

Environmental Atlas

Tracking Pollution and Athsma rates across California

created by Gwen

<https://github.com/gowin20>



Executive Summary

This environmental atlas showcases the geographic distribution of pollution and asthma across counties in California. Looking at both individual counties and California as a whole yields interesting data.

Pollution rates are far higher in the Central Valley than in anywhere else in the country. Additionally, urban regions around the Bay Area and LA County are also high. This is to be expected as a result of the population and industry. I suspect that the Central Valley pollution is due to large-scale agriculture operations there. Northern California is, in general, much less polluted than the rest.

Asthma rates follow a similar trend to pollution rates, but there are more outliers. Certain less populated tracts in San Bernardino and Imperial counties have some of the highest rates of asthma, which do not necessarily correlate to population density or pollution. Noticeable geographic clustering is still visible however, especially in the Inglewood and Southern LA areas of Los Angeles County. All of the tracts in this area show ED visits above 1.5 times the standard deviation.

Automation in GIS

Automation in GIS and mapping in general seems to have almost limitless potential. As a Computer Science major (and GIS Minor), I personally see so many options for dynamically generating maps in reports and atlases. Data Driven Pages provide a convenient and easy way to scale map production. If you make a visually pleasing map for one county, you can easily apply it to all. This automation is perfect for creating maps like the ones included here. However, Data Driven Pages has some pretty set limits to its automation. We are unable to

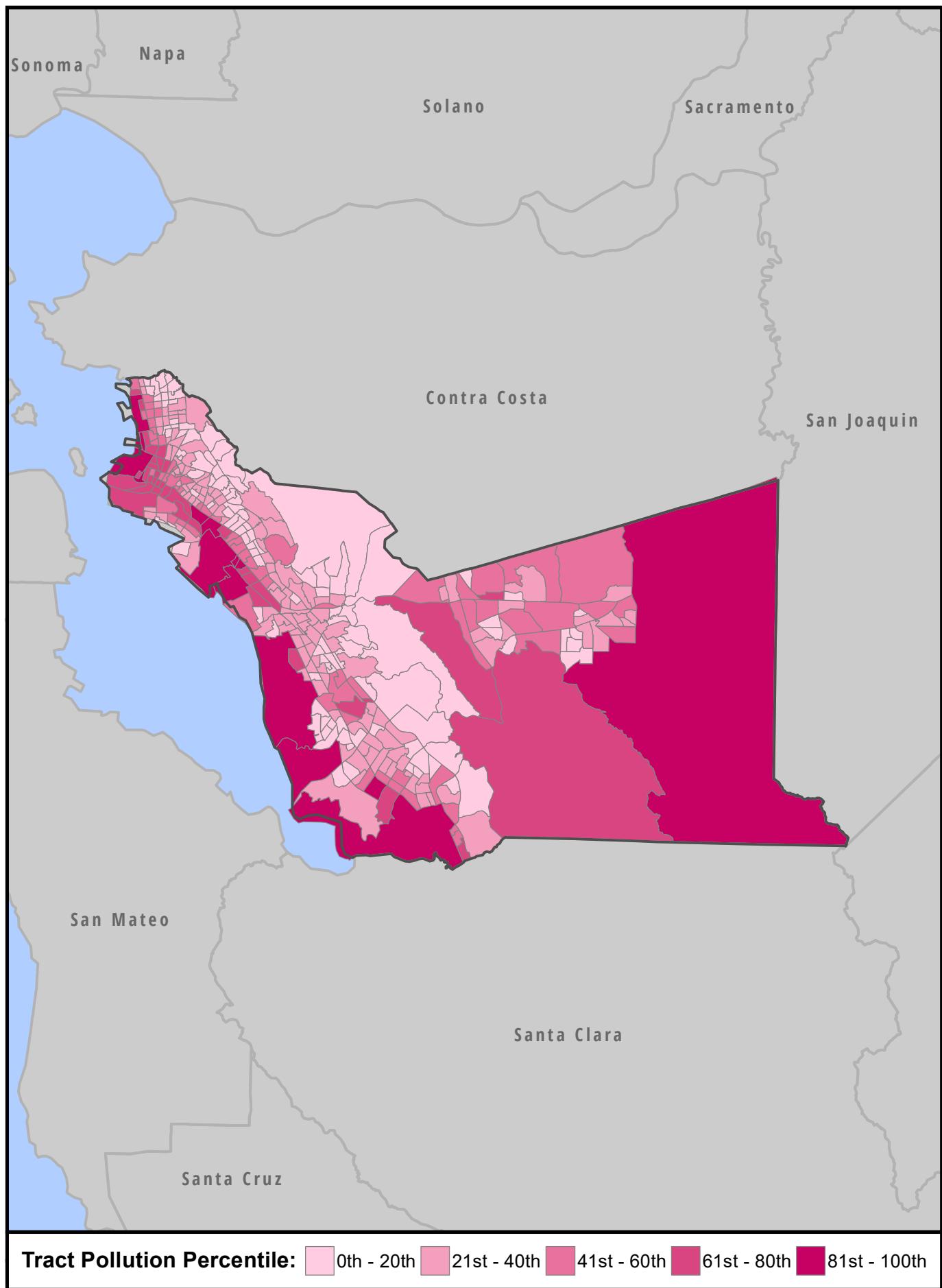
create dynamic legends or scale bars, and setting the projections of maps differently is possible but difficult without lots of work. For those with a background in computer science, using ArcGIS' built-in Python terminal seems like the objectively superior method. Data Driven Pages is a useful tool created for one specific use - general Python scripting is much more robust and flexible. While I do not have much personal experience with this in ArcGIS, I have coded in Python extensively and used it to some degree in QGIS. It can be difficult to set up, but once the initial hurdle is overcome I am confident that it would be just as efficient as data driven pages, and much more flexible.

To me, the major downside of automation in GIS is loss of individuality. When automating, it's pretty easy to create one visually pleasing map layout and just use that for everything. When creating individual maps by hand, much more thought and consideration goes into the stylistic process. While a single theme is usually okay for related maps, this can be a major limitation of automation in general. Additionally, if the regions selected for automation are of drastically different shapes and sizes, the results might not all look good. For example, Los Angeles County includes several islands, which in addition to its immense population makes its maps in this atlas almost impossible to interpret.

Mapping Pollution Percentile at the County Level

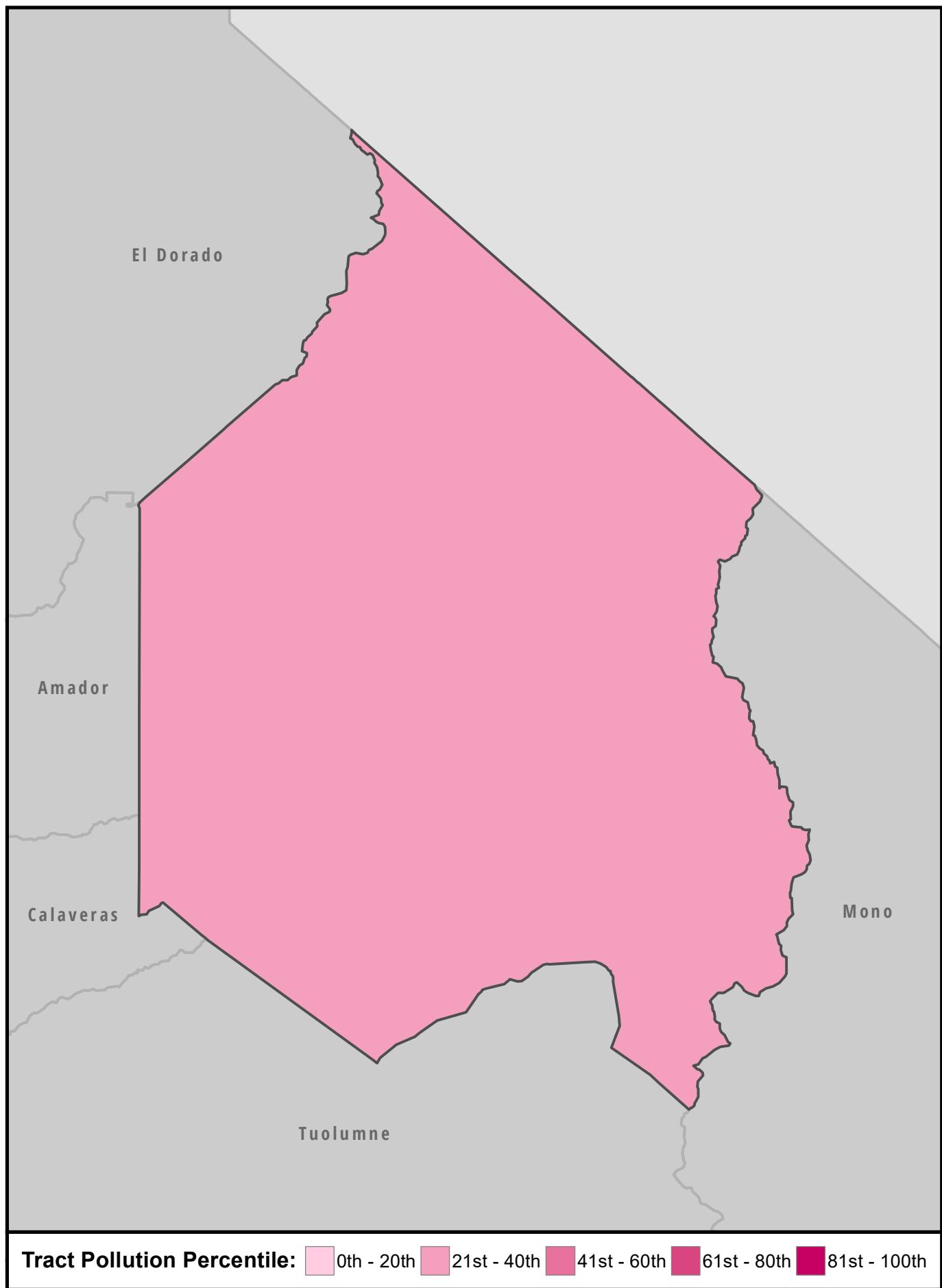
Alameda County

Pollution Percentile by Census Tract
Map 1 of 58



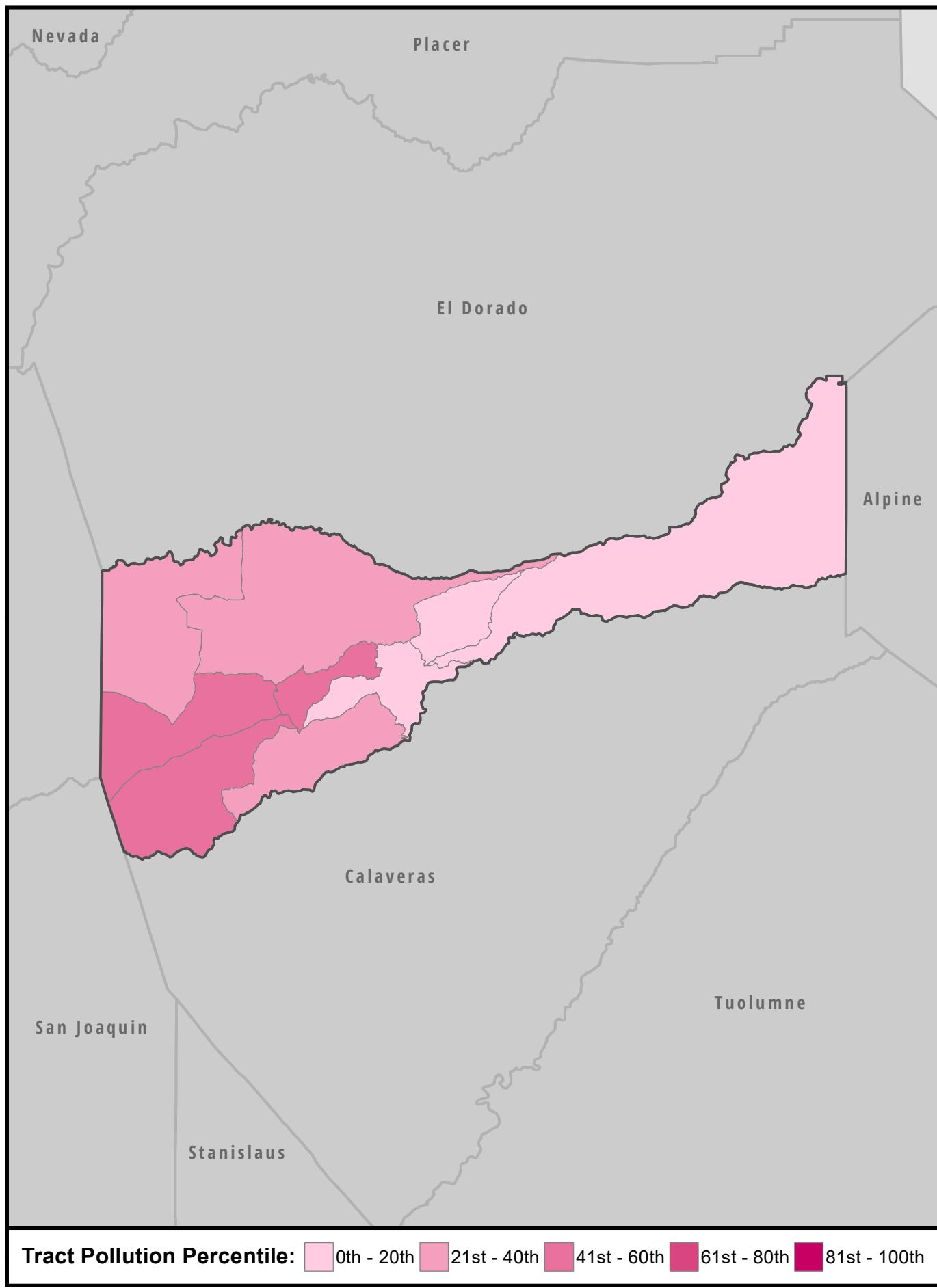
Alpine County

Pollution Percentile by Census Tract
Map 2 of 58



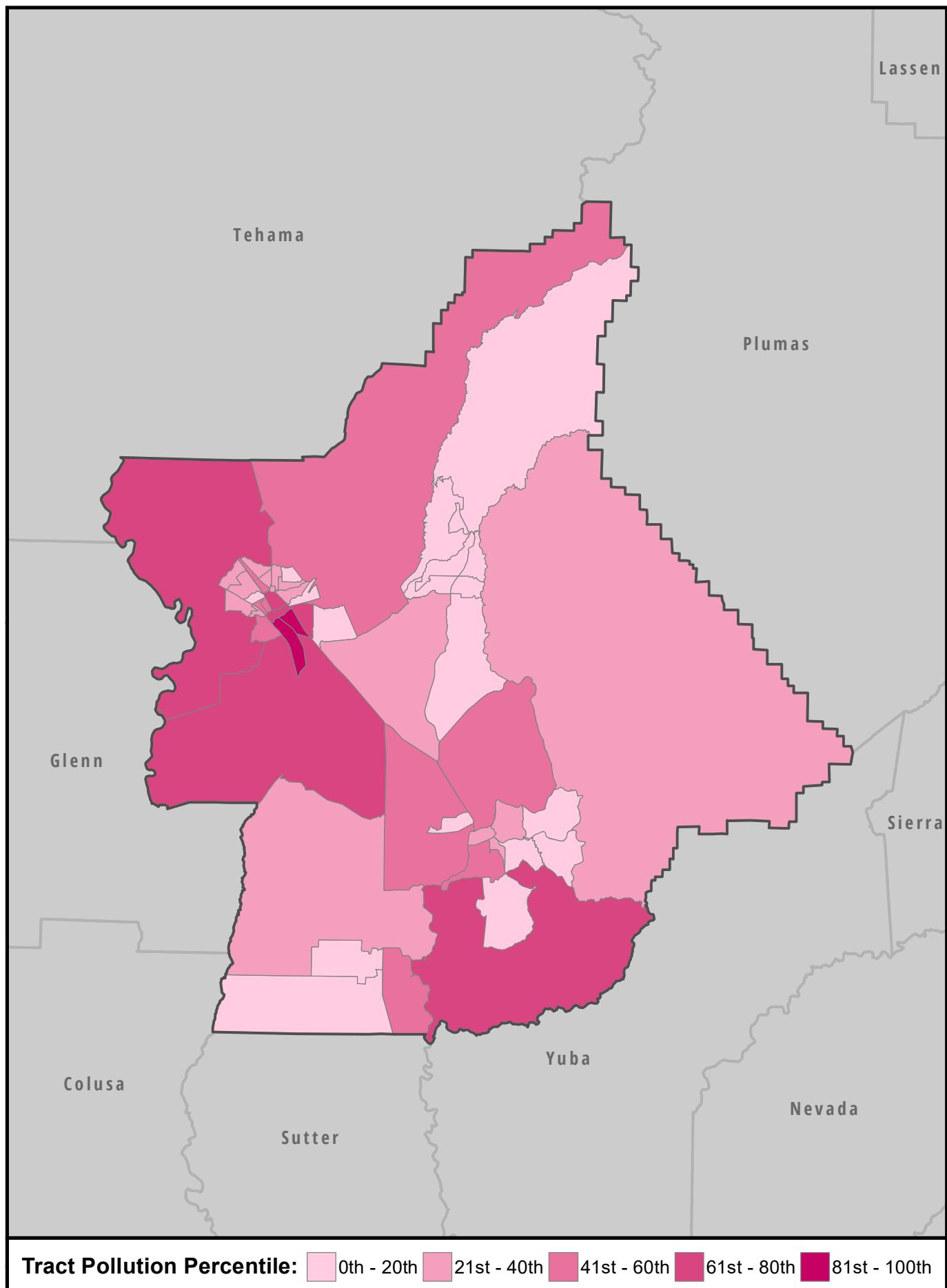
Amador County

Pollution Percentile by Census Tract
Map 3 of 58



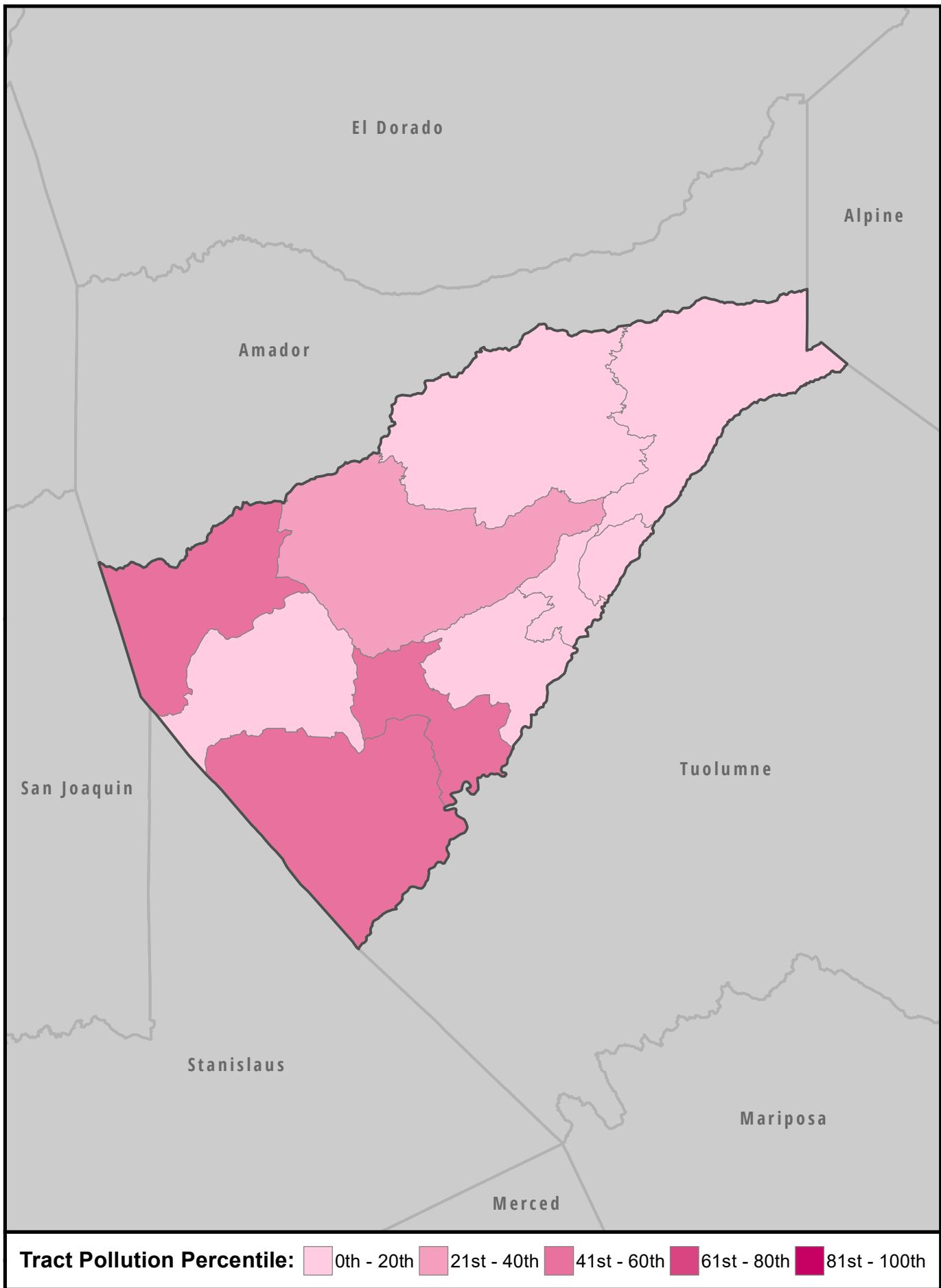
Butte County

Pollution Percentile by Census Tract
Map 4 of 58



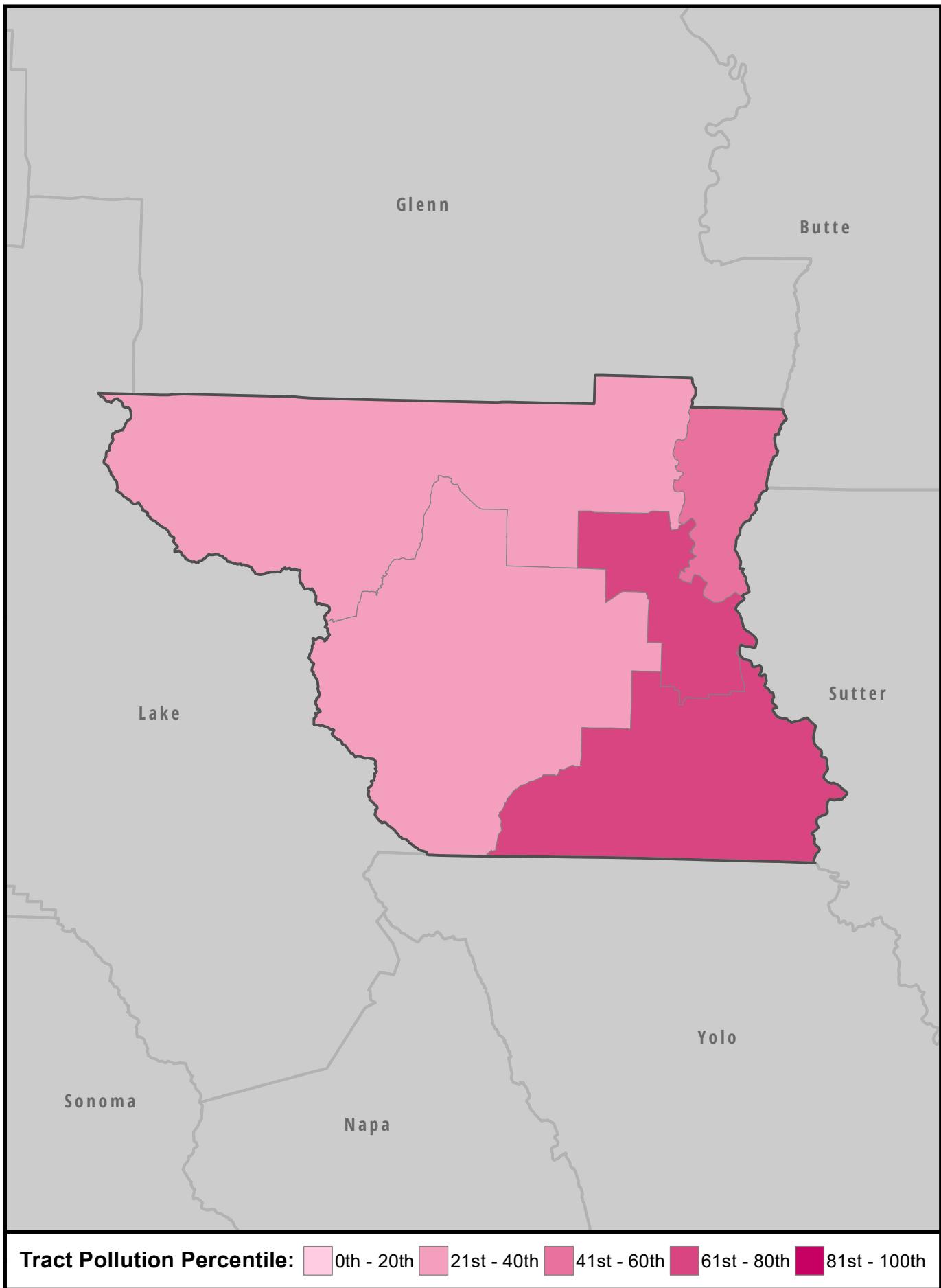
Calaveras County

Pollution Percentile by Census Tract
Map 5 of 58



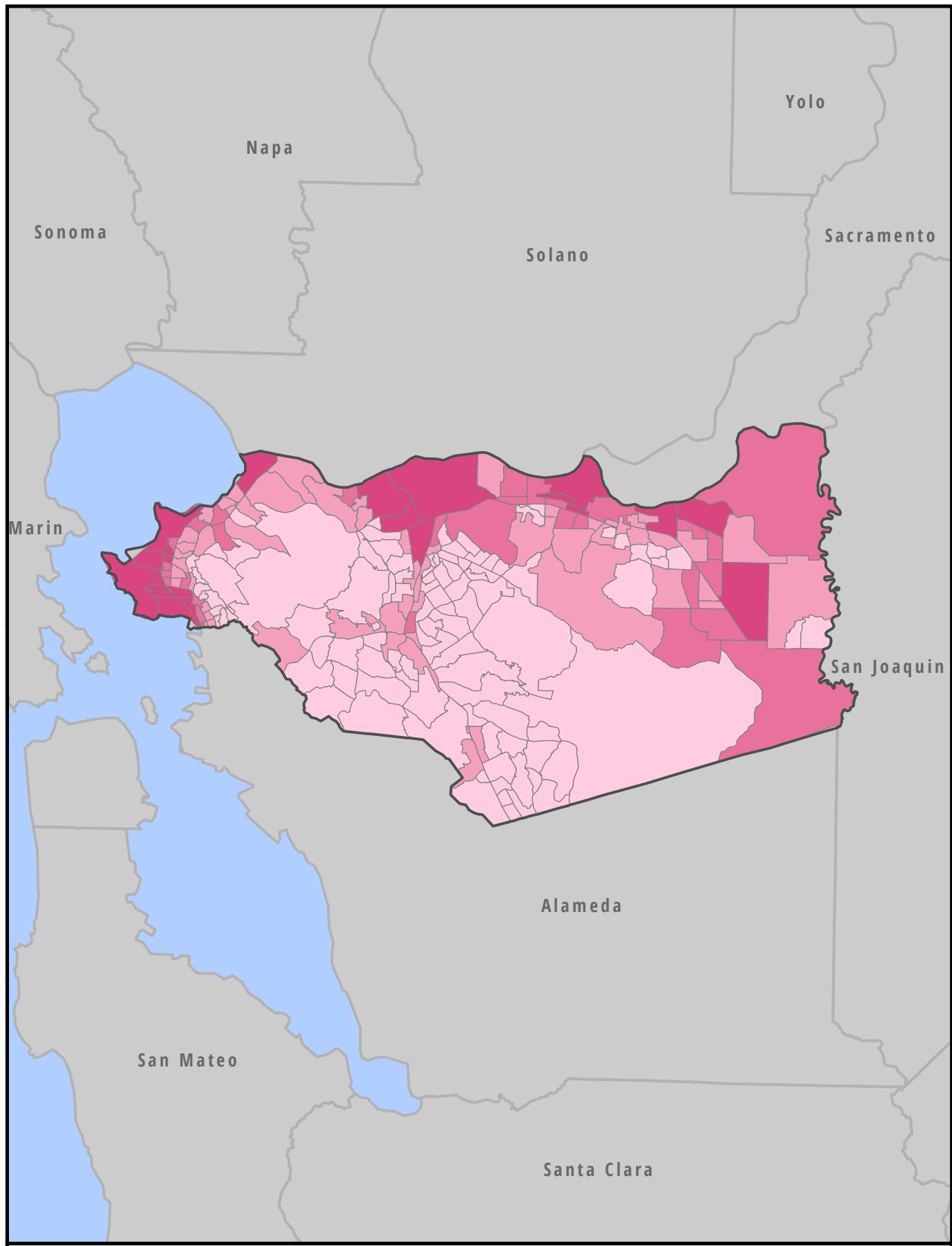
Colusa County

Pollution Percentile by Census Tract
Map 6 of 58



Contra Costa County

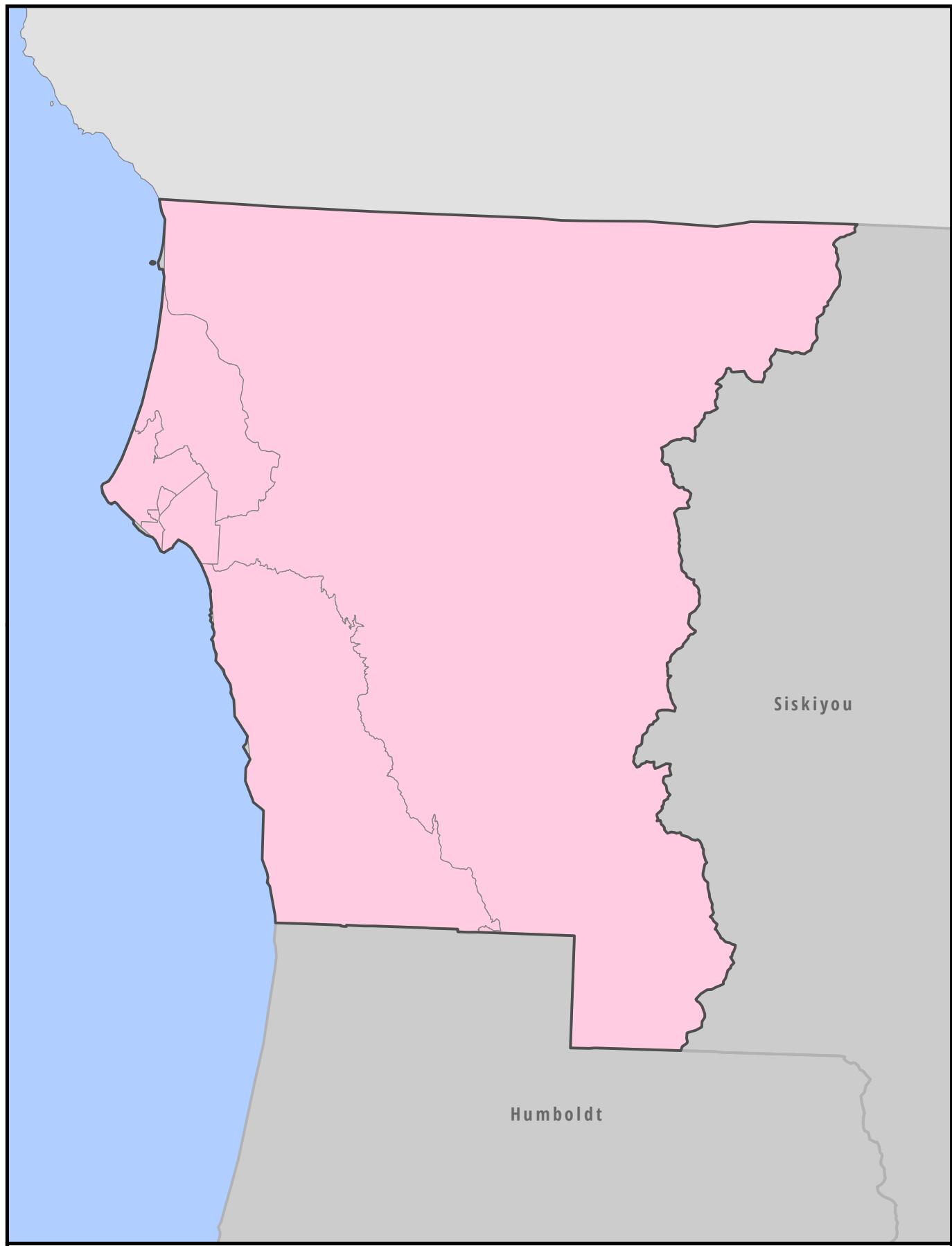
Pollution Percentile by Census Tract
Map 7 of 58



Tract Pollution Percentile: 0th - 20th 21st - 40th 41st - 60th 61st - 80th 81st - 100th

Del Norte County

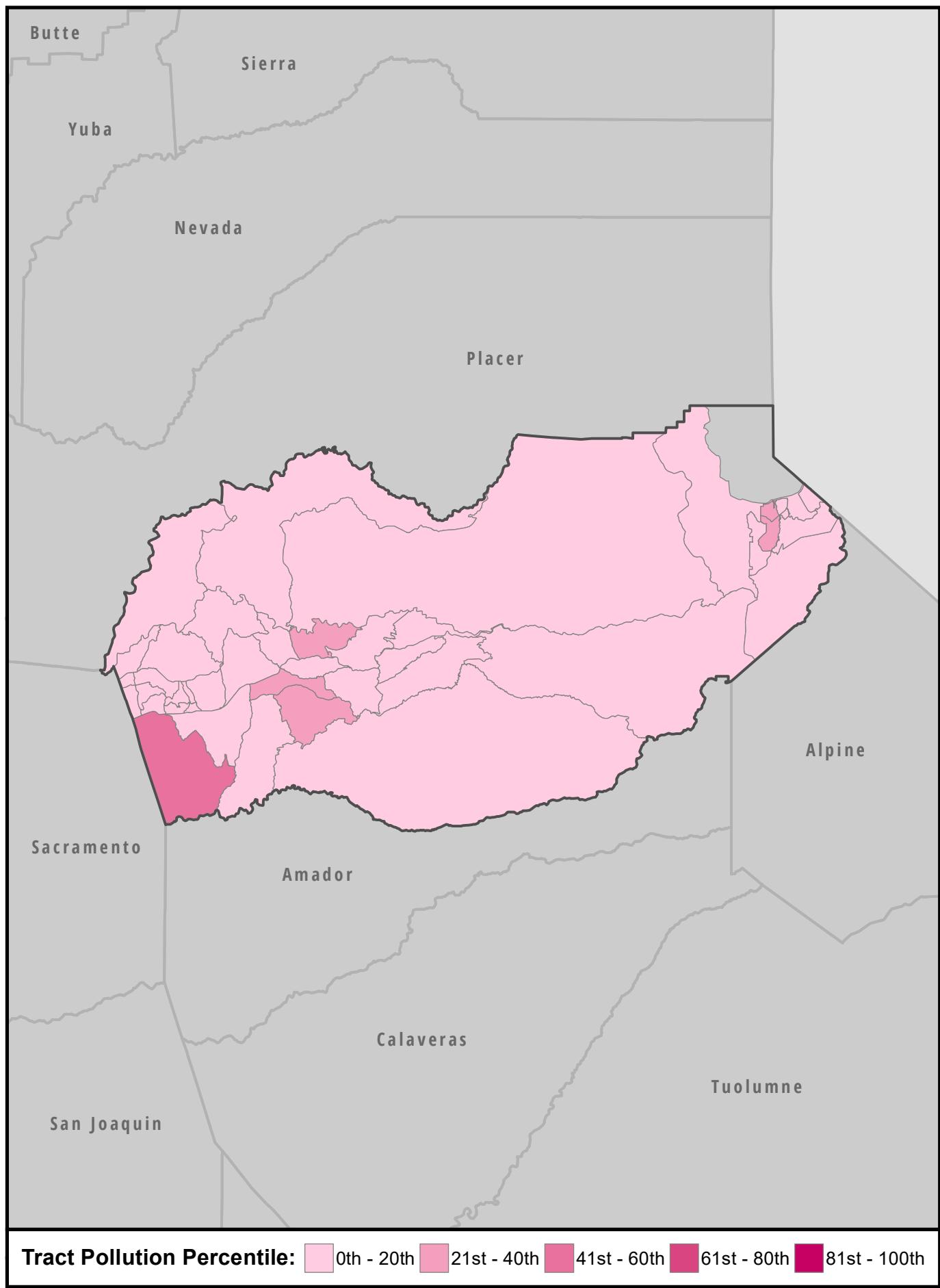
Pollution Percentile by Census Tract
Map 8 of 58



Tract Pollution Percentile: 0th - 20th 21st - 40th 41st - 60th 61st - 80th 81st - 100th

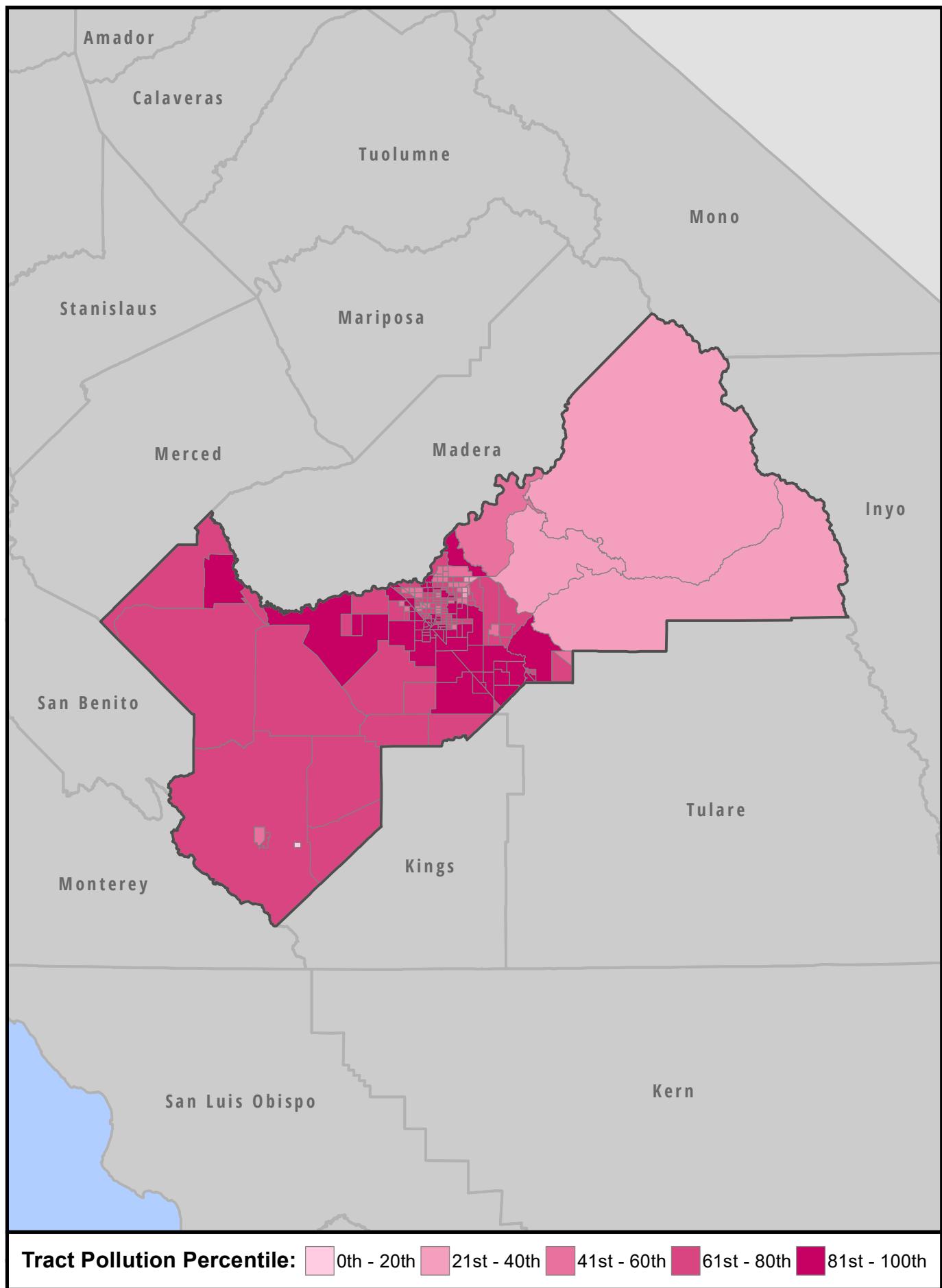
El Dorado County

Pollution Percentile by Census Tract
Map 9 of 58



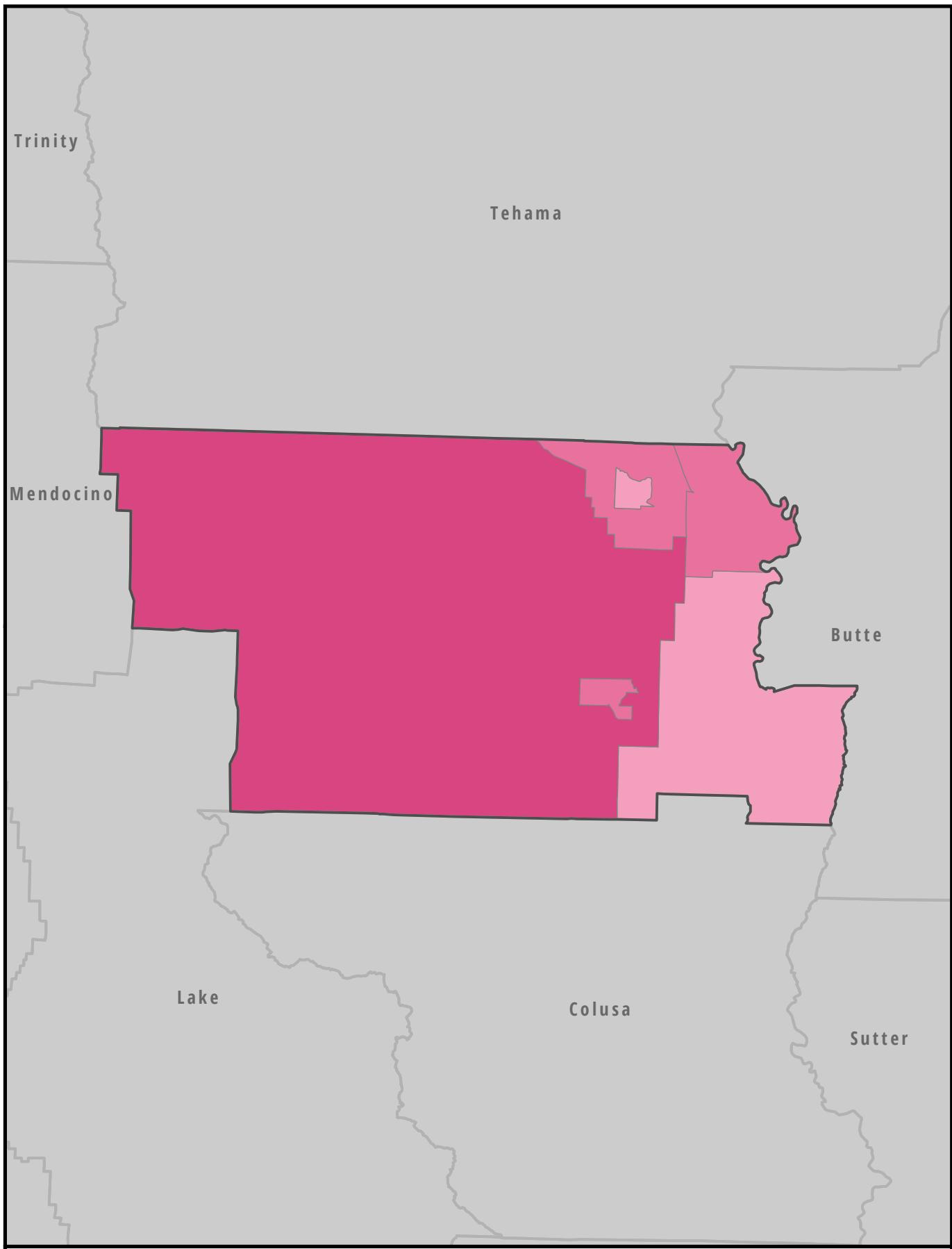
Fresno County

Pollution Percentile by Census Tract
Map 10 of 58



Glenn County

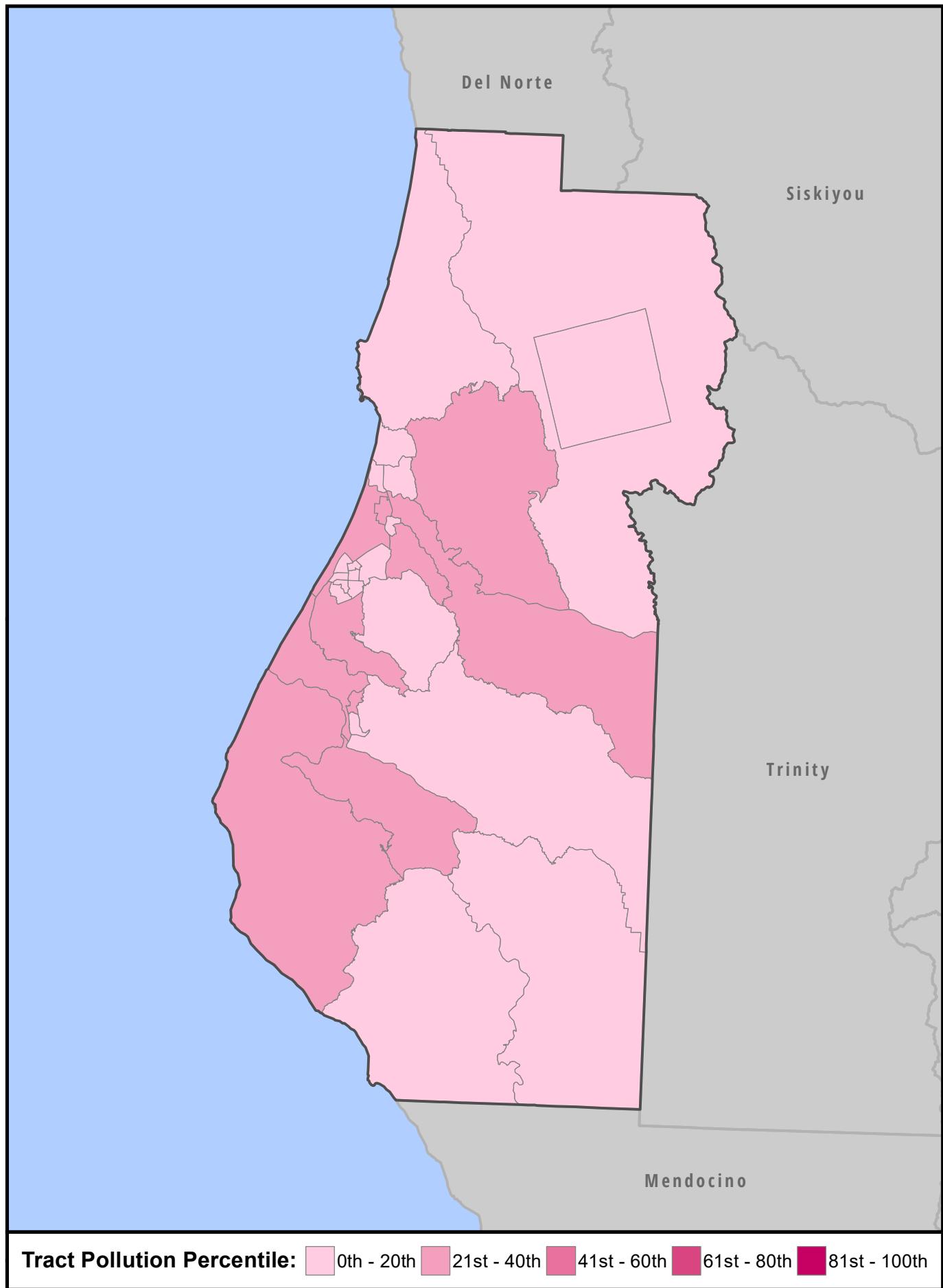
Pollution Percentile by Census Tract
Map 11 of 58



Tract Pollution Percentile: 0th - 20th 21st - 40th 41st - 60th 61st - 80th 81st - 100th

