

Achieving Groundwater Access for All

WHY GROUNDWATER SUSTAINABILITY PLANS ARE FAILING MANY USERS



Authors:

Caitrin Chappelle, Associate Director Water Program at The Nature Conservancy

Ngodoo Atume, Senior Water Policy Analyst at Clean Water Action

J. Pablo Ortiz-Partida, Senior Bilingual Climate and Water Scientist at Union of Concerned Scientists

E.J. Remson, Senior Project Director at The Nature Conservancy

Melissa M. Rohde, Principal at Rohde Environmental Consulting, LLC (formerly Groundwater Scientist at The Nature Conservancy)

Acknowledgements:

This report is based on findings from the Groundwater Leadership Forum's review of draft and final groundwater sustainability plans required under SGMA, and research findings published in *Nature Communications*. We are grateful to our colleagues at the Groundwater Leadership Forum for their support and contribution to this report: Audubon California, Clean Water Action, Community Alliance with Family Farmers (CAFF), CivicWell, Community Water Center, Leadership Counsel for Justice & Accountability, Self-Help Enterprises, The Nature Conservancy, and Union of Concerned Scientists for their support and contribution to this report. A special thanks to Dr. Debra Perrone, Dr. Courtney Hammond Wagner, Samantha Arthur, Rebecca Anderson, Meagan Brown, Lauren Esaki-Kua, Martha Gonzalez, Kelly Garvey, Katherine Heidel, William D. Jones, Sara Khosrowshahi Asl, Carrie Munill, and Dr. Rebecca Nelson for their contributions to the underlying research in this report, and to Lori Pottinger and Nancy Crowley for their contributions to this report. The authors also thank The Water Foundation for their generous support and funding for the Groundwater Leadership Forum to review and comment on the Groundwater Sustainability Plans.

Recommended Citation:

Chappelle, C., N. Atume, J.P. Ortiz-Partida, E.J. Remson, M.M. Rohde. 2023. Achieving Groundwater Access for All: Why Groundwater Sustainability Plans Are Failing Many Users. Groundwater Leadership Forum.

COVER, CLOCKWISE FROM TOP LEFT: Brent Tadman of Conservation Farms and Ranches on Staten Island, modeling how farmers can use their land and groundwater to improve ecosystems. © Jennifer Davidson/TandemStock; Young girl drinking water from a fountain. © iStock.com/RBFried; Community members in Allensworth as part of a San Joaquin Valley drought tour with the Department of Water Resources. © Self-Help Enterprises; Flocks of Dunlin in rice fields in Colusa, California. © Drew Kelly

Table of Contents

Executive Summary	2
What's At Stake.....	4
Our Findings	6
Determining What Is Protected	9
Key Takeaways	10
Recommendations	13
Conclusions	16

Executive Summary

Groundwater is a critical component of California’s water supply, and its importance is growing as climate change supercharges extreme flood and drought events.¹ Groundwater not only provides a buffer against the impacts of climate change, it is also the primary water supply for many communities and ecosystems.

Despite its important role in the state’s water supply, California has over-pumped groundwater for decades, resulting in dropping water tables and drinking water wells going dry, affecting more than 1,400 wells in 2022 alone.² Overdraft also causes groundwater aquifers—and the land above them—to collapse, a phenomenon that damages infrastructure, including critical water conveyance such as the California aqueduct and the Friant-Kern Canal.

Vulnerable groundwater users—such as those who rely on shallow drinking water or irrigation wells, and ecosystems that depend on groundwater—are particularly at risk from overuse of groundwater.

California made a serious commitment to bring the most depleted groundwater basins back into balance when it passed the Sustainable Groundwater Management Act (SGMA) in 2014. This commitment is being carried out at the local level through the formation of hundreds of new groundwater agencies, the launch of basin-level planning processes, and the creation of groundwater sustainability plans. This report summarizes the results of a scientific study published in *Nature Communications*³ that analyzed the degree to which these groundwater plans equitably integrate and protect vulnerable groundwater users, and suggests course corrections in the ongoing SGMA process to ensure we are preparing our groundwater basins for a changed climate.



Managed wetlands, like the Merced Wildlife Refuge, rely on both surface and groundwater.

© J. Pablo Ortiz-Partida

1 Rohde, M.M. Floods and droughts are intensifying globally. *Nat Water* 1, 226–227 (2023). <https://doi.org/10.1038/s44221-023-00047-y>

2 California Department of Water Resources Well Data (<https://mydrywatersupply.water.ca.gov/report/>)

3 Perrone, D., M.M. Rohde, C. Hammond Wagner, R. Anderson, S. Arthur, N. Atume, M. Brown, L. Esaki-Kua, M. Gonzalez Fernandez, K.A. Garvey, K. Heidel, W.D. Jones, S. Khosrowshahi Asl, C. Munill, R. Nelson, J.P. Ortiz-Partida, E. Remson. 2023. Stakeholder integration predicts better outcomes from groundwater sustainability policy. *Nature Communications*, doi: 10.1038/s41467-023-39363-y.

