WATER EDUCATION FOUNDATION

# Recommendations for Modernizing Water Rights for 21st Century Challenges

2025

A Report by the 2025 California Water Leaders

*American River* Photo Credit: California Department of Water Resources

# Disclaimer and Acknowledgements

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Finally, we express gratitude to the experts in this field, including mentors and speakers, who generously donated their time and expertise to share invaluable insights on the topic of Modernizing Water Rights for 21st Century Challenges. While our scope was specifically examining water rights in relation to extreme floods and droughts and how to make them more available to the public, we want to acknowledge that Tribal water rights are an essential part of modernizing water rights.

California Tribes have stewarded these waters since time immemorial. Yet, their rights have rarely been recognized and they have often been excluded from decisions that affect these waterways.

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Westlands Water District Photo Credit: California Department of Water Resources

# Acronyms & Abbreviations

| Acronym or Abbreviation | Definition |
|---|---|
| CalWATRS | California Water Accounting, Tracking, and Reporting System |
| CCR | California Code of Regulations |
| CEFF | California Environmental Flows Framework |
| CEQA | California Environmental Quality Act |
| DPCRP | Drought Preparedness & Climate Resilience Plan |
| DWR | California Department of Water Resources |
| EO | Executive Order |
| EWB | Environmental Water Budget |
| eWRIMS | Electronic Water Rights Information Management System |
| FERC | Federal Energy Regulatory Commission |
| GSA | Groundwater Sustainability Agency |
| GSP | Groundwater Sustainability Plan |
| MAR | Managed Aquifer Recharge |
| QA/QC | Quality Assurance/Quality Control |
| REWM | Regional Environmental Water Manager |
| SB | Senate Bill |
| SGMA | Sustainable Groundwater Management Act |
| SWMA | Surface Water Management Area |
| SWRCB | State Water Resources Control Board |
| SWSA | Surface Water Stewardship Agency |
| UPWARD | Updating Water Rights Data for California |
| WC | Water Code |

# Executive Summary

California's dual water-rights system, rooted in 19th-century riparian and appropriative doctrines and later layered with permitting, environmental regulation and local groundwater management not only underpins water allocations, but has been integral to turning California into the world's fourth-largest economy. However, the collisions between 19th-century water rights law, 20th-century infrastructure and 21st-century climate stressors are increasingly apparent. Intensifying droughts and floods, growing water demands and modern digital tools that outpace a paper-era system expose the limits of the state's antiquated system.

Over-prescription of surface and ground water supplies, fragmented records, mistrust and slow, cumbersome processes further hinder operational flexibility and timely curtailments, transfers and collaboration, especially during critical flood and drought periods. Together, these barriers increase the potential for endless conflict and uncertainty for water right holders, communities and ecosystems alike. Many voices across social, economic and political continuums have identified the growing need to improve California's current water governance structure. While a complete overhaul of California water rights system is unwarranted, changes are needed to modernize it with focused updates that improve transparency, access, equity and resilience statewide.

Members of the Foundation's 2025 California Water Leaders cohort spoke with experts in the field, attended Foundation tours and considered the values of transparency, accessibility, equity and resilience to develop the following recommendations for modernizing water rights for 21st century challenges. These recommendations consider the challenges of the state's changing climate, physical limitations, evolving technology, science and societal values. The 2025 cohort suggests decision-makers consider implementing the following three recommendations, which are described in more detail throughout the report.

First, cut the blue tape. Program-level California Environmental Quality Act (CEQA) coverage and standard playbooks can accelerate the benefits of key tools for conjunctive water management, groundwater recharge in wet years and water transfers in dry years. Successful temporary recharge permits should roll over and, when appropriate, convert to permanent water rights. Objections to State Water Resources Control Board (SWRCB) approvals should rely on evidence: Empower SWRCB to screen out scientifically weak protests or shift the burden so protestants must show likely harm; pair with added staffing and funding so decisions arrive within operational opportunity.

Second, bring the Sustainable Groundwater Management Act (SGMA)'s collaborative spirit to surface water to prepare for times of drought and excess water. Locally led Surface Water Stewardship Agency (SWSAs) within Surface Water Management Areas (SWMAs) would craft comprehensive water resilience plans. Regional Environmental Water Manager (REWMs) would run environmental water budgets tied to habitat goals, giving the environment a formal seat at the table. Models like the Russian River voluntary sharing program and the Yuba River Accord show that local leadership plus state backstops can advance sustainable water use, boosting reliability and ecological outcomes. Technical assistance, regional data hubs and funding are a must to make this work.

Third, improve certainty in groundwater management to avoid conflict between Groundwater Sustainability Plans (GSPs) that manage groundwater for sustainability (without the authority to modify water rights) and court adjudications that determine water rights. A targeted legislative package would allow independent court review of plan allocations or curtailments without triggering basin-wide court cases, while granting deference to other science-supported GSP actions. Standardized data and methods, explicit authority to quantify storage/banking rights, and procedural relief for small and disadvantaged users would reduce duplication, cut costs and align the dual systems.

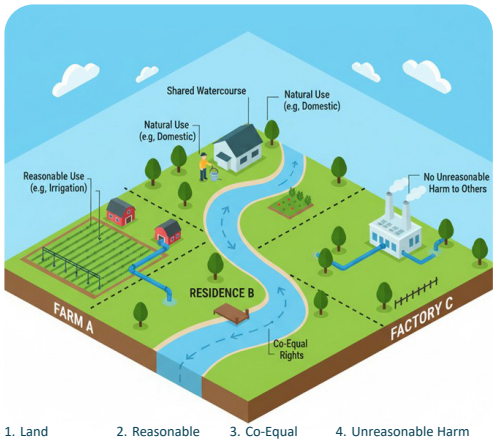
# Background

As California's population and agricultural economy expanded in the mid-19th century, competing systems of water allocation emerged, creating a complex surface water rights system. Riparian and appropriative water rights clashed and were reconciled in the landmark case of Lux v. Haggin in 1886. The California Supreme Court's decision established what is now known as "California Doctrine," recognizing the dual system of appropriative and riparian water rights. Importantly, the ruling affirmed that riparian rights are generally senior in priority to appropriative rights, a principle that continues to shape California's water management and legal framework today.