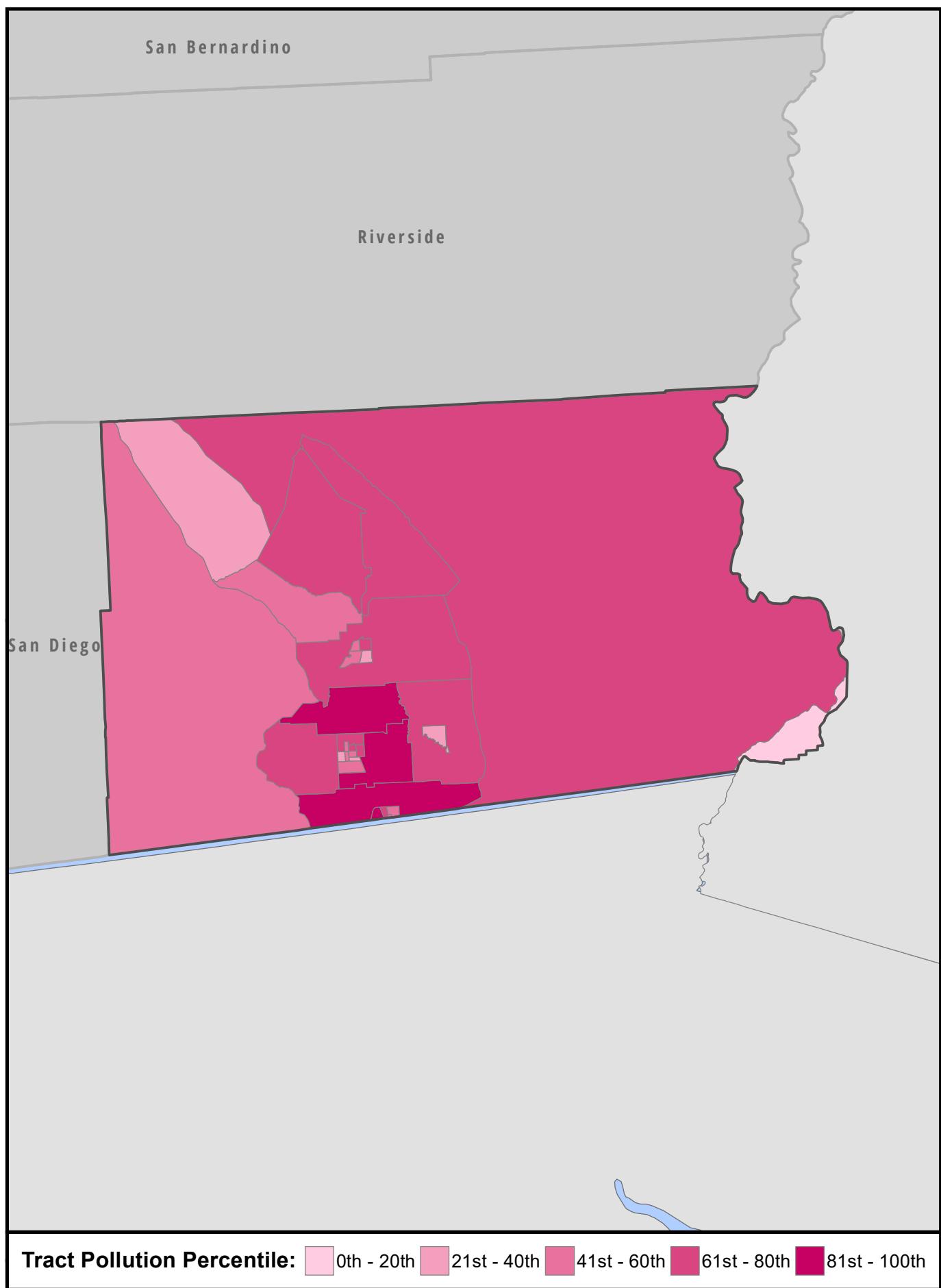
Humboldt County

Pollution Percentile by Census Tract
Map 12 of 58



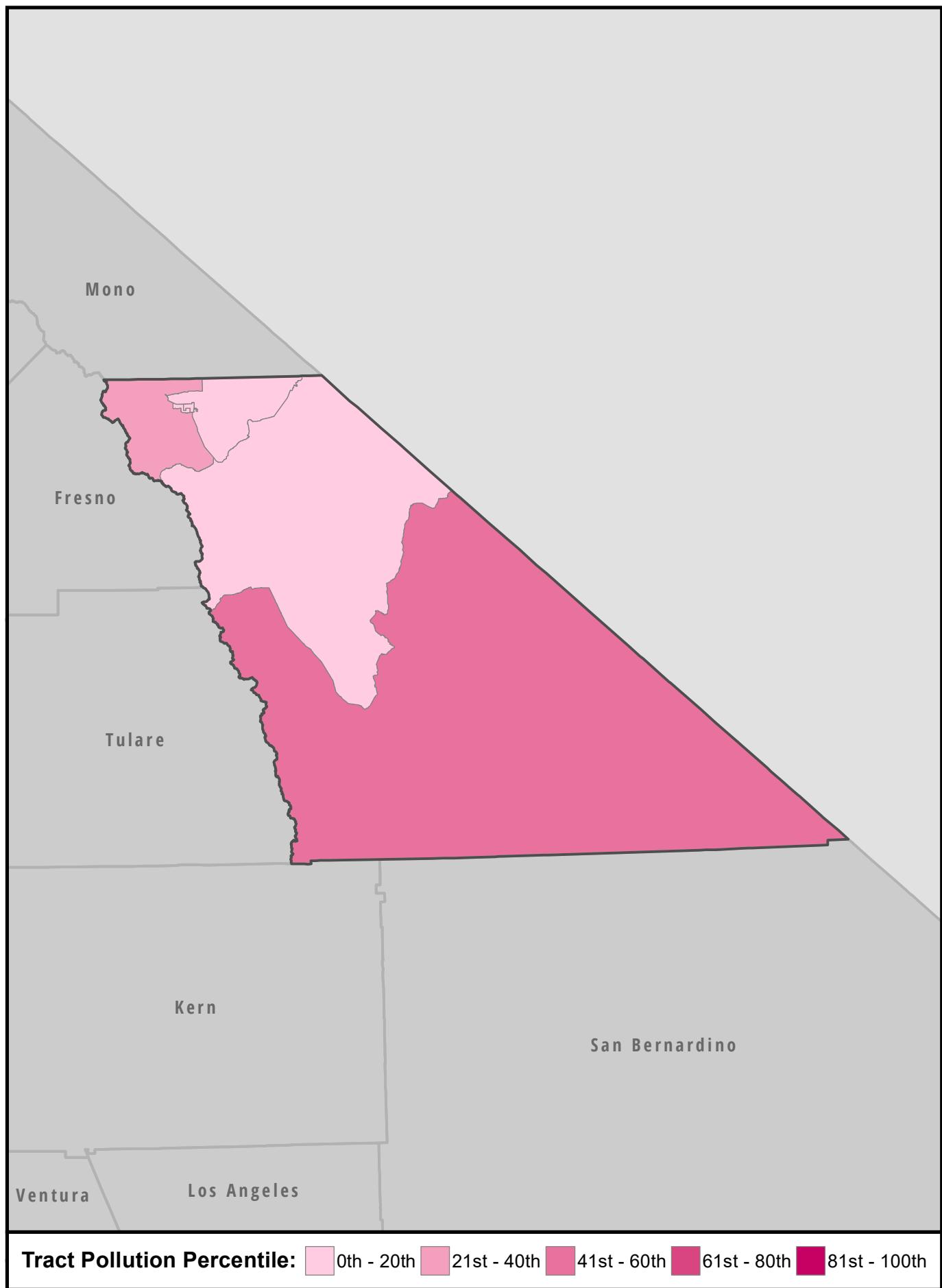
Imperial County

Pollution Percentile by Census Tract
Map 13 of 58



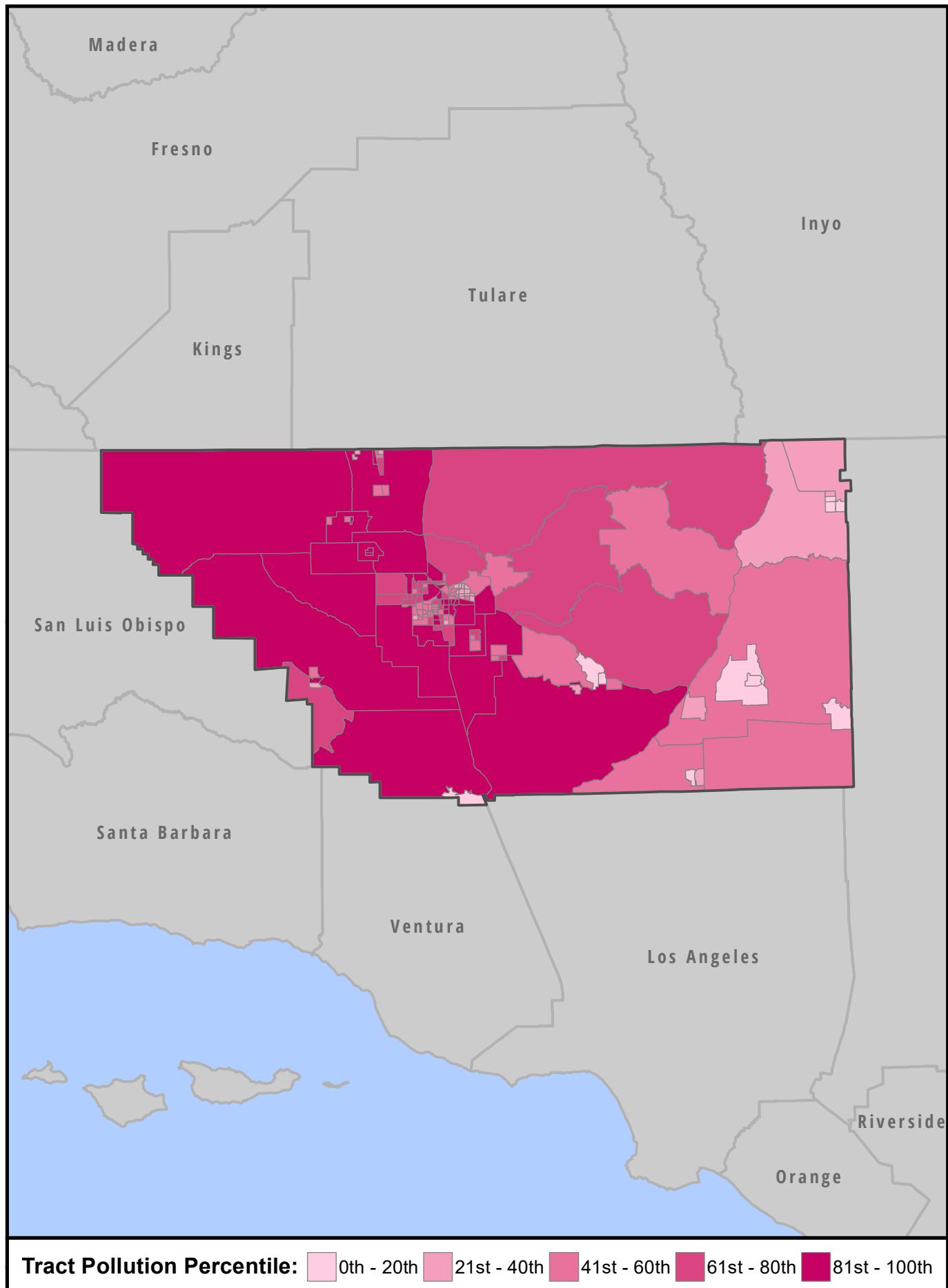
Inyo County

Pollution Percentile by Census Tract
Map 14 of 58



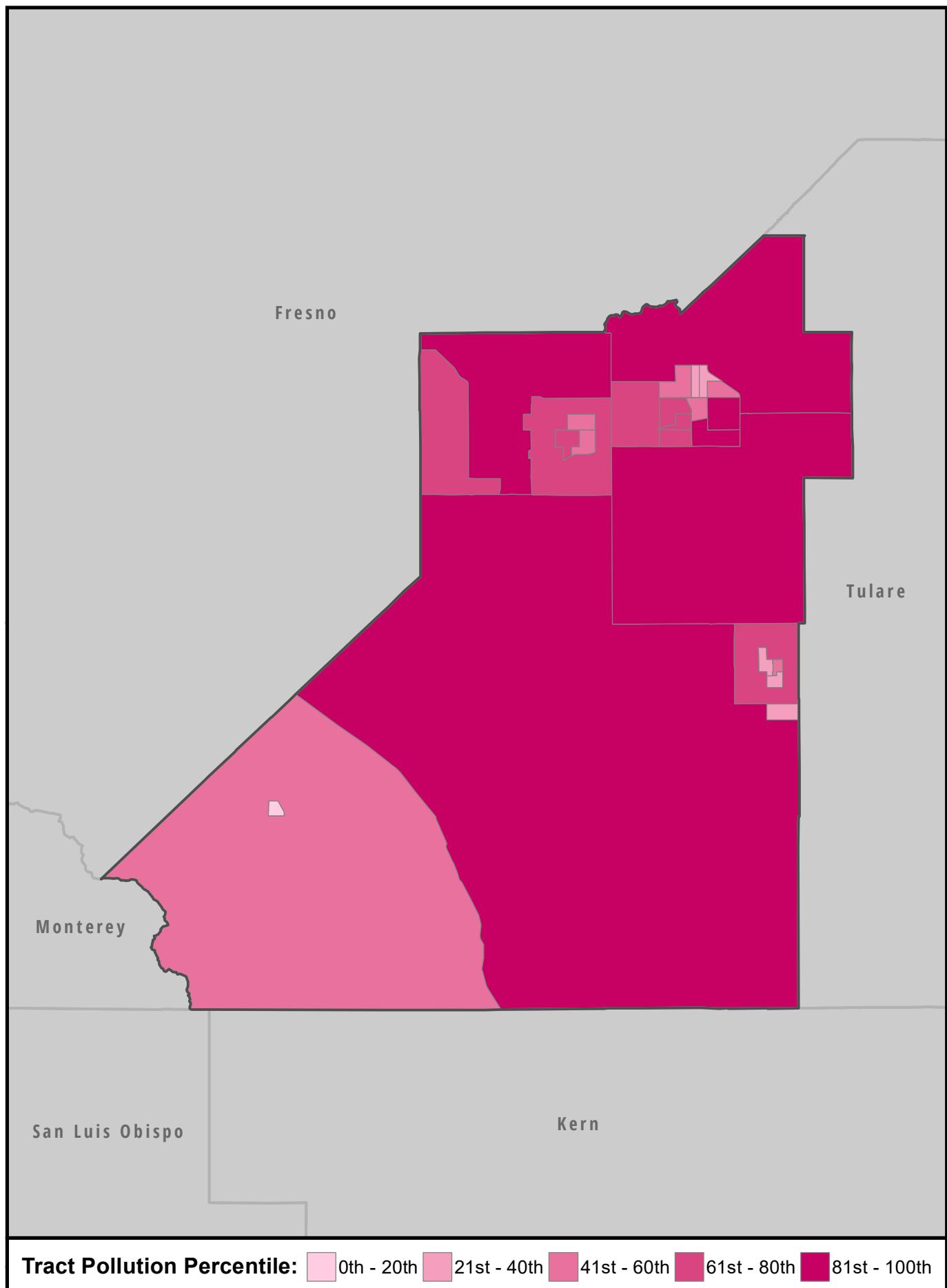
Kern County

Pollution Percentile by Census Tract
Map 15 of 58



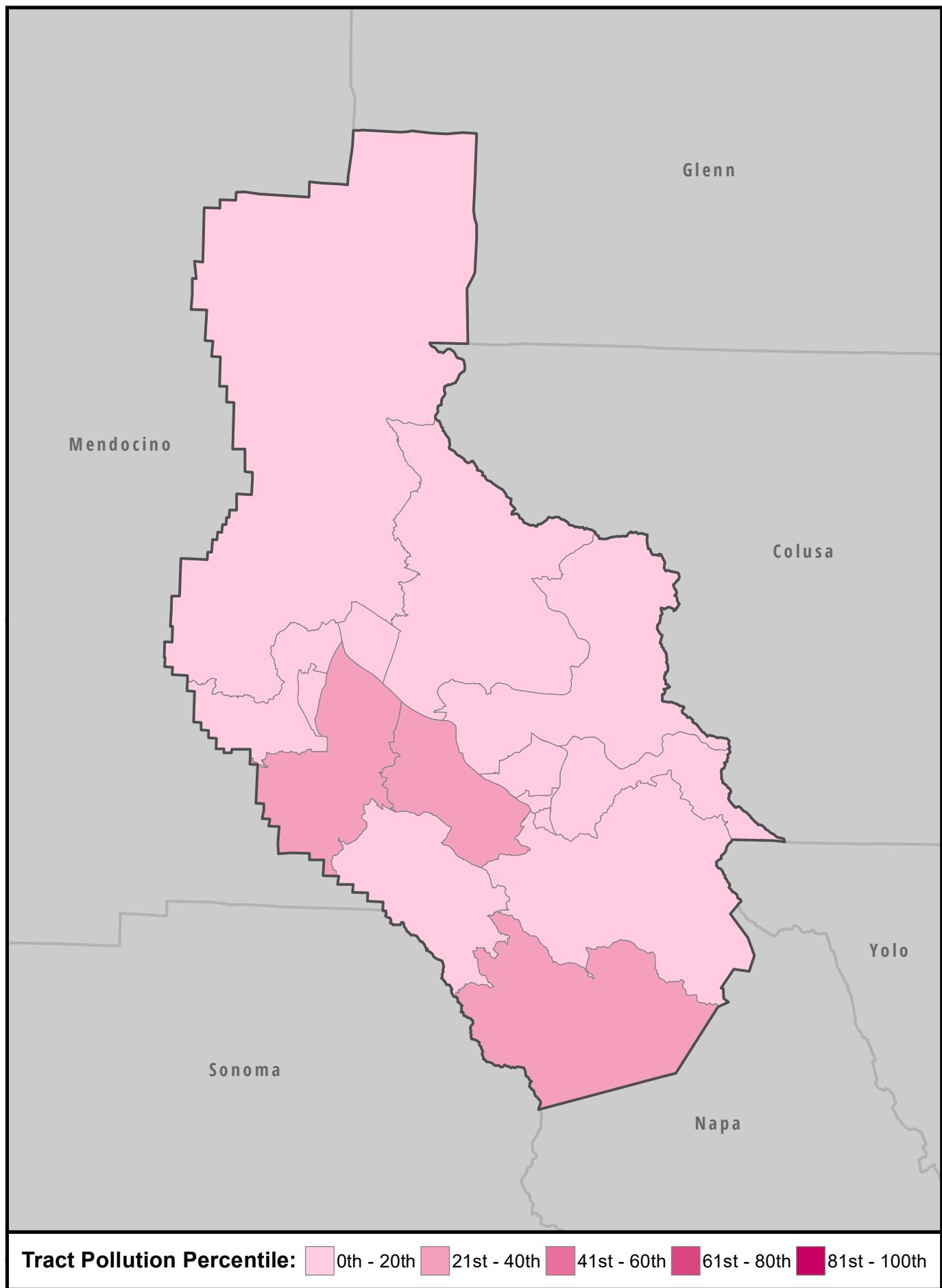
Kings County

Pollution Percentile by Census Tract
Map 16 of 58



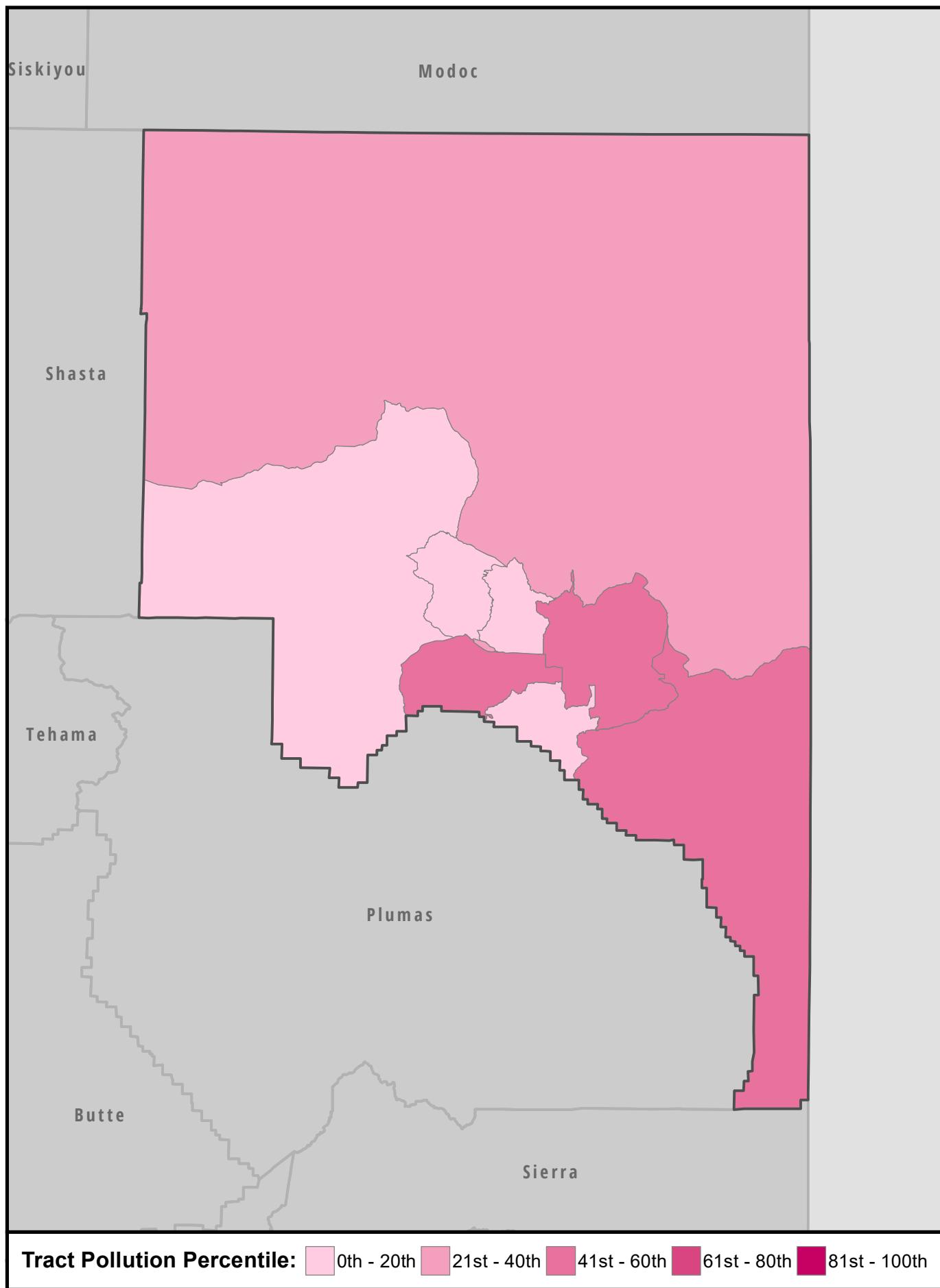
Lake County

Pollution Percentile by Census Tract
Map 17 of 58



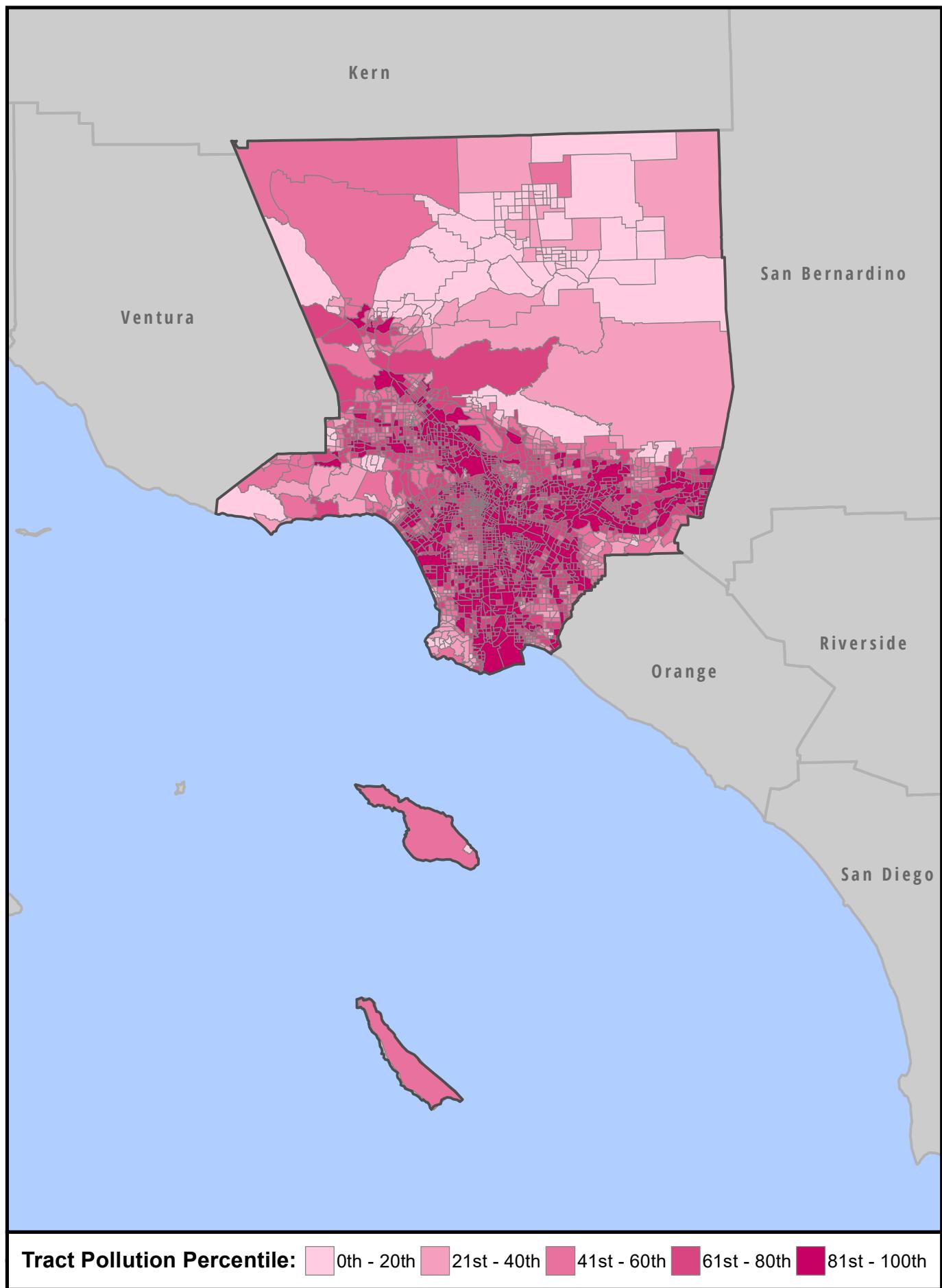
Lassen County

Pollution Percentile by Census Tract
Map 18 of 58



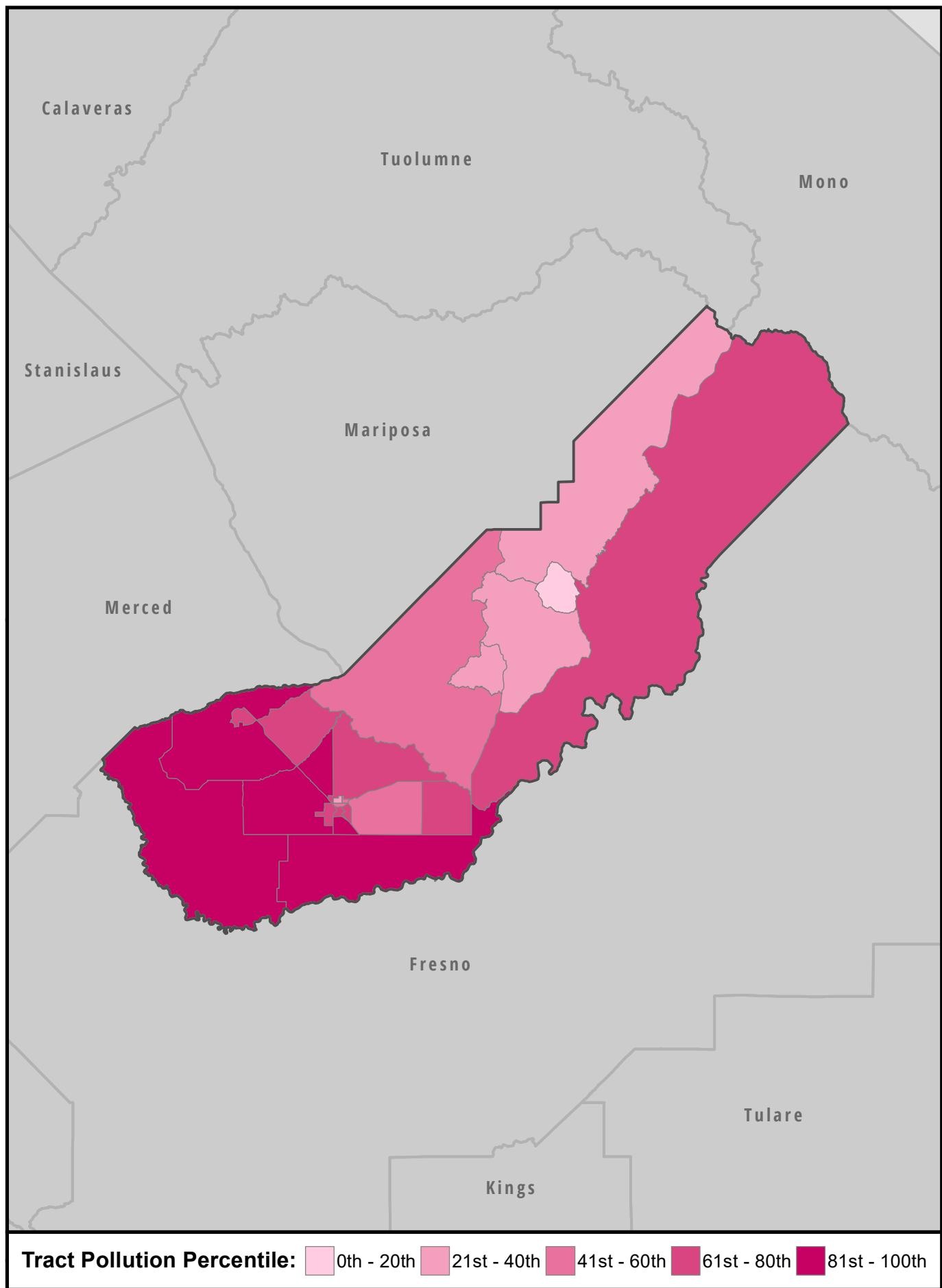
Los Angeles County

Pollution Percentile by Census Tract
Map 19 of 58



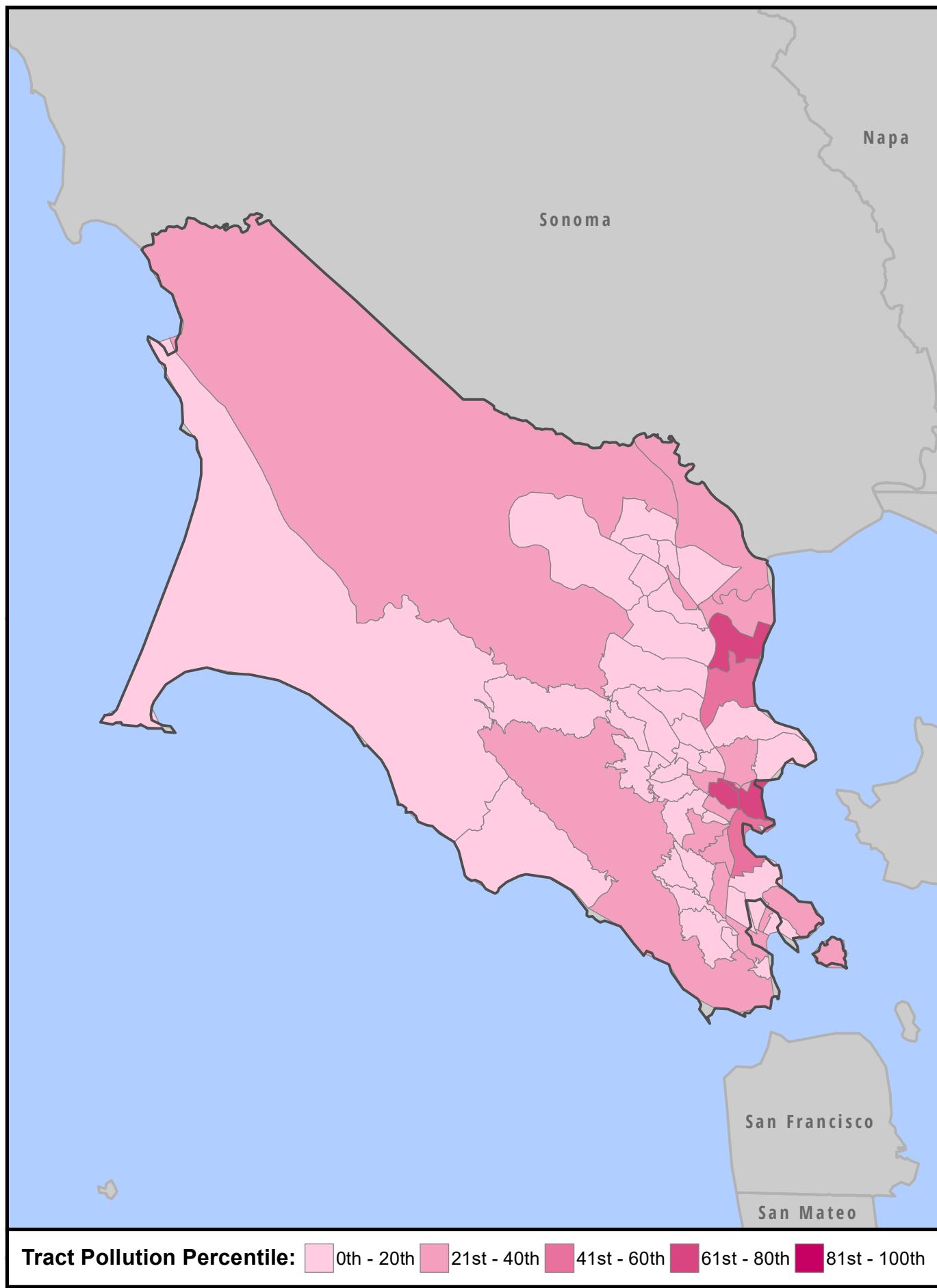
Madera County

Pollution Percentile by Census Tract
Map 20 of 58



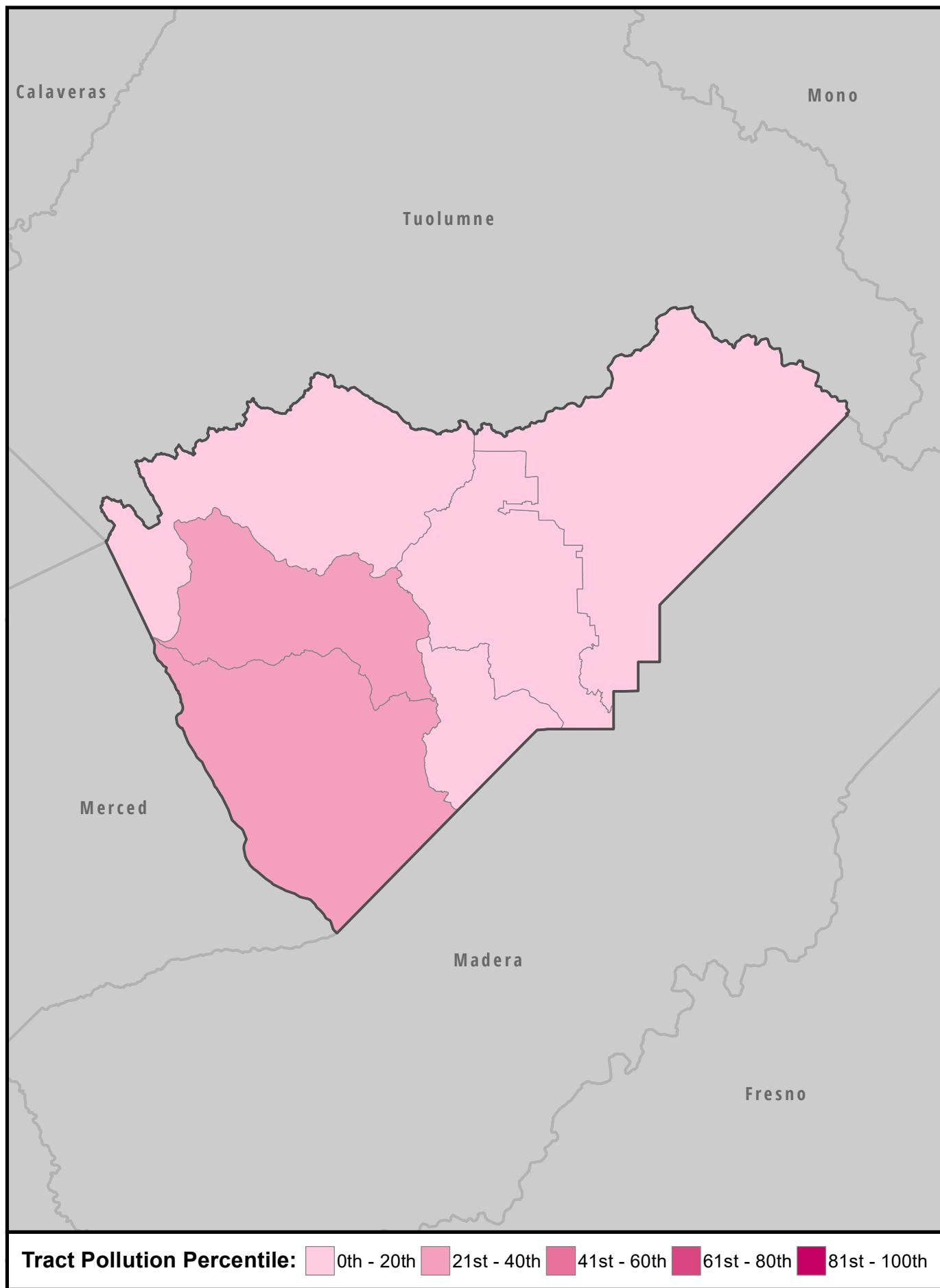
Marin County

Pollution Percentile by Census Tract
Map 21 of 58



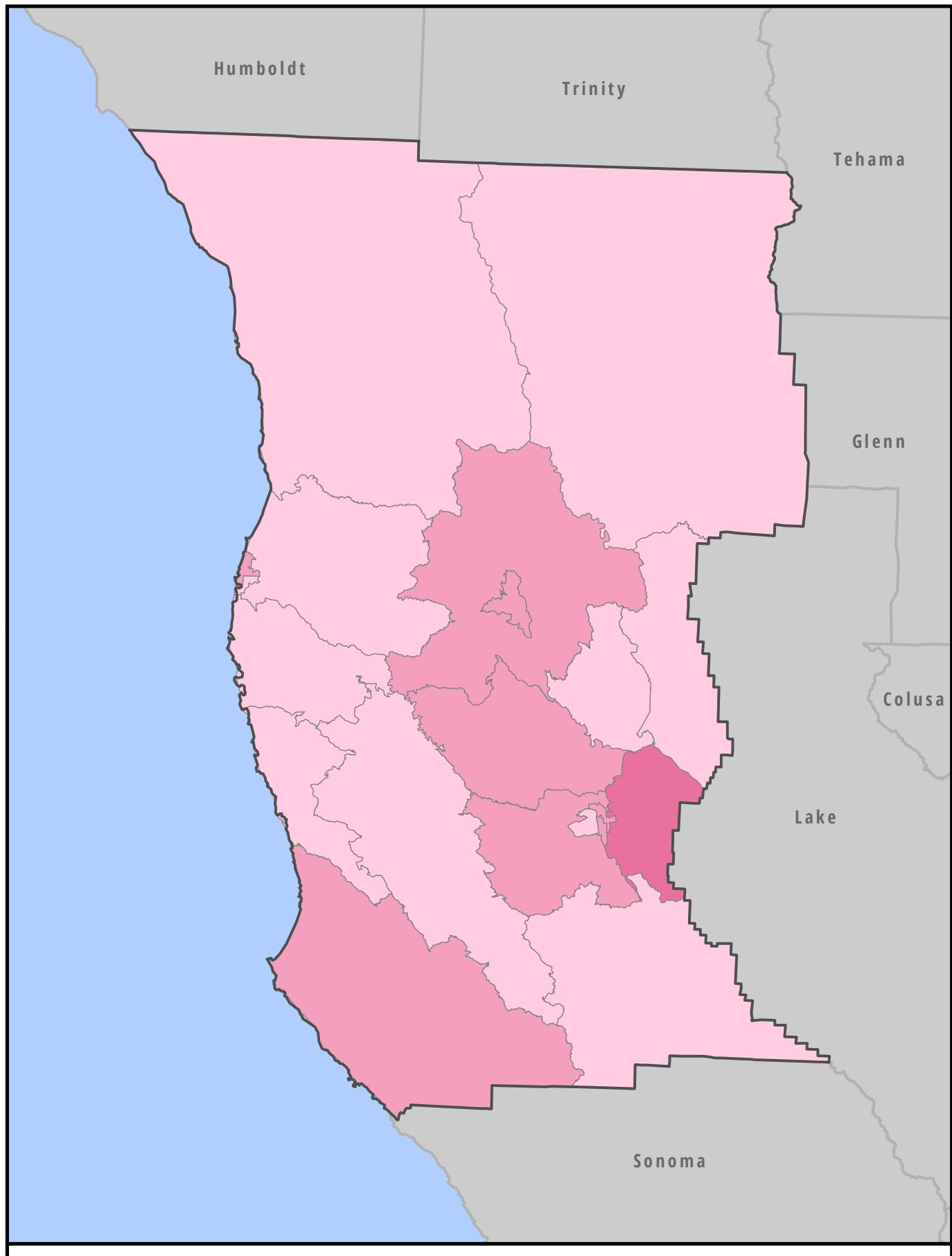
Mariposa County

Pollution Percentile by Census Tract
Map 22 of 58



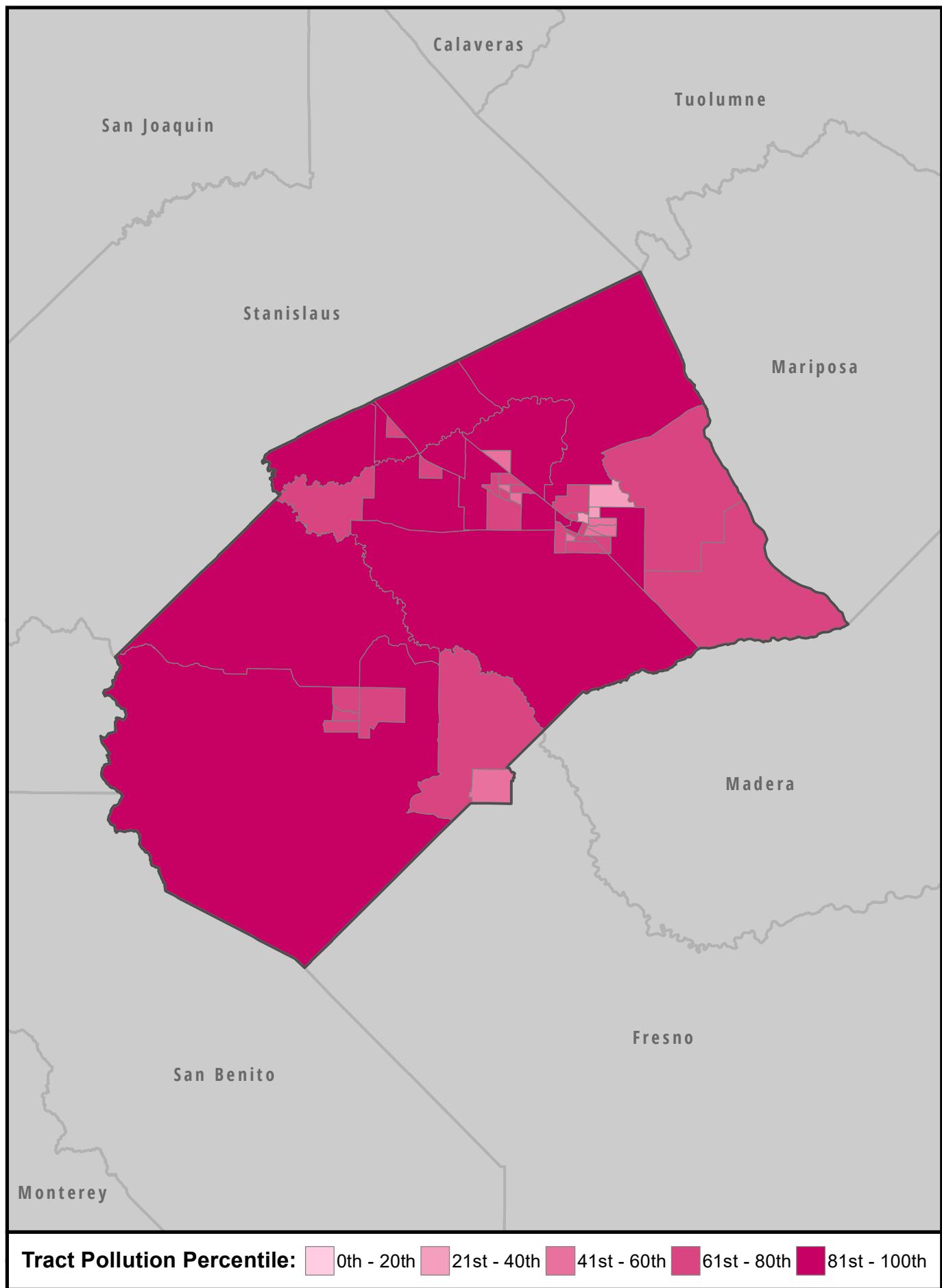
Mendocino County

Pollution Percentile by Census Tract
Map 23 of 58



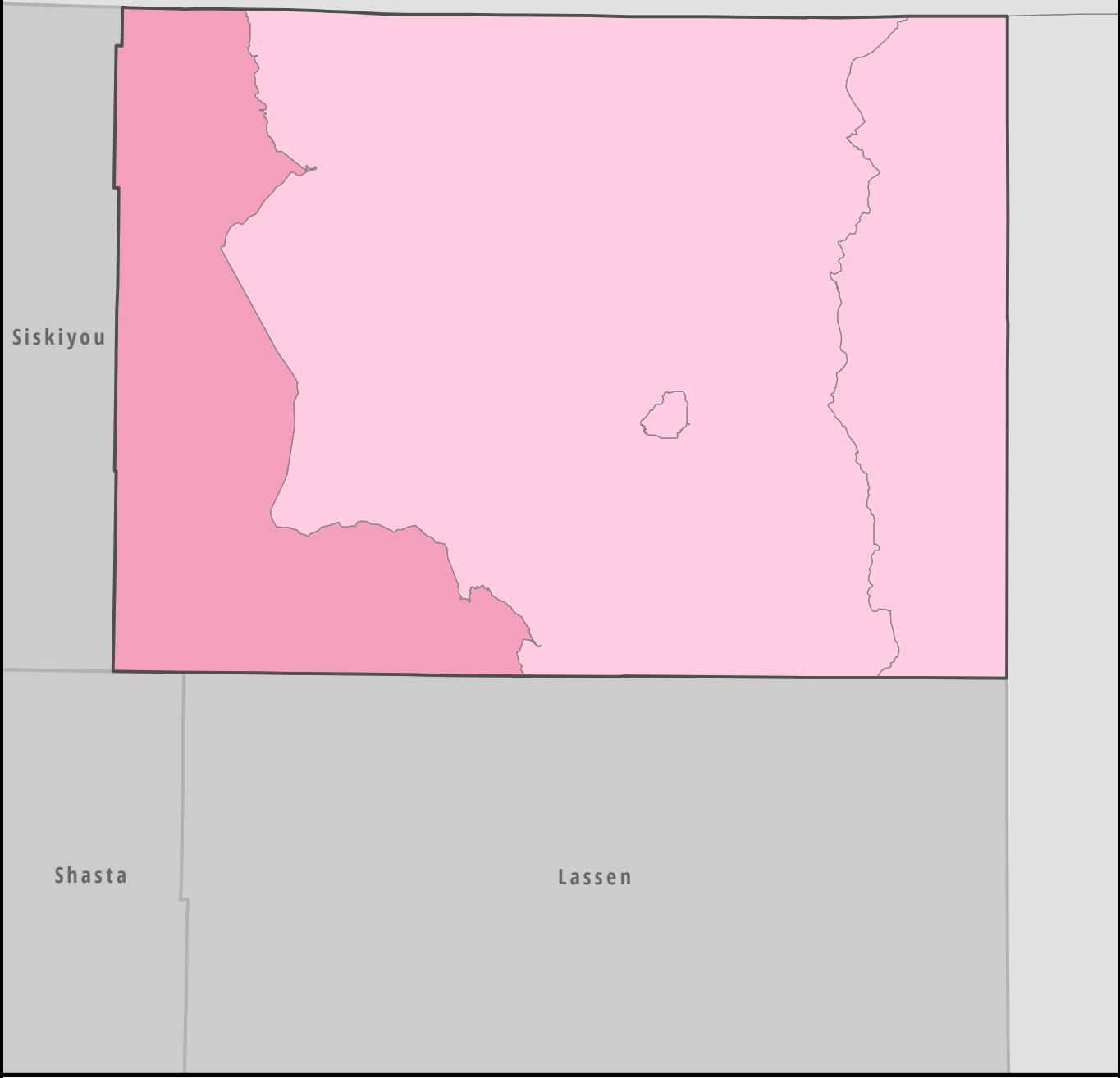
Merced County

Pollution Percentile by Census Tract
Map 24 of 58



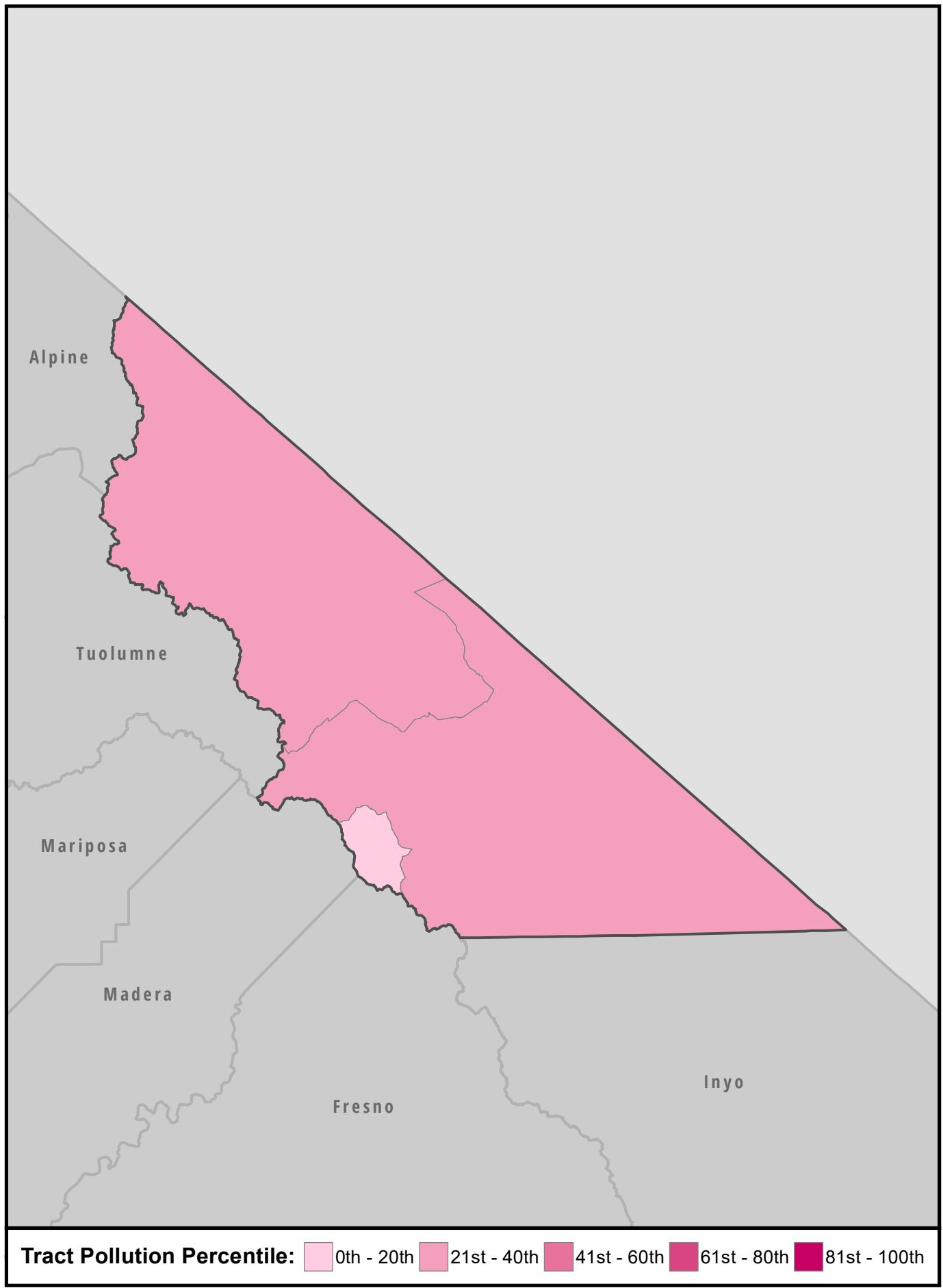
Modoc County

Pollution Percentile by Census Tract
Map 25 of 58



Tract Pollution Percentile: 0th - 20th 21st - 40th 41st - 60th 61st - 80th 81st - 100th

