Before the Well Runs Dry: Improving the Linkage Between Groundwater and Land Use Planning

Based on an Uncommon Dialogue on Groundwater and Land Use Planning, Stanford University

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About Water in the West

Water in the West is a partnership of the faculty, staff and students of the Stanford Woods Institute for the Environment and The Bill Lane Center for the American West. The mission of Water in the West is to design, articulate, and advance sustainable water management for the people and environment of the American West. Linking ideas to action, we accomplish our mission by engaging in cutting-edge research, creative problem solving, active collaboration with decision-makers and opinion leaders, effective public communications and hands-on education of students.

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EXECUTIVE SUMMARY

There is no comprehensive regulation of groundwater use in the state of California, and the right to withdraw groundwater is based on surface land ownership. This creates a direct linkage between every land use that requires water and the groundwater underneath that land. Because so many aspects of groundwater use are not regulated by the state, local governments' land use decisions become a key driver of demands on groundwater. Nonetheless, land use decisions and planning are not well coordinated with groundwater management.

Understanding how land use decisions affect groundwater resources has become increasingly important in recent years, as groundwater provides approximately 30 percent of California's water supply in average years and 40 percent of the supply in dry years. In some places, the reliance on groundwater during droughts is much higher, due to reduced supplies of surface water. Growth from housing and irrigated agriculture, among other demands, have led to chronic overdraft and declining groundwater elevations in many communities that rely heavily on groundwater.

To address this problem, Water in the West convened groundwater managers, land use planners, water lawyers, consultants and academics at Stanford University for an Uncommon Dialogue in the fall of 2013. Its aim was to discuss a growing consensus that more effective integration of land use planning and groundwater management is an essential component of preserving groundwater aquifers for the future, and to share possible means of accomplishing this in California.

This report, shaped in part by the Dialogue, provides the background and regulatory context for land use planning and groundwater management in California, shares case studies that highlight the intersection of groundwater and land use, and makes specific recommendations to improve the linkage between land use decisions and groundwater management in the state.

KEY FINDINGS

- Many communities are facing groundwater shortages due to land use changes; they seek tools, including clarity on their authority to regulate groundwater use. For example, groundwater-level declines in the Paso Robles Groundwater Basin have caused some wells to go dry, necessitating a temporary county urgency ordinance to curb the increasing rate of groundwater decline while permanent tools and a structure for managing the basin are explored.

- Local jurisdictions want to avoid adjudication because it is time-consuming, expensive and fails to incorporate a community's vision for the future. The case of Orcutt, a community overlying the adjudicated Santa Maria Groundwater Basin, illustrates that the water accounting done for adjudication by a judge bears little relation to what a community might envision or plan for the future.

- Effective integration of groundwater and land use from the perspective of land use planners is most likely to be driven by incorporating groundwater goals and policies into a jurisdiction's general plan, specific land use decisions and local ordinances.
  At least 96 cities and counties in California have adopted an optional water element in their general plans. More than half of these were adopted in the past decade.

- Regional water management, as illustrated by the Kings Basin Integrated Water Management Plan, can increase collaboration between land use planners and groundwater managers. Such collaboration builds trust and relationships that lead to projects on the ground that are coordinated to meet regional and basin goals. The regional scale is also a more natural scale to manage groundwater basins.

- A huge and chronic problem is the lack of groundwater data and access to such data. Well information is considered confidential by law, and many communities lack the information to make sound groundwater management decisions.

SPECIFIC RECOMMENDATIONS

Tailor Development to Water Availability: Communities in California need tools to manage new development and crops in a way that does not place additional strain on aquifers that are in chronic overdraft. These communities need locally tailored and flexible options, including regulations supported by state law, that give them the ability to limit the overall demand on these aquifers as land use changes. These tools can include requirements that new water use be offset by reduced demand, or that new demands seek alternative supplies of water.

Require General Plans to Focus on Water: All new general plans in California should include a water element. This new element would strengthen the linkage between land use and water by incorporating water goals into the public planning process. It would also ensure that plans for growth take into account the available water supply.

Increase Data Collection and Availability: The lack of data is a major contributor to groundwater overdraft. Many communities find out their aquifers are in overdraft when it is too late. The state needs to set standards for collecting and sharing groundwater data, including individual well data.

The report focuses on several local case studies — Paso Robles Groundwater Basin, Orcutt (Santa Maria Groundwater Basin), Butte County and Kings Basin Integrated Regional Water Management — to show how different communities in the state are responding to their groundwater and land use challenges.

INTRODUCTION

Water in the West convened an Uncommon Dialogue[1] on groundwater and land use planning at Stanford University on September 12 and 13, 2013. Land use planners and groundwater managers from throughout California, as well as water lawyers, consultants, NGOs, scientists and academics attended the meeting. The goals of the Uncommon Dialogue were to: 1) stimulate dialogue between land use planners and groundwater managers; 2) identify barriers to and explore opportunities for managing land and groundwater more coherently; and 3) develop recommendations for policies and practices that could lead to improved management of land and groundwater.

Groundwater is often called an "invisible" resource. Groundwater basins are not only hidden from sight, but understanding them well enough to manage is complicated and expensive. Groundwater basins are not defined by property boundaries or political subdivisions, which further compounds the difficulty of their governance. In California, landowners have a property right to withdraw groundwater from beneath their land, and the state does not regulate groundwater withdrawals. Land uses on the surface are closely linked to the groundwater underneath that land. Land use changes can require new or additional groundwater pumping, limit groundwater recharge and decrease groundwater quality. Because so many aspects of groundwater use are not managed or regulated by the state of California, a local government's land use decisions become a key driver of demands on groundwater.

Understanding how land use decisions affect groundwater resources has become increasingly important in recent years, as groundwater provides approximately 30 percent of California's water supply in average years and 40 percent of the supply in dry years.[2] In some places, the reliance on groundwater during droughts is much higher as surface water supplies get reduced. Development, whether in housing or in irrigated agriculture, usually increases demand on groundwater supplies. In communities that rely heavily on groundwater, that kind of growth has led to chronic overdraft and declining groundwater elevations in many parts of the state.

[Overdraft]
Groundwater overdraft is a condition in which pumping exceeds recharge in a groundwater basin over a period of time, resulting in harm to the basin. Negative effects could include land subsidence, loss of groundwater quality, loss or decline of stream flows and riparian habitat, higher pumping costs and seawater intrusion.

California legislation of the last 30 years reflects the increasing need for collaboration between land use planners and water managers to protect groundwater. Most state regulations, however, are voluntary or pertain only to very large projects. Groundwater management has largely been delegated to local jurisdictions, court-mandated water masters or regional collaborations. In some places, groundwater conflicts have escalated with land use changes, requiring resolution

[1] Through Uncommon Dialogues, Water in the West brings together leaders from different sectors to develop practical solutions to pressing environmental challenges centered on water.

[2] California Legislative Analyst Office, "Liquid Assets: Improving Management of the State's Groundwater Resources, 2010.

by the courts or through the creation of special districts by legislation. In California, there are 22 adjudicated groundwater basins and 10 or more major basins managed by special water-management districts.

Some local jurisdictions have been managing groundwater for a long time. The Santa Clara Valley Water District (SCVWD) and Orange County Water District manage basins with a strong local and regional presence. SCVWD has had a tax on groundwater pumping for 80 years. Fox Canyon Groundwater Management District has a system of phased management responses based on ambient basin conditions.

While many examples of successful local groundwater management exist,[3] on a whole, land use decisions are still largely made without considering water demands, and groundwater decisions are made without considering land use. As groundwater depletion continues, there is growing consensus that effective integration of land use planning and groundwater management is essential. The need for this integration created the urgency for the Uncommon Dialogue. This report summarizes and builds on that meeting.

The report provides background and regulatory context for land use planning and groundwater management in California.[4] It also shares case studies that highlight the intersection of groundwater and land use, and makes specific recommendations to improve the linkage between land use decisions and groundwater management in California. While the Dialogue helped shaped the recommendations, the recommendations are not meant to represent a consensus of the group, and Water in the West is responsible for its contents.

Although not explicitly addressed in this report, the quality of groundwater is an important issue that is inseparable from groundwater quantity and is directly affected by land use planning. The increasing costs of groundwater treatment and distribution can become significant challenges for a community, particularly those that are not connected to a regional system. Another issue not addressed here is the relationship between surface water and groundwater. Surface water and groundwater are governed separately under California law, despite the close physical connection between these water resources.

BACKGROUND

This section briefly describes the key land use planning and groundwater regulations and legislation in California in order to provide the context for the report's analysis and recommendations.

General Plans

[3] Rebecca Nelson, "Uncommon Innovation: Developments in Groundwater Management Planning in California," Water in the West, Stanford University, 2011.

[4] A comprehensive overview of the regulations and policies pertaining to the intersection of water and land use planning at the state, regional, and local levels is provided in the 2013 update of the State Water Plan, currently in draft. California Department of Water Resources, "Land Use Planning and Management," Draft Final State Water Plan, Update 2013, Vol. 3, Ch. 24.

Under state planning law, cities and counties must adopt a long-term (typically 10 to 20 years) general plan for the physical development of the jurisdiction and any related land outside its boundaries. A general plan is developed through a public process and is intended to reflect the community's values and priorities. It is a policy document that guides future development; city and county ordinances must be consistent with the plan. Guidelines for general plans, developed by the Governor's Office of Planning and Research (OPR), require seven mandatory elements and allow additional optional elements that the jurisdiction may choose to adopt. The seven mandatory elements for a general plan are: 1) land use; 2) circulation; 3) housing; 4) conservation; 5) open space; 6) noise; and 7) safety.