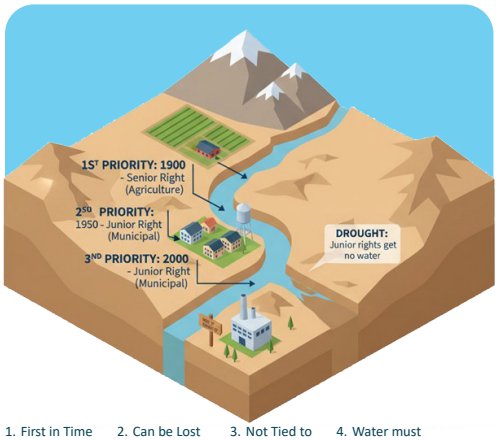
In 1914, the California Water Commission Act formalized the appropriative water rights system and centralized water rights records at the state level (Hyatt Jr., 1925). Since 1914, California has administered appropriative water rights, requiring a permit to be issued by a centralized agency. This agency is now the modern-day SWRCB, which is responsible for water rights administration in California. Water rights prior to the enactment of the Water Commission Act remain valid and are known as pre-1914 rights. (See Figure 1)

Figure 1. California's Surface Water Rights System

## Surface Water Rights System




1. Land Adjacency
2. Reasonable Use
3. Co-Equal Rights
4. Unreasonable Harm to Others




1. First in Time Right
2. Can be Lost by Non-Use
3. Not Tied to Land
4. Water must be Used Beneficially

### Riparian Water Rights

#### Riparian Rights

- Owners of land adjacent to a natural source of water have a right to use the water that is naturally available.
- Does not require permits or licenses but limits the use of water for what is reasonable and beneficial.
- Inherited from English common law, were adopted when California became a state in 1850.

### Prior Appropriation

Western US Doctrine: First in Time, First in Right

#### Appropriative Rights

- Originate from the 1800s and the California Gold Rush.
- Priority of each water user's entitlements based on the theory of "first in time, first in right".
- Appropriative rights with alternative place of use formally recognized by the California Supreme Court in 1855.

### Surface Water Rights Administration

A water right is legal permission to use a reasonable amount of water for a beneficial purpose such as swimming, fishing, farming or industry. California water rights law is administered by the State Water Board's Division of Water Rights.

If you take water from a lake, river, stream, or creek, or from underground supplies for a beneficial use, the California Water Code requires that you have a water right.

California's groundwater rights include overlying, appropriative and prescriptive rights. Overlying rights are similar to riparian surface water rights. Unlike surface water rights, there is no statewide permitting system for groundwater rights. There are two systems that manage groundwater today. A groundwater adjudication is a court settlement to determine water rights between competing water users. The first groundwater adjudication in California, the Raymon basin, started in 1937 and was finalized by California Supreme Court decision in 1949. Adjudications are limited to specific basins, often take decades to complete, are costly and may exclude the needs of the environment and small users. Beyond adjudications, groundwater rights were largely unregulated in California prior to the passage of SGMA in 2014. SGMA requires local agencies to manage groundwater to avoid six undesirable results but specifically withholds the authority to issue or change existing water rights. These two groundwater management avenues have come into conflict in recent years and there is potential for adjudications to be used as a delay tactic for implementing groundwater management under SGMA because of the lack of water rights authority given to GSAs. (See Figure 2)

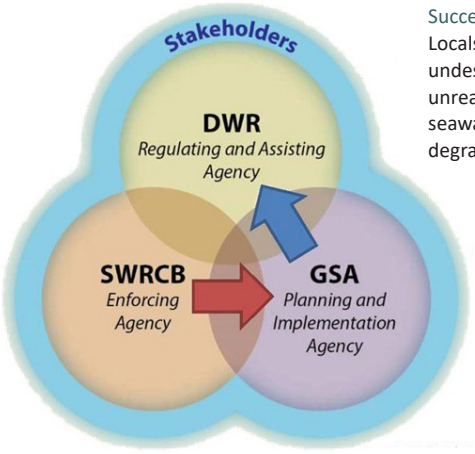
Figure 2. California's Groundwater Rights System

## Groundwater Rights System

Groundwater rights include overlying, appropriative and prescriptive rights. Groundwater is managed by a dual system in California, SGMA and Groundwater Adjudications.

### Sustainable Groundwater Management Act ("SGMA")

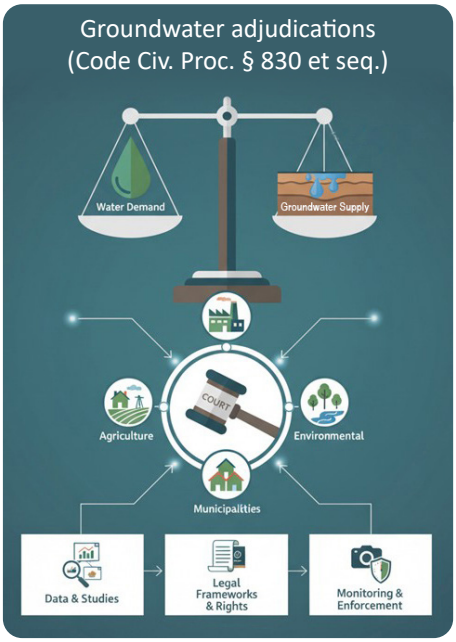
- Adopted into law in 2014
- Sustainability Plans developed in 2020 and 2022 with 20 years to reach sustainability
- DWR reviews for adequacy and progress
- Does not modify groundwater rights or priorities




Success - "Local Control"
Locals develop and implement plans to avoid 6 undesirable results: chronic lowering of groundwater, unreasonable reduction in storage, subsidence, seawater intrusion, interconnected surface water, and degradation of water quality.

Failure - "State Backstop"
SWRCB administers plan to meet sustainable yield until local control is resumed.

DRAFT GSP Emergency Regulations - Subject to Revisions




When water users within a basin are in dispute over legal rights to the water, a court can issue a ruling known as an adjudication. The court decree will define the area of adjudication. The court typically appoints a watermaster to administer the court's decree.