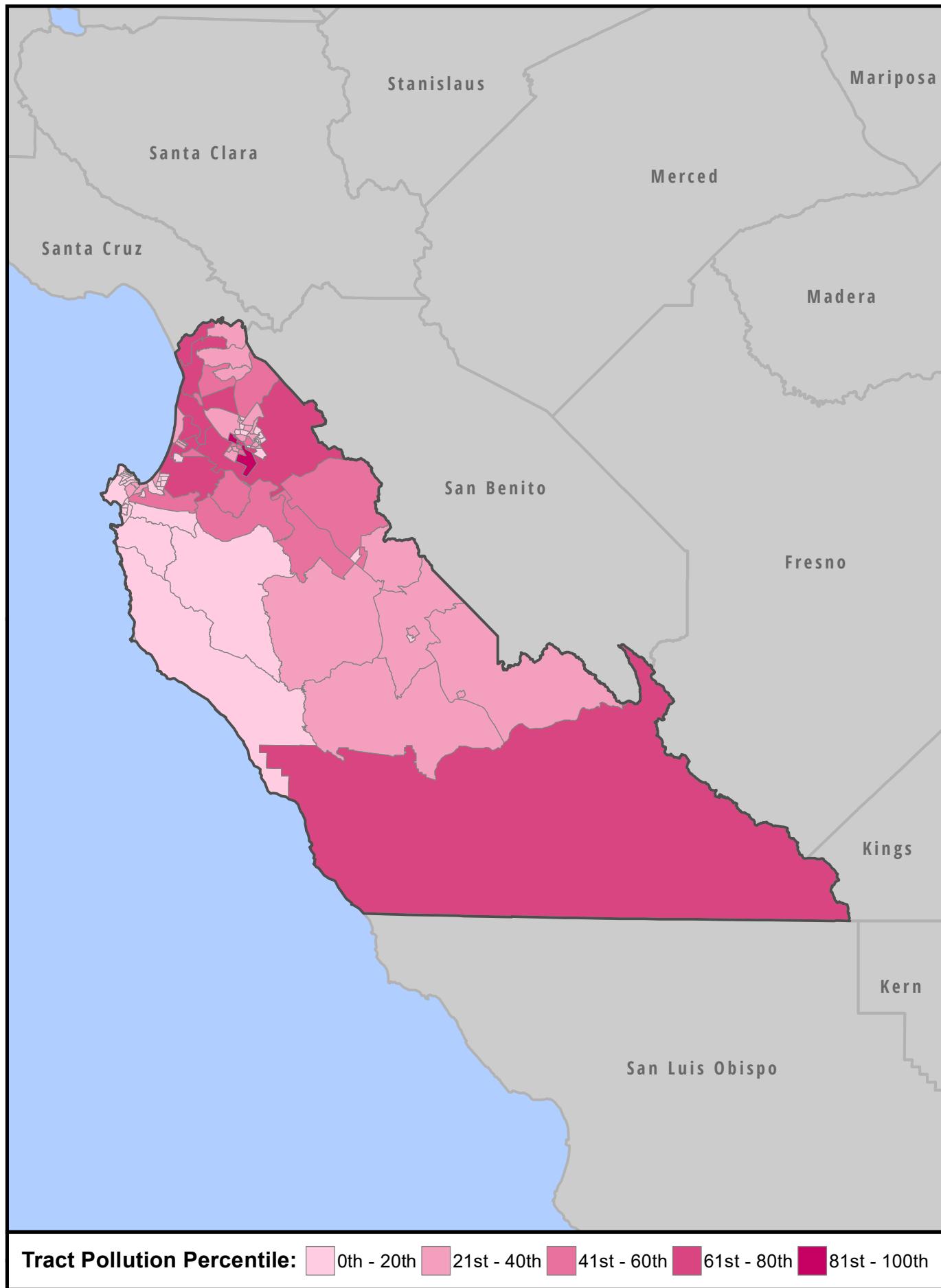
Mono County



Tract Pollution Percentile: 0th - 20th 21st - 40th 41st - 60th 61st - 80th 81st - 100th

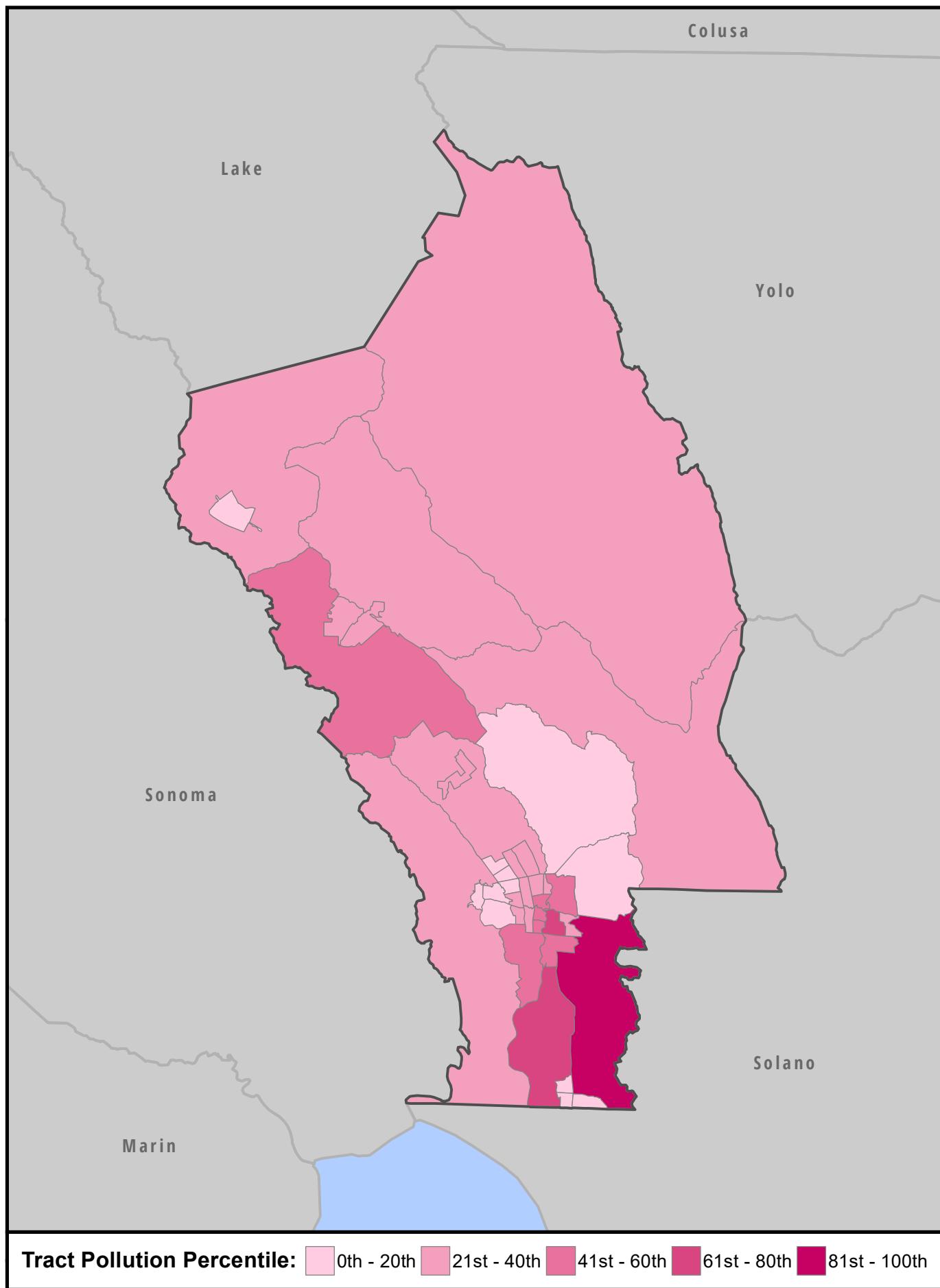
Monterey County

Pollution Percentile by Census Tract
Map 27 of 58



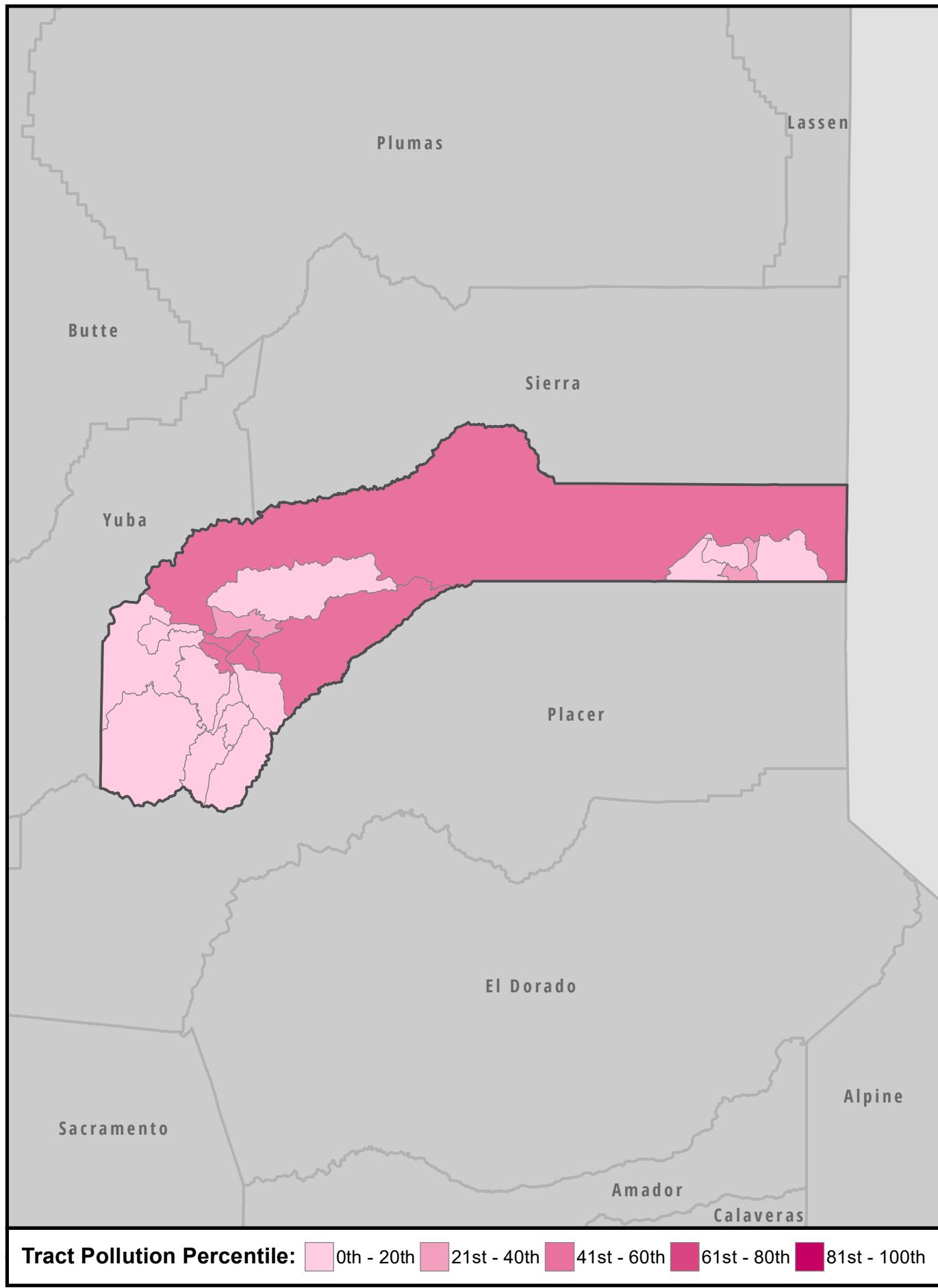
Napa County

Pollution Percentile by Census Tract
Map 28 of 58



Nevada County

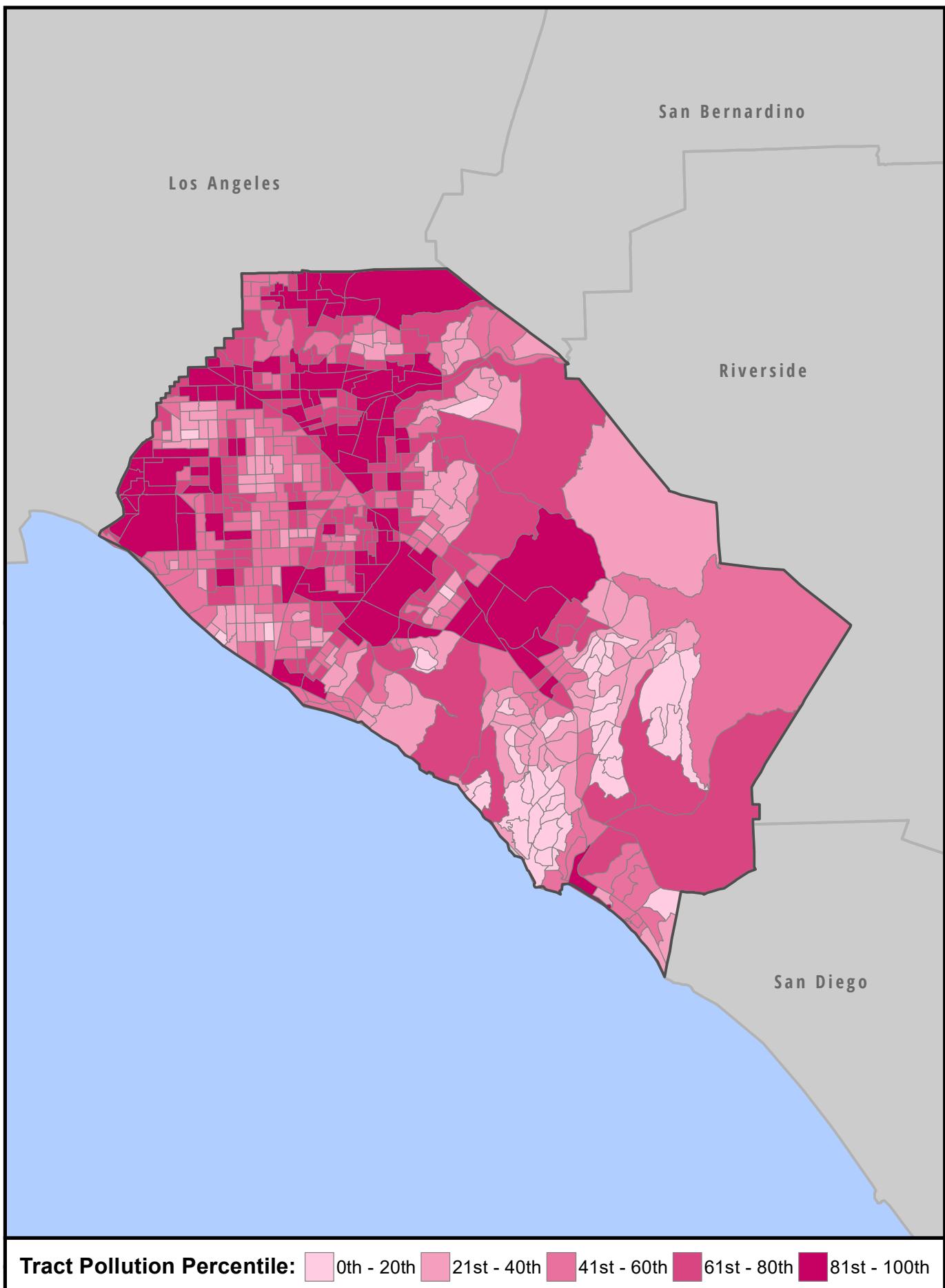
Pollution Percentile by Census Tract
Map 29 of 58



Tract Pollution Percentile: 0th - 20th 21st - 40th 41st - 60th 61st - 80th 81st - 100th

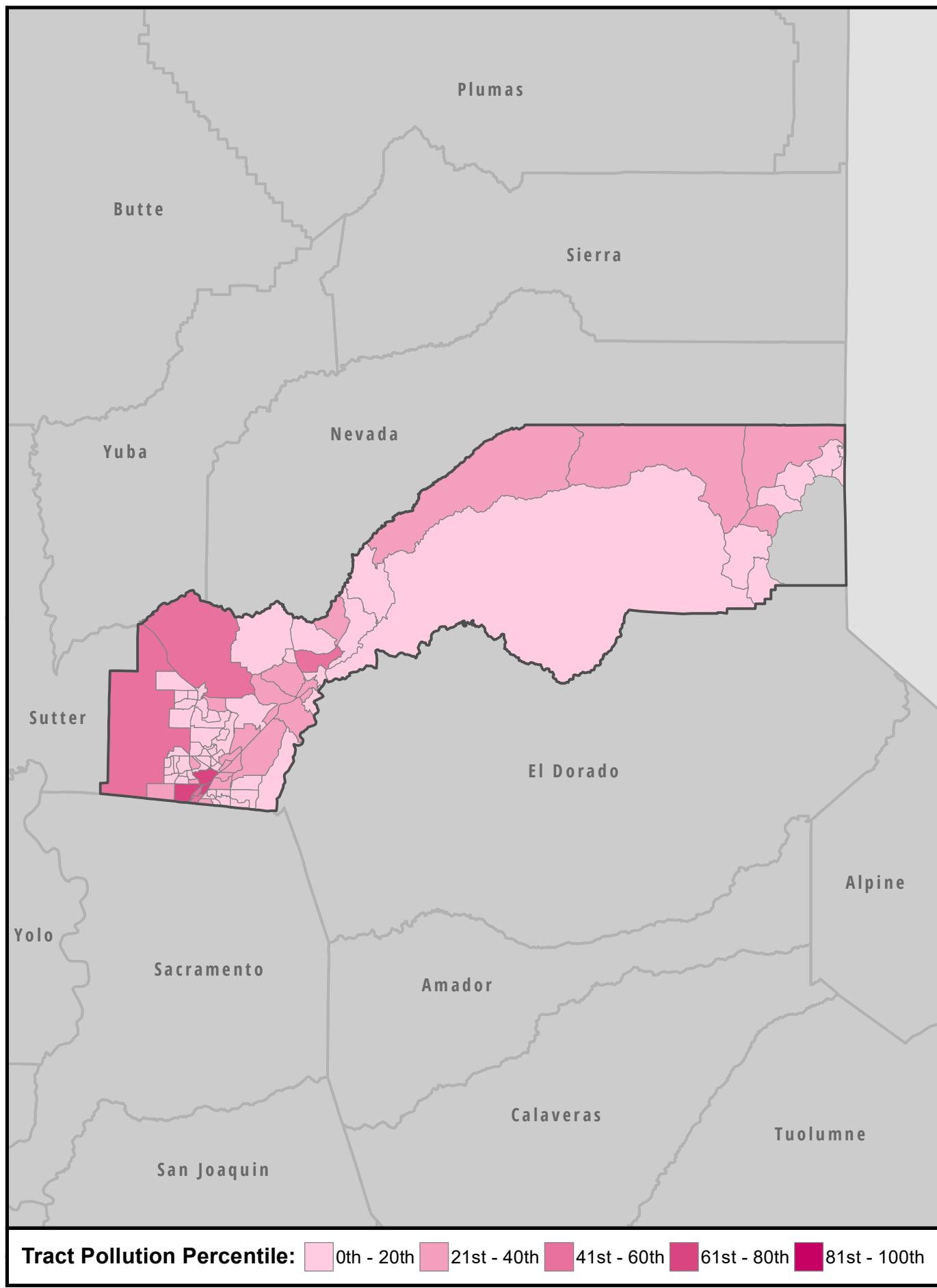
Orange County

Pollution Percentile by Census Tract
Map 30 of 58



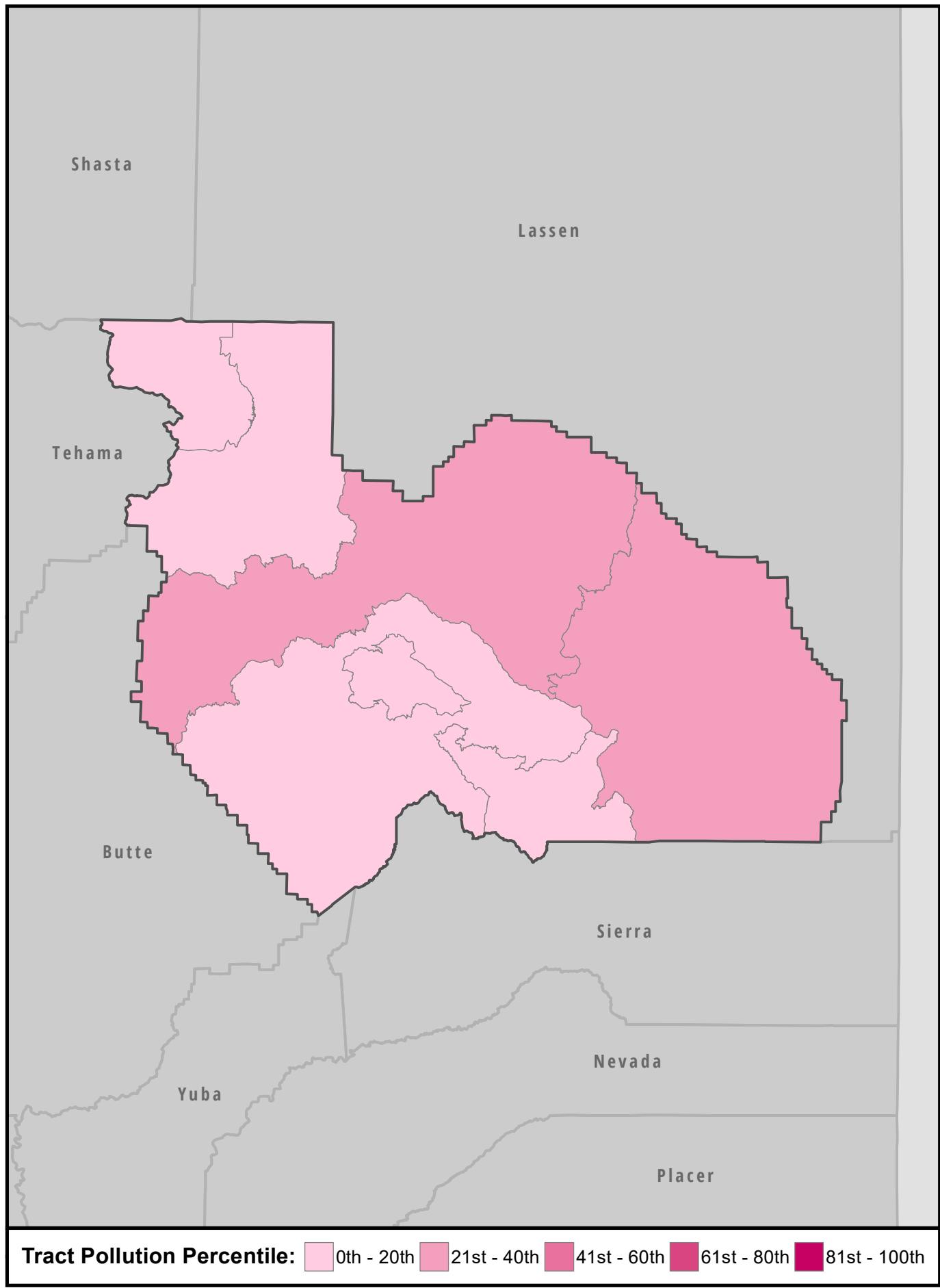
Placer County

Pollution Percentile by Census Tract
Map 31 of 58



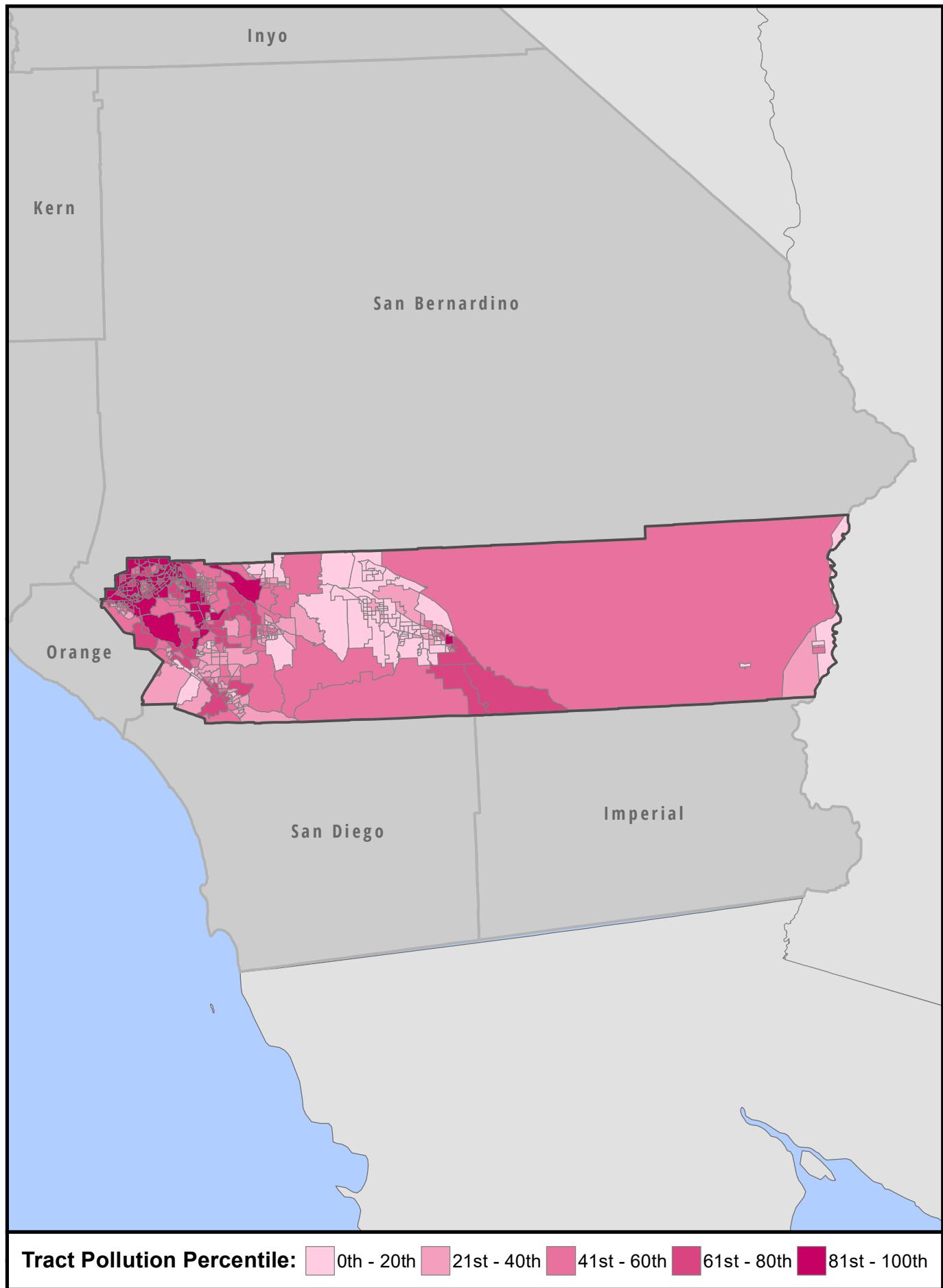
Plumas County

Pollution Percentile by Census Tract
Map 32 of 58



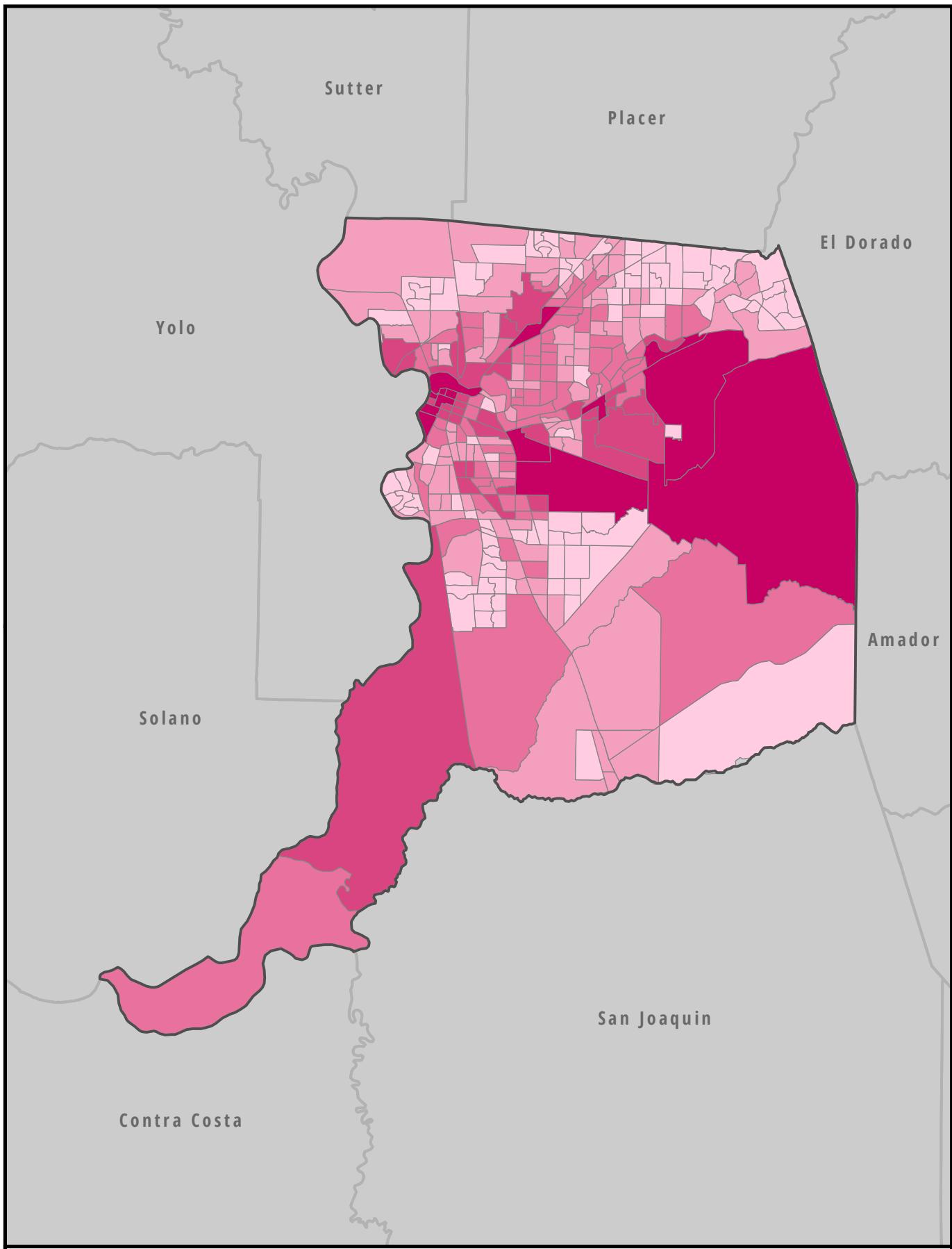
Riverside County

Pollution Percentile by Census Tract
Map 33 of 58



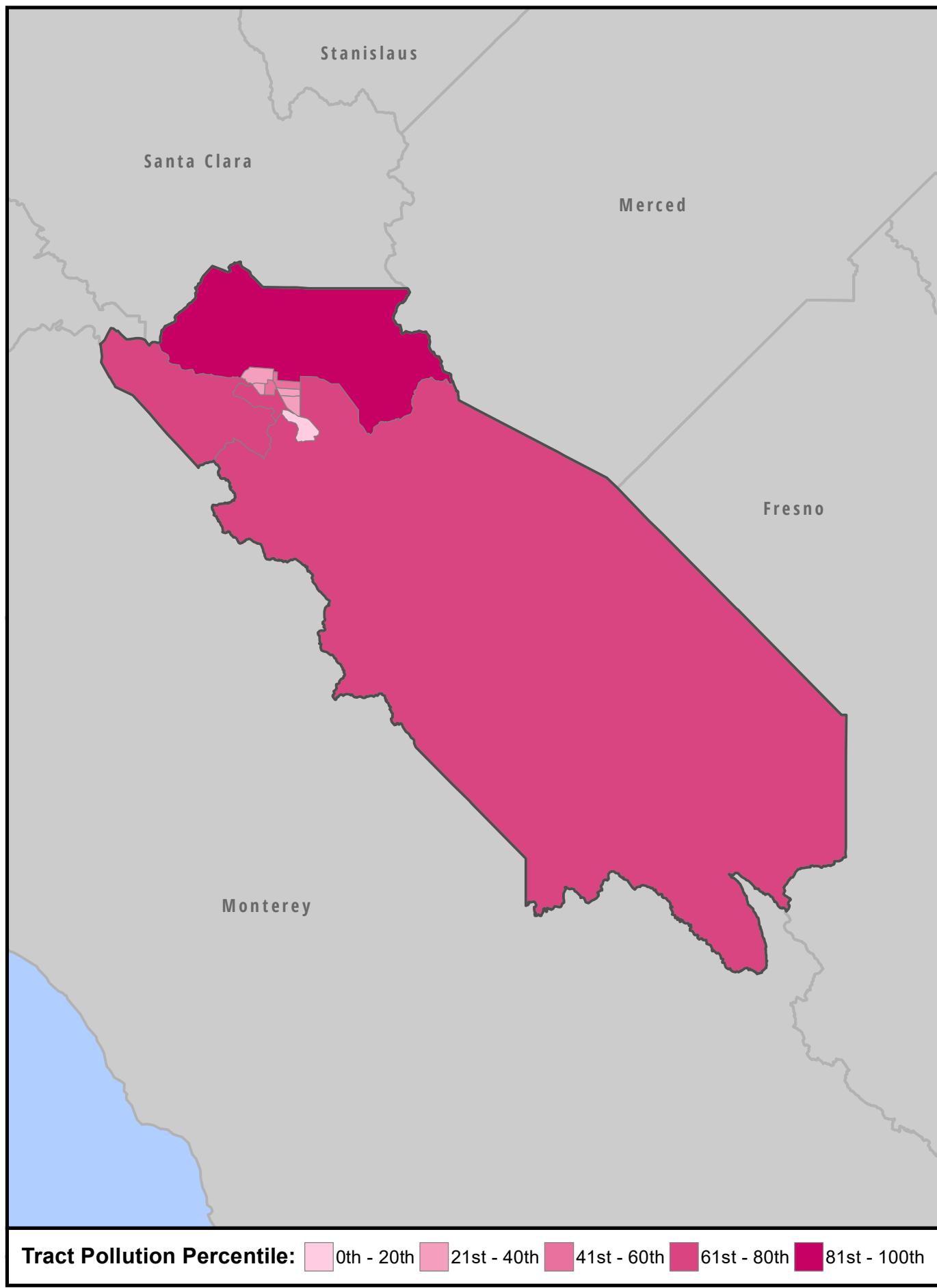
Sacramento County

Pollution Percentile by Census Tract
Map 34 of 58

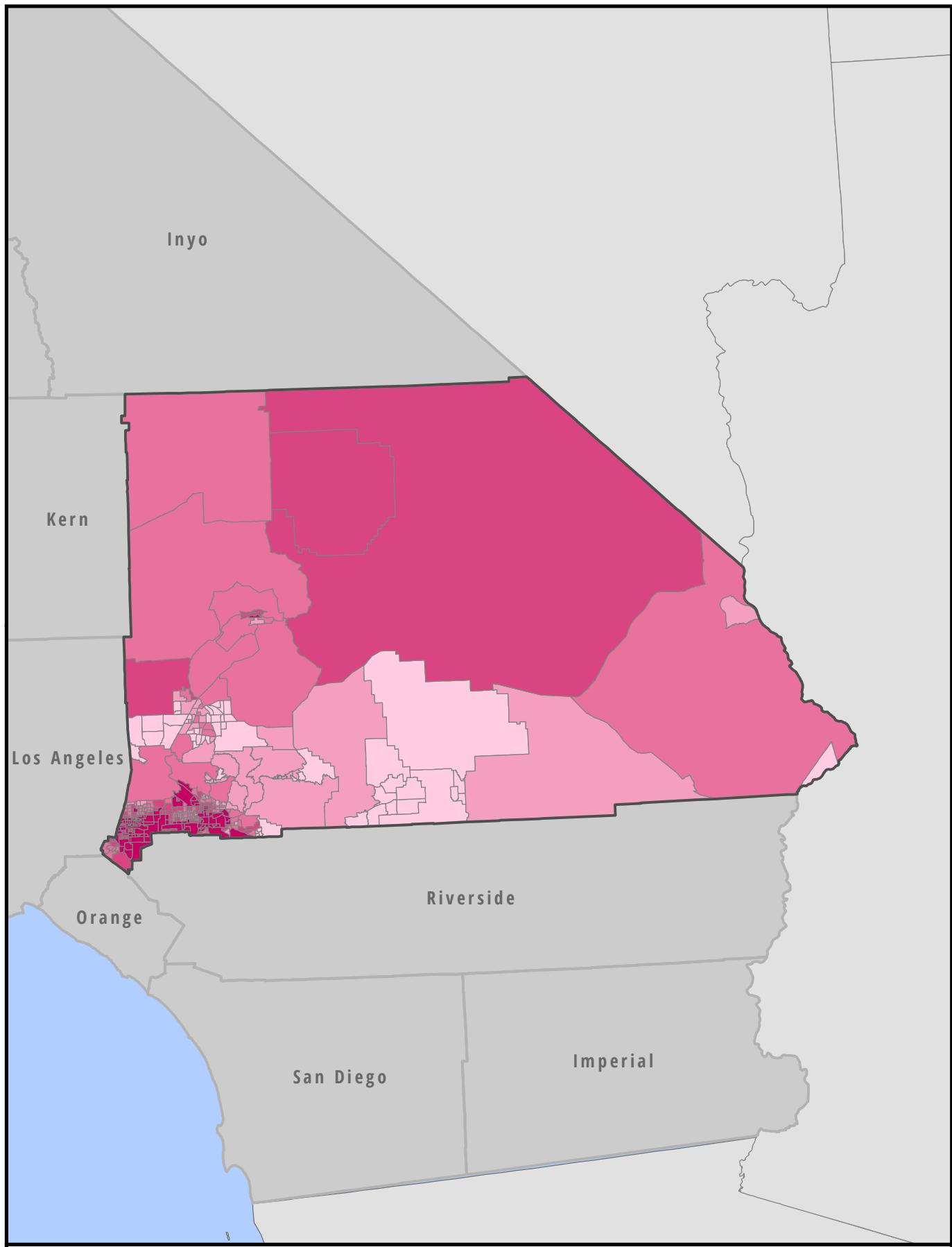


San Benito County

Pollution Percentile by Census Tract
Map 35 of 58



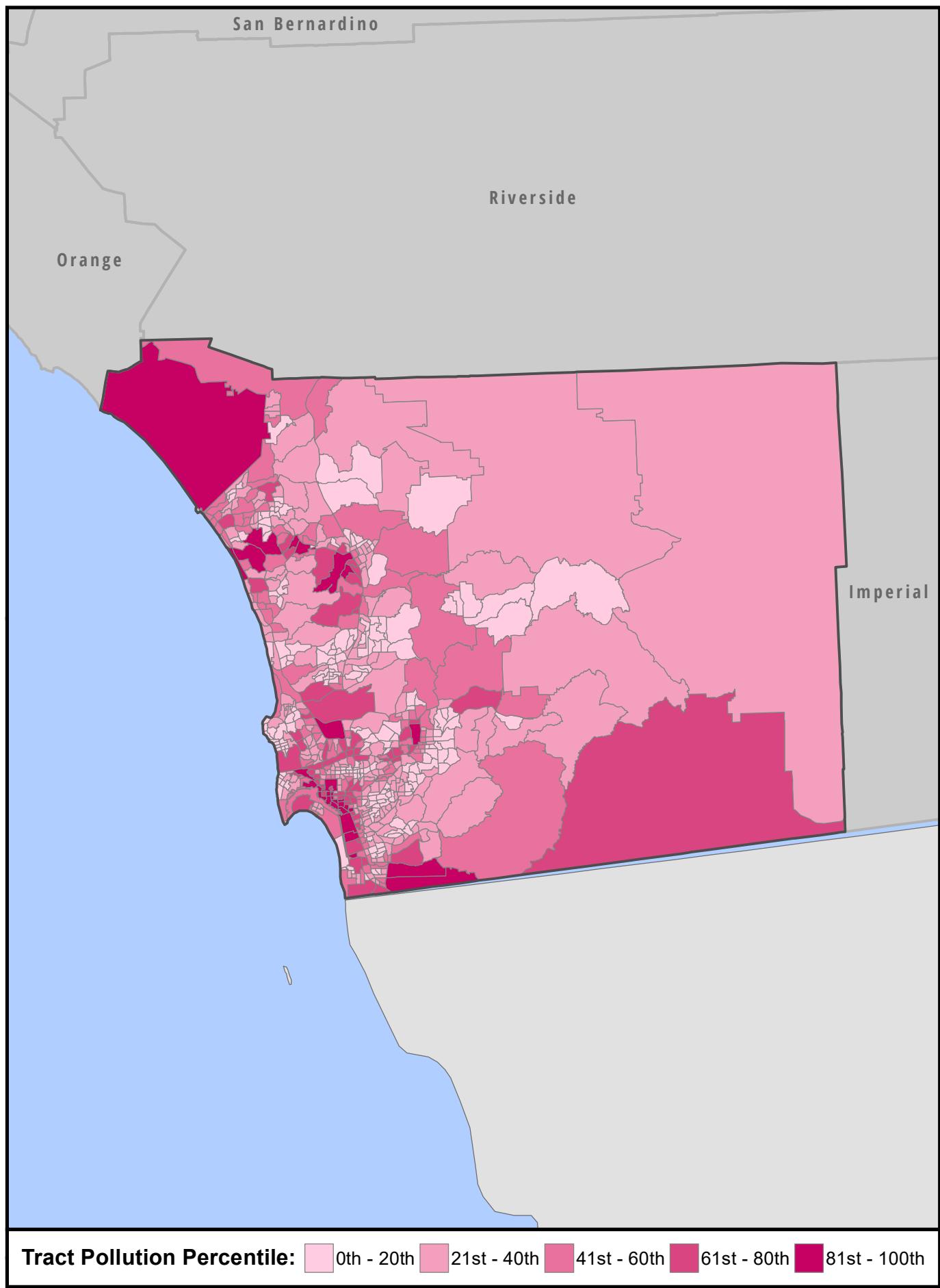
San Bernardino County



Tract Pollution Percentile: 0th - 20th 21st - 40th 41st - 60th 61st - 80th 81st - 100th

