Assessing Opportunities for SGMA* and CV-SALTS** to Drive Better Outcomes in Water and Sustainable Agriculture

* Sustainable Groundwater Management Act

** Central Valley Salinity Alternatives for Long-Term Sustainability

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Sustainable Conservation

GRIZZLY CORPS

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EXECUTIVE SUMMARY

Water flows through every facet of people's lives, continuously transforming itself through a cycle connected by the air we breathe, the food we eat, and the lands on which we live. A multitude of factors, including climate change and agricultural overpumping, have threatened the groundwater supply and forced the state to take action by mandating two key water management policies: the Sustainable Groundwater Management Act (SGMA) and Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS).

The implementation of these two game-changing water policy efforts will have long-lasting effects on the future of the environment, agriculture, and community drinking water in California's Central Valley. SGMA is pivotal legislation in the California water world, introducing rules concerning groundwater where none previously existed. SGMA responds to long-term overdraft of our groundwater aquifers and requires locally led solutions to manage groundwater sustainably. The Salt and Nitrate Control Programs arising from the CV-SALTS initiative responds to aquifer salt and nitrate contamination and requires dischargers to work together to improve water quality and provide emergency drinking water to residents. These two efforts are ambitious and complex in their own rights, including through the creation of many different sub-regional entities and plans. The complexity increases with the two efforts being implemented simultaneously, including potential duplication of efforts. Yet there is also a huge opportunity for these efforts to support more equitable water outcomes and to encourage holistic water management across policies.

This white paper seeks to address the following research question: "How can findings from SGMA and CV-SALTS activities be integrated to identify and pursue opportunities for improved and more equitable regional-scale climate and water outcomes?" Motivated by the objective to build a more integrated approach to water management, the 2021-2022 GrizzlyCorps fellow at Sustainable Conservation conducted qualitative research at meetings in California Central Valley hydrologic basins covering Eastern San Joaquin, Modesto, Turlock, Merced, Chowchilla, Madera, and Mid-Kaweah. Qualitative data was collected by attending and taking detailed notes at virtual meetings of various water agencies, including Groundwater Sustainability Agencies (GSAs), Nitrate Management Zone (MZ) Committees, the Central Valley Regional Water Quality Control Board, CV-SALTS Executive Committee, and Irrigated Lands Regulatory Program (ILRP). The detailed notes on topics discussed at the meetings were then coded and categorized by three key themes: Community Health, Ecosystem Health, and Agricultural & Economic Health.

Between late September 2021 and early June 2022, the GrizzlyCorps fellow attended and took notes on sixty SGMA and CV-SALTS-related meetings. Groundwater Sustainability Agency meetings represented the large majority (77%) of meetings attended, largely due to

the higher meeting frequency of SGMA-related activities. Overall, the largest number of coded comments were recorded under the Agricultural & Economic Health theme, with 88 entries total. The Community Health theme followed behind with 74 entries, and Ecosystem Health made up the smallest dataset with only 37 entries recorded. Research findings in the white paper highlight common codes discussed during meetings and offer insight on water management trends among SGMA and CV-SALTS stakeholders.

The final section of the white paper outlines areas for continued learning and action, which can be taken by GSAs, NMZs, environmental nonprofits, community groups, or other interests. Though SGMA and CV-SALTS primarily focus on water quantity and water quality, respectively, this document's qualitative research reveals a strong need for increased collaboration across programs. Greater collaboration could elevate community and ecosystem health benefits, whose interests are less readily represented in program activities in comparison to agricultural and economic health interests. GSA ownership of water quality work is critical to achieving integrated water management because GSAs are ultimately responsible for the impacts created by their projects and management actions, including potentially degraded water quality (as described under SGMA's list of undesirable results to be avoided). Groundwater Protection Formulas serve as a useful tool in evaluating agricultural impacts on groundwater quality under CV-SALTS, and there is potential for these formulas to do even more, as described in Table 1.

Table 1: Opportunities & Actions

OPPORTUNITY	ACTION
1. Collaborate across programs	Collaborative water management can help bring multiple stakeholders to the table with varying levels of expertise, engaging environmental nonprofits, environmental justice groups, growers, and regional agencies alike for optimized decision-making.
2. Increase GSA attention to water quality	GSAs can increase their attention to water quality by taking irrigation and nutrient management performance into account for on-farm recharge programs and coordinating data collection with ILRP and NMZs. GSAs can use data from ILRP and NMZs to: a) Encourage responsible recharge GSAs could coordinate with ILRP to cross-check potential recharge projects with unusually high nitrate dischargers, or

	outliers, identified from Irrigation and Nitrogen Management Plan (INMP) Summary Reports. GSAs can exclude outliers identified by ILRP from participation in on-farm recharge programs. This data can also be useful in the prioritization and ranking system of recharge projects. b) Incorporate Groundwater Protection Formulas (GWP) & Central Valley Soil and Water Assessment Tool (CV-SWAT) data into decision-making regarding projects and management actions GSAs could coordinate with NMZs to access concentration estimates from CV-SWAT and use these estimates to calculate water quality risks, recharge site suitability, and project prioritizations. The concentration estimates can also be used to calculate: • the amount of recharge water necessary to avoid degradation or improve groundwater quality and/or • the amount of degradation expected based on the quality of water applied to the basin.
3. Enhance ecosystem health	GSAs and NMZs have the opportunity to integrate ecosystem benefits through management actions that improve ecosystem functions as well as agricultural and economic viability. For example, multi-benefit flood mitigation projects can also enhance recharge to increase groundwater availability during droughts.
4. Prioritize diversity, equity, & inclusion	Beyond offering opportunities for public input, GSAs and NMZs can go a step further by ensuring community concerns are being addressed and fully integrated into the decision-making process. Although public meetings and community outreach are important steps towards furthering Diversity, Equity and Inclusion (DEI) efforts, it is crucial that these voices are considered in decisions as well. Increased funding for NGOs representing community and environmental concerns can also support DEI commitments via continued engagement with GSAs and NMZs.

This document's research findings identified several opportunities for future work. Sustainable Conservation intends to build upon this work with their 2022-2023 GrizzlyCorps fellow, who will continue to draw together findings for better integrated SGMA and CV-SALTS efforts. Environmental nonprofits, environmental justice organizations, and regional agencies can also continue this project's learnings by engaging with recommended next steps. The opportunities and actions are intended to drive more equitable outcomes that integrate water quality and water quantity management techniques. Our present and future water world depends on it.

ACRONYMS

CV-SALTS	Central Valley Salinity Alternatives for Long-Term Sustainability
CV-SWAT	Central Valley Soil and Water Assessment Tool
DEI	diversity, equity, and inclusion
DWR	Department of Water Resources
EAP	Early Action Plan (under CV-SALTS)
EJ	environmental justice
ET	evapotranspiration
Flood-MAR	Flood Managed Aquifer Recharge
GRAT	Groundwater Recharge Assessment Tool
GSA	groundwater sustainability agency
GSP	groundwater sustainability plan
GWP	Groundwater Protection (i.e. GWP Formulas, Values, and Targets)
ILRP	Irrigated Lands Regulatory Program
INMP	Irrigation and Nitrogen Management Plan
ISW	interconnected surface water
NGO	non-governmental organization
NMZ	Nitrate Management Zone
RB5 RWQCB	Central Valley Regional Water Quality Control Board
RCD	Resource Conservation District
SGMA	Sustainable Groundwater Management Act

SECTION 1: BACKGROUND AND CONTEXT

About This Document

Sustainable Conservation helps California thrive by uniting people to solve the toughest challenges facing our land, air, and water. Interdisciplinary work elevates Sustainable Conservation's commitment to fostering a collaborative environment to support the stewardship of California's land and water. Starting in the fall of 2021, Sustainable Conservation furthered this commitment by hosting a GrizzlyCorps fellow (the Fellow) to build organizational capacity in understanding the intersectional topic areas of water quality and water quantity work. The Fellow was tasked with identifying and pursuing opportunities for improved and more equitable regional-scale climate and water outcomes through two key water management policies: the Sustainable Groundwater Management Act (SGMA) and Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS).

GrizzlyCorps is an AmeriCorps fellowship launched in 2020 designed by Project Climate at UC Berkeley's Center for Law, Energy & the Environment in partnership with CaliforniaVolunteers. The program sends recent college graduates into rural communities across California to promote regenerative agri-food systems and fire and forest resilience.

Mikayla Tran (she/her) served as the 2021-2022 GrizzlyCorps fellow with Sustainable Conservation, where she worked to assess opportunities for SGMA and CV-SALTS to drive better outcomes in water and sustainable agriculture.

The implementation of these two game-changing water policy efforts will have long-lasting effects on the future of the environment, agriculture, and community drinking water in California's Central Valley. The San Joaquin Valley is the largest agricultural region in California, and water management is key to solving complex issues concerning the area's lands, people, and ecosystems. Limited water supplies have led to groundwater overdraft in the Valley, where groundwater is pumped at a rate faster than it is replenished. Climate change, droughts, and increased irrigation and water demand all contribute additional stress to the water system. For the San Joaquin Valley, water management is key to support its economy, safeguard public health, and protect its natural environment (Hanak 2019).