Our organizations have been deeply engaged in the SGMA process, and are committed to seeing it succeed. Our findings reveal issues with the way the law is being carried out that could pose an existential threat to its success. One basic problem that underlies all other shortcomings is the exclusion of the most vulnerable groundwater users in the SGMA process. These vulnerable groups have much to lose if groundwater plans don't protect them, and yet they are underrepresented in planning and decision making. This undermines the entire purpose of SGMA. California cannot get to sustainability if groundwater is managed primarily for a select group of users.

Recent actions by the state to deem plans in six basins inadequate for failing to meet sustainability requirements is a valuable step. But there is more that can be done. We are the only group that has rigorously reviewed all submitted groundwater sustainability plans through the lens of potential impacts to vulnerable drinking water users and the environment. We found the following obstacles blocking California's path to sustainable groundwater management:

- **Uneven playing field for stakeholders:** Stakeholder engagement in the planning and decision-making process was lacking for all groundwater user groups, but disproportionately more so for the most vulnerable groups (drinking water users, disadvantaged communities, small farms, and the environment). Agriculture was disproportionately overrepresented and issues around drinking water and the environment were overlooked.
- **Loss of groundwater access:** The lack of participation of the most vulnerable groundwater users is a critical barrier for protecting them from losing access to water. As a result, most groundwater wells (60% of agriculture and 63% of domestic wells) and ecosystems (91% of groundwater-dependent ecosystems) are not protected from going dry.

Attaining groundwater sustainability requires fully incorporating the needs of drinking water users, disadvantaged communities, small farms, and the environment. SGMA has already been a success in many ways: it reflects a significant shift in California's approach to water management, and has the potential to protect groundwater reserves for future generations. But to reverse groundwater depletion, the full range of users must be at the table, helping to devise the plans and carry

out implementation. That can be accomplished if state and local agencies are intentional about integrating the needs of vulnerable stakeholders. Based on these findings, we recommend the following:

- **Leverage state funding to increase stakeholder participation.** Groundwater agency boards need to include more diverse stakeholders in decision-making and implementation processes. State funding could also be used to compensate and incentivize the inclusion of under-represented users.
- **Improve state guidance on common challenges.** More robust guidance could help groundwater sustainability agencies (GSAs) address common technical challenges such as ecosystem monitoring and protection, as well as assess climate vulnerability.
- **Close crucial information gaps.** Many plans have major data gaps, making it almost impossible for them to protect vulnerable users from overdraft. State support is needed to fill key data gaps in water supply and quality, ecosystems, and climate change risks.

These recommendations would not only lead to better outcomes for groundwater users but would also increase investment in multi-benefit projects that reduce demand, increase groundwater recharge, and improve water quality.

Many Californians could lose access to drinking water under current definitions of “sustainability” in the plans.

What's At Stake

A diversity of water users rely on groundwater—including small and large farms, a wide range of communities, individuals, and plants and animals. To achieve sustainable management of shared groundwater resources, SGMA calls for groundwater plans to be inclusive of these many users' needs, but is not prescriptive on how to achieve that goal. The locally driven nature of SGMA allows for a wide spectrum of approaches, and has resulted in inconsistencies across plans in the protection of vulnerable stakeholders. Now that all groundwater plans have been submitted to the state, this is an opportune time to examine how integration and protection of these stakeholders is playing out across California. SGMA requires that the plans be updated every five years to reflect lessons learned and new data, making the findings of this report an important resource for much needed course corrections.

SGMA requires plans to avoid “significant and unreasonable” impacts on drinking water users. In recent years, thousands of people have seen their wells lose pressure or dry up after groundwater pumping increased and drought took its toll. Most failing wells are privately owned or located in disadvantaged rural communities. Many others have experienced increased drinking water pollutants, which concentrate when groundwater levels drop.

SGMA also requires groundwater plans to include an analysis of impacts on groundwater-dependent ecosystems. More than 90% of California's rivers, streams, wetlands, and other ecosystems that rely on groundwater have already been damaged or destroyed by land use changes and water management. The limited habitat that remains is increasingly at risk from unsustainable groundwater use, but at this stage this habitat has mostly been excluded from monitoring plans and therefore is left almost entirely unprotected.⁴ Significantly, very few of California's GSAs are equipped with the tools to predict the impact of groundwater pumping on the flows in rivers and streams – which can also potentially compromise downstream water-rights holders. Despite the clear connection between groundwater and surface water, some

Attaining groundwater sustainability requires fully incorporating the needs of drinking water users, disadvantaged communities, small farms, and the environment.



San Joaquin Valley resident with his private well, subject to pollutants and groundwater impacts.

© Self-Help Enterprises

4 Satellite-based remote sensing work reveals that groundwater levels for groundwater-dependent ecosystems across California have been declining, especially during extended droughts. Rohde, M.M., T. Biswas, I.W. Housman, L.S. Campbell, K.R. Klausmeyer, J.K. Howard. 2021. A machine learning approach to predict groundwater levels in California reveals ecosystems at risk. *Frontiers in Earth Science*, doi: 10.3389/feart.2021.784499.

water managers are operating under the false assumption that these water sources are not connected.