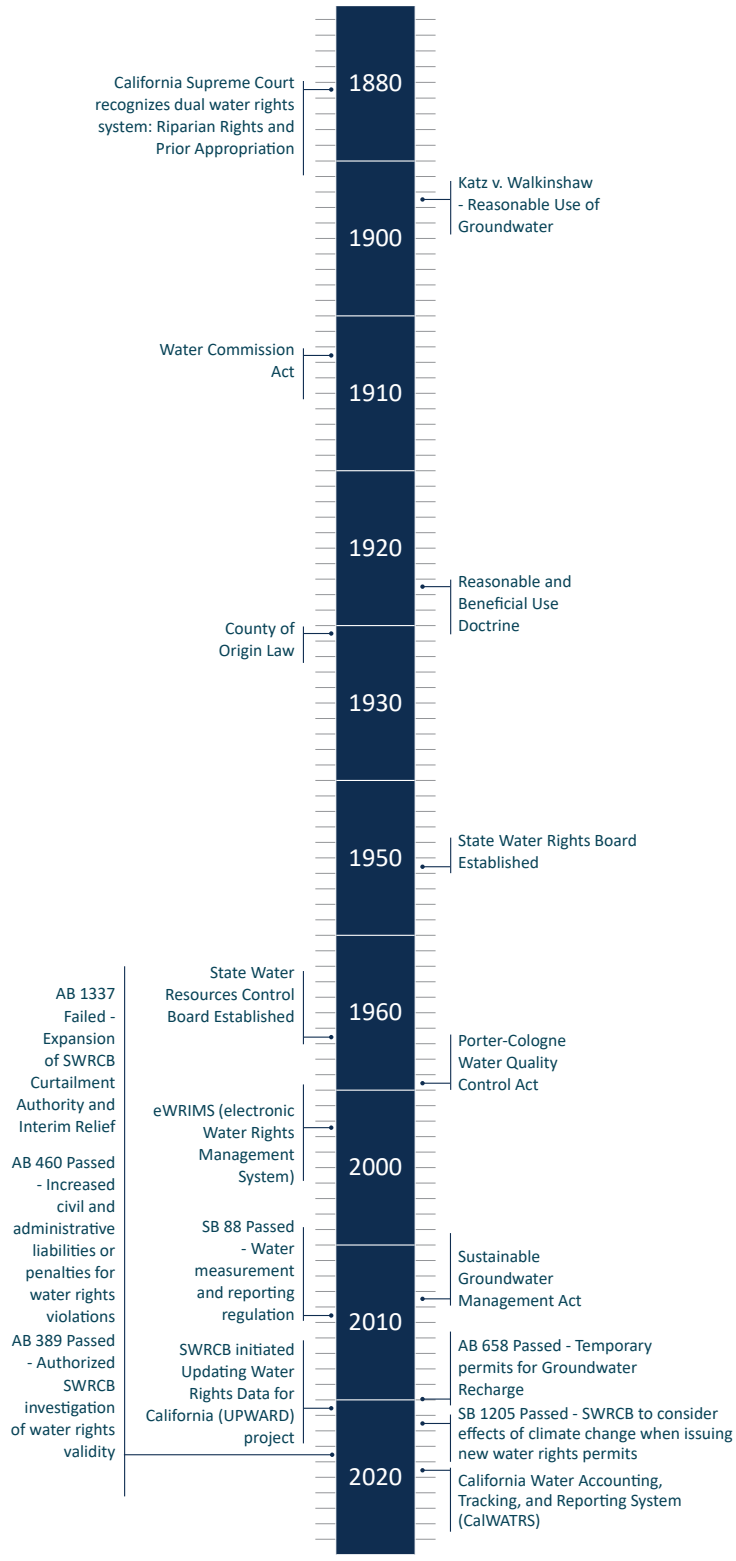
## Key Efforts to Modernize California's Water Rights System

California's water rights system is founded on laws established more than a century ago, but the information that currently supports it remains outdated and fragmented. Much of the state's water rights data has historically been stored in paper files or incomplete databases, limiting transparency, timely application and usefulness for resource management. As droughts have intensified and climate pressures have increased, the lack of timely, accurate and accessible data has become a central barrier to effective water management and has highlighted the need for modernization. The curtailment process, a critical tool for managing scarcity, highlights current limitations; and operates without the speed, clarity or adaptability needed in today's dynamic conditions.

Passed in the aftermath of the 2012-2016 drought, Senate Bill (SB) 88 (Title 23, California Code of Regulations §§ 931-938) authorized SWRCB to require most appropriative surface water diverters to measure and report diversions with greater accuracy and frequency. SB 88 aimed to improve transparency and give SWRCB, water managers and the public better visibility into how much water was being diverted, especially during curtailments. However, these efforts quickly revealed limitations of the state's legacy reporting platform, eWRIMS (the Electronic Water Rights Information Management System), which was not designed to handle high-volume, standardized reporting.

*The Water Rights Records Room at the State Water Resources Control Board* Photo Credit: WEF 2025 Water Leaders Tour

Recognizing this gap, in 2021 SWRCB launched the UPWARD project (Updating Water Rights Data for California). UPWARD is replacing eWRIMS with a modern platform known as the California Water Accounting, Tracking, and Reporting System (CalWATRS), designed to streamline reporting, digitize millions of historical water right records and integrate geospatial tools that connect water rights to place and time. By making water rights data more accurate, transparent and accessible, UPWARD provides the foundation for more equitable and data-driven decision making.



# Moving Forward

> **"19th-century water law, 20th-century infrastructure and 21st-century population growth and climate change are on a collision course throughout the West."**
>
> - Michael Dettinger, Bradley Udall and Aris Georgakakos

California has undergone significant changes in the century and a half since its dual water rights system was established. The following key water rights challenges have been identified by the 2025 Water Leader cohort as issues that must be addressed to effectively modernize water rights:

### CLIMATE

Intensifying droughts and floods driven by climate change demand a more adaptive and resilient water rights framework.

### PHYSICAL

Rapid population and industrial growth can push water demand beyond the system's capacity, leaving little room for error or excess.

### TECHNOLOGY

Digital tools, real-time data, and advanced analytics have revolutionized water management, yet the water rights system remains tethered to an outdated, paper-based process with limited data.

