Interactive Counties Layer

Updated interactive counties layer for the Drinking Water Tool (2024). Data processed and joined by Clare Pace and Ari Libenson, Water Equity Science Shop, UC Berkeley
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File name: Counties_final_080724.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 the boundaries of the 58 counties in California. County boundaries and sociodemographics from the 2017-2021 American Community Survey (ACS) were downloaded from the U.S. Census Bureau. To estimate a count of each entity per county, the following fields were spatially joined to the county boundaries: domestic wells locations, Groundwater Sustainability Agencies (GSAs), public supply well locations, water system boundaries and drinking water affordability data, severely disadvantaged community and disadvantaged community census places, and drinking water threats. Results from a drought analysis that compared domestic well depth to Sustainable Groundwater Management Act (SGMA)-related conditions set by GSAs in the Groundwater Sustainability Plans (GSPs) were aggregated to counties.

Methods

Updating county layer attributes

1. Joined ACS 2017-2021 5-year estimates[1,2] to county boundaries[3].
2. Spatially joined public supply wells[4] to county polygons in ArcGIS Pro, using the Completely Contained argument.
    a. Created a new field, Num_MunPub, populated with the sum of wells per county.
3. Spatially joined domestic well points[5] to county polygons, using the Completely Contained argument.
    a. Created a new field, Num_DW, populated with the count of wells per county.

   b. Selected all domestic wells with completed depth > 0 ft. Used summarize within function to calculate average and standard deviation of completed well depth.
4. Performed a pairwise intersection to identify overlaps between water system boundaries[6] and counties.
   a. Slivers were identified and excluded.
      i. **Note:** Slivers are erroneous polygons that occur when two layers intersect but their boundaries don't align perfectly, creating gaps. We estimated that slivers should be defined as any area equal to or less than 1% of the total water system's area (km²) based on visual inspection of the data.
   b. Dissolved by county ID (geoid) and calculated the sum of systems per county.
5. Calculated number of disadvantaged community (DAC) and severely disadvantaged community (SDAC) census designated places[2] in each county.
   a. Intersected 2021 census designated places and county boundaries.
   b. Selected by DAC and calculated the count of intersections per county.
   c. Selected by SDAC and calculated the count of intersections per county.
6. Spatially joined with point data for the following drinking water threats layers:
   a. Drinking water wells with PFAS detections,[7] wastewater treatment facilities,[8] landfills,[8] refineries and terminals,[8] chrome plating facilities,[8] active oil and gas wells.[9]
   b. Used the geoprocessing tool "summarize within" function to count the number of each threat by county.
   c. Calculated the percent of drinking water wells that had at least one sample that exceeded the detection limit.
   d. Calculated the percent of drinking water wells that had at least one sample that exceeded one or more PFAS maximum contaminant level (MCL).
7. Merged drinking water threat polygons representing Superfund sites;[10] military installations, ranges, and training areas;[11] and airports permitted to use aqueous film-forming foam (AFFF)[12] 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 counties and added the number of each type of facility by county.
8. Calculated total pesticide application[13] (pounds) for each county, 2011-2019.
   a. Used geoprocessing tool "make feature layer" and selected the option for "use ratio policy" for pesticide sum.
   b. Intersected layer with county boundaries.
   c. Dissolved by county ID and calculated sum of pesticides.
9. Spatially joined Groundwater Sustainability Agency (GSA) boundaries[14] to county polygons, using the Intersect argument.
   a. Created a new field, Num_GSA, populated with the count of GSAs per county.
10. Calculated population served by domestic wells[5] for each county.
   a. Used geoprocessing tool "make feature layer" and selected the option for "use ratio policy" for population field.

b. Intersected layer with county boundaries.
c. Dissolved by county ID and calculated sum of population.