Because a water resource element is not mandatory in the general plan, groundwater policies (if they exist) have typically been placed in the conservation element or in other elements of the plan. Groundwater provisions in the general plan may incorporate specific goals, policies, actions and development standards intended to improve the coordination of groundwater supply and land use planning, stabilize groundwater levels, and protect the groundwater basin from contamination.

Some jurisdictions choose to address groundwater resources in an optional water resources element in their general plan. This element can set goals, objectives and policies for the use and protection of water resources. Guidelines for an optional water element are included in the OPR's guidelines for general plans[5] and encompass potential strategies on water supply and demand, water quality, flood management, stormwater management, data and analysis, collaboration and coordination, and other water-related issues in the context of land use planning. Importantly, the OPR guidelines recommend considering the entire hydrologic cycle and how community policies and actions affect each component of the system.

Land Use Planning and Water Legislation

Several related pieces of legislation — Senate Bills (SB) 901, 610, and 221 — have attempted to increase collaboration between water managers and land use planners. Passed in 1995, SB901 was the first bill to require a water supply assessment for proposed new development projects, but it provided little direction and its reach was limited. Seven years later, companion measures SB610 and SB221 were enacted to promote more collaborative planning between local water suppliers and cities and counties.[6] Overall, SB610 and SB 221 have had limited impact due to their high thresholds (500 units or equivalent), lack of guidance on when and how to implement, and lack of linkage to general plans.

SB610 and SB221
Both statutes require water providers to submit detailed information regarding water availability to city and county decision-makers prior to approval of large residential, commercial,

[5] Jeff Loux, "Optional Water Element," Chapter 6 of General Plan Guidelines, State of California, Governor's Office of Planning and Research, 2003.

[6] For more information on the implementation of SB611 and 221, see Ellen Hanak's 2010 report entitled, 'Show Me the Water Plan: Urban Water Management Plans and California's Water Supply Adequacy Laws' and her 2005 Public Policy Institute of California report, 'Water for Growth: California's New Frontier.'

or industrial projects.[7] Under SB610, a water supply assessment must be provided for any development or related land use plan that is 1) defined as a "project" under the California Environmental Quality Act (CEQA); and also 2) consists of more than 500 housing units, 50,000 square feet of retail use, 250,000 square feet of office use, 500 hotel rooms, 40 acres, or 650,000 square feet of business park use or a mixed-use project with water demand equivalent to 500 housing units.

Under SB221, a land use agency approving a subdivision of more than 500 housing units (or a proposed subdivision of fewer than 500 units if the project represents 10 percent or more of all connections of a smaller water purveyor) requires a written verification from a water provider that a sufficient and reliable water supply is available. For groundwater-dependent communities, the lack of or access to groundwater data makes it difficult to determine basin condition and its potential as a long-term supply.

SB221 is intended as a fail-safe mechanism to ensure that water supplies are available and identified at the earliest stages of planning. It is also important to recognize that CEQA review is needed to address water supply adequacy regardless of project scale or size, which is another important safeguard for California communities.

These water supply evaluations cannot prohibit a land use agency from approving a project, but the SB610 water supply assessment must be included in its environmental document for the project. For SB221, if a written verification concludes that water supplies are insufficient, the approving agency may conclude that water sources not considered by the public water system will be available or may waive the condition imposed by SB221. These statutes have been litigated, culminating in a 2007 California Supreme Court decision in *Vineyard Area Citizens for Responsible Government v. City of Rancho Cordova,*[8] which affirmed that short-term and long-term water supply must be addressed for large-scale development.

It should be noted that agricultural projects (e.g., development of irrigated agriculture) are not subject to SB610 and SB221.

Urban Water Management Plans

Under the Urban Water Management Act of 1983, urban water providers must submit an Urban Water Management Plan (UWMP)[9] to the Department of Water Resources and update that plan every five years. UWMPs typically include population, demographics and climate; water supply sources; water demand; reliability and water-shortage contingency planning; and demand-side management measures. If groundwater is identified as an existing or potential water source, the following information is required: a copy of the groundwater management plan; a description of the groundwater basin(s), including adjudication or overdraft status as applicable (if overdraft is identified, a description of efforts to eliminate overdraft must be included); location, amount and

[7] This detailed information must also be included in the administrative record that serves as the evidentiary basis for an approval action by the city or county on such projects.

[8] *Vineyard Area Citizens for Responsible Government v. City of Rancho Cordova*, 40 Cal. 4th 412 (2007). *County of Amador v. El Dorado County Water Agency*, 76 Cal. App. 4 th 931(1999) is an example of an earlier ruling.

[9] This requirement pertains to urban water providers with more than 3,000 connections or providing more than 3,000 acre-feet of water annually.

sufficiency of groundwater pumped by the urban water supplier for the past five years; and pumping projections for average years, single dry years and multiple dry years.

Cities, counties, water districts, property owners and developers are able to use this document when planning for and proposing new projects. Both SB610 and SB221 suggest that UWMPs may be a good source of information for developing water assessments and verifications if the supply-and-demand analysis in the plan meets the requirements of these two statutes. UWMPs, while non-binding, can also serve as important source documents for cities and counties as they update their general plans. Conversely, general plans are source documents for water suppliers updating their UWMPs. The accuracy and usefulness of these planning documents are interdependent.

Groundwater Regulations

California has no statewide regulation of groundwater, and most groundwater management is done through local jurisdictions and agencies. In California, there are currently three ways to manage groundwater resources: through the California Water Code and related state statutes, through local ordinances and through court adjudications. The following summary of Assembly Bill (AB) 3030, SB1938, SBX7-6, SB1672 and AB359[10] provides the state-level regulatory context under which groundwater managers and land use planners work.

AB3030 and SB1938

The passage of AB3030 was spurred by the U.S. Environmental Protection Agency, which encouraged states to adopt mandatory groundwater-quality management guidelines or regulations for local agencies. Concurrently, pressure for groundwater management programs increased at both the state and local levels as a result of worsening groundwater overdraft and contamination problems.

The Groundwater Management Act, commonly referred to as AB3030, was signed into law in 1992. The legislation is designed to provide local public agencies with increased management options for groundwater resources through voluntary and collaborative efforts, including the use of groundwater management plans. According to the California Department of Water Resources (DWR), 149 agencies have adopted groundwater management plans to date.[11] Some plans have been created in partnerships by multiple jurisdictions and water districts, which better reflects the natural regional scale of groundwater basins.

SB1938 was passed to amend AB3030 in 2002; it requires new groundwater management plans to include documentation of public notification on how interested parties may participate in developing the groundwater management plan. In addition, the bill requires communities to have a groundwater management plan in order to be eligible for DWR funding for groundwater-related projects. The plan requires a blueprint for involving and cooperating with other agencies serving or overlying the groundwater basin; a map of the

[10] To learn more about groundwater management legislation, refer to the Department of Water Resources, "Bulletin 118 – Update 2003."

[11] For more information, see Department of Water Resources, 'Assembly Bill 3030,' available at water.ca.gov/groundwater/gwmanagement/ab_3030.cfm.

groundwater basin; and management objectives for the basin, including monitoring and management of groundwater levels, groundwater quality, inelastic land surface subsidence, and changes in surface water flow and surface water quality that directly affect groundwater levels or quality or are caused by groundwater pumping. It also requires adoption of monitoring protocols for the mandatory elements of the plan to track changes in conditions to meet the management objectives.

The legislature passed a final related bill, AB359, in 2011. AB359 adds a new prerequisite for a public agency to be eligible for state funding for water projects: namely, that its groundwater management plan include groundwater recharge maps to be provided to local planning agencies for use in their land use decisions. Unlike urban water management plans, groundwater management plans are not required to be submitted to DWR. Thus, this information is unavailable for preparing the California Water Plan.[12]

SBX7-6

In November 2009, the California State Legislature passed a series of bills focusing on the management, monitoring and conservation of the State's water resources. SBX7-6 mandates a statewide groundwater elevation monitoring program to track seasonal and long-term trends in groundwater elevations in California's groundwater basins. The amendment requires collaboration between local monitoring entities (e.g., water agencies) and DWR to collect and disseminate groundwater elevation data in the California Statewide Groundwater Elevation Monitoring (CASGEM) database. If local entities do not volunteer to perform groundwater monitoring, and DWR assumes those functions, then those entities and the counties in which they are located become ineligible for water grants or loans from the state.[13]

SB1672

Passage of SB1672 established the state's Integrated Regional Water Management (IRWM) program in 2002. IRWM is an optional collaborative regional planning process to coordinate the management of water quality, quantity and reliability issues. The IRWM process is intended to address the many issues and differing perspectives of the regional entities and stakeholders involved in water management across jurisdictional, watershed and political boundaries. Several state propositions passed subsequently provide grant opportunities for IRWM planning and implementation. These grant opportunities are the primary direct incentives for communities to engage in the IRWM process.

WHERE ARE THE GAPS?

While California has made progress over recent years in linking groundwater management and land use, the emerging and continuing groundwater problems throughout the state are clear indications that improvements are needed.

[12] California Department of Water Resources, "California's Groundwater Update 2003: Findings," Bulletin 118, 2003.

[13] See SBX7-6, Section 10933.7. The fact that a county is potentially penalized is a way to ensure that all groundwater basins in the state are addressed; a basin may not be in a water agency, but all basins are in at least one county.

As illustrated in the case studies in Appendix A, many communities are facing groundwater shortages due to land use changes. One example is the Paso Robles Basin in San Luis Obispo County along the Central Coast. Rapidly declining groundwater levels in the aquifer, largely driven by an increase in vineyards and low-density residential housing, have caused some residential and smaller agricultural wells to go dry. The community is now facing a water crisis driven by land use changes. The crisis triggered the passage of a two-year emergency county ordinance requiring new groundwater pumping to be offset by an equal amount of reduced groundwater demand in the basin. While this temporary measure only holds the rate of groundwater withdrawal constant, it allows the county and local stakeholders some time to explore management options, including a special water district or other governance structure, to more effectively manage groundwater and land use in the basin.