Motivated by the objective to better integrate SGMA and CV-SALTS, the Fellow at Sustainable Conservation approached her work with a critical eye geared towards assessing the inclusion of integrated water quality and water quantity discussions in regional meetings. Because the policies operate on different timelines, the Fellow found that SGMA activities

took place much more frequently than those from the CV-SALTS arena. SGMA responds to long-term overdraft of our groundwater aquifers and requires locally led solutions to manage groundwater sustainably. The Salt and Nitrate Control Programs arising from the CV-SALTS initiative responds to aquifer salt and nitrate contamination and requires dischargers to improve water quality and provide emergency drinking water to residents. Due to Sustainable Conservation's ongoing work in nitrogen management on farms and dairies, the Fellow focused her CV-SALTS efforts on the Nitrate Control Program.

Sustainable Groundwater Management Act (SGMA)

The Sustainable Groundwater Management Act (SGMA) responds to long-term overdraft of our groundwater aquifers and requires locally led solutions to manage groundwater sustainably. In September of 2014, California Governor Jerry Brown signed SGMA into law as part of a three-bill legislative package. In establishing a framework for protecting California's groundwater, SGMA outlined six undesirable results to be avoided:

1. Chronic lowering of groundwater levels
2. Reduction of groundwater storage
3. Seawater intrusion
4. Degradation of water quality
5. Land subsidence
6. Depletions of interconnected surface water

SGMA is pivotal legislation in the California water world, introducing rules concerning groundwater where none previously existed. To carry out the requirements set forth by SGMA, groundwater sustainability agencies (GSAs) were formed by local agencies in critically overdrafted, high and medium priority basins. GSAs were tasked with developing groundwater sustainability plans (GSPs) that act as roadmaps for basins to achieve sustainability by 2040 (or 2042*). (Under SGMA, sustainability is defined as avoiding undesirable results and mitigating groundwater overdraft.)

GSAs are regional agencies directly involved in local planning and implementation efforts, requiring coordination with a diverse set of local stakeholders. The Department of Water Resources (DWR) is a state agency tasked with reviewing local GSPs. If a GSP is deemed inadequate by DWR, the GSP is then sent to the California State Water Resources Control Board (Water Board) for review. The Water Board provides back-up enforcement if a GSP fails DWR requirements, as the Water Board has the right to place a GSP under probation and

* 2042 is the deadline for high and medium priority basins that were not designated as critically overdrafted.

potentially develop an interim plan if the local agency actions are not aligned with bringing the basin into compliance.

Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS)

The Salt and Nitrate Control Programs arising from the Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS) initiative responds to salt and nitrate contamination of Central Valley aquifers. The programs require dischargers to either 1) choose an individual permitting approach and work alone or 2) join a local Management Zone and work with others to improve water quality over time and provide immediate drinking water to affected residents. In 2018, the Central Valley Water Board adopted the original Salt and Nitrate Control Program Basin Plan Amendments (No. R5-2018-0034). Effective in 2020, the Nitrate Control Program outlined three goals: 1) Provide safe drinking water supplies; 2) Reduce nitrate impacts to water supplies; and 3) Restore groundwater quality, where reasonable and feasible ("Nitrate" 2022).

CV-SALTS presents a paradigm shift for regulating dischargers in the Central Valley, departing from a traditional regulatory framework by providing dischargers with a 35-year timeframe to develop new technologies to meet nitrate objectives as long as they provide clean drinking water to those with nitrate-contaminated wells. Additionally, dischargers can choose to collaborate and share resources in Management Zones in order to develop collective solutions.

Nitrate pollution is a hard-hitting issue in the San Joaquin Valley, where 95% of communities rely on groundwater as their main source of drinking water ("Groundwater" 2020). In 2018, the State Water Board's Human Right to Water data estimated that roughly 175,000 residents were subject to community water systems out of compliance with drinking water standards, with leading causes of contamination including arsenic and nitrate (Hanak 2019).

As the top milk producer in the U.S., California supports a thriving dairy economy whose cows and dairy facilities are highly concentrated in the San Joaquin Valley. Dairies and manure production contribute to nitrate contamination of groundwater (Parsons 2018). Additionally, more than 5 million acres of irrigated farmland span the San Joaquin Valley (Hanak 2019). Cumulative overapplication of nitrogen fertilizer in these agricultural production systems also contributes to the widespread nitrate contamination in California groundwater (Harter 2012).

Unfortunately, nitrate concentrations in groundwater are likely to worsen before getting better. While nitrate leaching from agriculture is an on-going challenge, most of the nitrate found in wells today is part of a legacy of contamination, sourced from nitrate applied to the

surface decades ago. As such, efforts to reduce excess nitrate leaching today may not impact drinking water quality for years in the future and will not address the entirety of nitrate contamination resulting from agricultural sources over time. Therefore, the CV-SALTS efforts are even more prudent for the sake of generations to come (Harter 2012).

Irrigated Lands Regulatory Program

To gain a better sense of CV-SALTS work and tools focused on water quality, the Fellow incorporated additional engagement with the Irrigated Lands Regulatory Program (ILRP) as well as informational research on ILRP's Groundwater Protection (GWP) Formulas, Values, and Targets into the scope of her work.

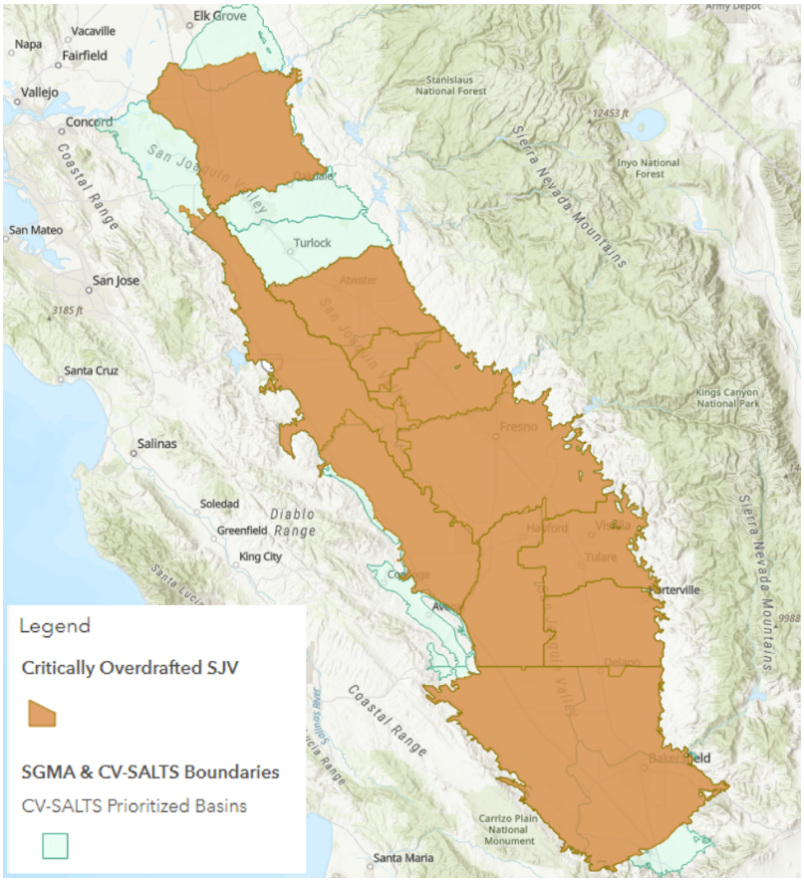
The ILRP's Waste Discharge Requirement General Orders require Central Valley growers to develop GWP Formulas, Targets, and Values. The development of these Formulas is intended to establish target loading rates necessary to achieve water quality compliance. There are three steps in the GWP process: 1) develop the GWP Formulas to define a method for estimating current nitrogen loads to groundwater from agricultural fields; 2) calculate leaching estimates using the formula, resulting in GWP Values; and 3) set GWP Targets, the target loading established by coalitions that will guide groundwater protection strategies moving forward ("Groundwater" 2021).

Part of step two includes developing a root-zone library using the Central Valley Soil and Water Assessment Tool (CV-SWAT). A unique tool for Central Valley crops, CV-SWAT is a physically based hydrological model that simulates water and salt movement through the watershed. CV-SWAT provides a methodological component to GWP Formulas by analyzing data on soil, climate, crops, applied nitrogen, and yield. This is needed for calculating GWP Values, which combines the GWP Formula with grower-reported data to estimate the amount of water and nitrate leaving the root zone ("Minutes" 2022).

The GWP Protection Formulas, Values, and Targets are incredibly valuable for understanding the potential impact of irrigated agriculture on groundwater quality. While conserving water through efficient irrigation methods and management practices is beneficial for water demand reduction, this will also result in less water percolating down through the soil. Thus, the concentration of nitrate at the bottom of the root-zone could increase. With the guidance of GWP Values and Targets, water users and stakeholders will be better prepared to minimize nitrate loading to groundwater ("Groundwater" 2021).

Integrating Policies

Figure 1-1: SGMA and CV-SALTS Boundaries Overlap



SGMA and CV-SALTS are ambitious and complex efforts in their own right, including the creation of many different sub-regional entities and plans. The complexity increases with the two independent efforts being implemented simultaneously and within similar geographies, which increases the potential duplication of efforts (Figure 1-1). Yet there is also a huge opportunity for these efforts to support more equitable water outcomes and to encourage integrated water management.

SECTION 2: METHODOLOGY

Research Question

The GrizzlyCorps fellow aimed to answer the following research question:

"How can findings from SGMA & CV-SALTS activities be integrated to identify and pursue opportunities for improved and more equitable regional-scale climate and water outcomes?"

