Groundwater Management and Safe Drinking Water in the San Joaquin Valley

Analysis of Critically Over-drafted Basins' Groundwater Sustainability Plans

June 2020

WATER FOUNDATION

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"These bills take the much needed steps to preserve and restore a limited and indispensable resource—groundwater."

—Senator Fran Pavley on the passage of the Sustainable Groundwater Management Act, September 2014

"Nothing in the budget makes me more proud than this. I'm dead serious about that. Some people wonder why the hell you get into politics. This is why."

—Governor Gavin Newsom on signing SB 200, the Safe and Affordable Drinking Water Fund, July 2019

Summary

Successful implementation of the Sustainable Groundwater Management Act (SGMA) is critical to California's prosperity, collaboration that achieves shared benefits for people and nature, and the Newsom administration's commitment to the human right to water for all residents. In 2014, California passed SGMA, a set of three laws that are intended to help the state sustainably manage its groundwater resources. Between 30% and 60% of the state's water supply comes from groundwater in any given year, and is used for drinking water, growing food, supporting industry, and maintaining a healthy environment. Groundwater over-pumping affects drinking water wells and surface water rights, pollutes water due to seawater intrusion or migrating contaminant plumes, harms ecosystems, and causes land subsidence, among other problems.

In January 2020, newly formed Groundwater Sustainability Agencies (GSAs) submitted their first Groundwater Sustainability Plans (GSPs or plans) to the state for the "critically over-drafted" sub basins, or those in the direst circumstances. Most of these sub basins are located in the San Joaquin Valley.

Since then, the COVID-19 pandemic has exposed how deeply public health, economic security, and clean water are intertwined. Put simply, a livable future in California depends on clean, reliable water, which is one of the main reasons why SGMA was passed. California's groundwater depletion challenges preceded the global pandemic and continue to persist in ways that impact drinking water, farming, economic development, public health, and environmental quality.

To support the state's implementation of SGMA and its continued progress on the human right to water, the Water Foundation commissioned an analysis of 26 GSPs in the San Joaquin Valley to understand how private domestic drinking water wells in the region will be affected on the path to sustainability. This analysis does not look at any of the other associated impacts or costs of declining groundwater levels, such as land subsidence, surface water rights, or groundwater dependent ecosystems.

California's state regulatory agencies have never had this level of detailed information about the effects of severe groundwater overdraft on the lives and livelihoods of residents, farmworkers, and rural households. Conducted in spring 2020 and using conservative estimates based on publicly available data, this analysis estimates that the goals in these San Joaquin Valley GSPs, if not proactively addressed, will result in:

- **Between roughly 4,000 and 12,000 partially or completely dry drinking water wells by 2040**
- **Between roughly 46,000 and 127,000 people who lose some or all of their primary water supply by 2040**
- **Between $88 million to $359 million in costs to restore access to drinking water**

These concerning results point to a simple fact: In spite of actions aimed at managing groundwater more sustainably, recently submitted GSPs still forecast that thousands, or tens of thousands, of Californians will lose their drinking water supply, which is inconsistent with the intent of SGMA and threatens to undermine the governor's commitment to safe and affordable drinking water for all residents. This analysis of drinking water and continued declines in groundwater also suggest that the goals of SGMA to avoid other undesirable results of groundwater mining also may not be fully addressed by GSPs.

Further analysis beyond the scope of this report is required to explore the effect of GSPs on other areas of concern, such as impacts on the environment and on important infrastructure due to land subsidence. As state decision-makers conduct their GSP review process, we hope that this brief will help bring greater attention to vulnerable Californians and their most basic need: safe, clean, and affordable water.

Key Terms

Human right to water: As defined by AB 685, "every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes."

Groundwater sustainability: As defined by SGMA, "management and use of groundwater in a manner that can be maintained…without causing undesirable results."

Undesirable results: Negative results that GSAs and GSPs are required to avoid under SGMA. There are six undesirable results: groundwater level lowering, reduction of groundwater storage, seawater intrusion, land subsidence, water quality degradation, and depletions of interconnected surface water.

Measurable objective: A basin's self-determined groundwater level goal to achieve sustainability under SGMA.

Minimum threshold: A basin's self-determined minimally acceptable level of groundwater decline. Beyond this threshold, a GSA anticipates it will face undesirable results.

Partially dry drinking water well: A drinking water well that has lost or will lose most of its usable water due to unsustainable groundwater practices. These wells are also called partially dewatered wells.

Completely dry drinking water well: A drinking water well that has lost or will lose all useable water due to unsustainable groundwater practices. These wells are also called dewatered wells.

Right to Water Depends on Sustainable Groundwater

Safe drinking water for Californians and groundwater management are inextricably connected. California has enshrined the concept of the human right to water – that all Californians have a basic right to safe and affordable drinking water and sanitation – into state code. However, unsafe drinking water has been an ongoing environmental justice challenge for decades. More than 1 million Californians go without safe and affordable drinking water each year, and low-income communities of color are disproportionately affected by this water crisis. These same communities are also on the frontlines of climate change and are hit the hardest by drought conditions.