11. Spatially joined the Sustainable Management Criteria (SMC) Drought Analysis[15] results to county polygons, using the Completely Contained argument.
    i. Calculated the count of domestic wells included in the drought analysis.
    ii. Calculated the count of domestic wells fully dewatered and partially dewatered under both the Measurable Objective and Minimum Threshold conditions.
    iii. Calculated the percent of domestic wells fully dewatered and partially dewatered under both the Measurable Objective and Minimum Threshold conditions.
12. Spatially joined Water System Affordability data[16] to counties using the pairwise intersect and pairwise dissolve functions.
    a. Performed a pairwise intersection to identify overlaps between water system boundaries and counties.
        i. Slivers were identified and excluded.
            1. **Note:** Slivers are erroneous polygons that occur when two layers intersect but their boundaries don't align perfectly, creating gaps. We estimated that slivers should be defined as any area equal to or less than 1% of the total water system's area (km^2) based on visual inspection of the data.
    b. Dissolved by county ID (geoid)
        i. Calculated the sum of systems assessed for: affordability, percent median household income (%MHI), extreme water bill, and household socioeconomic burden.
        ii. Calculated the sum of systems that have a high affordability burden and thresholds exceeded for %MHI, extreme water bill, and household socioeconomic burden.
        iii. Calculated the percent of systems assessed that have a high affordability burden and thresholds exceeded for %MHI, extreme water bill, and household socioeconomic burden.

Attribute Table

Field Heading	**Field type**	**Field Description**	**Source**
FID	Object ID	Object ID	ESRI generated
Shape	Geometry	Polygon	ESRI generated
geoid	Text	Geographic identifier	U.S. Census Bureau
NAME	Text	County name	U.S. Census Bureau

pop	Long	County population estimates	ACS
white	Long	Population that identifies as Non-Latinx White	ACS
afamer	Long	Population that identifies as Non-Latinx African American or Black	ACS
hislat	Long	Population that identifies as Latinx	ACS
aind	Long	Population that identifies as Non-Latinx American Indian/Alaska Native	ACS
asian	Long	Population that identifies as Non-Latinx Asian	ACS
nhpi	Long	Population that identifies as Non-Latinx Native Hawaiian and other Pacific Islander	ACS
other	Long	Population that identifies as Non-Latinx other category alone	ACS
more2	Long	Population that identifies as Non-Latinx Other category, with 2 or more races selected	ACS
mhhi	Long	Median Household Income	ACS
white_per	Double	Percent of population that identifies as Non-Latinx White	ACS/GIN
asian_per	Double	Percent of population that identifies as Non-Latinx Asian	ACS/GIN
afamer_per	Double	Percent of population that identifies as Non-Latinx African American or Black	ACS/GIN
hislat_per	Double	Percent of population that identifies as Latinx	ACS/GIN
nhpi_per	ouble	Percent of population that identifies as Non-Latinx Native Hawaiian and other Pacific Islander	ACS/GIN
aind_per	Double	Percent of population that identifies as Non-Latinx American Indian/Alaska Native	ACS/GIN
other_per	Double	Percent of population that identifies as Non-Latinx other category alone	ACS/GIN
more2_per	Double	Percent of population that identifies as Non-Latinx other category, with 2 or more races selected	ACS/GIN
dac_status	Text	3 level factor variable that identifies DAC & SDAC counties, defined as having an MHI under 80% and under 60% of the statewide MHI, respectively. Levels include: - Disadvantaged Community (DAC)	ACS/GIN

		- Severely Disadvantaged Community (SDAC) - Not a Disadvantaged Community	
WS_count	Float	Count of water systems	WESS
Num_MunPub	Float	Count of public supply wells	WESS
Num_DW	Float	Count of domestic wells	WESS
Av_depth	Float	Average total completed depth of domestic wells	WESS
SD_depth	Float	Standard deviation of total completed depth for domestic wells	WESS
Num_DAC	Float	Count of Disadvantaged Communities	WESS
Num_SDAC	Float	Count of Severely Disadvantaged Communities	WESS
Total_pest	Double	Total pounds of pesticide active ingredients applied in domestic well areas between 2011-2019	WESS
MIRTA	Float	Count of Military Installations, Ranges and Training Areas (MIRTA)	WESS
MIRTA_SPR	Float	Count of sites listed as both a MIRTA and Superfund Site (SRP)	WESS
MIRTASRPP1	Float	Count of sites listed as a MIRTA, Superfund Site, and P-139 Airport	WESS
P139	Float	Count of airports permitted to use aqueous film-	WESS