With this larger question in mind, the Fellow aided in Sustainable Conservation's capacity building through the following tasks:

1. Understand and track local and regional activities related to the Sustainable Groundwater Management Act, primarily through attending and documenting local agency meetings/outcomes and reading supporting documentation such as GSPs.
2. Understand and track local and regional activities related to the CV SALTS Management Zones primarily through attending and documenting local agency meetings/outcomes and reading supporting documentation such as Early Action Plans and Implementation Plans.
3. Integrate findings from the first two tasks to identify and pursue opportunities for improved and more equitable regional-scale climate and water outcomes.

Research Approach

The Fellow conducted qualitative research for the topic at hand, relying on data from first-person observations to better understand the experiences of diverse stakeholders in the water world. The Fellow adopted a deductive approach to the research, wherein themes were developed based on Sustainable Conservation's existing programmatic interests and organizational priorities in water policy decisions. For example, recharge is a programmatic focus of Sustainable Conservation that has been included in several water management discussions by GSAs seeking to increase water supply. Likewise, water and nutrient use efficiency is a programmatic focus relevant to both SGMA and CV-SALTS. Thus, these topics were thematic concepts that the team expected to see reflected in the Fellow's qualitative research. Additionally, the Fellow interpreted the data through thematic analysis, aimed at identifying common themes, ideas, and patterns that emerged repeatedly across the dataset (Caulfield 2019).

Qualitative data was collected by attending and taking detailed notes at virtual meetings of various water agencies, including Groundwater Sustainability Agencies (GSAs), Nitrate

Management Zone (NMZ) Committees, the Central Valley Regional Water Quality Control Board, CV-SALTS Executive Committee, and Irrigated Lands Regulatory Program (ILRP). The geographic scope of these meetings was primarily limited to the California Central Valley groundwater basins covering Eastern San Joaquin, Modesto, Turlock, Merced, Chowchilla, Madera, and Mid-Kaweah.

Themes and Codes

The dataset of qualitative notes was reviewed and organized into codes and themes through a process called coding. Coding involves highlighting sections of text based on corresponding labels or "codes" to describe their content. Themes are broader categories than codes, wherein a group of codes related to a specific topic combine to describe a theme emerging from the data (Braun 2019).

After an initial round of notetaking at a few water agency meetings, the Fellow drafted a codebook to organize the codes into three key themes: Community Health, Ecosystem Health, and Agricultural & Economic Health (Table 2-1). Throughout the Fellow's term at Sustainable Conservation, this codebook remained a living document that was revised based on the content discussed at agency meetings and feedback from the larger Sustainable Conservation team.

The three key themes strongly align with the widely cited "three pillars of sustainability": economic, social, and environmental. Used by government agencies such as the United Nations and the Environmental Protection Agency, the framework of these three sustainability pillars aims to provide an intersectional and balanced approach to sustainability issues and solutions ("Sustainable" EPA; "Sustainability" United Nations). At the same time, the three key themes of Community Health, Ecosystem Health, and Agricultural & Economic Health seek to integrate multi-benefit thinking and the interests of various stakeholders to the complex issue of water management in the Central Valley.

The social sustainability pillar relates most closely with the theme of Community Health, which highlights the importance of human health, environmental justice, outreach and participation, and security of clean drinking water. The theme of Ecosystem Health, similar to environmental sustainability, centers on the health of habitats and ecosystem services in response to stressors placed on the natural environment. Related to the economic pillar of sustainability, the theme of Agricultural & Economic Health prioritizes the security of agricultural jobs, incentives for sustainable management practices, discussion of supply and demand, and a focus on associated costs.

It is important to note that the coding process was dependent on the context in which certain topics were discussed in meetings. Oftentimes, the Fellow aimed to capture attitudes, tones,

and reactions from stakeholders participating in meetings, which were then coded under key themes accordingly. For instance, the topic of recharge was coded under both ecosystem health as well as agricultural & economic health, depending on the context in which recharge was discussed. When recharge was framed as multi-benefit project, the notes were included under the theme of ecosystem health. However, when recharge was discussed primarily as a method to augment water supply, the corresponding notes fell under the theme of agricultural & economic health. While the definition of multi-benefit recharge may vary based on one's perspective, the definition used in this paper considers recharge projects multi-benefit if ecosystem benefits and/or community drinking water benefits are integrated into the recharge goals. Outreach was another code highly dependent on context, as outreach efforts varied in target audiences, from farmers and landowners to domestic drinking water users.

Additional codes were also tracked across agency meetings (Table 2-1). These codes were added to the codebook in a separate section from the three key theme areas due to additional codes' specific purpose for project tracking purposes. For example, the additional codes section includes a code to track instances in which Sustainable Conservation was mentioned during a meeting, in order for the project team to review notes and evaluate organizational impacts in relevant regions. Under additional codes, water quality discussions in SGMA meetings and water quantity discussions in CV-SALTS meetings were also tracked across the dataset. This can help provide a big-picture perspective on integration of priorities across policy and regulatory areas. SGMA meetings typically focus on water quantity, and CV-SALTS prioritizes water quality, so our specialized tracking can help identify opportunities for further integration.

Table 2-1: Codebook for Qualitative Research

THEMES		
COMMUNITY HEALTH	ECOSYSTEM HEALTH	AGRICULTURAL AND ECONOMIC HEALTH
Codes		
Water quality - Safe drinking water - Nutrient management	Multi-benefit approaches	Demand reduction (e.g. fallowing)
Environmental justice	Endangered species	Outreach to growers & landowner input
Well mitigation (domestic) (testing, registration, monitoring)	Soil health practices (cover crops, conservation tillage, compost, nitrogen scavenging)	Costs, prices, & fees

Public benefits	Recharge (multi-benefit)	Recharge (not multi-benefit) (e.g. supply augmentation)
Community input	Impacts of dams	Change of business practices (e.g. trading programs)
Outreach to drinking water users	Groundwater dependent ecosystems	State interference
Engagement with minority communities	Interconnected surface water	Building dams
Flood risk	Climate change	Evapotranspiration (ET) & water allocations
	Irrigation efficiency	Land subsidence
Additional Codes		
Water quality (in SGMA meetings) Water quantity (in CV-SALTS meetings)		
Programmatic opportunities & barriers Sustainable Conservation mentioned		
Collaboration Interpersonal reactions Creative or interesting ideas		

Collecting and Organizing Data

Qualitative research notes from water agency meetings were coded by theme and organized into a centralized spreadsheet categorized by the three key themes. The spreadsheet organized the data with additional information including the name of the agency whose meeting was attended, the date of the meeting, and groundwater basin associated with the agency. This centralized system allowed the Fellow to view the qualitative data from a larger perspective and filter the data by individual variables in order to identify trends across the dataset.

SECTION 3: RESEARCH FINDINGS

Quantitative Meeting Engagement

The Fellow aimed to describe a general narrative of water quality and quantity integration work through qualitative research involving multiple Sustainable Groundwater Management Act (SGMA) and Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS) stakeholders. Between late September 2021 and early June 2022, the Fellow attended and took notes on sixty SGMA and CV-SALTS-related meetings. Groundwater Sustainability Agency (GSA) meetings represented the majority (77%) of meetings attended, largely due to the higher meeting frequency of SGMA-related activities (Figure 3-1).
The Fellow tracked her engagement with each SGMA or CV-SALTS agency throughout the project period and made concerted efforts to contact agency leads when public meeting information was unavailable online. Nonetheless, it is important to note that there were several public meetings that the Fellow was unable to attend and collect data. All meetings attended were held in either a fully virtual or hybrid format due to the ongoing COVID-19 pandemic.