Leonicio Ramirez and Guillermina Avila in East Porterville. Florence Low / California Department of Water Resources

Yet, too often, water policy deliberations and decision-making proceed as if the water in our rivers, the water underground, and the water flowing out of our taps are distinct from one another. That is not true.

The COVID-19 pandemic has shown California how we are all better off when everyone has the basic resources to protect themselves and their neighbors. By that same token of interdependence, the health of groundwater in California is the health of families, economies, and nature. In the San Joaquin Valley, 95% of communities rely on groundwater as their main drinking water source. Valley groundwater also fuels the operations of large and small farms and sustains a hub of world-class biodiversity.

For over 100 years, California has drained San Joaquin Valley rivers and groundwater faster than nature and humans can replenish them. A changing climate is exacerbating the effects of this behavior as it delivers more devastating and longer droughts. Between 2012 and 2016, California experienced the most intense drought on record since the 1400s. Over-pumping during the drought sank roads and homes, polluted wells, lowered river flows, and put farms and communities at severe risk.

Still, in the middle of that economic, social, environmental, and public health crisis, recognizing that it was a question of when, not if, another major drought will start, California residents living in the hardest hit parts of the state spurred their elected representatives to act to save groundwater for themselves and for future generations.

In 2014, for the first time in the state's history, legislators passed, and the governor signed, a series of laws to put California on a path that reaches groundwater sustainability by 2040 or 2042, depending on the basin. These laws are known as the Sustainable Groundwater Management Act (SGMA).

Californians' ability to work together and look out for one another will shape SGMA's success in turning groundwater into a drought-proof water resource. State leaders must ensure effective governance and that local plans dependably lead to groundwater sustainability, including protecting communities that rely on private drinking water wells. Local agencies charged with implementing SGMA must use science as a foundation for their plans and meaningfully engage and represent the communities directly affected by their decisions.

Inside a groundwater monitoring well. Kelly M. Grow / California Department of Water Resources

Under the Newsom administration—the first administration to review SGMA GSPs—new initiatives are poised to support full, fair, and effective execution of the law. The Newsom administration has also underscored its commitment to fulfilling the promise of the human right to water in California.

To advance these goals, the California Department of Water Resources (DWR) has started to collect and publish data on the depth of groundwater below the surface and groundwater elevation, which can help proactively identify threats to sustainability, including at-risk drinking water wells. These domestic wells tend to be very shallow, which means they dry up sooner than agricultural or municipal wells. When groundwater levels plummet and leave private wells dry, few San Joaquin communities and residents who are dependent on them as sources of drinking water have the capital to continuously drill and maintain deeper wells.

Farm workers in Pajaro Valley. Lance Cheung / US Department of Agriculture

To conduct this analysis for the Water Foundation, consultants at EKI Environment & Water, Inc. used DWR's latest Groundwater Center Interactive Map Application dataset and other publicly available information to understand how implementation of some of the first GSPs in critically over-drafted sub basins in the San Joaquin Valley would affect local drinking water wells. Because DWR's dataset does not include every part of the San Joaquin Valley, this analysis is limited to 26 GSPs in ten critically over-drafted sub basins. Further, one-quarter of the records in the dataset lack basic information about well depths and screening levels, and therefore could not be included in this evaluation.

Considering these data limitations, this analysis provides a conservative baseline assessment of how the estimated water decline predicted in these recently submitted GSPs will impact people who rely on groundwater for their primary water source. Because this analysis only addresses the ongoing impacts of GSP implementation on drinking water, additional research may be necessary to understand the impacts and costs on other undesirable results, such as land subsidence, impacts to ecosystems, and surface water flows.

Key Findings

- **Between roughly 4,000 and 12,000 drinking water wells will go partially or completely dry by 2040**
- **Between roughly 46,000 and 127,000 people will lose some or all of their current water supply by 2040**
- **It will cost between $88 million to $359 million to restore access to drinking water**