Protecting these ecosystems requires an understanding of where they are located, how they rely on groundwater, and how changing groundwater conditions affect them. Many plans were able to identify where ecosystems dependent on groundwater exist in their basins, largely due to publicly available data developed by state agencies and The Nature Conservancy, but very few adequately showed how ecosystem health could be affected by plan implementation. Greater engagement of environmental stakeholders can ensure that environmental groundwater needs are included in plans, which will help protect the groundwater system as a whole.

As SGMA implementation gets underway, local and state agencies must take steps to even the playing field for those stakeholders who are currently being overlooked.



Long-billed curlew, an at-risk shorebird species, in Morro Bay, CA.

© Donald Quintana



Local farmer holds rice at a storage facility near Olivehurst, California.

© Drew Kelly

Small Farms on the Sidelines

California's small farms are diverse in the range of products grown, sizes of farms, and the ethnic and racial diversity of ownership. The US Department of Agriculture defines small farms as those having an annual gross cash farm income of less than \$350,000. Small farms can also be classified by size—for example, operations of less than 50 acres in the Central Valley.

However they are defined, many small farms depend on shallow irrigation wells and generally lack the means to dig deeper wells, making them particularly vulnerable to declining groundwater levels. SGMA does not distinguish small farms as a separate stakeholder category, making it difficult to determine how well they have been protected by groundwater plans. A recent study on inclusion of small farms in SGMA found that out of 14 plans reviewed, none had specifically engaged small farms.⁵

5 SGMA and Underrepresented Farmers Impact of Groundwater Sustainability on Underrepresented Farmers (https://drive.google.com/file/d/1eKpPrhvv_irEWbBmi7sy66K5qS28RSM9/view).

Our Findings

Our organizations teamed up with researchers to evaluate all 108 groundwater sustainability plans (“plans”) submitted under SGMA to to examine whether greater stakeholder integration resulted in groundwater protection for these groups. The full results from the study, which we summarize here, are published in *Nature Communications*.³ For each stakeholder group—agriculture, domestic well users, environment, disadvantaged communities, and small farms—we evaluated each plan against the following questions:

1. Were stakeholder groups integrated into the planning process?
2. Were stakeholder groups protected by the plan’s sustainability metrics?
3. Did stakeholder integration into the plan result in greater protection?
4. Were vulnerable groundwater users (such as disadvantaged communities or small farms) integrated into and protected by the plans?

The study found that a considerable percentage of wells (60% agriculture and 63% domestic) and ecosystems (91%) in California’s regulated basins are not protected from losing access to water under the plans reviewed. Furthermore, when domestic and environmental stakeholders are better integrated into planning and decision making, they are also better protected by the plans.

Stakeholders



Vulnerable Subgroups



FIGURE 1. Stakeholder groups evaluated. Figure adapted from material in Perrone, Rohde, Wagner et al. (2023).³