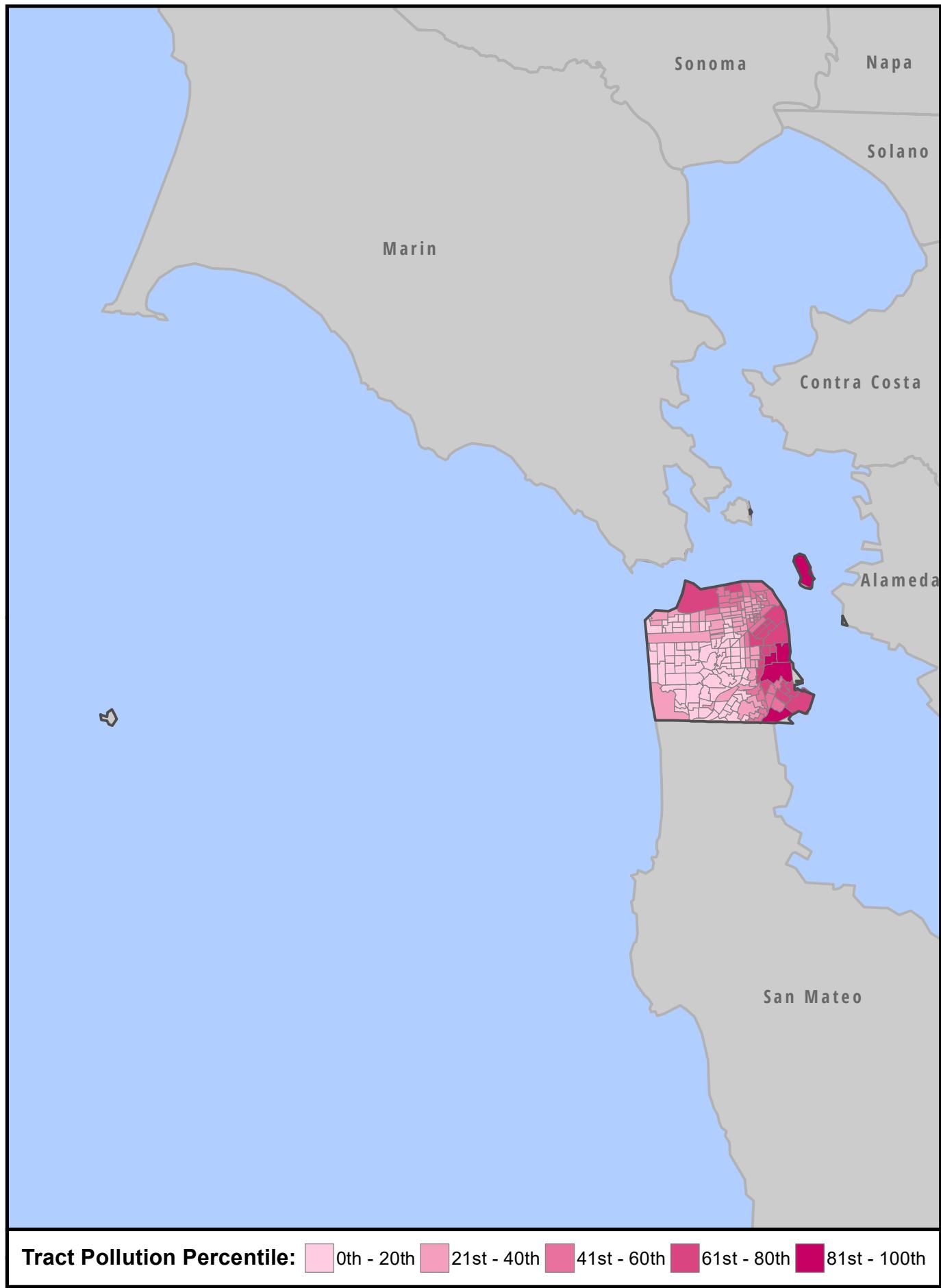
San Diego County

Pollution Percentile by Census Tract
Map 37 of 58



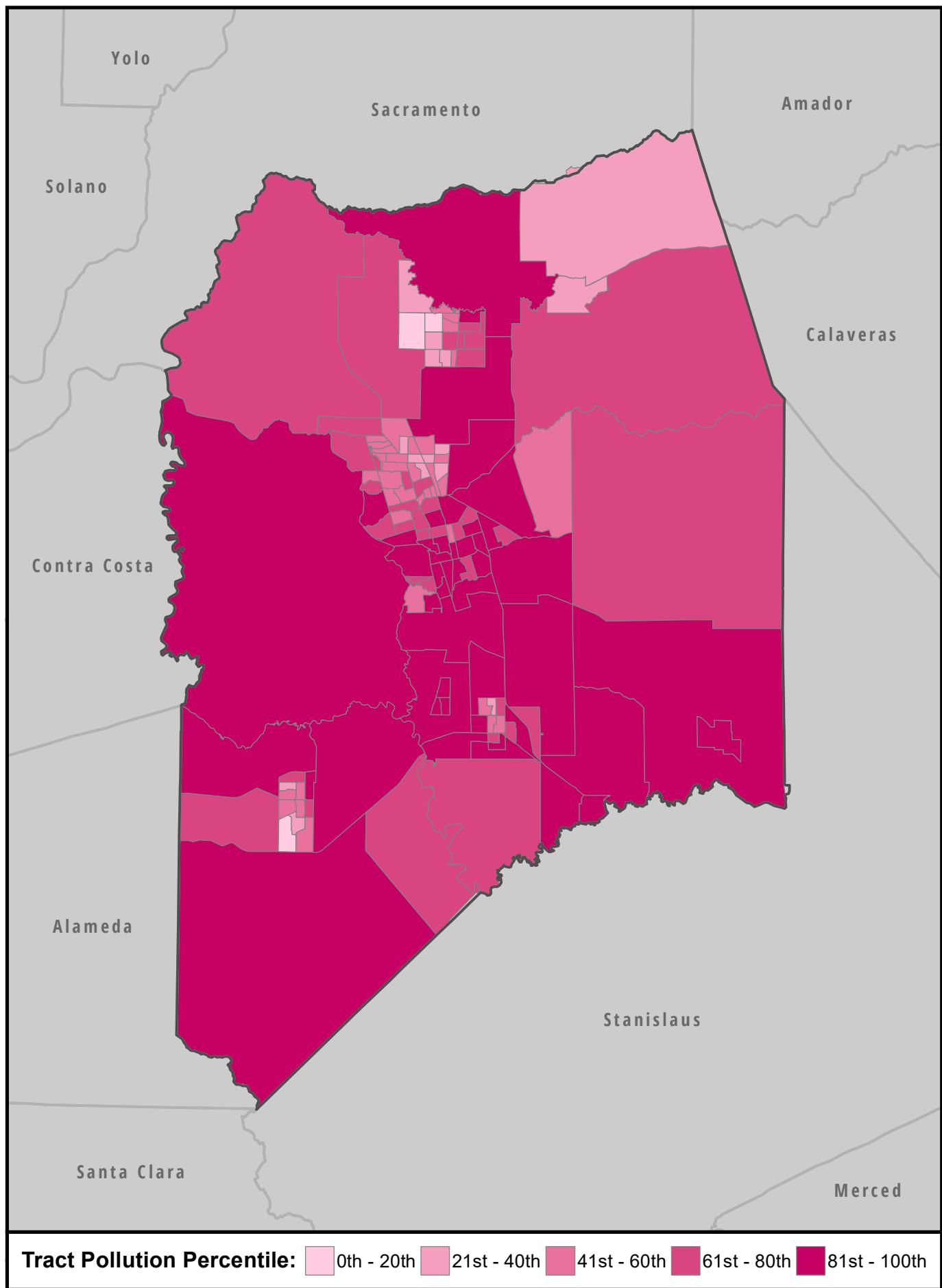
San Francisco County

Pollution Percentile by Census Tract
Map 38 of 58



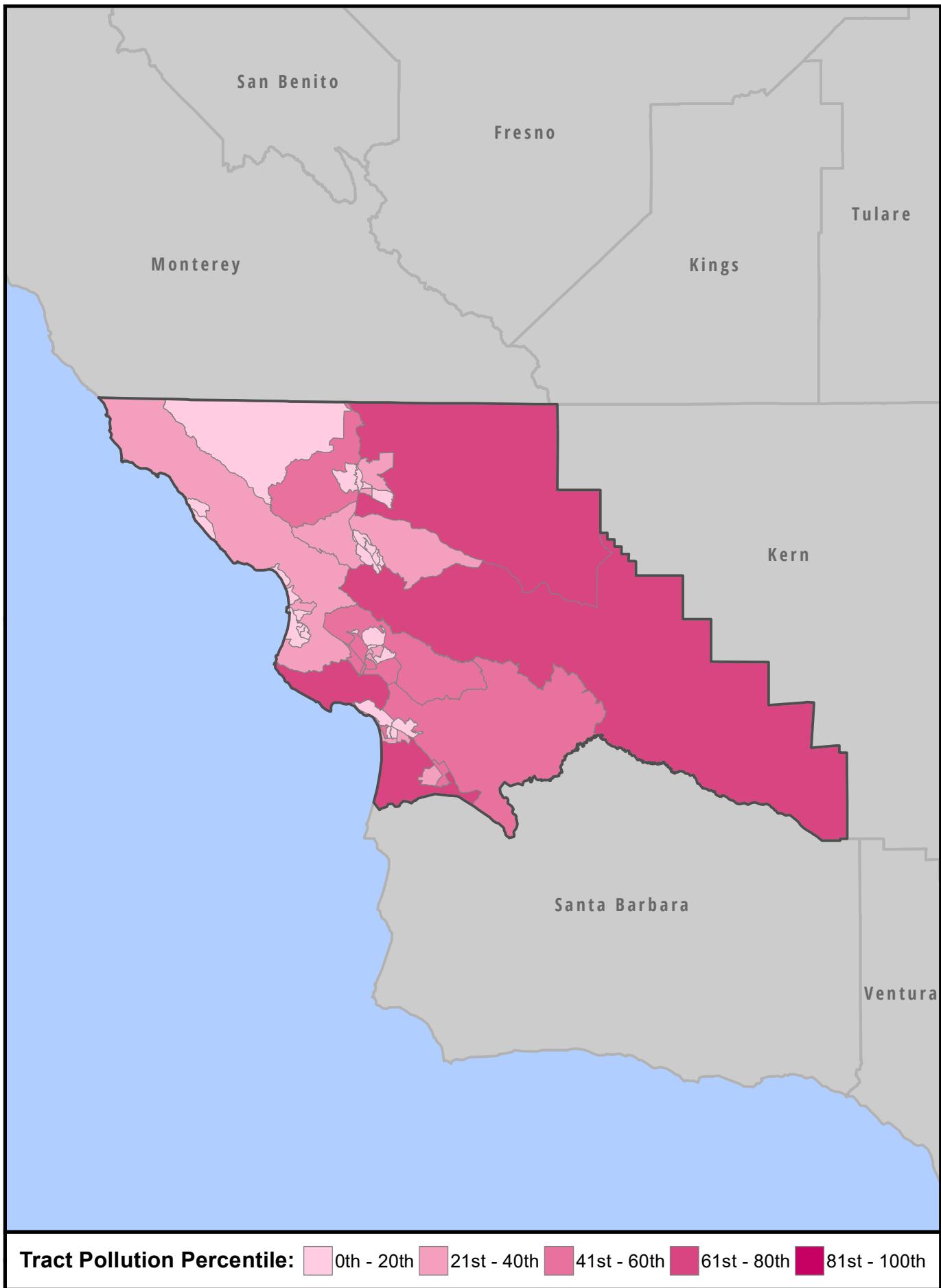
San Joaquin County

Pollution Percentile by Census Tract
Map 39 of 58



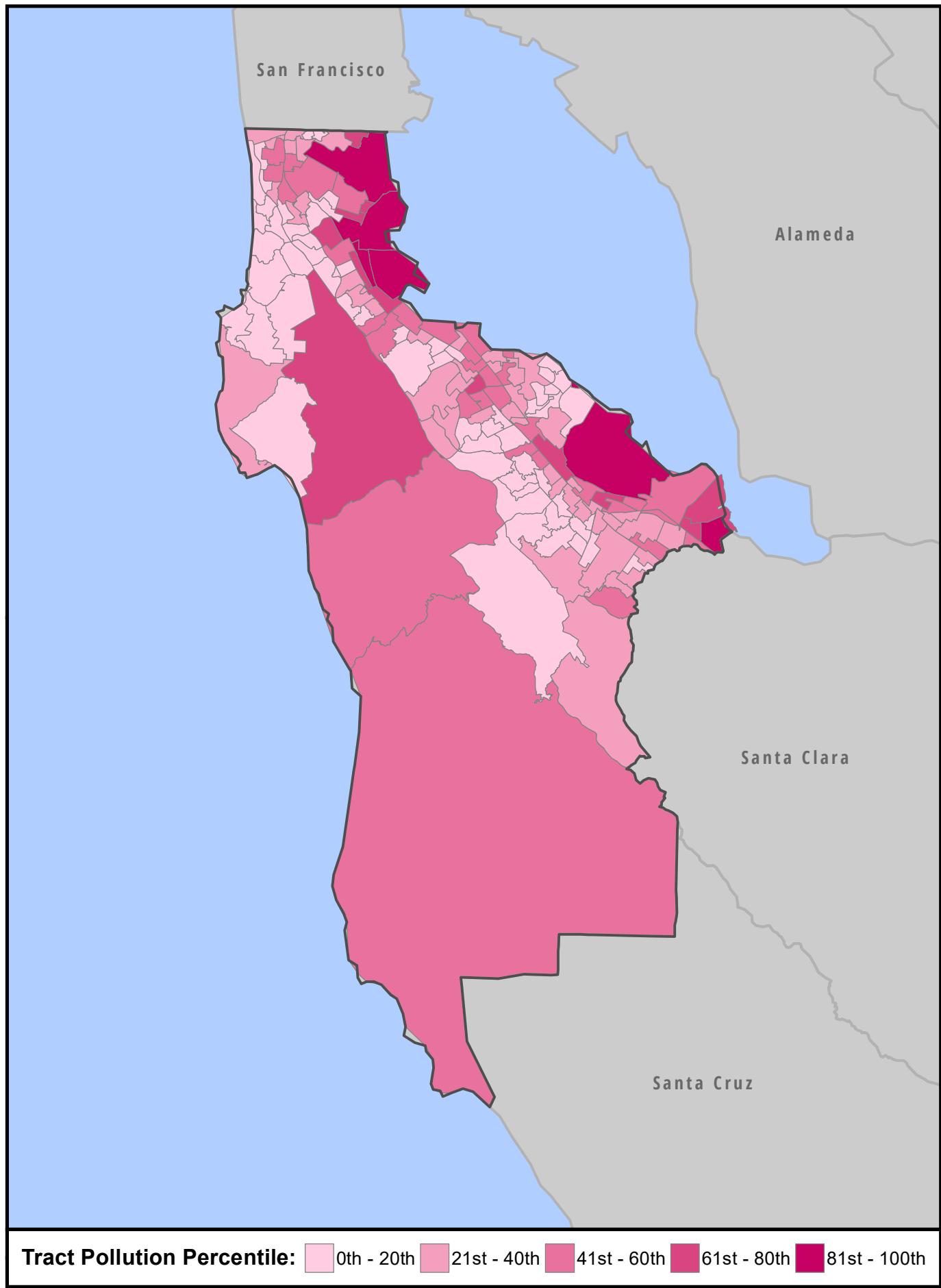
San Luis Obispo County

Pollution Percentile by Census Tract
Map 40 of 58



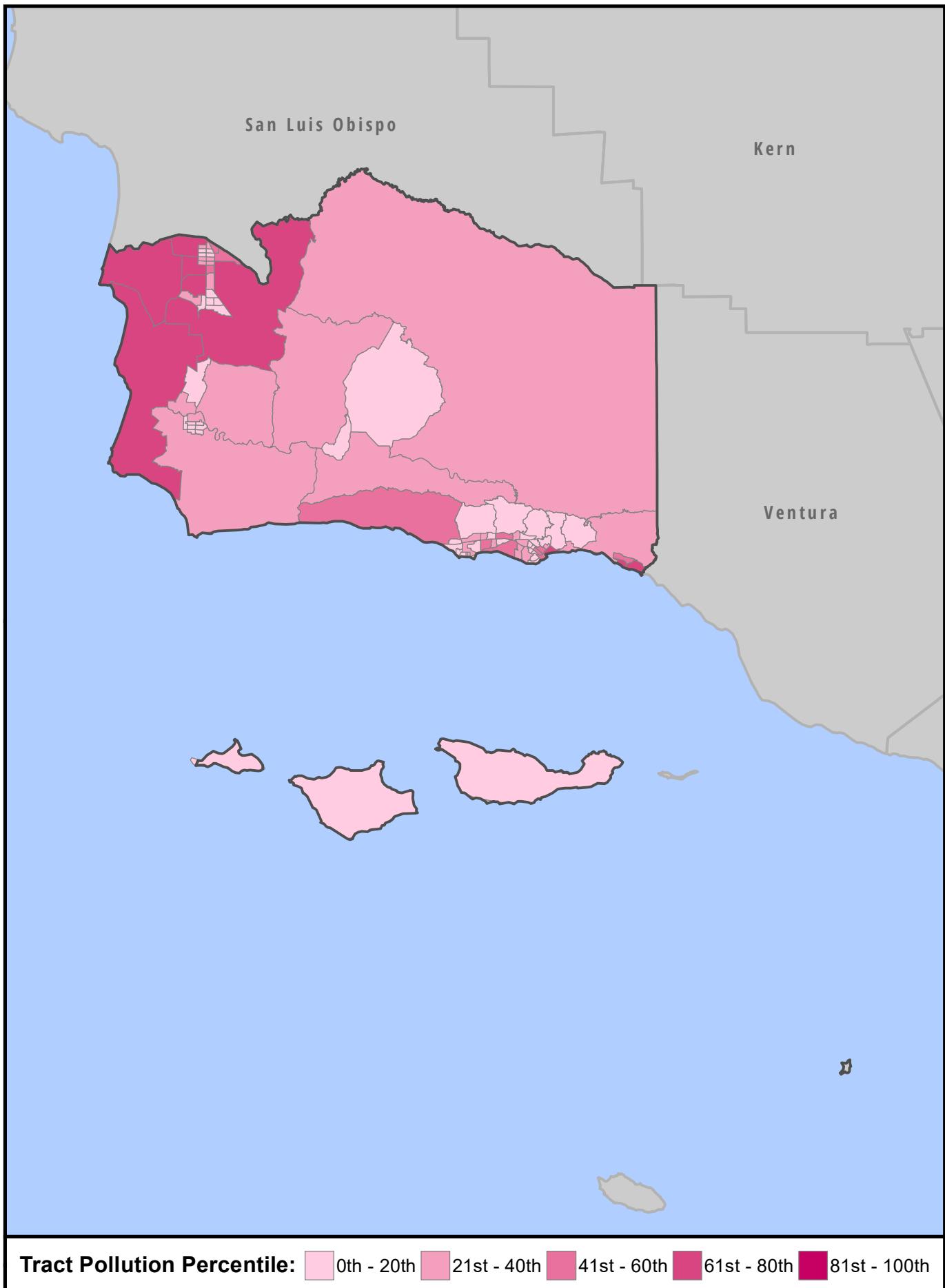
San Mateo County

Pollution Percentile by Census Tract
Map 41 of 58



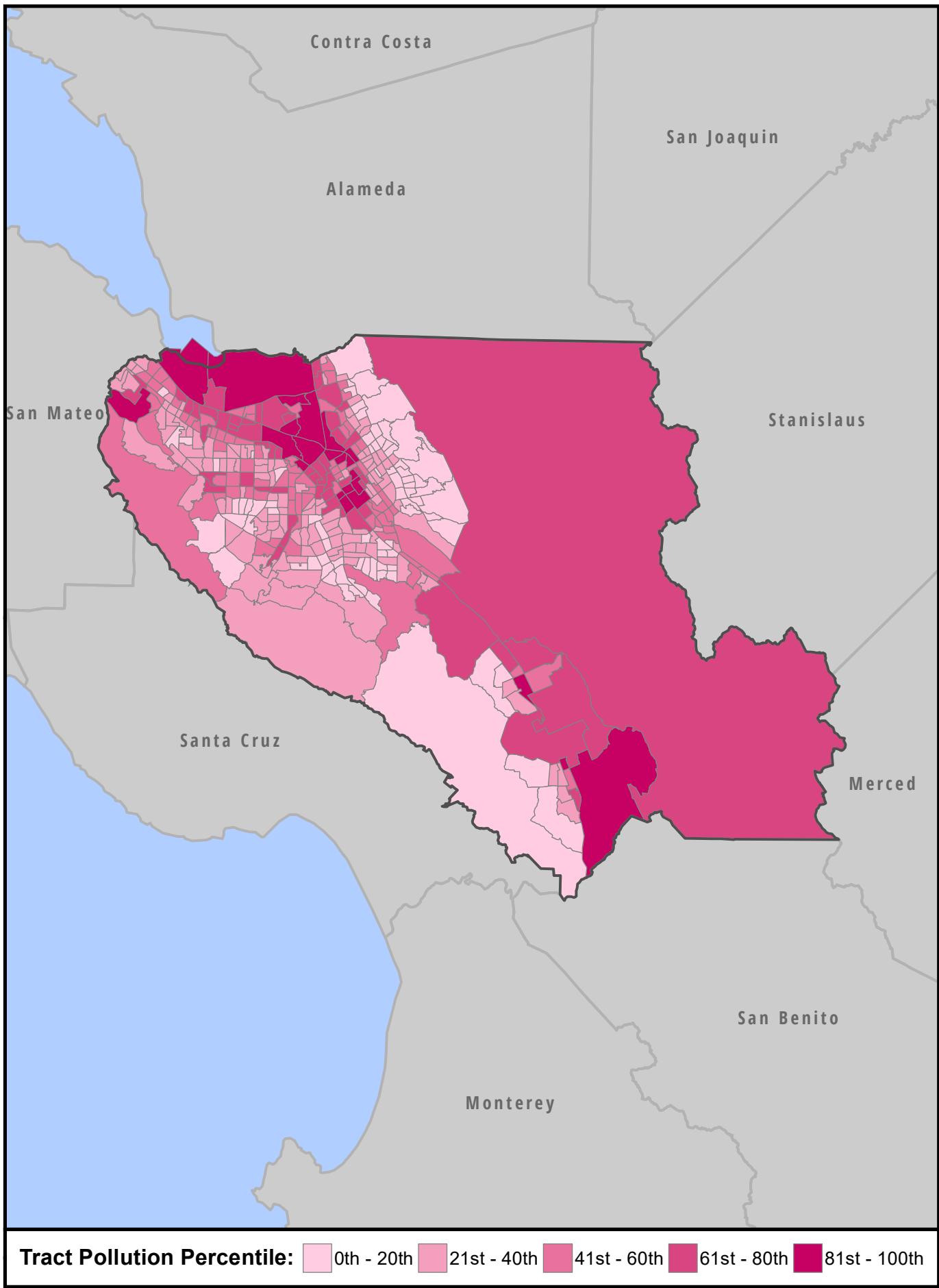
Santa Barbara County

Pollution Percentile by Census Tract
Map 42 of 58



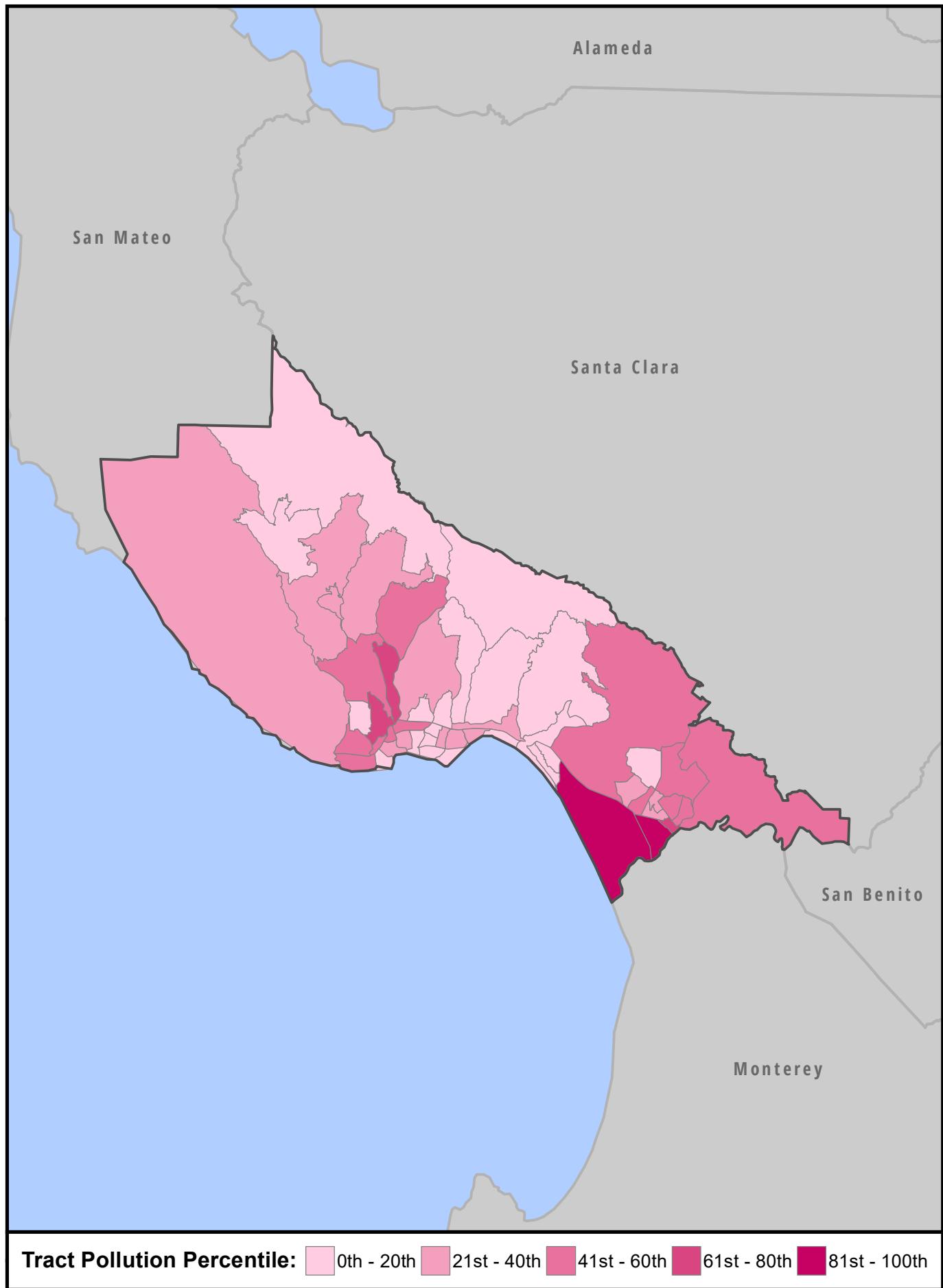
Santa Clara County

Pollution Percentile by Census Tract
Map 43 of 58



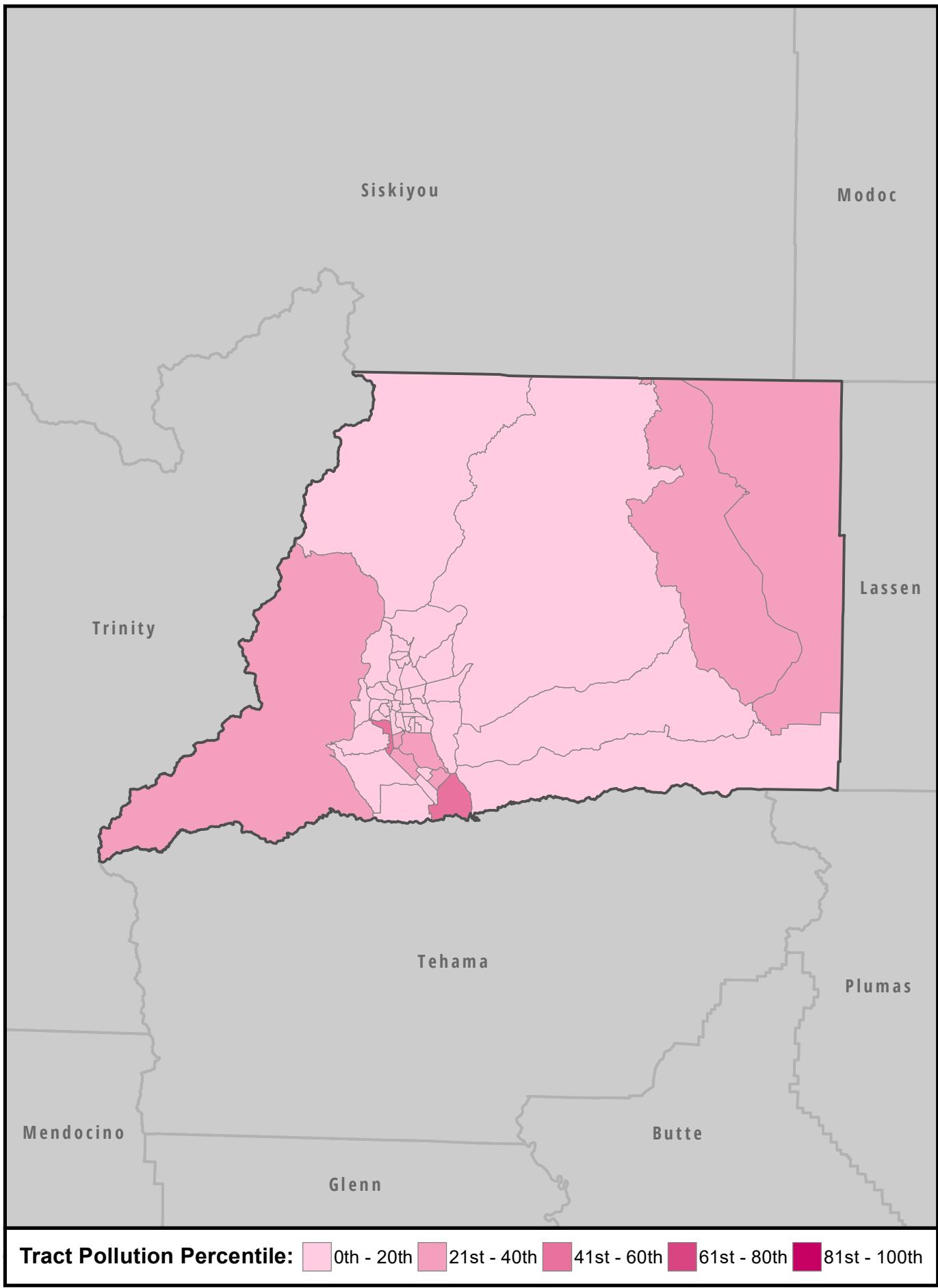
Santa Cruz County

Pollution Percentile by Census Tract
Map 44 of 58



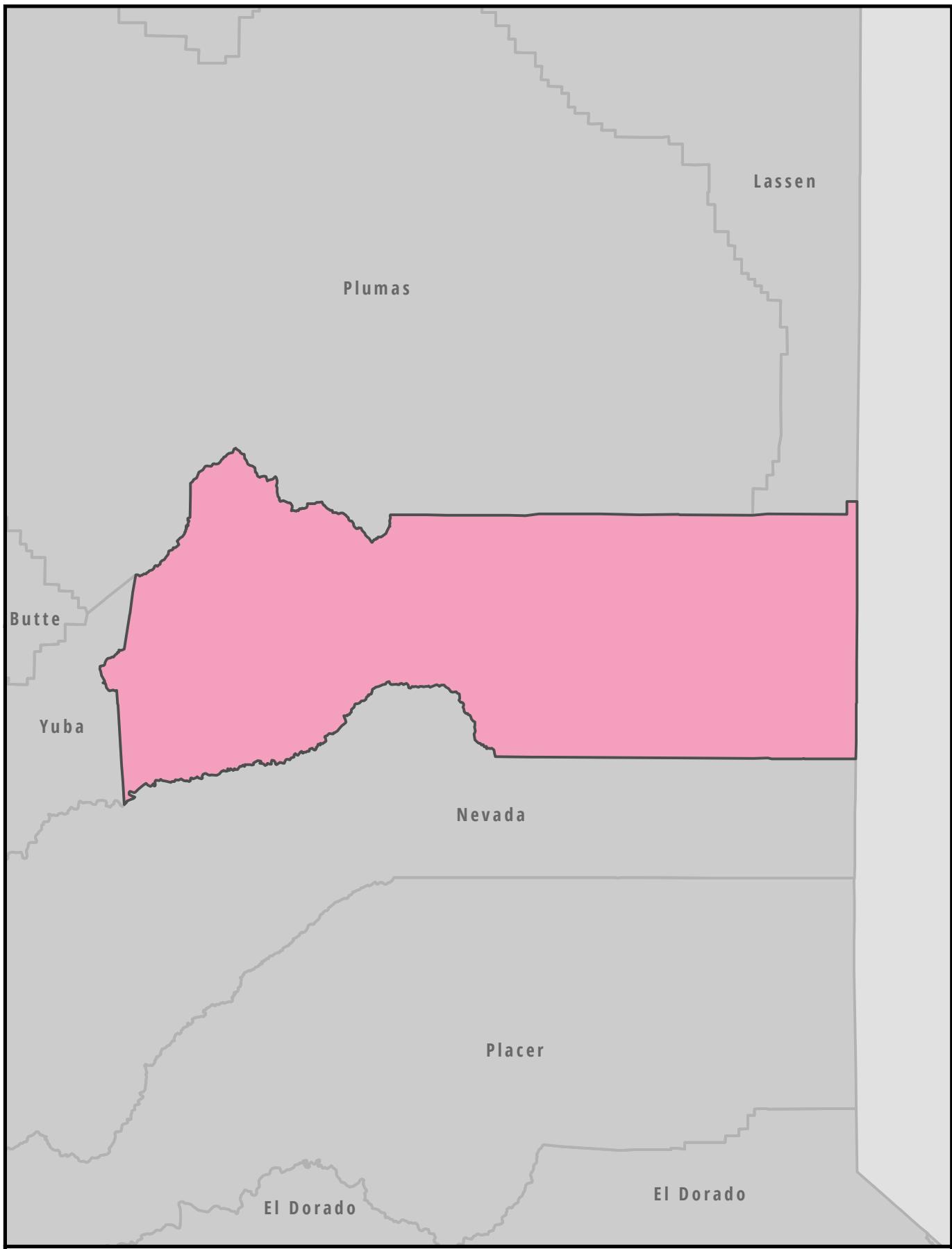
Shasta County

Pollution Percentile by Census Tract
Map 45 of 58



Sierra County

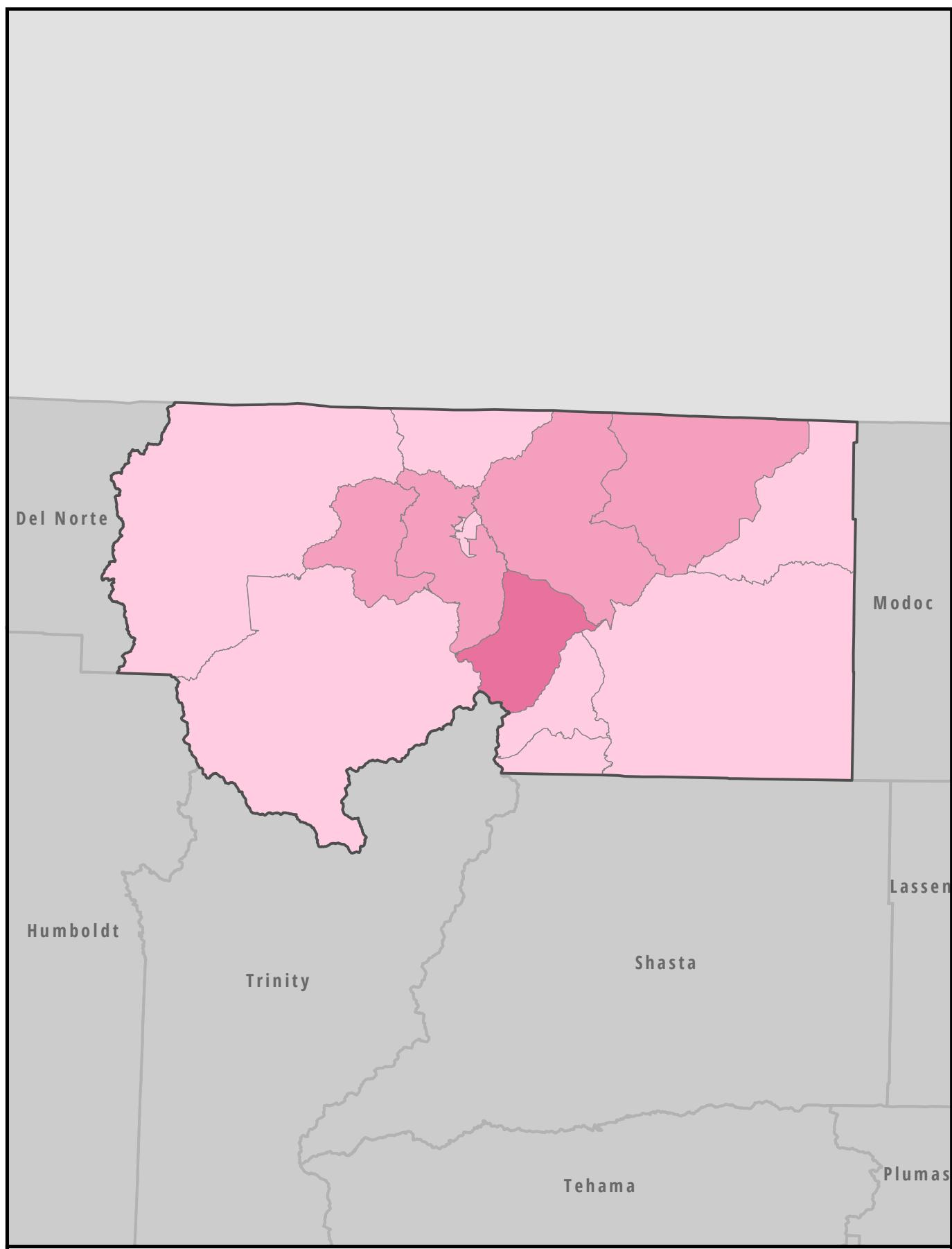
Pollution Percentile by Census Tract
Map 46 of 58



Tract Pollution Percentile: 0th - 20th 21st - 40th 41st - 60th 61st - 80th 81st - 100th

Siskiyou County

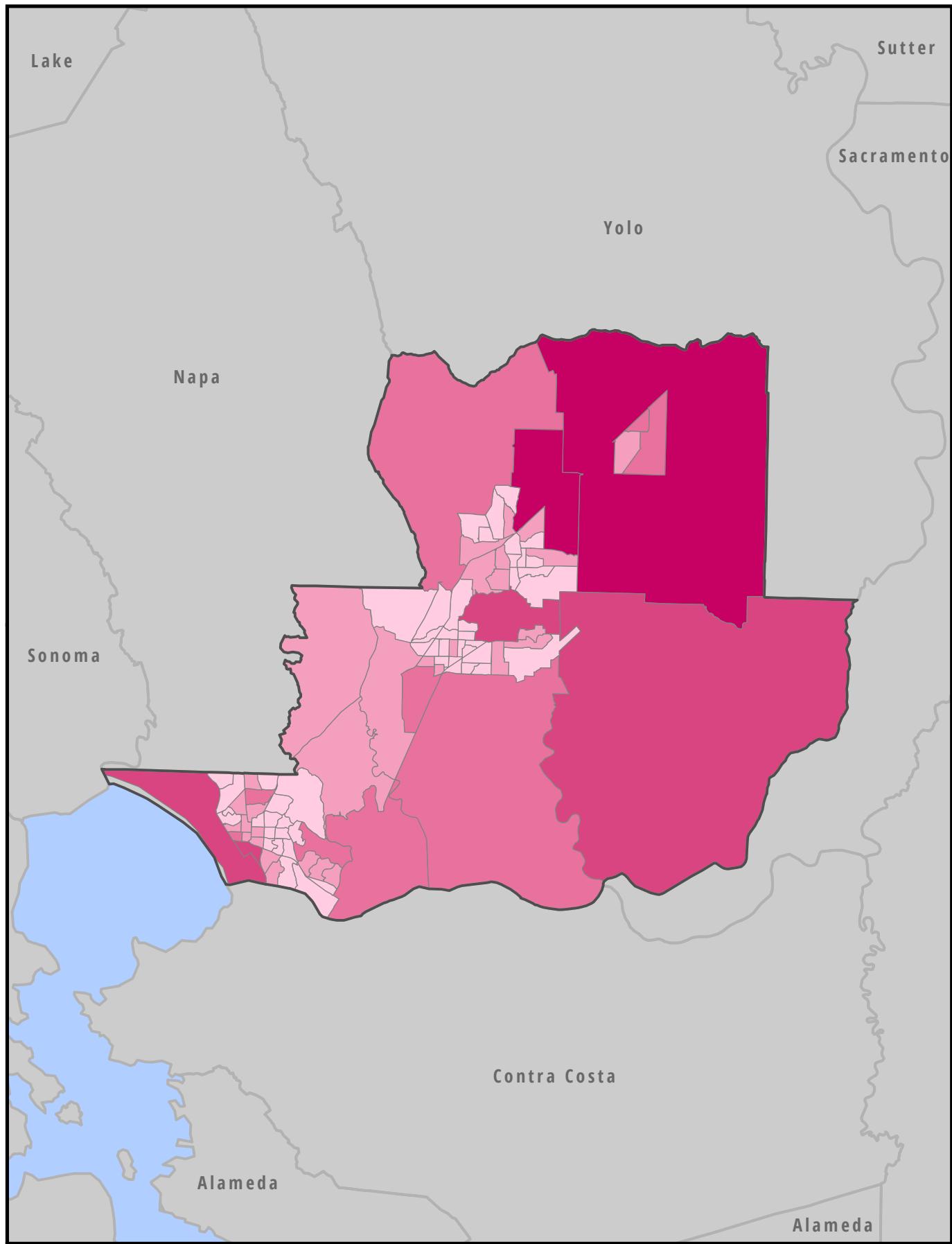
Pollution Percentile by Census Tract
Map 47 of 58



Tract Pollution Percentile: 0th - 20th 21st - 40th 41st - 60th 61st - 80th 81st - 100th

Solano County

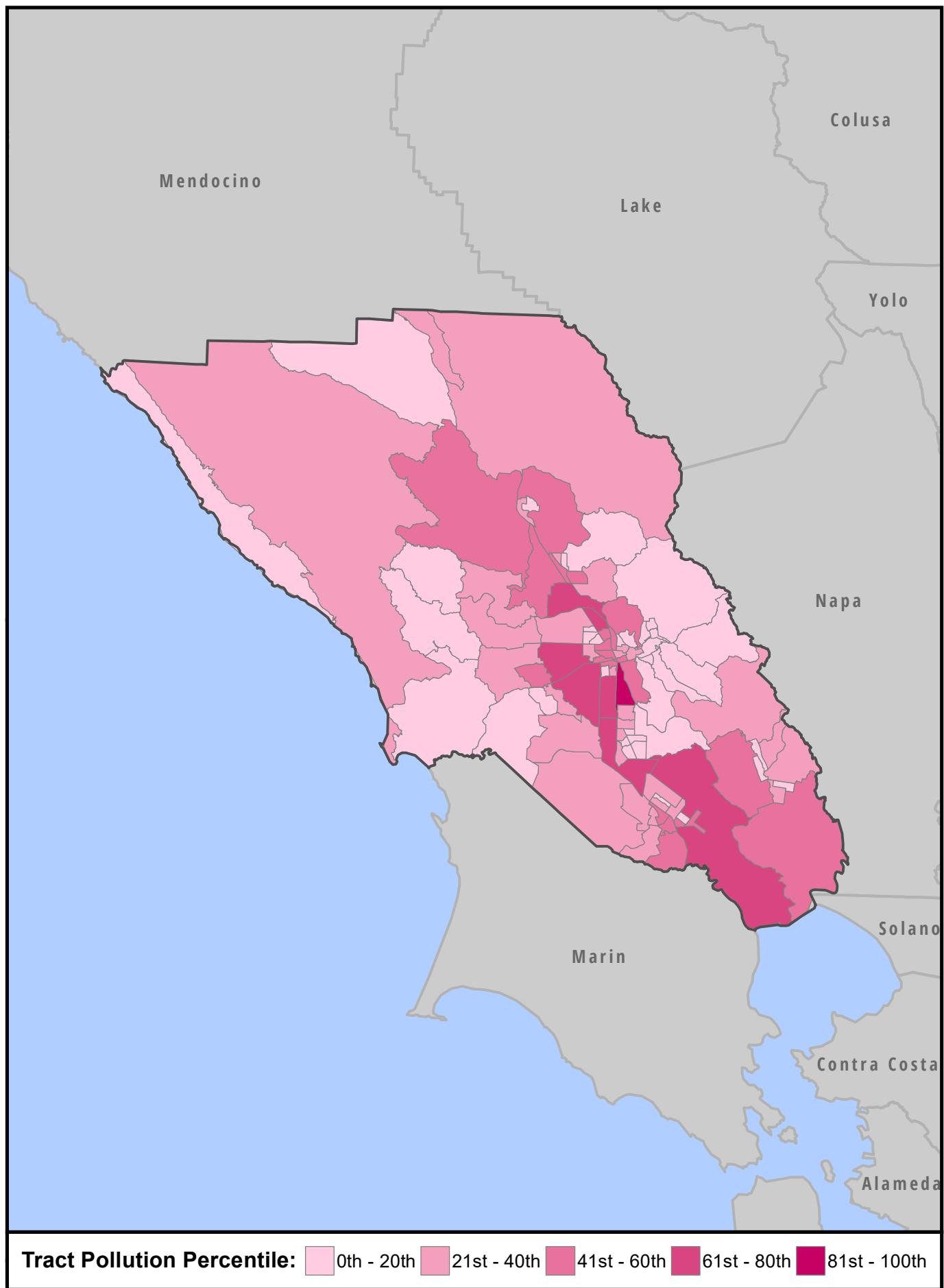
Pollution Percentile by Census Tract
Map 48 of 58



Tract Pollution Percentile: 0th - 20th 21st - 40th 41st - 60th 61st - 80th 81st - 100th