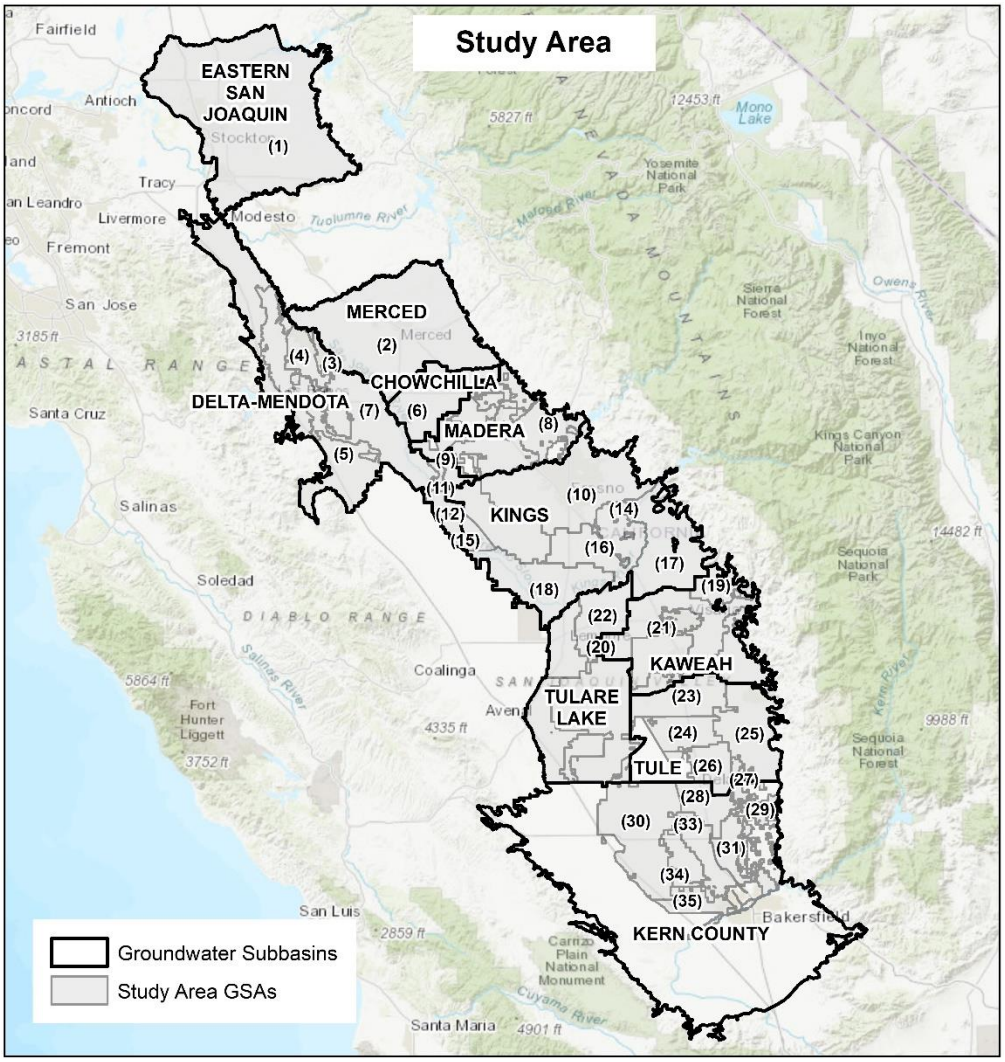
While these findings are deeply disturbing, they are not carved in stone. State regulatory agencies can work with these GSAs over the next two years to implement SGMA in a manner that avoids or mitigates these impacts, achieves groundwater sustainability by 2040, and strengthens the right to water for all California residents.

Analysis Results

Study Area: San Joaquin Valley

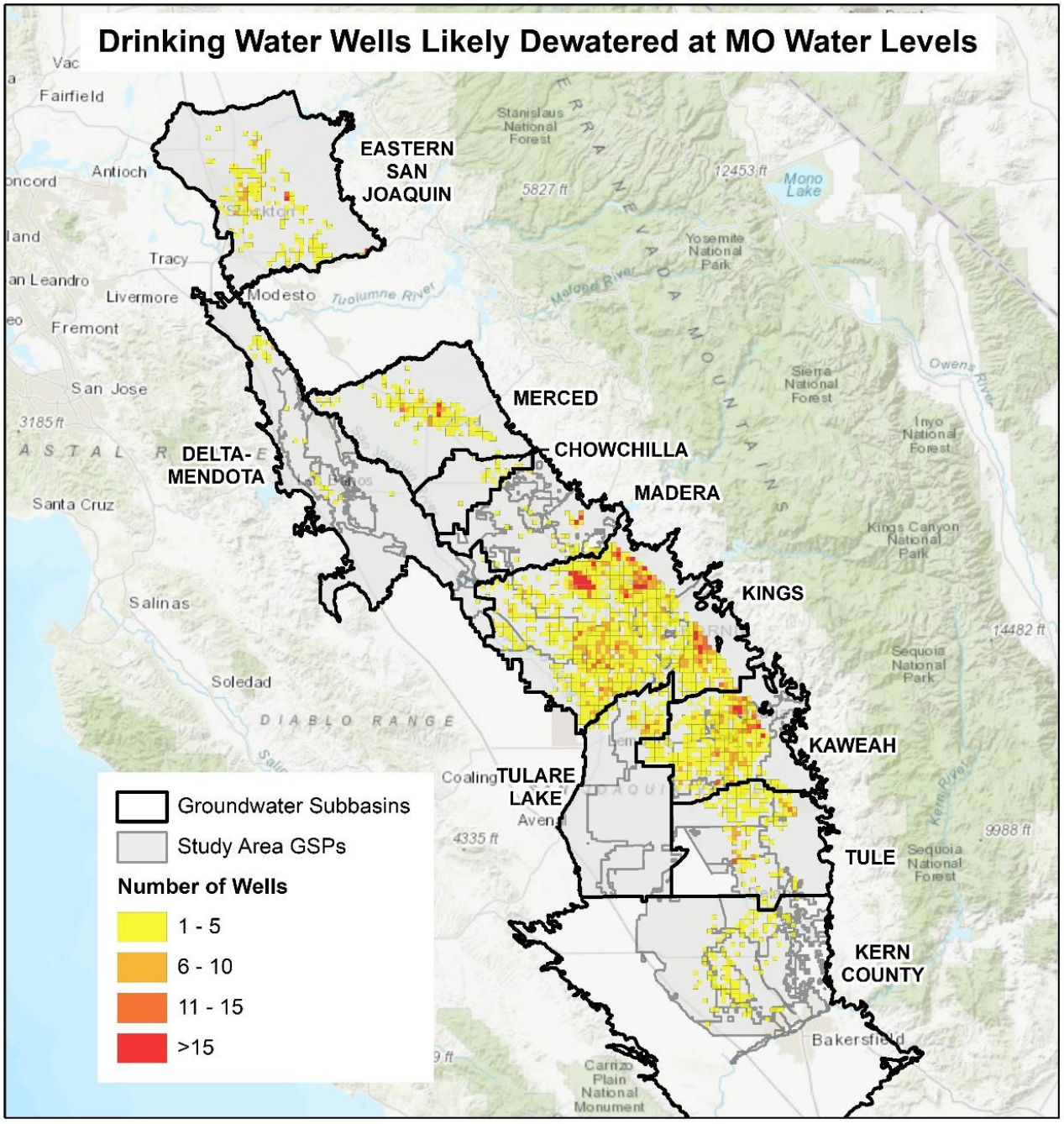
In the areas analyzed in this report, there are approximately 400,000 California residents who rely on private drinking water wells for their water supply and nearly 45,000 known drinking water wells.