		forming foam (contains PFAS)	
SRP	Float	Count of Superfund Sites	WESS
SRP_P139	Float	Count of sites listed as both a Superfund Site and P-139 Airport.	WESS
Num_OG	Float	Count of active oil and gas wells	WESS
ChromePlat	Float	Count of chrome-plating facilities	WESS
Landfills	Float	Count of landfills	WESS
RefsTerms	Float	Count of refineries and bulk terminals	WESS
WWTFs	Float	Count of wastewater treatment facilities (WWTFs)	WESS
Excd_MCL	Float	Count of wells with at least one water sample with PFAS measured above any EPA Maximum Contaminant Level (MCL)	WESS
Excd_DL	Float	Count of wells with at least one water sample with PFAS measured above the detection limit but below any EPA Maximum Contaminant Level (MCL)	WESS
n_PFAS_sam	Float	Count of wells that were sampled and tested for PFAS.	WESS

p_excd_MCL	Float	Percent of wells sampled with at least one water sample with PFAS measured above any EPA MCL.	WESS
p_excd_DL	Float	Percent of wells sampled with at least one water sample with PFAS detected above the detection limit but below any EPA MCL.	WESS
Num_GSA	Float	Number of Groundwater Sustainability Agency (GSA) boundaries that fall within the boundary of a county	WESS
SUM_Well_p	Double	Population served by domestic wells	WESS
MT_fully	Float	Count of fully dewatered domestic wells based on the Minimum Threshold (MT) groundwater level.	EKI
MT_partial	Float	Count of partially dewatered domestic wells based on the MT groundwater level.	EKI
MO_fully	Float	Count of fully dewatered domestic wells based on the Measurable Objective (MO) groundwater level.	EKI
MO_partial	Float	Count of partially dewatered domestic wells based on the MO groundwater level.	EKI
n_wells_sm	Float	Total number of domestic wells included in the Sustainable Management Criteria (SMC) drought analysis.	EKI
p_mt_full	Float	Percent of fully dewatered wells based on the MT groundwater level. Denominator is the total number of domestic wells included in the SMC drought analysis.	EKI
p_mt_part	Float	Percent of partially dewatered wells based on the MT groundwater level. Denominator is the total number of domestic wells included in the SMC drought analysis.	EKI

p_mo_full	Float	Percent of fully dewatered wells based on the MO groundwater level. Denominator is the total number of domestic wells included in the SMC drought analysis.	EKI
p_mo_part	Float	Percent of partially dewatered wells based on the MO groundwater level. Denominator is the total number of domestic wells included in the SMC drought analysis.	EKI
afford_hig	Double	Count of water systems located partially or fully within county boundaries with a high affordability burden, based on the SWRCB's 2024 Affordability Assessment.	SWRCB
pMHI_yes	Double	Count of water systems located partially or fully within county boundaries that exceeded the threshold for percent Median Household Income (MHI), based on the SWRCB's 2024 Affordability Assessment.	SWRCB
EWB_yes	Double	Count of water systems located partially or fully within county boundaries that exceeded the threshold for extreme water bill, based on the SWRCB's 2024 Affordability Assessment.	SWRCB
hseSES_yes	Double	Count of water systems located partially or fully within county boundaries that exceeded the threshold for household socioeconomic burden, based on the SWRCB's 2024 Affordability Assessment.	SWRCB
n_ws_affor	Long	Count of water systems that were included in the affordability assessment and assigned an affordability burden.	SWRCB
n_ws_pMHI	Long	Count of water systems that were included in the affordability assessment and evaluated for the percent MHI indicator.	SWRCB
n_ws_EWB	Long	Count of water systems that were included in the affordability assessment and evaluated for the extreme water bill indicator.	SWRCB
n_ws_hseSE	Long	Count of water systems that were included in the affordability assessment and evaluated for the household socioeconomic burden indicator.	SWRCB
p_afford_h	Float	Percent of water systems with a high affordability burden. Denominator is the count of water systems included in the assessment.	SWRCB

p_pmhi	Float	Percent of water systems that exceeded the threshold for percent MHI. Denominator is the count of water systems evaluated for percent MHI.	SWRCB
p_ewb	Float	Percent of water systems that exceeded the threshold for extreme water bill. Denominator is the count of water systems evaluated for extreme water bill.	SWRCB
p_hseSES	Float	Percent of water systems that exceeded the threshold for household socioeconomic burden. Denominator is the count of water systems evaluated for household socioeconomic burden.	SWRCB