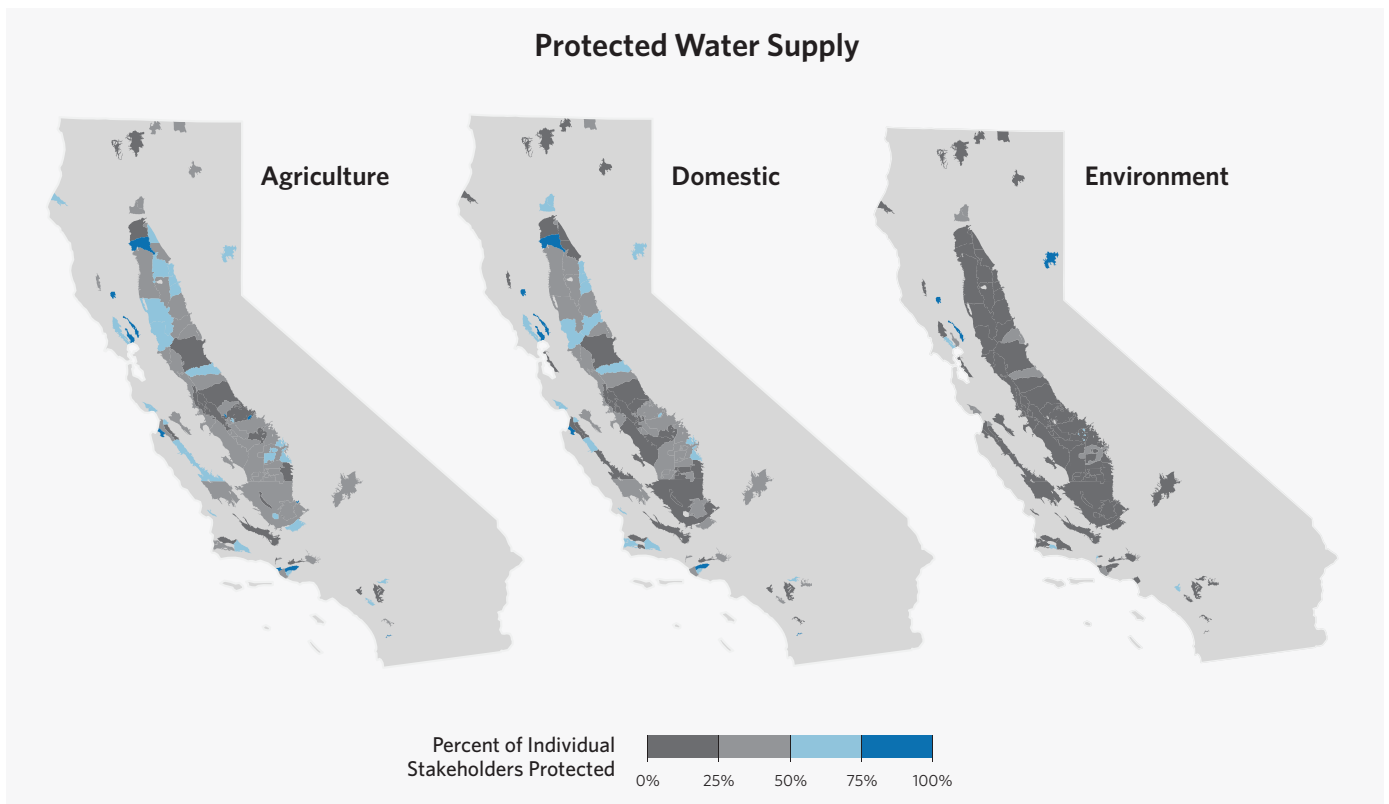


FIGURE 2. Percent of stakeholders protected by groundwater sustainability plan jurisdiction. Figure adapted from material in Perrone, Rohde, Wagner et al. (2023).³

FAST FACTS



Only 9% of plans include a member of an underrepresented stakeholder group in decision-making bodies (such as a board or advisory council).



Despite a regulatory requirement to do so, **25% of plans** fail to fully identify disadvantaged communities.



65% of plans fail to explicitly consider negative impacts to domestic wells.



Less than 10% of plans have prepared a well-mitigation plan, meaning that most local agencies have no plan to address drying wells.



While **92% of plans** identify groundwater-dependent ecosystems in their basins, **only 9% of those ecosystems** are protected from losing access to water in the plans.

What Is Stakeholder Integration?

We determined integration by analyzing how stakeholder groups were considered using the following categories:

Stakeholder Integration Categories



Engage

Stakeholders are represented in deliberations (e.g., advisory committee) and decision-making (e.g., voting board seat)



Identify

Stakeholders are mapped and described in sustainability plan



Consider

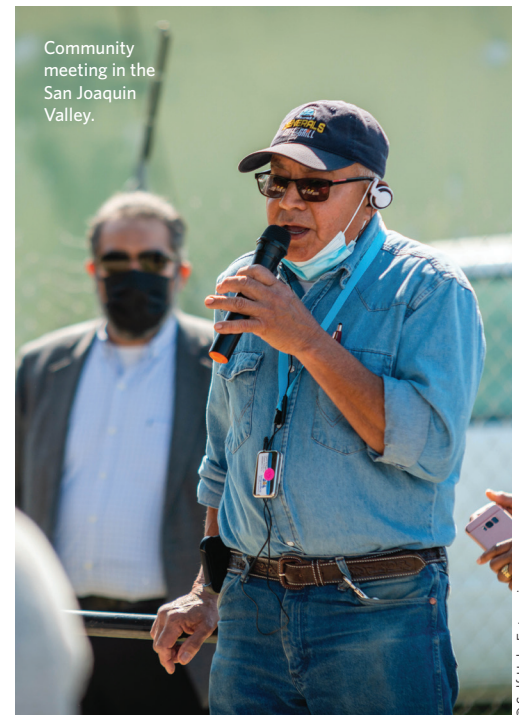
Stakeholders are considered when defining sustainability by quantifying impacts



Support

Stakeholders are identified as beneficiaries of project and management actions

FIGURE 3. Stakeholder integration categories. Figure adapted from material in Perrone, Rohde, Wagner et al. (2023).³



Determining What Is Protected

SGMA defines sustainability as the absence of six “undesirable results.”⁶ The study’s analysis focused on one of these undesirable results—chronic lowering of groundwater levels—that can impact individual groundwater users, causing wells and ecosystems to go dry. Under SGMA, plans are required to set “minimum threshold” groundwater levels at monitoring wells across the basin to detect whether groundwater declines are causing undesirable results. We defined a stakeholder as “protected” when a well or ecosystem is located within 1.5 miles of a monitoring well and the well depth (or, in the case of an ecosystem, the maximum rooting depth of vegetation) is deeper than the minimum threshold (Fig. 4). Those outside this radius were deemed unprotected because groundwater conditions are not being monitored and problems are unlikely to be detected, let alone remedied.

It is important to note that the way SGMA defines undesirable results is based on basin conditions—not impacts to individual wells. This means that individual wells or ecosystems can dry up even while the basin is still considered to be “sustainably” managed. Under SGMA, local agencies have great leeway to define undesirable results in their plans, which can include allowing some percentage of monitoring wells in their basin to exceed the minimum threshold. To address this gap, the analysis looks at impacts to individual wells in light of minimum thresholds, which is a more detailed picture of risks to individual wells and ecosystems than the plans provide.