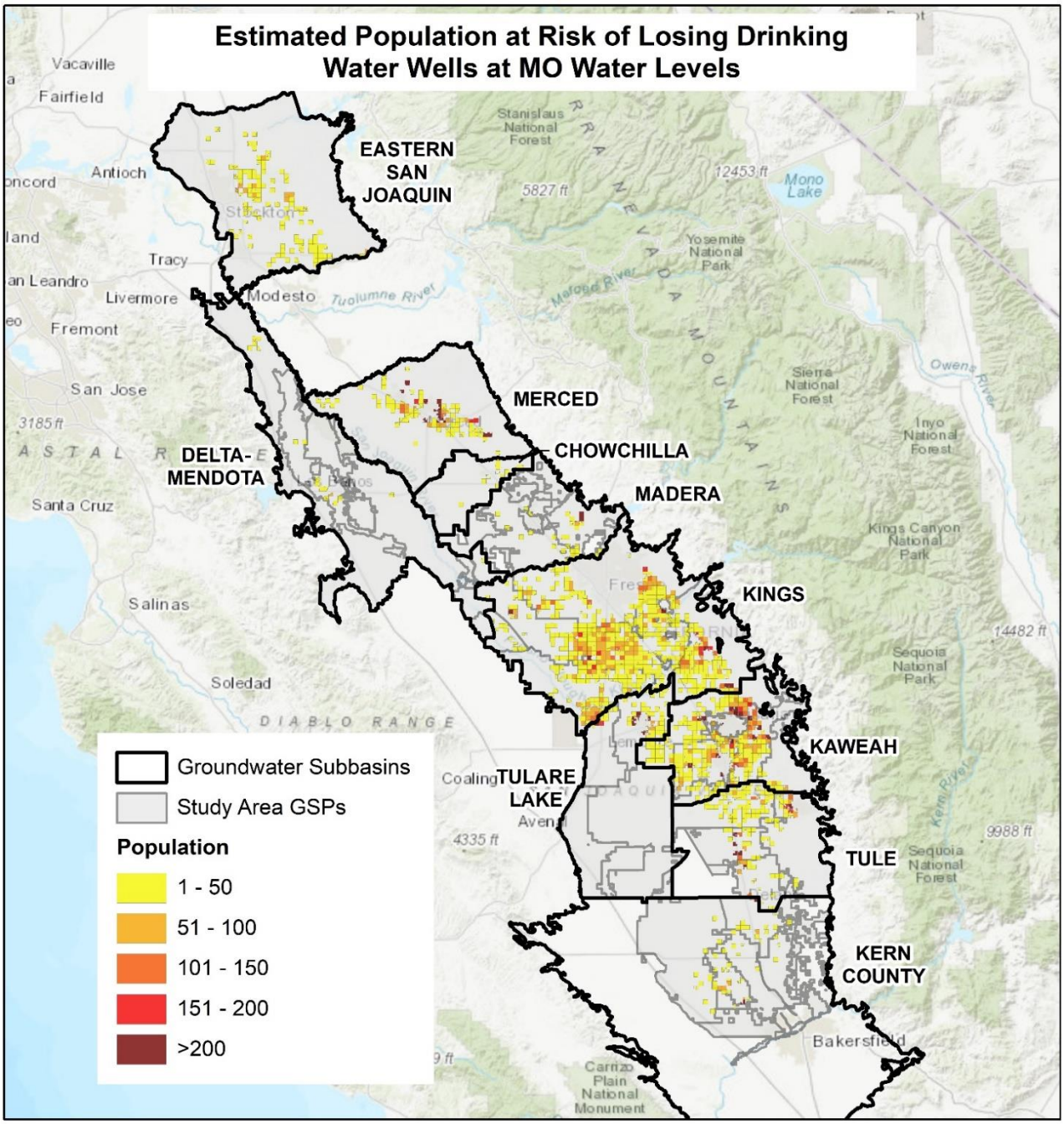
Of these wells, approximately 7,000 have already been dewatered due to declining groundwater levels and another 13,000+ could not be analyzed due to insufficient data. After accounting for these factors, this analysis assessed how approximately 24,500 drinking water wells will be affected at the levels identified in their respective GSPs.



