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**THE SUSTAINABLE GROUNDWATER MANAGEMENT ACT (SGMA):
LONG OVERDUE, BUT IS IT LIVING UP TO ITS POTENTIAL?**

by
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**SUBMITTED TO SCRIPPS COLLEGE IN PARTIAL FULFILLMENT
OF THE DEGREE OF BACHELOR ARTS**

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PROFESSOR MARYAN SOLIMAN**

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ABSTRACT:

This thesis discusses the Sustainable Groundwater Management Act (SGMA), California's first statewide groundwater regulatory legislation. The act established the formation of groundwater basins and local governing bodies called Groundwater Sustainability Agencies (GSAs) which are tasked with creating Groundwater Sustainability Plans (GSPs). More specifically, this thesis examines how the structure of GSAs affects stakeholder accessibility, community engagement, and transparency. Through a collection of four interviews as well as the use of primary and secondary sources, this paper will explore the potential, and the ultimate shortcomings of SGMA's transparency, particularly in ensuring clean, safe water to historically disenfranchised communities. Using Kern and Santa Cruz Mid-County Basins as case studies, this thesis explores the diversity of groundwater struggles across the state, the importance of GSA accessibility, and valuable strategies for ensuring accessibility. The differences between these two case studies explain the difficulty of statewide groundwater regulation and the potential for the local control design structure central to SGMA legislation. However, it seems that the complex governing structure of Kern is one of the factors limiting the engagement of particular stakeholders. Additionally, the paper will provide recommendations from the community outreach methods found in Santa Cruz Mid-County to be applied at a larger scale in Kern Basin. Transparency and accessibility in any governmental decision-making process are important but particularly in one which may determine the long-term water safety and access to communities across the state.

Key words: Groundwater, Sustainability, Transparency, Kern, Santa Cruz Mid-County

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INTRODUCTION:

Water has always been a particularly contentious resource in California, and recently groundwater has become more valued than ever before. Many communities across the state have become increasingly reliant on this natural resource due to irregular rain patterns associated with climate change. In response, the state has finally implemented its first mandatory statewide groundwater legislation. The Sustainable Groundwater Management Act was passed in 2014, which is astonishingly late for water legislation in California. California has been allocating, legislating, relegating, and regulating water since before its statehood. Many California government leaders love to evoke the quote “Whiskey is for drinking; water is for fighting over” (Doyle 2011). During my academic career I have taken a number of classes which touch on water issues in the United States, two of which specifically relate to California water policy. The more I learned, the more confused I became. How had groundwater slipped below the radar, both metaphorically and literally?

It seemed that every lake, river, delta, stream, even every rain drop, was accounted for. If a river did not exist, the Californian Government created one; if a lake was too far from a city, they moved it. California possessed a near obsessive drive to control, manage and quantify the water across the state. But through all of this, somehow, the moment water percolated into the earth it became invisible to the state. If you owned land above an aquifer, you owned rights to that aquifer and that was that. People were not required to report how much water they pumped, to register that they had dug a well, and nobody was monitoring how much water aquifers were able to hold, let alone how much water was in them. In a few areas across the state, mostly in Southern California where water has always been scarcer, communities opted to adjudicate their own groundwater. This usually resulted from individual legal action due to a water dispute.

However, the State itself never implemented any statewide regulation concerning groundwater like it had for surface water. Perhaps the omission came from the language of the Clean Water Act (1972) that the water it protected was exclusively “navigable waterways”, or perhaps it was because groundwater does not provide the aesthetic beauty or recreational potential of its surface self. Whatever the reason may be, the most recent severe drought in California history between 2012 and 2016, made clear the dire state of aquifers across California. Contamination from soil, industry, and saltwater had severely affected groundwater. Many basins had begun to run dry; the land was sinking into the now empty pockets left in the earth, and people began to ask, ‘how did this happen?’

This was the moment when the California Government had the opportunity to design a completely new system of groundwater management; one which would address the historic marginalization and inequity in statewide water access. The state recognizes small Disadvantaged Communities (DACs) as communities with less than 10,000 people and where the average Median Household Income (MHI) is less than 80% of the state’s average (Dobbin 2018). Small water systems are vulnerable to inadequate regulatory protection, and to uneven monitoring and reporting (Committee on Small Water Systems 1997). Unfortunately, SGMA seems to have fallen short in terms of the protection of these communities. The majority of DACs are not participating in GSAs despite the fact that SGMA specifically mentions their involvement as a priority (UC Davis 2018).

A local control design with state level oversight is the most rational management model for water in California. This allows for local considerations of hydrology, culture, demographics etc. that are remarkably diverse across this massive state, while still providing protections to prevent inequity at the local level. However, because the act relies so heavily on local control it

has neglected many important aspects of oversight. Each basin is able to create as many Groundwater Sustainability Agencies as members see fit, with some basins opting to construct GSA structures that are complex, disjointed, inaccessible and oftentimes contradictory to the goal of sustainability.

When researching Kern Basin, it took me days to understand how many GSAs there were. Many websites reported different numbers ranging from three to 13. Ultimately, I reached out to Dobbin who provided me with the DWR most up to date list of GSAs. However, some GSAs formed their own agency but are listed as a member of another because they are collaborating to create a GSP together. Looking at Figure 1, the map shows 21 agencies when Kern actually has 11 GSAs. Many of the agencies listed are members of the Kern Groundwater Authority (KGA) and a few are members of the Kern River Groundwater Sustainability Agency (KRGSA). It is profoundly important that community members are able to understand who is responsible for their water and this governmental design seems to actively work against that.

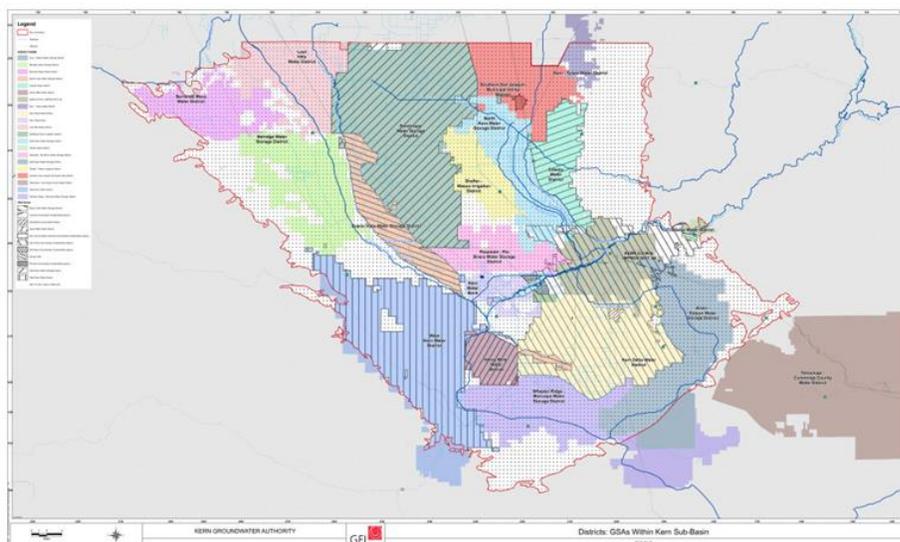


Figure 1. Map of Kern GSAs (Kern Groundwater Authority 2018).

The allowance of multi-GSA management has provided an arena for the preservation of the status quo, the powerful stayed in power and are now legally given the right

to manage groundwater in the basin. This thesis compares the exclusionary nature of the

complex GSA structure found in Kern County with the more successful community engagement model found in the single GSA of Santa Cruz Mid-County. Utilizing a series of primary and secondary sources, including four loosely formatted interviews with experts in the field, this thesis explores the potential and ultimate shortcomings of SGMA. Additionally, it provides analysis and recommendations as to how historically marginalized communities can be better represented throughout this process.

CHAPTER 1- BACKGROUND:

GROUNDWATER AND RIGHTS TO GROUNDWATER:

Groundwater is water that fills porous spaces between sediment or fissures in rocks (National Geographic Society 2019). Rocks and sediment have different levels of porosity and permeability, meaning that water does not move around the same way in all rocks below ground (United States Geological Service 2018). When water-bearing rock readily transmits water to wells and springs it is called an aquifer (United States Geological Service 2018). Aquifers can be confined or unconfined. Layers of impermeable material above and below the aquifer create a pressurized confined aquifer (United States Geological Service n.d.). A confined aquifer is an

Aquifers and wells

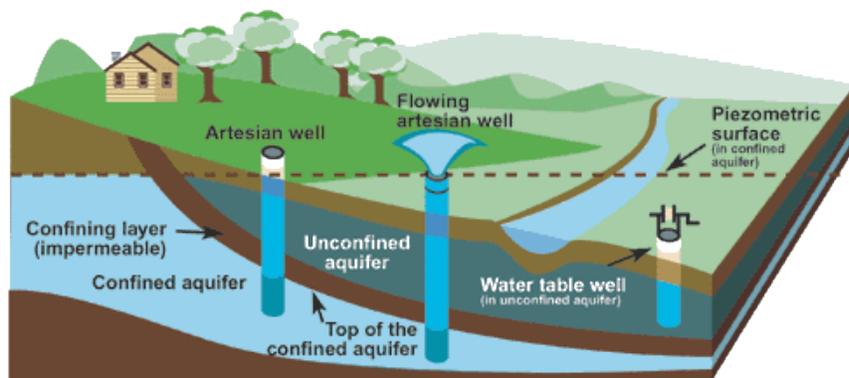


Figure 2. The illustration shows the difference between confined and unconfined aquifers, water table wells and artesian wells and the water table (United States Geological Service 2018).

aquifer with an upper water surface (water table) that is at atmospheric pressure, which enables it to rise and fall (United States Geological Service n.d.). Overdraft occurs when rates of recharge are slower than the rate of pumping in an aquifer;

this occurrence can be exacerbated by drought or simple overuse of a groundwater system (United States Geological Service 2018). Unconfined aquifers are usually closer to the surface which makes them more impacted by drought conditions (United States Geological Service n.d.) but because of surrounding impermeable sediment, it is much more difficult for confined

aquifers to recharge once they have become over drafted (United States Geological Service 2018).