Although the community was aware that it had a limited water supply, there was no mechanism for either limiting land use changes to the available supply, or to change the county's water management plans to cope with land use changes. In addition, the county must now deal with a higher level of "hardened" water demand — that is, demand created by perennial crops and urban growth that is difficult to reduce during periods of water shortage. This increase in perennial crops — primarily vineyards, and fruit and nut trees — and the inflexibility in demand they create, is a notable land use change that creates challenges for water managers and land use planners.

Local jurisdictions such as San Luis Obispo County have the unenviable job of not only needing to address immediate groundwater crises, but to also construct a proactive and long-term framework for aligning groundwater and land use planning. While this is an opportunity for planning based on a community and regional vision, constructing such a framework is neither easy nor straightforward. While a number of groundwater management districts have been able to successfully manage groundwater for decades, [14] many other jurisdictions are unclear about how to proceed or what authority they have to regulate groundwater and the land uses dependent on the resource.

In addition, the threat of adjudication looms over many groundwater basins. Most jurisdictions want to avoid this time-consuming and expensive process whereby a court allocates groundwater rights within a basin. There are currently 22 adjudicated basins in California, with many more agencies managing portions of these basins.[15] One of our case studies focuses on the unincorporated community of Orcutt, which overlies a portion of the adjudicated Santa Maria groundwater basin in northern Santa Barbara County. The Orcutt case highlights that while a court adjudication of a basin provides an allocation of water rights and addresses the immediate crisis, it is not a proactive long-term planning approach to groundwater management that is linked to a community's vision for the future.

[14] Examples include Santa Clara Valley Water District, Orange County Water District, Sacramento Groundwater Authority, Monterey County Water Resources Agency and Fox Canyon.

[15] California Department of Water Resources, 'Groundwater Management: Court Adjudications,' available at water.ca.gov/groundwater/gwmanagement/court_adjudications.cfm.

In its simplest form, adjudication is an accounting of available water and then a division of that water, according to legal principles, that has little to do with any existing general plan or community vision.

One place that realized the importance of groundwater policies to protecting quality of life and preserving a sense of place is Butte County, also described in Appendix A. A history of water exportation, starting in the 1960s for the State Water Project and continuing with the Emergency State Drought Water Bank in 1994, created heightened awareness of the need for the county to protect and manage their water resources. The county adopted a water resource element in its 2010 general plan that formalized and publicly affirmed groundwater and land use policies. Those policies included protecting groundwater recharge areas and assessing development impacts on groundwater for projects that fall below the SB610 and SB221 thresholds. While many implementation details need to be worked out, Butte County is demonstrating a broad commitment to assessing the implication of local land use decisions on water resources.

Land use planners and groundwater managers face many challenges and conflicting demands. In particular, the ability of land use planners to adopt effective tools is often limited by staffing and funding constraints. They are also constrained by the conflicting interests that must be addressed in a community's land use decisions. Accordingly, the success of land use and groundwater integration from a land use planner's perspective often is driven by the interest and commitment of the local land use jurisdictional leadership (i.e., board of supervisors and city councils) and is accomplished by integrating groundwater goals and policies into a jurisdiction's general plan, specific land use decisions, and local ordinances.

Because groundwater is a common-pool resource with withdrawal rights for overlying landowners, the planner's role in groundwater management is limited. The permitting of new wells, for example, tends to be a ministerial process requiring no environmental review or land use approval process. Such a ministerial process makes it difficult — if not impossible — to manage groundwater demand or gather information for more informed planning. Within this context, groundwater managers must effectively communicate priorities to planners and decision-makers to inform a community discourse on groundwater management options. However, a huge and chronic problem is the lack of groundwater data or lack of access to such data. While many water agencies have local monitoring programs, many others don't; groundwater-level monitoring is encouraged but not required by the state and the CASGEM database is a recent development (see the discussion of SBX7-6 above). For nongovernmental entities, getting well data is even more challenging because the California Water Code (Section 13752) considers well information confidential in the state; public agencies that possess well information can release the information only under certain circumstances.[16]

Another challenge is that land use planning and groundwater management operate at different time scales. A general plan is typically updated every 10 to 20 years, while some water plans,

[16] According to Section 13752 of the California Water Code, "well information shall not be made available for inspection by the public, but shall be made available to governmental agencies for use in making studies, or to any person who obtains a written authorization from the owner of the well."

such as the urban water management plan, are updated every five years. As a result, data may be outdated; different plans may use different projections on population, land use changes, and water supply needs; and goals and objectives of different plans could be misaligned.

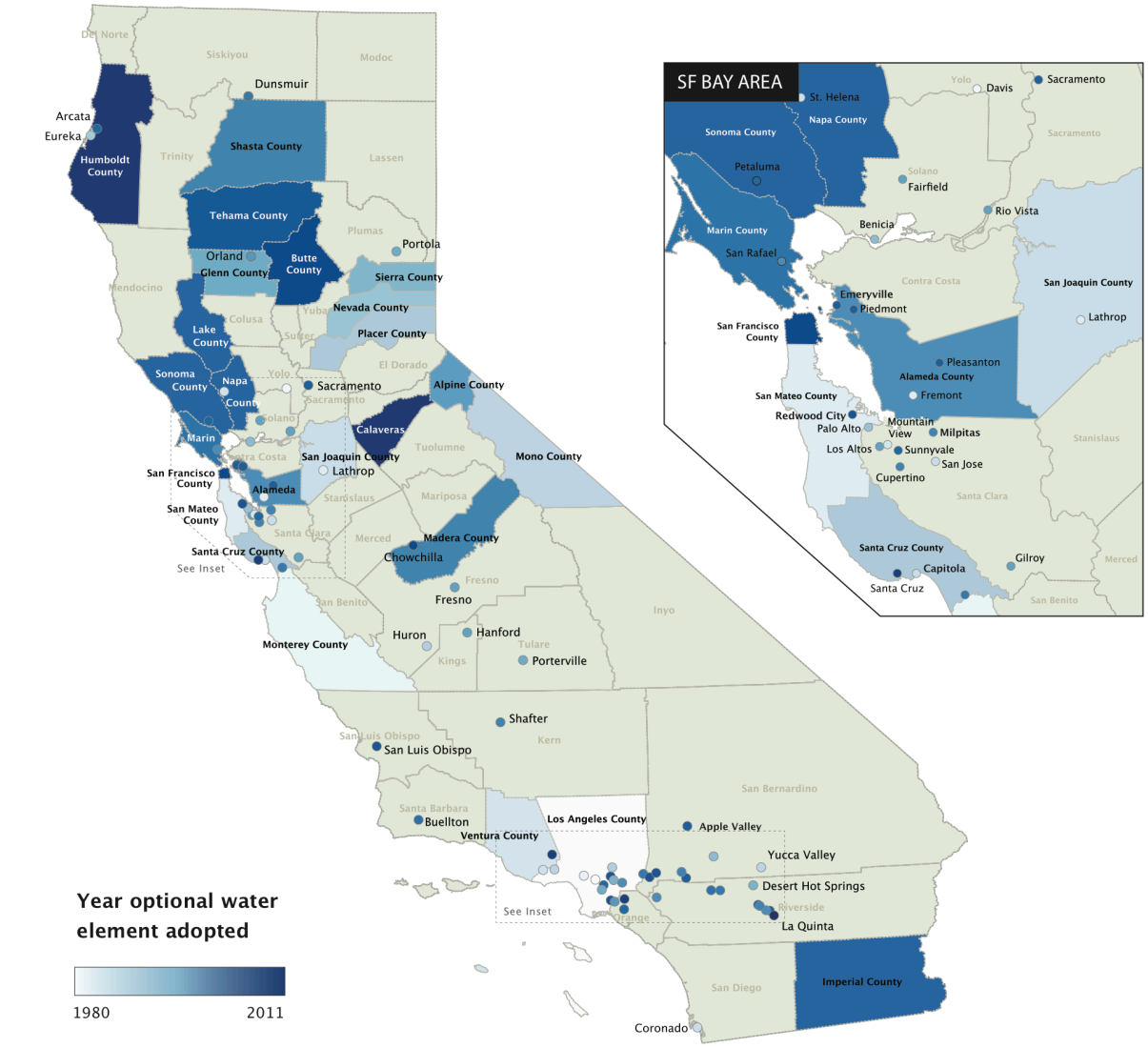
Some jurisdictions are incorporating an optional water element in their general plans as a tool to better integrate land use and water, as well as to highlight the importance of the resource. According to the respondents of the 2011 and 2012 California Office of Planning and Research Annual Planning Survey, 96 cities and counties have adopted an optional water element in their general plan (Figure 1). Of the 96 jurisdictions, 25 are counties — signifying that 43 percent of California counties have adopted a water element. Fifty-three of the 96 water elements were adopted in 2003 or later, after the release of the model optional water element in the general plan guidelines.

Anecdotal evidence suggests that the public process of adopting a water element as part of the general plan generates a valuable community conversation about water and affirms the importance of this resource. More research is needed, however, to determine how effectively this planning tool links land use and groundwater management decisions, and whether it leads to a more sustainable outcome.

More state oversight and funding to address the linkage between groundwater and land use planning is needed, while giving local jurisdictions the authority and flexibility to adapt policies to local conditions. Groundwater basins are not aligned with political boundaries, necessitating basin-wide or regional cooperation and governance — tasks that would benefit greatly from state funding assistance. An example of the state's success in using funding to motivate regional cooperation on water management is highlighted in our case study on the Kings Basin in the San Joaquin Valley.