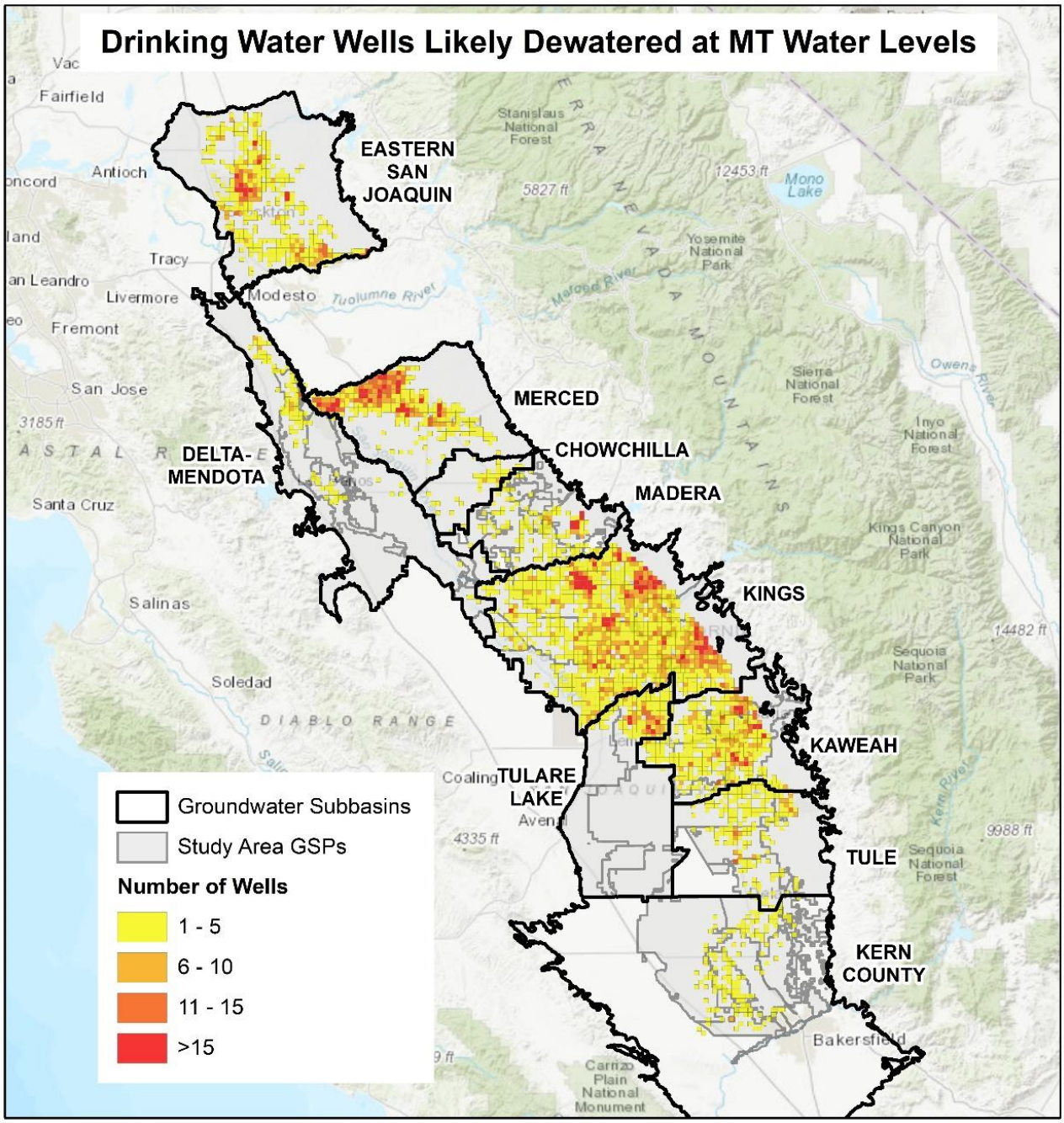
GSPs' Projected Water Levels Will Drain up to 12,000 Drinking Water Wells, Affecting up to 127,000 Residents

