Interactive Groundwater Sustainability Agency Boundaries

Updated interactive Groundwater Sustainability Agency (GSA) layer for the Drinking Water Tool (2023). Data processed and joined by Clare Pace and Ari Libenson, Water Equity Science Shop, UC Berkeley.
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File name: GSA_interactive_082823.shp

Spatial Reference

Geographic Coordinate System	NAD 1983	Projected Coordinate System	NAD 1983 (Teale) Albers (Meters)
WKID	4269	Projection	3310
Authority	EPSG	Authority	EPSG
Angular Unit	Degree (0.0174532925199433)	Linear Unit	Meters (1.0)
Prime Meridian	Greenwich (0.0)	False Easting	0.00
Datum	D North American 1983	False Northing	-4000000.0
Spheroid	GRS 1980	Central Meridian	-120.0
Semimajor Axis	6378137.0	Standard Parallel 1	34.0
Semiminor Axis	6356752.314140356	Standard Parallel 2	40.5
Inverse Flattening	298.257222101	Latitude of Origin	0.0

Description

This shapefile contains a feature class with polygons that represent 353 Groundwater Sustainability Agencies (GSA) formed under the Sustainable Groundwater Management Act (SGMA). The GSA boundaries were downloaded from the Department of Water Resources (August 7, 2023). To estimate a count of each entity per GSA, the following fields were spatially joined to the GSA boundaries: domestic wells locations, public supply well locations, water system boundaries, and severely disadvantaged and disadvantaged census places.

The drought scenario results for Central Valley private domestic wells were aggregated to GSAs (see Gailey 2020). Note that for the drought analysis results at the GSA level, there may be only partial data support for some areas as Gailey work was limited geographically to areas in the San Joaquin Valley that had well depth data available in a GIS format.

Methods:

Updating GSA layer attributes

1. Spatially joined public supply wells[1] to GSA polygons[2] in ArcGIS Pro, using the Completely Contained argument (note, Gailey work was limited geographically to areas in the SJ Valley that had department of water resources well depth data in a GIS format)
    a. Created a new field, Num_MunPub, populated with the sum of wells per GSA.
2. Spatially joined domestic well points[3] to GSA polygons, using the Completely Contained argument.
    a. Created a new field, Count, populated with the count of wells per GSA.

   b. Selected all domestic wells with completed depth > 0 ft. Used summarize within function to calculate average and standard deviation of completed well depth.
3. Spatially joined water system boundaries[4] to GSA polygons, using the Intersect argument.
   a. Created a new field, CWS_Count, populated with the count of systems per GSA.
4. Joined updated contact information for GSAs shared by CA Department of Water Resources on August 17, 2023.
5. Calculated population served by domestic wells[3] and population served by water system (Pace et al., 2023) for each GSA.
   a. Used geoprocessing tool "make feature layer" and selected the option for "use ratio policy" for population field.
   b. Intersected layer with GSA boundaries.
   c. Dissolved by GSA ID and calculated sum of population.
6. Calculated number of disadvantaged communities (DAC) and severely disadvantaged communities (SDAC) census designated places[5] in each GSA.
   a. Intersected 2021 census designated places and GSA boundaries.
   b. Selected by DAC and dissolved by GSA.
   c. Selected by SDAC and dissolved by GSA.
7. Spatially joined with point data for the following drinking water threats layers:
   a. Wastewater treatment facilities[6], water samples with any PFAS detection and detections exceeding the proposed maximum contaminant level (MCL)[7], landfills[6], refineries and bulk terminals[6], active oil and gas wells[8], chrome-plating facilities[6].
   b. Used the geoprocessing tool "summarize within" function to count the number of each threat by GSA.
8. Merged drinking water threat polygons representing superfund sites[9]; military installations, ranges, and training areas[10]; and airports permitted to use aqueous film-forming foam (AFFF)[11] into a single shapefile.
   a. Removed duplicates, dummy coded polygons based on which dataset (or combination of datasets) it came from.
   b. Intersected polygons with GSAs and added the number of each type of facility by GSA.
9. Selected public land survey system (PLSS) sections with the highest 10% of pesticide application. Intersected with GSA boundaries and calculated the number of PLSS sections with intense pesticide application in each GSA.