Groundwater is governed by overlying and appropriative rights. Overlying groundwater rights mean that groundwater is used on the land above the basin from which it is taken (California State Resource Control Board n.d.). Appropriative rights mean that the water is pumped out of the ground and transported elsewhere for use (California State Resource Control Board n.d.). In

Rights to Native Groundwater: Summary

California, overlying groundwater rights have a higher priority than appropriative rights. Overlying groundwater rights exist whether or

WATER RIGHT	BASIS OF RIGHT	SHORTAGE PRINCIPLE	ALLOCATION
Overlying	Land ownership	Correlative	Equitable sharing between overlying pumpers Overlying class senior to all appropriators
Appropriative	Use Pumping	Priority	First in time First in right

Figure 3. Rights to groundwater chart (Maven 2018)

not the owner of the land is using the groundwater and rights are protected during times of shortage (Maven 2018). Conversely, appropriative water rights are reliant on use and rights will be determined by priority in times of overdraft (Maven 2018). Public water suppliers have an appropriative right unless they are pumping water for use on public land, so the vast majority of municipal water systems using groundwater have less of a right to groundwater than overlying users (California State Resource Control Board n.d.). In most groundwater disputes, the overlying users generally tend to be the irrigators and the appropriators are cities in the basin or

anybody exporting water out of the basin (Maven 2018). As mentioned previously, in some areas across the state, particularly in Southern California, communities decided to adjudicate the rights to their groundwater basins many years ago (Maven 2018). However, the state never mandated the formation of groundwater governing bodies, records of groundwater users, or even had information on the quantity of water in groundwater basins until the passage of the Sustainable Groundwater Management Act in 2014.

SUSTAINABLE GROUNDWATER MANAGEMENT ACT (SGMA):

The Sustainable Groundwater Management Act (SGMA) is a three-bill legislative package (AB 1239, SB 1168, and SB 1319) that Governor Jerry Brown signed on September 16th, 2014 (California Department of Water Resources n.d. -a). It is California's first statewide groundwater management legislation. SGMA aims to prevent six undesirable results: decreased groundwater levels, reduction of groundwater storage, seawater intrusion, degraded water quality, land subsidence, and depletions of interconnected surface waters (Maven 2018). Under SGMA, the California Department of Water Resources (DWR) was required to develop regulations to revise groundwater basin boundaries; adopt regulations for evaluating and implementing Groundwater Sustainability Plans (GSPs) and coordination agreements; identify basins subject to critical conditions of overdraft; identify water available for groundwater replenishment; and publish best management practices for the sustainable management of groundwater (Groundwater Exchange 2020). The State Water Resource Control Board (SWRCB) is the primary oversight agency for SGMA. In areas where groundwater users and local agencies are unable or unwilling to sustainably manage their groundwater, the State Water Resource Control Board can intervene (State Water Resource Control Board n.d. -b)

Groundwater basin prioritization is determined using the best available data to classify California's 515 groundwater basins into one of four categories: high, medium, low and very low priority (Department of Water Resources n.d.-c). There are 127 basins designated as high or medium priority, accounting for 96 percent of the average annual statewide groundwater use and 88 percent of the 2010 population overlying the groundwater basin area (Department of Water Resources 2015). The California Statewide Groundwater Elevation Monitoring (CASGEM)

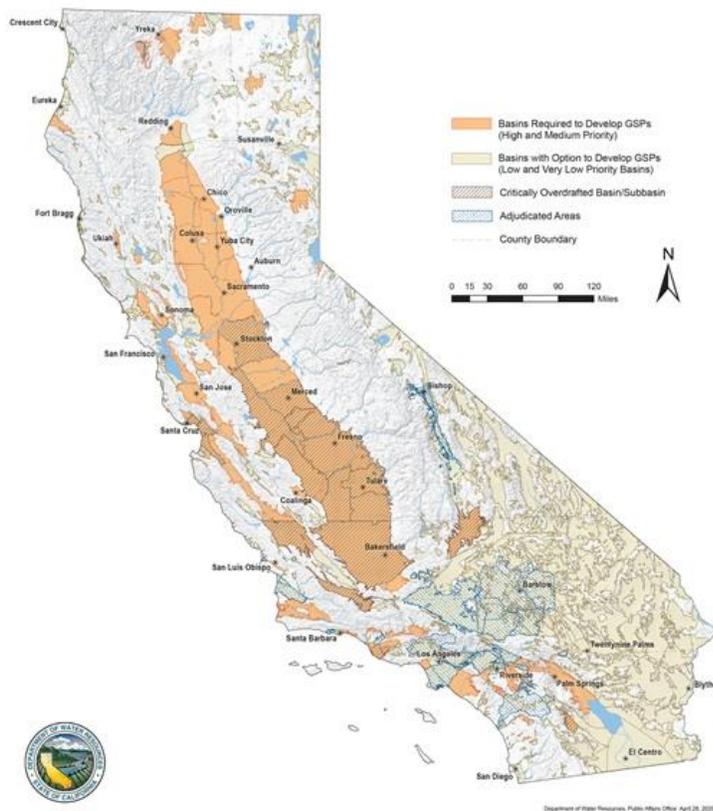


Figure 4. Statewide Map of Current SGMA Basin Prioritization (Department of Water Resources (n.d. -c)

Program is a DWR response to the 2009 amendment to the Water Code with SBx76 mandating a statewide groundwater elevation monitoring program (Monterey County Water Agency n.d.). CASGEM is a voluntary monitoring program in which local monitoring entities collect groundwater elevation data and provide that data to DWR (Monterey County Water Agency n.d.). DWR then consolidates data from across the state and makes it available to the

public (Monterey County Water Agency n.d.). This monitoring system is used, with minor changes, in the SGMA basin prioritization process, but SGMA, importantly, is not an optional process (Department of Water Resources n.d.-c). The technical process is based on eight components that are identified in the California Water Code Section 10933: the population

overlying the basin or subbasin, rate of current and projected growth of the population, number of public supply wells, the total number of wells, irrigated acreage, the reliance of overlying population on groundwater as their primary source of water, any documented impacts on the groundwater within the basin or subbasin, and any other information determined to be relevant by the department, including adverse impacts on local habitat and local stream flows (The California Water Code Section 10933 2015). All high and medium priority basins identified by DWR were required to form Groundwater Sustainability Agencies (GSAs) by June 30, 2017; basins subject to critical conditions of overdraft were required to be managed under a GSP by January 31, 2020; and all basins are expected to reach their sustainability goals within 40 years of GSP implementation (California State Water Resource Control Board n.d.).

As the top agricultural producer in the United States in terms of cash receipts, California is known nationally as an agricultural powerhouse (USDA 2019). Generating \$50 billion, California made over \$20 billion more than the next highest producing state in 2019 (USDA 2019). This economic sector's impact comes with very real interest in water rights. Powerful players across the state, whether they be agricultural interests or the municipal water interests of large cities like Los Angeles, have notoriously disenfranchised smaller water users for decades (Johnson 2019, Nadeau 1961). With the introduction of SGMA, a brand-new managerial process was possible. SGMA offered the potential creation of a single, local, representational body per groundwater basin, which would be able to make sustainability plans to protect safe water supplies and natural flows while protecting marginalized communities. However, that is not quite what happened.

GSAs can be formed by local public agencies, but are most commonly formed by water districts, irrigation districts, reclamation districts, cities, and counties (Groundwater Exchange

those hit the hardest (Stokstad 2020). Kern’s water supply faces the threat of overdraft related to arsenic contamination (Austin 2019) as well as to severe land subsidence and recharge limitations (Stokstad 2020). The basin has struggled to form any sort of cohesive GSA or GSP between its 29 participating agencies. Kern now has 11 GSAs preparing their own GSPs:

Kern Basin Groundwater Sustainability Agencies (GSAs) and their member agencies

GSA	Member Agencies
Pioneer GSA	Pioneer GSA
Henry Miller Water District GSA	Henry Miller Water District GSA
Buena Vista Water Storage District GSA	Buena Vista Water Storage District GSA
Olcese Water District GSA	Olcese Water District GSA
Greenfield County Water District GSA	Greenfield County Water District GSA
West Kern Water District GSA	West Kern Water District GSA
Cawelo Water District GSA	Cawelo Water District GSA
City of McFarland GSA	City of McFarland GSA
Semitropic Water Storage District GSA	Semitropic Water Storage District GSA
The Kern River GSA	City of Bakersfield Kern-Delta Improvement District No 4

Kern Groundwater Authority	Arvin Community Services District Arvin-Edison Water Storage District Cawelo Water District City of Shafter Kern County Water Agency Kern-Tulare Water District Kern Water Bank Authority North Kern Water Storage District Rosedale-Rio Bravo Water Storage District Semitropic Water Storage District Shafter-Wasco Irrigation District Southern San Joaquin Municipal Utility District Tejon-Castaic Water District West Kern Water District Westside District Water Authority Wheeler Ridge-Maricopa Water Storage District
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Figure 6. List of GSAs in Kern and their member agencies (Austin 2019; Department of Water Resources n.d. B; Kern Groundwater Authority n.d.; Kern River Groundwater Sustainability Agency n.d.)

