

Technical Appendix

Case study data and analysis

Analysis of case studies was based upon GSA formation meeting observations (primarily during 2016 and 2017), and reviews of meeting minutes, presentations, draft and final versions of governance documents (including Memoranda of Agreement, Joint Powers Agreements, and related documents), and GSA notices submitted in each basin. Types of observation, time periods, and meeting minutes' availability varied across cases, as shown in Table T1. One co-author served as facilitator for the Yolo and Colusa basin GSA formation processes, and therefore observed and participated in the entire process in these two basins. Another co-author served as a facilitator for other GSA formation processes in the state, and contributed knowledge of how our case studies compared to processes in other parts of the state.

Findings from meeting observations were discussed among co-authors with regard to common themes of GSA formation discussions, including key concerns raised by agricultural stakeholders and other participants, and factors that contributed to decisions about governance structures. Meeting notes were reviewed to confirm details, and were used to compile a list of the types of stakeholders who attended GSA formation meetings in each case (presented in Table 2). Governance documents from the three cases studies were compared to confirm the formal multi-level decision-making arrangements ultimately agreed upon in each basin.

Methods for GSA Formation Analysis

Background. Under SGMA, GSAs are required to be formed within high and medium-priority basins, as defined and prioritized by the California Department of Water Resources (DWR). Basins were prioritized based on multiple factors, such as overlying population, irrigated acreage, reliance on groundwater as a primary source, and other factors (DWR 2014). The 127 basins that were ranked as high or medium priority in 2014 were required to be completely covered by one or more GSAs by June 30, 2017 in order to avoid state intervention. SGMA does not require GSA formation in the remaining 388 low and very low priority basins. DWR is currently in the process of re-prioritizing basins after boundary modifications were made in 2016, to be completed in 2017. Any basins that are re-prioritized as medium or high priority will have two years within which to form GSAs (CWC §10722.4).

Adjudicated areas within high and medium priority basins are exempt from most of SGMA's requirements, including the requirement to form GSAs. However, GSAs must still be formed in parts of a basin that fall outside of an adjudicated area. In addition, GSAs need not be formed in basins that are covered by an alternative plan (CWC §10733.6), although some GSAs have formed in these basins. Alternative plans were submitted in 22 basins prior to the January 1, 2017 deadline, and these plans are currently under review by DWR.

Upon receiving a GSA notice, DWR reviews it for completeness and posts it on its SGMA Portal (<http://sgma.water.ca.gov/portal/#gsa>). Once a GSA notice is posted, there is a 90-day waiting period before that GSA is deemed an "exclusive" GSA for that area. This gives other entities within that geographic area the opportunity to submit

their own notice. If another, overlapping notice is submitted, then no GSA within that area becomes “exclusive” until overlaps are resolved.

Analysis. The analysis of GSA notices was based on all notices submitted to the SGMA portal as of June 30, 2017 (DWR completed the posting of these notices on July 17, 2017). Our analysis included notices for which the 90-day waiting period had not yet elapsed. Agencies may still make changes to their GSA arrangements after June 30 by revising or submitting new GSA notices.

Analysis of the number and type of GSAs, consideration of the interests of beneficial users, and the role of agricultural interests in GSA governance was conducted based on all GSAs, including those in low and very low priority basins. The analysis of the number of GSAs per basin was conducted only for high and medium priority basins, where GSA formation was required by June 30, 2017.

- Number and type of GSAs. GSA notices were reviewed to count the number of separate entities declaring as GSAs. This is different from the number of notices, since some agencies have submitted multiple GSA notices. Next, GSAs were classified as single-agency or multi-agency. A GSA was designated as multi-agency if its governing body was composed of multiple agencies, pursuant to a Joint Powers Agreement (JPA), Memorandum of Agreement (MOA) or another legal instrument. If a GSA notice was submitted by single agency and the GSA would be governed by its existing board of directors, this GSA was classified as single agency. This includes special act districts that had been formed by the

state legislature prior to SGMA with specific authority to manage groundwater, as listed in CWC §10723 (c)(1). Two notices involved multiple organizations, but the legislation has since been approved forming special act districts to serve as GSAs in these areas. These were coded as single agency GSAs. If a single agency signed an MOA with other entities regarding coordination of GSA activities, but the GSA is still governed by the board of one agency, this GSA was also classified as single agency. Single agencies were further categorized according to whether they were involved in managing water for agricultural or urban use, or both. When available, agency websites were consulted to determine this.

- Consideration of the interests of beneficial groundwater users in GSA formation. SGMA requires Groundwater Sustainability Agencies (GSAs) to “consider the interests of all beneficial uses and users of groundwater, as well as those responsible for implementing groundwater sustainability plans,” and provides a list of ten specific types of beneficial users that must be included, as well as entities responsible for groundwater monitoring (CWC §10723.2). All GSA notices submitted to DWR must include a “list of interested parties developed pursuant to Section 10723.2 and an explanation of how their interests will be considered in the development and operation of the groundwater sustainability agency and the development and implementation of the agency’s sustainability plan,” (CWC §10723.8).

