirements are satisfied. Rather than assert their water or contract rights to a specific water quantity and price, the participants would bid for delivery of available water (or available conveyance space). The ISO would then allocate water based on the highest to lowest bids over various time horizons.

7.4

The Australian water market

Several regions of Australia have water markets for short-term leases of annual allocations as well as permanent sales of water rights (or “entitlements”) (Brennan 2006; Garry 2007). In the 2008–2009 water year, approximately 3.2 million acre-feet of water rights and allocations were traded, about 16 percent of nationwide entitlements (National Water Commission 2009). The largest volume of trading occurs in the southern part of the Murray-Darling Basin, where an active electronic exchange operates (www.waterfind.com.au/contact.html).

Water market development has been spurred by national water policy reforms. Following several decades of water scarcity, the Council of Australian Governments initiated a sweeping water policy reform process (Kendall 2011). Among other changes, the reforms gave financial incentives and legal support to Australian state governments to implement property rights reforms that facilitate water trading (Garry 2007; National Water Initiative 2004).

The property rights reforms separated water rights from land on which the water was used (something also possible in California for appropriative rights) and also allowed water rights to be traded even if they were not being exercised (something generally not possible in California, where only water that was in use within the past five years can be transferred). Australian water rights holders are also able to transfer the full diversion right, corresponding to “gross” water use (Box 2.1) rather than just the net water savings resulting from reduced use on the property. (In California, generally only net water savings can be transferred.) These conditions make it possible to sell water required to maintain environmental flows.

The clarity of property rights and lack of environmental limitations on water sales have allowed the Australian water market to evolve quickly and with lower transaction costs than in California. However, this market efficiency comes at a high environmental cost, which became increasingly apparent during the past record drought. To address this problem, the national government plans to spend over \$3 billion in the next decade to purchase back environmental water and to invest over \$5.5 billion in water savings whose yield will be shared between irrigators and the environment. Connor (2010) and Young (2010) call for modifying water allocations to reflect the value of environmental water.

This bidding system would allow the market—specifically the price that users are willing to pay—to direct the allocation of water among participating water users. Such a bidding system would likely result in a different allocation of water than would occur under existing CVP and SWP contracts and the various water rights held by other users that may choose to join the ISO. The

highest bidders (most likely urban and industrial users, followed by high-value agricultural users) would be assured firm supplies in all but extraordinarily dry years, whereas lower bidders would obtain their water for less but with greater frequency of shortages.

Both ISO models would require authorization from Congress and the state legislature. The broader model, which creates a market for conveyance on all CVP and SWP supplies, would also need to address the issue of contract rights. Project contractors who received less water or face higher prices than under their existing contracts would have a valid claim that the government had breached their contract rights and would be entitled to compensation for the fair market value of the lost water or the difference in price between market and contract prices. To address this issue, federal and state legislation creating the ISO would need to authorize the condemnation of CVP and SWP contracts and establish some other process for awarding just compensation. Thus, the broader model, while conferring substantially more flexibility to the system, could also have significant up-front costs.¹²

Given the greater complexities of the broader model, we recommend beginning with the “ISO-lite” model that focuses on a voluntary transfer clearing-house function. If California faces significant longer-term reductions in water supplies as a result of climate change, expansion of the ISO might become necessary. Severe long-term drought, with roughly a 90 percent reduction in supplies, was a major factor in the overhaul of the Australian system of water rights management and water marketing.

Because water operations have more direct and complex environmental consequences than electricity grid operation, the water ISO would be responsible for administering the system to comply with laws governing water transfers and wheeling, as well as water quality standards, endangered species limitations, and other environmental requirements applicable to the operation of facilities.¹³ Water rights and contract holders would retain responsibility for environmental mitigation related to their own water development and use. Facility owners,

12. However, to the extent that the new system conferred additional value to water users (through increased operational efficiencies and flexibility), the net costs of the transition might be very low or negative. A major issue would be whether compensation should be based on the present value of full contract amounts or expected deliveries given hydrologic variability and changing environmental regulations. Although the latter method would appear consistent with the reasonable use and public trust doctrines, the federal appellate court decision in the Stockton East case (Box 7.1) held that making contract performance less reliable through new environmental restrictions is a breach of contract.