Unlike Kern County, which is made up of one basin managed by many different GSAs, Santa Cruz County is made up of three distinct groundwater basins; each has one GSA (Department of Water Resources n.d. -b). This thesis focuses on the Santa Cruz Mid-County Groundwater Basin. The basin is a much smaller basin than that of Kern. Located in California's Central Coast hydrologic region, the Santa Cruz Mid-County is 36,290 acres in size and is home to an estimated 84,933 people (Groundwater Exchange 2020-a). The main groundwater stakeholders in Santa Cruz are municipal water providers. Urban water users are the primary stakeholders rather than agriculture, although there are farms in the basin. Additionally, the foremost threat to groundwater in the basin is saltwater intrusion. Despite the differences between the two basins Santa Cruz Mid-County provides an example of intentional, and comparatively successful, stakeholder engagement in contrast to Kern's situation. The consolidation of information by a single GSA and GSP in Santa Cruz Mid-County makes information concerning groundwater much more accessible to the average person, as opposed to the groundwater complexity of Kern.

Kern Basin and Santa Cruz Mid-County Basin are facing quite different threats and have responded in dramatically different ways. This makes a perfect comparison between the two nearly impossible. However, the Kern Groundwater basin provides a great example of the main shortcomings of SGMA, and Santa Cruz Mid-County was recommended to me by Kristin Dobbin as a particularly good example of community engagement success. These aspects make the two basins valuable case studies as to the diversity of a statewide groundwater management system and the potential of a local control design. That being said, Kern seems to have struggled much more in terms of transparency and equity. Because SGMA allows the formation of many GSAs and there is such a complex relationship between each GSA, the basin structure is limiting access to the groundwater sustainability process for the communities most threatened by groundwater issues. It is valuable to compare the vastly different application of SGMA across the state to explore the successes and failures of this landmark law.

Kern is a much more rural basin with massive agricultural interests, a complicated multi-GSA structure, and many issues with transparency. Conversely, Santa Cruz Mid-County has a much more urban water focus which largely prioritizes municipal water use, a single GSA and has been intentionally transparent to its groundwater stakeholders. However, in both basins the most marginalized communities are rural municipal water users. It is true that the situation in Kern is a more complicated one. Kern's basin covers a much larger area which must allocate a significantly larger quantity of water than Santa Cruz Mid-County. Kern's population also includes a considerably higher proportion of low-income communities, communities of color and marginalized small municipal water systems. And perhaps most importantly, Kern is, at its core, an agricultural basin. The weaknesses written into SGMA's GSA formation scheme were created for areas like Kern, not necessarily Santa Cruz Mid-County. However, there are many

community outreach methods and overall cooperation techniques used within Santa Cruz Mid-County which could be utilized at a larger scale in Kern. While many of these best management practice strategies and outreach methods do not disrupt the status quo, what Kern needs most is a reevaluation of its current management system and the power imbalance across the basin. Any truly effective engagement and transparency strategies must follow a reevaluation of the current model.

CHAPTER 2- LITERATURE REVIEW:*GROUNDWATER MANAGEMENT STRUCTURE:*

SGMA is a relatively new law that is still being implemented, so scholarly literature on the topic must continually be updated. Most published information about SGMA seems to have come out around 2014 when the law was first passed and specifically during the 2012-2016 California drought. There is a plethora of scientific information concerning the need for statewide groundwater management, data on land subsidence, over pumping and California agriculture. Also, the vast majority of information on individual basin management is either published by the basin itself or in news articles. However, some academic scholarship on the development and success of GSAs and their representation of marginalized communities does exist.

Initially, as the 2017 deadline for basin GSA formation loomed, research focused on the potential of a completely new governing structure. Kiparsky et. al. (2017) suggest that local governance is a promising model for groundwater management, and should it be successful, it may provide a template for other states. Each basin must create a GSA but SGMA allows discretion in institutional design (Milman et. al. 2018). Each basin has its own diverse existing water management practices, geological circumstance, history, and culture. This has led to the development of very different governing systems across the state's 127 high and medium priority basins (Milman et. al. 2018; Kiparsky et.al. 2017; Dobbin 2020). Collective resource management is promising but because groundwater is often a highly politicized, common-pool resource, the voluntary development of effective local governance can be limited (Kiparsky et.al. 2017). Nine criteria can be used as principles or standards in the evaluation of institutional design for local level groundwater governance: scale, human capacity, funding, authority,

independence, participation, representation, accountability, and transparency (Kiparsky et. al. 2017). These criteria will be useful to analyze the institutional design of Kern and Santa Cruz Mid-County basins.

MARGINALIZED COMMUNITES:

Even though California law lists domestic water use as the highest priority use, small community water systems and homes with shallow domestic wells are at the highest risk of water contamination and are among the first to lose their water supply due to overdraft (Groundwater Exchange 2020 -c). Not only that, many of those who depend on shallow domestic wells or small water systems cannot afford to deepen wells or treat their water (Groundwater Exchange 2020 - c). It is well documented that within California, drought has had a greater impact on small public water systems, especially those serving disadvantaged communities (Feinstein et al. 2017; Milman et. al. 2018). In 2017 alone, nearly 600,000 Californians were served by public water systems which had been issued primary health violations under the Safe Drinking Water Act (State Water Resources Control Board 2018; Dobbin 2020). Up to another two million of the state's residents rely on unregulated private wells whose water quality is unknown but are at a higher risk for contamination (Harter et al. 2012; State Water Resources Control Board 2015; Dobbin 2020). Low-income rural communities of color bear the brunt of these effects, especially those in the San Joaquin Valley, where Kern is located (Francis and Firestone 2010; Pannu 2012; Balazs et al. 2012; Dobbin 2020). Sixty-eight percent of the 505 small water systems in the state with recent primary drinking water violations rely on groundwater as their primary or only supply source (California State Water Resources Control Board n.d.). The significant reliance on groundwater, heightened risk of drinking water contamination or limited access to water and California's commitment to the human right to water (Assembly Bill 685 2012) makes SGMA

particularly key legislation to address this intersection (Dobbin & Lubell 2019; Foster, 2002; Patrick, 2009).

Because of the open-ended institutional design, GSA formation is not only influenced by what kinds of organization would best accomplish groundwater sustainability, but also, and perhaps more so, by considerations of control over a limited water supply (Milman et. al. 2018). Local-level actors may view shifts in control resulting from coordination as limiting their ability to act in the best interest of their constituencies (Schafer 2016) and as reducing their autonomy (Milman et. al. 2018). There are many incentives for agencies to create their own GSAs, particularly for low-income communities seeking to ensure greater inclusion. However, this also requires capital and manpower that would otherwise be going to other projects. In one instance, the choice to take a non-voting role in their GSA rather than a voting one saved the local drinking-water district a much needed \$8,000 (Dobbin 2020). The resources necessary for successful GSA formation makes it much less attainable for small, low-income water systems. Dobbin and Lubell (2019) identify disadvantaged communities (DACs) as communities with a median household income less than 80 percent that of the rest of the state and are defined as census places. Census places are geographies defined by the U.S. Census Bureau, which include both Incorporated Places and Census Designated Places (Conduent Healthy Communities Institute 2019). Overall collaborative governance is associated with increased representation of marginalized stakeholders (Dobbin & Lubell 2019). Even in collaborative settings representation of the smallest, most low-income communities and those lacking political recognition via incorporated cities or public water districts still lags far behind their more advantaged counterparts (Dobbin & Lubell 2019).

Formal representation of DACs in GSAs is far from typical: Only 16 percent of DACs are formally represented and only 28 percent of GSAs with DACs inside their boundaries have a formal institutional arrangement for representing them (Dobbin & Lubell 2019). This lack of representation persists even though SGMA legislation specifically recognizes the importance of DAC engagement. This is because there are few measures in place to ensure engagement. Despite the fact the Water Code Section 10723.8 required the inclusion of small DACs in the initial interested parties lists each basin submitted to DWR, many were not included (Dobbin 2018). Only 51 percent of GSAs correctly identified all the small DACs in their boundaries and 23 percent identified none of the small DACs in their boundaries (Dobbin 2018). While the Greenfield Water Districts GSA, list claimed that there are no known DACs in their boundaries at this time, according to DWR's publicly available DAC mapping tool, this GSA contains eight small DACs (Dobbin 2018). It is clear that despite promising language used in SGMA legislation and across government websites, DAC engagement is not being actively pursued or seriously considered as a priority.

In Dobbin's (2020) study of DACs in the San Joaquin Valley, interviewees repeatedly said that SGMA was not created by or for rural communities. Instead, they insisted, agricultural interests were behind the crafting of the local control design of SGMA in the first place (Dobbin 2020). The percentage of land covered by agriculture is greater in basins with multiple GSAs, while the percentage of developed land is greater in basins with a single basin-wide GSA (Milman et. al. 2018). Dobbin's interviewees were quoted saying things such as: "What is your biggest problem? Farming. Who got all the control? Farmers. So good luck fixing the problem" (Interviewee 8 quoted in Dobbin 2020). Not only were interviewees disillusioned about their power in the SGMA process, but one interviewee claimed that their right to water is less than

that of cattle. “There are few of us and more of the [cows], who do you think is going to get the water?” (Interviewee 6 quoted in Dobbin 2020).