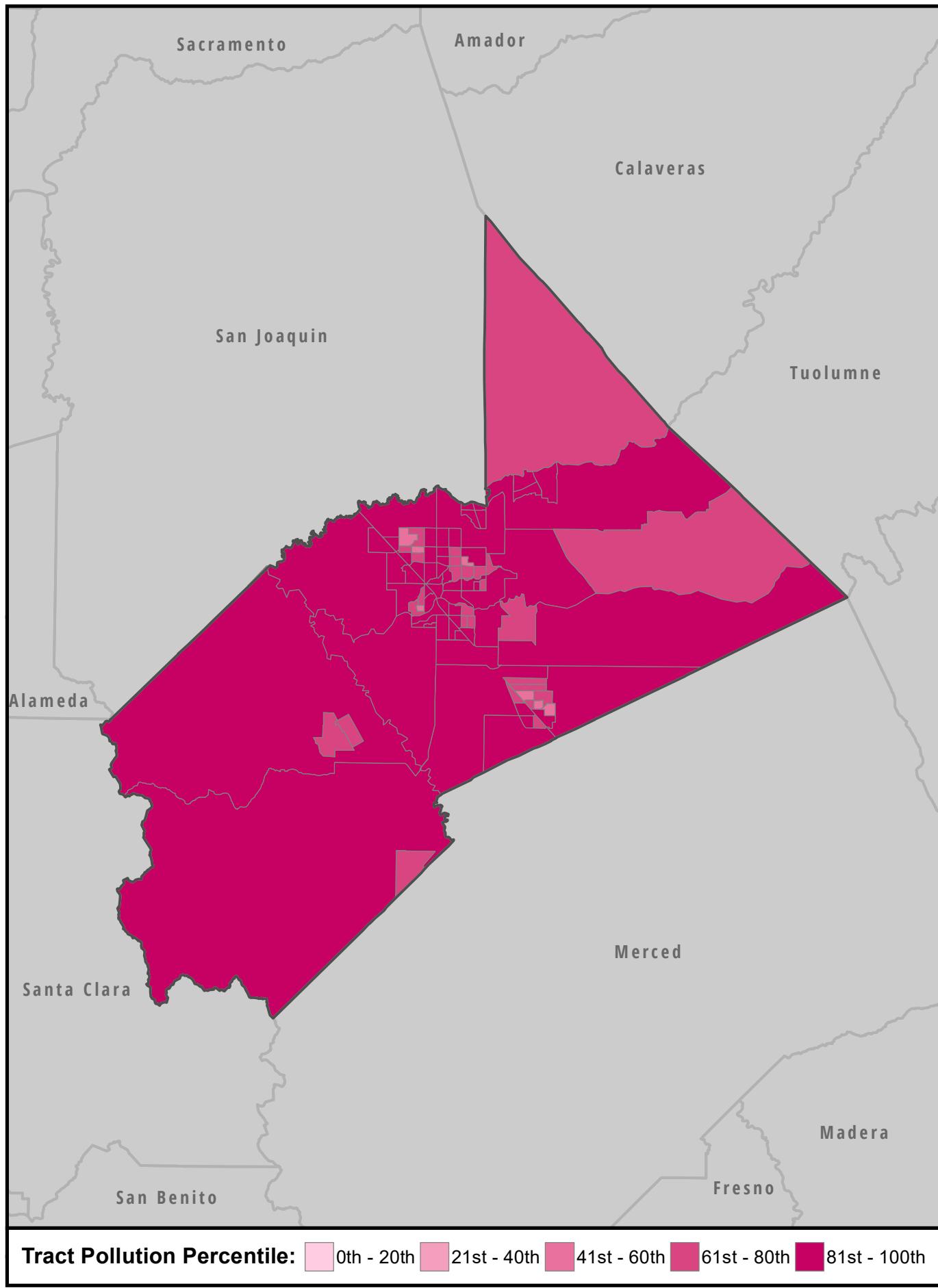
Sonoma County

Pollution Percentile by Census Tract
Map 49 of 58



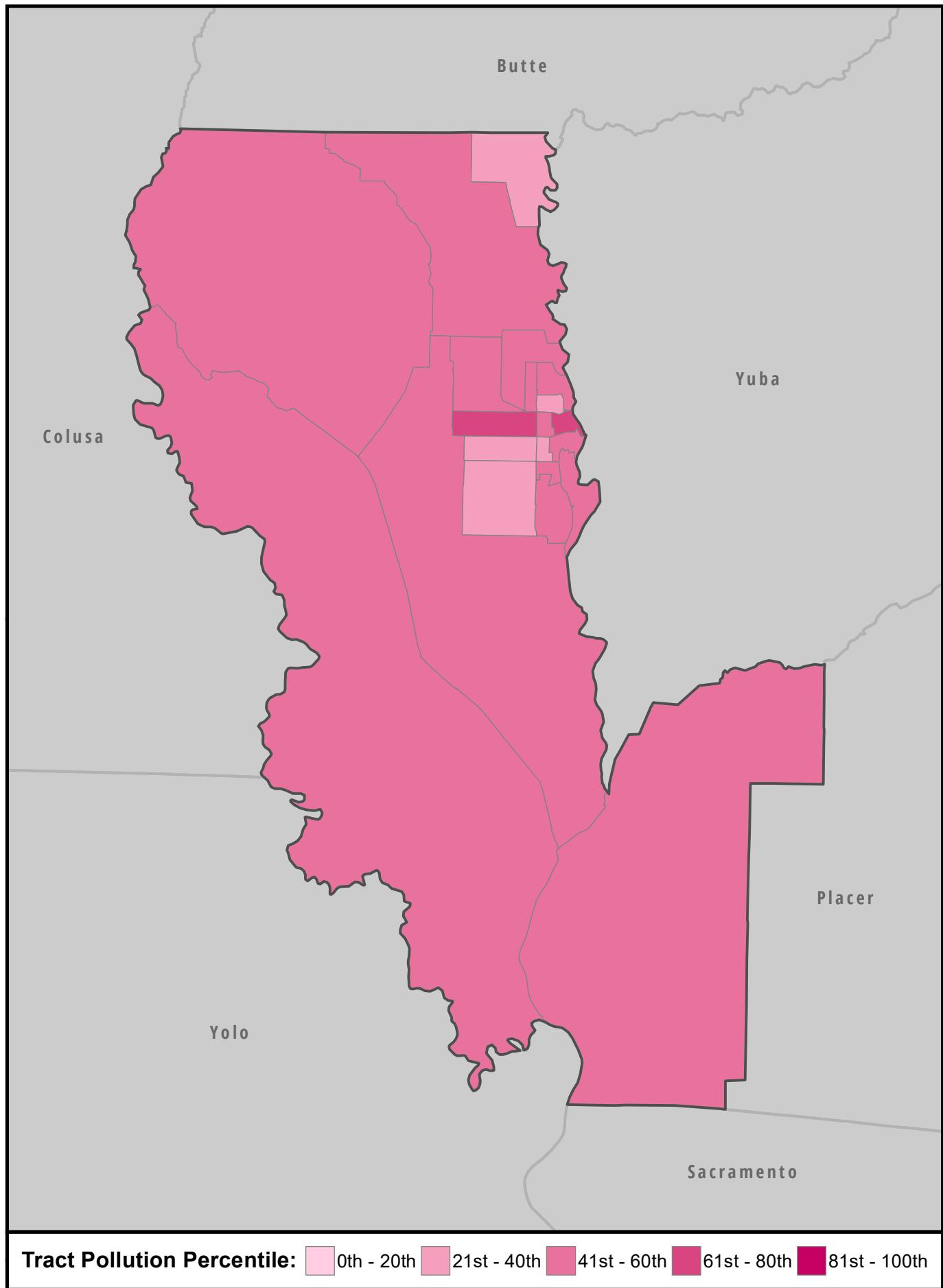
Stanislaus County

Pollution Percentile by Census Tract
Map 50 of 58



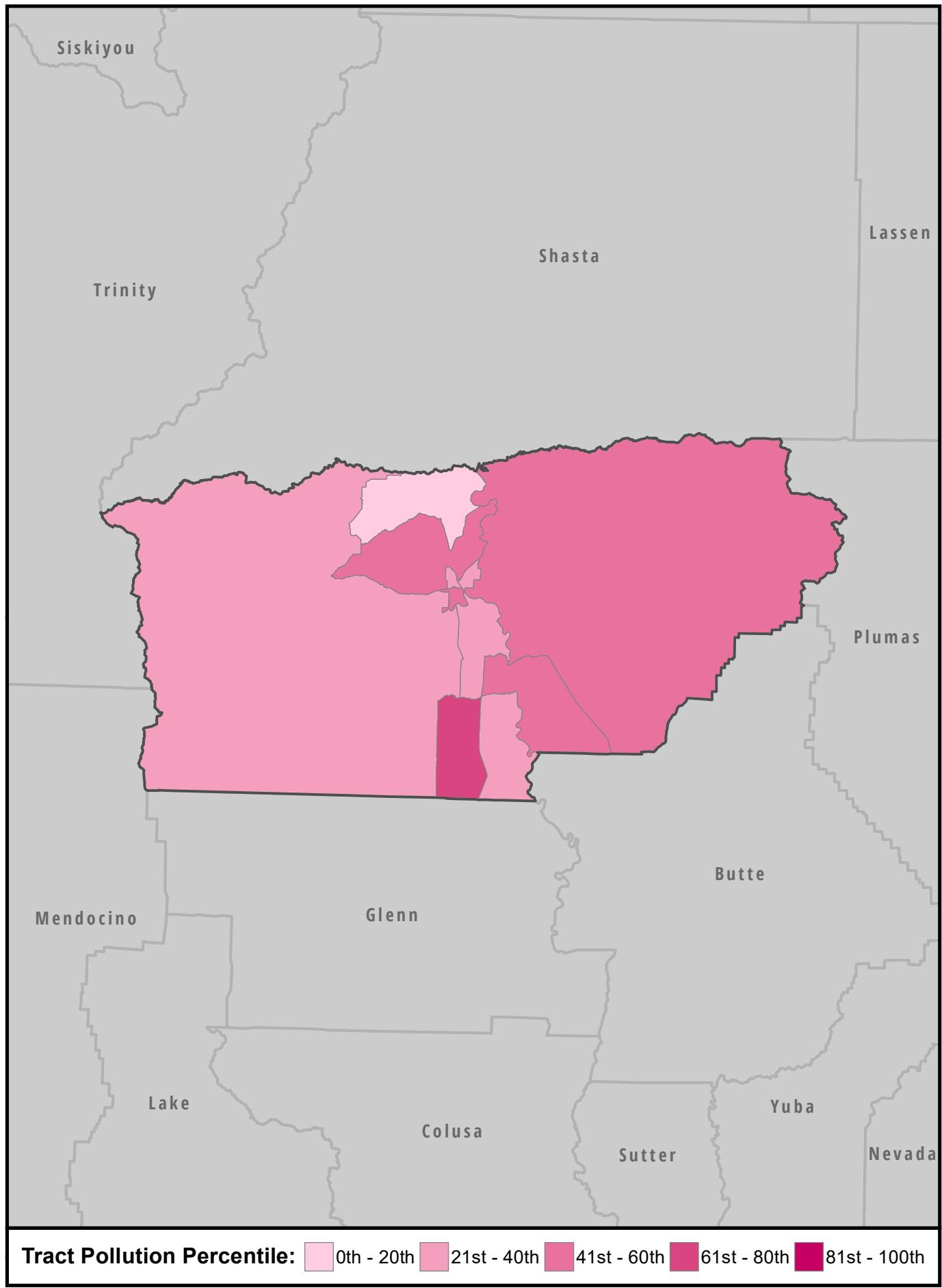
Sutter County

Pollution Percentile by Census Tract
Map 51 of 58



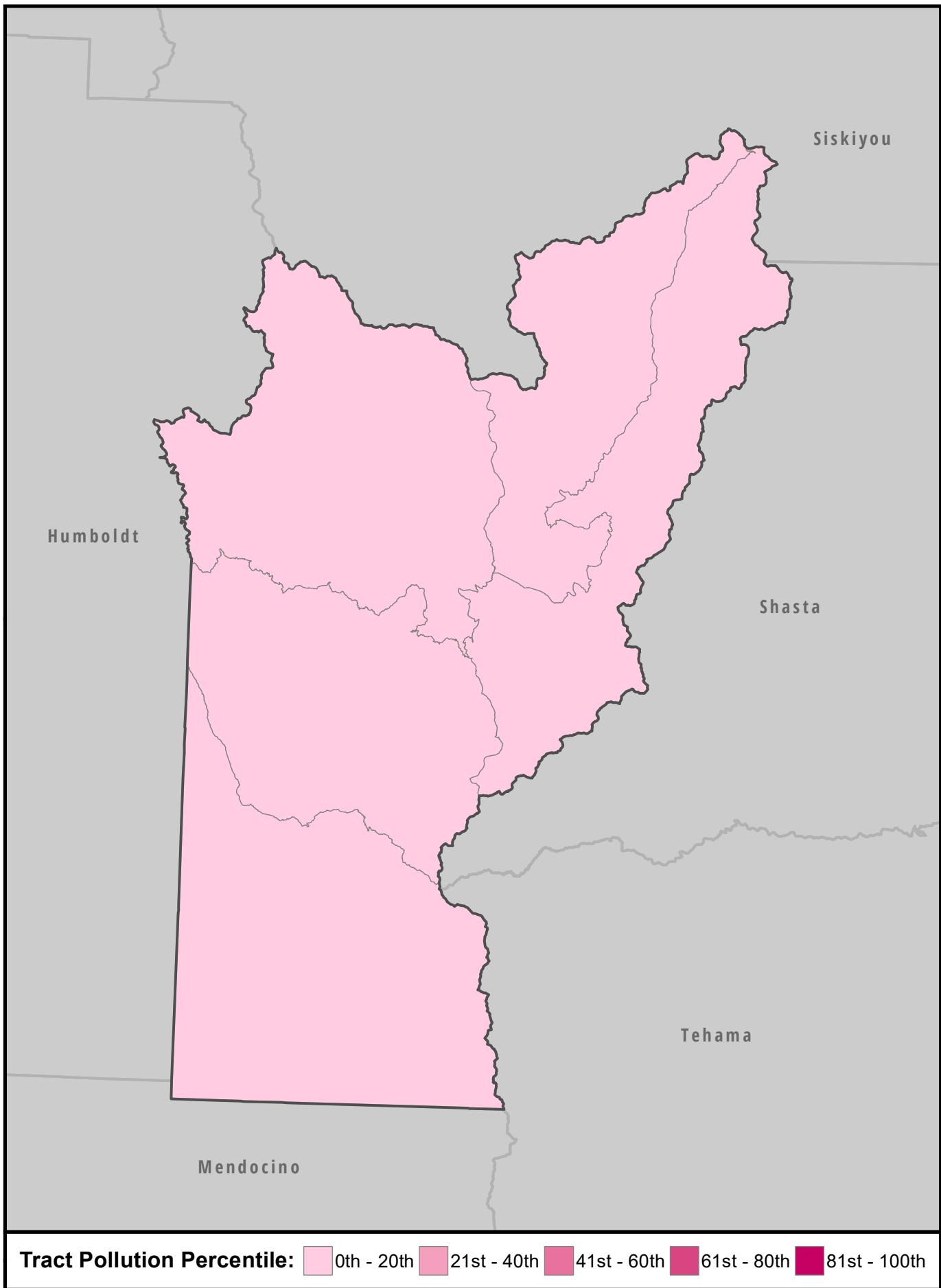
Tehama County

Pollution Percentile by Census Tract
Map 52 of 58



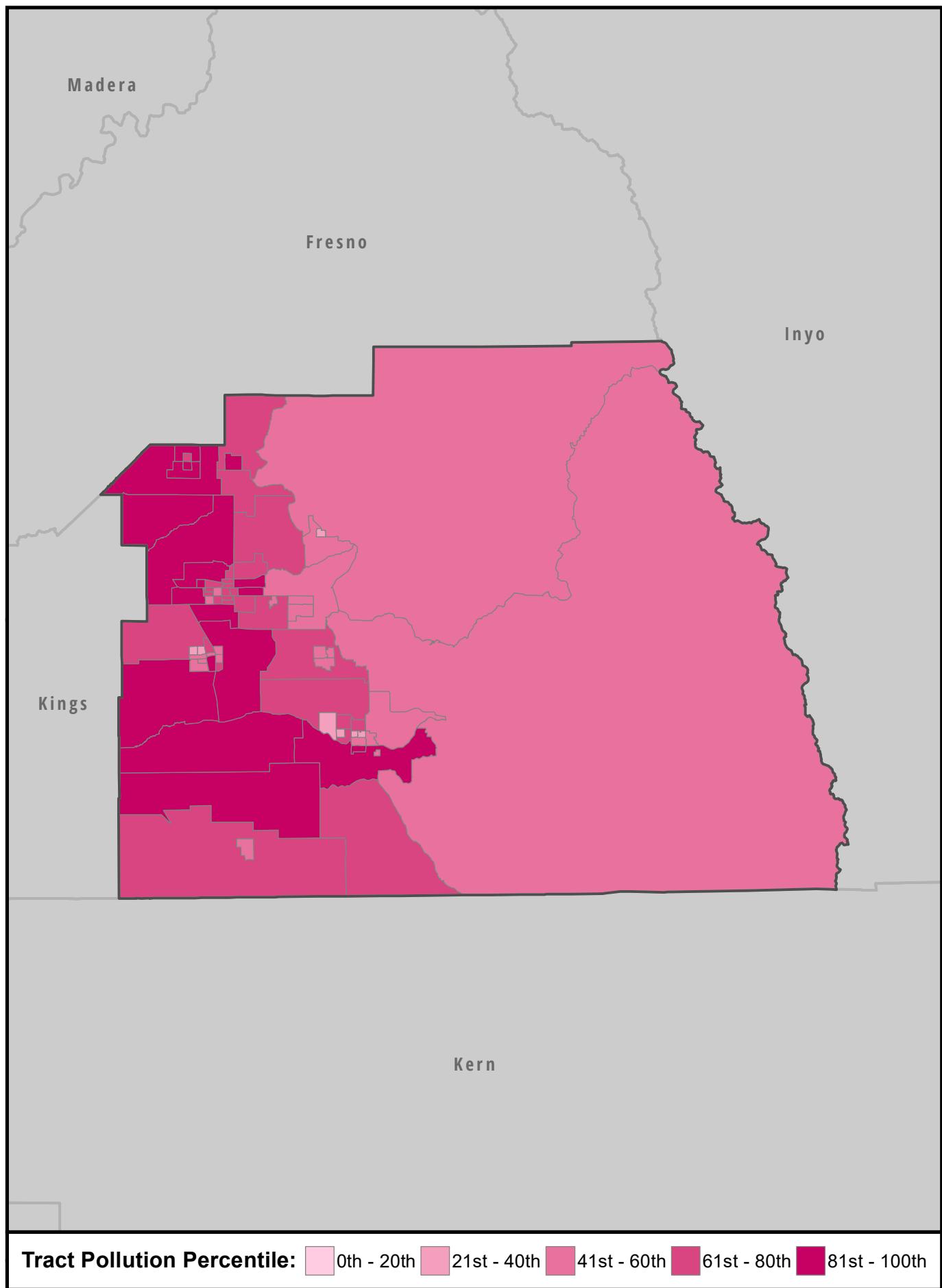
Trinity County

Pollution Percentile by Census Tract
Map 53 of 58



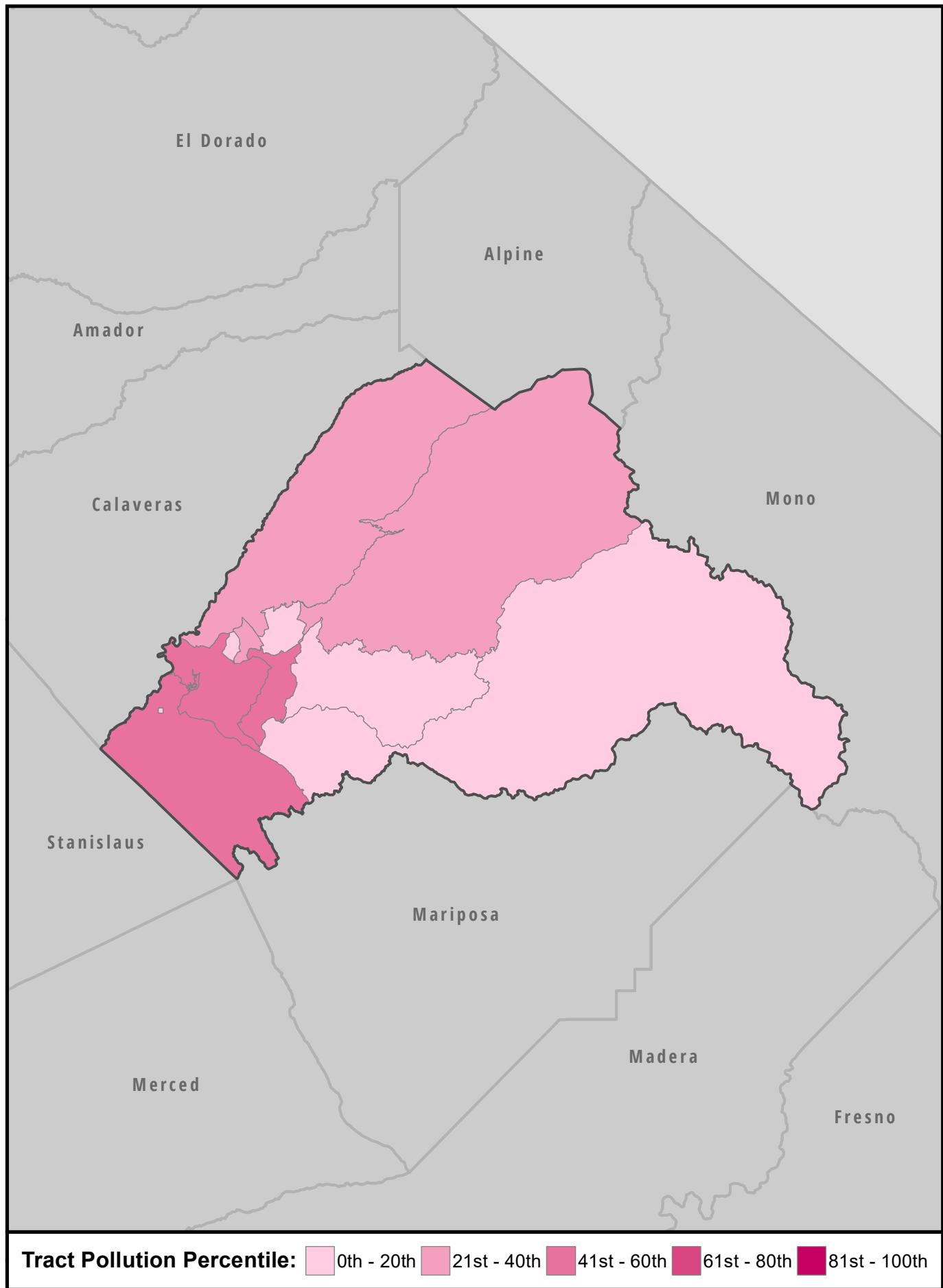
Tulare County

Pollution Percentile by Census Tract
Map 54 of 58



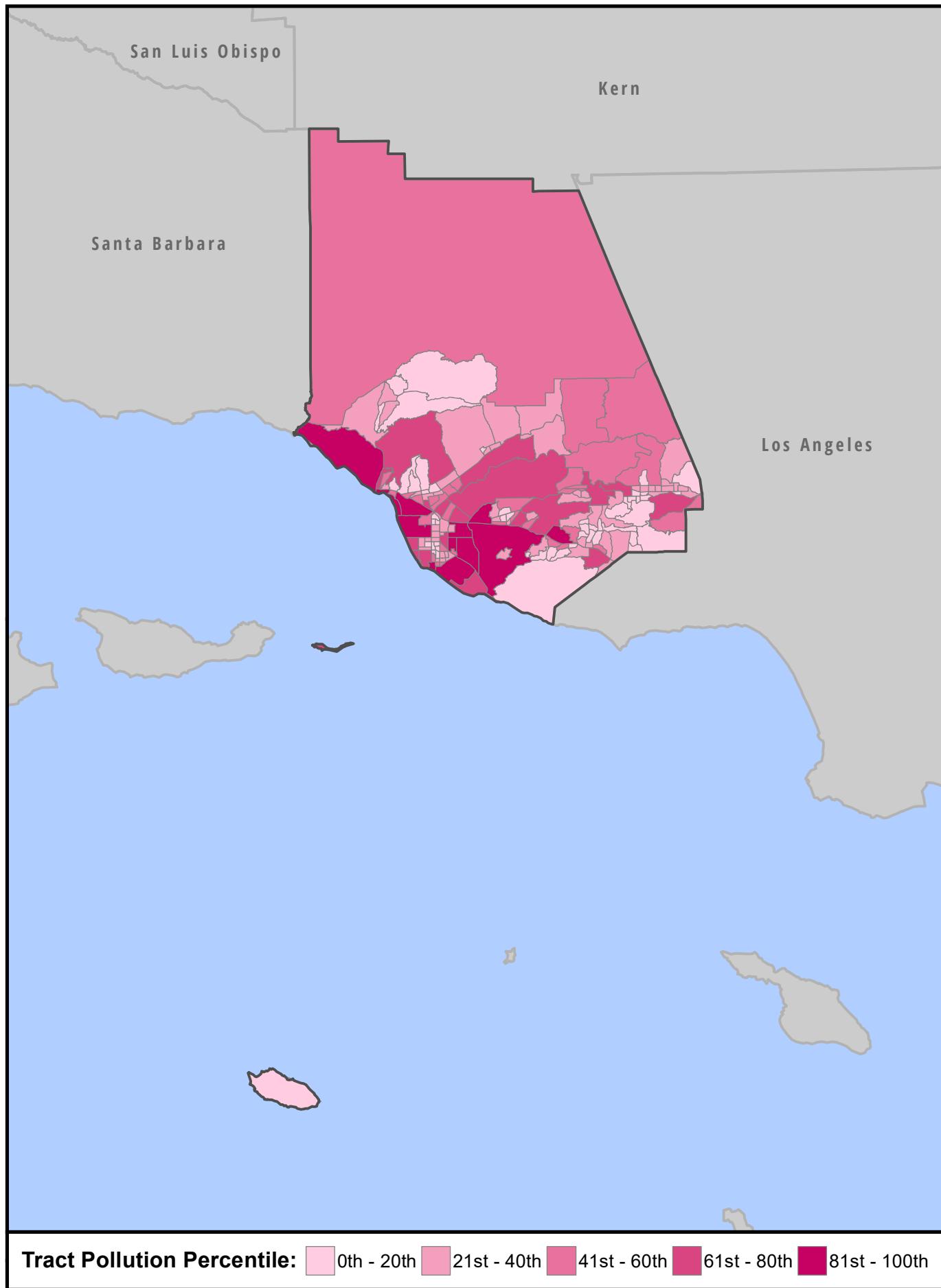
Tuolumne County

Pollution Percentile by Census Tract
Map 55 of 58



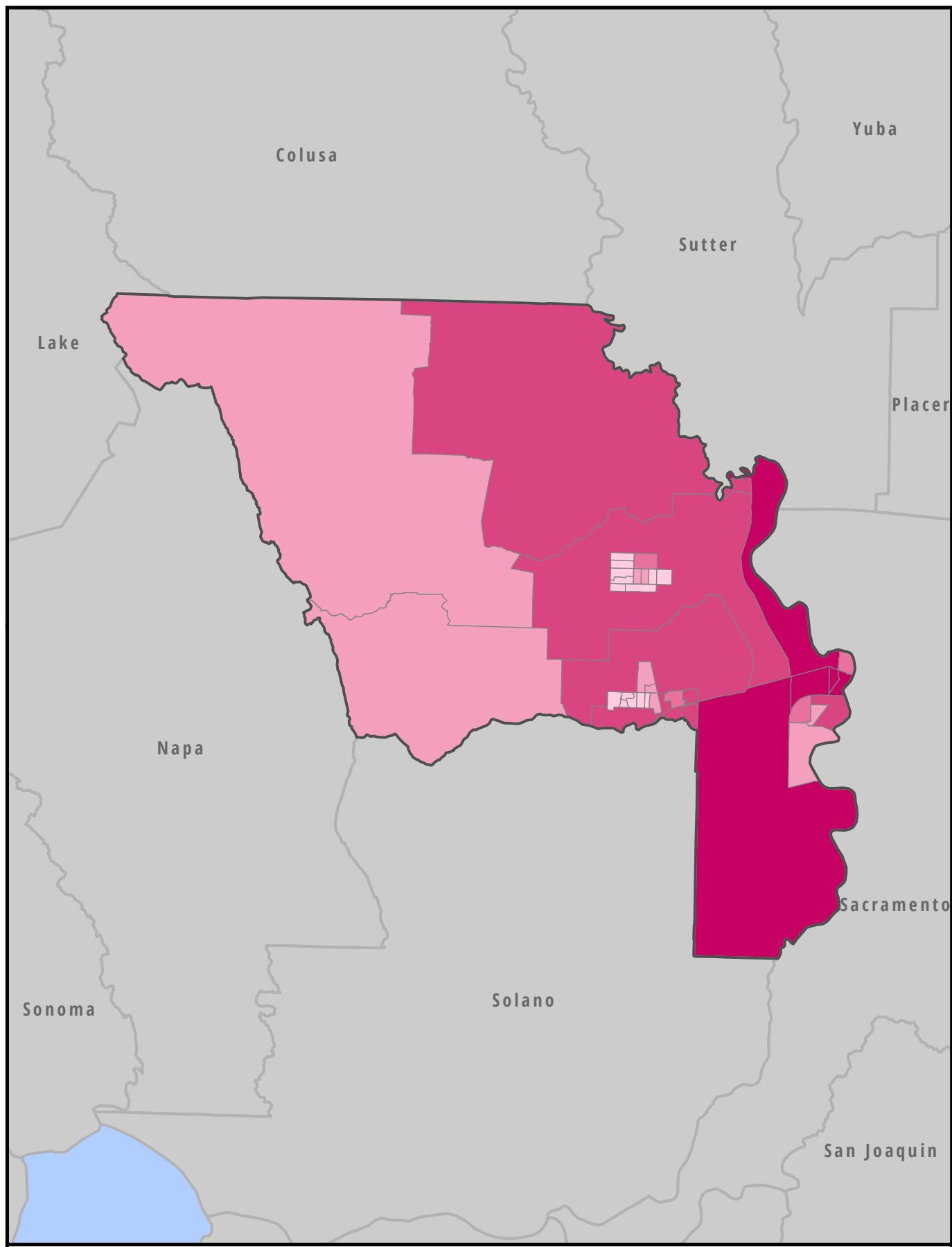
Ventura County

Pollution Percentile by Census Tract
Map 56 of 58



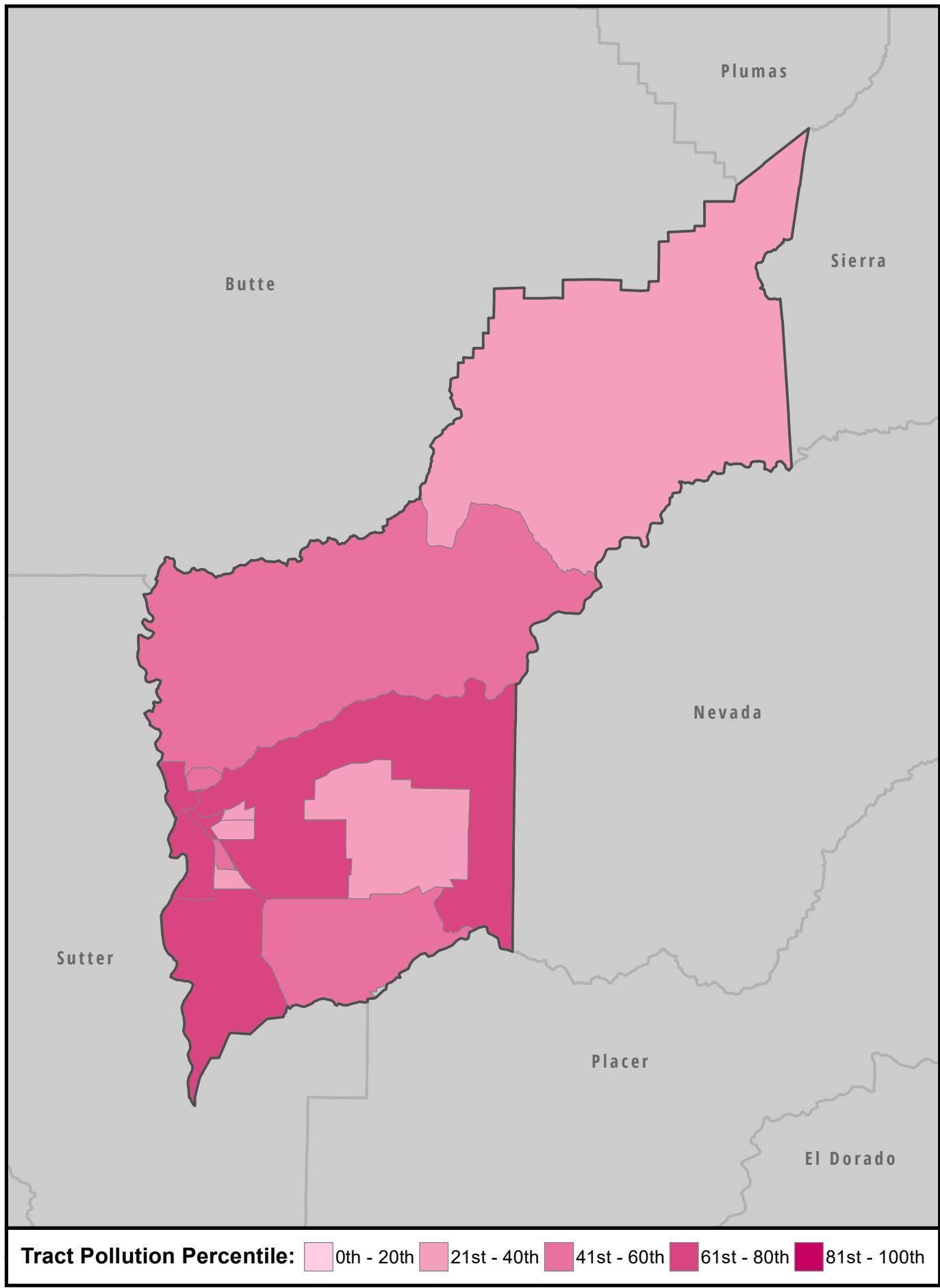
Yolo County

Pollution Percentile by Census Tract
Map 57 of 58



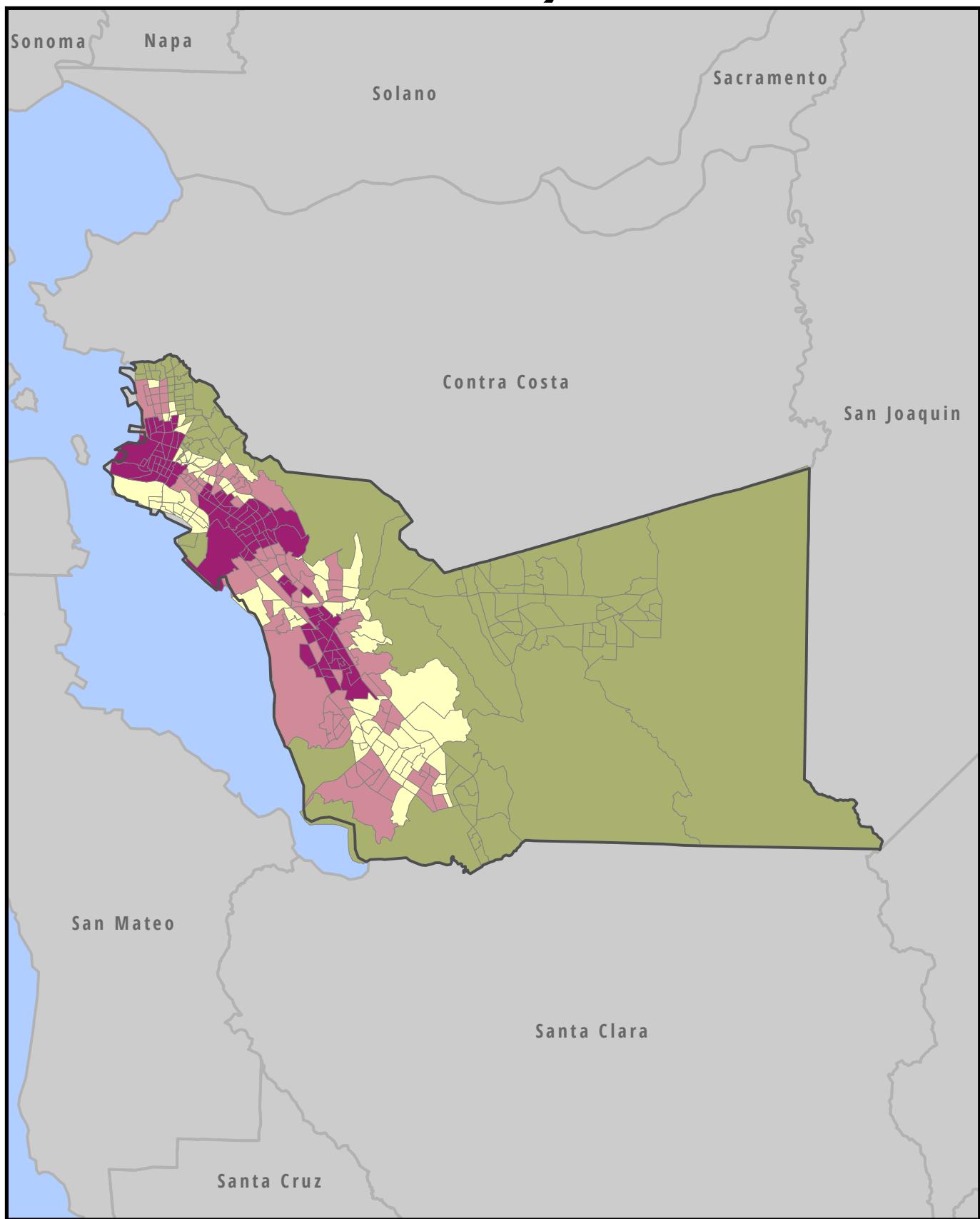
Yuba County

Pollution Percentile by Census Tract
Map 58 of 58



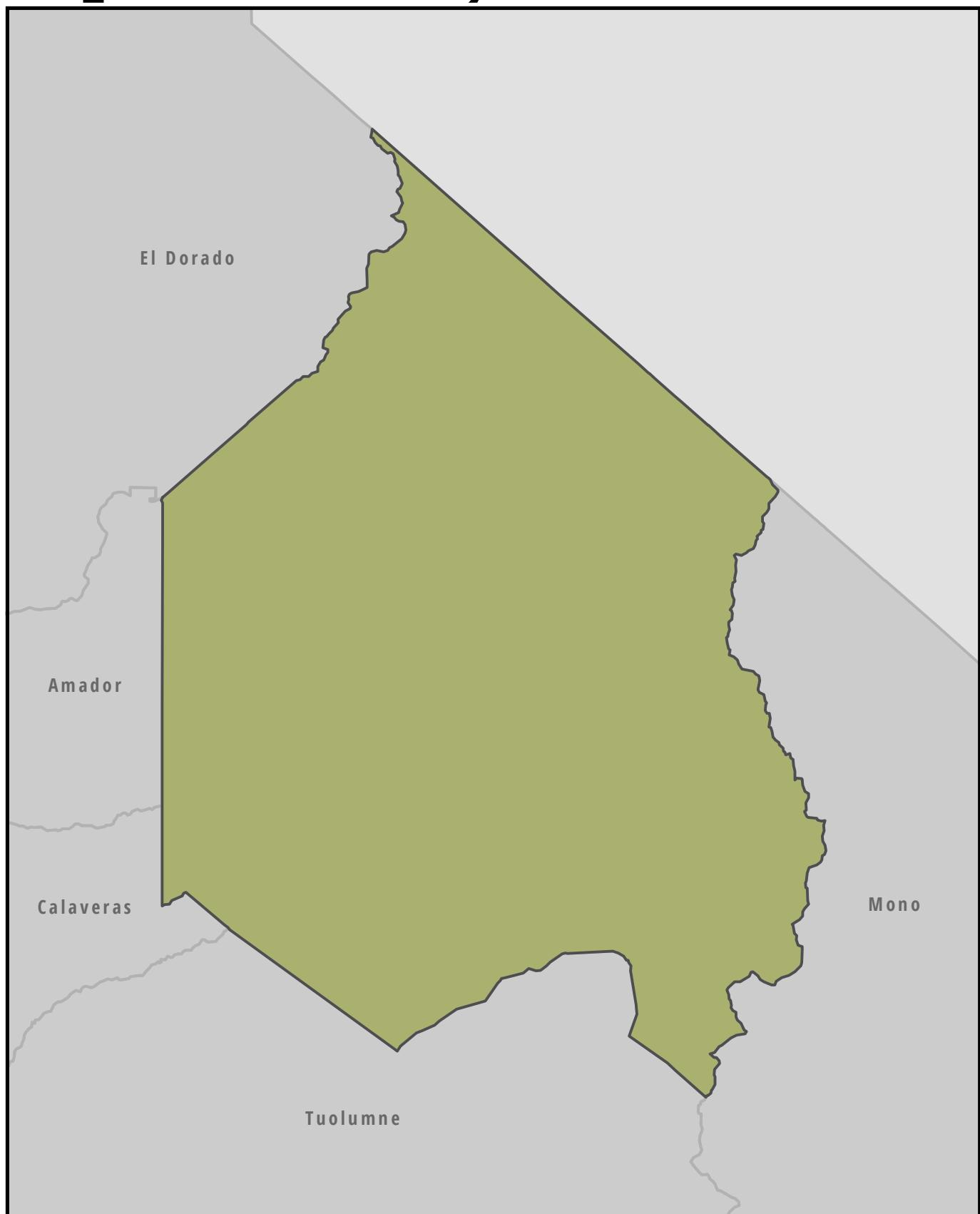
Mapping Rate of Emergency Department Visits for Asthma per 10,000 People, at the County Level

Alameda County



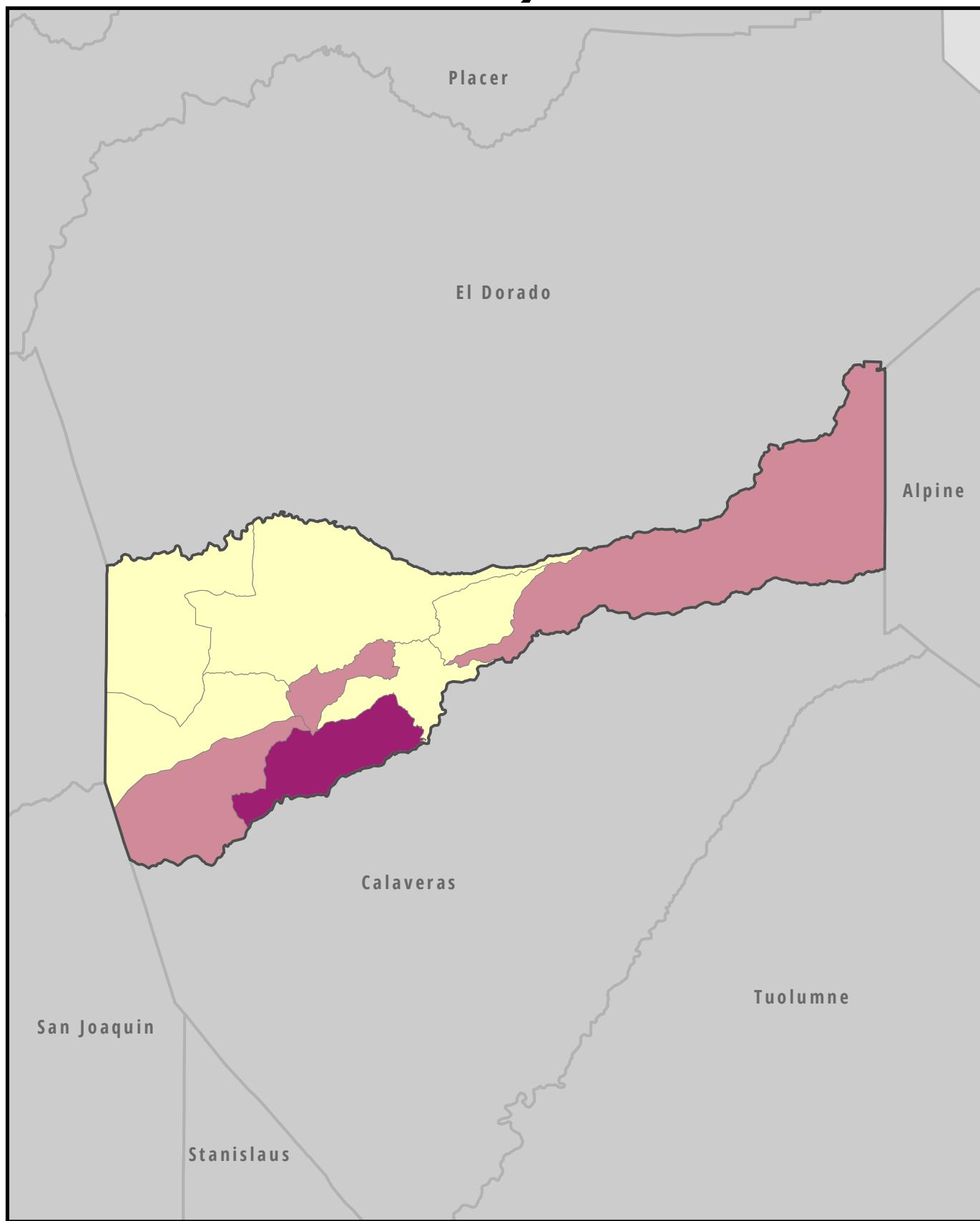
Tract ED Visits per 10,000	7 - 36 (-1.5 - -0.5 Std. Dev.)	68 - 98 (0.5 - 1.5 Std. Dev.)
0 - 6 (< -1.5 Std. Dev.)	37 - 67 (-0.5 - 0.5 Std. Dev.)	99 - 279 (> 1.5 Std. Dev.)

Alpine County



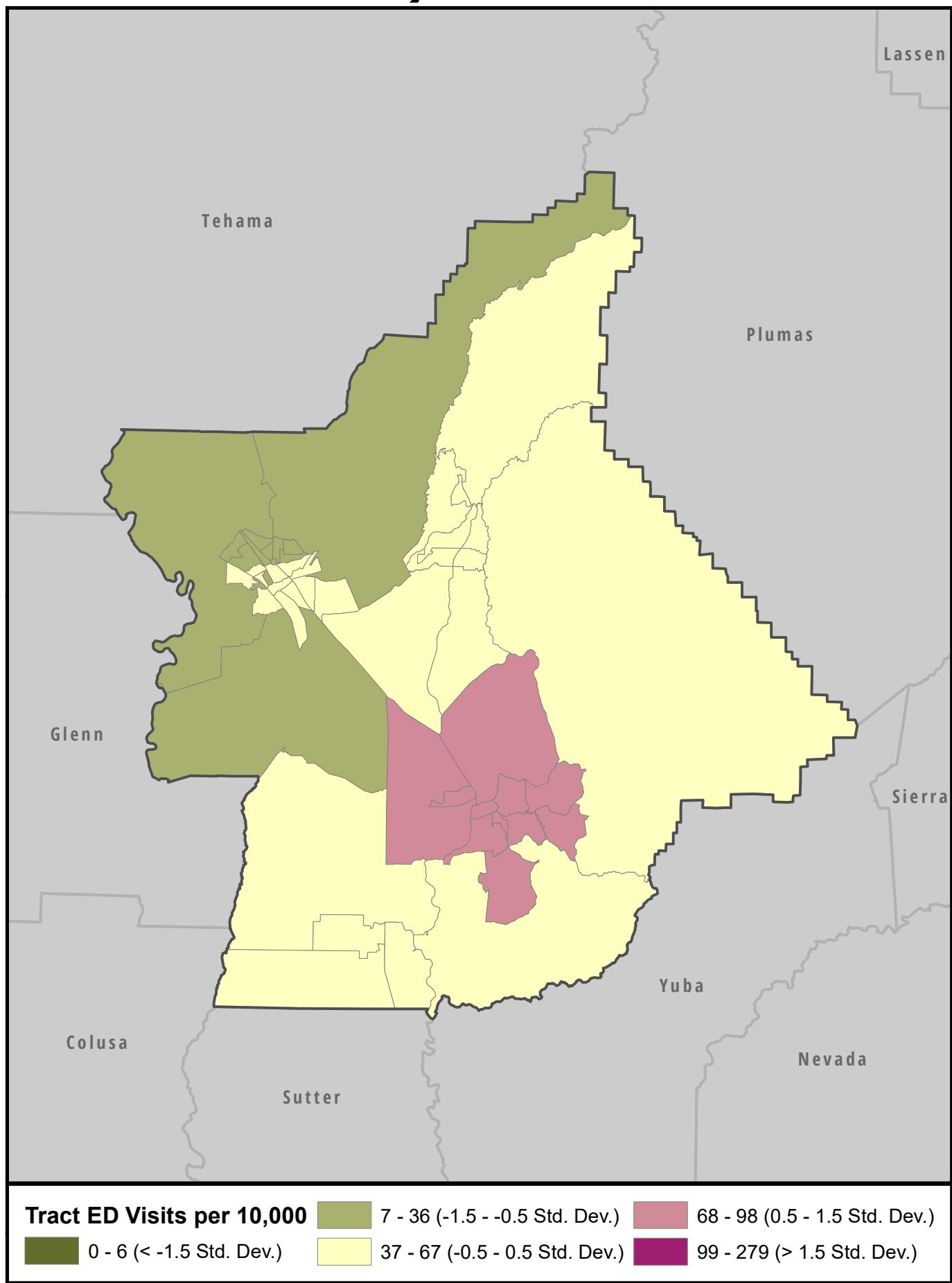
Tract ED Visits per 10,000	7 - 36 (-1.5 - -0.5 Std. Dev.)	68 - 98 (0.5 - 1.5 Std. Dev.)
0 - 6 (< -1.5 Std. Dev.)	37 - 67 (-0.5 - 0.5 Std. Dev.)	99 - 279 (> 1.5 Std. Dev.)

Amador County

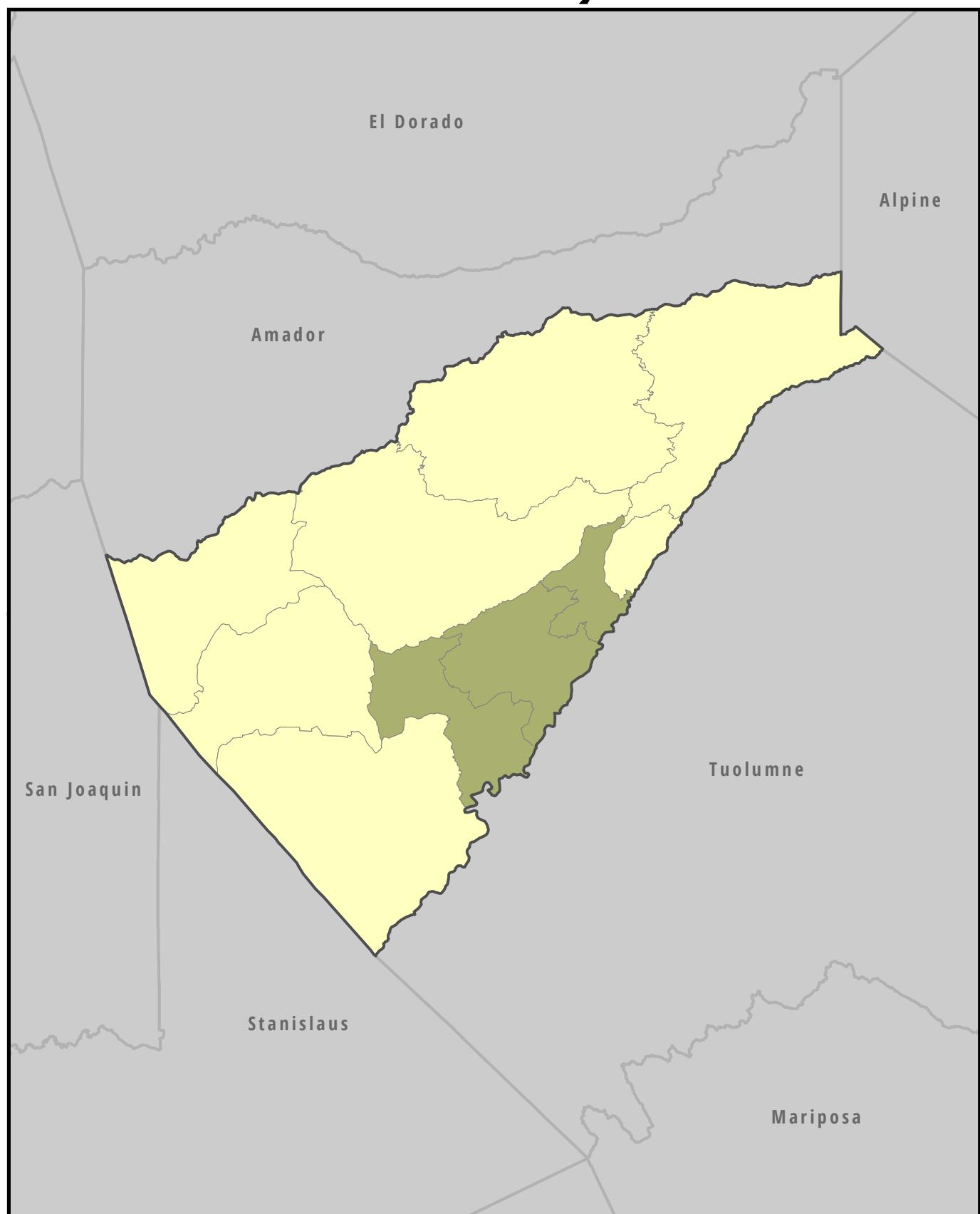


Tract ED Visits per 10,000	7 - 36 (-1.5 - -0.5 Std. Dev.)	68 - 98 (0.5 - 1.5 Std. Dev.)
0 - 6 (< -1.5 Std. Dev.)	37 - 67 (-0.5 - 0.5 Std. Dev.)	99 - 279 (> 1.5 Std. Dev.)

Butte County

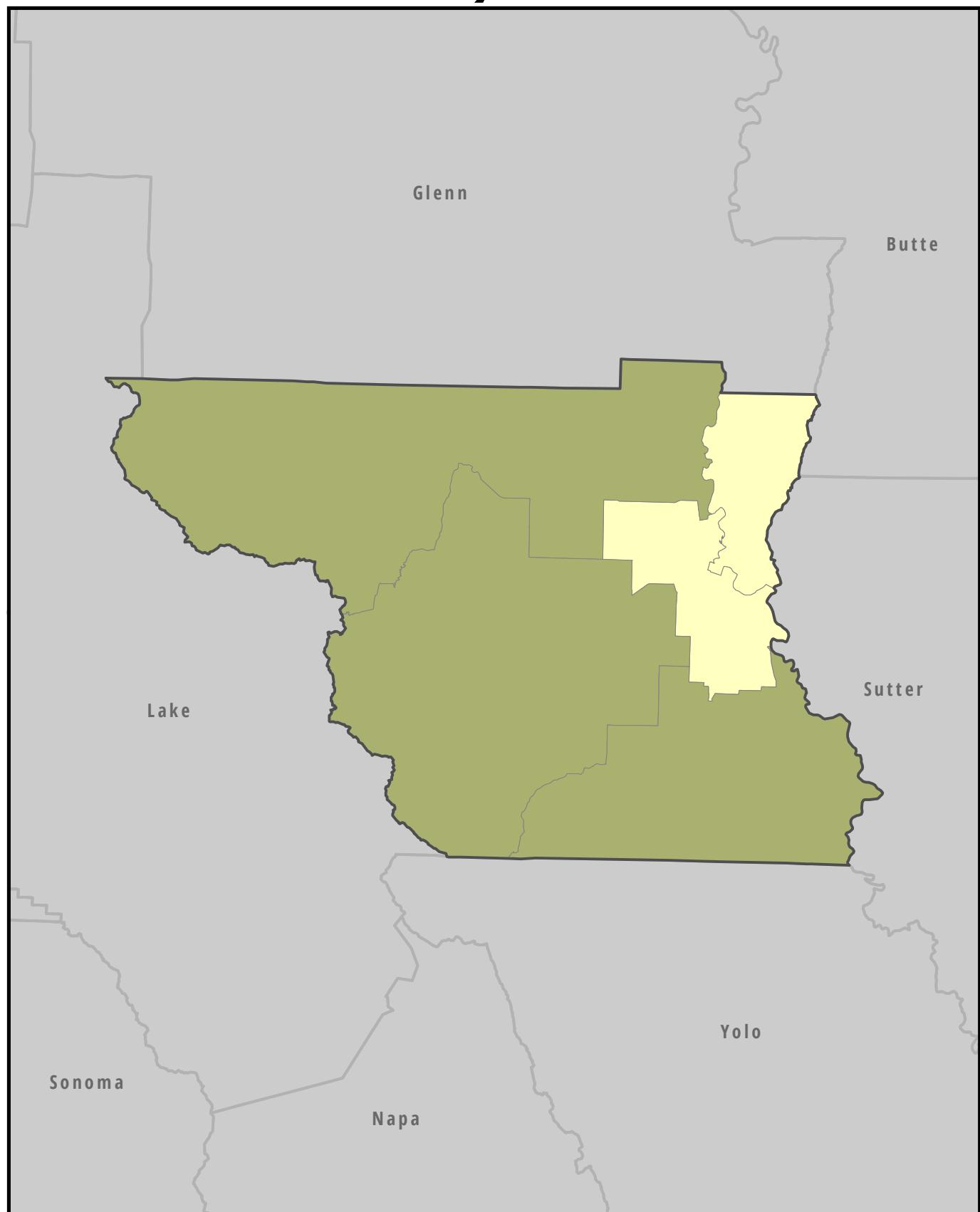


Calaveras County



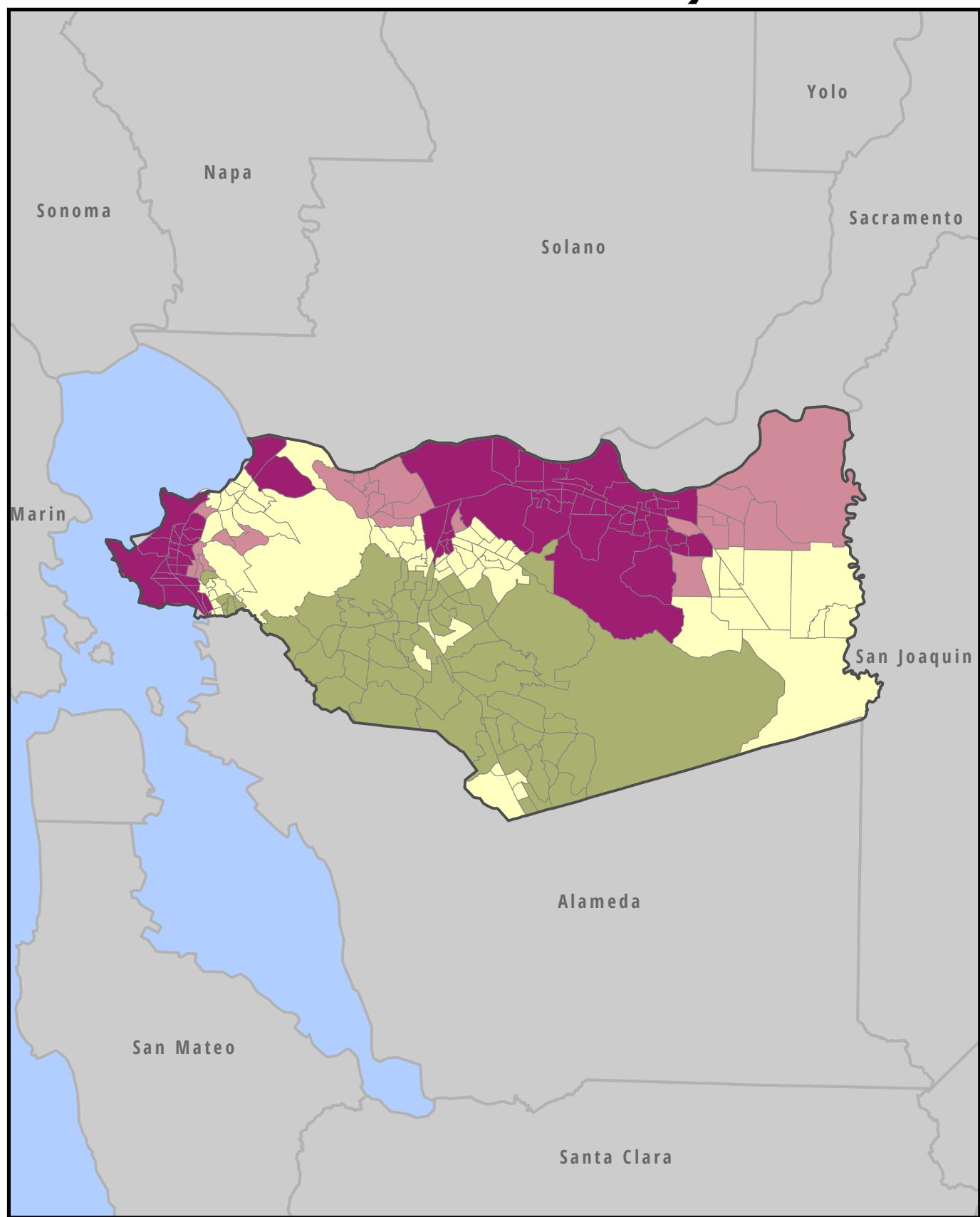
Tract ED Visits per 10,000	7 - 36 (-1.5 - -0.5 Std. Dev.)	68 - 98 (0.5 - 1.5 Std. Dev.)
0 - 6 (< -1.5 Std. Dev.)	37 - 67 (-0.5 - 0.5 Std. Dev.)	99 - 279 (> 1.5 Std. Dev.)

Colusa County



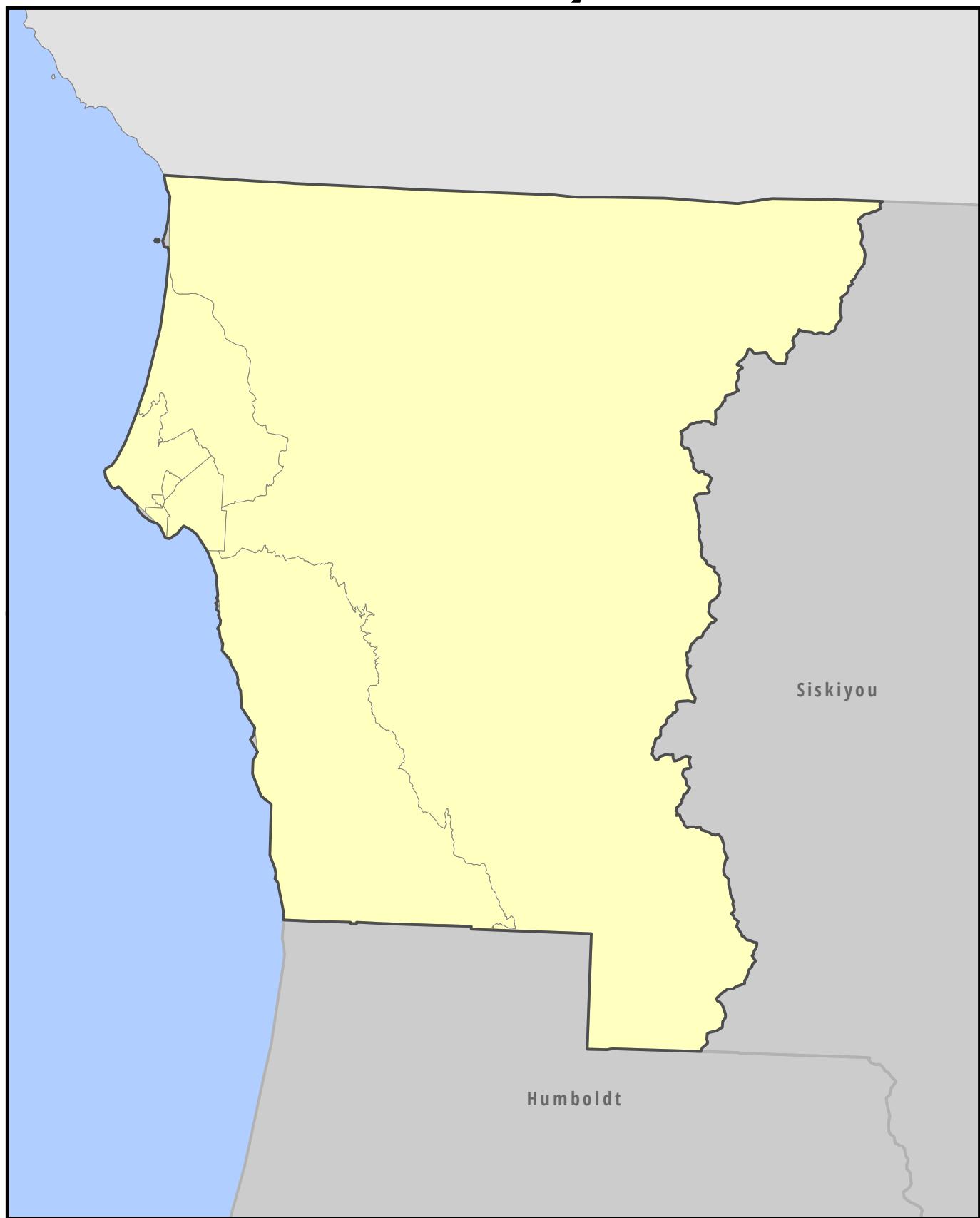
Tract ED Visits per 10,000	7 - 36 (-1.5 - -0.5 Std. Dev.)	68 - 98 (0.5 - 1.5 Std. Dev.)
0 - 6 (< -1.5 Std. Dev.)	37 - 67 (-0.5 - 0.5 Std. Dev.)	99 - 279 (> 1.5 Std. Dev.)