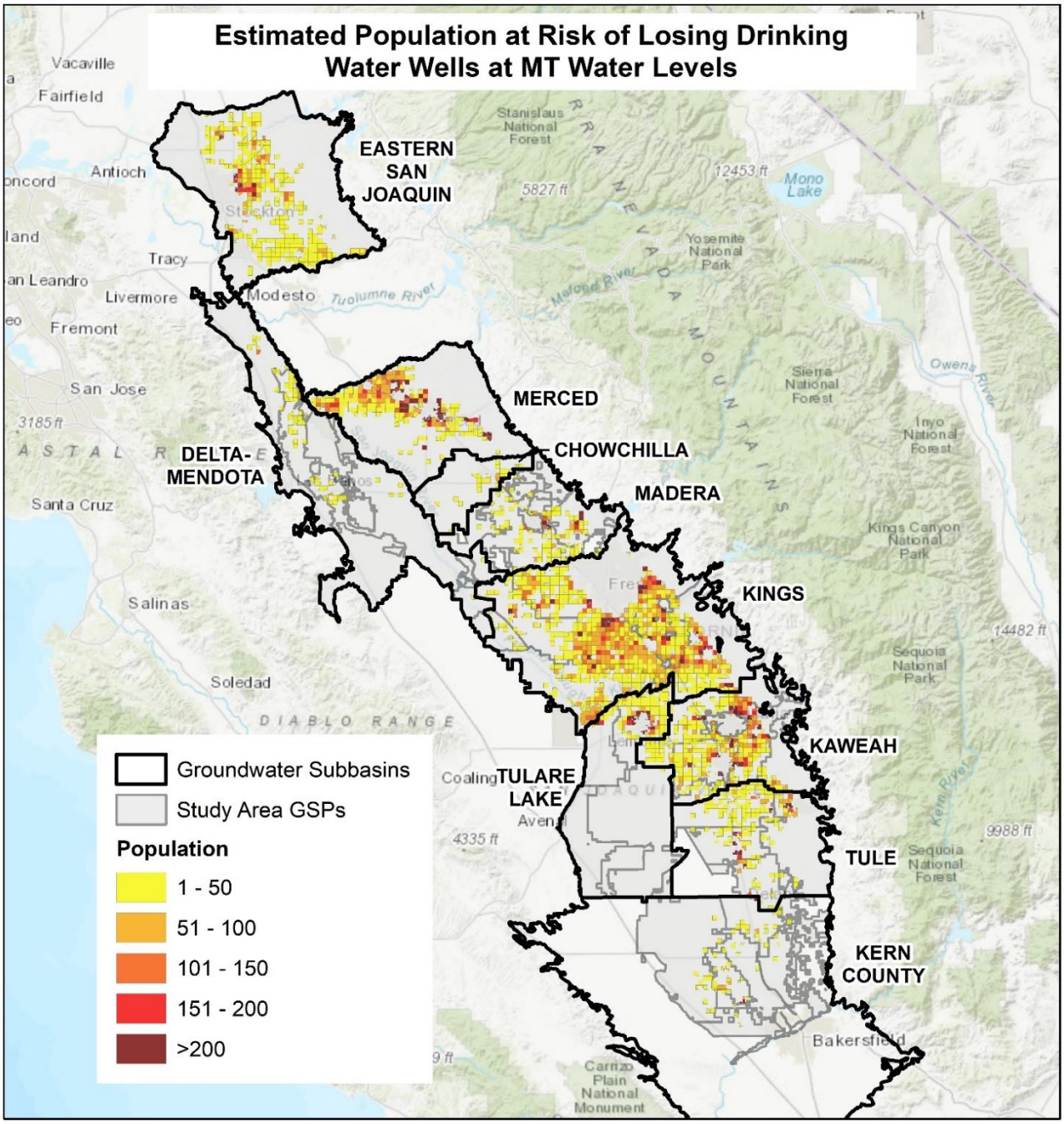
The GSPs have been developed with a goal of reaching sustainability by 2040. Based on the target water levels, or measurable objectives, defined in the GSPs, up to 5,600 drinking water wells in the region will go partially or completely dry. Under these circumstances, between 45,700 and 62,500 people will lose their primary drinking water source.




Estimated Population at Risk of Losing Drinking Water Wells at MO Water Levels
EASTERN SAN JOAQUIN
MERCED
CHOWCHILLA
MADERA
DELTA-MENDOTA
KINGS
KAWEAH
TULARE LAKE
TULE
KERN COUNTY
Groundwater Subbasins
Study Area GSPs
Population
1 - 50
51 - 100
101 - 150
151 - 200
>200
Vacaville
Fairfield
Antioch
Stockton
Tracy
Livermore
Modesto
Fremont
San Jose
Santa Cruz
Salinas
Soledad
Coalinga
Bakersfield
Yosemite National Park
Sierra National Forest
Kings Canyon National Park
Sequoia National Park
Sequoia National Forest
Inyo National Forest
Carrizo Plain National Monument
Mono Lake
Stanislaus National Forest
Tuolumne River
Merced River
Owens River
Kern River
DIABLO RANGE
12453 ft
5827 ft
14482 ft
9988 ft
4335 ft
3185 ft

This analysis concludes that even if GSPs achieve their measurable objectives, groundwater levels will likely fall below those levels to minimum acceptable levels. Under this scenario, between now and 2040, up to roughly 12,000 drinking water wells in the region, or 49% of wells, could go partially or completely dry. Under these circumstances, between roughly 106,000 and 127,000 people will lose their primary drinking water source. This is a conservative estimate because it assumes that all of the actions in the GSPs will be taken and will be successful.