My thesis uses the case studies of Kern Basin and Santa Cruz Mid-County Basin to demonstrate how GSA structure and agricultural interests affect DAC engagement and SGMA accessibility for local groundwater users. I argue that the GSA structure of Kern County is particularly inaccessible, prioritizes agricultural interests and will not lead to sustainable groundwater use due to differing management strategies and goals. In a recent conversation, Dobbin mentioned to me that the Santa Cruz Mid-County GSA has done a good job in terms of decision-making accessibility, community engagement and transparency. By comparing the two basins it may be possible to gain a greater understanding of the potential of SGMA and its dramatic shortcomings.

CHAPTER 3- KERN BASIN:*INTRODUCTION:*

The Kern Basin is the largest groundwater basin covered by SGMA (Maven 2019). Kern County Water Agency estimates the total water in storage to be 40,000,000 acre-feet and dewatered aquifer storage to be 10,000,000 acre-feet (Fryer 2002). These calculations consider areas of the subbasin which are known to overlay useable groundwater, which are reported to be about 1,000,000 acres (Department of Water Resources 2006). The scale of Kern Basin is part of the reason for its complex system of GSAs. Forming a new institution and operating it requires time and effort to meet, communicate, and make decisions, among other tasks (Feiock, 2013). When coordinating across diverse or heterogeneous interests, larger groups, and larger geographic expanses these tasks become all the more difficult (Peters 1998; Feiock 2007; Provan & Kenis 2008; Kwon & Feiock 2010). However, the weaknesses written into SGMAs governing body formational requirements were also specifically crafted for places like Kern, where huge agricultural interests are king. A representative at DWR pointed out that SGMA does not actually require any representation for disadvantaged communities; it simply requires that these stakeholders' interests be considered. More powerful stakeholders can take advantage of this fact.

Another weakness of the act is that it requires sustainability not water quality or water access. SGMA, in some ways, is interested in water quality because basin overdraft can lead to water contamination. However, if a large-scale farmer, who does not live in the basin themselves, is looking to use as much water as possible they would not be concerned with drinking water quality in a small community water system or private well elsewhere in the basin. The massive stakeholder imbalance in Kern makes the multi-GSA structure even more

detrimental to the access and engagement of disenfranchised communities. So, while some agencies and individuals may claim the issues in Kern are due to its size that is only one small aspect of the difficulties facing the basin.

MESSING WITH THE NUMBERS:

Kern Basin has already had to deal with multiple instances of agencies acting out of self-interest rather than towards the goal of groundwater sustainability. A primary example of this is the issues that the Kern Groundwater Authority (KGA) has had with agency water budgets. Agencies and powerful stakeholders feel entitled to an amount of water that is no longer sustainable. The GSP process, as of now, seems to basically consist of an honor code in which there is an understanding that nobody wants to run out of water. However, when many agencies believe themselves to be the exception to the rule, that they should be allowed to pump a little more and someone else will just have to pump a little less, this system does not work. The process relies on many different agencies self-reporting water budgets and suggesting restrictions which will affect their economic success and that of their constituents.

In 2019, during the GSP process, the KGA had issues with their member agencies misreporting water budgets. Member agencies claimed an overdraft of 90,000 acre-feet per year for the entire 3,000-square-mile Kern subbasin. Modeling has shown the number is closer to 300,000 to 350,000 acre-feet a year (Henry 2019). “It’s obvious that some districts have created water with their paperwork” KGA Chairman Dennis Mullins said about the budgets (Quoted in Henry 2019). Ultimately, leadership within the KGA required member agencies found to be reporting false information to correct the numbers they presented. While this case is particularly egregious it is very possible for local agencies to misrepresent water budgets.

The Department of Water Resources is the oversight agency responsible for verifying the accuracy of basin GSPs. According to Amanda Peisch-Derby, the DWR point of contact for Kern Basin, the water budget of each basin is created at the local scale, and the Department of Water Resources looks at the state scale. In taking this approach, the department is looking at the “reasonableness” of a GSP, not necessarily comparing the amount of water in the basin to the amount proposed to be used (Peisch-Derby Interview March 24, 2021). DWR does not have the breadth of information to assure all water budgets are perfectly correct, so they generally assume that locals know best (Peisch-Derby Interview March 24, 2021). Because of the governing complexity in which nearly 20 agencies are reporting their own agency estimates on water availability and use there is much more space for GSP errors and intentional misreporting.

There are 16 agencies coordinated under the KGA; each of them is preparing their own GSP but are calling them a chapter (Douglas 2016). The chapters will then be consolidated into one master GSP. Additionally, each of the 10 other GSAs are creating their own GSPs which must be combined with one another and the KGAs GSP before submission. The state requires that each basin utilize a unified monitoring program and to sign a coordination agreement. This ultimately, allows for profoundly individual work within agency boundaries without any mandate to require GSA cooperation. This can also lead to inaccurate water allocation between agencies and the neglect of a unified hydrological system.

LAND SUBSIDENCE AND SAFE YEILD LIMITS

The issue of groundwater depletion rose in public interest when massive sinkholes began to appear across the Central Valley and news broke that the center of California was sinking into the earth. About half of the groundwater depletion nationwide is from irrigation (Dimick 2014).

Agriculture is the leading use of water in the U.S. and around the world, and globally irrigated farming takes more than 60 percent of the available freshwater (Dimick 2014). Long term overuse of underground aquifers resulted in land subsidence. Land subsidence is not a new phenomenon in the state, but the rate at which it has accelerated during recent drought years has been astonishing. Since the 1920s, excessive pumping of groundwater at thousands of wells in California's San Joaquin Valley has caused land in sections of the valley to subside, or sink, by as much as 28 feet (8.5 meters). The valley is one of the most productive agricultural regions in the nation and so subsidence is exacerbated during droughts, when farmers rely heavily on groundwater (Buis & Thomas 2017). During the 2012-2016 drought, parts of the valley sank as much as 60 centimeters per year (Stokstad 2020). This subsidence is not only dangerous because it can create sudden sink holes capable of killing people and destroying homes, but it is also slowly threatening California's surface-water infrastructure. The Friant-Kern Canal has sunk so much that it has lost about 60 percent of its flow (Water Education Foundation 2020). The 152-mile canal from Millerton Lake to Kern County has sunk two to three feet in some places over about a 25-mile area and the original design capacity of 4,000 cubic feet per second in that area has dropped to 1,600 cubic feet per second (Water Education Foundation 2020). The California Aqueduct is the principal feature of the State Water Project (SWP) consisting of 700-miles of artificial river that conveys water from Northern California across California through the Central Valley and into Southern California (Pitzer 2019). In 2014, when NASA scientists flew radar equipment over the California Aqueduct, they found that one section had dipped 20 centimeters over four months (Stokstad 2020).

The affects felt by California infrastructure trickle down to Kern. Patricia Poire, the only fulltime salaried employee of the KGA and Vice President of the Kern County Farm Bureau, was

adamant that the primary reason Kern is a critically over drafted basin is because they are not receiving their allocated water deliveries from the SWP. Kern's current invoice is \$138 million for 100 percent of the water deliveries from the State Water Project but is only receiving five percent (Poire Interview March 29, 2021). The invoice must be paid despite the lack of delivery. The basin only expected to receive 10 percent of deliveries in 2021 but upon the time of our interview had just been notified by the state that that number would have to decrease by half (Poire Interview March 29, 2021). There is a common perception, particularly among farmers in the central valley, that water from the State Water Project is being dumped into the ocean. This is in reference, primarily to recharge programs which involve pumping water into the bay delta to protect endangered fish and water fowl populations. These recharge programs are only necessary because of continued overuse of California waterways which have been exacerbated by the unnatural transportation of water from northern to southern California. Water limitations are being placed onto state water infrastructure as well as groundwater because the entire California water systems has been overextended. While these issues may seem unrelated, that is not necessarily the case. Due to drought and increased agricultural irrigation, basin levels have been decreasing across the Central Valley. Basin overdraft has caused land subsidence which has resulted in damaged water infrastructure, making water deliveries more difficult. Also, surface water flows have become contaminated, overused, and have been affected by drought and decreased snow melt. And so, because groundwater recharge programs in Kern are reliant on water deliveries, these two seemingly independent systems actually illustrate how arbitrary delineations between connected water systems truly are.

Because the San Joaquin Valley has very little surface water throughout the region, scientists estimate recharge alone can, at best, make up for just 25% of the groundwater deficit

(Stokstad 2020). This means that pumping will need to be dramatically reduced and some croplands will need to be left uncultivated (Stokstad 2020). Using the numbers reported by its member agencies, the KGA set the safe yield number, at 0.15 acre-foot of water per acre of land. In this context safe yield is synonymous with sustainable yield, meaning the amount that can be pumped out of the aquifer is equal to the average replenishment rate of the aquifer from natural and artificial recharge and does not result in a long-term decline in water levels (Groundwater Education). A safe yield of 0.15 acre-feet per acre of land means if you are a grower with 1,000 acres in the Kern subbasin, you are allowed to pump 150 acre-feet of groundwater per year of safe yield, which is only enough to irrigate 50 acres of crop (Henry 2019).

Disputes between some GSAs in Kern Basin have resulted from contention which preexisted the passage of SGMA. During the initial GSA formational process there were many disputes concerning the overlap of basin and GSA boundaries (Douglas 2016). Many of the GSAs in Kern are noncontiguous which only adds to stakeholder confusion when determining the GSA responsible for their groundwater. Additionally, because for the most part, government boundaries were prioritized over hydrogeological one's, arguments arose as to groundwater allocation across agencies.