Figure 3-1: Meeting Engagement Totals

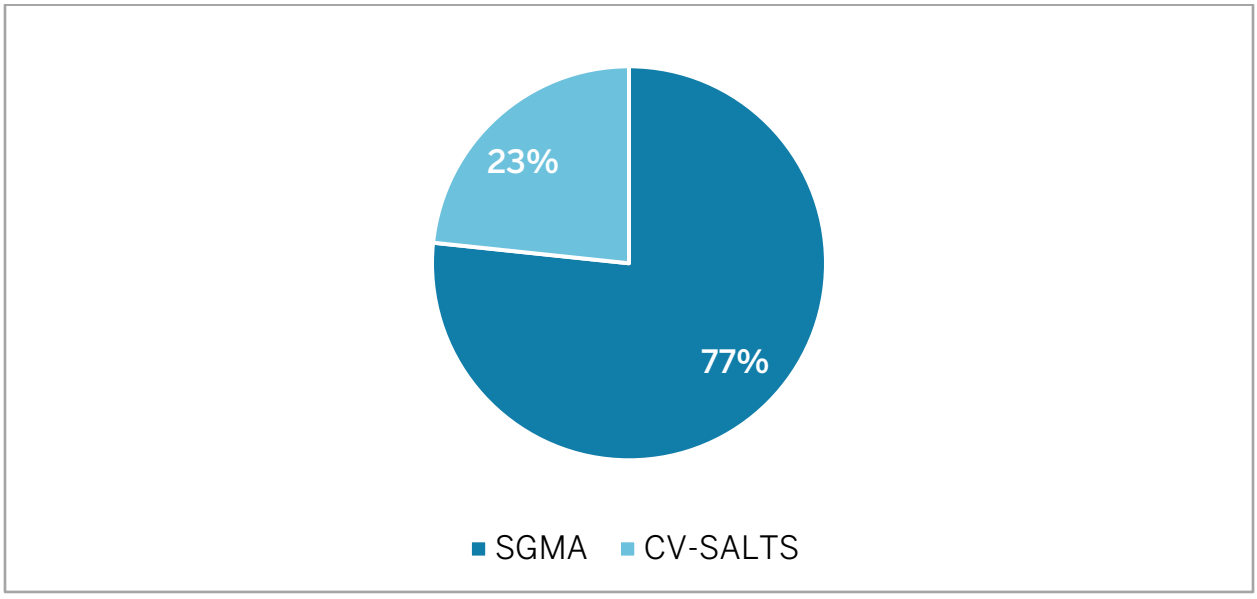
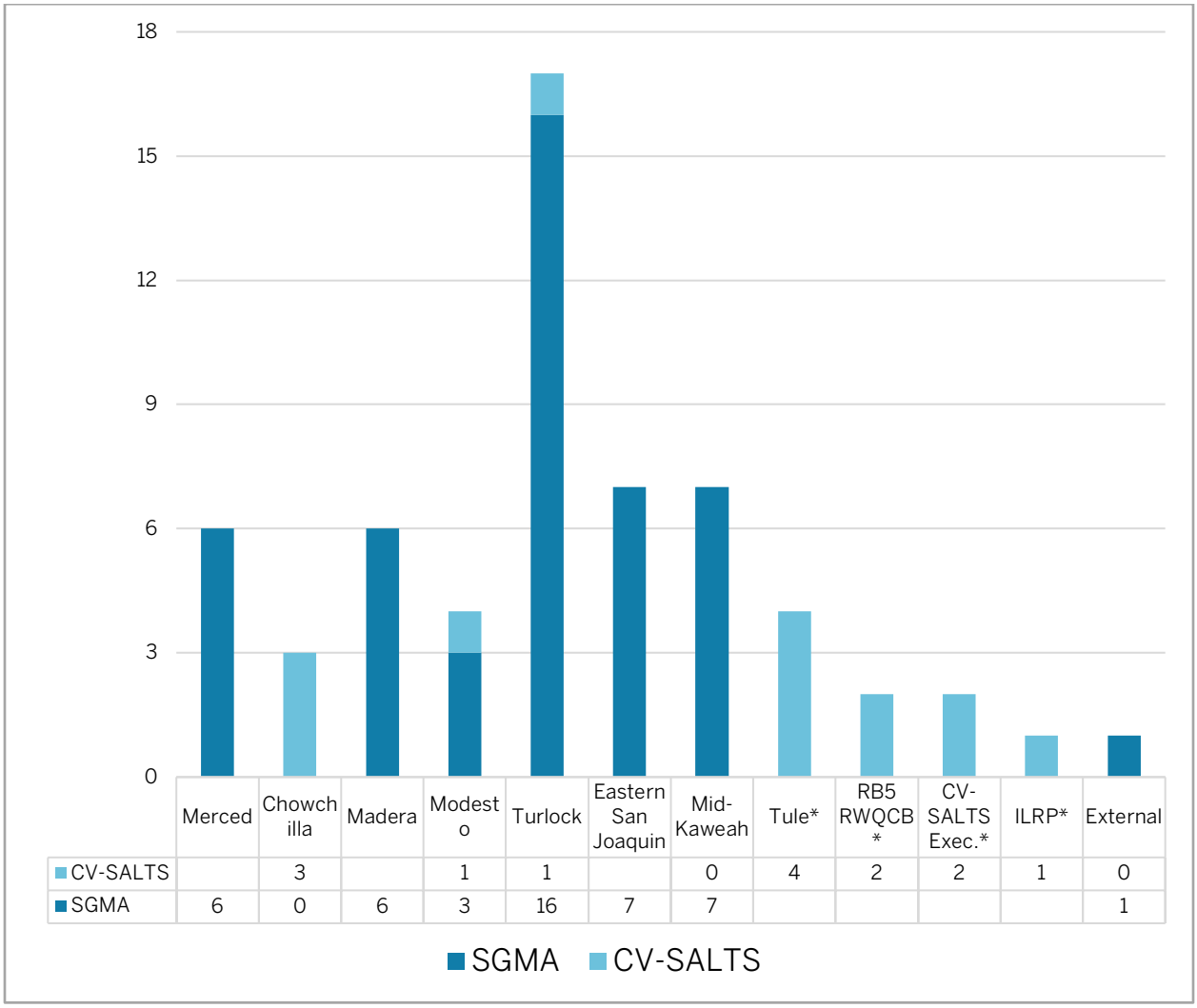


Figure 3-2: Meeting Engagement by Program and Basin



	Merced	Chowchilla	Madera	Modesto	Turlock	Eastern San Joaquin	Mid-Kaweah	Tule*	RB5 RWQCB*	CV-SALTS Exec.*	ILRP*	External
CV-SALTS		3		1	1		0	4	2	2	1	0
SGMA	6	0	6	3	16	7	7					1

*CV-SALTS related agency only

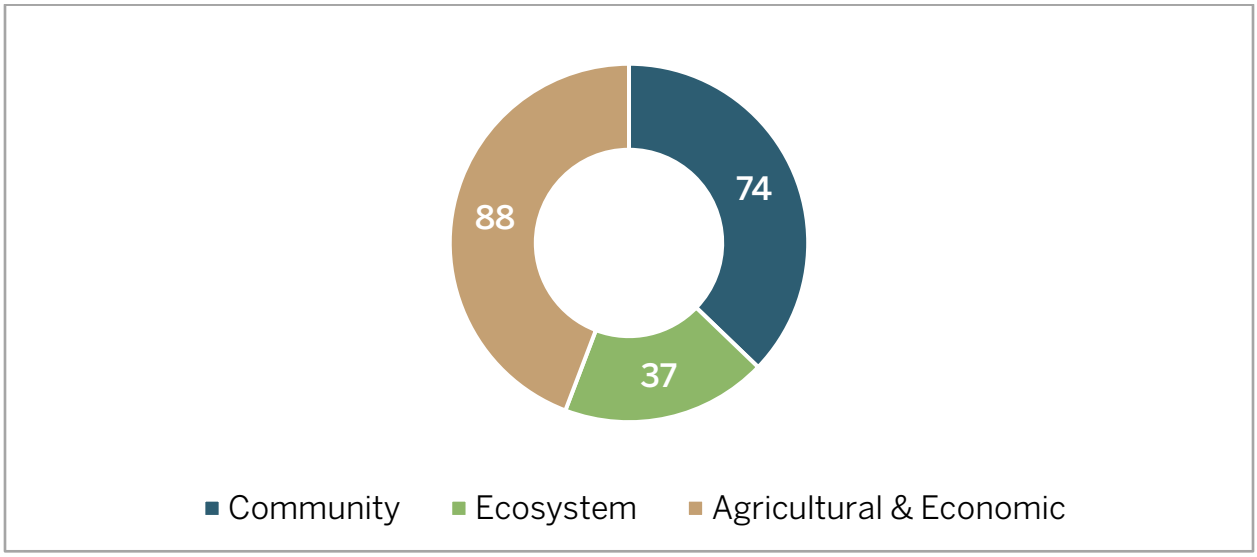
Note: Under CV-SALTS, Modesto and Turlock share Nitrate Management Zone called the Valley Water Collaborative. Quantitative meeting counts for these meetings were divided evenly between the two basins to account for this shared agency structure. In other words, there were two Valley Water Collaborative meetings total, designated in Figure 3-2 as one meeting each for Modesto and Turlock.

In the chart legend, empty spaces represent unapplicable categories. For example, Merced is not currently subject to CV-SALTS regulations, so the legend shows an empty space (Figure 3-2).

Acronyms for Figure 3-2
RB5 RWQCB = Central Valley Regional Water Quality Control Board
CV-SALTS Exec. = CV-SALTS Executive Committee
ILRP = Irrigated Lands Regulatory Program (Stakeholder meetings)
External = Webinar on groundwater management strategies, hosted by Maven's Notebook & the Groundwater Exchange