This case shows that stakeholders are leveraging the integrated regional water management plan (IRWMP) to provide a roadmap for multi-faceted regional approaches to water and groundwater management. They're also using the plan to build relationships for addressing these issues across jurisdictions at a more natural scale. The Kings Groundwater Basin is a primary water supply for this region; at the same time, overdraft is estimated to be over 100,000 acre-feet per year. Agriculture and urban development are the primary drivers of land use changes and groundwater demands. To face these difficult challenges, the Kings River IRWMP stakeholders have evolved to embrace a regional perspective based on a better understanding of each member's issues and concerns to achieve collective goals. (Read the full case studies on the Paso Robles, Orcutt, Butte County and Kings basins in Appendix A.)

California Jurisdictions with Optional Water Elements in Their General Plans



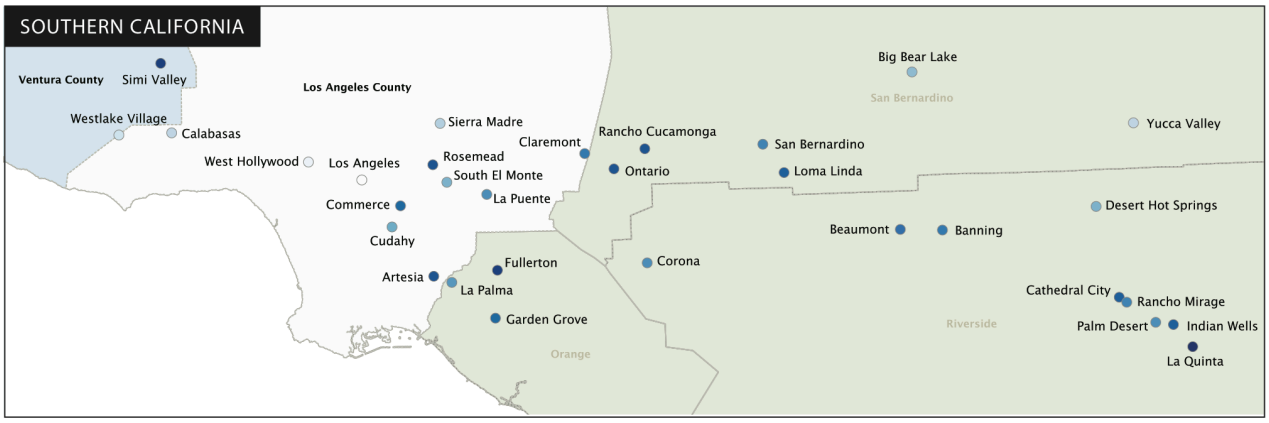


Figure 1. Cities and counties in California that have adopted an optional water element in their general plan. Source: Water in the West and The Bill Lane Center for the American West, based on the California Office of Planning and Research 2011 and 2012 Annual Planning Surveys.

RECOMMENDATIONS

To address the existing gaps in groundwater and land use planning, we recommend focusing on three key areas: tailoring development to water availability, enhancing general plans and increasing data availability.

Tailor Development to Water Availability

Land use changes that outstrip water supply are perhaps the most persistent cause of chronic groundwater overdraft. This includes both changes that planners have historically exercised control over, such as development, and changes that jurisdictions typically do not plan for or regulate, such as increasing acreage in irrigated agriculture. State policies need to enable and support locally tailored and flexible regulations and policies that link land use changes, ranging from urban to agriculture uses, to available groundwater supply. First, basins that are in chronic overdraft must be identified. This requires estimating or knowing the "water balance," or the groundwater inflows and outflows of a basin. If a basin is in "critical" overdraft, local governments and agencies need tools to remedy the problem through managing groundwater extractions and land use.

- *Update State Analysis of "Critical" Groundwater Basins*
  A comprehensive assessment of overdraft in the state's groundwater basins has not been conducted since Bulletin 118 in 1980. At that time, the Department of Water Resources responded to California Water Code Section 12924, which directed the Department to "investigate existing general patterns of groundwater pumping and groundwater recharge within groundwater basins to the extent necessary to identify basins which are subject to critical conditions of overdraft." In the 1980 assessment, 42 groundwater basins were identified as in overdraft, and 11 basins were identified as subject to "critical conditions of overdraft."[17] As acknowledged in the findings of the 2003 update to Bulletin 118, the extent and impacts of overdraft must be evaluated to determine whether groundwater will provide a sustainable water supply.

- *Manage Groundwater Basins in Critical Condition Differently*
  For groundwater basins in dire circumstances, such as those in critical condition of overdraft, the state should give local jurisdictions and agencies the ability to limit or

[17] "A basin is subject to critical conditions of overdraft when continuation of present water management practices would probably result in significant adverse overdraft-related environmental, social or economic impacts." California Department of Water Resources, "Groundwater Basins in California: A Report to the Legislature in Response to Water Code Section 12924," Bulletin 118-80, 1980.

mitigate new demands—a function closely tied to land use. Here are some ways that could be done:

Allow local jurisdictions to limit groundwater extractions. Within the framework of AB3030, which is a voluntary law, give local jurisdictions and agencies the ability if they so choose to manage groundwater demand in dire circumstances. Some experts believe that local governments already have the jurisdiction to regulate groundwater extraction and use as part of their general police powers, and that local water agencies have similar authority under AB3030.[18] The extent of a jurisdiction's ability to manage groundwater extraction and use under existing law should be clarified, and AB3030 should be amended as necessary to allow local management of groundwater demand in dire circumstances.

Limit basins in critical overdraft as water sources. Only groundwater basins that are *not* in chronic overdraft should be allowed for consideration as sources for future water demands in Urban Water Management Plans.

Permit land use changes. Local jurisdictions should be able to subject land use changes in basins under critical overdraft conditions to permitting based on mitigation of new demand. How this option could be implemented depends on the circumstances. It could be folded into land use decisions or well permits. In conjunction, local water districts and jurisdictions, perhaps in consultation with DWR, resource conservation districts and others, should develop guidance on how to create and maintain water supply offset programs. The guidance should be for those areas in which overdraft conditions or lack of available water sources has made it difficult to approve new projects or allow new water demands of any type. Information on model programs that have been established and their effectiveness would be highly useful to some local jurisdictions.

- *Lower the threshold for water supply assessments to 100 units or the equivalent; clarify and simplify compliance requirements*
  The current threshold of 500 units or equivalent affects only very large projects that would have received extra scrutiny regardless, and does not capture the vast majority of developments that have individual and cumulative water demands on water supply. Overall, SB610/221 has garnered little attention from most communities. A 100-unit threshold, while still high, would be a practical step forward in assessing water availability for larger projects as originally intended. It would also keep the issue of water supply adequacy for ongoing growth before local governments more effectively. The state should lower the threshold for water supply assessments and make compliance more explicit and simpler. For example, clarify that general plans are not subject to SB610, and allow projects to comply on the basis of an Urban Water Management Plan's demand analysis when it shows that there is water available from a jurisdiction's general plan.

[18] Ellen Hanak, Jay Lund, Ariel Dunar, Brian Gray, Richard Howitt, Jeffrey Mount, Peter Moyle and Barton "Buzz" Thompson, "Managing California's Water: From Conflict to Reconciliation," Public Policy Institute of California, 2011.

Enhance General Plans with Water Element

Requiring a water resources element would strengthen the linkage between land use and water by explicitly connecting general plans with groundwater management plans, urban water management plans and other pertinent water plans. At least 96 counties and cities in the state have voluntarily adopted a water element and momentum is gaining.

- *Require a water resources element as part of the general plan*
  As an initial step, requiring a water resources element would raise the profile of this critical resource in communities, incorporate water goals into a highly visible public planning process and put all water-related policies in one place. This would ensure broad agreement on goals and hopefully improve coordination in projections used for population and water-demand analyses. While work is needed to determine how well water elements have worked and how much of a difference they have made on the ground, incorporating a water element is an important step forward for a community to create a vision that enables it to live within its water supply.

Increase Data Collection and Availability

A major contributor to unsustainable groundwater use is the lack of data. Sometimes this is because it has not been collected, but often, it is because the data cannot legally be shared. Both of these issues must be addressed. We recommend starting with the following actions.

- *Make well data publicly available*
  Some agencies have simply collected little groundwater data on their basin. But for many others, the problem is not the lack of data, but the unavailability of data for analysis by other agencies or groups.[19] Information from well drilling is publicly restricted. Per Section 13752 of the California Water Code, information about wells is considered confidential. Public access to this data would increase understanding of groundwater conditions and issues and help identify where the data gaps are. Data would also enable research that could advance groundwater technologies to help solve some of our groundwater problems. Many people fear that making information available would lead to an increase in regulation, but "business as usual" until the point of collapse is far worse for individuals and communities.

- *Create a water budget for each groundwater basin*
  A water budget should be developed for each groundwater basin. To create it, the amount of annual recharge and discharge, including pumping, should be determined to define basin status and determine actions necessary to ameliorate any water shortages that could lead to overdraft. Districts such as Pajaro Valley and Fox Canyon already require groundwater-pumping data.[20]

[19] Ellen Hanak, Jay Lund, Ariel Dunar, Brian Gray, Richard Howitt, Jeffrey Mount, Peter Moyle and Barton "Buzz" Thompson, "Managing California's Water: From Conflict to Reconciliation," Public Policy Institute of California, 2011.
[20] Rebecca Nelson, "Uncommon Innovation: Developments in Groundwater Management Planning in California," Water in the West, Stanford University, 2011.