### SCIENCE

Modern hydrology recognizes the deep interconnection between surface water and groundwater — yet the water rights system and management remain bifurcated.

### SOCIETY

Evolving values around equity, tribal sovereignty, environmental stewardship and local self-determination call for inclusive recognition of all water users[2].

*Lake Oroville* Photo Credit: California Department of Water Resources

These changes have outpaced the current system's ability to respond. Without modernization, California's water rights framework will remain fragmented and ill-equipped to manage water equitably and efficiently. Modernization is not synonymous with reform. There is no intention of overhauling a system that has allowed California to flourish. As stated in the 2023 briefing to the Assembly Committee on Water, Parks and Wildlife, "targeted, incremental changes will be less disruptive, more legally defensible, and easier to implement than a major overhaul of the state's complex water rights system."

California's existing network of water infrastructure (e.g., canals and pipes) does not have the capacity to move water when and where it's needed - both in dry times and wet. Recommendations included in this report focus on administrative, collaborative and legislative changes to improve the water rights system, but we recognize that efforts to modernize water rights will be ineffective without the conveyance and storage infrastructure to physically move water. Any serious efforts to modernize California's water rights system must be paired with significant investment in the infrastructure needed to manage water in the state.

Groundwater Monitoring Well Run in Colusa County Photo Credit: California Department of Water Resources

# Recommendations

A modernized California water rights system is one which is transparent, accessible, equitable and resilient to meet the challenges and opportunities of the 21st century and beyond: A system where information is easy to find and decisions are clear; participation and collaboration are barrier-free; the needs and rights of historically disadvantaged communities and the environment are upheld; and institutions and water users can adapt to changing climate, social and regulatory conditions.

The following sections detail the recommendations developed by the 2025 Water Leaders cohort for "Modernizing Water Rights for 21st Century Challenges." These recommendations include strengthening institutional flexibility, enhancing local collaboration for surface water management and improving certainty in groundwater management. We acknowledge these recommendations vary in level of detail and ambition. Some could be actionable in the short term, but we recognize others are more aspirational and would take several years to implement.

## Recommendation 1: Strengthen Institutional and Regulatory Flexibility

Any water rights modernization process must acknowledge the need for California's water management framework to meet the challenges of a changing climate and continued population growth. Strengthening institutional and regulatory flexibility will enable state and local agencies to better respond to extreme conditions, from droughts to floods. This recommendation focuses on pragmatic reforms, including streamlining permitting, improving the state's administrative capacity through increased staffing and reporting and upgrading infrastructure. These changes would help 'cut the blue tape' by enhancing the ability of water managers in California to adapt more quickly and make timely, data-driven decisions to support sustainable water use statewide. They would further the goals presented in California's Water Supply Strategy Adapting to a Hotter, Drier Future Action 4 (Newsom, 2022).

### Streamline water recharge/ transfer permitting and expand CEQA exemptions where feasible

Streamlining regulatory requirements and procedures, including targeted CEQA and other permitting requirements, can sharpen our most promising tools for adapting to the current realities of California's climate cycles: Water transfers to move scarce supplies during drought and groundwater recharge to capture wet year and flood flows. This section focuses on streamlining to improve conjunctive water management, with an emphasis on accelerating high-value groundwater recharge and transfer approvals.

California State Capitol Building Photo Credit: Pexels

In recent years, the Governor's administration, the state Legislature and SWRCB have used executive actions and temporary permits to mitigate flood flows and incentivize groundwater recharge. This has created multi-benefit outcomes that reduce flood risk and benefit agricultural users and the environment. In the wake of 2023's unprecedented atmospheric rivers, Executive Orders (EO) N-4-23 and N-7-23 allowed for expedited diversion of flood water for underground recharge by suspending typical CEQA and diversion permitting requirements. After the 2023 EOs expired, similar but longer-term legislation was enacted through California Water Code § 1242.1 and modified by EO N-16-2025 to allow for more streamlined diversions of floodwater for groundwater recharge with environmental safeguards (California State Water Resources Control Board, n.d.).

SWRCB Division of Water Rights has separate administrative processes in place to issue temporary permits for groundwater recharge, including 180-day and 5-year temporary permits. These permits allow water from high flow events to be diverted to underground storage. The conjunctive water management opportunities provided by these permits are key to meeting future water demands and sustainable groundwater management. While these permits are intended as a streamlined option compared to a full water right permit application, approvals still often require CEQA analysis, CDFW consultation and a simplified or standard water availability analysis, meaning they are still costly and often take several months or longer for approval. Further, the temporary permits do not provide applicants with certainty on a return of investment as agencies must apply far before it is clear if hydrologic conditions will allow the permit to be used within its timeframe.

More can be done to promote and simplify these permitting pathways by providing better clarity on diversion equipment requirements (e.g., fish screens), leveraging cutting edge frameworks such as the California Environmental Flows Framework (CEFF) to develop alternative water availability analysis methods, and further expediting administrative review processes. Drawing inspiration from California's "Cutting the Green Tape" initiative, which sought to streamline ecological restoration and stewardship, we recommend the following actions be taken to improve the processes for permitting temporary groundwater recharge and water transfers, especially for conjunctive water management:

**1. The state should develop programmatic level CEQA coverage.**

Temporary permits for groundwater recharge and surface water transfers enhance flexibility during floods and drought. For temporary groundwater recharge permitting, the state should expand CEQA coverage by granting statutory exemptions for low impact projects or issuing a statewide programmatic environmental document (e.g., PEIR with SWRCB as lead agency).

For specific classes of water transfers, defined by hydrologic region and water year type, SWRCB should similarly consider statewide programmatic CEQA coverage and create a pre-approval 'playbook' process with checklists and standardized methods and thresholds. In addition, SWRCB should create monitoring requirements for commonly used surface water transfers to expedite the movement of water to where it is most needed in dry and critically dry years. This builds on existing authorities for temporary changes due to transfers under Water Code § 1725 (effective for up to one year) and temporary urgency change petitions (up to 180 days, renewable), which already allow streamlined, time-limited adjustments to point of diversion, place or purpose of use. Tiered pathways would standardize submittals and review, reduce duplicative analysis and align with state practice recognizing transfers as an important drought tool, while acknowledging that such transfers are only effective if processed in a timely manner.