10. **Determining Drought Scenario Results for Small Community Water Systems in the Central Valley (Gailey 2020)****

As described in the accompanying project report (Gailey 2020)[13], R. M. Gailey, a Consulting Hydrogeologist PC generated a drought scenario analysis to evaluate private domestic well impacts for those wells located in the Central Valley, as defined by the alluvial groundwater basin boundary. The analysis compares private domestic well construction information to estimated decreases in groundwater levels, identifies potential impacts to well production regarding quantity, and estimates mitigation costs. Calculations are performed for each PLSS section in the Central Valley where information is available for both well construction and groundwater level during the 2012 to 2016 drought. For the GSA analysis, the PLSS results are then aggregated to GSA boundary using an aggregation approach outlined in the accompany methodology report (see Gailey 2020).

For a given drought scenario being considered, a single selected value for the drought factor (0.0, 0.50, 0.75, 1.0) is applied to all locations in the area of interest. The factor scales the maximum groundwater level change estimated to have occurred in each PLSS section during the 2012 to 2016 drought and adds this calculated level decrease to the estimated depth to groundwater at the beginning of the SGMA compliance period (Fall 2014). The result is an estimated groundwater level within the PLSS section, for each of the four drought scenario under consideration, which translates to 1) count of impact wells and 2) mitigation costs. For each scenario, mitigation measures considered include lowering pumps in existing wells, cleaning well screens and replacing wells with deeper wells.

Only scenarios 2 (50%), 3 (75%) and 4 (100%) are available in the interactive California Water Data map interface of the Drinking Water Tool. However, the downloadable data that this metadata accompanies includes all scenarios and all impacts/costs. The four scenarios are abbreviated for GIS field names.

- S1: Scenario 1 or reference case (0% of 2012-2016 groundwater level change)
- S2: Scenario 2, (50% of 2012-2016 groundwater level change)
- S3: Scenario 3 (75% of 2012-2016 groundwater level change)
- S4: Scenario 4 (100% of 2012-2016 groundwater level change).

For each scenario (S1 through S4), mitigation measures are identified separately:

- S1_PL_coun = Count of Wells with Pump Lowering (PL)
- S1_PL_cost = Pump Lowering Cost
- S1_SR_coun = Count of Wells with Screen Rehabilitation (SR)
- S1_SR_cost = Screen Rehabilitation Cost
- S1_WR = Count of Wells with Well Replacements (WR)
- S1_WR_cost = Well Replacement Cost

For each scenario (S1 through S4), summary figures of total domestic wells impacted and costs are calculated:

- S1_CostXLi = Extra Lift Cost, which is the cost for extra pumping lift. If the water level decreases, all wells will experience extra lift cost but only some wells may experience other impacts that result in mitigation costs.
- S1_SumImpa = Count of all Drought Impacted Wells where the sum is a tally of all wells with at least one impact (pump lowering, well screen cleaning or well replacement).
- S1_TotalCo = Total Cost which is the sum of the CostImpact(total of all mitigation costs) + CostXLift

Attribute Table

Field Heading	Field type	Field Description	Source
GSA_ID	Long	GSA ID	DWR
GSA_Name	Text	GSA name	DWR
GSA_URL_1	Text	URL	DWR
POC_Name_1	Text	Person of contact name	CWC
POC_Email_	Text	Person of contact email	CWC
POC_Phone_	Text	Person of contact phone number	CWC
Local_ID	Text	Local ID	DWR
Posted_DT	Date	Date GSA posted to DWR database	DWR
Av_depth	Double	Average total completed depth of wells	WESS
SD_depth	Double	Standard deviation of total completed depth for wells	WESS
Count	Long	Count of domestic wells	WESS
Num_MunPub	Long	Count of public supply wells	WESS
Basin_Numb	Text	Basin Number (B118)	DWR, B118
Basin_Subb	Text	Sub-Basin Number (B118)	DWR, B118
Basin_Name	Text	Basin Name (B118)	DWR, B118
Basin_Su_1	Text	Sub-Basin Name (B118)	DWR, B118
Basin_1	Text	Sub-Basin Number (B118)	DWR, B118
Region_Off	text		
Hydrologic	Text	Hyrologic Region (DWR)	DWR, CASGEM
DWR_Projec	Long	DWR CASGEM Project Phase	DWR, CASGEM
Adjud_C8c	Long	Adjudicated Basin [True / False]	DWR, CASGEM
CritOvrdrft	Long	Critically Overdrafted Basin [True / False]	DWR, CASGEM

