

PFAS Pesticide Application, California, 2019-2022

Libenson, A., Pace, C. (2024). PFAS Pesticide Application, California, 2019-2022. Drinking Water Tool metadata, prepared by the Water Equity Science Shop, UC Berkeley.

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File name: pfas_pest_ai_plss_100924.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 estimates for annual and total agricultural pesticide application between 2019-2022 for 48 selected pesticides active ingredients that are defined as per- and polyfluoroalkyl substances (PFAS) according to the Organization for Economic Cooperation and Development (OECD).¹ We report pounds of active ingredient per Public Land Survey System (PLSS) section for 20,031 polygons in California where these pesticides were applied.

Methods

PLSS section dataset (Plsnet.shp) was downloaded from The [US Bureau of Land Management](#).² The dataset contains 164,642 polygons uniquely identified by county, meridian, township, range, section (CO-MTRS) field in the attribute table. We dissolved by meridian, township, range, section (MTRS) field in ArcGIS, resulting in 158,680 polygons that are approximately 1x1 mile grid squares, i.e. PLSS sections.

Pesticide application data were downloaded on September 27, 2024 for 2019 through 2022 from the California Department of Pesticide Regulation's Pesticide Use Reporting (PUR) Program database,³ using the [California Pesticide Information Portal Application \(CalPIP\)](#). The PUR program collects monthly data on pesticide application at the scale of PLSS sections and releases aggregated annual data by pounds of active ingredient applied to each PLSS section.

We filtered the PUR data for 66 pesticide active ingredients that were identified in a study by [Donley et al.](#),¹ to be PFAS chemicals according to the OECD definition. The OECD considers PFAS as chemicals with at least one perfluorinated methyl group (-CF₃) or a perfluorinated methylene group (-CF₂-).⁴ Each active ingredient was assigned a chemical code according to the Department of Pesticide Regulation database, accessed online at (<https://apps.cdpr.ca.gov/docs/chemical/master2.cfm>). The chemical codes were used to identify the 48 active ingredients applied in California between 2019-2022.

The pounds of active ingredients were summed by the PLSS section, by year, and across the 4-year study period. Each PLSS section received a value representing the total pounds of applied pesticides by year (one value for each year, 2019-2022) and a value representing cumulative sum across all years. We also calculated the average pounds of pesticide applied to each section across the 4-year study period and the pounds of active ingredient per square km. Data were processed in R. Processed pesticide data were joined to PLSS sections in ArcGIS pro based on matching MTRS fields in pesticide dataset and Plsnet shapefile.

Attribute Table

Field Heading	Field Description
FID	ESRI generated field
Shape	Polygon – ESRI generated field
MTRS	Meridian, Township, Range, Section (MTRS); PLSS identifier
Shape_Leng	Shape length in meters
Shape_Area	Shape area in square meters
lb_ai_19	Pounds of pesticide active ingredient (ai) applied in 2019
lb_ai_20	Pounds of pesticide active ingredient applied in 2020
lb_ai_21	Pounds of pesticide active ingredient applied in 2021
lb_ai_22	Pounds of pesticide active ingredient applied in 2022
total_lb_a	Total pounds of pesticide active ingredient applied between 2019-2022
area_km2	Area of the PLSS section in square kilometers (km2)
avg_lb	Annual average pounds of pesticide active ingredient applied 2019-2022.
T_lb_km2	Total pounds of pesticide active ingredient applied per square kilometer (total_lb_a / area_km2)
region_cde ⁵	Numerical value assigned to each region (1-8): 1 = Bay Area 2 = Central Coast 3 = Eastern Sierra 4 = Imperial / Mojave Desert 5 = Northern California 6 = Northern Sierra 7 = San Joaquin Valley 8 = Southern California
Region	Bay Area; Central Coast; Eastern Sierra; Imperial / Mojave Desert; Northern California; Northern Sierra; San Joaquin Valley; Southern California

References

1. Donley N, Cox C, Bennett K, Temkin AM, Andrews DQ, Naidenko OV. Forever Pesticides: A Growing Source of PFAS Contamination in the Environment. *Environmental Health Perspectives*. 2024;132(7):075003. doi:[10.1289/EHP13954](https://doi.org/10.1289/EHP13954)
2. Public Land Survey System (PLSS): Sections - California Open Data. Accessed September 20, 2022. <https://data.ca.gov/dataset/public-land-survey-system-plss-sections>.
3. Pesticide Use Reporting. Accessed September 10, 2022. <https://www.cdpr.ca.gov/docs/pur/purmain.htm>.
4. Z W, Am B, It C, et al. A New OECD Definition for Per- and Polyfluoroalkyl Substances. *Environmental science & technology*. 2021;55(23). doi:[10.1021/acs.est.1c06896](https://doi.org/10.1021/acs.est.1c06896)
5. Pace C, Balazs C, Bangia K, et al. Inequities in Drinking Water Quality Among Domestic Well Communities and Community Water Systems, California, 2011–2019. *Am J Public Health*. 2022;112(1):88-97. doi:[10.2105/AJPH.2021.306561](https://doi.org/10.2105/AJPH.2021.306561)