We reviewed the list of interested parties provided in each GSA notice. Most notices described interested parties according to the ten categories in CWC

§10723.2, which are listed in Table T2. Notices provided varying degrees of detail about interested parties, with some naming specific entities under each category and others simply listing the categories present. For each notice, we tracked whether each interest was described as present, not present, or not yet identified or not mentioned. Notices also listed entities responsible for monitoring and reporting groundwater elevations, but since these are not groundwater users they were not included in the analysis. Data in Table T2 is presented by GSA, not by notice. When a GSA submitted multiple notices, data from these notices were combined to reflect all interested parties within the whole area covered by that GSA. To assess the degree of diversity of stakeholders that GSAs plan to engage, we counted how many of the ten beneficial users were listed as present by each GSA; results are presented in Table T3.

- Role of agricultural interests in GSA governance. Additional analysis was performed to assess how agricultural interests were represented in each GSA's governance structure. For single-agency GSAs, all irrigation districts and reclamation districts – whose boards are typically elected by participating landowners – were coded as having agricultural representation. For water districts and other types of single-agency GSAs, agency websites were consulted (if available) to confirm whether the agency's board of directors includes representatives of the agricultural water users or landowners. For multi-agency GSAs, the JPA or MOA included in the GSA notice was reviewed to determine whether agricultural interests are represented by a specific entity on the governing body or on an advisory committee. A GSA was counted if its JPA or

MOA included an irrigation district as a voting member, or designated a specific seat for representatives of agriculture and/or private pumpers on its board or advisory committee.

- Number of GSAs per basin. This analysis was conducted only for high or medium priority basins where GSA formation is required. Since DWR has not yet completed its prioritization using the 2016 basin boundaries, for the purposes of this analysis we considered a basin as high or medium priority if any part of it had been ranked as a high or medium priority basin as of 2014. This resulted in 134 high and medium priority basins, using 2016 basin boundaries. This number may change after DWR completes its re-prioritization by the end of 2017. The list of GSA notices and the GSA map viewer in the SGMA portal were used to identify the basins in which GSAs have been formed and the number of GSAs formed in each.

TABLE T1. Case study data

	Yolo	Colusa	Eastern San Joaquin
Observation type	Facilitation by co-author; attendance by two co-authors	Facilitation by co-author	Attendance by three co-authors
Time period	Oct. 2015 – June 2017	Jan. 2016 – June 2017	July 2016 – June 2017
No. of meetings observed	5 GSA formation mtgs; 12 meetings of the Water Resources Association (WRA) of Yolo County, 1 meeting of the Yolo Subbasin Groundwater Agency (the GSA)	Colusa County: 19 Glenn County: 12	8 SGMA Workgroup Meetings (GSA formation), 1 meeting of the Eastern San Joaquin Groundwater Authority (basinwide JPA of GSAs)
Minutes available?	No minutes of GSA formation meetings; minutes available for WRA meetings	Yes	Yes
Other documents reviewed	GSA formation meeting handouts; drafts of JPA forming the basinwide GSA; final JPA; GSA formation notices	GSA formation meeting presentations; drafts of MOAs and JPAs; final JPAs formed in Glenn and Colusa counties; GSA formation notices	GSA formation meeting presentations; drafts of basinwide JPA of GSAs; final JPA; GSA formation notices

Table T2. Beneficial users of groundwater listed in GSA notices

Beneficial users listed in GSA notices*	Present	Not present	Unknown†	Percent GSAs with these users present (%)
Overlying rights for agricultural use	219	26	8	87
Overlying rights for domestic/other use	226	18	9	89
Municipal well operators	169	79	5	67
Public water systems	184	53	16	73
Land use planning agencies	251	0	2	99
Environmental uses of groundwater	108	91	54	43
Surface water uses connected with groundwater	132	87	34	52
Federal government	132	101	20	52
Tribes	71	163	19	28
Disadvantaged communities	123	108	22	49

*SGMA requires these beneficial users to be consulted in GSA formation (CWC §10723.2). Entities responsible for monitoring and reporting groundwater elevations are also listed in this section but were not included here because they are not groundwater users. † These GSAs either did not mention this user type, or noted that particular users had not yet been identified.

Conrad E, Moran T, DuPraw M, Ceppos D, Martinez J, Blomquist W. 2018. Diverse stakeholders create collaborative, multilevel basin governance for groundwater sustainability. Calif Agr 72(1):44-53. <https://doi.org/10.3733/ca.2018a0002>.

Table T3. Number of beneficial users listed as present in GSAs

GSAs with 10 beneficial users present	12
GSAs with 9 beneficial users present	32
GSAs with 8 beneficial users present	47
GSAs with 7 beneficial users present	37
GSAs with 6 beneficial users present	36
GSAs with 5 beneficial users present	39
GSAs with 4 beneficial users present	27
GSAs with 3 beneficial users present	14
GSAs with 2 beneficial users present	3
GSAs with 1 beneficial users present	4
GSAs with 0 beneficial users present	2