PriorityCh	Text	Change in CASGEM Priority between 2014 and 2018	DWR, CASGEM
CASGEMPhas	Text	CASGEM Priority Ranking (Phase 2)	DWR, CASGEM
CWS_count	Long	Count of water systems	WESS
CWS_pop_fi	Double	Population served by water systems	WESS
DWA_pop_To	Double	Population served by domestic wells	WESS
Num_DAC	Double	Count of disadvantaged communities	WESS
Num_SDAC	Double	Count of severely disadvantaged communities	WESS
S1_PL_coun	Double	Count of Wells with Pump Lowering (PL)	Gailey 2020
S1_PL_cost	Double	Pump Lowering Cost	Gailey 2020
S1_SR_coun	Double	Count of Wells with Screen Rehabilitation (SR)	Gailey 2020
S1_SR_cost	Double	Screen Rehabilitation Cost	Gailey 2020
S1_WR	Double	Count of Wells with Well Replacements (WR)	Gailey 2020
S1_WR_cost	Double	Well Replacement Cost	Gailey 2020
S1_CostXLi	Double	Extra Lift Cost	Gailey 2020
S1_SumImpa	Double	Count of all Drought Impacted Wells *(sum is a tally of all wells with at least one impact - pump lowering, well screen cleaning or well replacement).*	Gailey 2020
S1_TotalCo	Double	Total Cost (S1_PL_cost + S1_SR_cost + S1_WR_cost + CostXLi)	Gailey 2020
S2_PL_coun	Double	Count of Wells with Pump Lowering	Gailey 2020
S2_PL_cost	Double	Pump Lowering Cost	Gailey 2020

S2_SR_coun	Double	Count of Wells with Screen Rehabilitation	Gailey 2020
S2_SR_cost	Double	Screen Rehabilitation Cost	Gailey 2020
S2_WR	Double	Count of Wells with Well Replacements	Gailey 2020
S2_WR_cost	Double	Well Replacement Cost	Gailey 2020
S2_CostXLi	Double	Extra Lift Cost	Gailey 2020
S2_SumImpa	Double	Count of all Drought Impacted Wells	Gailey 2020
S2_TotalCo	Double	Total Cost (S2_PL_cost + S2_SR_cost + S2_WR_cost + S2_CostXLi)	Gailey 2020
S3_PL_coun	Double	Count of Wells with Pump Lowering	Gailey 2020
S3_PL_cost	Double	Pump Lowering Cost	Gailey 2020
S3_SR_coun	Double	Count of Wells with Screen Rehabilitation	Gailey 2020
S3_SR_cost	Double	Screen Rehabilitation Cost	Gailey 2020
S3_WR	Double	Count of Wells with Well Replacements	Gailey 2020
S3_WR_cost	Double	Well Replacement Cost	Gailey 2020
S3_CostXLi	Double	Extra Lift Cost	Gailey 2020
S3_SumImpa	Double	Count of all Drought Impacted Wells	Gailey 2020
S3_TotalCo	Double	Total Cost (S3_PL_cost + S3_SR_cost + S3_WR_cost + S3_CostXLi)	Gailey 2020
S4_PL_coun	Double	Count of Wells with Pump Lowering	Gailey 2020
S4_PL_cost	Double	Pump Lowering Cost	Gailey 2020
S4_SR_coun	Double	Count of Wells with Screen Rehabilitation	Gailey 2020
S4_SR_cost	Double	Screen Rehabilitation Cost	Gailey 2020

S4_WR	Double	Count of Wells with Well Replacements	Gailey 2020
S4_WR_cost	Double	Well Replacement Cost	Gailey 2020
S4_CostXLi	Double	Extra Lift Cost	Gailey 2020
S4_SumImpa	Double	Count of all Drought Impacted Wells	Gailey 2020
S4_TotalCo	Double	Total Cost (S4_PL_cost + S4_SR_cost + S4_WR_cost + S4_CostXLi)	Gailey 2020
WWTFs	Double	Count of wastewater treatment facilities (WWTFs)	WESS
Excd_MCL	Double	Count of well water samples with PFAS concentrations above any EPA proposed Maximum Contaminant Level (MCL)	WESS
Excd_DL	Double	Count of well water samples with PFAS concentrations above the detection limit but below any EPA proposed Maximum Contaminant Level (MCL)	WESS
RefsTerms	Double	Count of refineries and bulk terminals	WESS
Landfills	Double	Count of municipal landfills in GSA	WESS
ChromePlat	Double	Count of chrome-plating facilities in GSA	WESS
Num_OG	Double	Count of oil and gas wells in GSA	WESS
Top10pest	Double	Count of section with the top 10% of pesticide use	WESS
SRP	Double	Count of Superfund Sites	WESS
MIRTA	Double	Count of Military Installations, Ranges and Training Areas (MIRTA)	WESS

P139	Double	Count of airports permitted to use aqueous film-forming foam (contains PFAS)	WESS
MIRTA_SPR	Double	Count of sites listed as both a MIRTA and Superfund Site (SRP)	WESS

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