Estimated Population at Risk of Losing Drinking Water Wells at MT Water Levels
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Yosemite National Park
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Kings Canyon National Park
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Stanislaus National Forest
Tuolumne River
Merced River
Owens River
Kern River
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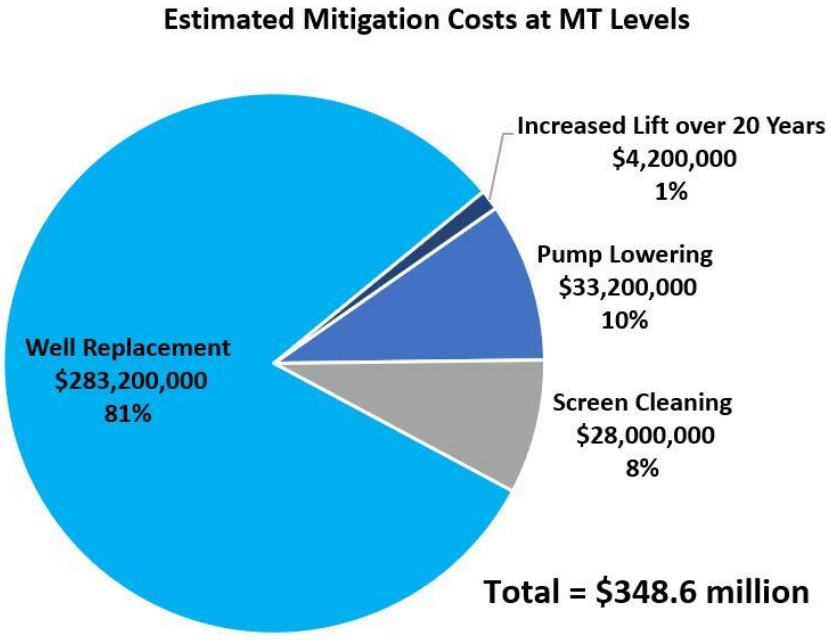
3185 ft

Restoring Water Access Could Cost between $88 and $359 Million

The stark findings detailed above demand action by GSAs to implement policies and programs to ensure that community members maintain access to reliable and safe drinking water. The first priority for GSAs must be to do more to stop groundwater declines to the extent possible. This is all the more important given that the impact of continually declining groundwater also includes worsening subsidence, dry rivers, and degradation of water quality below safe drinking water levels. Those impacts are worthy of further analysis.

DWR and the State Water Board (Board) have two years from January 31, 2020 to review critically over-drafted sub basin GSPs and make an initial determination to either 1) approve as is, 2) reject, or 3) conditionally approve with modifications. As DWR and the Board review and evaluate GSPs, they must ensure that GSAs take proactive action today to achieve sustainability and avoid devastating impacts to communities, economies, and the environment.

If this does not happen, community members will face high costs to mitigate those impacts. To ensure that community members maintain access to drinking water under circumstances where it is not possible to avoid declines in groundwater levels, drinking water well owners and users can conduct repeated well screen cleanings, drill deeper wells, develop new replacement wells, and/or spend more on operations and energy costs to lift the water from deeper underground. Based on this analysis, we expect that it will cost community members between $88 million and $359 million to pay for these mitigation measures to maintain and restore use of existing drinking water wells.



While these capital, operations, and maintenance costs are not insignificant, it is vital that GSAs and state agencies acknowledge this issue and take proactive steps to prevent these impacts. These costs are a fraction of what it will likely cost to address these issues on an emergency basis as vast and remote communities lose their drinking water wells.

For example, during the 2012-2016 drought, California taxpayers paid about $650,000 per month to provide temporary replacement bottled water to the East Porterville residents. The number of residents who will lose their primary drinking water source over the implementation of these GSPs is equivalent to up to 17 East Portervilles. Unlike the 2012-2016 drought, however, GSAs and state agencies have the benefit of the comprehensive scientific data compiled in these GSPs to plan for and address these issues before they become another more severe crisis.

The stakes are high. Failure by GSAs and state agencies charged with implementing SGMA to prevent these negative impacts will increase the current number of Californians without safe drinking water.

In 2019, the Safe and Affordable Drinking Water Fund was established to end the toxic taps crisis facing 1 million Californians today. However, the Fund was not designed or intended to address costs that could be avoided by knowledgeable and informed planning by GSAs that have failed to consider communities in their planning processes. The impacts summarized here are foreseeable, and if not proactively addressed, would add additional unnecessary demands on state and local budgets.