**2. SWRCB and DWR should set clear, science-based rules for checking water availability and update streamlined pathways for temporary permits.**

Interested parties have raised concerns regarding the cumulative effects of approving multiple temporary permits in the same basin. For instance, while a single permit may divert a small portion of wet-season stream flows, multiple permits together may result in a significant portion of the stream being depleted, even under the wettest of conditions.

A 2019 SWRCB guidance document, Water Availability Analysis for Streamlined Recharge Permitting, identified a method for determining diversion thresholds unlikely to cause injury to the environment that, if used, would expedite permit approval. However, the method often results in sub-optimal permit terms and conditions for many permittees and could better incorporate contemporary science. To alleviate concerns regarding cumulative impacts and water availability, we recommend that SWRCB, in collaboration with DWR, update best management practices for standardized water availability analysis based on best available science such as the CEFF and codify streamlined approval processes that implement such guidance. We envision the updated guidance would limit total diversions to a percentage of the overall flow while protecting flood pulses and other key elements of the natural flow regime. This approach would add certainty for applicants and SWRCB staff, improve efficiency and could be adopted with a sunset date of 5 to 10 years and only renewed if found to be effective.

**3. SWRCB should allow temporary recharge permits to roll over to the next year and, where feasible, be streamlined into permanent water rights.**

A clear permit rollover and water right conversion pathway would give applicants confidence to invest in groundwater recharge, resulting in significantly more successful recharge efforts, and keeping no-injury and ecosystem safeguards firmly in place. This new pathway would allow proponents who are in good standing with their temporary recharge permit(s) and wish to continue recharging to expeditiously renew permits with constant terms and conditions, and eventually apply to convert to a permanent right through a streamlined review. For conversions to permanent rights, strong guardrails would need to be established that protect senior water right holders, keep bypass flow/curtailment rules, maintain water quality, provide for metering and public accounting, and provide equity support for Tribes, disadvantaged communities and small water systems.

**4. The Legislature should either modify the "no-injury rule" or California Water Code § 1333.**

The no-injury rule is a key legal safeguard in California, which ensures that any changes to a water right, such as a proposed water transfer, be analyzed to confirm it will not harm the rights of other lawful water users. Currently, water right applicants are required to complete a no-injury analysis, as outlined in Water Code §§ 1702 and 1706, and water right protesters may challenge this analysis without demonstrating actual injury, which can delay or obstruct applications for transfers.

Modernizing WC § 1333, which requires SWRCB staff to "resolve" any protest to the permit, would allow SWRCB staff more discretion to determine if objections are scientifically valid. A "scientifically valid objection" must include relevant data, appropriate methods, transparent assumptions and uncertainty, and a plausible causal pathway to harm, evaluated through a two-tier screen that quickly triages unsupported claims and fully reviews supported ones.

Alternatively, the no-injury rule could be modified with legislation shifting the no-injury burden of proof to protestants, requiring them to show likely harm, and pair it with a pre-approval "playbook" that spells out required considerations for transfers during dry versus wet years. Together, these changes would streamline SWRCB decisions, improve responsiveness, and allow urgent drought-response transfers and temporary groundwater recharge permits to proceed quickly and fairly.

### Expand staff and funding at the SWRCB

SWRCB Division of Water Rights is responsible for water rights permitting and licensing, enforcement and compliance, and data management. Therefore, an essential component of modernizing California's water rights system is to ensure that SWRCB has the resources and administrative capacity to effectively carry out its current responsibilities. Insufficient staffing and limited funds have contributed to delays in processing water right permits, reviewing transfer petitions, and providing technical assistance to rights-holders and other constituents.

Increasing staff and funding at SWRCB would support more efficient administration of the water rights system. Additional capacity would facilitate expedited review of transfers, improve the timeliness of permitting, allow for fair and effective curtailments in times of drought, and strengthen the technical support available to both water agencies and smaller rights-holders. Providing SWRCB with sufficient resources would enhance its ability to balance competing demands, respond to changing conditions, and ensure that modernization efforts are implemented in a manner that provides practical and measurable benefits statewide.

For example, SWRCB staff time could be paid by the state General Fund for processing temporary permits for groundwater recharge. Currently permit fees are paid by applicants, often in excess of $100,000, with no guarantee of water availability within the permit timeline. If water agencies did not bear the full burden of these fees, it would encourage expansion of this emerging and important part of California water management.

*Russian River* Photo Credit: Water Education Foundation

## Recommendation 2: Enhance Local Collaboration for Surface Water Management

California's current groundwater management framework under SGMA highlights the importance of locally crafted management plans and the benefits of collaboration when describing physical conditions, quantifying water supplies and demands, mapping administrative boundaries, setting measurable management objectives, and developing project and management actions. A similar approach with surface water would empower local users and affected parties within regions defined by shared physical and hydrologic conditions to plan for looming drought and climate risks while preserving existing water rights and ensuring that environmental water needs are managed to the same standards as other water uses. This locally driven system would encourage voluntary collaboration rather than top-down intervention.

### Unify surface water management with watershed collaboration

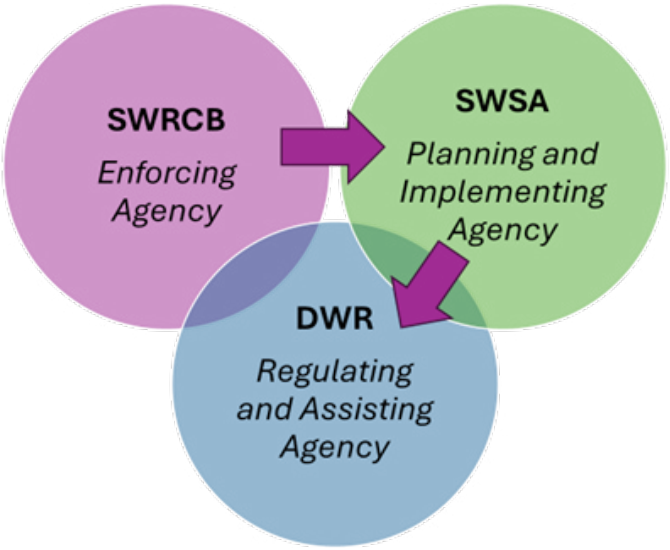
This recommendation proposes a regional, incentive-driven framework that aligns local governance, voluntary collaboration and ecological resilience. It merges two complimentary strategies: 1) Creating SWSAs within designated SWMAs to manage surface water resources at the local level, and 2) establishing REWMs to integrate environmental water budgets and ecosystem objectives into regional surface water planning. Together, these locally led institutions would coordinate surface water and environmental flow management under a unified, regional scale framework.