Contra Costa County



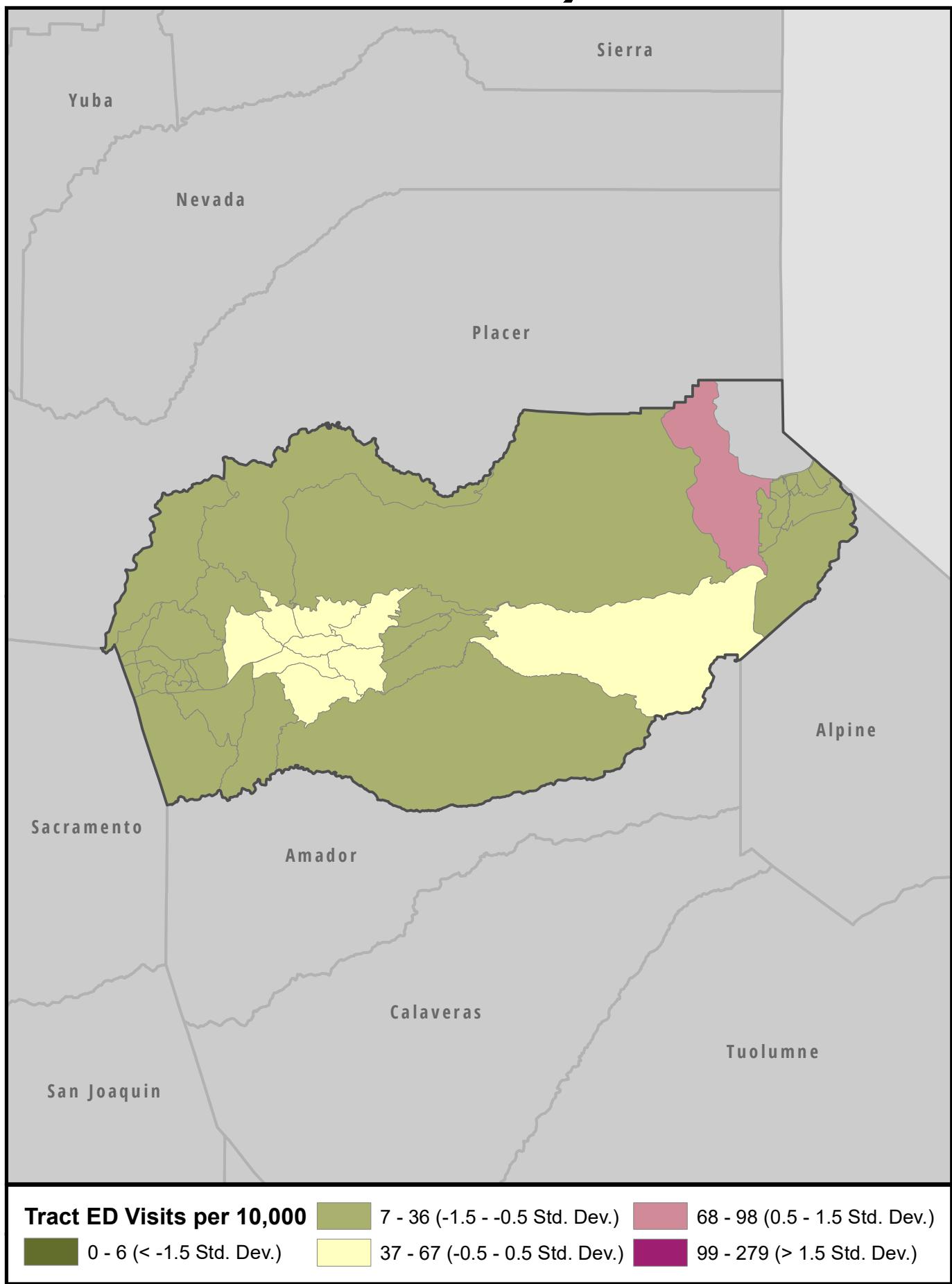
Tract ED Visits per 10,000	7 - 36 (-1.5 - -0.5 Std. Dev.)	68 - 98 (0.5 - 1.5 Std. Dev.)
0 - 6 (< -1.5 Std. Dev.)	37 - 67 (-0.5 - 0.5 Std. Dev.)	99 - 279 (> 1.5 Std. Dev.)

Del Norte County

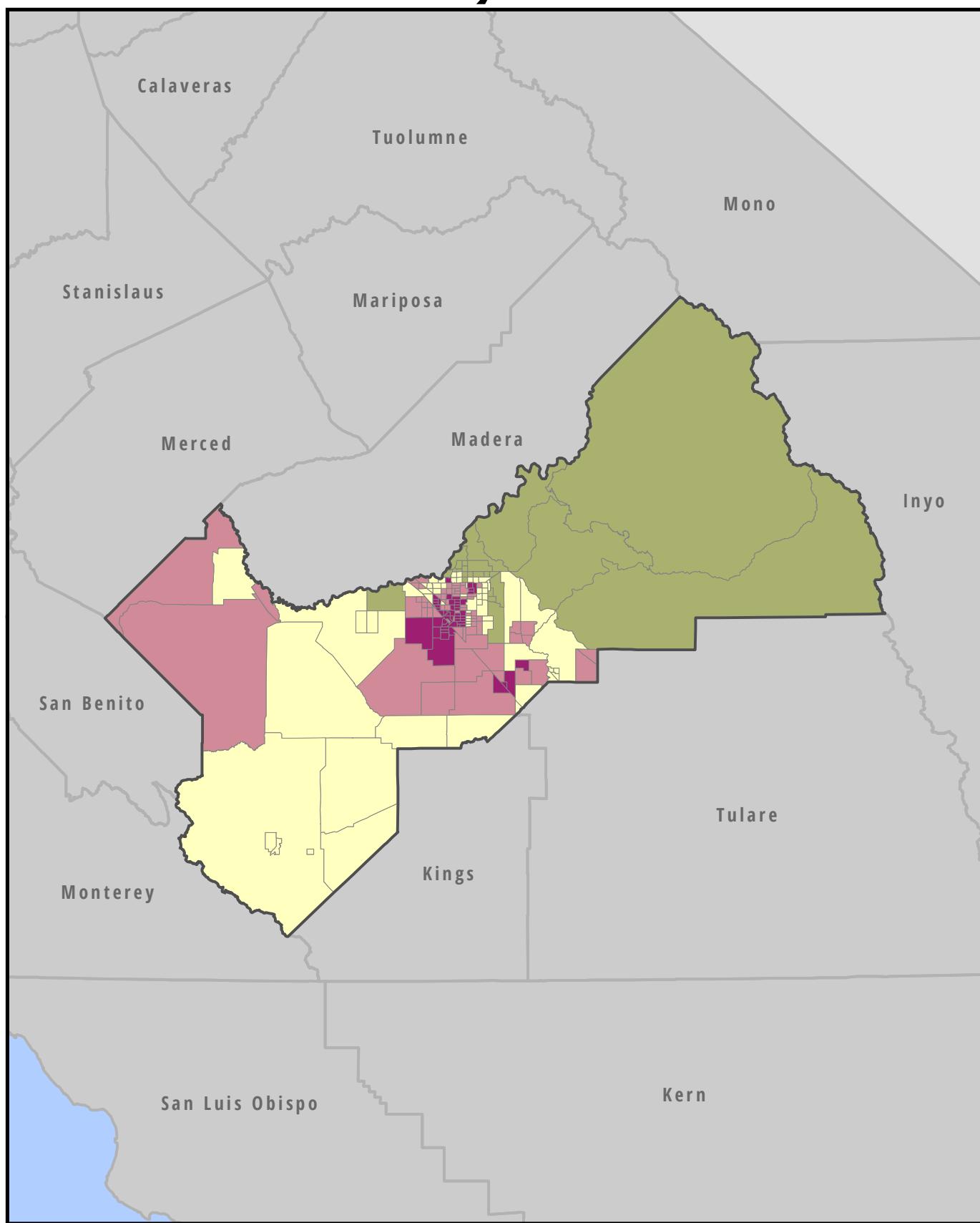


Tract ED Visits per 10,000	7 - 36 (-1.5 - -0.5 Std. Dev.)	68 - 98 (0.5 - 1.5 Std. Dev.)
0 - 6 (< -1.5 Std. Dev.)	37 - 67 (-0.5 - 0.5 Std. Dev.)	99 - 279 (> 1.5 Std. Dev.)

El Dorado County



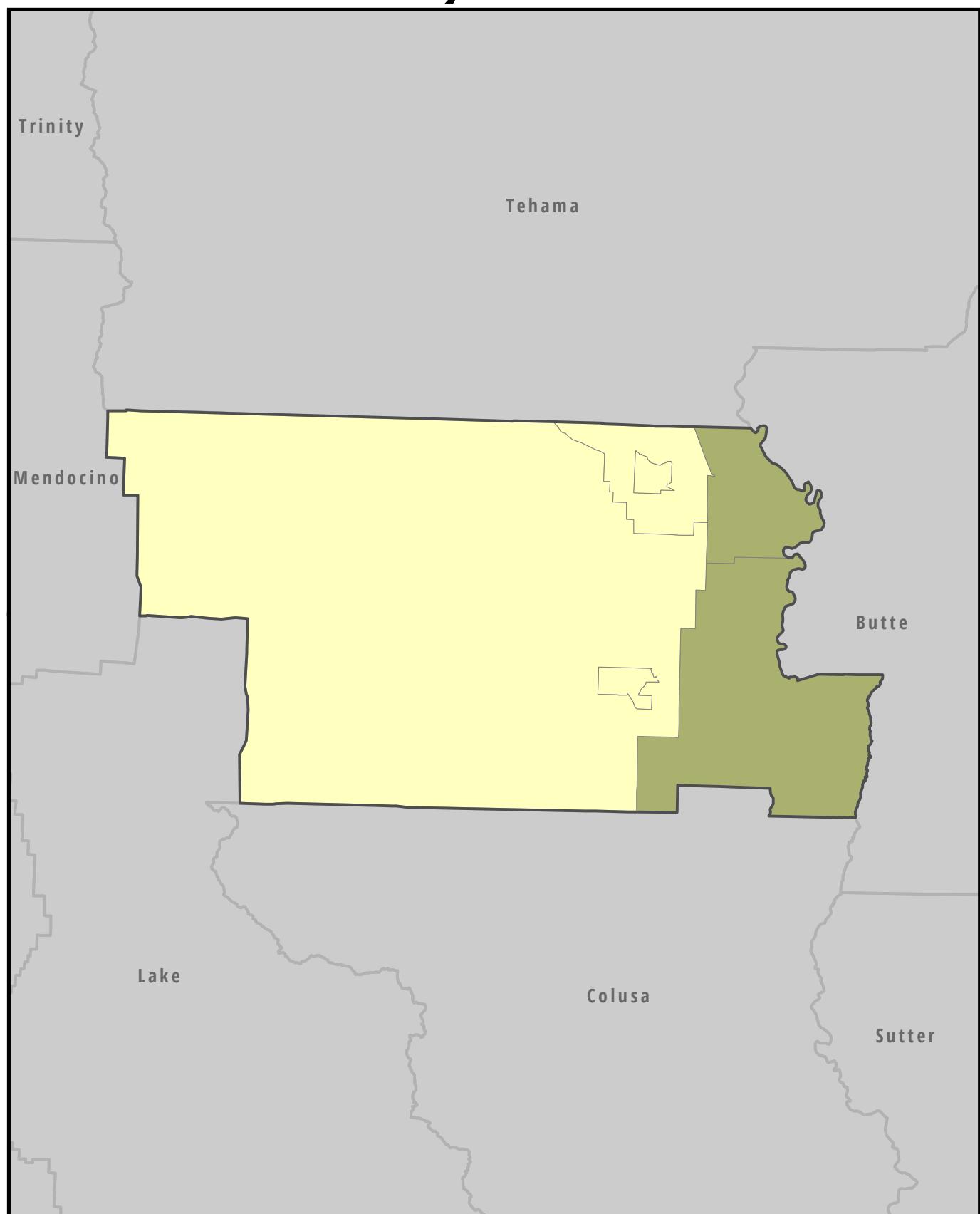
Fresno County



Tract ED Visits per 10,000

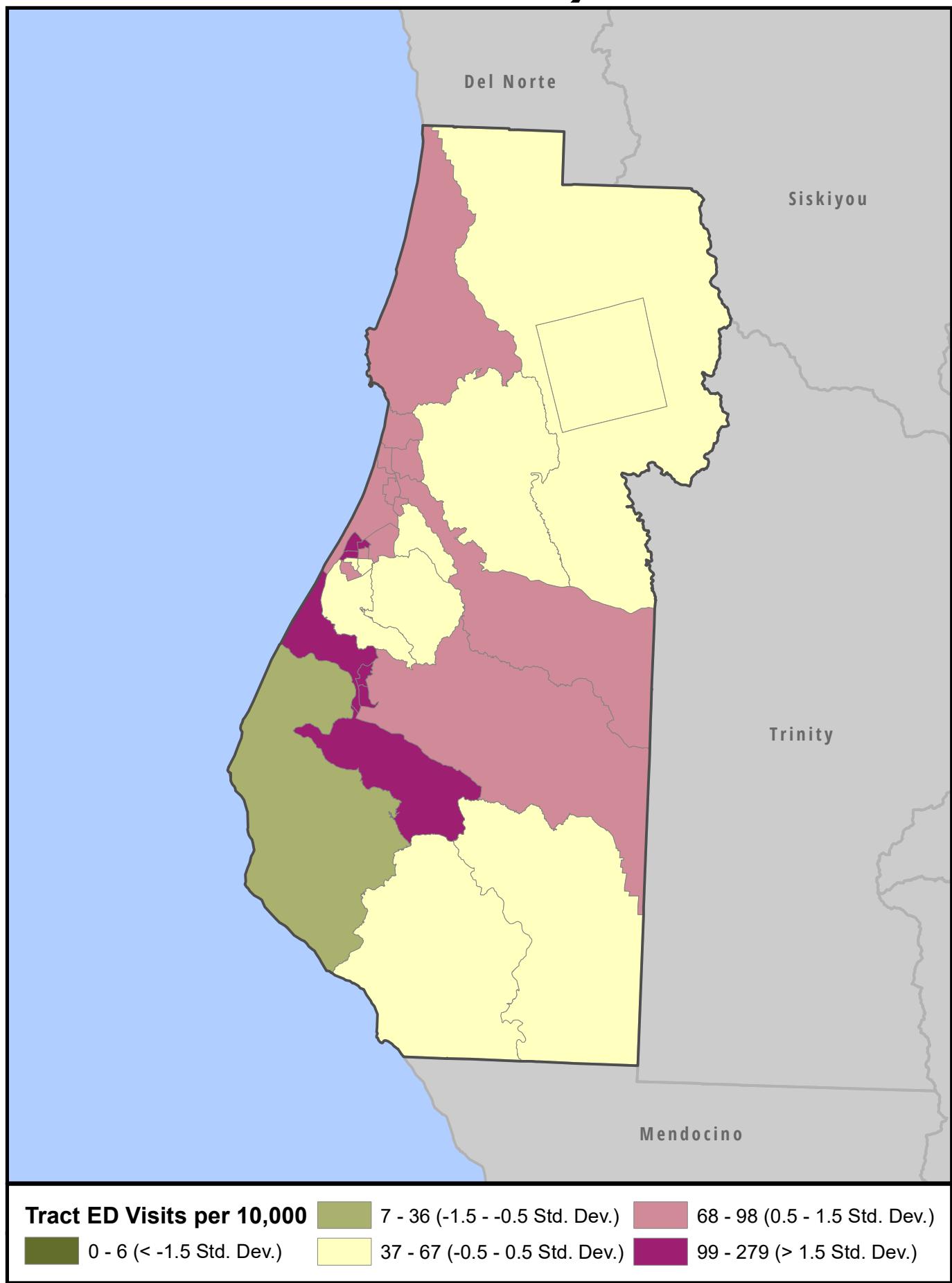
0 - 6 (< -1.5 Std. Dev.)	7 - 36 (-1.5 - -0.5 Std. Dev.)	37 - 67 (-0.5 - 0.5 Std. Dev.)	68 - 98 (0.5 - 1.5 Std. Dev.)	99 - 279 (> 1.5 Std. Dev.)
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Glenn County

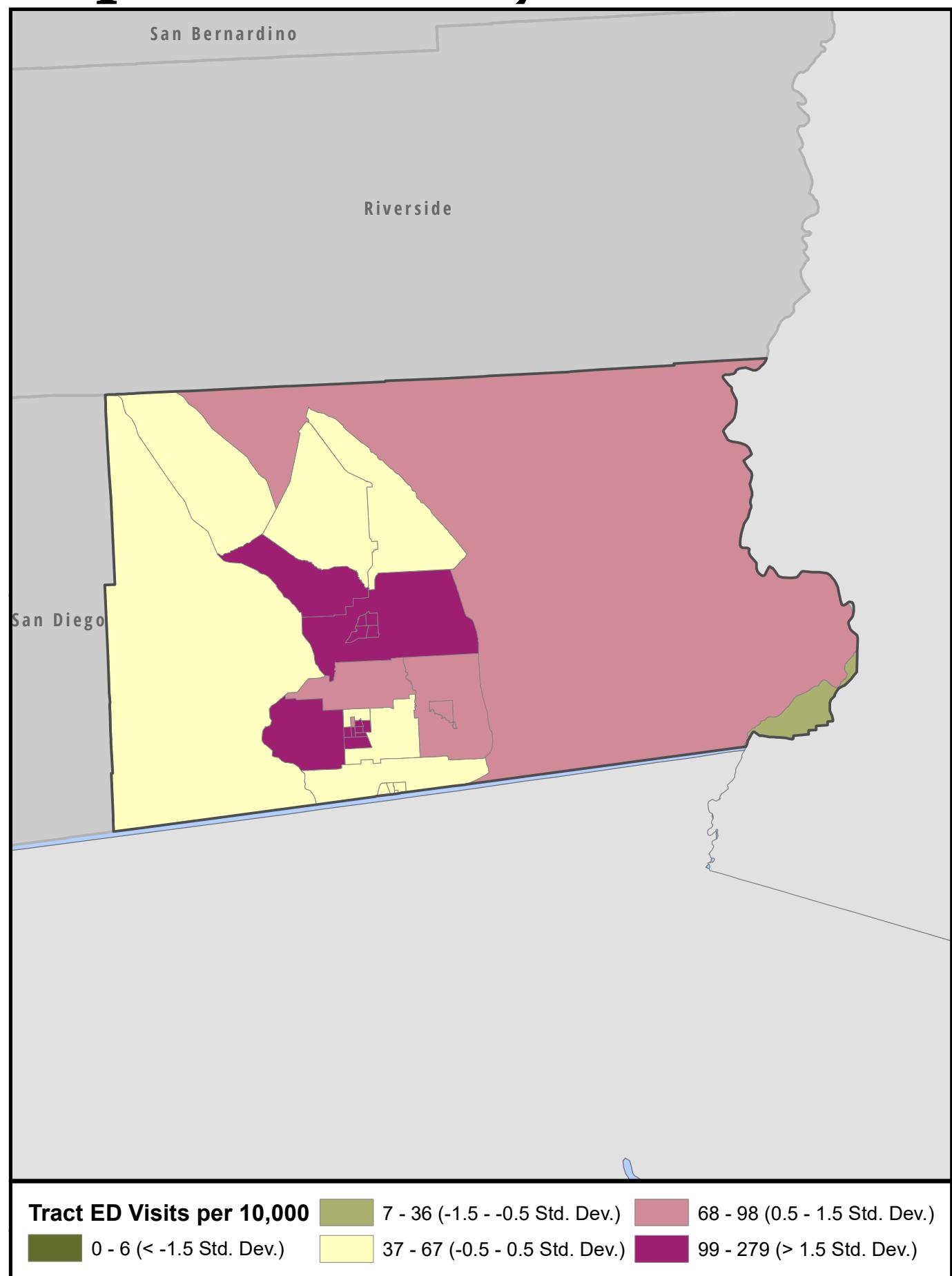


Tract ED Visits per 10,000		7 - 36 (-1.5 - -0.5 Std. Dev.)		68 - 98 (0.5 - 1.5 Std. Dev.)	
	0 - 6 (< -1.5 Std. Dev.)		37 - 67 (-0.5 - 0.5 Std. Dev.)		99 - 279 (> 1.5 Std. Dev.)

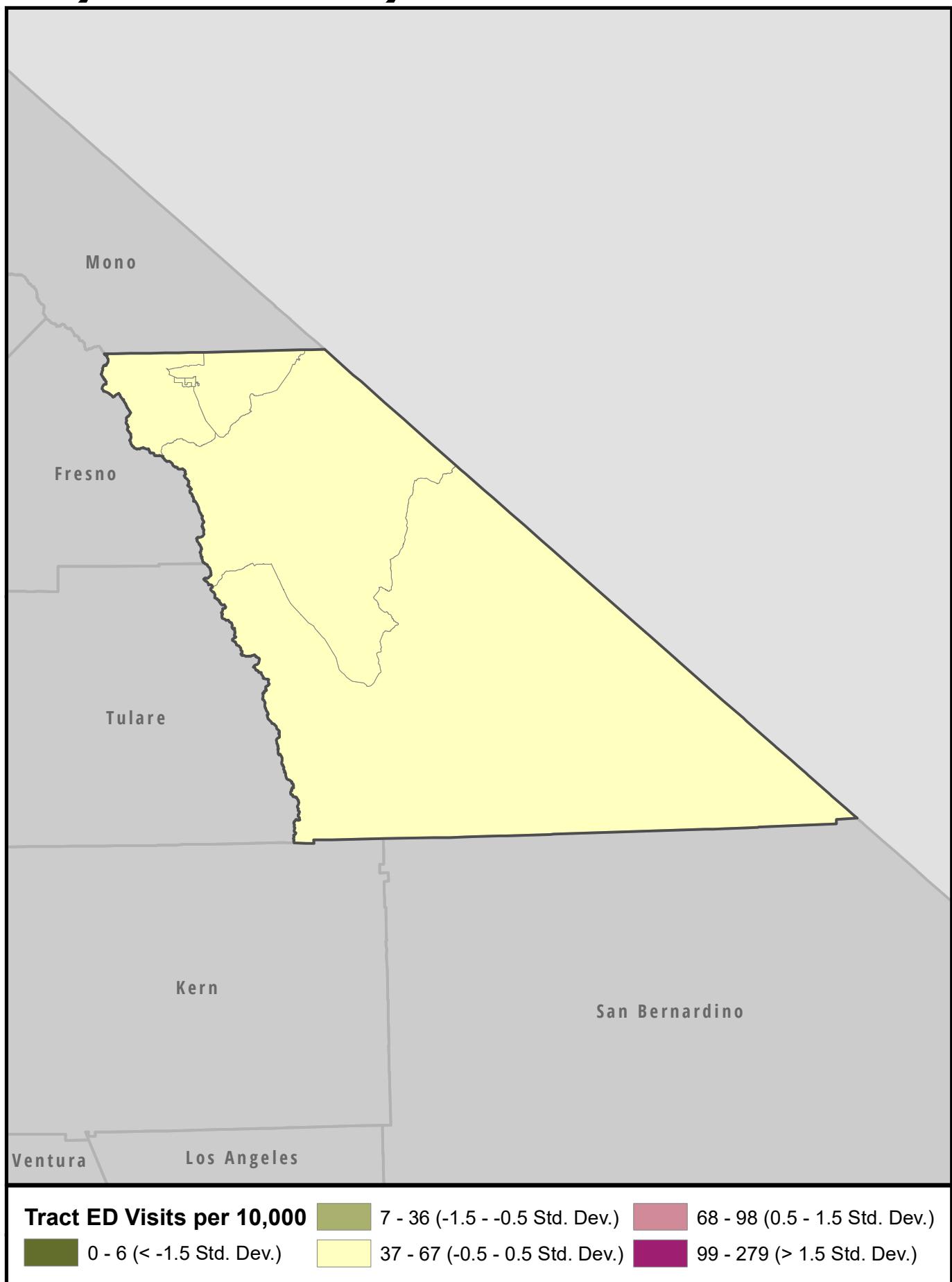
Humboldt County



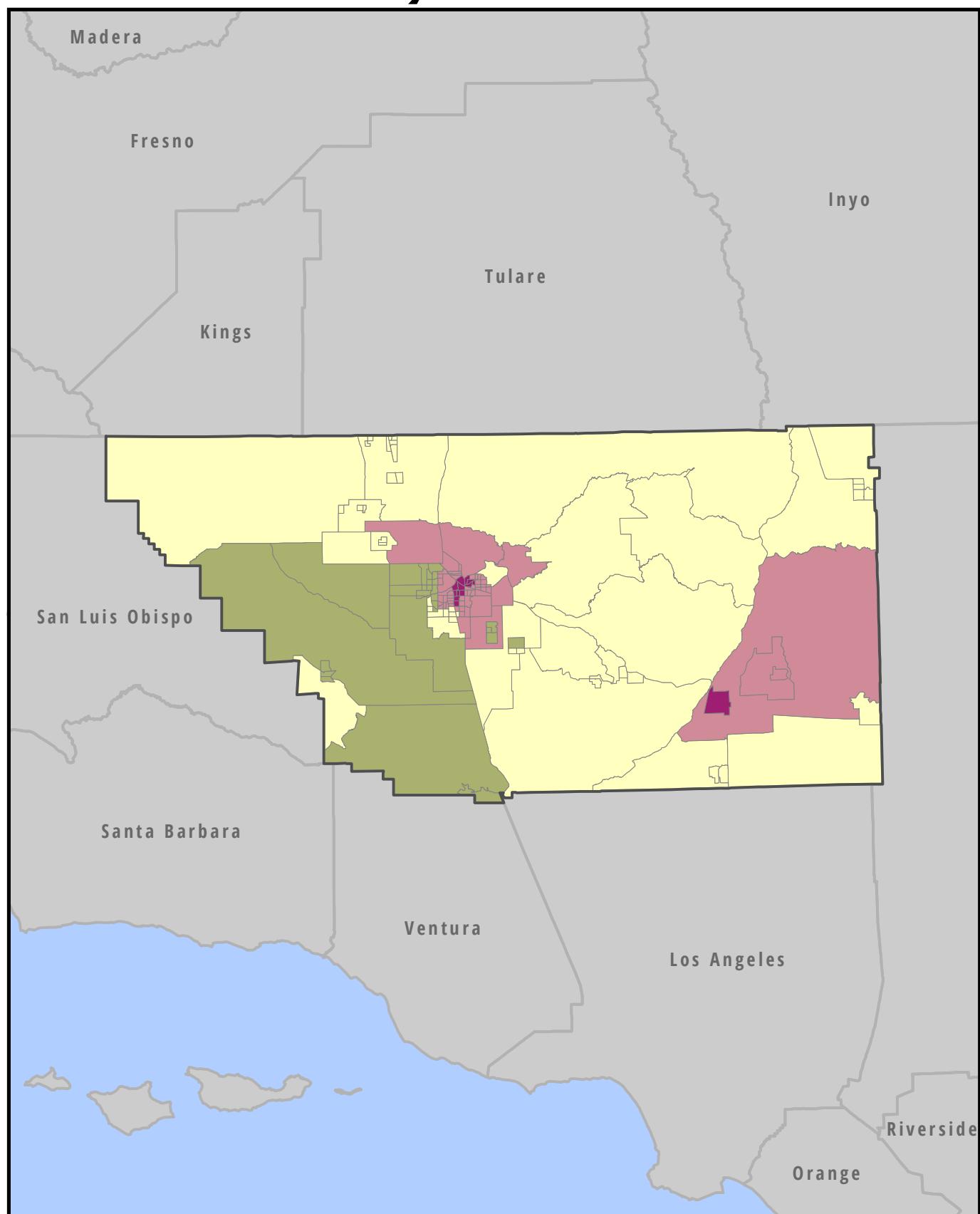
Imperial County



Inyo County



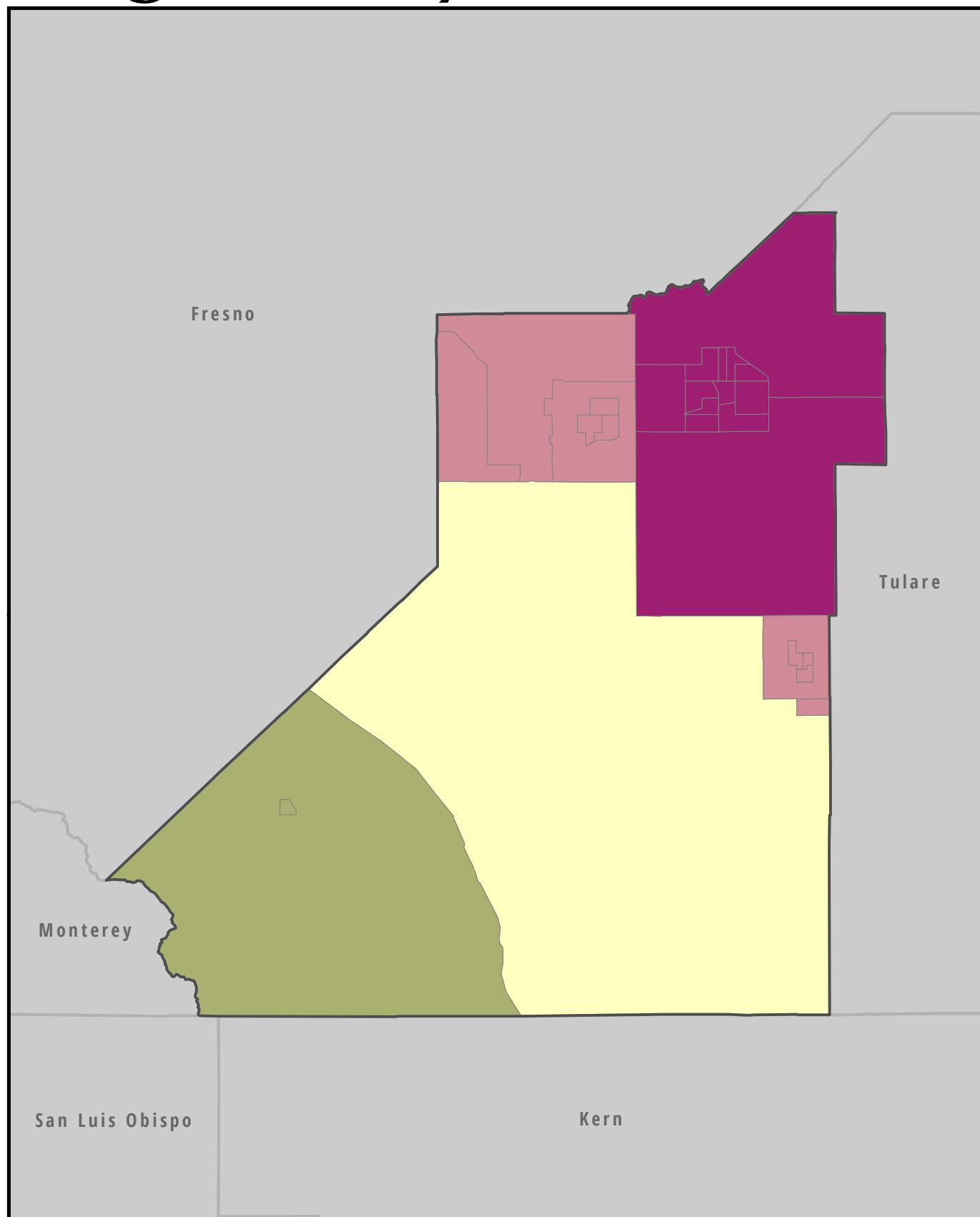
Kern County



Tract ED Visits per 10,000

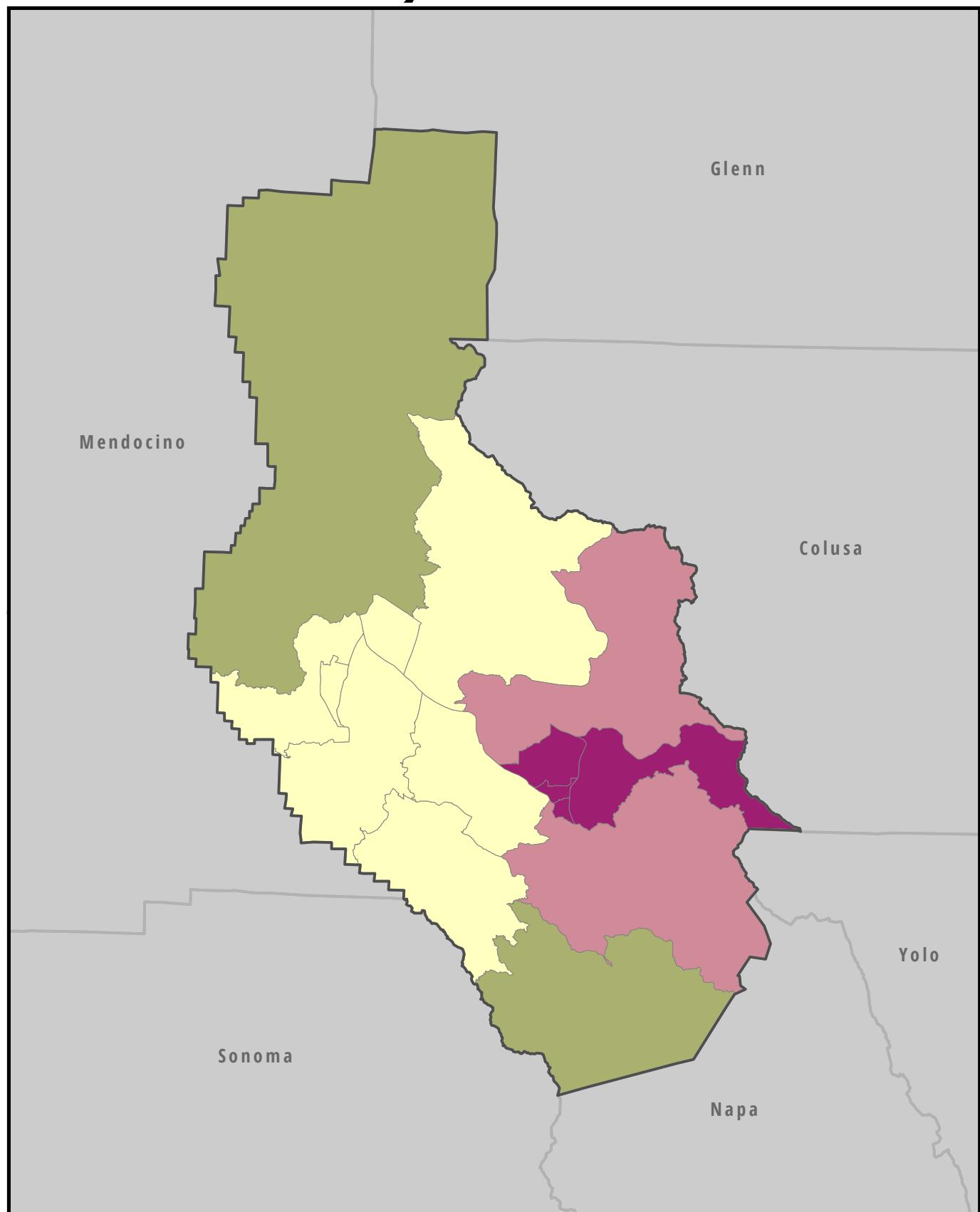
0 - 6 (< -1.5 Std. Dev.)	7 - 36 (-1.5 - -0.5 Std. Dev.)	37 - 67 (-0.5 - 0.5 Std. Dev.)	68 - 98 (0.5 - 1.5 Std. Dev.)	99 - 279 (> 1.5 Std. Dev.)
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Kings County



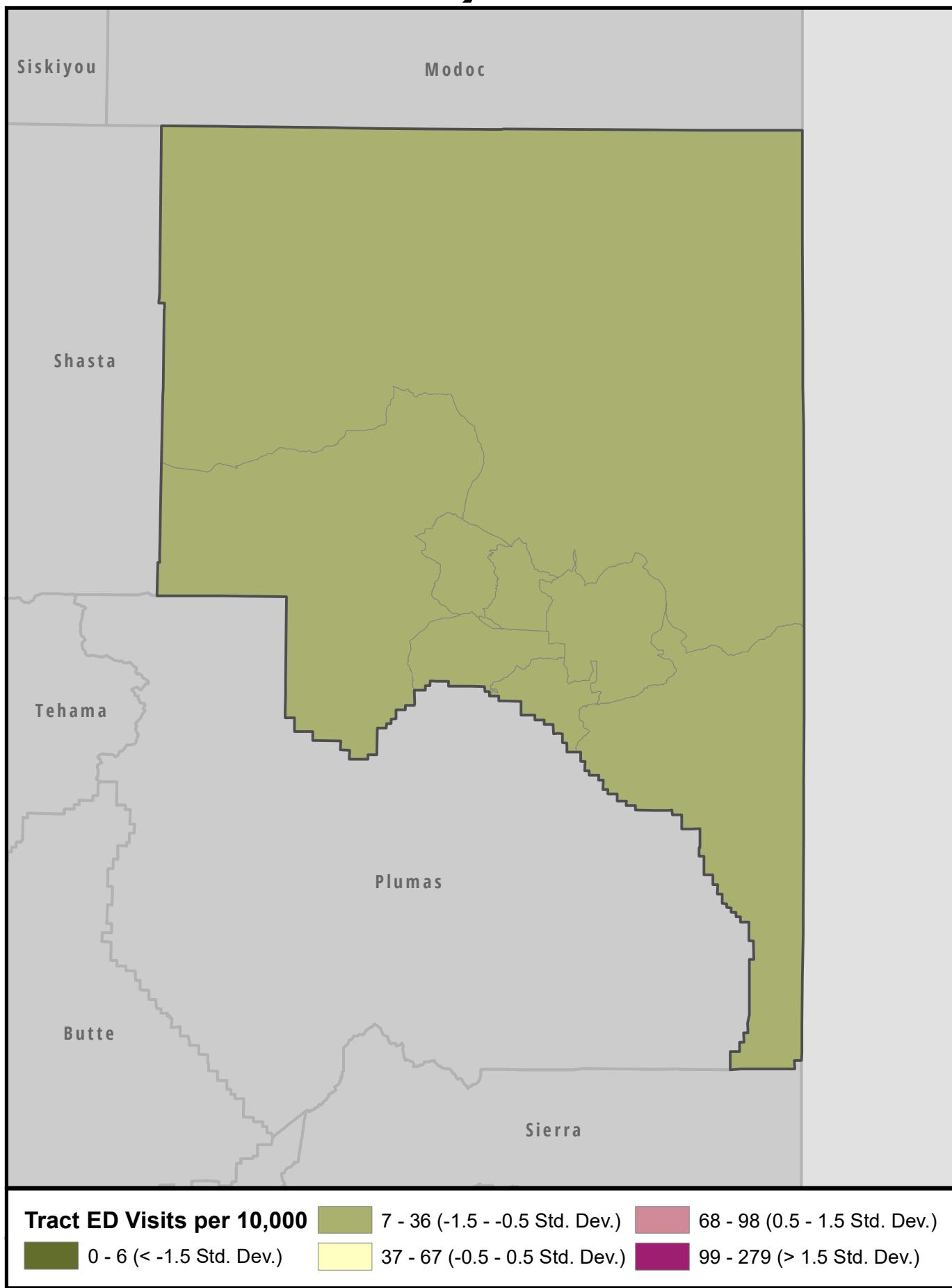
Tract ED Visits per 10,000	0 - 6 (< -1.5 Std. Dev.)	7 - 36 (-1.5 - -0.5 Std. Dev.)	37 - 67 (-0.5 - 0.5 Std. Dev.)	68 - 98 (0.5 - 1.5 Std. Dev.)	99 - 279 (> 1.5 Std. Dev.)
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Lake County

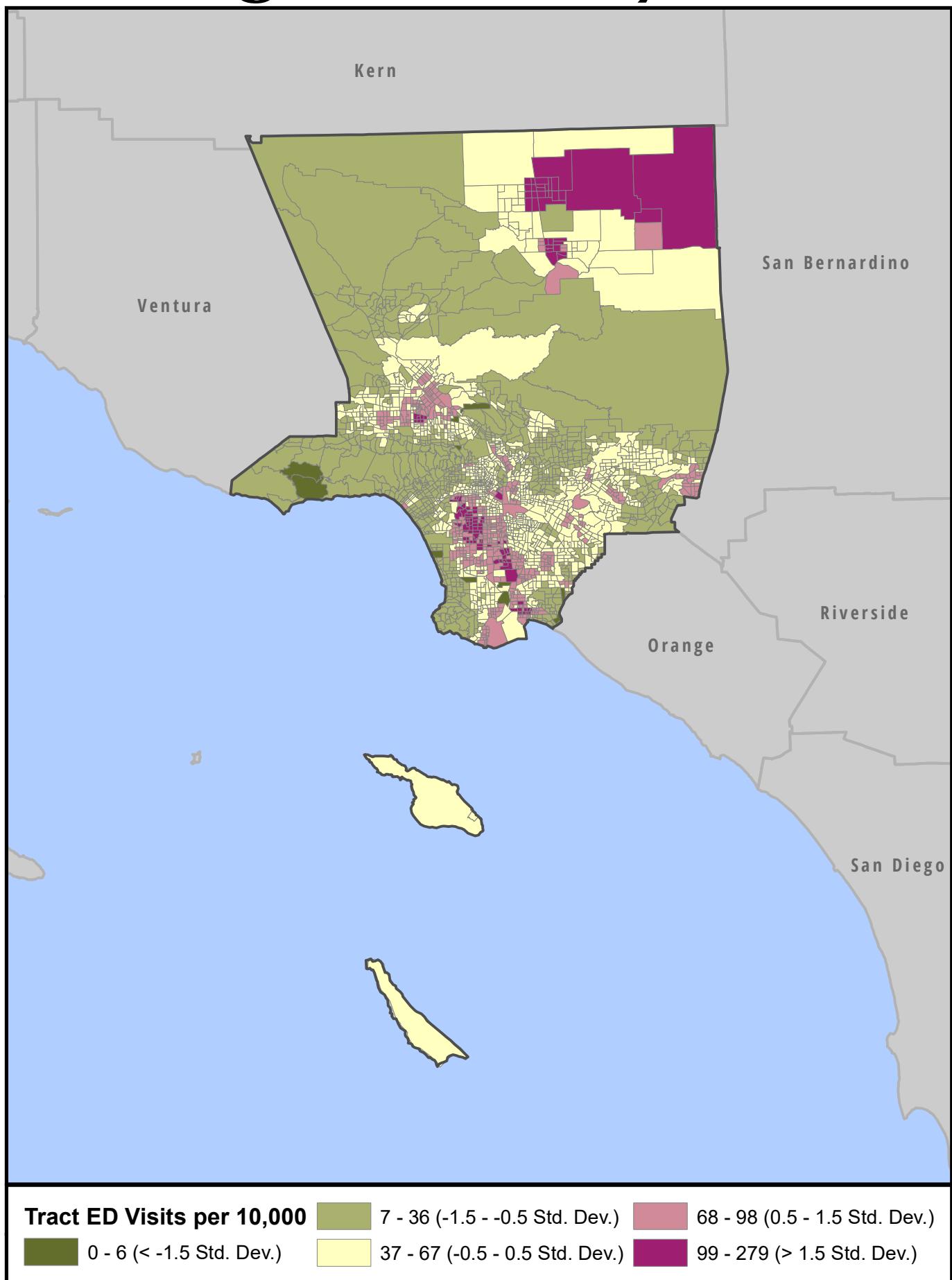


Tract ED Visits per 10,000	7 - 36 (-1.5 - -0.5 Std. Dev.)	68 - 98 (0.5 - 1.5 Std. Dev.)
0 - 6 (< -1.5 Std. Dev.)	37 - 67 (-0.5 - 0.5 Std. Dev.)	99 - 279 (> 1.5 Std. Dev.)

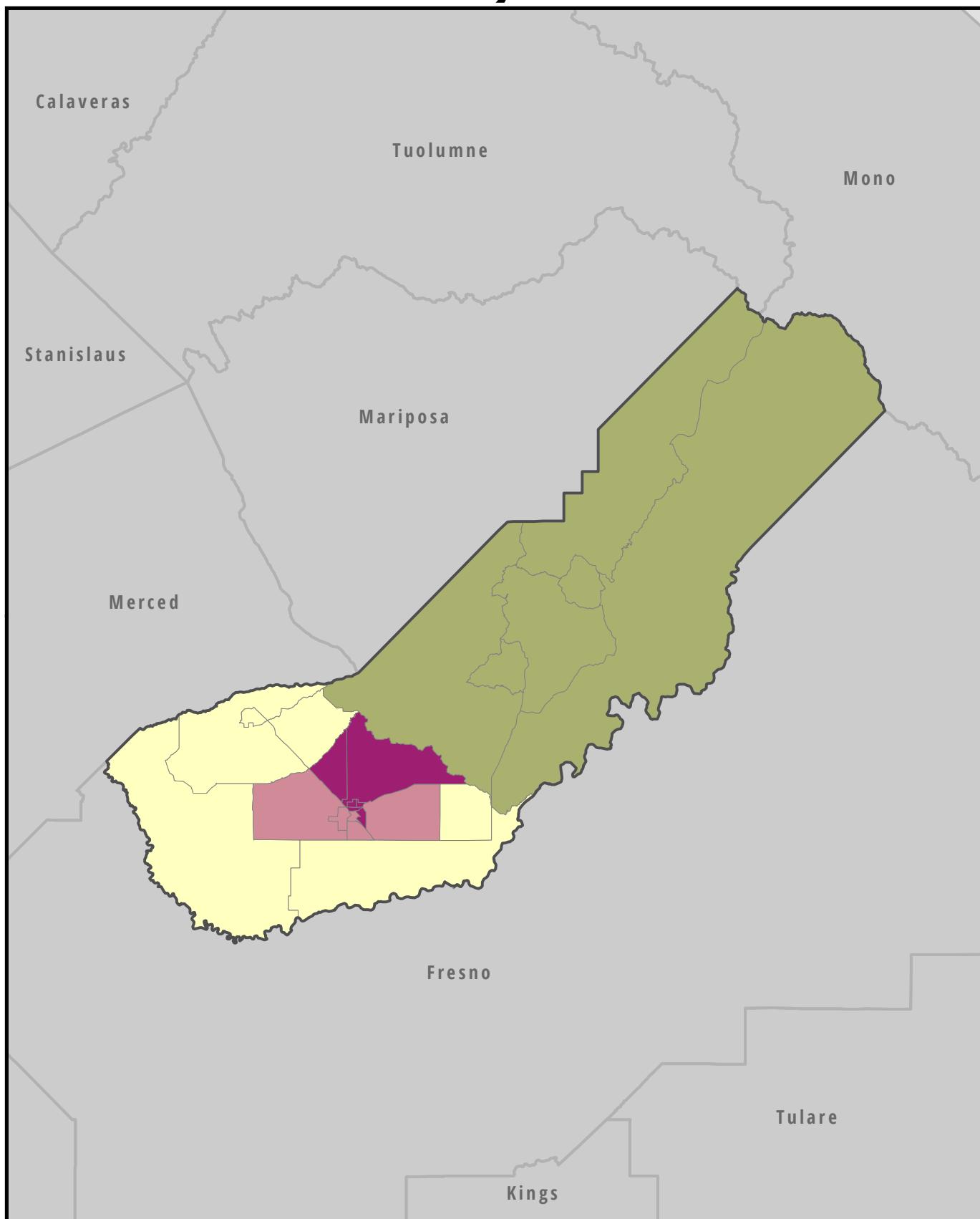
Lassen County



Los Angeles County



Madera County



Tract ED Visits per 10,000

0 - 6 (< -1.5 Std. Dev.)	37 - 67 (-0.5 - 0.5 Std. Dev.)	68 - 98 (0.5 - 1.5 Std. Dev.)	7 - 36 (-1.5 - -0.5 Std. Dev.)	99 - 279 (> 1.5 Std. Dev.)
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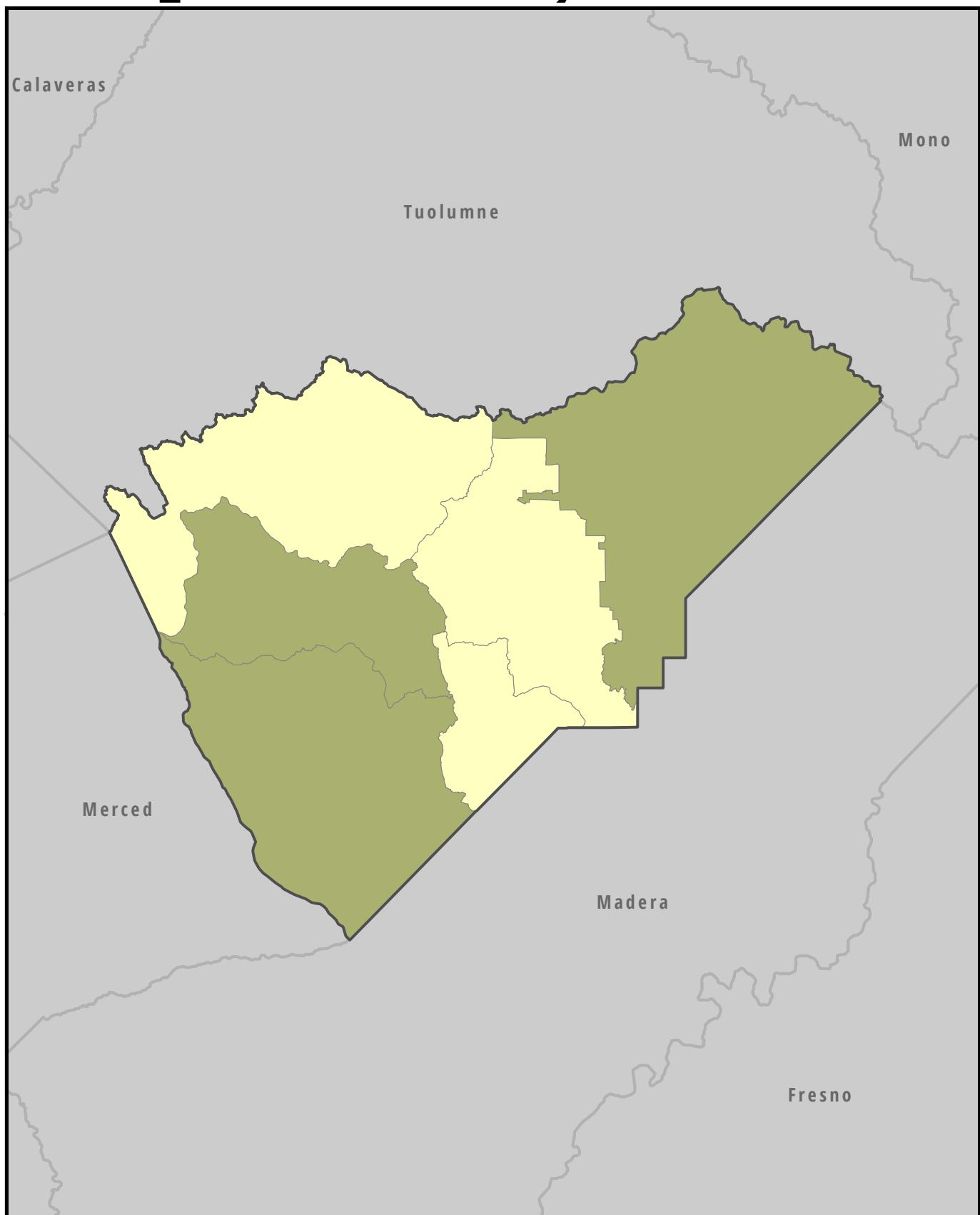
Marin County



Tract ED Visits per 10,000

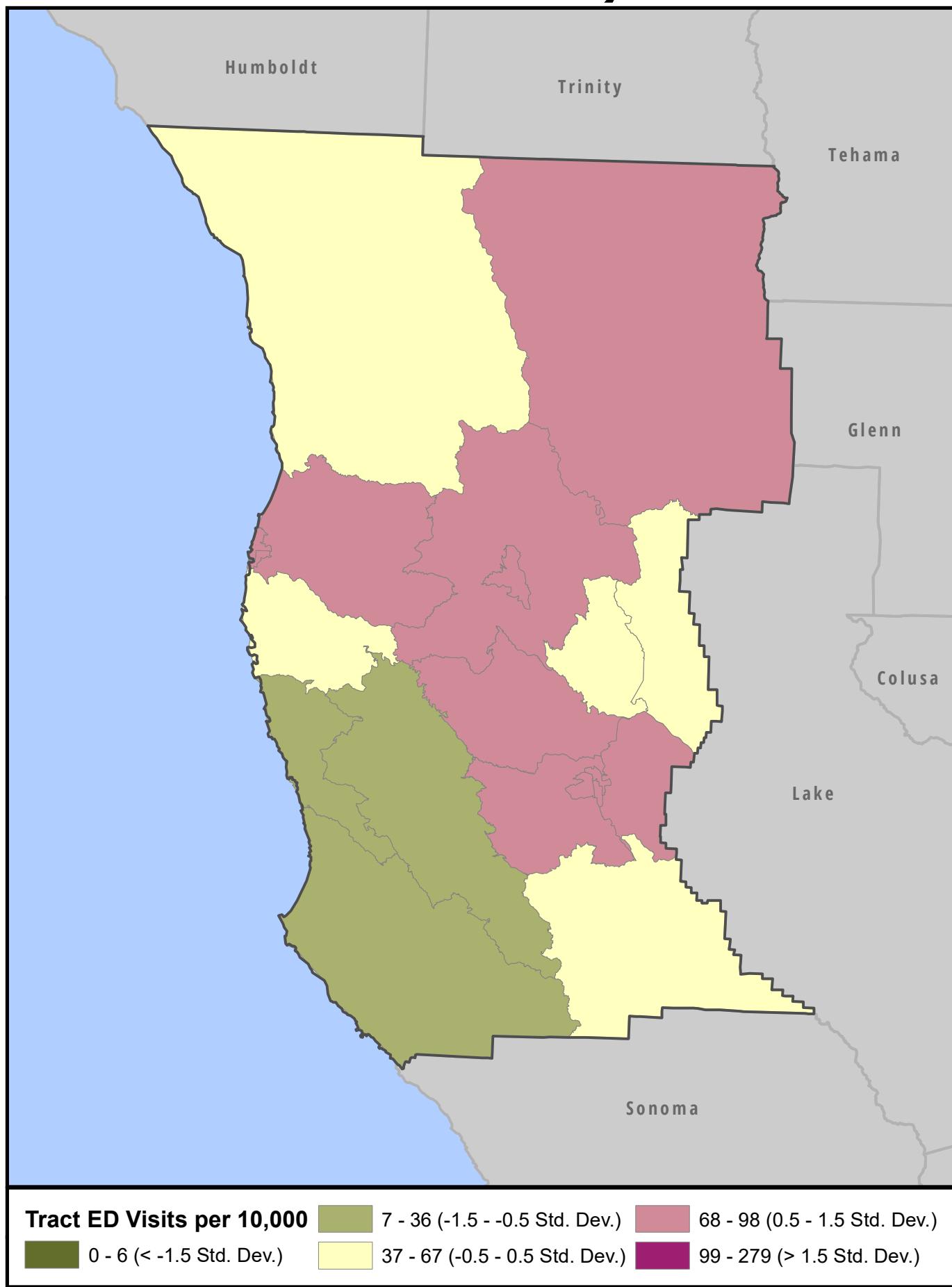
Range	Color
0 - 6 (< -1.5 Std. Dev.)	Dark Green
7 - 36 (-1.5 - -0.5 Std. Dev.)	Light Green
37 - 67 (-0.5 - 0.5 Std. Dev.)	Yellow
68 - 98 (0.5 - 1.5 Std. Dev.)	Pink
99 - 279 (> 1.5 Std. Dev.)	Magenta

Mariposa County

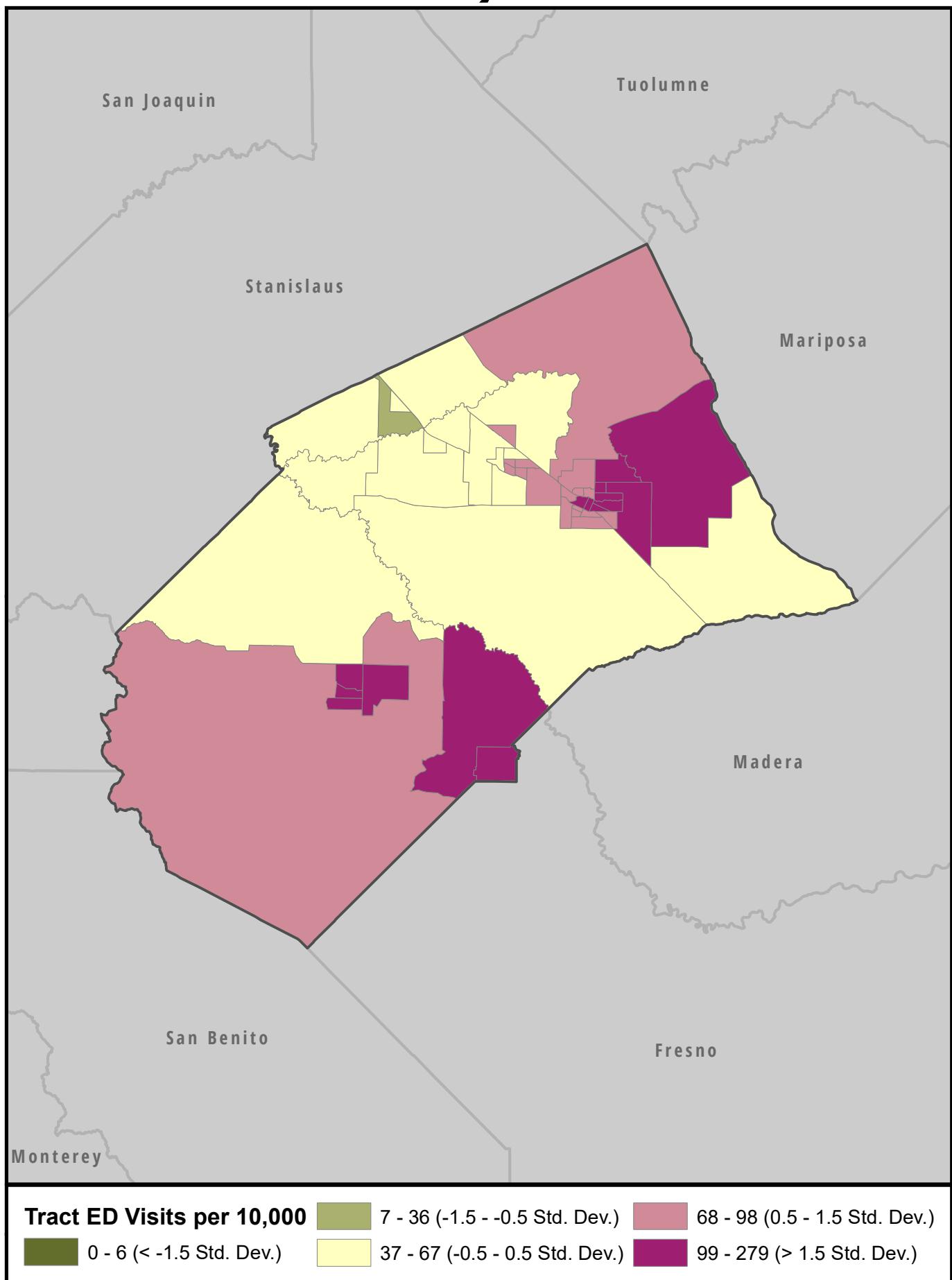


Tract ED Visits per 10,000	7 - 36 (-1.5 - -0.5 Std. Dev.)	68 - 98 (0.5 - 1.5 Std. Dev.)
0 - 6 (< -1.5 Std. Dev.)	37 - 67 (-0.5 - 0.5 Std. Dev.)	99 - 279 (> 1.5 Std. Dev.)