- *Create web-based tools that effectively convey data to the public*

  Allocating groundwater and making difficult land use decisions require public support and buy-in. Unfortunately, groundwater data and modeling can be difficult for the public to process. The state should help communities develop web-based tools to effectively convey to the public the status of local aquifers and the level of groundwater use.

CONCLUSION

More state oversight and support in conjunction with local groundwater management is needed to help communities address the many stresses on groundwater supply throughout California as land use changes occur over time. The recommendations provided in this report are intended to help further this critical conversation given groundwater's crucial role. The state should consider an ongoing source of funding to help local institutions accomplish these goals given the importance of groundwater to the state's economy and vitality. Due to the interconnected nature of the water system in the state, most if not all Californians have a stake in this conversation about the "invisible" resource that is our groundwater.

APPENDIX A. CASE STUDIES

The four case studies presented here show how several different communities in California are responding to their groundwater and land use challenges. The cases are meant to help other communities, practitioners and policymakers gain a fuller understanding of the current state of groundwater management on the ground. There are agencies and districts that have been highlighted for good groundwater management over time and we have nothing to add to those in this report.[21] We are focusing instead on more recent emergences of different methods and tools being used that show successes and shortcomings in today's groundwater management. These case studies originated from the presentations and discussions in the Uncommon Dialogue and were developed in collaboration with the land use planners and/or groundwater managers in each case.

Case Study 1: Paso Robles Aquifer, Northern San Luis Obispo County

Over the last four years, rapidly declining groundwater levels in the Paso Robles aquifer have caused some residential and smaller agricultural wells to go dry. This triggered an emergency county ordinance requiring any new groundwater pumping to be offset with an equal amount of reduced groundwater demand in the basin. The community is still dealing with this crisis and searching for long-term water management solutions.

Background

The Paso Robles aquifer is a large groundwater basin underlying 505,000 acres in San Luis Obispo County along the central California coast. The basin is the primary water source for the northern part of the county, which includes several small communities, rural residences, vineyards and other irrigated agriculture.[22] In July 2013, more than 100 rural property owners went to the San Luis Obispo (SLO) County Board of Supervisors (the Board), with complaints that their water wells were going dry. On August 27, 2013, the Board passed a 45-day temporary "urgency" ordinance requiring new development and new irrigated agriculture to offset projected water use in the basin at a 1:1 ratio. This temporary urgency ordinance was intended to give the county and local stakeholders time to investigate permanent solutions for managing

[21] In the Santa Clara Valley Water District, a permit is required for new wells that intersect the groundwater aquifers of Santa Clara County. Groundwater monitoring is conducted, with monthly reports on groundwater levels and recharge and pumping estimates. For more information, see valleywater.org/Programs/Ordinance901.aspx and valleywater.org/DocumentList.aspx?id=236&terms=groundwater+ordinances. Fox Canyon Groundwater Management District is an independent special district created by the California Legislature in 1982 to oversee both confined and unconfined aquifers within several groundwater basins underlying the southern portion of Ventura County. Over the past 32 years, the district has adopted a comprehensive set of ordinances that require well owners to register their wells, report annual extraction, pay an annual groundwater extraction charge; install a flow meter on all wells; and limit groundwater extractions, with the objective of reducing extractions to a "safe yield," while providing for historical, baseline, and efficiency allocations, credits for under pumping, and penalties for pumping more groundwater than is provided by an allocation. Available at fcgma.org.

[22] San Luis Obispo County, "Paso Robles Groundwater Basin." Available at slocounty.ca.gov/planning/commguidelines/PRgroundwater.htm.

the groundwater basin.[23] In accordance with state law, the Board extended the ordinance for two years, starting October 11, 2013.

While the groundwater crisis in the Paso Robles Basin erupted in 2013, its roots can be traced back 30 years, when lands uses overlying the Basin started changing from dryland agriculture and grazing to irrigated agriculture and residential development (Table 1). With respect to irrigated agriculture, alfalfa production declined over time as vineyard development increased. Along with the changes in irrigated agriculture, the period between 1980 and 2010 also saw the rise of low-density residential development around the basin; sizeable lots and cheap land attracted people to the area. Many of these residences have their own domestic wells, typically drilled to a depth of 400 feet.

Table 1. Land Use Changes Over Time in Paso Robles Basin (in acres)

	Irrigated Agriculture		Residential		
Year	Alfalfa	Vineyard	Low Density Residential	Med. Density Residential	High Density Residential
1985	10,945	6,032	3,261	0	0
1997	4,702	13,706	19,461	0	0
2007	2,726	38,864	145,537	2,481	1,074

Data obtained from the Draft Approach and Methodology for Water Balance Estimation - Paso Robles Groundwater Basin Model Update, 2013.

The first groundwater study of the basin conducted by the county in 2002 indicated that groundwater pumping was rising with the land use changes as shown in Table 1. The first groundwater model for the Paso Robles basin completed in 2005 established a perennial yield of 97,700 acre-feet per year and estimated pumping at 80,000 acre-feet per year. By 2011, a Resource Capacity Study[24] showed that pumping had increased to 95,000 acre-feet per year, which is at or approaching the estimate of perennial yield. Recognizing the severity of the issue, and using its land use authority, the Board adopted a set of actions on groundwater monitoring, water conservation, and land use measures. These actions were meant to address groundwater demand based on recommendations of the Resource Capacity Study.[25] In 2011, a voluntary groundwater management plan (under AB3030) was completed.

[23] David Sneed, 'Supervisors approve emergency Paso groundwater ordinance,' August 27, 2013, *San Luis Obispo Tribune*. Available at sanluisobispo.com/2013/08/27/2654250/emergency-paso-groundwater-ordinance.html.

[24] A Resource Capacity Study is a San Luis Obispo County General Plan study to assess whether resources and services are adequate to serve new development.

[25] Examples of actions include subdivision prohibition and 2:1 water offset for all discretionary land uses. San Luis Obispo County, "Paso Robles Groundwater Basin." Available at slocounty.ca.gov/planning/commguidelines/PRgroundwater.htm.

["Safe", "Perennial", and "Operational" Yields]

Safe yield is the rate at which groundwater can be withdrawn without causing long-term decline of water levels or undesirable effects (e.g. groundwater quality, surface subsidence). It is also defined as the amount of groundwater that can be economically and legally withdrawn from a basin on a sustained basis without producing undesired effects. Safe yield is generally considered equal to the average replenishment rate of the aquifer from natural and artificial recharge.
Perennial yield is defined as the amount of usable water of a groundwater basin that can be withdrawn and consumed economically each year for an indefinite period of time. It cannot exceed the sum of the natural and artificial recharge without causing basin depletion.
Operational yield is the amount (or rate in acre-feet per year) of localized groundwater withdrawn on an annual average basis by an agency that does not exceed the long-term annual average recharge rate of the localized aquifer.

Despite groundwater pumping at or below level the estimated perennial yield for the basin, groundwater elevations in the Basin have dropped substantially (Figure 2). Several factors are likely contributing to declining groundwater levels, including increasing groundwater pumping and below-average precipitation.

Through a five-part series entitled 'Wine and Water,' reporters from the *San Luis Obispo Tribune* raised public awareness of the basin's groundwater issues and generated sufficient momentum locally and regionally for the Board of Supervisors to pass the urgency ordinance.

What is the outcome?

While the urgency ordinance is intended to provide the county and local stakeholders with time to investigate permanent solutions for managing the groundwater basin, it is important to note that the 1:1 water-offset ratio only maintains current rates of basin overdraft. As a result, without significant decreases in groundwater pumping or increases in groundwater recharge, the Paso Robles Groundwater Basin will continue to be in a state of overdraft.

Local stakeholder groups representing certain basin landowners have been investigating a more permanent structure for managing the Paso Robles groundwater basin. The two main stakeholder groups are PRO Water Equity, a coalition of rural residential property owners and small landowners; and Paso Robles Agricultural Alliance for Groundwater Solutions, representing large agricultural landowners. It is clear that the current AB3030 plan is not adequate to deal with the current crisis, and the county is working with these stakeholders to enhance that plan. These two groups have also joined to recommend a special district for managing local groundwater supply and obtaining supplemental water, but they are still working out the exact terms of the district and its governance before they submit a bill to the Legislature.[26] While the issue of fair representation among small and large basin landowners on the Board of the future district has been a major topic of debate, the proposed district's goals and objectives, particularly its regulatory ability to manage water demand in addition to

[26] Julie Lynem & David Sneed, 'Groups reach agreement on managing Paso Robles groundwater basin,' *San Luis Obispo Tribune*, December 5, 2013. Available at sanluisobispo.com/2013/12/05/2819418/paso-robles-groundwater-basin.html.

procurement of supplemental water, have not been discussed as prominently. Some believe that a water district should require well metering, with the ability to determine the fair share of water among basin users and supervise their water use.[27]