SWMAs would be managed by a collaborative group of users, SWSAs, served by common water sources and conveyance infrastructure. Many such groups already exist in the form of local water agencies with state or federal supply contracts, regional wholesalers formed by municipal, county or irrigation districts to import and distribute water, and joint authorities or associations of rights holders that operate major canals and reservoirs. An example of a region-based, incentive-driven collaborative water management effort is the Russian River Voluntary Water Sharing Program, which is further described below. With a goal of establishing new watershed-based management areas, DWR would lead the establishment and updates of all boundaries and the program would be anchored by SWRCB's oversight and enforcement.

Stakeholders could form SWSAs through joint powers agreements or memoranda, following public notice and hearings. These new agencies would prepare Drought Preparedness & Climate Resilience Plans (DPCRPs) detailing the sources of supply, conveyance infrastructure and major contracts; inventorying riparian, pre-1914 and appropriative rights; assessing historic and projected diversions, return flows, reservoir storage and climate-driven inflows; and mapping the management area. The DPCRP would set out drought-response frameworks using water-availability tiers and voluntary sharing agreements, specify monitoring and reporting requirements, outline funding mechanisms, describe inclusive stakeholder engagement processes and commit to periodic updates. An emerging example is the Healthy Rivers and Landscapes voluntary agreements in the Bay-Delta. The DPCRP would include projects and management actions such as voluntary curtailments and water conservation projects in times of drought and opportunistic water sharing in high flow years where those with excess water could transfer their water in real time to a downstream diverter for groundwater recharge. As in the Russian River example, participants would gain greater predictability of their water supply across many hydrologic conditions and protection from curtailment actions.

## Establish Regional Environmental Water Managers (REWM) to integrate ecosystem objectives into regional surface water planning

REWMs, either established within SWSAs or as collaborating entities, would be responsible for designing and administering Environmental Water Budgets (EWBs) to be incorporated into SWMA-scale DPCRPs. The goal of establishing EWBs is to define a clear, adaptable share of water for ecosystems and allow managers to store, trade or carry over water to meet environmental needs (Gray et al., 2015; Mount & Gray, 2015, Null et al., 2022). REWMs would tailor EWBs to local hydrologic conditions, aligning environmental flows with habitat restoration and/or climate smart conservation and transparently tracking ecological outcomes (Harder et al., 2025). When managed transparently and locally, EWBs improve accountability and reduce regulatory uncertainty for other users (Mount & Gray, 2015).




### CASE STUDY: RUSSIAN RIVER VOLUNTARY WATER SHARING PROGRAM

In 2021, SWRCB and local right holders in Sonoma and Mendocino Counties launched the Russian River Voluntary Water Sharing Program in response to critical drought conditions (California State Water Resources Control Board, 2023). The program provided an alternative to rigid curtailments by asking senior right holders to voluntarily reduce diversions by 20 to 30 percent, with the conserved water shared among junior users who otherwise would have been fully curtailed. Participants gained greater predictability and partial protection from state curtailments, while non-participants remained subject to the traditional "first in time, first in right" system.

The program was a novel departure from California's reactive water allocation framework. This experiment in cooperative drought management relied heavily on trust and partnerships, with weekly meetings among right holders to build consensus, and foster transparency and trust. Though later suspended in 2022 when reduced inflows from the Eel River made sharing infeasible, the effort demonstrated how voluntary, locally led agreements can improve flexibility and build collaboration within California's complex water rights framework (Russian River Flood Control & Water Conservation Improvement District, 2025).

Within the new regional framework, REWMs would give the environment a formal seat at the table by treating ecosystems as managed 'users' rather than incidental recipients of leftover water. Integrating ecological and human water management under a shared governance model would fundamentally modernize California's water allocation system. Although similar efforts have been unsuccessful in the past, REWMs would have accountability and decision authority to enforce priority and/or contracts for water, as negotiated within each SWMA. The statewide Program EIRs discussed in Recommendation 1, or similar regulatory approvals, would enable quick action adaptive management triggers (i.e., hydrologic, species/community populations) for these actions to be pre-authorized in the DPCRP. As described below, the Yuba River Accord offers proof of concept as inspiration for this recommendation: A voluntary, locally crafted agreement that met ecological flow needs, improved supply reliability and generated community benefits through water trading (Gray et al., 2015).

grant funding for telemetry, installation, quality assurance and quality control (QA/QC) and trust building activities. Additional incentives could include priority access to grants for organizations adopting approved DPCRPs and EWBs.

## Provide incentives with state oversight to ensure implementation and compliance

After DWR reviews DPCRPs and associated EWBs, it will determine if they are adequate. If a plan were deemed inadequate or not implemented, SWRCB would step in to manage diversions until the plan is corrected and compliance is re-established. As in the Russian River example, participants would gain greater predictability of their water supply across many hydrologic conditions and protection from curtailment actions. Participation would also be encouraged through regulatory certainty, financial incentives such as grants or tax relief for voluntary reductions and sharing, technical support, and streamlined permitting processes with other state and federal programs. The implementation timeline would begin with legislation authorizing SWMAs and stewardship agencies, followed by boundary designations, capacity-building support, plan development and adoption, and periodic review and updates.

### CASE STUDY: YUBA RIVER ACCORD

The Yuba River Accord (Accord) was developed in 2008 as a collaborative response to decades of conflict over water management in Northern California's Yuba River watershed. Competing demands from agricultural users, urban suppliers and endangered salmon populations had created a cycle of litigation and regulatory uncertainty. To break the impasse, local agencies, SWRCB, federal fisheries agencies, conservation groups and water contractors negotiated a voluntary settlement that became the Accord.