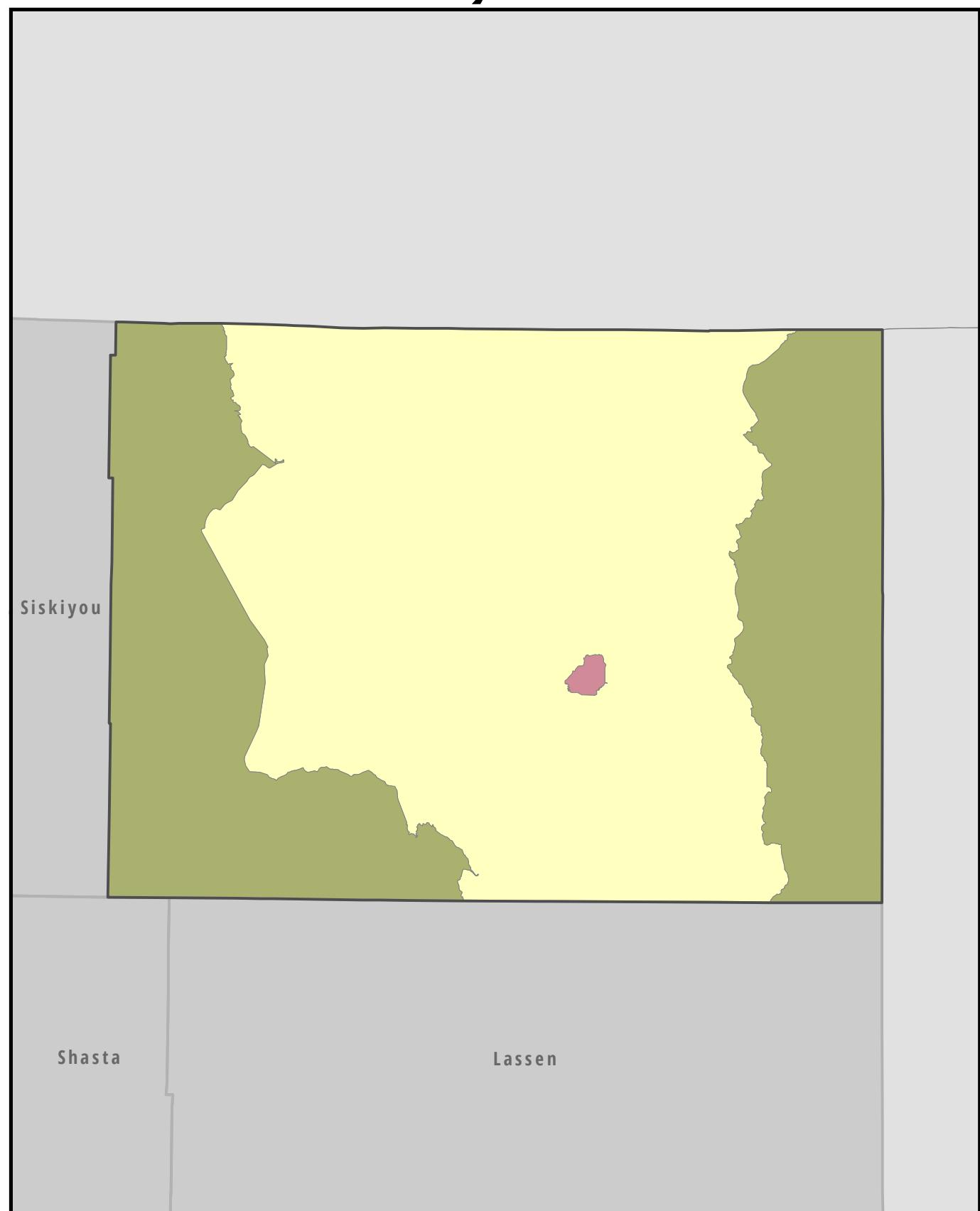
Mendocino County



Merced County



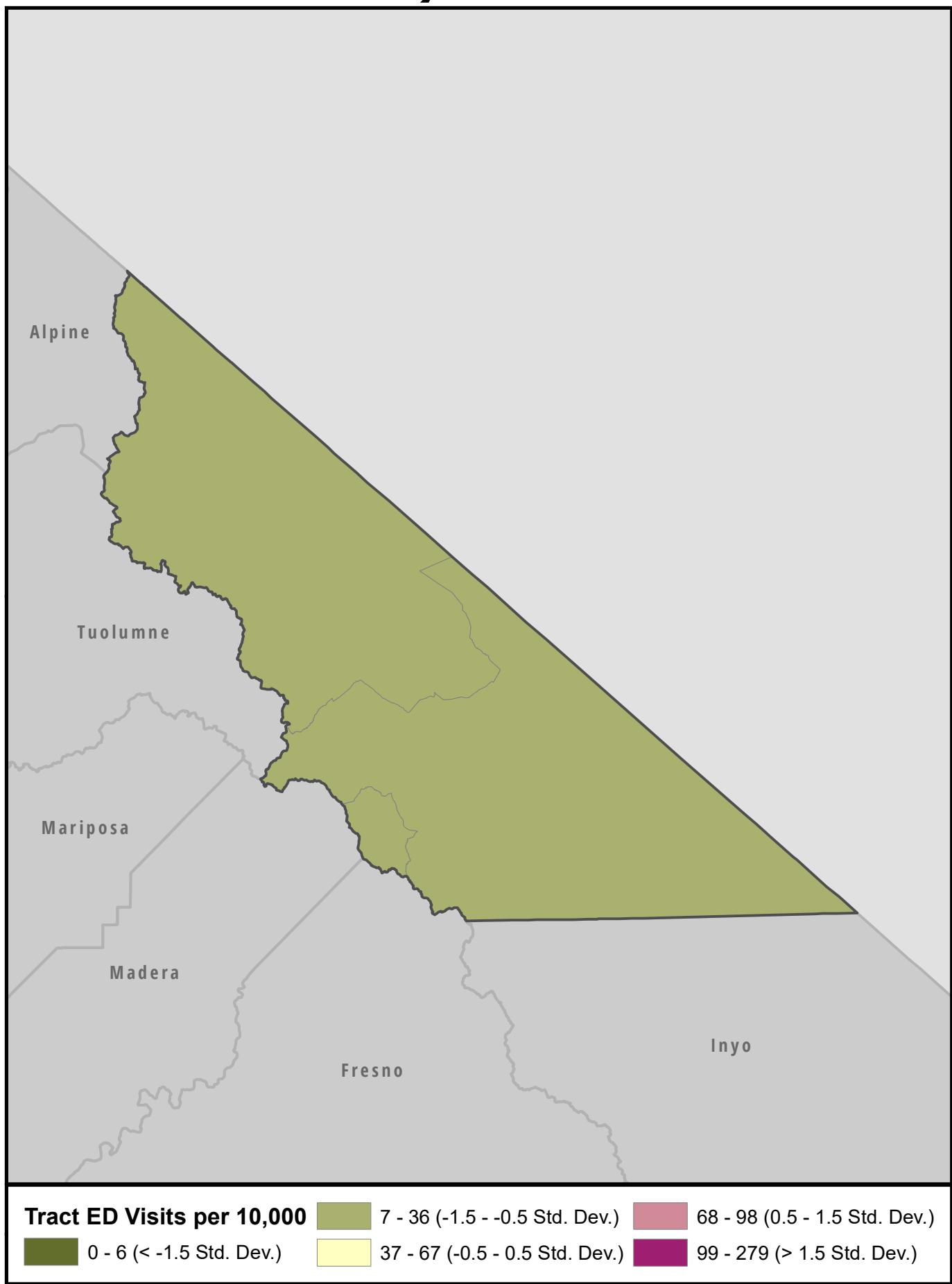
Modoc County



Tract ED Visits per 10,000

0 - 6 (< -1.5 Std. Dev.)	7 - 36 (-1.5 - -0.5 Std. Dev.)	37 - 67 (-0.5 - 0.5 Std. Dev.)	68 - 98 (0.5 - 1.5 Std. Dev.)	99 - 279 (> 1.5 Std. Dev.)
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Mono County



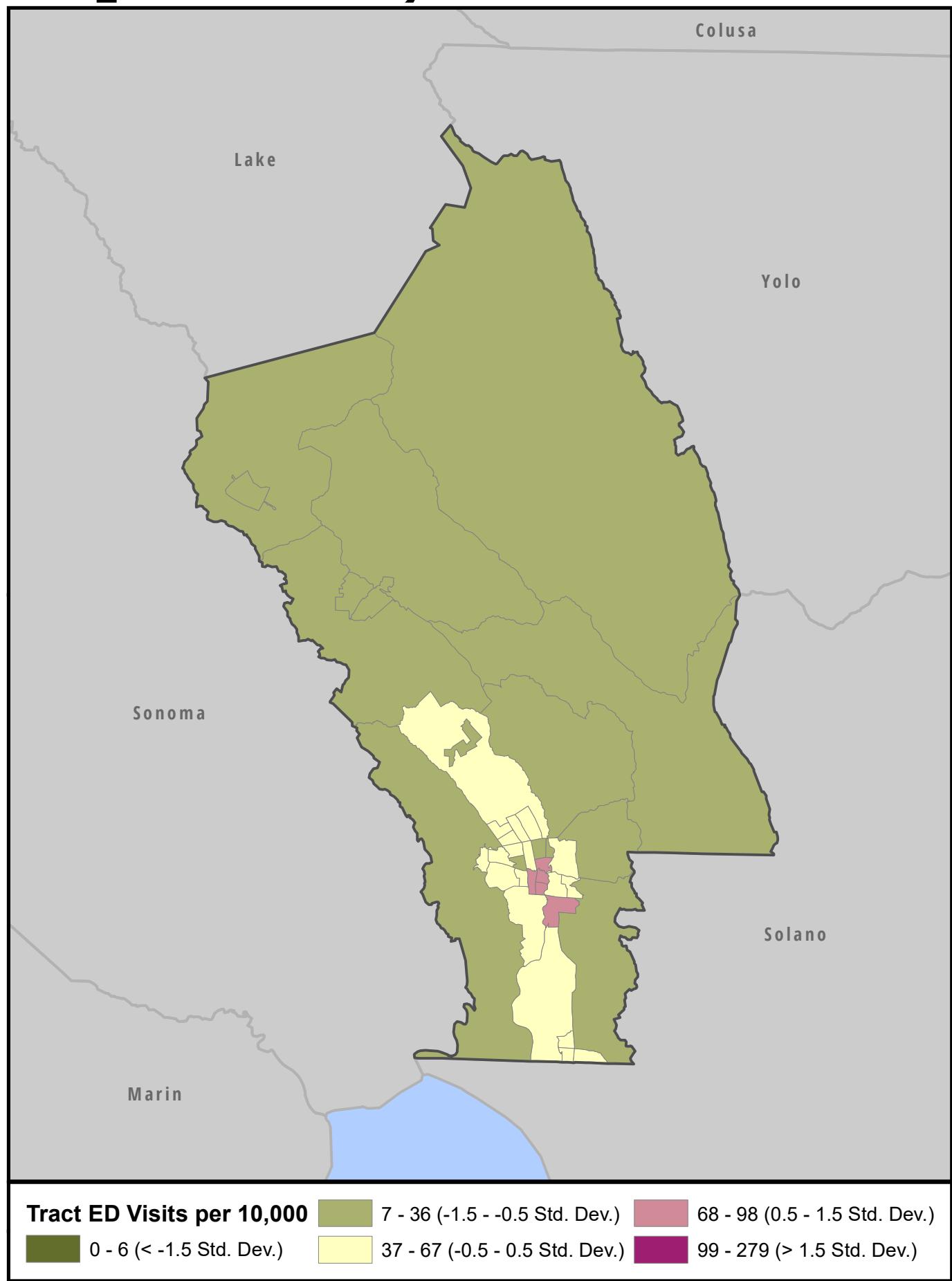
Monterey County



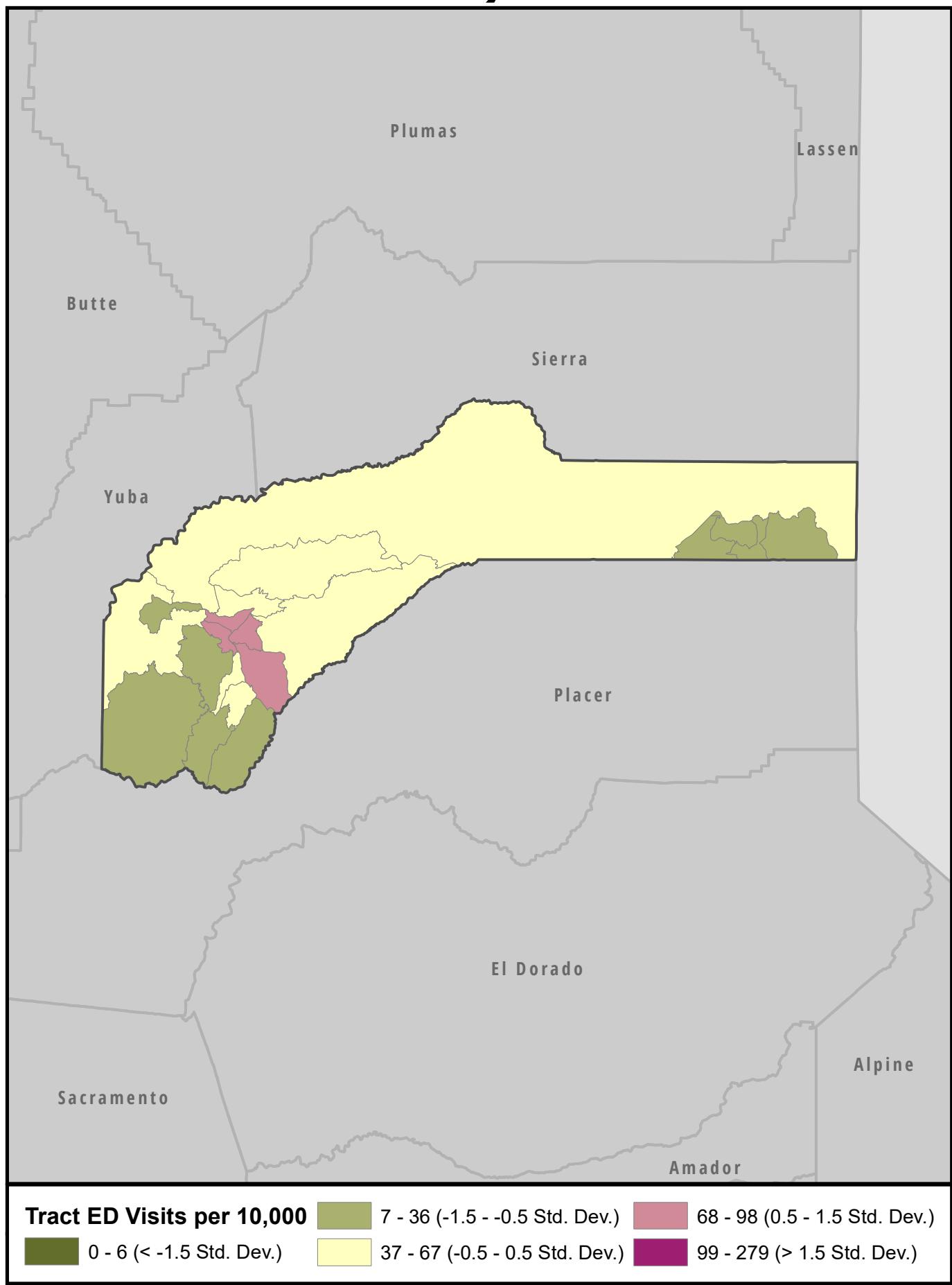
Tract ED Visits per 10,000

0 - 6 (< -1.5 Std. Dev.)	7 - 36 (-1.5 - -0.5 Std. Dev.)	68 - 98 (0.5 - 1.5 Std. Dev.)
37 - 67 (-0.5 - 0.5 Std. Dev.)	99 - 279 (> 1.5 Std. Dev.)	

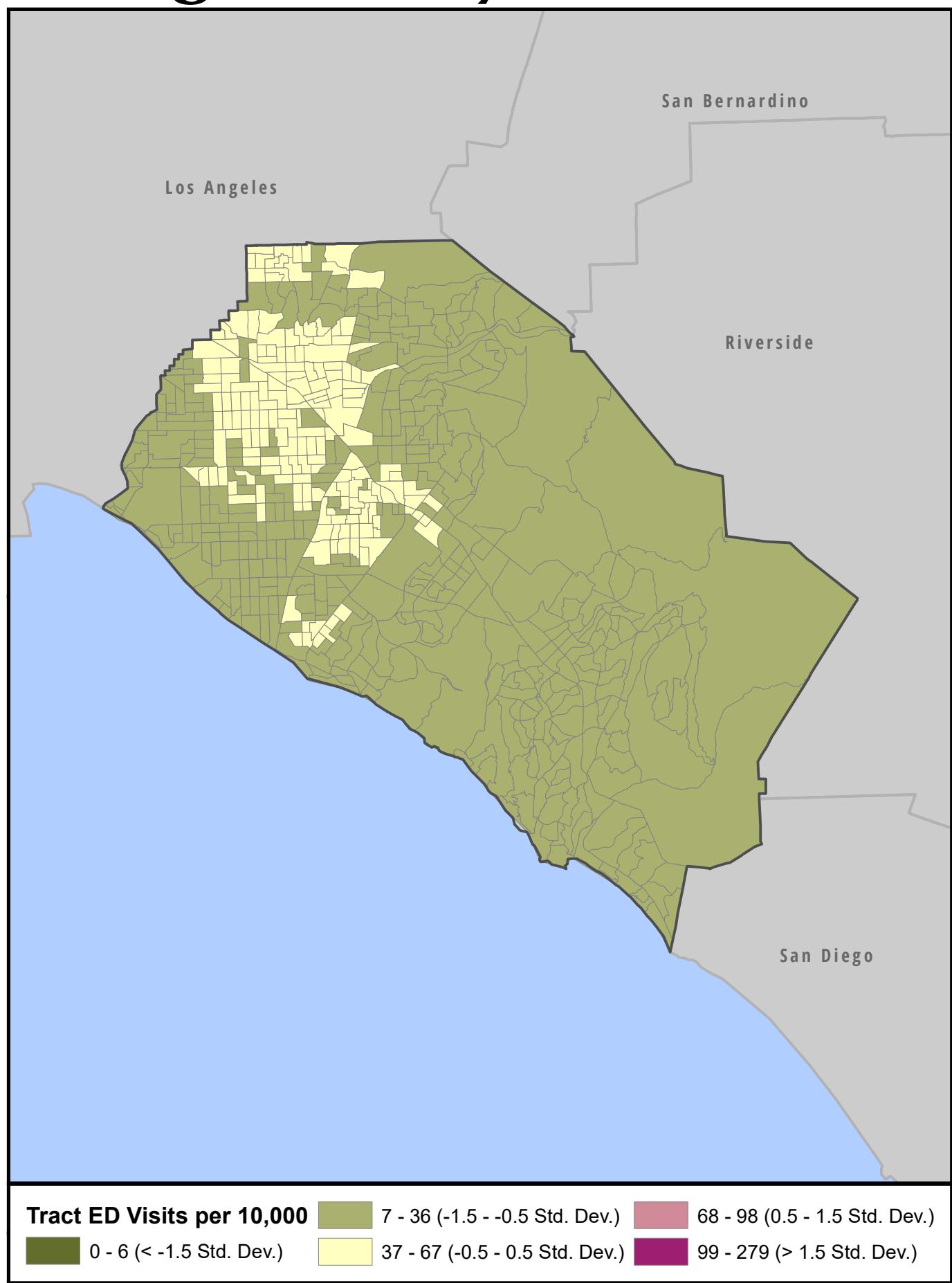
Napa County



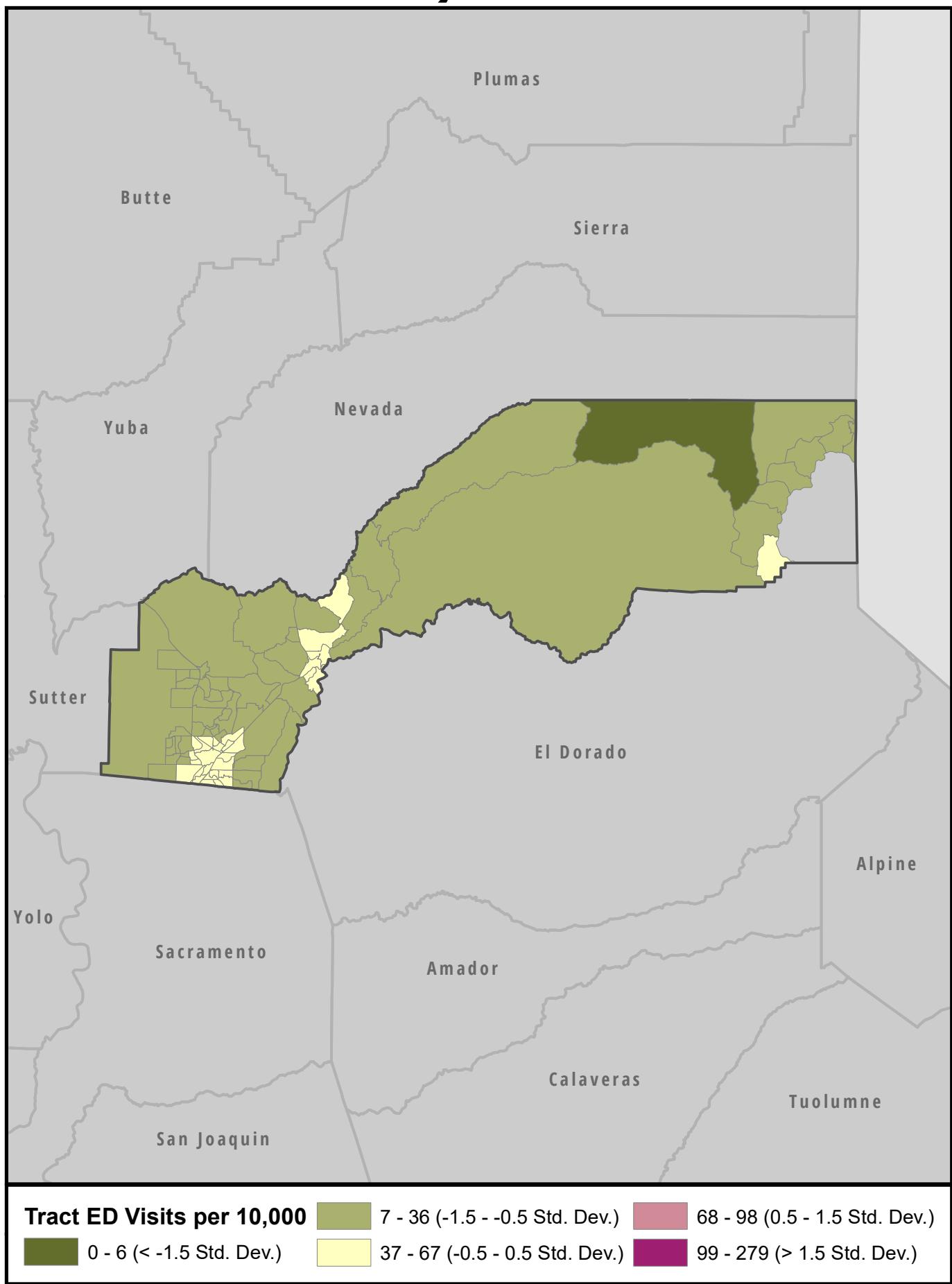
Nevada County



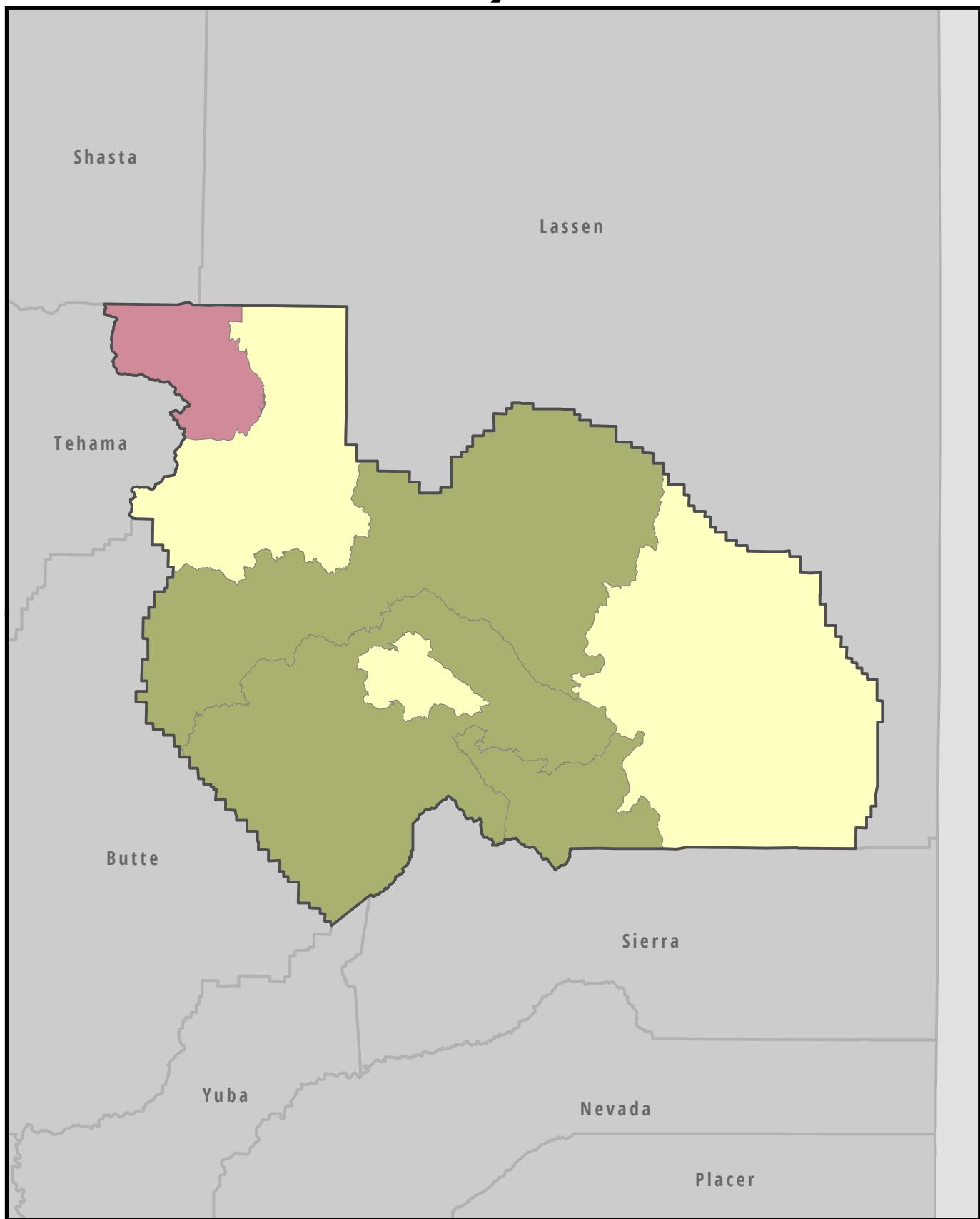
Orange County



Placer County



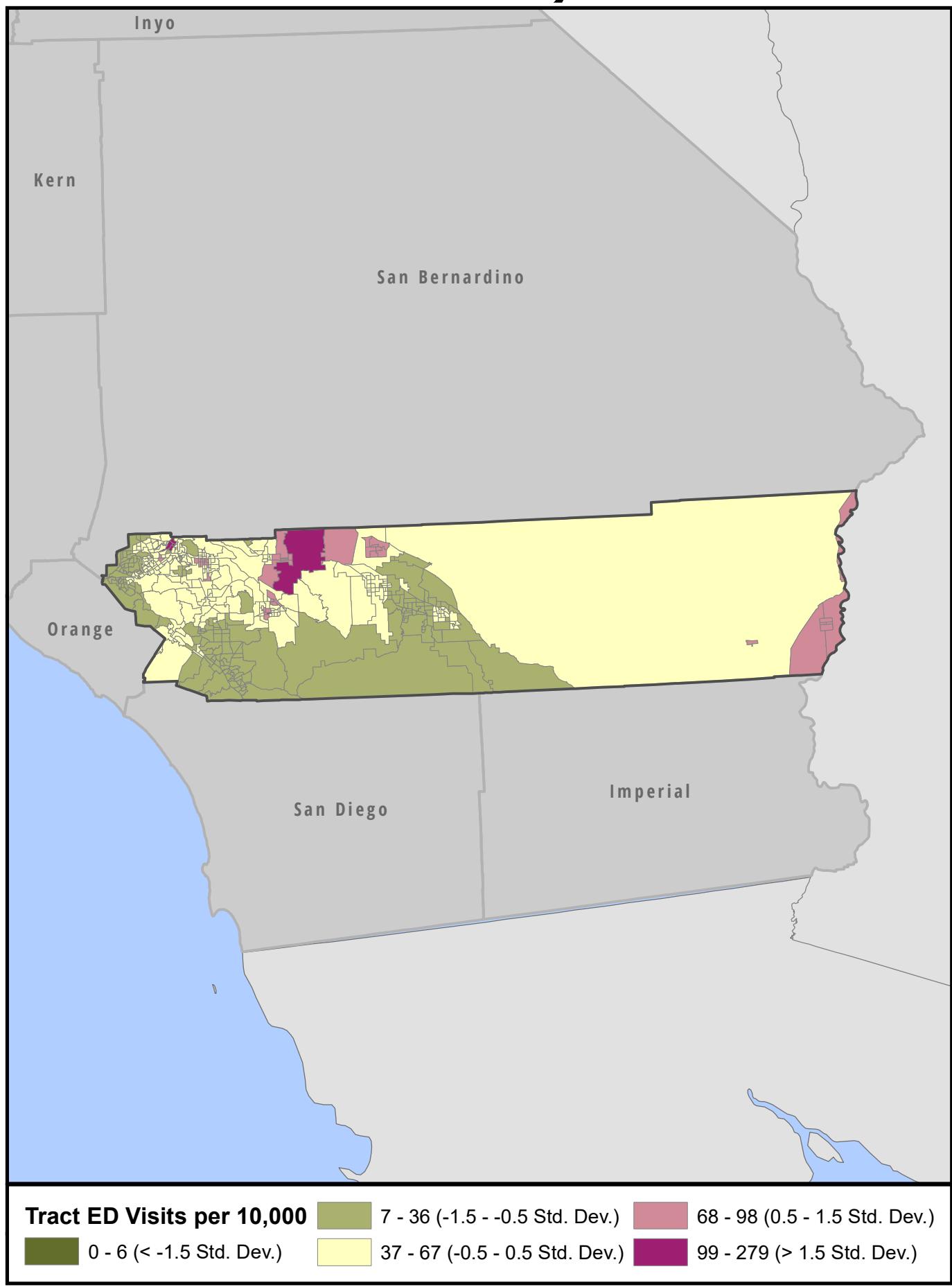
Plumas County



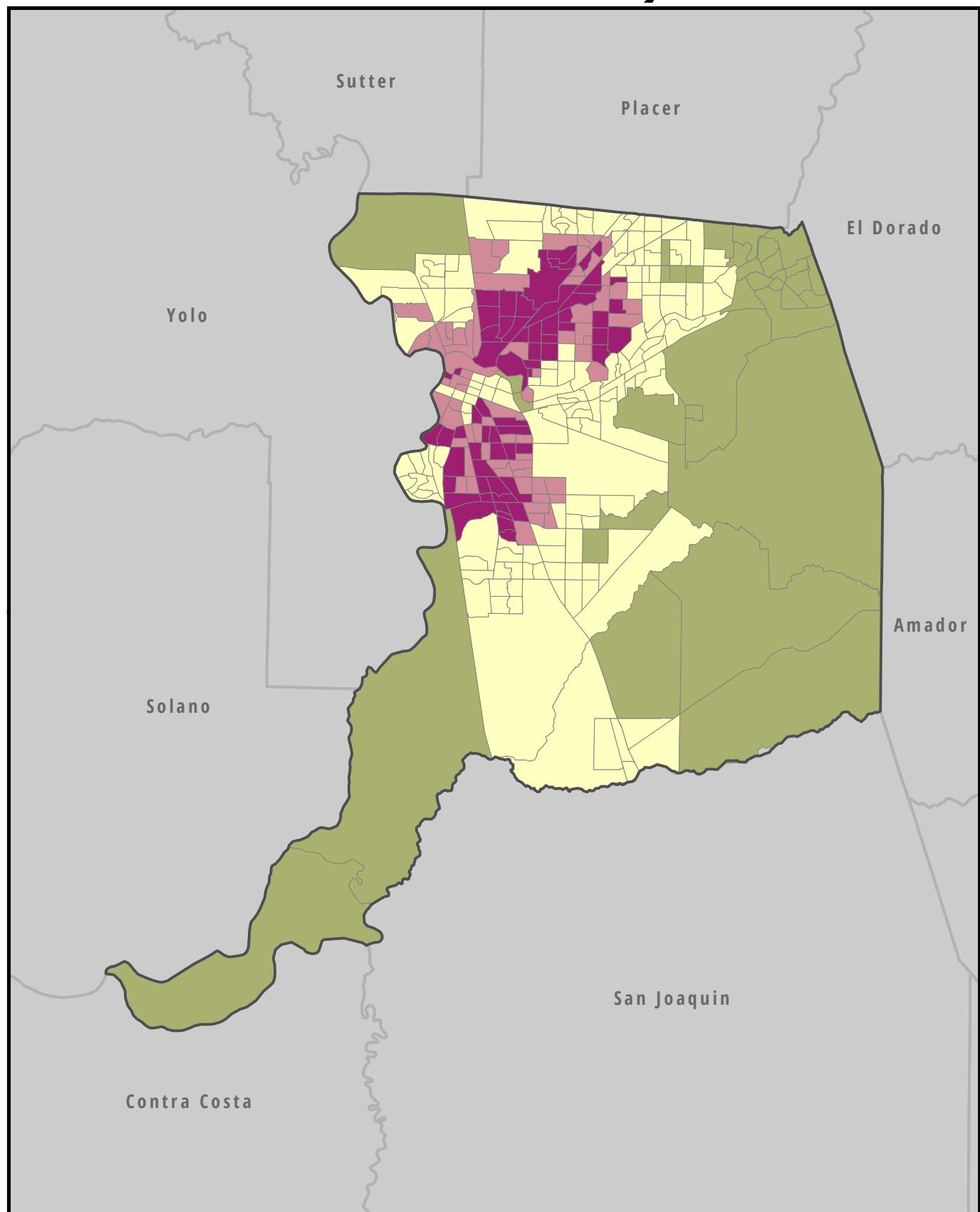
Tract ED Visits per 10,000

0 - 6 (< -1.5 Std. Dev.)	7 - 36 (-1.5 - -0.5 Std. Dev.)	37 - 67 (-0.5 - 0.5 Std. Dev.)	68 - 98 (0.5 - 1.5 Std. Dev.)	99 - 279 (> 1.5 Std. Dev.)
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Riverside County



Sacramento County

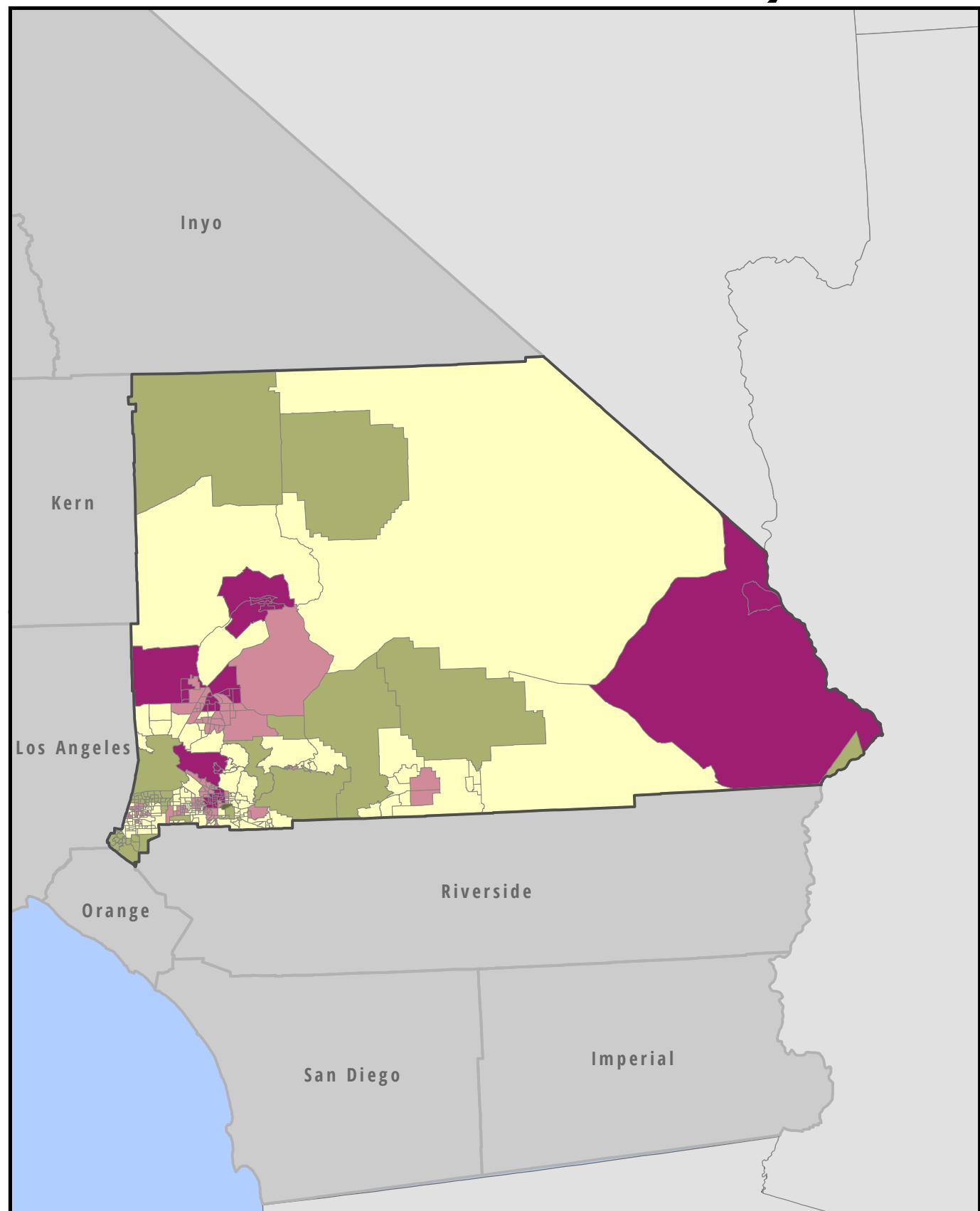


Tract ED Visits per 10,000	7 - 36 (-1.5 - -0.5 Std. Dev.)	68 - 98 (0.5 - 1.5 Std. Dev.)
0 - 6 (< -1.5 Std. Dev.)	37 - 67 (-0.5 - 0.5 Std. Dev.)	99 - 279 (> 1.5 Std. Dev.)