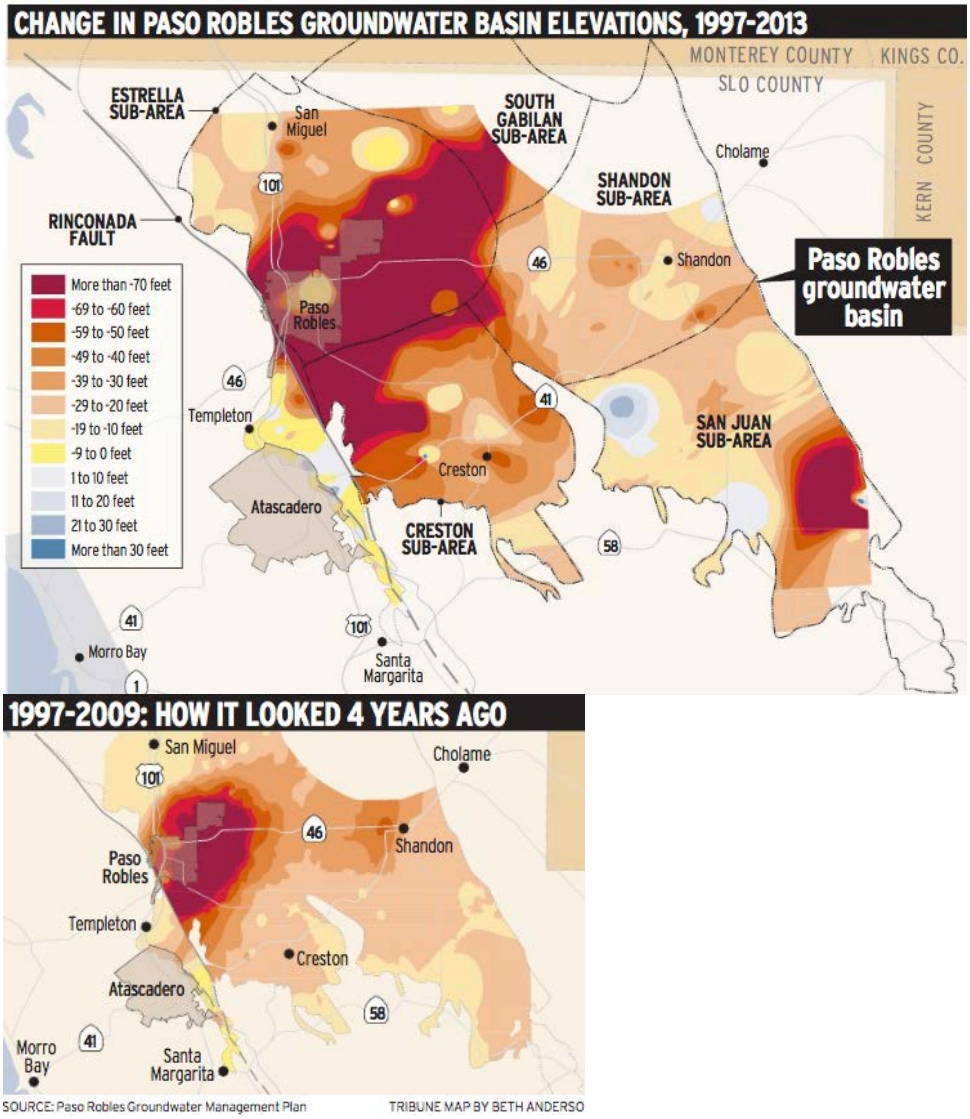


Figure 2. Changes in Paso Robles Groundwater Basin Elevations, 1997-2013 (top) and 1997-2009 (bottom). Source: Paso Robles Groundwater Management Plan, 2011 and *San Luis Obispo Tribune*.

There has also been controversy over vested rights that predate the urgency ordinance. Some landowners petitioned for an exemption from the offset requirement, arguing that they had invested planning and resources into activities for new irrigated agriculture prior to the passage

[27] Phil Dirkx, 'Groundwater pumping needs to be regulated,' *San Luis Obispo Tribune*, December 5, 2013. Available at sanluisobispo.com/2013/12/05/2819978/groundwater-pumping-needs-to-be.html.

of the urgency ordinance. In response, the county developed eligibility criteria for vested rights to determine who may proceed without the offset requirement.[28]

To implement the new urgency ordinance, the county is in the process of developing the details of the offset program for rural residential development and new irrigated agriculture. As of January 2014, new development will have to meet CAL Green standards with an anticipated water use of 280 gallons per household per day. Proponents of new development would then pay into a fund an amount that can be used to retrofit existing development to reduce an equivalent amount of existing water use. For new irrigated agriculture, the county is working with the local resource conservation district to develop an offset program that would promote efficiency measures for irrigated fields by fall 2014.[29]

Two lawsuits regarding the Basin were filed in November 2013. One lawsuit is a writ of mandamus seeking to overturn the urgency ordinance, and the other is a quiet title claim that asks the court to affirm the rights of overlying property owners to access basin groundwater. The quiet title claim may be the first step toward an adjudication in which the court would decide who has rights to groundwater in the basin and in what quantity based on historical usage.

For the Paso Robles Groundwater Basin, a special water district, court adjudication and permanent county groundwater ordinance are possibilities in the foreseeable future. Which one or more of these options will ultimately prevail is uncertain.

What are the main lessons to be learned?

The situation that emerged in the Paso Robles Groundwater Basin in the summer of 2013 showed that the county had limited tools to deal proactively with the groundwater overdraft problem. Although county officials had just completed an AB3030 plan in 2012, the plan did not give them adequate authority to manage groundwater in a way that would cope with the crisis. Ultimately, the county had to rely on its police powers to pass the urgency ordinance, rather than any powers under the plan. This case highlights that a county's police power can be used to regulate land uses that affect groundwater on a temporary basis until a viable basin management plan that can achieve results on the ground is adopted and implemented.

Cities and counties should regularly review local regulations and antiquated subdivision plans, and modify or remove those that don't make sense. This "housecleaning" would help minimize the unintentional consequences of outdated land use decisions. Antiquated subdivisions in the Paso Robles basin created in the 1920s were developed in the '80s and '90s under entirely

[28] David Sneed, 'Exemptions to North County water limits on supervisors' agenda,' November 24, 2013, *San Luis Obispo Tribune*. Available at sanluisobispo.com/2013/11/24/2802409/exemptions-to-north-county-water.html; San Luis Obispo County, "Paso Robles Groundwater Basin" available at slocounty.ca.gov/planning/commguidelines/PRgroundwater.htm.
[29] Most retrofit programs in the county are funded by water rates. So direct-subsidy program (e.g. turf buyback) will require the use of general-fund money.

different conditions than when the plans were first created. These water demands, along with those from irrigated agriculture, contributed to the groundwater depletion in the basin.

In addition, Paso Robles has suffered from not dealing with the groundwater overdraft problem until it turned into a crisis. Regardless of the method used to manage groundwater, communities should take steps earlier when data indicate that a basin is in overdraft.

Finally, the situation in Paso Robles basin demonstrated that public awareness and media focus can make a difference. Reporters from the *San Luis Obispo Tribune* wrote an award-winning five-part series entitled 'Wine and Water' that created public awareness of the basin's groundwater issues and generated sufficient momentum locally and regionally for the Board of Supervisors to pass the urgency ordinance.[30] In part because of these articles, the community acknowledged a major problem, and the Board garnered the political support necessary to pass a fairly serious ordinance.

Case Study 2: Orcutt, Northern Santa Barbara County

The community of Orcutt provides an example of using an adjudication to resolve a crisis. While the court has issued an order in the adjudication that requires a "physical solution" (acquiring more water), the adjudication did not represent a proactive, long-term management approach to groundwater overdraft.

Background

Groundwater comprises 83 percent of the water supply for communities along the Central Coast of California.[31] Orcutt is an unincorporated community located in northern Santa Barbara County. Historically an agricultural area, this community is being rapidly converted to residential and commercial land uses. Orcutt's water supply is primarily groundwater drawn from the underlying Santa Maria Groundwater Basin (Figure 3).

[30] *San Luis Obispo Tribune*, 'The Tribune wins top state journalism award for 'Wine and Water' series," October 19, 2013. Available at sanluisobispo.com/2013/10/19/2740788/the-tribune-wins-top-state-journalism.html.

[31] California Department of Water Resources, "Bulletin 118 – Update 2003." Available at water.ca.gov/groundwater/bulletin118/update2003.cfm.

Figure 3. Southern portion of the Santa Maria Groundwater Basin. Source: Brownstein Hyatt Farber Schreck, LLP

In response to ongoing litigation regarding the Santa Maria basin and perceived basin overdraft, the Orcutt Community Plan, when released in 1997, enacted a new water policy (WAT-0-2) requiring that water demand from new discretionary development must be offset by "supplemental water." This supplemental water must come from other sources besides groundwater.[32] To meet this requirement, developers have been purchasing State Water Project water from the city of Santa Maria — currently the most feasible option for supplemental water — at a one-time cost of $25,000 per acre-foot. As an unintended consequence, the ability to sell or withhold supplemental water has given Santa Maria some ability to influence land use changes in unincorporated Orcutt.

In 2005, the court responded to a lawsuit seeking an adjudication of the Santa Maria basin by approving a written stipulation, setting forth a physical solution agreed to by a majority of the parties.[33] Significantly, the court did not order reductions in groundwater pumping, but rather required that new users obtain supplemental or "developed" water — including various forms of artificial recharge — instead of "native" groundwater. In addition to the stipulation, the court established groundwater rights and required groundwater monitoring and reporting for the basin. The court also upheld Orcutt's supplemental water requirement.[34]

[32] Orcutt Community Plan, Santa Barbara County Planning and Development, adopted July 1997.

[33] A "physical solution" has been defined by the court as "an equitable remedy designed to alleviate overdrafts and the consequential depletion of water resources in a particular area, consistent with the constitutional mandate to prevent waste and unreasonable water use and to maximize the beneficial use of this state's limited resource." *California American Water v. City of Seaside (2010) 183 Cal.App.4th 471, 480.*

[34] Santa Maria Valley Water Conservation District v. City of Santa Maria, et al (Lead Case No. CV 770214; consolidated with Case Nos.: CV 784900, 784921, 784926, 785509, 785511, 785515, 785522, 785936, 786791, 787150, 787151, 787152).

What is the outcome?
The stipulated agreement is currently the mechanism in place to manage groundwater in the Santa Maria basin. Under the agreement, developers pay for supplemental water for urban development. Agriculture, which uses the majority of the groundwater from the basin, has overlying rights to use groundwater without limitation unless a "several water shortage" occurs. The present situation will continue until groundwater monitoring indicates a severe water shortage, at which point all parties will go back to court for another court-based solution. The agreement calls for continuing judicial oversight because overdraft is a "reasonable certainty" for the basin in the future.