When determining the safe yield budgets, some GSAs were upset that agencies which had greater surface water rights were also taking their entire groundwater allocation. The agencies which have the largest rights to the river are Buena Vista Water Storage District, Kern Delta Water District, and the city of Bakersfield, which also owns the riverbed and adjacent lands (Henry 2019). None of those entities is a KGA member agency as each has formed its own groundwater sustainability agency (Henry 2019). Each of the three agencies has claimed its full

river rights in its water budget: 149,000 acre-feet for Buena Vista; 201,000 acre-feet for Kern Delta; and 163,000 acre-feet for Bakersfield as well as the safe yield of 0.15 acre-foot per acre set by KGA as a supply in its water budgets. On the other hand, other agencies argue that areas in the basin which do not have groundwater of their own should be left out of groundwater allocations. All areas of the subbasin are not equal in terms of native yield; the far eastern and western foothill sections have little to no usable groundwater (Henry 2019). If they were carved out of the equation that would give farmers closer to 0.3 acre-foot of water per acre of land, which adds up quickly when you stretch it across thousands of acres (Henry 2019). However, despite some agency's insistence of this distribution method it did not come to fruition.

AGRICULTURE IN KERN:

The limit of .15 acre-feet means that many farmers are going to have to fallow large portions of their crop lands. Fallowed land is a piece of land that is well maintained but will not be cultivated for at least the duration of a crop year, in this context it would be left completely unseeded with no crops at all (Merriam-Webster n.d.). Richard Schafer, a long-time Visalia engineer whose groundwater experience goes back decades, expects that some 15 to 20 percent of productive agricultural lands will need to be set aside without groundwater use to meet SGMA requirements (Wright 2019). Some estimates peg the impending fallowing at more than a million acres throughout the San Joaquin Valley (Henry 2019). Kern Basin will not be free from this limitation on farmed land. In Kern, nearly 200,000 of the 900,000 irrigated acres could be lost (Henry 2019). That would mean about \$600 million in lost farm income and 12,400 direct and indirect farming jobs, according to water district estimates (Henry 2019).

Despite drought and the passage of SGMA, water intensive crops, particularly nut and fruit trees have become an increasingly popular crop across California, even in the dry San Joaquin Valley. In California, tree nut acreage alone increased 85% between 2008 and 2018 (Stokstad 2020). Groves and vineyards cannot be fallowed like other fields, although they can survive with less water than normal (Stokstad 2020). Farmers, in general, are reluctant to rip them out because they are expensive to plant, can take years to mature, and have relatively long-life spans (Stokstad). Stewart Resnick, the man who owns the most agricultural land in the United States, about 180,000 in California alone (Olsen-Sawyer 2018) and the owner of Pom, Wonderful Pistachios, Halo oranges and Fiji water (Harkinson 2016) is not a resident of Kern but does own huge swaths of land in the northwest portion of the basin. He owns 79,000 acres of almonds, 73,000 acres of pistachios, 35,000 acres of grapes, and 13,000 acres of mandarins (Arax 2018). Resnick is one of the most famous landowners in the Kern Basin but is mentioned in very little SGMA literature because he holds water rights to the Kern Water Bank, a storage site for the State Water Project but has famously been aiding in basin overdraft as covered in Mark Arax's *Kingdom of Dust*.

Contentious relationships between large scale agricultural operations like Resnick's and domestic water users existed prior to SGMA, particularly during severe drought when domestic wells ran dry due to agricultural deep-well over pumping. The contention between large scale farming and small local farms is central to the psyche of the Central Valley. However, according to Dobbin, small farming is not particularly common in Kern Basin. She argues that the primary community at the greatest risk of being taken advantage of in the Kern Basin SGMA process is small rural drinking water users. There is a long history of disenfranchisement, lost trust, contaminated water, and the prioritization of wealthy stakeholder interests. This has led to a

greater need for community engagement in the SGMA process and increased difficulty to do so after many disadvantaged communities no longer place their trust in the government. In Dobbin's report, interviewees repeatedly asserted that SGMA was not created by, nor for, rural communities (Dobbin 2020). Rather, they insisted that agricultural interests were behind the crafting of the local control design of SGMA (Dobbin 2020).

LACK OF COUNTY INVOLVEMENT:

Kern County Government is not involved in any GSAs in the Kern Basin. They opted out of the GSA process for political reasons. According to Peisch-Derby, this is very rare. Most groundwater basins have their county government leaders involved at some capacity, either as board members or voting members. Counties usually represent undistricted areas, also known as unincorporated areas or census places. These are areas that are not part of a municipal government (Mathews 2020). However, the county stepped down and did not notify any residents. According to Poire, in December 2018, in the middle of work on the GSP, the county decided to step away from the SGMA process leaving the GSAs to cover the now unrepresented areas. "So, when the KGA should have only been focused on the GSP development they had to notify stakeholders that the county was no longer involved and attempt to get them engaged" (Poire Interview March 29, 2021).

The undistricted area is close to 500,000 acres but only about 40,000-50,000 acres of that has been developed as irrigated agriculture; the vast majority of it is for grazing (Austin 2019). Even though the undistricted area in Kern is not hugely populated, there are people who live in these undistricted areas who deserve to be represented in the SGMA process. Specifically in water management, unincorporated communities have had to fight to literally be on maps and in

plans, let alone play a meaningful role in decision making (Francis & Firestone, 2010, Dobbin & Lubell 2019). While 47 percent of incorporated small DACs are members of their GSA and 53 percent are board members, only 10 percent of unincorporated small DACs are members of their GSAs and only 12 percent are board members (Dobbin 2018). It seems that their disenfranchisement has continued throughout the SGMA process. "Some water districts have voluntarily taken on undistricted landowners and have both signed deals. But these are bad agreements, I've read some of these and I wouldn't sign them. They are left with basically no rights" (Peisch-Derby Interview March 24, 2021). The KGA was put in a difficult position with representatives already overwhelmed by state deadlines. "We've really been scrambling with how we fill that backstop with County withdrawal. It is a significant hurdle. We've come up with some creative ideas; it's ongoing" said General Manager of Rosedale-Rio Bravo Water Storage District Eric Averett (Austin 2019). The threat of state intervention is an ever-present fear in the minds of many GSAs, only one GSA to date has required significant intervention out of the over 200 overdrafted basins in the state. However, the fear is still a large driver for representatives and stakeholders alike. "The reality of trying to get such a large effort coordinated across basins with many stakeholders meant that there are some fundamental technical and policy issues that all of us have had to put on the shelf while we meet the deadlines" said Averett (Austin 2019). The rush of creating a completely new system with fairly strict deadlines is difficult but quality must not be given up in the process. Scrambling to represent a group of people who are rarely represented at all and who were said to be a priority is not sufficient. Perhaps, as Averett mentioned, the agreements resulted from the rush to avoid state intervention which would result should these undistricted areas not be covered by some representation (Austin 2019). However, the behavior of some of these agencies could also be

interpreted as predatory. Regardless of the current KGA management of undistricted areas, the initial flippancy with which the county treated these people, of whom they were allegedly responsible for, was unacceptable.

THE KERN RESPONSE:

Despite the fact that SGMA was passed in 2014, the majority of basins were delineated by about 2016 and the first round of GSPs were only implemented at the end of January 2020. Poire says that having lived in Kern through the GSA process and witnessing the community on a day-to-day basis, she believes there to be a false narrative concerning Kern. She believes that many people incorrectly assume that agricultural interests in Kern are separate from the community at large (Poire Interview March 29, 2021). One in five jobs is directly or indirectly linked to the agricultural industry and five of the top 15 private employers in the county are agriculture-based, according to the Kern County Farm Bureau and the Kern Economic Development Corporation (Pitzer 2019). Additionally, she believes that some academics and politicians vilify Kern leadership.

Poire stated that she was personally told by a Department of Water Resources representative that the KGA provided the most community workshops of any GSA in the State. The Agency holds stakeholder and informational workshops in addition to the many workshops held by their member agencies. This is one method of outreach that can be very important when educating community members on a new act and their role in the process. That being said, Dobbin claims that nearly all that Kern GSAs do, in terms of community engagement, is to hold workshops (Dobbin Interview February 2, 2021). In the interview, she stated that these workshops are not as effective as they may seem. Dobbin believes that Kern meetings are hard to

follow and often end in GSA leadership saying that they will deal with an issue in a separate council meeting but do not describe to the public how to access those meetings (Dobbin Interview February 2, 2021). The other situation she has often noticed are large public workshops that just explain the basics of SGMA as an act or are co-opted by agricultural interests (Dobbin Interview February 2, 2021). The only way the agency has been able to provide a platform for stakeholders other than agriculture is to provide drinking water focused workshops or informational sessions (Dobbin Interview February 2, 2021). This is something that the KGA has done in the past but seems to be insufficient as a single method of outreach.

Money is one limiting factor to engagement for SGMA agencies. "SGMA is not free. People talk about it like it's just a process but it's a very expensive process" (Poire Interview March 29, 2021). The SGMA compliance process has cost the KGA and its members \$5 million to date, mainly from hiring consultants, monitoring water levels, gathering data, writing, and developing the GSP and the individual management area plans and the development, gathering data and writing two annual reports (Poire Interview March 29, 2021). While GSAs can receive some state funding to aid in monitoring systems and SGMA compliance, there is a local level bill that must be paid. Some water agencies have had to increase water rates for their members. One of the primary matters of contention between undistricted areas and the water agencies they are entering into agreements with, is the matter of fees.