Qualitative Analysis

Figure 3-3: Entries by Theme

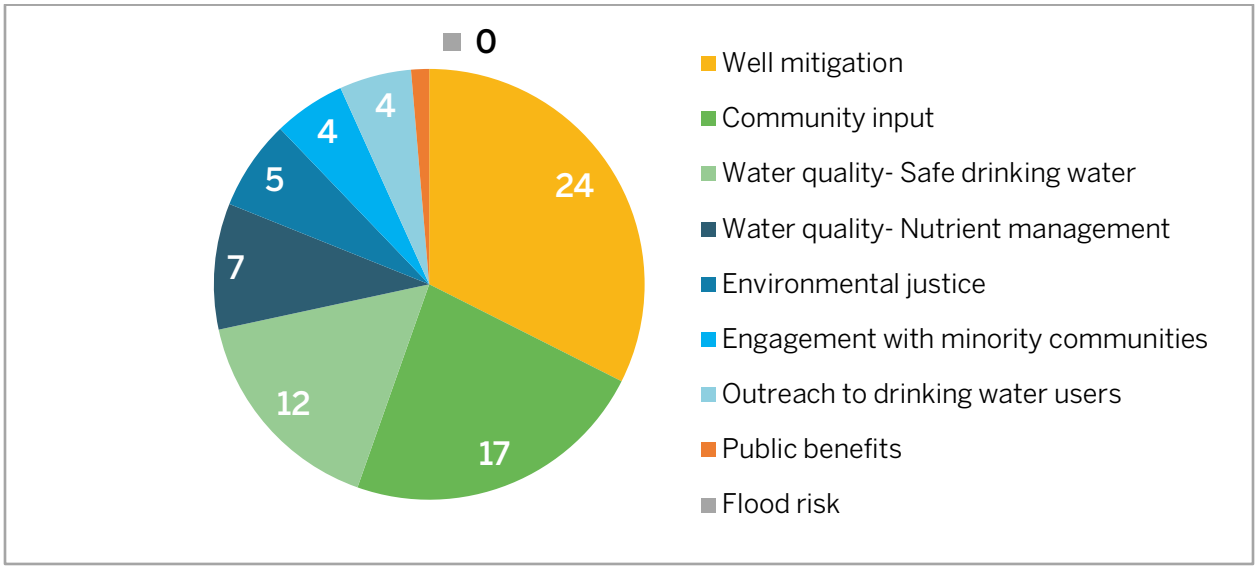


Overall, the largest number of entries were recorded under the Agricultural & Economic Health theme, with 88 entries total (Figure 3-3). (Entries refer to the highlighted text of coded notes that were added to a cumulative spreadsheet.) The Community Health theme followed behind with 74 entries, and Ecosystem Health made up the smallest dataset with only 37 entries recorded. This distribution of entries was an ongoing trend from the start of the qualitative research process, as many meeting participants and committee members involved in SGMA and CV-SALTS include landowners and growers. This demographic aligns well with the interests of Agricultural & Economic Health, thus contributing to the large dataset of entries falling under this theme.

It is notable that the Community Health theme dataset was less than 20 entries behind Agricultural & Economic Health (Figure 3-3). The large number of entries under Community Health could potentially be explained by GSA outreach efforts to local communities and/or targeted engagement by community advocacy organizations, as well as Early Action Plan (EAP)-related activities executed by Nitrate Management Zones to provide safe drinking water to nearby residents.

With less than half the number of entries as Agricultural & Economic Health, the Ecosystem Health theme generated the smallest dataset by far (Figure 3-3). This finding demonstrates the limited attention given to ecosystem services during meeting discussions, which often focused on the utility of natural resources for external economic benefits rather than for the benefit of ecosystems and habitats themselves.

Figure 3-4: Community Health Entries by Code



For Community Health, the most frequently highlighted codes under Community Health were 'Well mitigation,' 'Community input,' and 'Water quality- Safe drinking water,' respectively (Figure 3-4). Other codes listed in Figure 3-4 include: Water quality – Nutrient management; Environmental justice; Engagement with minority communities; Outreach to drinking water users; Public benefits; and Flood risk.

Well mitigation

The 'Well mitigation' code encapsulates the testing, registration, and monitoring of domestic wells- all of which are crucial steps in providing safe drinking water to groundwater dependent communities. In this context, the term 'community' refers to groundwater-dependent residents in impacted GSA or NMZ basins, whose shallow wells are often impacted by overpumping and/or nitrate contamination.

Community input

Entries under 'Community input' varied from public comments made during meetings to survey results of impacted residents. Generally, public comments were either made by local landowners and farmers or by environmental justice (EJ) groups. EJ group representatives demonstrated strong support for GSA well mitigation programs through consistent public comments across subbasins.

The tone of comments shared under 'Community input' entries varied based on the comment speaker, subject matter, and audience. One EJ group often offered comments on specific GSA or NMZ activities through brief advocacy-based points and supporting explanations. At other times, community input consisted of more in-depth back and forth discussion between the commentor and GSA/NMZ committee. These discussions tended to be more debate-like in nature, with vested and passionate comments contributing to a

somewhat tense atmosphere. For example, concerns about nitrate loading targets during an ILRP April meeting demonstrated the contentious nature of water policies when members of the public and organized groups potentially disagree. EJ groups often conveyed concerns on behalf of local communities, as most GSA/NMZ meetings did not have individual community members in attendance. When local community members were in attendance, their comments often reflected personal experiences and urged committee members to act on water issues that have impacted the community for some time.

The anonymity of data was another highly debated topic under Community Health. Public comments during CV-SALTS meetings, and some GSA meetings, raised concerns about the transparency and public accessibility of data used to inform models and policy decisions. Staff responded that committee members are burdened with the desires of growers to keep field-specific data anonymous. Staff have proposed alternatives to verify the accuracy of grower data, but the debate surrounding transparency and public availability of data has not been resolved to this date.

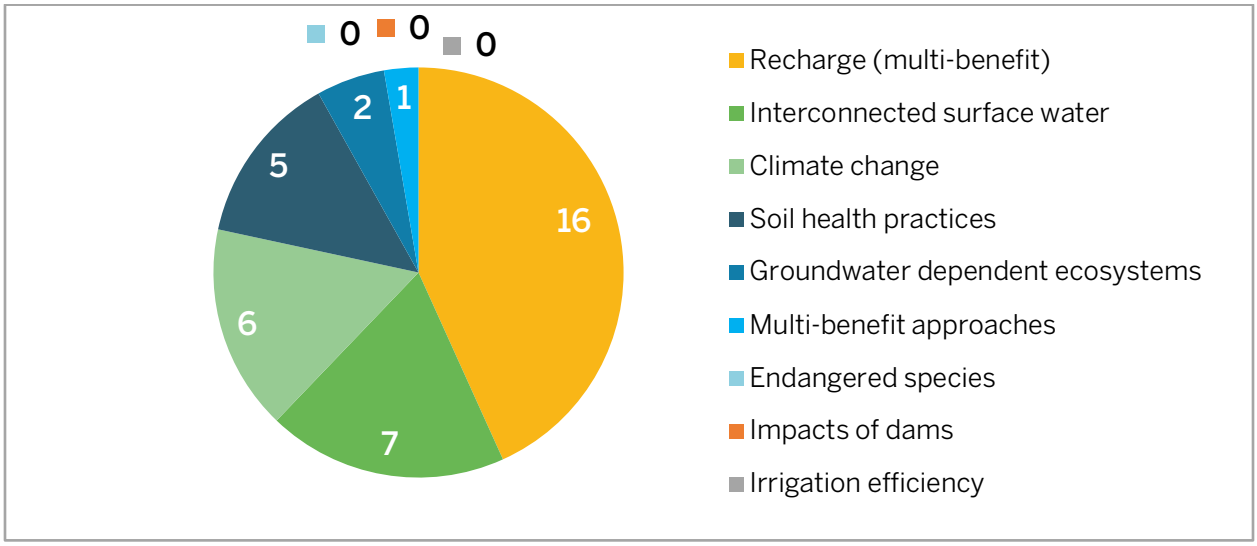
Water quality - Safe drinking water

Two-thirds of the entries under 'Water quality- Safe drinking water' were recorded from CV-SALTS-related meetings such as Nitrate Management Zones and the Irrigated Lands Regulatory Program, while SGMA-related entries compiled only a third. This distribution aligns with the policy direction of CV-SALTS compared to SGMA, as the former is more occupied with the groundwater quality from pollutants rather than balancing supply and demand impacts to groundwater quantity.

GSA meeting comments recounted the emergency drinking water resources offered to the community, including bottled water programs and domestic well assessments. On the CV-SALTS end, NMZs have continued to implement EAP activities through interim emergency drinking water efforts and have worked on plans for long-term drinking water solutions as well. Outreach from both GSAs and NMZs often consisted of informing the community about these safe drinking water programs. From a policy end, ILRP coalitions and NMZs have also discussed pursuing SAFER funding to expand drinking water protections beyond nitrate pollution to address co-contaminants. Lastly, EJ groups consistently centered the subject of safe drinking water in public comments during meetings and aided in water quality testing themselves.

The least frequently highlighted codes for Community Health were 'Flood risk' and 'Public benefits' (Figure 3-4). Public benefits were most commonly discussed in the context of safe drinking water, which can help explain why some entries may have been coded under 'Water quality- Safe drinking water' rather than the broader category of 'Public benefits.' There were no entries for 'Flood risk,' likely due to the timing of the 2021-2022 meetings during a historic California drought.

Figure 3-5: Ecosystem Health Entries by Code



Under Ecosystem Health, the code 'Recharge (multi-benefit)' contributed 16 of the 37 entries for the entire theme (Figure 3-5). The next top codes included 'Interconnected surface water,' 'Climate change,' and 'Soil health practices.' Other codes listed in Chart 3-5 include: Groundwater dependent ecosystems; Multi-benefit approaches; Endangered species; Impacts of dams; and Irrigation efficiency.

Recharge (multi-benefit)

Though the theme of Ecosystem Health is less emphasized across the research dataset, the concept of recharge for water management is popular among several GSAs in the San Joaquin Valley. Although recharge can be discussed narrowly as a means of increasing water supply, entries for multi-benefit recharge under the category of Ecosystem Health incorporated another beneficial element to the projects such as ecosystem enhancement and community benefits.

GSA discussions on multi-benefit recharge were often vague in terms of outlining the desired benefits of multi-benefit recharge projects, but the Fellow was able to code notes sufficiently through context of proposed projects. General sentiments expressed overall conceptual support and a desire for projects to include ecosystem and/or community benefits, illustrating growing interest in multi-benefit recharge projects for basins looking for a path forward to sustainability. A few entries mentioned recharge in the context of Flood Managed Aquifer Recharge (FloodMAR) concepts, floodplain expansion, and ecosystem and habitat benefits. Mentions of multi-benefit recharge in GSA meetings were largely project-oriented, focused on multi-benefit recharge projects and management actions in GSPs (including on-farm recharge) and opportunities for grant funding. From a technical side, GSAs highlighted

resources such as the Groundwater Recharge Assessment Tool (GRAT)[†] to aid in identifying potential recharge projects.