The Accord established clear instream flow schedules tailored to the needs of salmon and steelhead, while also creating a flexible framework for groundwater substitution transfers and water sales to downstream contractors (Yuba Water Agency, n.d.) By effectively creating an environmental water budget for the river, the Accord provided greater certainty for fish and wildlife managers and improved supply reliability for water users. It also generated community benefits, as transfer revenues supported habitat restoration, monitoring programs and local flood protection upgrades (Hanak, 2018).

*Yuba River* Photo Credit: California Department of Water Resources

## Provide financial and technical support to local entities

Financial and technical support for SWSAs, likely provided by the state, will be needed to ease the local cost burdens and enable local users to collaborate with timely, accurate data. This backing will improve data quality and speed access for regional work, including curtailment planning, water transfers and water sharing agreements. Regional data hubs and/or monitoring programs promote sharing and build trust through a common understanding of watershed conditions, streamline monitoring and cut costs. It keeps monitoring decisions local, and when possible, builds on existing systems rather than adding burdensome new requirements. Technical support should include training, user education and clear documentation. Financial support should fund dedicated teams to develop regional data systems, plus

## Recommendation 3: Improve Certainty in Groundwater Management

California manages groundwater mainly through SGMA and groundwater adjudications, but these tools serve different aims: SGMA centers on planning and management, while adjudications determine relative water rights. Where these overlap during an adjudication process, they result in practical and legal problems: Timing conflicts, duplicated technical work, uncertainty regarding sustainable yield determinations. In addition, beneficial groundwater management practices such as managed aquifer recharge and storage credits are stalled.

Adjudications can set allocations or a "safe yield" that conflict with a GSP's sustainable yield, undermining SGMA's budget-based framework and creating regulatory uncertainty for GSAs and water users. GSAs can set pumping limits in their plans, but they can't decide or change who holds legal water rights. That means their allocations can be challenged in court on the basis of harming senior right-holders, and court orders that ignore sustainability targets can, in turn, weaken SGMA (Garner et al., 2020). Parallel timelines duplicate work and slow sustainability efforts: Adjudications take years and spawn separate analyses than GSPs, while SGMA imposes firm deadlines for GSP adoption and implementation (Cole et al., 2024). Existing law around recharge, banking and storage leaves out large-scale managed aquifer recharge (MAR), aquifer storage-and-recovery and formalized banking credits. It is unclear under existing law how to define and account for storage rights when determining water right allocations (Choy et al., 2014). High costs and delays burden small pumpers, disadvantaged and low-income communities and Tribes (Cole et al., 2024). Finally, inconsistent disclosure requirements and monitoring/modeling standards erode transparency and can lead to divergent GSA and court determinations (Hanak et al., 2020).

To address these issues in California's groundwater rights management framework, we recommend a targeted legislative package to align SGMA implementation and groundwater adjudications so allocations set by courts and locally adopted plans reinforce one another and converge on enforceable, equitable groundwater sustainability:

**1. Independent review of allocations or curtailments, judicial deference for other GSP actions:** To reduce the risk that SGMA actions trigger sprawling basin-wide adjudications, California should clarify how courts review GSP decisions. Because SGMA does not determine water rights, GSP measures that implicate water rights, like pumping allocations or curtailments, are especially vulnerable to protracted challenges in court. A statutory update would let parties seek independent judicial review of those allocation decisions without launching a comprehensive basin-wide adjudication, encouraging voluntary agreements to cut pumping and accelerating any necessary water rights determinations, if challenged. For all other GSP actions, courts would grant presumptive deference to valid, scientifically supported findings in the plan, thereby reinforcing local management while preserving due process.

**2. Statutory coordination and consolidation provisions:** In addition, the state should hard-wire coordination between adjudications and GSP processes so they share data, avoid duplicative modeling and align timelines (Hanak et al., 2020).

**3. Mandatory early disclosures/standardized technical protocols:** Standardized, meter-based reporting and hydrogeologic datasets from GSAs would flow to the court during adjudications, and courts would be required to consider GSP technical reports and consolidate related cases when possible (California State Water Resources Control Board, 2025).

**4. Explicit statutory authority to adjudicate storage/banking rights:** Statute should also explicitly define "use of storage space" and authorize courts to quantify storage rights or credits with uniform accounting rules adopted by DWR (or jointly by DWR and SWRCB), including clear priority and credit rules for MAR/banking projects and common standards for tracking recharge and stored water in groundwater adjudications (Babbitt et al., 2018; Dlubac et al., 2024).

**5. Procedural relief for small claimants:** To keep proceedings accessible, small farmers and disadvantaged or low-income communities would get procedural relief: Expedited tracks, presumptive exemptions for very low pumping, alternative dispute resolution options, proactive outreach and notice to disadvantaged water users and fee waivers and/or legal-aid support (Hanak et al., 2020).

**6. Funding:** A standing state-local funding mechanism combining GSA assessments, state grants and user fees would support metering, monitoring, watermaster operations and ongoing GSP-court coordination in adjudicated basins (California State Water Resources Control Board, 2023).

*Delta Aerials* Photo Credit: California Department of Water Resources

# Conclusion

Rooted in historical precedent, California's water system is as unique and complex as its geography and people. What is increasingly apparent is that the challenges of the 21st century like climate change and population growth cannot be met with 19th century laws and 20th century infrastructure. Today's climate whiplash, population growth and real-time data expose the limits of paper-era processes: Over-prescribed rights, fragmented records and slow approvals that turn curtailments, transfers and recharge into friction. Trust frays, small users bear higher costs and disadvantaged communities and ecological needs are too often afterthoughts. Modernization isn't a teardown; it means building upon that foundation with practical updates and investments.

Adopting the recommendations presented in this paper would create a system in California that's transparent, accessible, equitable and resilient, with clear decisions, barrier-free collaboration, built-in environmental and community protections, and institutions nimble enough to lead through ever-changing climate, social and regulatory conditions.