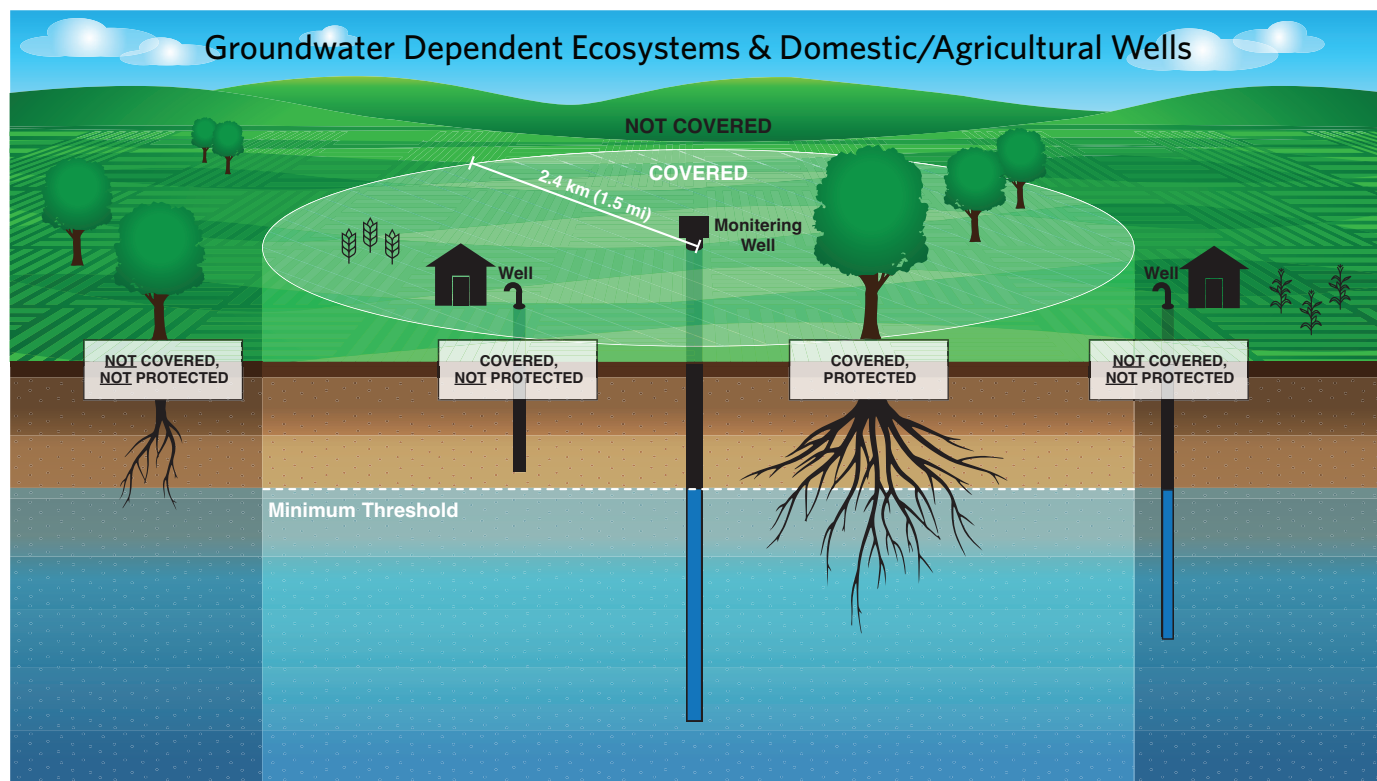


FIGURE 4. Determining protection for stakeholders. Figure adapted from material in Perrone, Rohde, Wagner et al. (2023).³

6 SGMA’s sustainability criteria require the avoidance of the following: Chronic lowering of groundwater levels; significant reduction of groundwater storage; seawater intrusion; degraded water quality; land subsidence, and depletion of interconnected surface water. See <https://ca.water.usgs.gov/sustainable-groundwater-management/>

Key Takeaways

The majority of GSAs lack representation from disadvantaged communities, environmental interests, and tribes. Diverse and inclusive engagement in planning is key to adequately identifying and addressing stakeholders' needs and ensure that local definitions of "sustainability" protect more users. Yet the majority of outreach by agencies has been passive, mostly in the form of "inform and consent" via email listservs, public meetings, and the public commenting process. A lack of formal representation for the environment and disadvantaged communities resulted in superficial forms of participation and limited opportunities for these entities to penetrate decision-making processes.

Stakeholder integration is necessary to reach sustainability. When domestic and environmental stakeholders are integrated into the planning process, they are more likely to be protected. There is strong evidence that integrating diverse stakeholders into plans can protect users who rely on shallow groundwater and are most vulnerable to groundwater depletion. Going forward, ensuring that plans protect the diversity of stakeholders that rely on groundwater will be critically important for attaining long-term sustainability in individual basins, and for the equitable implementation of SGMA.



Long-billed curlew, an at-risk shorebird species, on the Salinas River.