The KGA is the only GSA in the basin to have disenfranchised communities on their board (Poire Interview March 29, 2021). This is a step in the right direction but with a basin consisting of 11 GSAs and the KGA itself consisting of 16 member agencies, two representatives from marginalized communities is not the success it may sound like. Additionally, many rural

municipal water users are private well owners who lack formal representation. As previously mentioned in the section on marginalized communities, there are many barriers to engagement for low-income communities, particularly those who have been marginalized in the past. Most community leaders for these rural municipal water agencies have limited funds, time, and often do not hold a salaried position in relation to their work in the GSA process. This means that all the time spent engaging in the SGMA process is free labor and must work around members full-time jobs (Dobbin 2020). Additionally, meetings require interested parties to transport themselves to the location of the meetings. In a basin as large as Kern this can mean that rural water users may be required to drive hours to attend meetings. Some meetings use exclusionary language because the SGMA process is rife with technical scientific and policy terms, confusing shorthand, jargon, and are primarily conducted in English. There is a history of abuse that feels very personal to some marginalized community members which can heighten a sense of isolation and alienation. There are many more limiting factors to engagement that may not seem intuitive to local leadership when they believe themselves to be providing access through workshops and public meetings. Poire stated that if a community feels that they are being intentionally excluded from the SGMA process they can respond through a lawsuit. Aside from a lawsuit, the act seems to offer no real protection for these communities, and because lawsuits are expensive, time consuming and difficult to win, they are not a good method to ensure representation.

CHAPTER 4- SANTA CRUZ MID-COUNTY BASIN:*INTRODUCTION:*

Santa Cruz Mid-County Basin is located on the Pacific coast, stretching from the area east of the Santa Margarita basin, including Live Oak, Soquel, Aptos, and Capitola (County of Santa Cruz n.d.). It provides water to the Soquel Creek and Central Water districts, the City of Santa Cruz, over 20 small water systems, and over 1900 parcels served by private wells (County of Santa Cruz n.d.). Municipal water use is the largest use, agriculture is close to 10 percent and private wells are 7 percent (Ryan Interview February 26, 2021). The primary threat to the basin is saltwater intrusion. Groundwater accounts for about 83 percent of the basin's water supply (Groundwater Exchange 2020 -a). Santa Cruz Mid-county was one of the 21 water basins across the state that was reclassified as critically drafted in response to the declaration of a Groundwater Emergency by Soquel Creek Water District in 2014 (Groundwater Exchange 2020 -a). The basin is in the process of a groundwater replenishment project using advanced water purification methods to purify recycled water to introduce into the groundwater basin to protect against seawater intrusion (Groundwater Exchange 2020 -a). The purified water would mix with existing groundwater and eventually become part of the groundwater supply that is delivered to customers (Groundwater Exchange 2020 -a).

When asked if there had ever been discussions of creating multiple GSAs within the basin Sierra Ryan, a representative from Mid-County, laughed and said no (Ryan Interview February 26, 2021). Creating more GSAs would triple the cost and would not make sense with the size of the basin and the amount of water they are adjudicating (Ryan Interview February 26, 2021). Santa Cruz Mid-County is delineating about 60,000-acre feet of water which, in

comparison to Kerns 40,000,000 acre-feet, is very little. “Our entire basin would be an error of margin in Kern,” said Ryan.

PLACE IN THE COUNTY:

Santa Cruz Mid-County groundwater basin is one of three basins found in Santa Cruz County. The basin is sandwiched between the Pajaro Valley basin and Santa Margarita basin. Santa Margarita and Santa Cruz Mid-County have little geological overlap. The hydrogeophysical boundary does not allow much transition between the two. They only share one surface water boundary, and that stream is on granite which prevents infiltration into the groundwater system (Ryan Interview February 26, 2021). On the other hand, the boundary between Pajaro Valley and Santa Cruz Mid-County is purely governmental (Ryan Interview February 26, 2021). The two basins are essentially part of a single larger basin but have been administrated separately. The Pajaro Valley district predated SGMA and had a groundwater plan in place prior to the creation of Santa Cruz Mid-County (Ryan Interview February 26, 2021). This means that it has its own monitoring program and did not involve Mid-County in its initial decision-making process. Hydrologically the two basins are very connected. Recharge and pumping limitations that Santa Cruz-Mid County implements, affects the easternmost 3rd of Pajaro Valley more than Santa Cruz Mid-County itself (Ryan Interview February 26, 2021). The groundwater aquifer is on a slant, so groundwater flows down the basin and replenishes Pajaro water levels rather than Mid-County basin levels. Pajaro Valley has begun recycling water for irrigation for some of its farming areas and through meetings they have agreed to extend this line closer to the Santa Cruz Mid-County boundary to aid in the prevention of saltwater intrusion (Ryan Interview February 26, 2021).

Santa Margarita and Santa Cruz Mid-County share a monitoring system and the city and county of Santa Cruz have representatives on their board. Many of the same figures are on the boards of all three basins. Sierra Ryan, whom I interviewed, is a staff member of both Santa Margarita and Mid-County. Pajaro staff are sure to attend as many Santa Cruz Mid-County meetings as they can, to strengthen the relationship between the two basins. Additionally, the City of Santa Cruz as well as the County are voting members in all three basins. This has led to increased communication and cohesion between the three basins. While Santa Cruz Mid-County is made up of only one GSA, in order to achieve basin wide sustainability multi-agency cooperation has been necessary. Because they are separate basins, they were not required to share a monitoring system or to sign a coordination agreement like the Kern GSAs. Despite this, there seems to be much more transparency and voluntary collaboration between the three GSAs.

DISENFRANCHISED COMMUNITIES AND OUTREACH METHODS:

Soquel Creek Water District is a key player in the Mid-County GSA. Soquel is an unincorporated community, but they do not function in the way that many people imagine unincorporated communities to act (Ryan Interview February 26, 2021). Many unincorporated communities have a long history infrastructural issues such a lack of sewer systems, clean drinking water, sidewalks, streetlights, and storm drains (Yeung 2012) Unincorporated communities are often thought of as low income, rural, communities of color and have a history of government neglect. However, Soquel is a fairly affluent, predominantly white community. According to the 2019 US Census, the community is 76.2 percent white alone, not Hispanic or Latino, 15.9 percent Hispanic or Latino, 7.2 percent two or more races and the median income is \$93,305 (US Census Bureau 2019). The Soquel Creek Water District serves approximately 40,400 customers through 15,800 connections in four service areas within mid-Santa Cruz

County solely with groundwater (Soquel Creek Water District n.d.). Additionally, 90 percent of its customers are residential not rural (Soquel Creek Water District n.d.). Not only in Soquel but basin wide, Ryan mentioned that the majority of disadvantaged communities are members of a water district and have strong representation in the GSP process. She said that this has made the situation easier than it has been for areas like Kern.

In spite of this, Mid-County still has rural municipal water users and a few small farms that are located up in the mountains. The GSA has made efforts to engage these communities in the decision-making process. In terms of outreach, Mid-County has held many workshops. However, they have also placed signs on the roads that go up into the mountains where the vast majority of private well owners and farms are located, weeks prior to meeting dates. During the initial GSA process, drop-in meetings were held between community members and board members where board members would answer questions in a less formal setting. The agency provides quarterly email updates and regular community meetings that they record and make available online. Since Covid-19 began, they have continued holding online sessions and at times have seen greater engagement.

CONCLUSION:

Kern Basin GSAs may be able to adapt some of the methods utilized by Santa Cruz Mid-County and apply them to a larger scale throughout their own basin. Santa Cruz Mid-County participated in some tangible engagement methods such as placing signs near locations frequented by rural water users or setting up informal meeting times where community members can address concerns and ask questions without the same time constraints or pressure of a large forum, which are good practices. Additionally, Dobbin recommended good advisory boards as central to achieving greater equity in the GSA process (Dobbin Interview February 2, 2021). Kern does not have any advisory boards. YouTube videos or other materials that can be accessed outside of specified meeting times as well as multiple meeting times and alternating meeting location can be useful when working to ensure that diverse stakeholders are able to attend (Dobbin Interview February 2, 2021). She also mentioned that surveys can be particularly useful when done well but it is important to find a successful way to dispense the survey and gather feedback from diverse groups (Dobbin Interview February 2, 2021).

During my preliminary research process, Santa Cruz Mid-County was pointed out to me as a particularly successful basin in terms of community outreach. It seems that its leadership is more cohesive, the basin is likely easier to work with at the state level, and there is an energy that leadership wants to engage community members. It seems that Mid-County's strategies are potentially more effective outreach methods in terms of accessing rural communities and there seems to be more of an interest in hearing diverse perspectives within the basin than throughout some areas within Kern. That being said, none of the engagement strategies mentioned throughout the research process address histories of marginalization or matters of broken trust. It

seems that Santa Cruz may not be doing the ideal in terms of engagement, they simply began in a more ideal position. As mentioned previously, most low-income, and non-white water users are members of municipalities, and so they are represented throughout the process by their water districts. The Kern basin may benefit from adopting some of the outreach strategies found in Santa Cruz Mid-County. However, basins throughout the state would benefit from mandates which actually ensure the engagement marginalized communities.