# References


Babbitt, C., Dooley, D. M., Hall, M., Moss, R. M., Orth, D. L., & Sawyers, G. W. (2018, 7). Groundwater Pumping Allocations under California's Sustainable Groundwater Management Act [CONSIDERATIONS FOR GROUNDWATER SUSTAINABILITY AGENCIES]. Environmental Defense Fund. https://www.edf.org/sites/default/files/documents/edf_california_sgma_allocations.pdf

California Department of Finance. (2025). Implementation of the Sustainable Groundwater Management Act. https://bcp.dof.ca.gov/2526/FY2526_ORG3940_BCP7809.pdf

California State Water Resources Control Board. (2023, 4 5). Voluntary Water Sharing Program. https://www.waterboards.ca.gov/drought/russian_river/voluntary_program.html

California State Water Resources Control Board. (2024, 10 29). Groundwater recharge. https://www.waterboards.ca.gov/waterrights/water_issues/programs/groundwater-recharge/

California State Water Resources Control Board. (2025, 1). Sustainable Water Management Act & Groundwater Adjudications. https://www.waterboards.ca.gov/laws_regulations/docs/2-26-2025-sgma-booklet.pdf

California State Water Resources Control Board. (2025, 2). Statutory Water Rights Law [And Related California Code Sections (As amended, including Statutes 2024)]. https://www.waterboards.ca.gov/laws_regulations/docs/wrlaws.pdf

California State Water Resources Control Board. (2025, 2 13). Temporary Permits for Groundwater Recharge. https://www.waterboards.ca.gov/waterrights/water_issues/programs/applications/groundwater_recharge/temporary_permits.html

California State Water Resources Control Board. (n.d.). Protest Submittal Information. https://www.waterboards.ca.gov/waterrights/water_issues/programs/applications/docs/protests.pdf

California State Water Resources Control Board. (n.d.). Recharge diversions. https://www.waterboards.ca.gov/waterrights/water_issues/programs/groundwater-recharge/recharge-diversions.html

Choy, J., McGhee, G., & Rohde, M. (2014, 7 31). Recharge: Groundwater's Second Act. Stanford Woods Institute for the Environment. https://waterinthewest.stanford.edu/groundwater/recharge/

Cole, S., Hanak, E., Escriva-Bou, A., Medellín-Azuara, J., & Peterson, C. (2024, 6). Drought and Groundwater Sustainability in California's Farming Regions. Public Policy Institute of California. https://www.ppic.org/wp-content/uploads/policy-brief-drought-and-groundwater-sustainability-in-californias-farming-regions.pdf

Dlubac, K., Bellan, D., Najmus, S., Onsoy, S., Uecker, J., Godwin, T., Nordberg, M., Tung, J., Hull, R., & Springhorn, S. (2024, 9). Recharge Area Identification, Utilization, and Protection Resource Management Strategy [CALIFORNIA WATER PLAN UPDATE 2023]. California Department of Water Resources. https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/California-Water-Plan/Docs/RMS/2025/Recharge-Area-RMS---2025.pdf

Garner, E., McGlothlin, R., Szeptycki, L., Babbitt, C., & Kincaid, V. (2020). The Sustainable Groundwater Management Act and the Common Law of Groundwater Rights—Finding a Consistent Path Forward for Groundwater Allocation. Journal of Environmental Law, 38(2), 163-215. https://www.edf.org/sites/default/files/

documents/01JELP38-2_Garner_etal.pdf

Gray, B., Hanak, E., Frank, R., Howitt, R., Lund, J., Szeptycki, L., Thompson, B., & Jezdimirovic, J. (2015, 11). Allocating California's Water: Directions for Reform. Public Policy Institute of California. https://www.ppic.org/wp-content/uploads/content/pubs/report/R_1115BGR.pdf

Hanak, E. (2018, 5 15). The Yuba Accord: A Model for Water Management. Public Policy Institute of California. https://www.ppic.org/blog/the-yuba-accord-a-model-for-water-management/

Hanak, E., Jezdimirovic, J., Escriva-Bou, A., & Ayres, A. (2020, 5 14). PPIC.ORG/WATER 1 A Review of Groundwater Sustainability Plans in the San Joaquin Valley [Public comments submitted to the California Department of Water Resources]. Public Policy Institute of California. https://www.ppic.org/wp-content/uploads/ppic-review-of-groundwater-sustainability-plans-in-the-san-joaquin-valley.pdf

Harder, J., Gray, B., Grenier, L., Hanak, E., Sencan, G., & Sommer, T. (2025, 3). Implementing Climate-Smart Conservation: Law and Institutions. Public Policy Institute of California. https://www.ppic.org/publication/implementing-climate-smart-conservation/

Hyatt Jr, E. (1925, February). Control of Appropriations in Water in California. Journal of the American Water Works Association, 13(2), 125-144. https://www.jstor.org/stable/pdf/41231715.pdf?addFooter=false

Mount, J., & Gray, B. (2015, 12 14). California's Environment Needs a Water Budget. Public Policy Institute of California. https://www.ppic.org/blog/californias-environment-needs-a-water-budget/

Newsom, G. (2022, August). California's Water Supply Strategy Adapting to a Hotter, Drier Future [Action]. California Water Library. Retrieved October 26, 2025, from https://cawaterlibrary.net/document/californias-water-supply-strategy-adapting-to-a-hotter-drier-future/

Null, S., Mount, J., Gray, B., Dybala, K., Sencan, G., Sturrock, A., Thompson, B., & Zeff, H. (2022, 8). Storing Water for the Environment: Operating Reservoirs to Improve California's Freshwater Ecosystems. Public Policy Institute of California. https://www.ppic.org/publication/storing-water-for-the-environment/

Office of Governor Gavin Newsom. (2023, 3 10). Groundwater recharge executive order. https://www.gov.ca.gov/wp-content/uploads/2023/03/3.10.23-Ground-Water-Recharge.pdf

Russian River Flood Control & Water Conservation Improvement District. (2025). Upper Russian River Voluntary Water Sharing Program. https://www.rrfc.net/upper-russian-river-voluntary-water-sharing-program

Yuba Water Agency. (n.d.). Lower Yuba River Accord. https://www.yubawater.org/157/Lower-Yuba-River-Accord

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2025

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