KEY DATES FOR SGMA AND HUMAN RIGHT TO WATER

Jan 31, 2020: GSPs Due from Critically Over-drafted Basins

May 15, 2020: First 2020 GSP Public Comment Deadline

June 3, 2020: Second 2020 GSP Public Comment Deadline

July 1, 2020: State Water Board Expenditure Plan for Safe and Affordable Drinking Water Fund Due

Jan 31, 2022: DWR Deadline to Evaluate Critically Over-drafted GSPs

Jan 31, 2022: GSPs Due from Remaining High- and Medium-Priority Basins

Considerations for California's Water Future

Californians have a shared commitment to the human right to water. Residents and their elected representatives have said clearly that they want clean, affordable, and reliable tap water for all families. They want California farming to prosper, and they want to protect the breathtaking beauty of the state's land and wildlife.

This year marks the start of a new era in California water policy, where state laws and funding recognize and reflect how closely the trajectory of groundwater sustainability and safe drinking water are intertwined. As policymakers and GSAs work diligently to implement SGMA in a manner that supports the state's economy, its communities, and nature, this analysis can conservatively fill existing data gaps on how unsustainable groundwater practices directly affect drinking water wells.

GSAs must make policy decisions in GSPs that protect drinking water. As part of the state's review of GSPs, DWR and the Board should ask key questions to help achieve sustainability and avoid undesirable results. These questions, which are detailed in the Human Right to Water Scorecard shared below, include:

- If minimum thresholds are reached in the GSP, how many Californians might lose access to water?
- How might the measurable objectives and minimum thresholds set by the GSP affect water quality for vulnerable communities?
- How can GSPs go further to avoid declining groundwater levels and the associated impacts on drinking water and other undesirable results?
- What is the GSP's plan to mitigate impacts to water quantity and quality for vulnerable communities?
- How does DWR and the Board intend to assess and analyze the GSP's impacts to drinking water quality and quantity for vulnerable communities?

Thorough evaluations and smart policy decisions today will ensure SGMA implementation protects drinking water for rural communities and residents, advances the legislature's and governor's commitments to the human right to water, and turns groundwater into a drought-proof resource for generations to come.

Related Resources

Human Right to Drinking Water GSP Scorecard: Developed by Leadership Counsel for Justice and Accountability, Community Water Center, and Self-Help Enterprises, the scorecard identifies the elements that must exist in GSPs for those plans to adequately protect the human right to water.

Drinking Water Well Impact Mitigation Program Framework: Developed by Community Water Center, Leadership Counsel for Justice and Accountability, and Self-Help Enterprises, the framework provides information to GSAs to both prevent impacts to drinking water resources and to mitigate those impacts should they occur. The framework recommends best practices, including setting up monitoring networks to quickly identify if negative impacts are occurring near drinking water wells, a trigger system for when correction actions are necessary, and what should be done if impacts occur.

Community Water Center Drinking Water Tool: This interactive, online tool helps communities and decision-makers better prepare to protect drinking water in future droughts. The tool shows 1) who manages and makes decisions about your water supply; 2) the groundwater quality where you live; 3) potential impacts to groundwater supply from future droughts; and 4) how to get involved in local groundwater management decisions.

Groundwater Markets: Recommendations to Ensure Drinking Water Protections for Communities: Developed by Community Water Center, Environmental Defense Fund, Self-Help Enterprises, The Nature Conservancy, and Union of Concerned Scientists, this guide helps GSAs considering a groundwater market or trading system help, or at least prevent harm, to shallow groundwater users.

White Paper: Estimated Numbers of Californians Reliant on Domestic Wells Impacted as a Result of the Sustainability Criteria Defined in Selected San Joaquin Valley Groundwater Sustainability Plans and Associated Costs to Mitigate Those Impacts: Developed by EKI Environment & Water, Inc., this document provides the detailed analyses that are summarized in this brief.

Acknowledgements & Sources

This brief was made possible through analysis by EKI Environment & Water Inc. and research by Community Water Center, Robert M. Gailey Consulting Hydrogeologist PC, and the University of California Berkeley Water Equity Science Shop. Thank you to the individuals at these and other organizations, including Clean Water Action, Leadership Counsel for Justice and Accountability, and Self-Help Enterprises, who contributed their time and expertise to analyze state datasets, review GSPs, and develop this brief.

To conduct the analysis summarized in this brief, the following data sources were used:

- Fall 2018 depth to groundwater contours, available from the California Department of Water Resources' Groundwater Information Center Interactive Map Application
- California Department of Water Resources' California Statewide Groundwater Elevation Monitoring system
- United States Geological Survey 10-meter Digital Elevation Model
- University of California Berkeley Water Equity Science Shop's 2019 domestic well dataset
- California Department of Water Resources' Online System for Well Completion Reports
- Robert M. Gailey's PhD dissertation, Approaches for Groundwater Management in Times of Depletion and Regulatory Change
- California Supply Well Impact Analysis for Drinking Water Vulnerability Webtool, prepared by Robert M. Gailey Consulting Hydrogeologist PC for Community Water Center

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The Water Foundation and its partners advance lasting water solutions for communities, economies, and the environment.

Cover photo: Kelly M. Grow / California Department of Water Resources