© Craig Goettsch

Disadvantaged communities, drinking water wells and the environment were rarely considered when establishing sustainable management criteria.⁷ SGMA requires all beneficial users to be identified and considered in plans. In addition, plans should be consistent with other laws and policies that protect water uses (e.g., the Human Right to Water policy, Public Trust Doctrine, and federal and state endangered species laws). Yet in too many instances, the risks to and needs of vulnerable users were not analyzed. In addition, historically low groundwater conditions were used to set minimum thresholds, resulting in a higher risk of harm to drinking water wells (particularly in disadvantaged communities) and threatened or endangered species.

Many Californians could lose access to drinking water under current definitions of "sustainability" in the plans. Almost two-thirds of domestic wells in SGMA-regulated basins are not protected by minimum thresholds, which means many more wells could run dry. Only a handful of basins have mitigation plans to address well failure or contamination of drinking water wells, through actions such as drilling new or replacement wells or connecting users to existing public supplies. Drilling deeper wells can avert declining water levels for unprotected wells, but this is expensive and can introduce water quality concerns. Because most drying wells are found in rural, low-income communities, the lack of well mitigation plans places significant burdens on economically vulnerable groups.

California's struggling natural world is unprotected by current plans. Nine out of ten ecosystems in SGMA-regulated basins are not protected by minimum thresholds, putting already-vulnerable plants and animals at risk. With only 10% of California's historical wetlands remaining, some are slated to be permanently dewatered under current SGMA plans. Drying and dying ecosystems have trickle-down effects on other public interests, such as critical habitat for threatened and endangered species; ecosystem services such as water purification, recreation and flood mitigation; and climate regulation.

Major data gaps increase the risk that unsustainable groundwater use will harm vulnerable communities and the environment. Too many plans—particularly those with shallow aquifers—fail to include monitoring wells that would detect the impact of groundwater pumping on disadvantaged communities, shallow domestic well users,

⁷ SGMA calls for groundwater agencies to define the following in a plan's sustainable management criteria: sustainability goals, undesirable results, minimum thresholds, and measurable objectives.



Groundwater used to flood a vineyard in Lodi, CA.

© Sustainable Conservation

Vulnerable groundwater users—such as those who rely on shallow drinking water or irrigation wells, and ecosystems that depend on groundwater—are particularly at risk from overuse of groundwater.

groundwater-dependent ecosystems, and aquatic habitats. In addition to insufficient monitoring wells, there is a lack of investment by GSAs to monitor ecosystem health – necessary to understand and mitigate harm to nature from dropping groundwater levels.

Demand management is minimized in most plans.

Reducing groundwater use is key to bringing basins into balance and for avoiding adverse impacts to vulnerable

users, yet very few plans describe the need for pumping cuts, fees, and other demand-management techniques. Most plans emphasize increasing supply, especially through increased groundwater recharge. While new supply projects can provide multiple benefits for nature and people, they need to be balanced with reduced demand. There is a limit to how much runoff can be captured for recharging basins across the state, so cooperation between basins – which will require oversight by the state – is needed to ensure that efforts to increase supply in one basin do not worsen problems elsewhere or create new water conflicts.

Groundwater conditions will deteriorate under many plans. Many basins where the sustainable yield – the amount of groundwater that can be withdrawn safely according to a plan’s water budget – has not yet been exceeded are allowing groundwater conditions to deteriorate further. The result is too many plans propose projects or management actions that would only be triggered after the basin went into further overdraft. Also, SGMA measures sustainability not only by sustainable

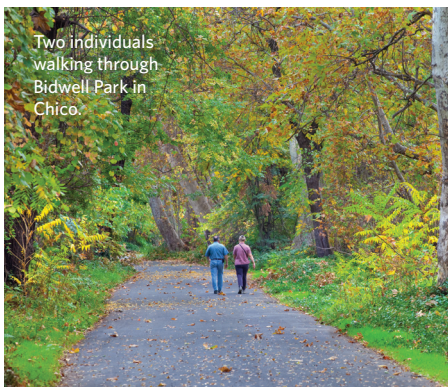
yield but also by the avoidance of the six undesirable results, so plans should identify actions needed to avoid the negative consequences of groundwater pumping such as subsidence, water quality degradation, and impacts to streams.

Most groundwater plans do not adequately address climate change. Climate change is increasing the intensity of weather events. Groundwater sustainability cannot be achieved in California without planning for climate extremes. Nearly all of the plans we reviewed did not incorporate extreme dry and wet scenarios into projected water budgets, meaning that water budgets risk overestimating supply and underestimating demand. This could set up groundwater agencies and SGMA for long-term failure under worst-case drought conditions or extreme precipitation events, resulting in missed opportunities to proactively reduce groundwater use and recharge aquifers.

When domestic and environmental stakeholders are better integrated into planning and decision making, they are also better protected by the plans.

Promising New Collaborations

The Department of Conservation's Multibenefit Land Repurposing Program (MLRP) is funding new cross-sector partnerships to reduce groundwater pumping and plan for land-use changes that support sustainable agricultural economies and provide benefits to communities and the environment. In one program, the Pixley Groundwater Sustainability Agency has convened a project team of GSAs, conservation organizations, local land trusts, clean drinking water organizations, and education experts to carry out community-level outreach to disadvantaged communities, farmers, and schools to plan for land repurposing and develop multi-benefit projects. Three other regions—the Salinas Valley, Kaweah and Madera—were awarded block grants for similar work in 2022 and the Department of Conservation is funding a second set of block grantees in 2023. This program may create a new model of stakeholder integration that the state and GSAs can build upon to improve groundwater sustainability plans and overall groundwater management.