13. For this reason, the transfer of operational authority also would likely require revised biological opinions, as well as environmental review under the National Environmental Policy Act and CEQA unless the federal and state legislation creating the ISO were to declare otherwise.

likewise, would be responsible for permits and compliance with environmental laws related to the facilities themselves.

Under either model, a water ISO could interact with the electricity ISO in at least two ways. First, the ISO would buy and sell power from the energy ISO, thereby creating healthier incentives for energy efficiency. Currently, the projects subsidize water contractors by using revenues from hydropower sales to lower water delivery costs and, in the case of the CVP, charging contractors below-market rates for hydroelectric power produced by project facilities.¹⁴ (This change would, for instance, raise the price of water delivery over the Tehachapis.) Under the new system, water conveyance (including energy costs) would be fully priced. Second, under either model, the energy ISO might pay the water ISO to schedule pumping and operation of hydropower releases as part of managing the electric grid.

In either model, the market operated by the ISO could be accessed by environmental managers and others wishing to acquire water for instream purposes (e.g., environmental and recreational flows). The reform also could provide environmental managers with revenue-raising options to lease out excess regulatory flows and bank the receipts. The market could then enhance the potential for flexible environmental flow management—which is important for the new approaches to ecosystem reconciliation discussed in Chapter 5.

Clearly, the benefits of this institutional change are closely tied to the fate of the Sacramento–San Joaquin Delta. As discussed in Chapter 6, if the present through-Delta conveyance system collapses and is not replaced with an alternative, many benefits of integration disappear, along with many other water supply management options available to the state. As long as conveyance limits Delta water exports, however, having a reliable and transparent market to manage scarce Delta export capacity can significantly improve the system's efficiency.

Assuring Funding for Public Benefits

In recent years, California has come to rely on an unreliable funding source—general obligation (GO) bonds—to support ecosystem programs and state planning and management functions (Chapter 2). GO bonds have also supported local and regional water projects that are primarily funded by ratepayers.

14. Central Valley Project electricity is heavily subsidized, relative to market prices. In 2002–2003, the project charged its contractors less than one-tenth the price PG&E charged to industrial water users (Sharp and Walker 2007). The SWP does not sell electricity to contractors at subsidized prices, but it uses project hydropower revenues to reduce water delivery costs.

Inadequate resources have been a theme in virtually all studies of the state agencies key to managing California's waters (e.g., Little Hoover Commission 1990, 2010). Yet increased support through the state's general fund seems unlikely in the current fiscal environment and unreliable in the long run. California needs to establish public funding sources supported by water users, as is now done in the energy and transportation sectors.

Public Goods Charge on Water Use

A statewide "public goods" charge (PGC)—a volumetric charge on all surface and groundwater used in the state—is a promising solution to the chronic underfunding of the state's water-related agencies and ecosystem programs. It would also provide a more efficient and equitable way to support local and regional water infrastructure.¹⁵ A PGC could support (1) operations of state agencies directly related to overseeing water allocation and extraction, (2) scientific and technical activities to improve water management, (3) environmental protection and restoration needed because of water extraction, and (4) local and regional water infrastructure improvements.

A similar public goods charge for energy, passed by the legislature as part of its 1996 deregulation of the energy sector, collects roughly \$800 million per year from a roughly 0.5 cent per kilowatt hour charge on electricity and a similar charge on natural gas.¹⁶ This funding has gone to support energy use by low-income households (47 percent), increasing energy efficiency (28 percent), renewable energy sources (17 percent), and research (8 percent) (Kuduk and Anders 2006). These funds assure steady funding for state-of-the-art infrastructure, social goods, and research and development (Chapter 2) and have received high marks for supporting energy efficiency and the development of renewable sources (Griffin, Leventis, and McDonald 2010). Nationally, the federal highway trust fund, financed by a per gallon charge on fuel, supports roads, mass transit, and environmental cleanup associated with transportation projects.¹⁷

15. See Griffin, Leventis, and McDonald (2010) for an exploration of this idea for local and regional infrastructure support.