Addressing underlying inequalities is likely a prerequisite for leveraging groundwater protection, at least to any meaningful scale (Dobbin and Lubell 2019). Groundwater basins would benefit through the incorporation of an equity framework which:

- 1) clearly acknowledges their marginalization, historically and currently
- 2) specifies how strategies shown to redress this marginalization will be used e.g. project staff from similar cultural backgrounds, working with trusted legitimate community-based organizations and local champions
- 3) defining measurable indicators of progress and inclusion
- 4) qualitative and quantitative evaluation of success, barriers, and future strategies

(Center for Evaluation Innovation 2020)

These equity frameworks would be crafted at the local scale in an effort to be specified to individual basin situations. It is necessary that there either be a section of GSAs or an individual agency responsible for crafting and managing this process, in addition to state level monitoring. The local control design of SGMA could be used in all the ways it had the potential to be used.

In the majority of basins across the state community engagement strategies do not address existing power inequity, histories of abuse, or existing barriers to engagement. In the San Joaquin valley, any real power given to rural municipal water users is seen as power taken away from big agricultural players. The equity framework this thesis is advocating for would not be possible under the current model and that is the primary critique of SGMA.

Water is a famously convoluted, complex, and cutthroat industry in California. There are many reasons why the implementation of SGMA is difficult and some basins, such as Kern, began the process in a much more challenging position for reaching groundwater sustainability. It is easy to list barriers to success and reasons which make engagement difficult. However, if the engagement of marginalized communities were truly a priority there would have been stronger language in the legislation itself, oversight to ensure engagement, and state intervention should basins not comply. There seems to be an assumption that sustainability is attainable without the engagement of small rural communities because they are just that, small and rural. However, if entire communities are left out of the decision-making process, continue to be left with no power, and are not accounted for in water banks, groundwater will not be truly sustainable basin wide because it will not be sustainable for these populations.

Works Cited

- AB 1739, 2014 Reg. Sess. (Cal., 2014)
https://leginfo.ca.gov/faces/billNavClient.xhtml?bill_id=201320140AB1739
- Arax, M. (2018, January 31). *A Kingdom from Dust*. The California Sunday Magazine.
<https://story.californiasunday.com/resnick-a-kingdom-from-dust>
- Austin, C. (2020, February 19). *SGMA implementation: Groundwater Sustainability goals and Challenges*. Maven's Notebook: Water News. Retrieved February 11, 2021, from
<https://mavensnotebook.com/2019/06/05/sgma-implementation-groundwater-sustainability-goals-and-challenges/>
- Balazs, C. L., R. Morello-Frosch, A. E. Hubbard, and I. Ray. (2012). *Environmental justice implications of arsenic contamination in California's San Joaquin Valley: A cross-sectional, cluster design examining exposure and compliance in community drinking water systems*. Environmental Health: A Global Access Science Source 11 (1):84. doi:10.1186/1476-069X-11-84.
- Buis, A., & Thomas, T. (2017, February 28). NASA Data Show California's San Joaquin Valley Still Sinking. NASA. <https://www.nasa.gov/feature/jpl/nasa-data-show-californias-san-joaquin-valley-still-sinking/>
- California State Water Resources Control Board. (n.d.) *Human right to water portal*. Retrieved March 6, 2021, from https://www.waterboards.ca.gov/water_issues/programs/hr2w/
- CalTrans. (n.d.). Chapter 3 - Waters of the U.S. and the State | Caltrans. State of California. Retrieved April 30, 2021, from <https://dot.ca.gov/programs/environmental-analysis/standard-environmental-reference-ser/volume-3-biological-resources/ch-3-waters-of-the-us-and-state#3-3.1>
- Center for Evaluation Innovation. (2020, January 27). Equitable Evaluation Framework Applies to all Evaluation. <https://www.evaluationinnovation.org/insight/equitable-evaluation-applies-to-all-evaluation/#:%7E:text=Equitable%20evaluation%20means%20aligning%20our,four%20aspects%2C%20all%20at%20once%3A&text=Degree%20to%20which%20those%20affected,and%20own%20how%20evaluation%20happens>
- Chappelle, C., & Hanak, E. (2019, May 17). *Groundwater in California*. Public Policy Institute of California. <https://www.ppic.org/publication/groundwater-in-california/>
- Conduent Healthy Communities Institute. (2019, May 1). *What is a Census Place?*
<https://help.healthycities.org/hc/en-us/articles/115013485248-What-is-a-Census-Place-#:~:text=Census%20Places%20are%20geographies%20defined,cities%2C%20towns%2C%20villages%2C%20boroughs>
- County of Santa Cruz. (n.d.). *Groundwater Management*. Retrieved March 21, 2021, from <http://sccch.com/Home/Programs/WaterResources/GroundwaterManagement.aspx>

- Department of Water Resources. (2006, January 20). *San Joaquin Valley Groundwater Basin Kern County Subbasin*. California's Groundwater Bulletin 118. https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Bulletin-118/Files/2003-Basin-Descriptions/5_022_14_KernCountySubbasin.pdf
- Department of Water Resources. (2015, April). *California's Groundwater Update 2013 A Compilation of Enhanced Content for California Water Plan Update 2013*. State of California. <https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Data-and-Tools/Files/Statewide-Reports/California-Groundwater-Update-2013/California-Groundwater-Update-2013---Statewide.pdf>
- Department of Water Resources. (n.d. -a). *SGMA Groundwater Management*. State of California. Retrieved January 25, 2021, from <https://water.ca.gov/Programs/Groundwater-Management/SGMA-Groundwater-Management>
- Department of Water Resources. (n.d. -b). *GSA Map Viewer*. State of California. Retrieved January 24, 2021, from <https://sgma.water.ca.gov/webgis/index.jsp?appid=gasmaster&rz=true>
- Department of Water Resources (n.d. -c). *Basin prioritization*. State of California. Retrieved March 19, 2021, from <https://water.ca.gov/Programs/Groundwater-Management/Basin-Prioritization>
- Dimick, D. (2014, August 24). *If You Think the Water Crisis Can't Get Worse, Wait Until the Aquifers Are Drained*. National Geographic Society. <https://www.nationalgeographic.com/history/article/140819-groundwater-california-drought-aquifers-hidden-crisis>
- Dobbin, K. (2018, June 8). SGMA struggles to overcome marginalization of disadvantaged communities. California WaterBlog. <https://californiawaterblog.com/2018/06/10/who-is-being-left-out-of-californias-groundwater-reform/>
- Dobbin, K. B., & Lubell, M. (2019). Collaborative governance and environmental justice: Disadvantaged community representation in California sustainable groundwater management. *Policy Studies Journal*.
- Dobbin, K. B. (2020). "Good Luck Fixing the Problem": Small Low-Income Community Participation in Collaborative Groundwater Governance and Implications for Drinking Water Source Protection. *Society & Natural Resources*, 33(12), 1468-1485.
- Douglas, T. (2016, September 13). *County supervisors vote to form groundwater agency*. The Bakersfield Californian. https://www.bakersfield.com/news/county-supervisors-vote-to-form-groundwater-agency/article_fcee0dc6-abdf-5384-af6f-c82dc9a5756f.html

- Doyle, M. (2011, January 28). Twain's whiskey/water quote appears greatly exaggerated. McClatchy Newspapers. <https://www.mcclatchydc.com/news/politics-government/article24609343.html>
- Feinstein, L.; Phurisamban, R.; Ford, A.; Tyler, C. and Crawford, A. (2017). *Drought and equity in California*. Oakland, CA: Pacific Institute.
- Feiock, R.C. 2007. *Rational choice and regional governance*. Journal of Urban Affairs 29(1): 47-63.
- Feiock, R.C. 2013. *The institutional collective action framework*. Policy Studies Journal 41(3): 397-425.
- Foster, S. (2002). "Environmental Justice in an Era of Devolved Collaboration." Harvard Environmental Law Review 26: 459.
- Francis, R., and L. Firestone. (2010). *Implementing the human right to water in California's Central Valley: Building a democratic voice through community engagement in water policy decision making*. Willamette Law Review 47:495
- Groundwater Exchange. (2020 -a). *San Joaquin Valley – Kern County*. (n.d.). Groundwater Exchange. Retrieved January 4, 2021, from <https://groundwaterexchange.org/basin/san-joaquin-valley-kern-5-022-14/>
- Groundwater Exchange. (2020 -b). *Santa Cruz Mid-County*. Groundwater Exchange. Retrieved January 4, 2021, from <https://groundwaterexchange.org/basin/santa-cruz-mid-county-3-001/>
- Groundwater Exchange. (2020 -c). *Groundwater sustainability agencies*. Groundwater Sustainability Agencies - Groundwater Exchange. Retrieved January 13, 2021, from <https://groundwaterexchange.org/groundwater-sustainability-agencies/>
- Harter, T., J. Lund, J. Darber, G. Fogg, R. Howitt, K. Jessoe, S. Pettygrove, J. Quinn, and J. Viers. (2012). *Addressing nitrate in California's drinking water with a focus on Tulare Lake Basin and Salinas Valley Groundwater*. Report for the State Water Resources Control Board Report to the Legislature. Davis, CA: UC Davis Center for Watershed Sciences.
- Henry, L. (2019, August 5). *LOIS HENRY: Groundwater overdraft numbers 'don't add up,' and that's a big problem*. Bakersfield.Com. https://www.bakersfield.com/news/lois-henry-groundwater-overdraft-numbers-don-t-add-up-and-that-s-a-big-problem/article_ae310d60-e631-11e9-84df-0fb9eebca1c7.html
- Johnson, N. (2019, June 3). California's water crisis has put farmers in a race to the bottom. Grist. <https://grist.org/article/californias-water-crisis-has-put-farmers-in-a-race-to-the-bottom/>