Left to right: © Anthony Dunn; © Dale Kolke/California Department of Water Resources/Public domain; © Bridget Besaw

Recommendations

In the years since SGMA became law, California has made some significant strides toward its goal of achieving sustainable groundwater use. Results of the analysis show, the effort is weakened by the widespread failure to bring underrepresented stakeholders to the table, by inadequate protection of drinking-water wells and groundwater-dependent ecosystems, and by failing to fully consider climate change impacts on water resources. As it stands now, most plans do not reach SGMA’s potential. The state needs to continue to hold a firm line on protecting all users’ groundwater supply.

While there is much that needs fixing in the current groundwater plans, the state can take additional steps now to address these shortcomings while allowing local agencies to work through the process. Here we summarize our recommendations for getting SGMA on a course that will better protect vulnerable stakeholders and the environment.

Leverage state funding to increase stakeholder integration

To ensure sustainable outcomes, GSA boards need to expand the ability for diverse stakeholders to participate in decision making and include voting representatives from drinking water and environmental groups. State directives and full stakeholder integration is needed to balance out entrenched voting majorities and entrenched interests.

State funding could also help incentivize more-inclusive decision-making and implementation through actions such as:

- Requirements for GSAs applying for state funding should ensure that vulnerable groups’ needs are addressed in the plans and unreasonable harm to nature and disadvantaged communities is avoided. Some ways to achieve this include:
 - Require all implementation grants to include metrics that demonstrate how GSAs are integrating vulnerable users into groundwater planning. For example, agencies could be required to document

how stakeholders have been integrated into decision making and project development, and quantify benefits to those various users.

- Require a significant portion of implementation funds be used by GSAs to protect the public benefits of groundwater resources—for example, with drinking water well-mitigation actions or ecosystem protection. To protect drinking water and reduce burdens on underserved and economically vulnerable groups, well mitigation plans must be implemented where minimum thresholds will allow dewatering of domestic wells.
- A portion of state funds dedicated to SGMA implementation should continue to go to disadvantaged communities, environmental partners, small farmers, and other underrepresented users to fund their ability to engage and participate. Recent investments by the state legislature and DWR will support targeted engagement, but these vulnerable users will need continued financial support to participate in the SGMA process. GSAs can also use implementation funding to help build capacity for local stakeholders.
- State funding should be used to help local agencies add monitoring wells to understand and prevent the harmful effects of pumping on groundwater-dependent ecosystems and domestic well users. Prioritize funding for GSAs that work with drinking water and environmental stakeholders to design their monitoring network.
- Expand funding for projects that focus on reducing pumping through land-use changes (e.g., the Department of Conservation’s Multibenefit Land Repurposing Program). Prioritize projects that benefit disadvantaged stakeholders.

Update and expand guidance to groundwater agencies

Groundwater agencies rely heavily on DWR's technical guidance documents and regulatory determination letters to ensure they comply with SGMA. More robust directives and guidance are needed to improve planning for groundwater sustainability in a changing climate.

- Improve and finalize the guidance on sustainable management criteria to ensure GSAs identify what they consider to be significant and unreasonable effects of groundwater pumping (i.e. undesirable results) and adequately analyze the effects of minimum thresholds on vulnerable groundwater users.
- Create statewide guidance for addressing common technical challenges—such as identifying interconnected surface waters, assessing effects of pumping on neighboring users, and protecting water quality. Update existing guidance documentation on groundwater-dependent ecosystems to include best available science and tools.
- Create a technical advisory group to weigh in on guidance documents and ensure they reflect needed technical data and best available science. This could be modeled after the Multibenefit Land Repurposing Program's designation of statewide support entities.
- SGMA climate change guidance is focused on moderate changes to the climate, but more extreme scenarios will be more decisive in whether or not

groundwater can be sustainably managed in future. To avoid underestimating water demand and overestimating water availability, climate guidance for groundwater planning must require the integration of extreme climate change scenarios.

- Update guidance documents on stakeholder communication and engagement as well as on engagement with tribal governments to cover the plan implementation phase.
- Augment DWR's existing written translation services to improve translation during stakeholder outreach and GSA meetings.

As it stands now, most plans do not reach SGMA's potential. The state needs to continue to hold a firm line on protecting all users' groundwater supply.



© Rui Pereira

Close information gaps

Sustainability plans that have major data gaps—whether on drinking water wells or ecosystems—lack the tools to protect vulnerable users from overdraft. The state has invested heavily in ensuring that data is made available to water managers and stakeholders. Building on that foundation and increasing transparency for the public will benefit everyone. For instance, DWR’s California Groundwater Live should be managed to include real-time data on which wells and ecosystems are at risk. Here are some other ways to fill important data gaps:

Water Supply and Quality

- Improve well-completion reports (e.g., by including well locations and well depth) to support GSAs in expanding and improving monitoring networks.
- To enable GSAs to identify contaminants of concern within their basins, DWR in coordination with the State Water Board should provide them with water quality contaminants data.
- To regulate demand, GSAs need robust data on water use in their basin. This can be achieved through increased metering or building targeted groundwater models.