Climate change

Entries under 'Climate change' included discussions on climate resiliency plans, drought conditions, and climate change scenarios for projected hydrology models. These entries highlighted the importance of emergency ordinances for extreme weather and emphasized a common sentiment that ongoing water planning should assume dry conditions, particularly when it comes to predicting future climate change scenarios in management plans.

Interconnected surface water

Interconnected surface water (ISW) was subject to increased discussion following DWR's determination of several Central Valley GSPs as 'incomplete.' A common issue shared among GSPs was the use of groundwater level minimum thresholds and sustainable management criteria as a proxy for interconnected surface water (ISW) levels, but DWR required more in-depth analysis on the specific criteria for ISW and thresholds to support them. In revising their GSPs, GSAs addressed data gaps in their monitoring network for ISW, made plans to install new monitoring wells, and used sustainable yield modeling to help establish minimum thresholds.

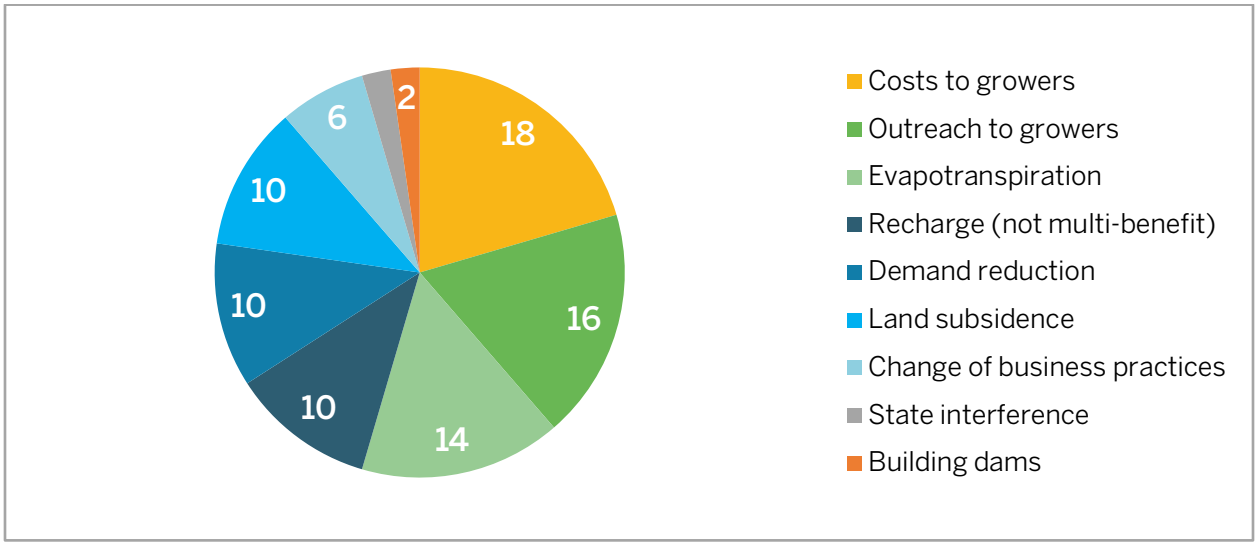
Soil health practices

Soil health was scarcely discussed in GSA or NMZ meetings, with only a few entries entered under this code (Figure 3-5). One Resource Conservation District (RCD) lightly mentioned a potential meeting with GSAs to explore the relationship between healthy soils and recharge projects, as well as a cover cropping for drought resiliency workshop hosted by local RCDs.

Less frequently highlighted codes include 'Multi-benefit approaches' and 'Groundwater dependent ecosystems' (Figure 3-5). Moreover, zero entries were entered under the codes 'Endangered species,' 'Impacts of dams,' and 'Irrigation efficiency.' This finding suggests either a lack of priority for these topics or a lack of relevance to meeting activities. Nevertheless, it is important to note that most GSA and NMZ committee members share agricultural backgrounds rather than environmental, which may impact the representation of interests during meeting discussions. The lack of discussion on 'Endangered species' and 'Groundwater dependent ecosystems' highlights a broad trend across SGMA and CV-SALTS activities in which ecosystem and habitat health are not prioritized in water management decisions.

[†] Decision support tool developed by Sustainable Conservation and The Earth Genome

Figure 3-6: Agricultural and Economic Health Entries by Code



The codes with the most entries under Agricultural & Economic Health were 'Costs to growers,' 'Outreach to growers,' and 'Evapotranspiration' (Figure 3-6). (Note that the term "growers" in this report refers broadly to landowners, farmers, and agricultural water users alike.) Other codes listed in Chart 3-6 include: Recharge (not multi-benefit); Demand reduction; Land subsidence; Change of business practices; State interference; and Building dams.

Costs to growers

'Costs to growers' includes pumping fees, prices, and general restrictions that growers may face with the implementation of SGMA and/or CV-SALTS. Concerns about costs to growers was a recurring trend in meetings, demonstrating a heightened emphasis on grower interests during discussions. Most of these entries were recorded from GSA meetings, likely because GSAs are further into SGMA implementation timelines compared to NMZs working on CV-SALTS. It is important to note that many entries concerned with 'Costs to growers' came from GSA committee members themselves rather than growers offering public comments. Specific concerns include growers' continued ability to use groundwater, as well as potential charges and allocations that may arise as part of demand management strategies. Centering 'Costs to growers' in the planning process itself, some GSAs have also adopted adaptive management and/or phased implementation approaches for SGMA to minimize economic impacts to the agricultural sector.

Outreach to growers

Many outreach efforts were targeted specifically to growers, as growers will ultimately be the ones in charge of implementing regional actions set forth in GSPs. Many GSA meetings expressed the need to scale down language to the local grower level to ease the general fear of restrictions being placed on irrigated agriculture, and committee members often urged consultation with the farming community as the ones who will be 'paying the bill.' Growers

were specifically kept in mind as members of the public who should have opportunities to comment on decisions and plans, and GSAs shared the general sentiment against unduly impacting individuals without their knowledge. ILRP members also targeted outreach to growers by trying to make Groundwater Protection targets as understandable as possible.

Evapotranspiration

Evapotranspiration (ET) was primarily discussed in the context of assessing groundwater pumping, discussing water allocations, and reviewing water budgets during GSA meetings. A common topic among GSAs was the potential benefits and drawbacks of measuring groundwater use with satellite ET data versus traditional meters on groundwater wells, as ET is a relatively newer concept among many GSAs. In terms of data management, GSAs highlighted the ease in gathering consumptive use data via satellite rather than property owners registering individual wells. Additionally, GSA members highlighted the fact that wells and meters require more time and maintenance. ET data was also suggested as a way to verify non-irrigated parcels, especially ones that are unwilling to be metered. Nevertheless, EJ groups expressed concerns about the accuracy of ET models and recommended metering as a primary source of data.

In a notable public comment during one GSA meeting, a local grower expressed support for ET models, as ET had let them identify where they were overpumping and prompted them to change their irrigation practices. Since ET data will potentially be used to measure excess pumping and calculate penalties, GSAs have expressed the desire for good, accurate data that is also cost-effective for the basin.

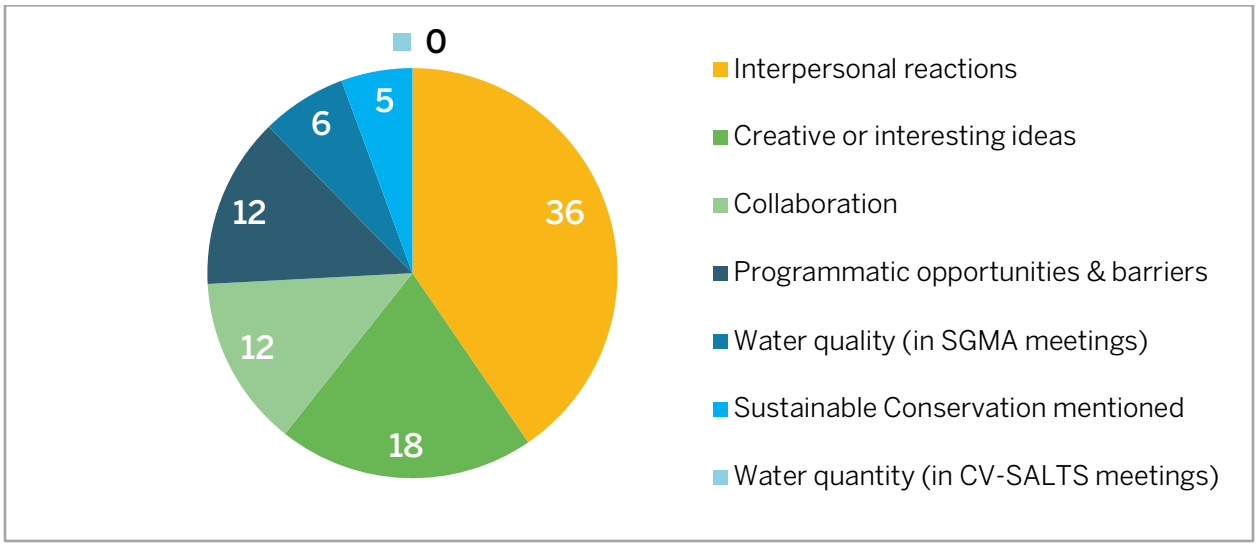
Recharge (not multi-benefit)

An interesting set of findings arose from coding meeting notes for 'Recharge (not multi-benefit).' As reflected in the Ecosystem Health theme as well, recharge is a popular topic for many GSAs looking to meet their mandated sustainability goals (Figure 3-5). The qualitative data shows that discussions around recharge often view the management action as a method to increase water supply in the basin.