- Kern Groundwater Authority. (2018, April 26). Districts: GSAs within Kern Sub-Basin. North Kern Water Storage District. https://www.northkernwsd.com/wp-content/uploads/2018/08/KGA_District_Boundaries.pdf
- Kern Groundwater Authority. (n.d.). *About Us*. Retrieved January 23, 2021, from <http://www.kerngwa.com/about-us.html>
- Kern River Groundwater Sustainability Agency. (n.d.). *About*. About- KRGSA. Retrieved January 23, 2021, from http://www.kernrivergsa.org/?page_id=17
- Kiparsky, M., Milman, A., Owen, D., & Fisher, A. T. (2017). *The importance of institutional design for distributed local-level governance of groundwater: The case of California's sustainable groundwater management act*. *Water*, 9(10), 755.
- KRGSA. (n.d.). *KRGSA- Kern River Groundwater Sustainability Agency*. Kern River Groundwater Sustainability Agency. Retrieved March 21, 2021, from <http://www.kernrivergsa.org/>
- Kwon, S.-W. and Feiock, R.C. 2010. *Overcoming the barriers to cooperation: Intergovernmental service agreements*. *Public Administration Review* 70(6): 876-884.
- Mathews, J. (2020, November 10). California's Unincorporated Places Can Be Poor, Powerless—And the Perfect Place to Commit Murder. Zócalo Public Square. <https://www.zocalopublicsquare.org/2020/11/10/california-unincorporated-communities-covid19-pandemic/ideas/connecting-california/>
- Maven. (2018, March 7). *Groundwater Rights Primer: What Agencies & Project Developers Need To Know*. MAVEN'S NOTEBOOK | Water News. <https://mavensnotebook.com/2018/03/07/groundwater-rights-primer-agencies-project-developers-need-know/>
- Merriam-Webster. (n.d.). Fallow. The Merriam-Webster.Com Dictionary. Retrieved April 30, 2021, from <https://www.merriam-webster.com/dictionary/fallow>
- Milman, A., Galindo, L., Blomquist, W., & Conrad, E. (2018). *Establishment of agencies for local groundwater governance under California's Sustainable Groundwater Management Act*. *Water alternatives*, 11(3).
- Monterey County. (n.d.). *Monterey County water Resources Agency*. Retrieved March 19, 2021, from <https://www.co.monterey.ca.us/government/government-links/water-resources-agency/programs/california-statewide-groundwater-elevation-monitoring-casgem>
- Moran, T., & Wendell, D. (2014). THE SUSTAINABLE GROUNDWATER MANAGEMENT ACT OF 2014: Challenges and Opportunities for Implementation. *Water in the West*. https://waterinthewest.stanford.edu/sites/default/files/WitW_SGMA_Report_08242015_0.pdf

- Nadeau, R. (1961, December). The Water War | AMERICAN HERITAGE. American Heritage. <https://www.americanheritage.com/water-war>
- National Geographic Society. (2019, July 29). *Groundwater*. <https://www.nationalgeographic.org/encyclopedia/groundwater/#:%7E:text=Water%20that%20has%20travelled%20down,an%20impenetrable%20layer%20of%20rock>
- Olson-Sawyer, K. (2018, February 27). *Stewart Resnick: Land, Nuts and Water Made America's Biggest Farmer*. Water Footprint Calculator. <https://www.watercalculator.org/news/articles/wonderful-nuts-water-farmer/>
- Pannu, C. (2012). *Drinking water and exclusion: A case study from California's Central Valley*. California Law Review 100 (1):223–68.
- Patrick, Robert J. (2009). "Source Water Protection in a Landscape of 'New Era' Deregulation." The Canadian Geographer/Le Géographe canadien 53 (2): 208–21.
- Peters, B.G. 1998. *Managing horizontal government: The politics of co-ordination*. Public Administration 76(2): 295-311.
- Pitzer, G. (2019, March 28). *As Deadline Looms for California's Badly Overdrafted Groundwater Basins, Kern County Seeks a Balance to Keep Farms Thriving*. Water Education Foundation. <https://www.watereducation.org/western-water/deadline-looms-californias-badly-overdrafted-groundwater-basins-kern-county-seeks>
- Provan, K.G. and Kenis, P. 2008. *Modes of network governance: Structure, management, and effectiveness*. Journal of Public Administration Research and Theory 18(2): 229-252.
- Santa Cruz Mid-County Groundwater Agency. (n.d.). *FAQs | Santa Cruz Mid-County Groundwater Agency*. Retrieved March 21, 2021, from <https://www.midcountygroundwater.org/faqs>
- SB 1168, 2014 Reg Sess. (Cal., 2014) https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140SB1168
- SB 1319, 2014 Reg. Sess. (Cal., 2014) https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140SB1319
- Schafer, J.G. (2016). *Mandates to coordinate: The case of the Southern Nevada Public Lands Management Act*. Public Performance & Management Review 40(1): 23-47.
- Soquel Creek Water District. (n.d.). *History, Mission, Values, and Goals*. Retrieved April 26, 2021, from <https://www.soquelcreekwater.org/who-we-are/history-mission-values-and-goals>

- State Water Resource Control Board. (2014, December). *Groundwater Legislation Timeline*. California Water Boards.
https://www.waterboards.ca.gov/water_issues/programs/gmp/docs/sgma/timeline.pdf
- State Water Resources Control Board. (2015). *A Guide for Private Domestic Well Owners*. California Water Boards.
https://www.waterboards.ca.gov/gama/docs/wellowner_guide.pdf
- State Water Resources Control Board. (2018). *Annual compliance report 2017*. California Water Boards
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/dwdocuments/2017/acr_2018_final_20180718_combined_cvltr.pdf.
- State Water Resource Control Board. (2019, April). *Stakeholder Inclusion*. Sustainable Groundwater Management Act.
https://www.waterboards.ca.gov/water_issues/programs/gmp/docs/sgma/20190411_stakeholder_inclusion.pdf
- State Water Resources Control Board. (n.d. -a). *Water Rights FAQs | California State Water Resources Control Board*. California Water Boards. Retrieved March 1, 2021, from https://www.waterboards.ca.gov/waterrights/board_info/faqs.html#:~:text=There%20is%20one%20exception%2C%20which,you%20have%20an%20E2%80%9Cappropriate%20groundwater
- State Water Resource Control Board. (n.d. -b). *SGMA Resources for GSAs | California State Water Resources Control Board*. California Water Boards. Retrieved April 30, 2021, from https://www.waterboards.ca.gov/water_issues/programs/sgma/gsa_resources.html#:~:text=SGMA%20is%20a%20landmark%20law,to%20sustainably%20manage%20groundwater%20resources.&text=Other%20programs%20at%20the%20State,direct%20use%20or%20groundwater%20recharge
- Stokstad, E. (2020, April 16). *Droughts exposed California's thirst for groundwater. Now, the state hopes to refill its aquifers*. American Association for the Advancement of Science. Retrieved January 22, 2021, from <http://www.sciencemag.org/news/2020/04/droughts-exposed-california-s-thirst-groundwater-now-state-hopes-refill-its-aquifers>
- UC Davis. (2018, June). *Research Brief: Small Disadvantaged Community Participation in Groundwater Sustainability Agencies*. Center for Environmental Policy and Behavior <https://environmentalpolicy.ucdavis.edu/sites/g/files/dgvnsk6866/files/files/person/Research%20Brief%20June%202018%20-%20English.pdf>
- United States Department of Agriculture Economic Research Service. (2019). *Cash receipts by commodity State ranking*. United States Department of Agriculture.
<https://data.ers.usda.gov/reports.aspx?ID=17844>

- United Nations General Assembly. (2011). *Report of the Special Rapporteur on the Human Right to Safe Drinking Water and Sanitation*. UN Human Rights Council.
www2.ohchr.org/english/bodis/hrcouncil/docs/18session/A-HRC-18-33-Add4en.Pdf
- United States Geological Service. (n.d.). *What is the difference between a confined and an unconfined (water-table) aquifer?* USGS Science for a Changing World. Retrieved March 1, 2021, from https://www.usgs.gov/faqs/what-difference-between-a-confined-and-unconfined-water-table-aquifer?qt-news_science_products=0#qt-news_science_products
- United States Geological Service. (2018). *Aquifers and Groundwater*. USGS Science for a Changing World. https://www.usgs.gov/special-topic/water-science-school/science/aquifers-and-groundwater?qt-science_center_objects=0#qt-science_center_objects
- U.S. Census Bureau (2019). QuickFacts: Aptos CDP, California; Soquel CDP, California; Orange Cove city, California. Retrieved from <https://www.census.gov/quickfacts/fact/table/aptoscdpcalifornia,soquelcdpcalifornia,orangeovecitycalifornia/PST045219>
- Water Education Foundation. (2020 -a). *Land Subsidence*. Water Education Foundation.
<https://www.watereducation.org/aquapedia/land-subsidence#:~:text=Subsidence%20impacts%20the%20Friant%2DKern,about%20a%2025%20mile%20area>
- Water Education Foundation. (2020 -b). *Safe Yield*.
<https://www.watereducation.org/aquapedia/safe-yield#:~:text=Safe%20yield%20is%20generally%20considered,factored%20in%20to%20replenishment%20rates>.
- Wright, D. (2019, May 9). *The good, the bad, and the ugly of SGMA, explained*. The San Joaquin Valley Sun. <https://sjvsun.com/ag/the-good-the-bad-and-the-ugly-of-sgma-explained/>
- Yeung, B. (2012, April 6). *Neglected for decades, unincorporated communities lack basic public*. Center for Health Journalism.
<https://centerforhealthjournalism.org/fellowships/projects/neglected-decades-unincorporated-communities-lack-basic-public-services>