In other words, the adjudication has been about responding to crisis rather than about achieving long-term sustainable groundwater management. While the stipulated agreement could be considered a form of groundwater management, it governs water rights and water accounting only, and perpetuates existing uses and groundwater impacts. It is not, nor is it intended to be, a comprehensive management plan to guide long-term regional and community planning.

What is the primary lesson to be drawn from this case study?
Adjudication is a solution to a crisis, but it tends to be a short-term answer to the larger groundwater problem. To be successful, it must be complemented by a long-term approach that manages groundwater resources in concert with regional land use planning. What is needed is a community vision that is consistent with available water resources, and a plan to implement this vision. The process to date has not directly addressed the issue of groundwater depletion. Water supply — in this case, groundwater — should be engaged as part of a public planning process that takes into account the water demands and supplies needed to guide a community's vision for the future. A broad planning framework already exists in the shape of the county general plan. An initial step would be to create a water element containing the goals and objectives for water management of the community and county and bring together the pieces currently contained within the conservation element and other parts of the general plan.

Case Study 3: Butte County

The exporting of water has threatened the sustainability of Butte County water resources and raised awareness of groundwater among its citizens. The community has developed water resource management tools that include assessing the implication of local land use decisions on water resources through local ordinances and polices to preserve the community's culture and quality of life.

Background
Butte County is located in California's northern Central Valley (Figure 4). The western half of the county is on the valley floor, and the eastern half is in the foothills and mountains of the Sierra Nevada. The county benefits from prime agricultural land, abundant snow-fed surface water and significant groundwater resources. Groundwater directly meets nearly one-third of the county's water demand, and there is recognition among the public that the vitality of streams and other surface water-dependent ecosystems are tied to the condition of the groundwater basin.

Figure 4. Butte County in northern Central Valley. Source: Butte County

Citizens of Butte County have had a long interest in water, but two events were pivotal in the county's approach to water resources: the establishment of Lake Oroville by damming the Feather River in the 1960s as part of the State Water Project, and the 1982-1992 drought. Both events increased awareness of the need for local water resource protection and management. In 1992, partially in response to a drought, local groundwater users, water districts, water purveyors and local governments formed the Butte Basin Water Users Association (BBWUA). The BBWUA managed the basin's surface water and groundwater resources to prevent adverse impacts from water transfers within and outside the basin. Specific efforts included funding the development of the Butte Basin Groundwater Model and assisting Butte County in producing the annual Groundwater Status Report. Over time, counties and other local agencies institutionalized the efforts started by the BBWUA.

In 1994, the Department of Water Resources, in response to continued drought conditions in the state, established an Emergency Drought Water Bank that included a groundwater-substitution program. Willing sellers, through the irrigation districts, were able to sell a portion of their surface water through the program and replace the transferred surface water with groundwater. The program provided water to buyers in other parts of the state that were experiencing emergency drought shortages. The program raised concerns, such as how the state responded to local reports that the program contributed to some wells going dry. The concerns over how the state managed the program (e.g., planning, communication and response) led to the recognition that the county needed to exercise local oversight of water, including groundwater.

In 1996, Butte County citizens voted to adopt the Groundwater Conservation Ordinance.[35] The ordinance requires a permit, including a public review process, to export groundwater outside the county and to pump groundwater as a substitution for surface water that is exported outside the county.[36] Additionally, the ordinance requires quarterly groundwater monitoring and an annual report on groundwater conditions. In 1999, the county created the Department of Water and Resource Conservation. Its duties were to implement the Groundwater Conservation Ordinance and oversee local water resource management (including groundwater monitoring and reporting). It was also charged with communicating about water resources and their conditions to citizens and leaders, and administering Butte County's State Water Project Table A allocation.

The department subsequently adopted a groundwater management plan, prepared a water inventory and analysis report and an integrated water-resource plan and conducted research to improve the Butte Basin Groundwater Model. The integrated water resource plan's recommendation to consider water resources in updating zoning ordinances led to greater attention on water resources in the 2010 update to the county's general plan.

To further highlight the importance of water and its relationship to land use, an optional water resource element was included in the Butte County General Plan in 2010. While primarily organizational in nature, the element achieved two notable outcomes. One, it heightened communications and technical exchanges between the Planning and Water Resource Departments through the general planning process which has since continued. Two, it validated the water resources programs, policies and actions described above, thereby affirming the importance of water to the county. In addition, the accounting and compilation of the water and land use planning efforts for the water element created an opportunity for a gap analysis to examine current and explore additional actions.

The process allowed water managers and land use planners to educate county leaders and citizens about current water management. For Butte County, the value of having a water element lies primarily in the public process — in having a community discussion about water and what is important to the people.

Butte County's water resource policies and actions allow the county to more proactively manage their groundwater resources and potential land use impacts. Two key policy and program areas relating to groundwater and land use planning were emphasized through the general plan process. The county has been working to identify and characterize groundwater recharge zones. In recharge areas, development proponents must demonstrate that the proposal would not preclude recharge, including using best management practices to minimize potential impacts. Another significant policy example is the requirement that a comprehensive assessment of groundwater impacts would be conducted for significant development projects. While intended to go beyond the state SB610 and SB221 requirements, the county has yet to define the specifics

[35] Chapter 33 of the Butte County Code.

[36] CDM, 'Integrated Water Resources Plan,' Butte County Department of Water and Resource Conservation, 2005.

of the policy. In any event, the required analyses will provide information to the Planning Commission and the Board of Supervisors on the implications of proposed groundwater-dependent projects. The increased evaluation of groundwater impacts will allow for more informed land use decisions.

What is the outcome?

Butte County has set in place groundwater goals and objectives to more effectively manage its resources, including a water element in the general plan, but implementation actions need to be worked out to facilitate benefits on the ground. The long-term benefit is that the interaction between water resources managers and land use planners will foster more informed decision-making.

What is the main lesson?

Proactive management of groundwater resources expressed through land use policies and programs provide greater local control for communities that wish to dictate the terms of their own future.

Case Study 4: Kings Basin Integrated Regional Water Management Plan (IRWMP)

In a region dominated by agriculture, expanding urban development and declining groundwater levels, stakeholders from the Kings Groundwater Basin have found that coming together around the integrated regional water management plan (IRWMP) builds relationships and provides a roadmap for more multi-faceted regional approaches to water management. These regional-scale approaches to water management are better able to address the intersections between land use planning and groundwater management.

Background

The Kings Basin Integrated Regional Water Management Plan (IRWMP) is a collaborative effort between 54 public, private and non-governmental agencies to manage water resources in the Kings Groundwater Basin, a sub-basin of the San Joaquin Valley Groundwater Basin. The Kings Basin IRWMP covers 610,000 acres, of which 480,000 acres, or 79 percent of the total, are used for irrigated agriculture.[37] Groundwater overdraft is generally considered the largest regional problem (Figure 5). Overdraft is estimated to be 100,000 to 150,000 acre-feet per year.[38] One of the main goals of the IRWMP is to stop groundwater overdraft in the Kings Basin and reverse declining groundwater levels.

[37] Kings Basin Water Authority, Kings Basin Integrated Regional Water Management Plan, 2012.
[38] Ibid.

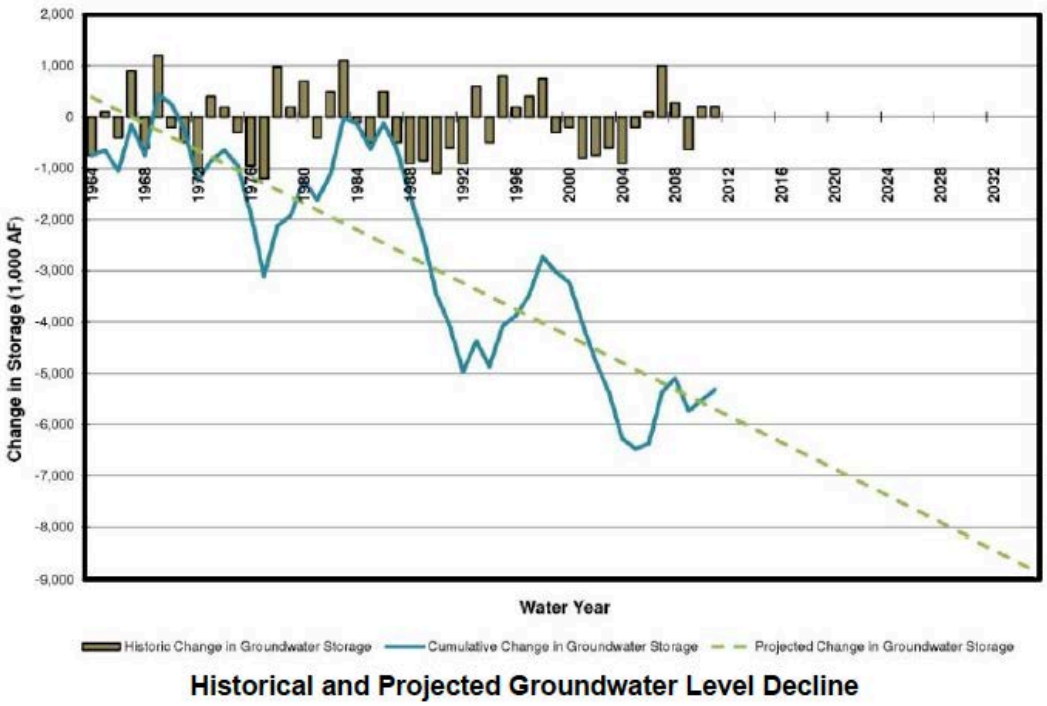


Figure 5. Historical and projected groundwater levels in the Kings Groundwater Basin. Source: Kings Basin IRWMP

Several local agencies in the Kings River region came together in 2000 with a growing awareness that a different way of looking at water was necessary. Around this same time, the California Senate passed SB1672, the Integrated Regional Water Management Act (2002), to encourage local agencies to work cooperatively to manage local and imported water supplies. The aim was to improve quality, quantity and reliability. Soon after, voters passed Proposition 50 in 2002 and Proposition 84 in 2006, directing the Department of Water Resources to offer $500 million and $1 billion, respectively, in funding for integrated regional water management planning and implementation.[39] This funding opportunity gave incentives to other regional entities — cities, counties, irrigation districts, and nongovernmental organizations — to come to the table. Motivated by these new laws, the Kings River water forum eventually formalized as a joint powers authority in 2009 and became known as the Kings Basin Water Authority. The first water management plan from the authority was completed in 2007. This plan was redone in 2012 to meet new state requirements.