16. This amounts to a relatively small share of customer energy costs (e.g., 4 percent in the San Diego area—see Kuduk and Anders 2006). The surcharge on electricity was introduced as part of legislation restructuring electric utilities in 1996 (AB 1890) and renewed with specific legislation in 2000 (AB 995). In 2000, a consumption surcharge on natural gas was also introduced (AB 1002). The surcharge on electricity expires on January 1, 2012, and would likely require a two-thirds vote for renewal under the terms of Proposition 26 (see text below). These earlier bills all passed with high majorities: AB 1890 passed by unanimous vote of both houses; AB 995 and AB 1002 passed with 95 percent of all assembly votes, and 86 percent and 75 percent of senate votes, respectively (www.leginfo.ca.gov).

17. The ability of this fund to serve its various purposes is now challenged by several factors, including Congress's failure to index the per gallon gas tax to inflation—it has remained at \$0.18 per gallon since 1993 (National Surface Transportation

By providing stable funding for the administration of statewide and regional water rights, planning, and quality programs, a PGC would reduce much of the disruption, delay, and inefficiencies resulting from irregular, bond-dependent, and increasingly stressed general revenue funds. Funding for research and development would benefit in similar ways.

PGC funds for ecosystem reconciliation would support habitat development for native species, long-term purchases of water for environmental uses, invasive species enforcement, reconciliation-oriented research, and other environmental management activities. This funding would partially compensate for damage to native ecosystems and species from water infrastructure and operations and, by improving conditions, it would also reduce environmental pressures on water deliveries. The administration of such funding would need to ensure sound mechanisms for allocation and oversight in support of effective ecosystem reconciliation.

PGC funding for water reliability would support water infrastructure, conservation, reuse, and other activities that materially improve the reliability of water deliveries throughout the state. These funds would provide incentives for local and regional water agencies to cooperate in developing integrated water management activities, along the lines of current bond funding. These funds would also support state water rights administration to improve the institutional reliability and security of water rights and contracts. The creation of a PGC would likely require a two-thirds vote of the legislature.¹⁸

Regional fees for water system management might be levied in parallel to the statewide public goods charge. For instance, Metropolitan Water District of Southern California instituted a stewardship fee on its wholesale water sales in the early 1990s to support a range of water supply reliability programs, including water use efficiency, recycled wastewater, and desalination projects.

A PGC also would help ensure that water users are paying a rate that better reflects the cost of their water use to society, including management and

Infrastructure Financing Commission 2009). California levies a similar fee on fuels to support transportation investments and maintenance and has faced similar challenges in recent decades.

18. Although the SWRCB has authority to impose fees to fund the board's issuance, administration, review, monitoring, and enforcement of water rights permits and licenses (see Water Code §§ 1525–1560), this authority applies only to surface water users within the board's direct permit and license jurisdiction. In contrast, the PGC proposed here would apply to all surface and ground water use. Creation of a PGC therefore would require new legislation, most likely with a two-thirds majority vote under Proposition 26 (enacted by the electorate in November 2010 (Cal. Const. art. XIII A, § 3(a))). The PGC would likely not fall within the exemption set forth in Proposition 26 for charges "imposed for the reasonable regulatory costs to the State incident to issuing licenses and permits, performing investigations, inspections, and audits, enforcing agricultural marketing orders, and the administrative enforcement and adjudication thereof" (Cal. Const. art. XIII A, § 3(a)(3)).

environmental protection and mitigation. Why should general tax revenue support administration and regulation of what is ultimately a utility service? Because water users are not currently paying a price that reflects these costs, they do not take these costs into account in making economic decisions, such as the appropriate level of water conservation.

Much as the federal highway trust fund taxes all highway fuel use to support federal highways built and maintained by state and regional transportation agencies, this approach to supporting statewide and regional water reliability would create financial incentives for local and regional cooperation in operations, planning, and infrastructure development. A major by-product of the federal highway fund is that it has provided incentives for states to agree on national data-collection and design and maintenance standards for roadways. The public goods charges in the energy sector have also fostered cooperation between utilities and local and regional governments in the use of energy efficiency grants (Hanak et al. 2008). These demand management programs and research and development activities funded through the program help to lower energy prices for all users.

Specific Fees for Specific Problems

In addition to a general public goods charge, some specific fees should be levied to address specific problems:

- ▷ A surcharge on chemical contaminants could help fund containment of source pollutants. Such a fee could be modeled after California's electronic waste fee, introduced by the legislature in 2003, and the fee levied on paint manufacturers to mitigate lead paint poisoning, introduced in the mid-1990s;¹⁹ and
- ▷ A fee on beneficiaries of dams to help fund dam retirement actions (similar in spirit to the requirement under California's Surface Mining and Reclamation Act that mine operators provide a bond sufficient for restoring the mine site) and to fund programs to improve the condition of fish whose habitat is compromised by dams (Chapter 5).