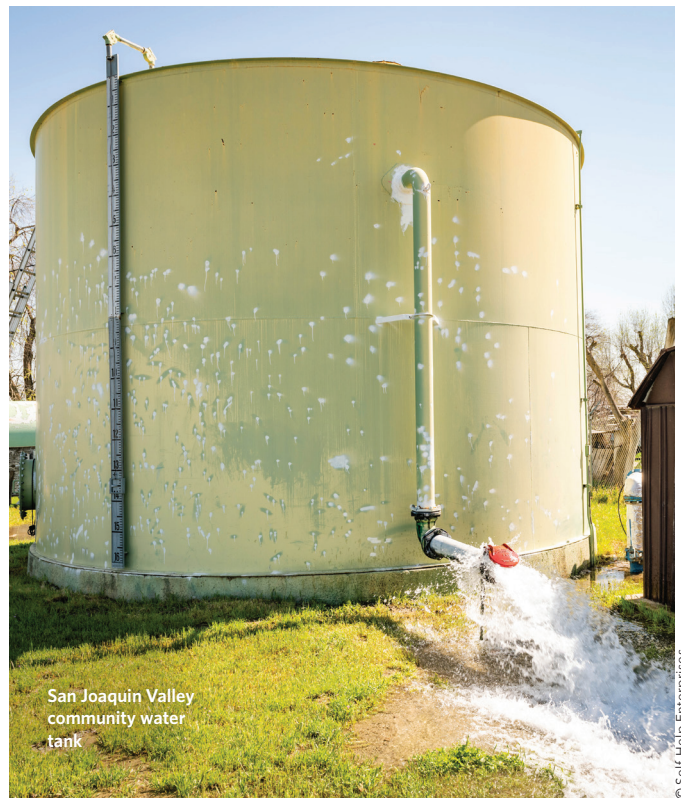
Ecosystems

- Provide specific technical guidance on how to quantify the effects of groundwater pumping on surface water systems by improving existing models (e.g., C2VSIM) or providing new analytical tools to assess impacts where numerical models do not exist.
- Increase state capacity to help GSAs develop ecosystem monitoring and protection, and design effective projects that improve conditions for nature. This includes new staff at DWR and improved coordination with other agencies such as the State Water Board and Department of Fish and Wildlife.
- Increase access to monitoring wells by encouraging GSAs to work with state and federal agencies, land trusts and other land managers to build monitoring networks for priority groundwater-dependent ecosystems.

- To protect rivers and streams from over-pumping, the state needs to enact and enforce in-stream flow requirements—which define the timing and amount of water required to maintain aquatic habitat, wildlife, and human uses—for priority rivers.

Climate Change

- Help low-capacity GSAs secure federal funding (e.g. Inflation Reduction Act funds or Bipartisan Infrastructure Law) to improve climate resilience, including for safe drinking water.
- The state should complete their update of extreme climate scenarios (including data from the most recent drought and extreme precipitation events) and help local agencies access and navigate climate change data relevant to their region.



San Joaquin Valley
community water
tank

© Self-Help Enterprises

Conclusions

Making these kinds of course corrections to existing plans now can greatly reduce the risk that vulnerable groups and the environment are further disadvantaged by groundwater plans that do not account for their needs, while also improving future groundwater management across the state. GSAs must prioritize the monitoring and protection of vulnerable users. The state must ensure that all groundwater plans incorporate the needs of drinking water users (including tribal nations), disadvantaged communities, and the environment. For groundwater plans to be able to address the risks of a warmer, drier climate and extreme precipitation events for all users, a representative group of users must be at the table helping to devise the plans and implement projects.

Two overarching issues will also be critical to the long-term sustainability of California’s groundwater resources: protecting groundwater resources in basins beyond SGMA’s boundaries, and managing groundwater to protect the resource in a warming climate.

Significantly, while SGMA requires the sustainable management of groundwater, the regulations only cover 18% of the state’s groundwater basins. SGMA does not require management plans for basins that fall outside of the state’s prioritization map, including those deemed low or very low priority. Many wells (40%) and most ecosystems (87%) are not covered under SGMA.⁸

To show that California is serious about reaching its goals on sustainability and climate change, in future the state will need to implement groundwater sustainability requirements to other regions—preferably before they get to a crisis stage.

Every step we take now to make SGMA more robust, comprehensive, and easier to engage in for vulnerable water users will improve California’s ability to reach groundwater sustainability and to thrive under more extreme climate conditions.



© Lara Weatherly

8 Mind the Gaps: The Case for Truly Comprehensive Sustainable Groundwater Management (Thompson, B., M.M. Rohde, J.K. Howard, S. Matsumoto. 2021. Mind the Gaps: The Case for Truly Comprehensive Sustainable Groundwater Management. Water in the West. Stanford Digital Repository. Available at: <https://purl.stanford.edu/hs475mt1364>.) https://groundwaterresourcehub.org/public/uploads/pdfs/Stanford_Mind_the_Gaps.pdf