These findings align with the general attitude of many GSAs who have repeatedly emphasized their commitment to augmenting water supply before pursuing demand reduction. For other GSAs, recharge is an alternative to demand reduction as evidenced in a meeting slide on subsidence management that stated, "Target pumping reduction (or recharge activities)." In another example, the language on a slide about undesirable results noted the need to "Change pumping levels (or recharge volumes)." For GSAs with surface water supplies, the interchangeable use of recharge activities in parentheses suggests that recharge can be used as another way to increase water supply.

The codes with the least number of entries included 'Building dams,' 'State interference,' and 'Change of business practices' (Figure 3-6). Similar to the dam-related code under Ecosystem Health, the topic of dams were either considered irrelevant to GSA and NMZ meetings or not afforded attention. Many entries related to the code 'State interference' were entered under the Additional Codes category of 'Interpersonal reactions' instead, which was better suited to capture the stakeholder attitudes around the desire to maintain regional control and fear of state interference. The limited number of entries under 'Change of business practices' could reflect a general sentiment against changing the status quo, as SGMA and CV-SALTS are both potentially hugely impactful policies creating groundwater regulations where few previously existed.

Figure 3-7: "Additional Codes" Entries by Code



Disclaimer: The "Additional Codes" category is largely subjective based on the Fellow's understanding and interpretation of what was said during meetings.

Interpersonal reactions

The Additional Codes category amassed 89 entries total, with the code 'Interpersonal reactions' contributing the largest number of entries (Figure 3-7). Under this code, the Fellow sought to capture stakeholder attitudes, reactions, and perspectives through qualitative notetaking. Though some of these entries relate to previous categories, the code focused on comments that reflected reactions to other stakeholders or related agencies. Most entries were recorded from GSA meetings, and common themes reflected members' reactions to DWR's GSP determinations, thoughts on the scope of SGMA, and dialogue weighing agricultural interests with ecosystem and/or community benefits.

Reacting to DWR's determination of their GSP as incomplete, one GSA noted that most of DWR's comments were concerned with how the GSA set minimum thresholds and objectives to be protective of drinking water, beneficial uses, and water quality. In meeting discussions, some people expressed the sentiment that some DWR's comments exceeded the SGMA statute and were potentially ill-informed.

Under another set of interpersonal reactions, GSA members dealt with disagreements between stakeholders and GSA committees working in the same basin, with frustrations ranging from GSA costs to water accounting products. Decision-making processes involving diverse stakeholders usually prompted more interpersonal reactions and dialogue, such as a notable conversation from a GSA where several public comments debated the responsibility and culpability of agricultural lands versus cities in reducing water demand.

Entries under this code were occasionally positive in tone, as exemplified by the eagerness of some GSA growers to better understand pumping emergency ordinances and willingness to adapt.

Creative or interesting ideas

A wide range of entries coded as 'Creative or interesting ideas' reflected best practices for community engagement, innovative data management options, and tips for communicating with growers. A handful of examples of entries under this code are listed in Table 3-1.

Table 3-1: Example Entries for 'Creative or interesting ideas'

SUBJECT AREA	EXAMPLES OF 'CREATIVE OR INTERESTING IDEAS'
Outreach	Visually communicate nitrate conditions in the MZ to the public
	Local presentations, giving people graphics and a page of talking points when talking with others in the area; go to their meetings rather than them coming to ours Newsletter to invite people to our meetings & meet people in smaller groups for better conversation
	Outreach to growers may be helpful since growers may need help considering factors / making decisions in shifting from groundwater to surface water Recharge program is great because it'll get a lot of growers involved, and our current systems will work for it
Data management	EDF's open source water management platform

	GSAs will need to communicate with pumpers, each will need to be able to see what role their pumping/management is playing Easy, clear interface so individual users can track their water decisions, and where groundwater managers can understand individual components and communicate back and forth to share how management decisions are impacting users
	Growers can request their own field reports rather than relying on averages Farm managers must provide written consent from landowners to access data
	Encourage GSA to start doing something to prevent & protect wells even when we don't have all the accurate data (as this will take a while)

Programmatic opportunities and barriers

Complementing this inventory of creative ideas, entries under 'Programmatic opportunities and barriers' reveal potential areas where Sustainable Conservation and others can amplify program work and where potential conflicts may pose barriers to engagement. For example, a regional meeting floated the idea of creating a best practice management list specifically for growers interested in recharge, which aligns well with Sustainable Conservation's water quality work on recharge. Other opportunities included Sustainable Conservation's GRAT-related work, which was mentioned in several GSA meetings. General challenges and potential conflicts include items such as implementation schedules of projects in development, uncertainty for GSA project funding, and the hyper-local nature of water work in each groundwater basin.

Collaboration

Pivoting to external relationships, the 'Collaboration' code demonstrates potential areas of collaboration between regional water agencies and local environmental justice groups, as well as between GSAs and CV-SALTS agencies such as NMZs or ILRP. This code had 12 entries total, with the majority sourced from NMZ and CV-SALTS Executive Committee meetings (Figure 3-7). Some of these entries came from EJ representatives themselves who highlighted the value in connecting regulatory programs with EJ programs for support with community services, while other entries discussed opportunities for more efficient data reporting across NMZs and ILRP. Most entries recorded during GSA meetings focused on inter-basin collaborative efforts or efforts across neighboring GSAs. The lack of discussion on direct collaboration between SGMA and CV-SALTS agencies reveals ample opportunity for increased collaboration between programs.

Water quality (in SGMA meetings) & Water quantity (in CV-SALTS meetings)
While six entries were coded under ‘Water quality (in SGMA meetings)’, zero entries were entered under ‘Water quantity (in CV-SALTS meetings)’ (Figure 3-7). Half of the entries under ‘Water quality (in SGMA meetings)’ referenced water quality data for the annual Water Year Report, while other entries mentioned water quality monitoring sites or nitrate analysis. The lack of entries recorded under ‘Water quantity (in CV-SALTS meetings)’ is likely due to the limited number of NMZ meetings the Fellow was able to attend, thus resulting in little data to code. CV-SALTS is also earlier in its policy implementation stage than SGMA, with most CV-SALTS discussions focused on Early Action Plans for safe drinking water requirements rather than water quantity considerations.

DISCUSSION

The following discussion unpacks the qualitative research findings through in-depth analysis on the main codes identified under each theme. The Fellow's insights offer a subjective analysis that contextualizes the significance of these findings and their potential consequences. The discussion is structured under the three pillars of sustainability framework in order to align the analysis with the research objective of identifying areas of opportunity for integrated water management across SGMA and CV-SALTS.

Community Health

Community input

The repeated nature of advocacy-based public comments from EJ representatives to the same agency suggests that their comments may have not been sufficiently addressed or acted upon by the local agencies. However, it is important to note that the Fellow's research was unable to determine which public comments were incorporated into decision-making processes. Since EJ groups such often convey the concerns of community members unable to attend meetings, this finding may illustrate the need to support the continued funding of NGOs that represent EJ and community concerns.

Water quality- Safe drinking water

The high number of 'Water quality- Safe drinking water' entries sourced from CV-SALTS was largely anticipated due to the nature of CV-SALTS work with nitrate contaminants. The lack of this code's entries under GSA meetings demonstrates substantial room for improvement for better integration of water quality-water quantity work into GSPs. SGMA addresses some water quality concerns through the six undesirable results that the program intends to avoid, yet the lack of robust GSA discussion on water quality suggests that GSAs have taken less ownership of water quality issues compared to topics of water quantity. This lack of ownership may be partly due to the impression that ILRP and NMZs are the regulatory mechanisms solely responsible for water quality issues, rather than GSAs.

The disconnect across program areas on water quality-water quantity work raises concerns about the policies' directions on environmental justice. Based on the research findings, GSA activities were geared towards water quantity work without substantial discussion on potential water quality impacts due to GSA management actions. This raises concern for the successful implementation of SGMA, as water quality and quantity are inextricably tied components of water management work. This gap in oversight can potentially place disadvantaged communities at higher risk of contaminated wells and lowering groundwater levels that inhibit their human right to water. In a telling impacted stakeholder survey conducted by one Management Zone, as of May 2022, responses from 52 individuals

revealed that the average miles traveled for bottled water was 12 miles and the average amount bought was 24 gallons, or 8 cases, per month. These responses help convey the socioeconomic burden of individuals impacted by lowering groundwater levels and contamination.

Ecosystem Health

Recharge (multi-benefit)

Though the general sentiment and interest around multi-benefit recharge is promising, conversations about recharge often lacked specificity on how projects were achieving multiple benefits. Environmental NGOs such as Sustainable Conservation can build on the interest around recharge and guide GSAs/NMZs towards a pathway that is considerate of both ecosystem and community needs. This multi-benefit recharge work represents an area of opportunity for environmental NGOs to help GSAs build a better understanding of ecosystem benefits as well. (See this link for an example of potential outreach materials: https://www.edf.org/sites/default/files/Groundwater-recharge-guidelines-checklist_07-spreads.pdf).