The plan, or IRWMP, is a reflection of the existing integration of land use planning with water planning across the region. Issues covered include water supply, water quality, flood management, groundwater recharge, conjunctive water use, treatment facilities, water conservation, general plan policies, and planning and development review. The plan is nonbinding; its strength lies in the IRWMP process that allows committed planners and resource managers to collaborate on a regional vision and determine the actions that they should take to

[39] Department of Water Resources, 'Integrated Regional Water Management Grants,' available at water.ca.gov/irwm/grants/index.cfm.

realize their collective goals. For the authority, this includes stopping groundwater overdraft in the basin and reversing declining groundwater levels. Achievement of goals may require local land use agencies to ensure consistency between the IRWMP and their planning documents. For instance, groundwater recharge areas are mapped in the IRWMP and provide an opportunity for local jurisdictions to consider appropriate zoning for these areas.

[Conjunctive Use]
Some groundwater basins are managed using conjunctive use strategies, which involves coordinated use of surface and groundwater to meet water supply objectives. In conjunctive use, pumping in a basin may temporarily and intentionally exceed groundwater recharge, but surface waters will be used to recharge groundwater during times of surplus to maintain healthy basin conditions over time. Many conjunctive use and groundwater banking programs exist in California. Some of them — like Kern Water Bank and Semi-Tropic Water Bank — have been in existence for decades, whereas others like the Sacramento Groundwater Authority are newer.

Benefits and Challenges

Partnerships, funding opportunities, operational connectivity, as well as increased awareness of planning efforts and potential projects are key benefits of the IRWMP process for Kings Basin.[40] However, local agencies involved in the IRWMP process cite the cultivation of relationships as being the greatest benefit. The IRWMP process highlights the need for land use planners to be cognizant of water throughout the planning process. Heightened awareness of water issues and relationships between the IRWMP members now make it likely that outreach and coordination on water and land use policies will not only happen, but will proceed from a deeper baseline of knowledge and trust.

The IRWMP planning process is not without its challenges. One challenge is that future state funding for IWRM plans and projects is uncertain. The Kings Basin IRWMP has successfully obtained DWR funding for planning and implementation over the past few years. In addition to two state-funded plans, funded projects at the intersection of groundwater and land use include groundwater recharge basins and flood-control facilities that help meet IRWMP goals. Each project has involved multiple partners and significant local and regional outreach efforts. Other projects include an integrated groundwater and surface water model, water meter installation and river trails. But Proposition 50 and 84 funding is nearly exhausted, so alternative funding mechanisms need to be explored. Despite the uncertainty, there seems to be agreement that IRWMP engagement has helped shaped a new norm for regional coordination that will not disappear even as funding changes over time.

Other challenges include programmatic funding and stakeholder fatigue. Programmatic funding provides for the administration and implementation of the IRWMP, which is not included in the state funding. By law, paying members and nonpaying "interested parties" have the same ability to influence decisions by the advisory council and board of directors.[41] Paying members are

[40] Kings Basin Water Authority, Kings Basin Integrated Regional Water Management Plan, 2012.

[41] California Water Code governing the formation of the Regional Water Management Groups such as the Kings Basin Water Authority states that no one is restricted from participating based on ability to pay.

starting to explore creative options for reducing their own fees, which could further impact programmatic funding for the IRWMP. Stakeholder fatigue is another issue. Given the complexity of water issues, the IRWMP group must meet frequently. A deep commitment to the outcome and process is required to keep members energized and invested.

What has enabled the success of the Kings River IRWMP?
Several factors have contributed to the success of the Kings River IRWMP process. A shared vision among several local agencies in the region that jointly recognized the need for a more integrated approach to water management was vital, as was the leadership and administration of the Kings River Conservation District. Key people believed in the IRWMP process and got themselves and their staffs involved. Relationships between members existed to a certain degree, so the group was able to leverage those connections toward building a regional vision. Finally, the financial resources from both local and state agencies facilitated the process.

What is the outcome?
The Kings River IRWMP process has evolved to embrace a truly regional perspective based on a better understanding of each member's issues and concerns. This partnership enables members to use the network for outreach, education, collaboration and expertise to achieve better water management. While long-term data is not yet available to quantify tangible benefits on the ground, one clear indication of the success of the Kings River IRWMP is its ability to obtain grant funding for plans and projects, which highlights the state's confidence in the region's ability to work together to achieve results.

What is the primary lesson to be drawn from this case study?
The IRWMP is a dialogue about water and land use, not about individual projects. Getting all parties involved in a functioning regional partnership is not easy, and requires that all involved parties want the process to succeed. True regional collaboration is a time-consuming process that requires dedication, financial resources and frequent communication. Despite the challenges, the IRWMP process has been worthwhile for the Kings Basin because long-term goals have been created and the way forward has become clearer, with many goals likely to be achieved.

Recognizing the alternative of the IRWMP process — mandated participation because water is not available to support people and the land — helps all parties to fully engage in the process. The IRWMP framework could be utilized by federal agencies as vehicles for partnerships, outreach, policy implementation and funding.

APPENDIX B. UNCOMMON DIALOGUE PROGRAM

The Nexus of Groundwater and Land Use Planning
September 12 - 13, 2013
Stanford University

Day 1

9:15 – 9:45	**Welcome — Introductions — Goals**
9:45 –11:15	**Panel Discussion** **Land Use Planner's View and Challenges —** Pete Parkinson, Sonoma County Water Agency and Glenn Russell, Santa Barbara County **Groundwater Manager's View and Challenges —** Tim Parker, Parker Consulting and Jay Jasperse, Sonoma County Water Agency **Facilitated Discussion** — Jeff Loux, University of Davis
11:15 – 11:30	**Break**
11:30 – 12:15	**Leveraging Water and Land Use Planning Laws to Strengthen Local Resources Management** — Ellen Hanak, Public Policy Institute of California
12:15 – 1:30	**Lunch**
1:30 – 3:00	**Legal and Institutional Constraints/Challenges —** Stephanie Hastings, Brownstein Hyatt Farber Schreck, and David Aladjern, Downey Brand
3:00 – 3:15	**Break**
3:15 – 4:45	**The Promise of Integrated Regional Water Management** (opportunities for coordinated land use and groundwater management) — Cristel Tufenkijan, Kings River Conservation District and Bernard Jimenez, Fresno County Department of Public Works and Planning
4:45 – 5:00	**Overview of Day**
6:30 – 9:00	**Dinner**

Day 2

9:00 – 9:30	**Continental Breakfast**
9:30 – 11:00	**Land Use Planning and Groundwater Management** (recharge zoning, general plans, water element) James Caruso and Courtney Howard, San Luis Obispo County, and Paul Gosselin, Butte County Department of Water and Resource Conservation
11:00 – 11:15	**Break**
11:15 – 12:00	**Synthesis and Discussion** — Buzz Thompson, Stanford University
12:00 – 1:00	**Lunch**
1:00 – 2:00	**Next Steps**

APPENDIX C. UNCOMMON DIALOGUE PARTICIPANTS

David Aladjem, Water Law Attorney, Downey Brand
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Joya Banerjee, Program Officer, S.D. Bechtel, Jr. Foundation
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James Caruso, Senior Planner, San Luis Obispo County
Anthony Firenzi, Senior Engineer, Placer County Water Agency
Michelle Fodge, Senior Planner, City of Scotts Valley
Paul Gosselin, Director, Butte County Dept. of Water & Resource Conservation
Ellen Hanak, Senior Fellow, Public Policy Institute of California
Allison Harvey-Turner, Program Director, S.D. Bechtel, Jr. Foundation
Stephanie Hastings, Water Law Attorney, Brownstein Hyatt Farber Schreck
Courtney Howard, Water Resources Engineer, San Luis Obispo County Flood Control and Water Conservation District
Jay Jasperse, Chief Engineer, Sonoma County Water Agency
Bernard Jimenez, Deputy Director of Planning, Fresno County Department of Public Works
Jeff Loux, Director, Land Use and Natural Resource Program, UC Davis Extension
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Tim Parker, Consultant, Parker Consulting
Pete Parkinson, Planning Director, Sonoma County
Iris Priestaf, President, Todd Engineers
Glenn Russell, Planning Director, Santa Barbara County
Cristel Tufenkjian, Manager of Community and Public Relations, Kings River Conservation District
Derrik Williams, President, HydroMetrics WRI
Don Zdeba, General Manager, Indian Wells Valley Water District

Water in the West and Stanford Faculty, Researchers, and Staff
Vanessa Casado-Perez, Teaching Fellow, Environmental Law and Policy Program, Stanford Law School
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Barton "Buzz" Thompson, Co-Director, Stanford Woods Institute for the Environment