19. On electronic waste recycling, www.calrecycle.ca.gov/electronics/act2003/. On the fee for lead paint mitigation, see Misczynski (2009). This regulatory fee was upheld by the California Supreme Court in *Sinclair Paint v. State Board of Equalization* (1997).

Other sources of state revenue also could help support work critical to the health of California's waterways. Recognizing the major effect of roads on aquatic ecosystems, for example, a small percentage of transportation mitigation funds might appropriately support the work of the Department of Fish and Game. As a precedent, 0.1 cent per gallon of the federal gas tax funds a Leaking Underground Storage Tank Trust Fund.

Until recently, these types of specific mitigation fees could be approved with a simple majority vote of the state legislature. However, with the passage of Proposition 26 in November 2010, they are also likely subject to a two-thirds vote by the legislature.²⁰

Treating Water as a Public Commodity

Treating water as a public commodity—balancing the public benefits of water and its value as an economic input—is the most promising approach for meeting environmental and economic objectives both now and in the future, as water becomes increasingly scarce. Management flexibility is essential for achieving this balance. Fortunately, California water law, especially through the reasonable use and public trust doctrines, has the capacity for balance and flexibility.

Water management in California has already moved substantially in the direction of treating water as a public commodity, particularly through the development of the state's water market. However, several changes are needed to consolidate this trend. Foremost among these is to put groundwater on an equal footing with surface water—necessary to protect environmental stream flow in some systems, to reduce harm to other surface and groundwater users, and to facilitate the development of water marketing and groundwater banking—needed tools for adapting to increasing water scarcity. As discussed further in Chapter 9, there are good reasons for the state to play a leading role in guiding policy on this issue, while encouraging local water users to develop comprehensive management solutions within their watersheds. Establishing incentives for better legal and administrative definition and security of other water rights, including pre-1914 and riparian surface water rights, will also improve the functioning of the system, facilitating water transfers and groundwater

20. See Cal. Const. art. XIII A, § 3(a). Before passage of Proposition 26, regulatory fees to fund "remedial measures to mitigate the past, present, or future adverse impact of the fee payer's operations" could be enacted by majority vote of the legislature (*Sinclair Paint v. State Board of Equalization* 1997). At the local level, such fees previously could be adopted by simple majority vote of the local agency's governing board. After Proposition 26, these fees are now subject to a supermajority vote of the general public within the local agency (Cal Const. art. XIIC, § 1).

banking. Improved water accounting—including better reporting, monitoring, and analysis of all types of water usage—is also fundamental to managing water more effectively for economic and environmental objectives.

California also needs to strengthen its water marketing law to allow the market to move beyond the growing pains of adolescence and continue to expand. Environmental reviews should be streamlined to improve efficiency, and their scope should be extended to ensure that the public values of the system are protected. A further change—establishing an independent water transfer clearinghouse, modeled after the state’s electricity ISO—would allow California to benefit more from its complex network of storage and conveyance infrastructure and facilitate water marketing. This system currently bears the weight of a fragmented history of development by numerous federal, state, and local agencies.

Finally, California should draw on the experiences in the energy and transportation sectors to develop a more reliable, user-based source of funding for the public functions of the water system, establishing a public goods charge on water use and specific environmental mitigation fees.

The state legislature will have a pivotal role in driving these changes, as many will require or benefit from new legislation. This will not be easy, because those who benefit from the regulatory status quo are likely to resist change. However, if the legislature fails to act, both the courts and the State Water Resources Control Board have considerable existing authority under the reasonable use and public trust doctrines to further the goals of more efficient and environmentally beneficial water management. In particular, the courts can play an important role in furthering groundwater management. The board can also assume a leadership role on the integration of groundwater and surface water management in cases where groundwater pumping is causing environmental harm, as demonstrated by its recent actions in the Russian River Valley.

To institute reforms such as those outlined here and in previous chapters, California needs a more capable and nimble set of governance institutions and approaches to the reform process itself. Part III of this book examines promising alternatives in both areas.