Interconnected surface water

The Fellow was unsurprised by the increase of interconnected surface water (ISW) entries following the DWR determinations of incomplete GSPs, as ISW was a common problem area in many DWR comment letters. The elevated discussion of ISW following DWR determinations potentially illustrates the importance and value of DWR's oversight and review of GSPs, as many GSAs were subsequently compelled to better monitor and assess ISW conditions in their basins as a result.

Soil health practices

The Fellow found the lack of substantial group discussion on soil health practices to be disappointing, given the importance of healthy soils for effective water management of groundwater basins. Moreover, the lack of soil health entries from CV-SALTS meetings was quite surprising, since nutrient management work often intersects with soil health practices as well. However, the limited number of soil entries may be due to the early stages of implementation in which CV-SALTS is still engaged and focused on providing well testing and water supplies. The Fellow would expect greater emphasis on soil health practices as CV-SALTS meeting discussions turn to specific projects and management actions for their Management Zone Implementation Plans.

Agricultural and Economic Health

Costs to growers

The emphasis on 'Costs to growers,' combined with a lack of discussion about existing and future costs to communities dependent on groundwater, suggests that some interests are better represented than others in SGMA and CV-SALTS activities. The finding that many of this code's entries came from GSA committee members themselves rather than public comment further demonstrates how grower interests are fully integrated into the planning and decision-making processes of regional activities. Growers are not only affected by GSA decisions—their actions will determine the success of SGMA, and there is a cost to implementing those actions for the benefit of all.

Outreach to growers

Under this code, GSAs and NMZs prioritized outreach for growers as the main impacted audience of groundwater issues. The large amount of attention and consideration given to "dulling the edge" for growers as the ones who will have to "pay the fees" and continue to operate in uncertain conditions illustrates the ways in which financial and economic impacts for growers are given weight and importance. This is particularly revealing when compared to the lack of discussion of outreach to ecosystem stakeholders, since ecosystems will continue to face increasing challenges under the current groundwater conditions.

Recharge (not multi-benefit)

The narrow framing of recharge as "supply augmentation" reflects the GSA focus on addressing water supply. For the Central Valley groundwater basins researched in this document, recharge can in fact partially substitute for demand reduction, but it is not a "silver bullet," and most local agencies will also have to lower pumping demand from the agricultural sector. Managing recharge for a single purpose also carries the risk of ignoring its water quality and ecosystem impacts. Multi-benefit recharge projects can instead help GSAs meet their sustainability goals and the avoidance of SGMA undesirable effects.

Note: Although CV-SALTS meetings did not mention recharge based on the Fellow's qualitative data, the Fellow knows contextually that recharge work is being considered by NMZs and ILRP coalitions. Rather than pursuing recharge to address past leaching and improve aquifer conditions, NMZs and ILRP coalitions may be looking to recharge as a way to offset ongoing discharges. This is an area of work that agencies and NGOs such as Sustainable Conservation should monitor, as trying to use recharge to offset ongoing discharges while also flushing historic nutrient loads may not be simultaneously feasible and could further degrade groundwater quality.

OPPORTUNITIES AND UPCOMING MILESTONES

Bridge to Opportunities

The original research question guiding this document aimed to integrate findings from the Sustainable Groundwater Management Act (SGMA) and Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS) activities to identify and pursue opportunities for improved and more equitable regional-scale climate and water outcomes. The qualitative research discussion reveals potential areas of improvement to advance integrated water management efforts. The following paragraphs offer a conceptual "bridge" from the findings discussion to the opportunities and actions in Table 5-1.

A major theme across the qualitative research findings and subsequent discussion was the crucial importance of collaboration across SGMA and CV-SALTS programs. Though SGMA and CV-SALTS primarily focus on water quantity and water quality, respectively, this qualitative research reveals a strong need for increased collaboration across programs. Greater collaboration could elevate community and ecosystem health benefits, whose interests are less readily represented in program activities in comparison to agricultural and economic health interests. Program efforts could engage outside of their silos to bridge the gaps between these sustainability pillars and provide integrated water management.

GSA ownership of water quality work is critical to achieving integrated water management. GSAs are responsible for the impacts created by their projects and management actions, including potentially degraded water quality (as described under SGMA's list of undesirable results to be avoided). Groundwater Protection Formulas serve as a useful tool in evaluating agricultural impacts on groundwater quality under CV-SALTS, and there is potential for these formulas to do even more. With increased coordination between programs, GWP Formulas can be applied towards water quality considerations of recharge projects and help both SGMA and CV-SALTS protect and/or improve drinking water for local communities.

Additionally, parties responsible for implementing SGMA and CV-SALTS could merge data on the concentration of contaminants and the amount of water applied to the fields in order to improve groundwater modeling.

GSAs can also play a critical role in vetting groundwater recharge projects for potential impacts to water quality. Soil records and information on parcels with excessive nitrogen use could provide a clearer picture of recharge suitability as one of the criteria for participation in GSA on-farm recharge programs. Thus, GSAs can better integrate water quality considerations into SGMA work by encouraging responsible recharge.

Ecosystem health is pivotal to the longevity of agricultural and economic health, but the two are often discussed as if they were in opposition with one another. The significant lack of ecosystem-related entries in this qualitative research demonstrates the potential for growth in this topic area. Measures to improve ecosystem health such as multi-benefit recharge and soil health practices are favorable starting points for shared objectives.

Lastly, the principles of diversity, equity, and inclusion (DEI) could be better prioritized to ensure that all stakeholders, regardless of economic or official standing, can be well-represented in water management decisions. Outreach by local agencies such as GSAs and NMZs and environmental nonprofits all have a role to play in centering DEI in their work. Decreased water supplies will impact small, disadvantaged, and minority communities and farmers most deeply, creating the need for increased resources and funding for these communities. Based on this document's research, agricultural workers and tribal representatives were unable to participate in daytime GSA and NMZ meetings, revealing just one example of how difficult it can be for community members to engage in these processes. As discussed under the Community Health theme, NGOs representing community and environmental interests can help elevate DEI principles in SGMA and CV-SALTS proceedings.

Opportunities and Actions

This document's research findings generated several avenues for opportunities and future work. Sustainable Conservation intends to build upon this work with their 2022-2023 GrizzlyCorps fellow, who will continue to draw together findings for better integrated SGMA and CV-SALTS efforts. Environmental nonprofits, environmental justice organizations, and regional agencies can also continue this project's learnings by engaging with recommended next steps.

The opportunities and actions listed in Table 5-1 are intended to drive more equitable outcomes that integrate water quality and water quantity management techniques. Our present and future water world depends on it.

Table 5-1: Opportunities and Actions

OPPORTUNITY	ACTION
1. Collaborate across programs	Collaborative water management can help bring multiple stakeholders to the table with varying levels of expertise, engaging environmental nonprofits, environmental justice groups, growers, and regional agencies alike for optimized decision-making.

2. Increase GSA attention to water quality	GSAs can increase their attention to water quality by taking irrigation and nutrient management performance into account for on-farm recharge programs and coordinating data collection with ILRP and NMZs. GSAs can use data from ILRP and NMZs to: a) Encourage responsible recharge GSAs could coordinate with ILRP to cross-check potential recharge projects with unusually high nitrate dischargers, or outliers, identified from Irrigation and Nitrogen Management Plan (INMP) Summary Reports. GSAs can exclude outliers identified by ILRP from participation in on-farm recharge programs. This data can also be useful in the prioritization and ranking system of recharge projects. b) Incorporate Groundwater Protection Formulas (GWP) & Central Valley Soil and Water Assessment Tool (CV-SWAT) data into decision-making regarding projects and management actions GSAs could coordinate with NMZs to access concentration estimates from CV-SWAT and use these estimates to calculate water quality risks, site suitability, and project prioritizations. The concentration estimates can also be used to calculate: • the amount of recharge water necessary to avoid degradation or improve groundwater quality and/or • the amount of degradation expected based on the quality of water applied to the basin.
3. Enhance ecosystem health	GSAs and NMZs have the opportunity to integrate ecosystem benefits through management actions that improve ecosystem functions as well as agricultural and economic viability. For example, multi-benefit flood mitigation projects can also enhance recharge for groundwater availability during droughts.
4. Prioritize diversity, equity, and inclusion	Beyond offering opportunities for public input, GSAs and NMZs can go a step further by ensuring concerns are being addressed and fully integrated into the decision-making process. Although public meetings and community outreach are important steps

	towards furthering DEI efforts, it is crucial that these voices are considered in decisions as well. Increased funding for NGOs representing community and environmental concerns can also support DEI commitments via continued engagement with GSAs and NMZs.

Upcoming Milestones

Interested parties and the next GrizzlyCorps fellow at Sustainable Conservation should take note of the following milestones coming soon from SGMA and CV-SALTS implementation timelines. Continued discussions at local agency meetings and plans available to the public can provide insight into the direction of the two water policies and allow the GrizzlyCorps fellow to make determinations on which action items of opportunity should be taken.

- SGMA: Groundwater Sustainability Plans – Resubmittals for incomplete GSPs due no later than July 27, 2022
    - Following the GSP resubmittal: DWR will host a public comment period for consideration in its reevaluation and reassessment
- CV-SALTS: Final Management Zone Plans – Due end of August 2022
- CV-SALTS: Management Zone Implementation Plans – Estimated progress in Q2 or Q3 2023
    - Management Zone Implementation Plans are due 6 months after Regional Board approves the FMZP

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