References

1. U.S. Census Bureau. B03002: HISPANIC OR LATINO ORIGIN ... - Census Bureau Table. 2017-2021 American Community Survey 5-Year Estimates. Available from https://data.census.gov/table?q=B03002
2. U.S. Census Bureau. B19013: MEDIAN HOUSEHOLD INCOME IN ... - Census Bureau Table. 2017-2021 American Community Survey 5-Year Estimates. Available from https://data.census.gov/table?q=B19013
3. County Boundaries. TIGER/line Shapefiles, US Census. Accessed 08/07/2023.
4. Municipal Wells Dataset (2023). California State Water Resources Control Board, Groundwater Ambient Monitoring and Assessment (GAMA), Groundwater Information System, available from https://gamagroundwater.waterboards.ca.gov/gama/gamamap/public/
5. Rempel, J., Pace, C., Cushing, L., Morello-Frosch, R. (2023) UC Berkeley Water Equity Science Shop. Domestic well areas version 2.0, Update for the Drinking Water Tool.
6. Pace, C., Bangia, K., Fisher, E., Cushing, L., Morello-Frosch, R. (2023). UC Berkeley Water Equity Science Shop. Water System Boundaries version 2.0, Update for the Drinking Water Tool.
7. Karasaki, S., Pace, C., Cushing, L., Morello-Frosch, R. (2024). PFAS detections in water samples. Drinking Water Tool metadata, prepared by the Water Equity Science Shop, UC Berkeley.
8. Karasaki, S., Pace, C., Cushing, L., Morello-Frosch, R. (2023). Additional PFAS sources – Landfills, Chrome plating facilities, water treatment facilities, and refineries and terminals. Drinking Water Tool metadata, prepared by the Water Equity Science Shop, UC Berkeley.
9. All Wells Dataset, GIS Mapping, (2021). California Department of Conservation, California Geologic Energy Management Division (CalGEM), https://www.conservation.ca.gov/calgem/maps/Pages/GISMapping2.aspx, Accessed online January 6, 2022.
10. Pace, C., Karasaki, S., Cushing, L., Morello-Frosch, R. (2023). Superfund Sites in California. Drinking Water Tool metadata, prepared by the Water Equity Science Shop, UC Berkeley.

11. Karasaki, S., Pace, C., Cushing, L., Morello-Frosch, R. (2023). Military Installations Ranges and Training Areas (MIRTA). Drinking Water Tool metadata, prepared by the Water Equity Science Shop, UC Berkeley.
12. Karasaki, S., Pace, C., Cushing, L., Morello-Frosch, R. (2023). Airports permitted to use PFAS-containing aqueous film-formig foam (AFFF). Drinking Water Tool metadata, prepared by the Water Equity Science Shop, UC Berkeley.
13. Libenson, A., Pace, C., Cushing, L., Morello-Frosch, R. (2023). Pesticide application in California, 2011-2019. Drinking Water Tool metadata, prepared by the Water Equity Science Shop, UC Berkeley.
14. Dept. of Water Resources (2023) i03 Groundwater Sustainability Agencies MapService. (https://data.ca.gov/dataset/i03-groundwater-sustainability-agencies-mapservice). Accessed 08/7/2023
15. EKI Environment & Water, Inc. (2024) Community Water Center Drinking Water Tool 2024 Well Impact Analysis Update.
16. Affordability Assessment. California State Water Resources Control Board, 2024. Available from https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2024/2024affordabilityassessment-metodology.pdf. Accessed July 22, 2024.