San Benito County



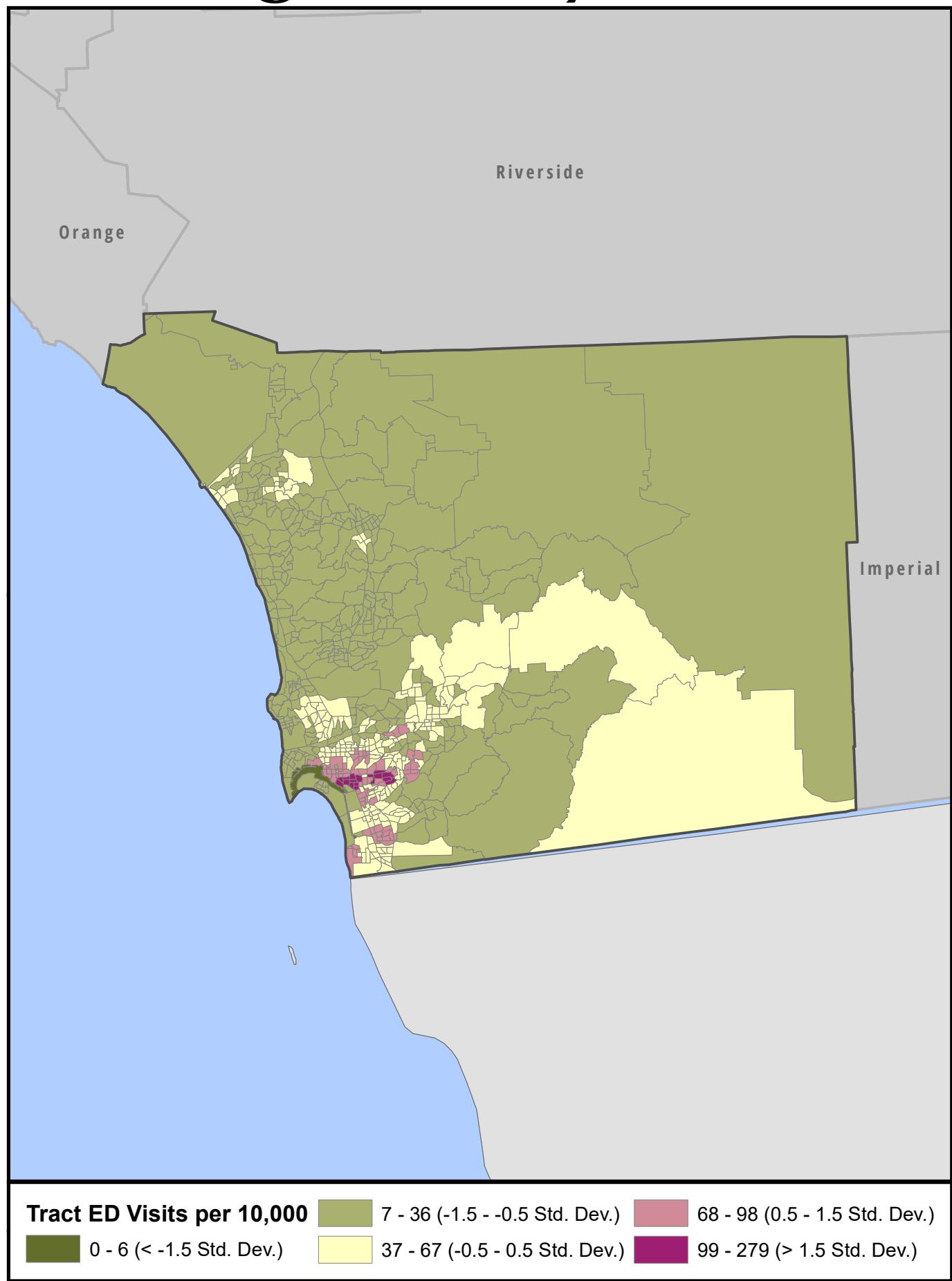
San Bernardino County



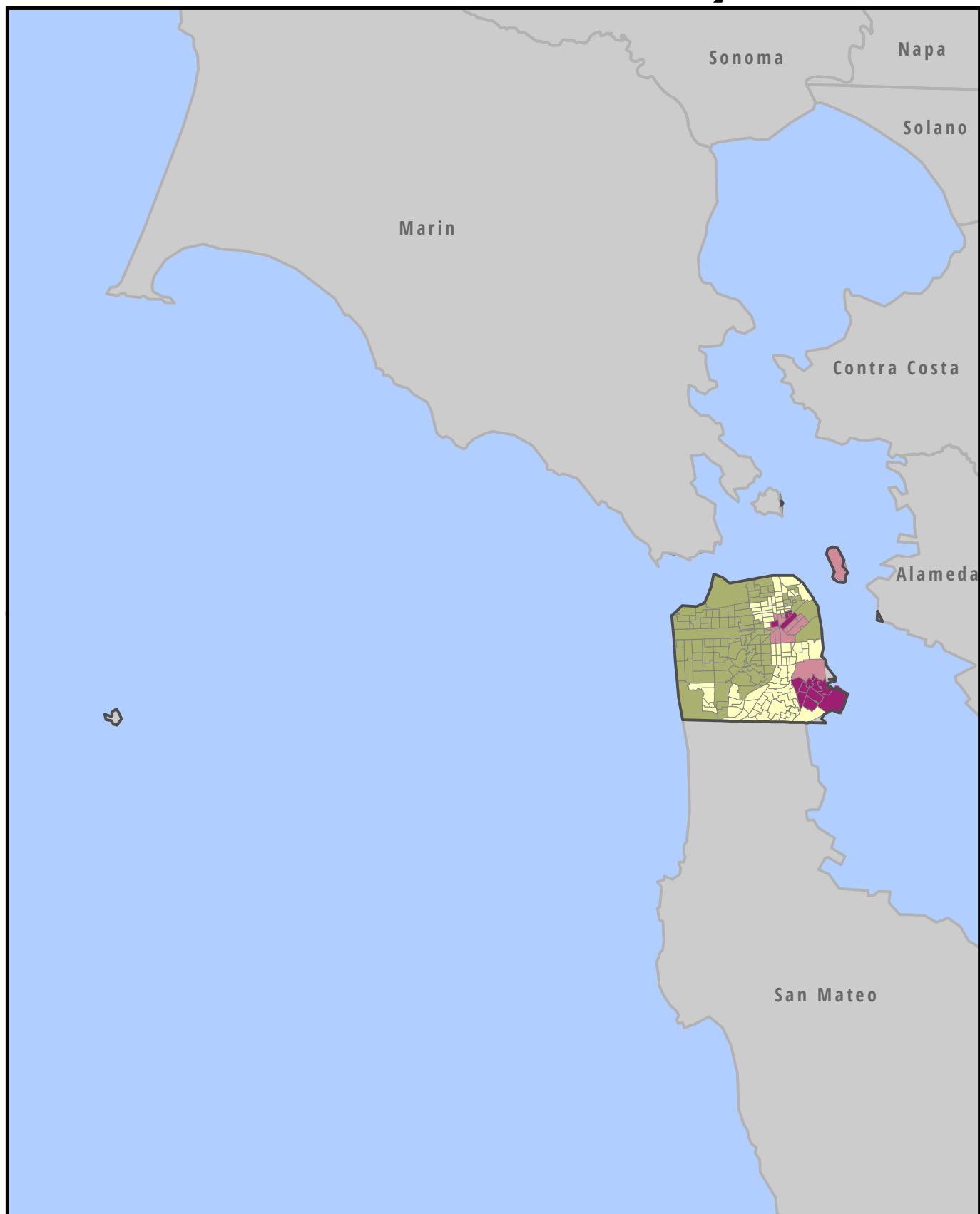
Tract ED Visits per 10,000

0 - 6 (< -1.5 Std. Dev.)	7 - 36 (-1.5 - -0.5 Std. Dev.)	37 - 67 (-0.5 - 0.5 Std. Dev.)	68 - 98 (0.5 - 1.5 Std. Dev.)	99 - 279 (> 1.5 Std. Dev.)
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San Diego County



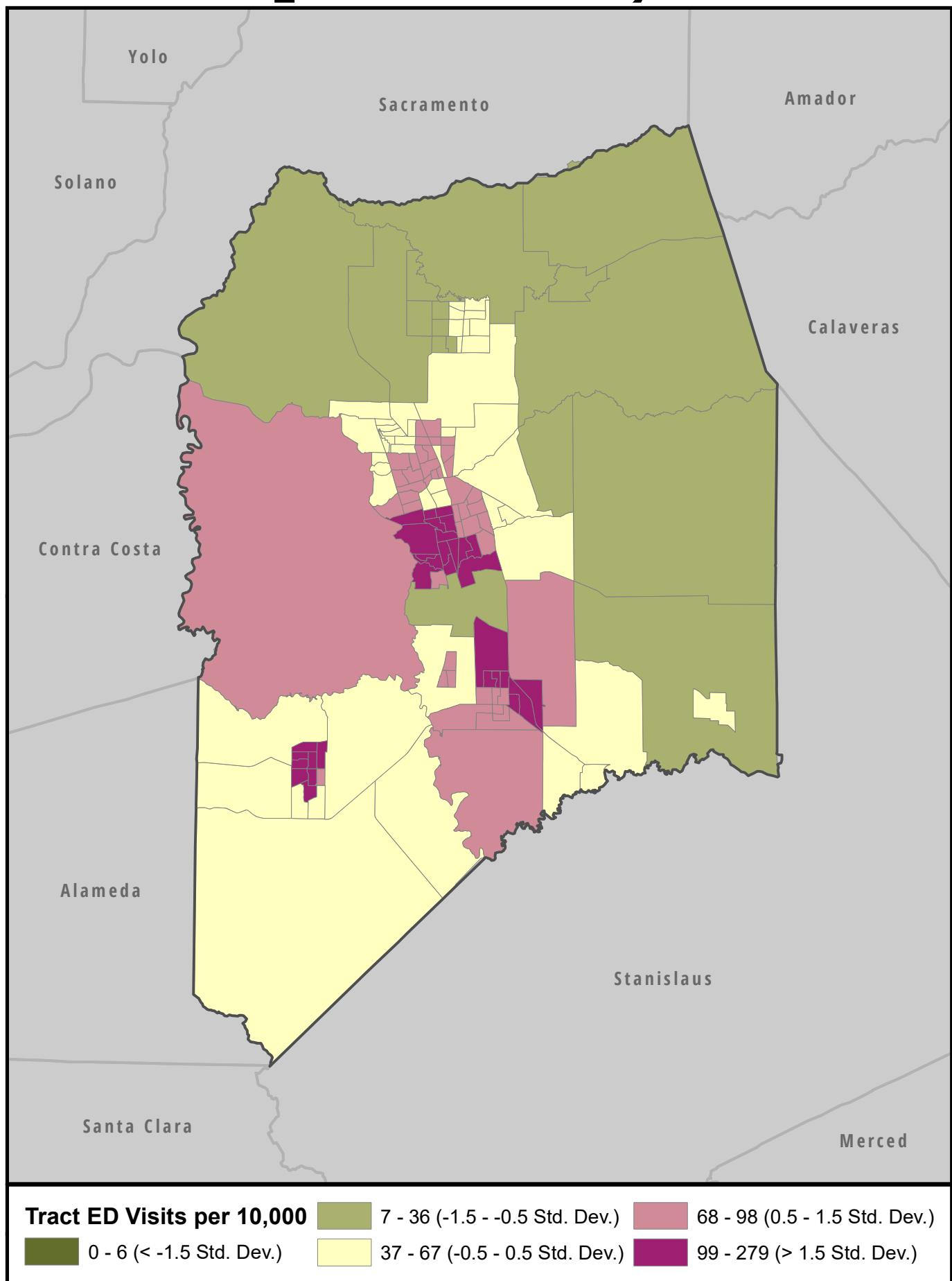
San Francisco County



Tract ED Visits per 10,000

0 - 6 (< -1.5 Std. Dev.)	7 - 36 (-1.5 - -0.5 Std. Dev.)	37 - 67 (-0.5 - 0.5 Std. Dev.)	68 - 98 (0.5 - 1.5 Std. Dev.)	99 - 279 (> 1.5 Std. Dev.)
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San Joaquin County



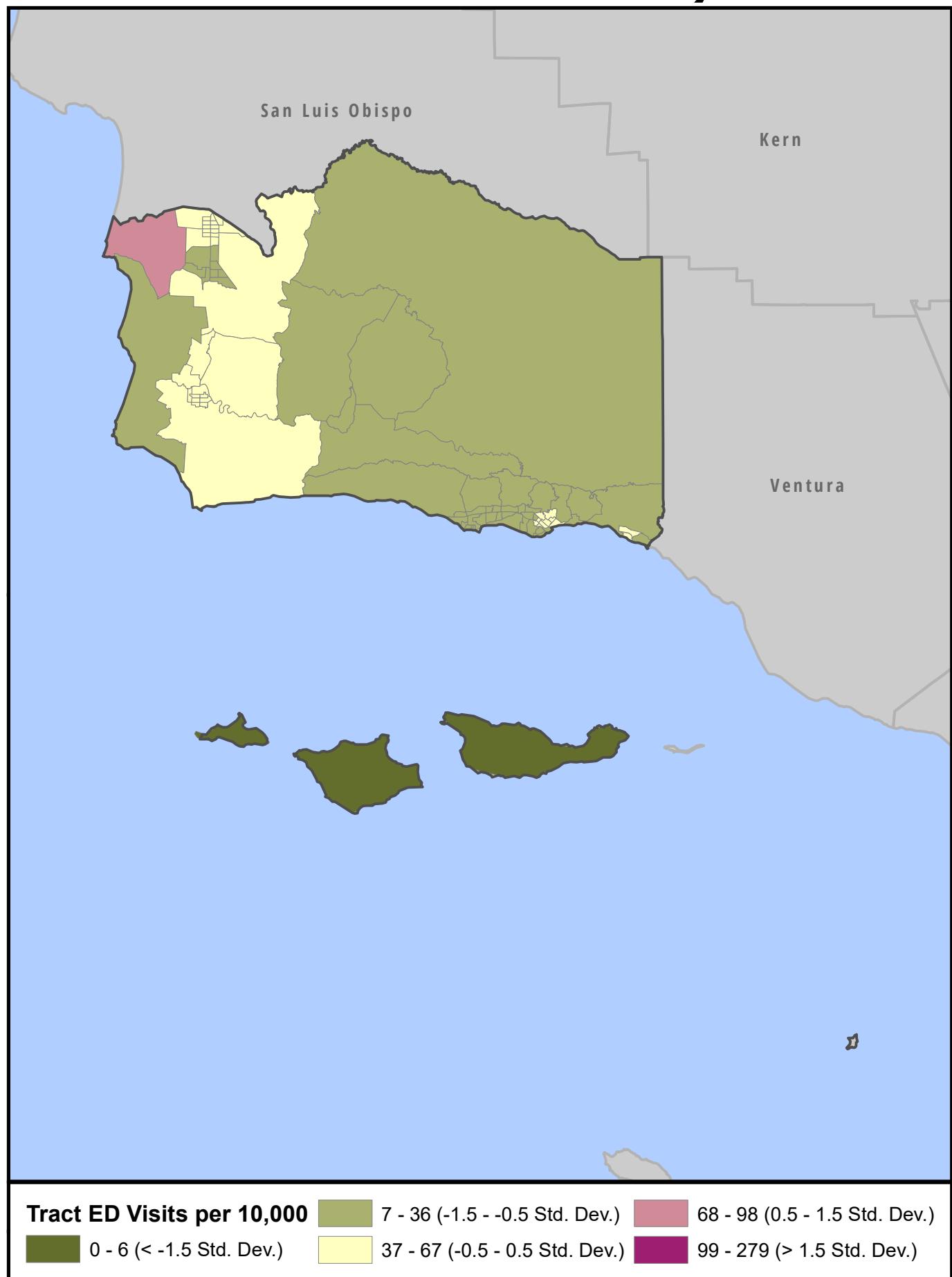
San Luis Obispo County



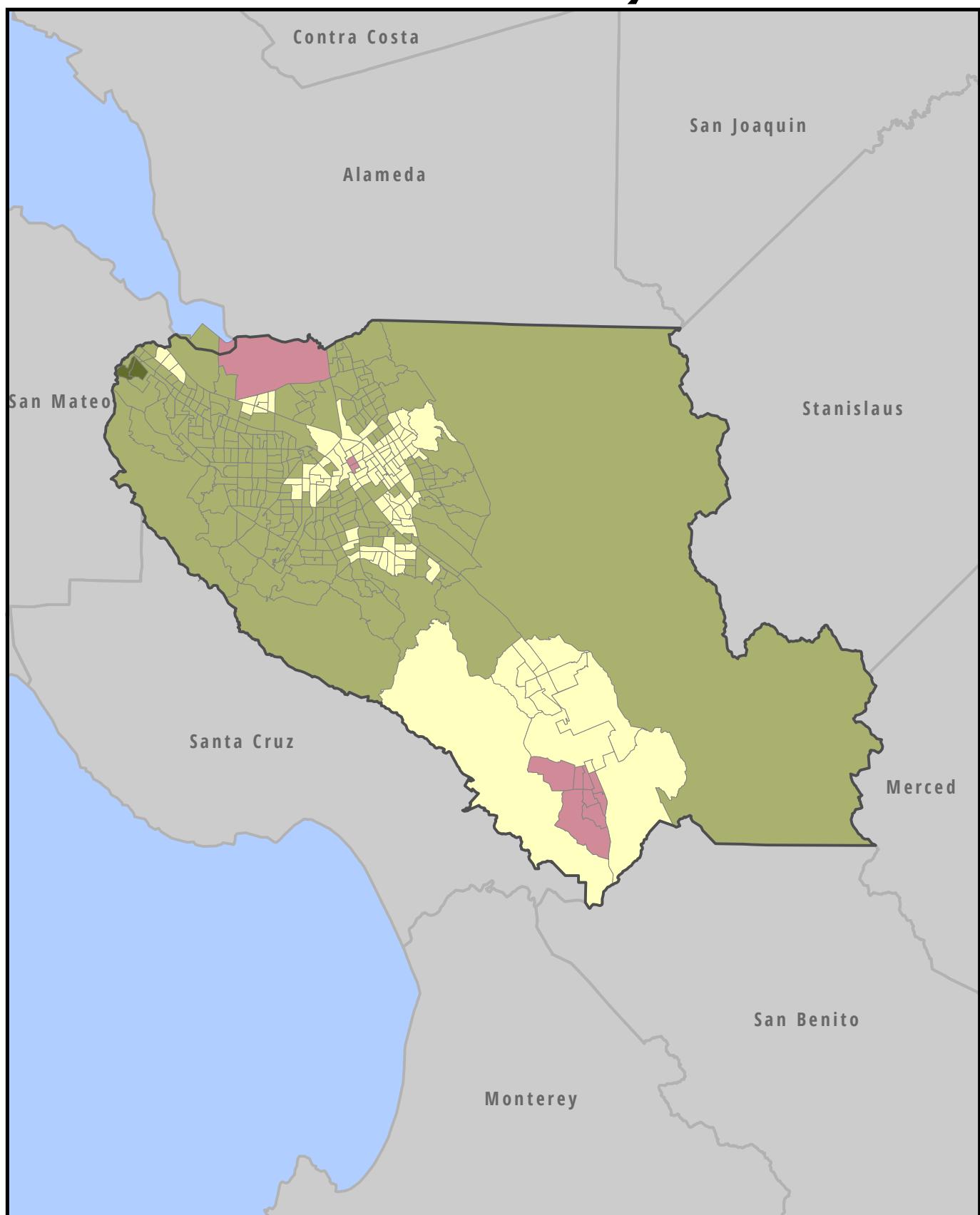
San Mateo County



Santa Barbara County

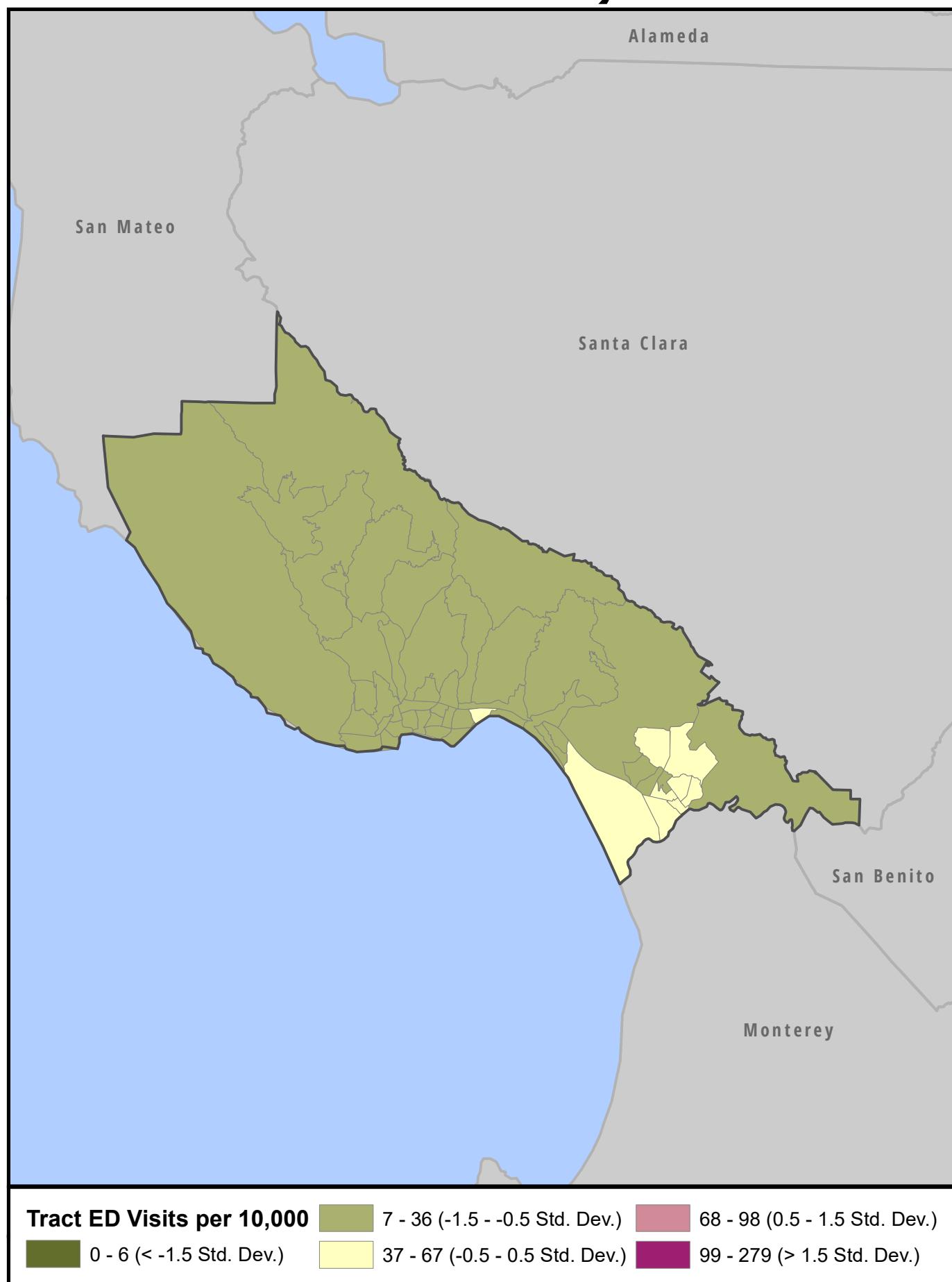


Santa Clara County

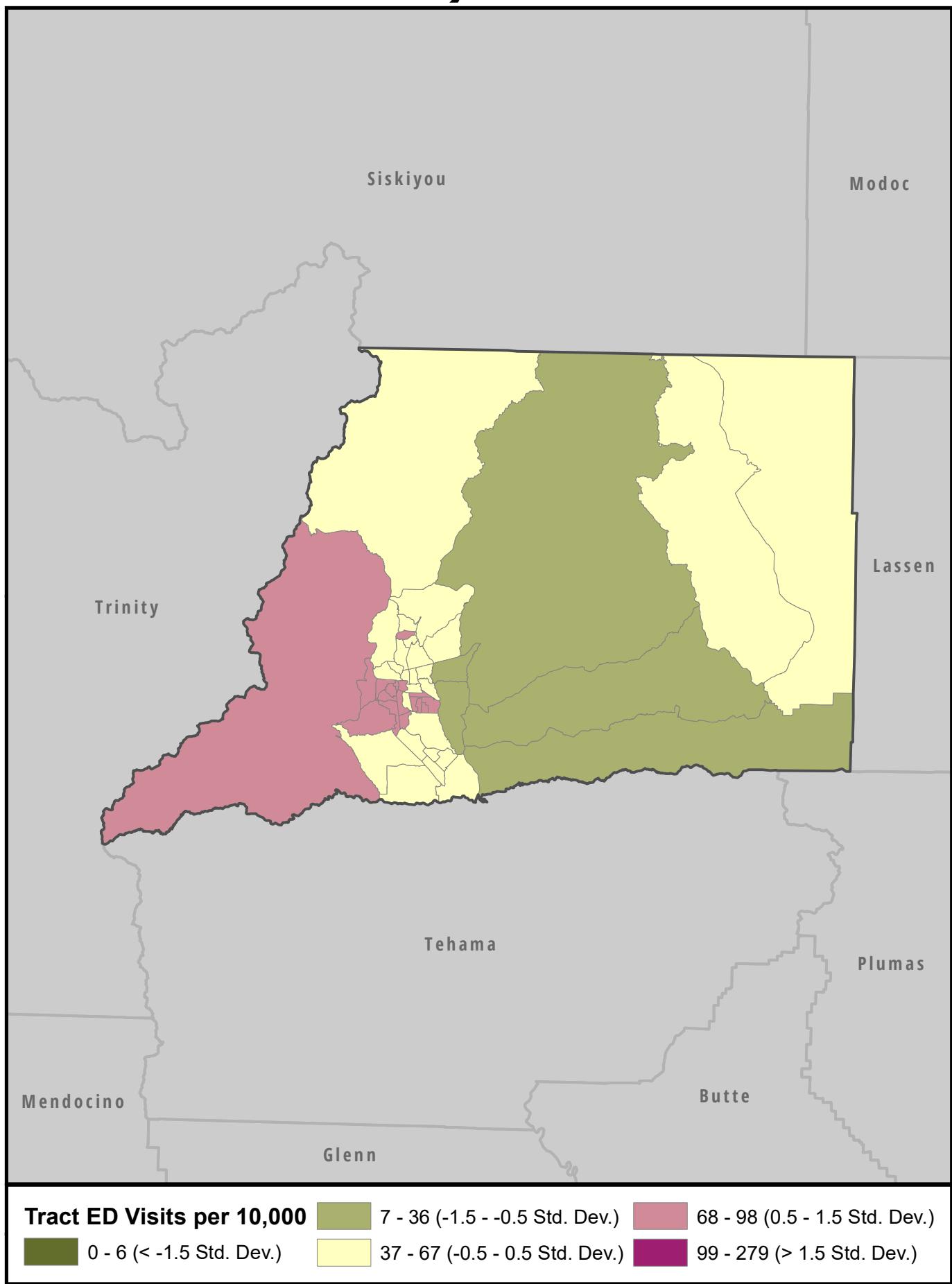


Tract ED Visits per 10,000	7 - 36 (-1.5 - -0.5 Std. Dev.)	68 - 98 (0.5 - 1.5 Std. Dev.)
0 - 6 (< -1.5 Std. Dev.)	37 - 67 (-0.5 - 0.5 Std. Dev.)	99 - 279 (> 1.5 Std. Dev.)

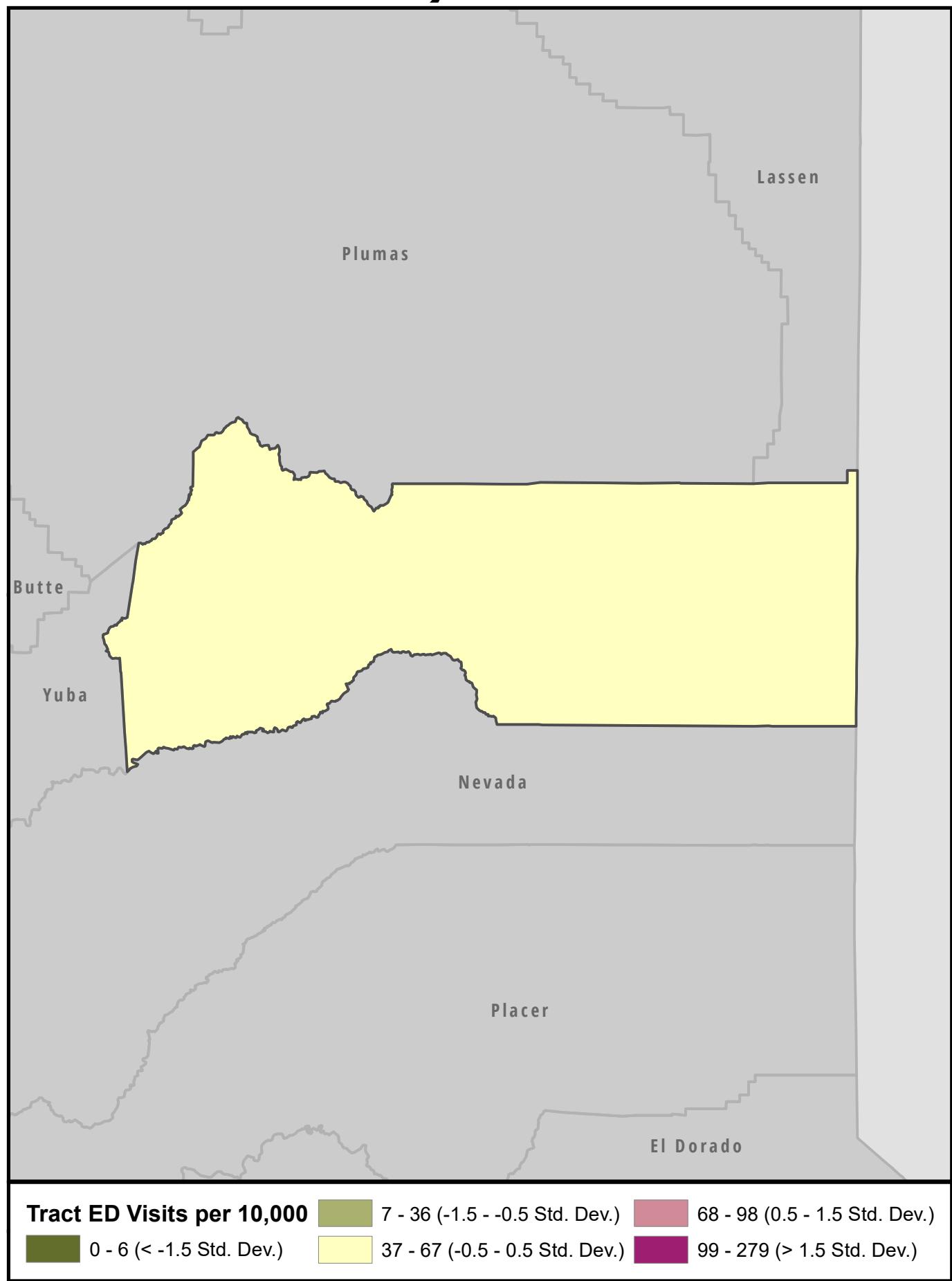
Santa Cruz County



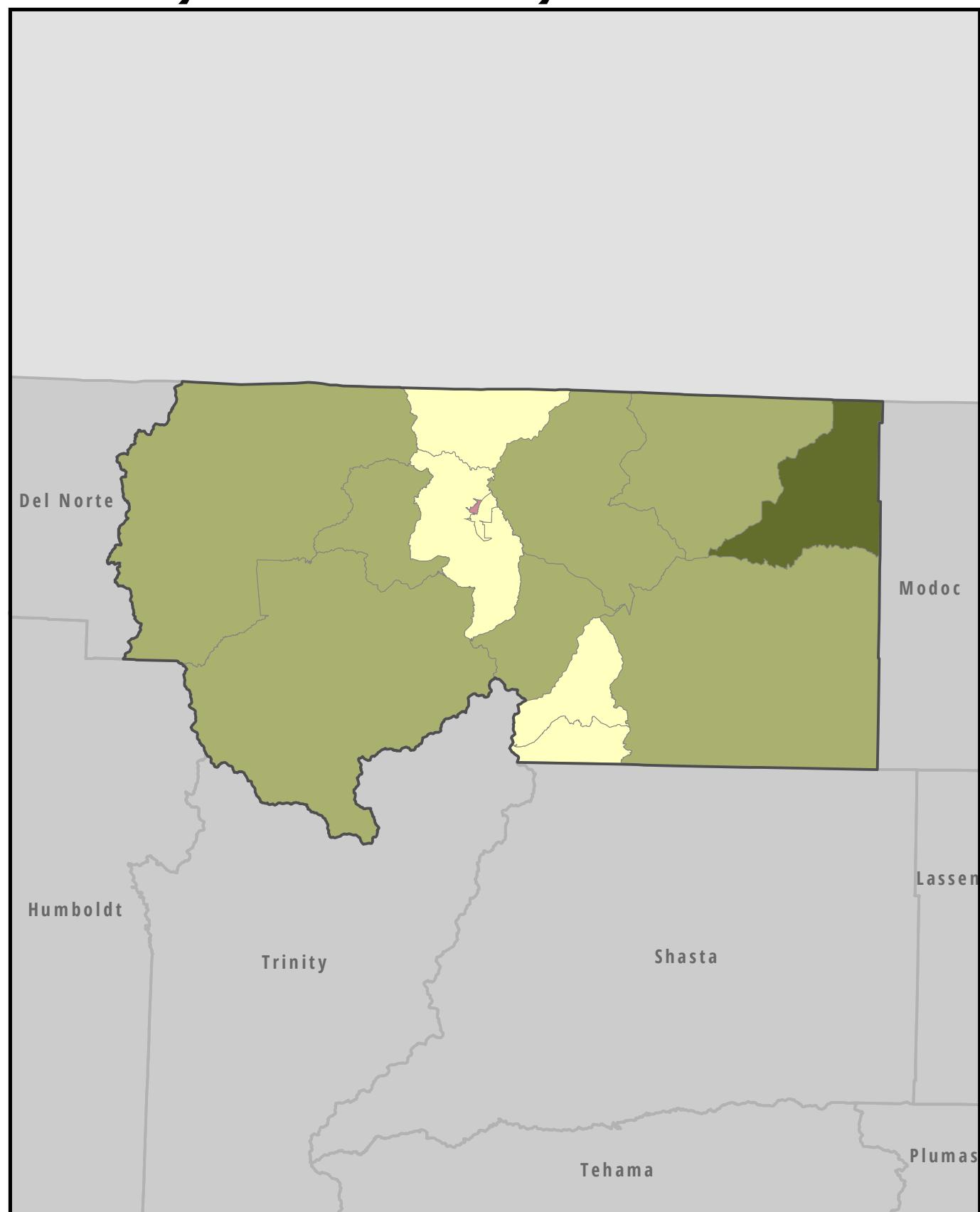
Shasta County



Sierra County

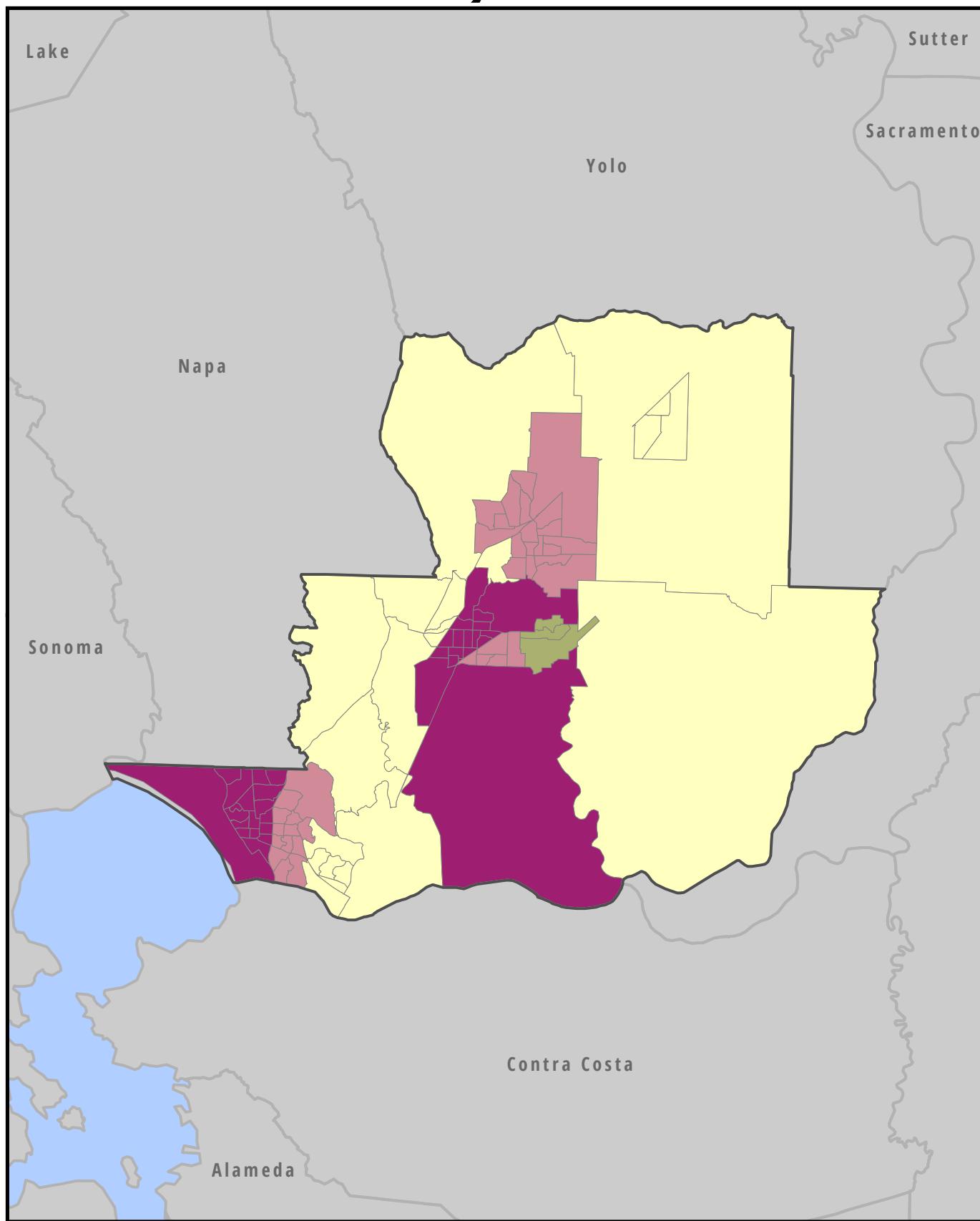


Siskiyou County



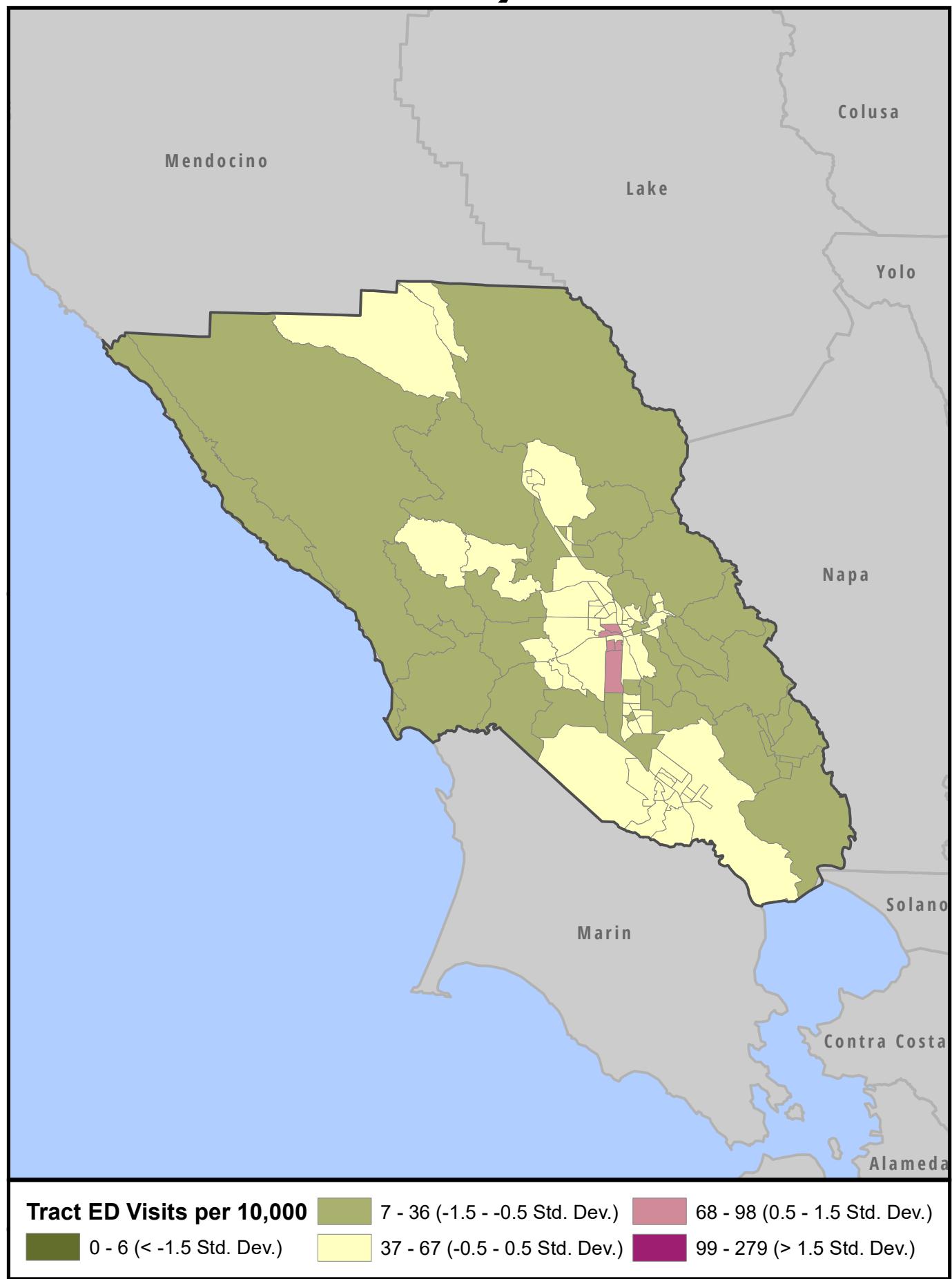
Tract ED Visits per 10,000	0 - 6 (< -1.5 Std. Dev.)	7 - 36 (-1.5 - -0.5 Std. Dev.)	37 - 67 (-0.5 - 0.5 Std. Dev.)	68 - 98 (0.5 - 1.5 Std. Dev.)	99 - 279 (> 1.5 Std. Dev.)
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Solano County

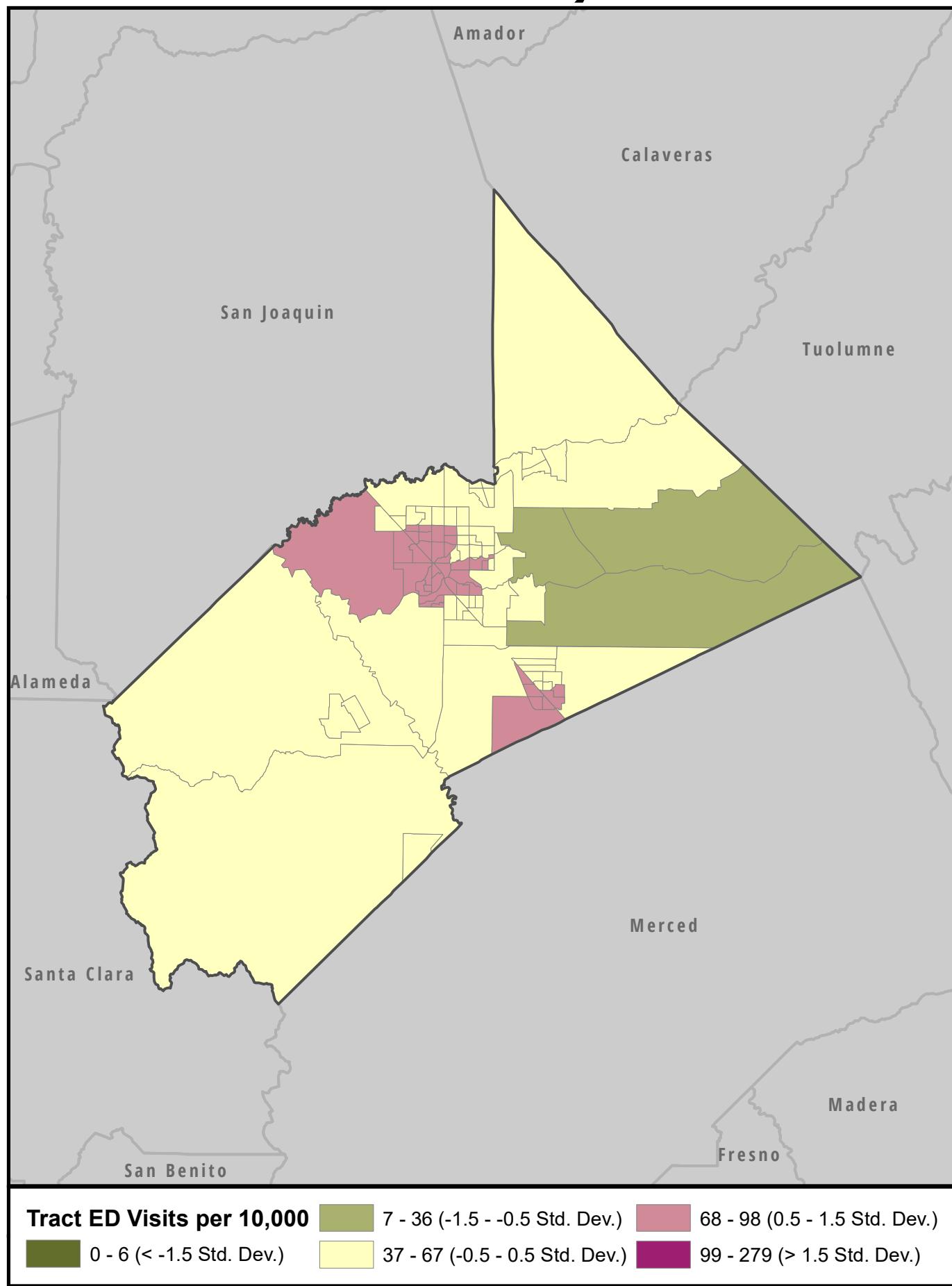


Tract ED Visits per 10,000	7 - 36 (-1.5 - -0.5 Std. Dev.)	68 - 98 (0.5 - 1.5 Std. Dev.)
0 - 6 (< -1.5 Std. Dev.)	37 - 67 (-0.5 - 0.5 Std. Dev.)	99 - 279 (> 1.5 Std. Dev.)

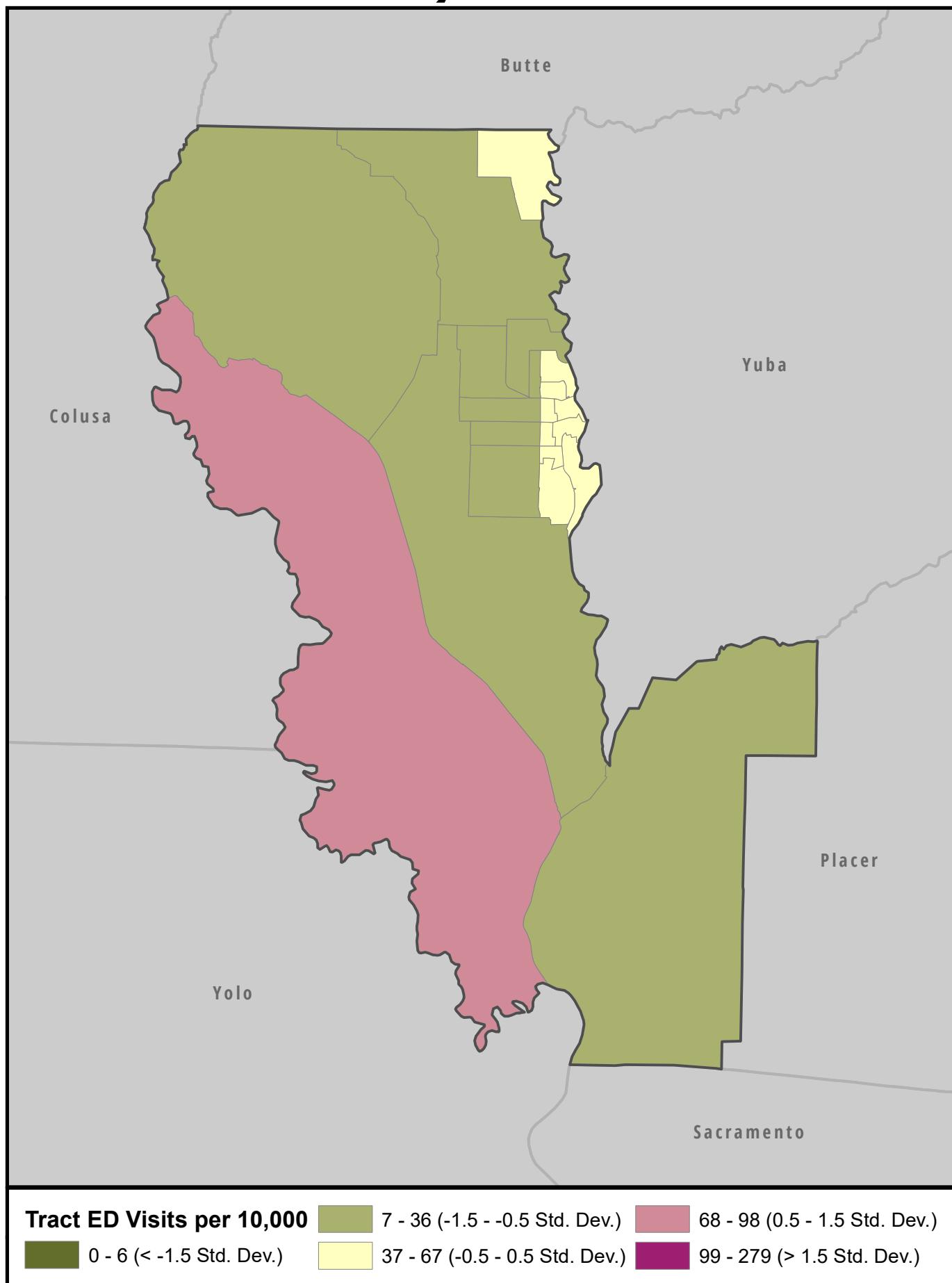
Sonoma County



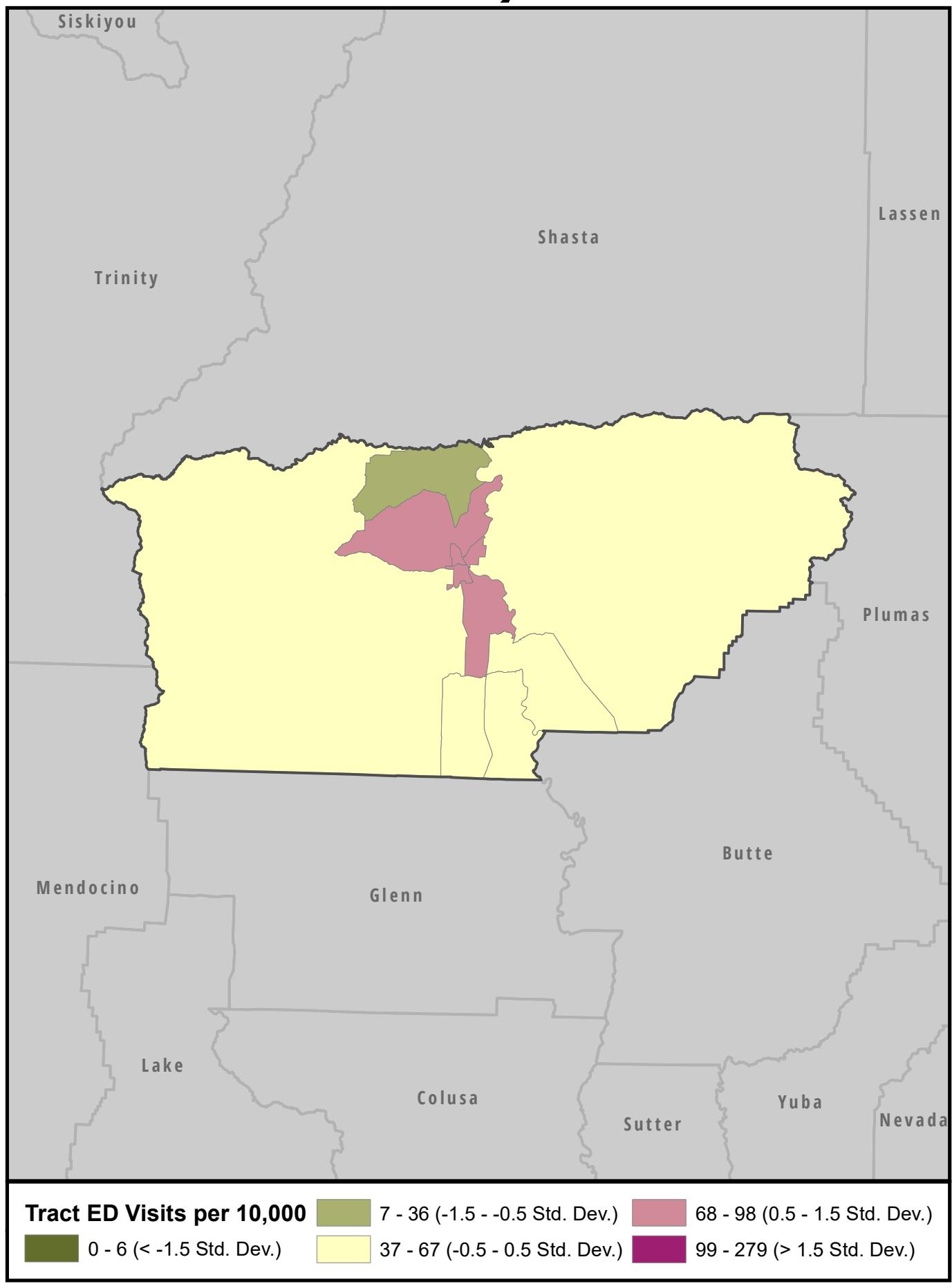
Stanislaus County



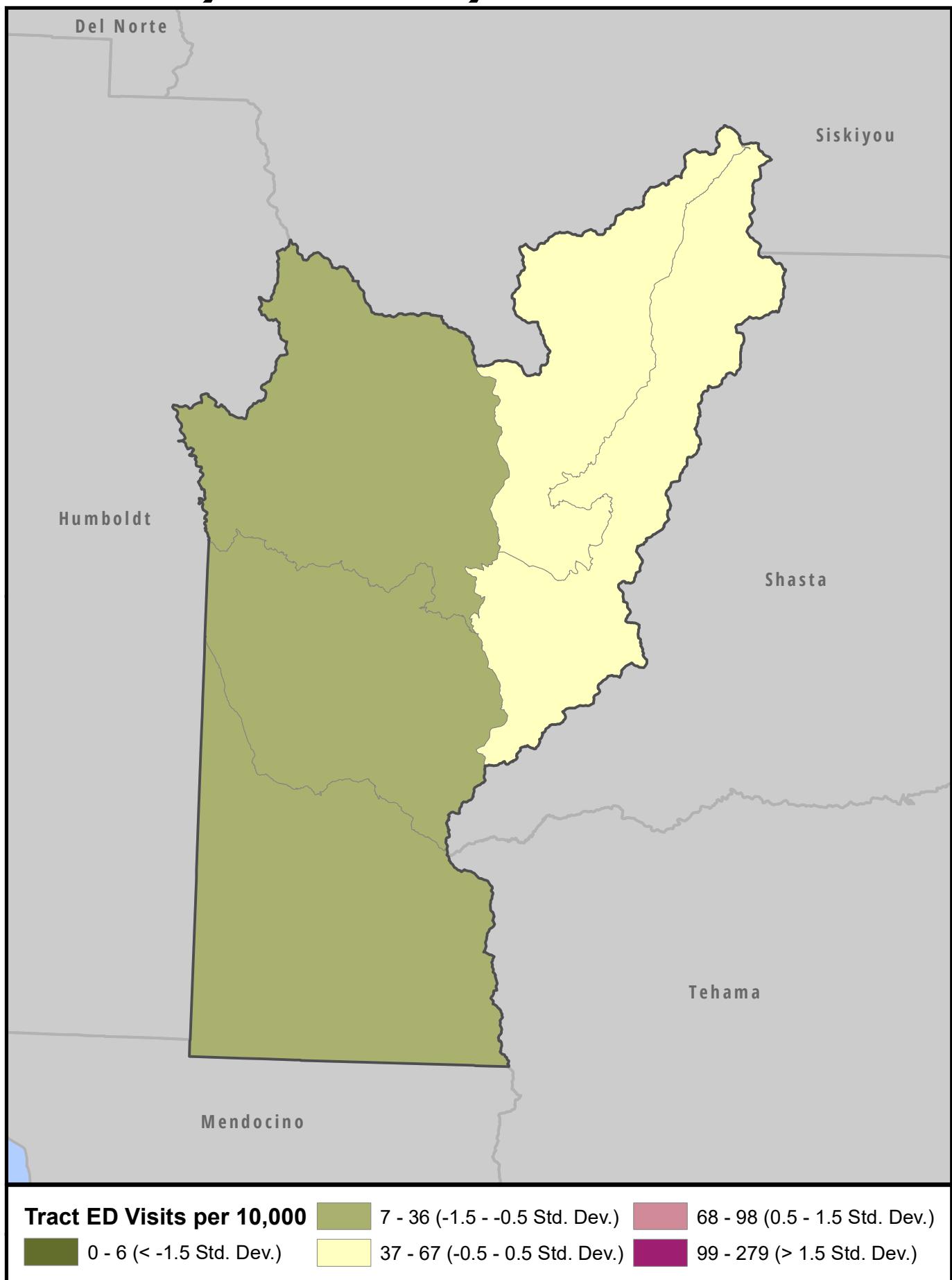
Sutter County



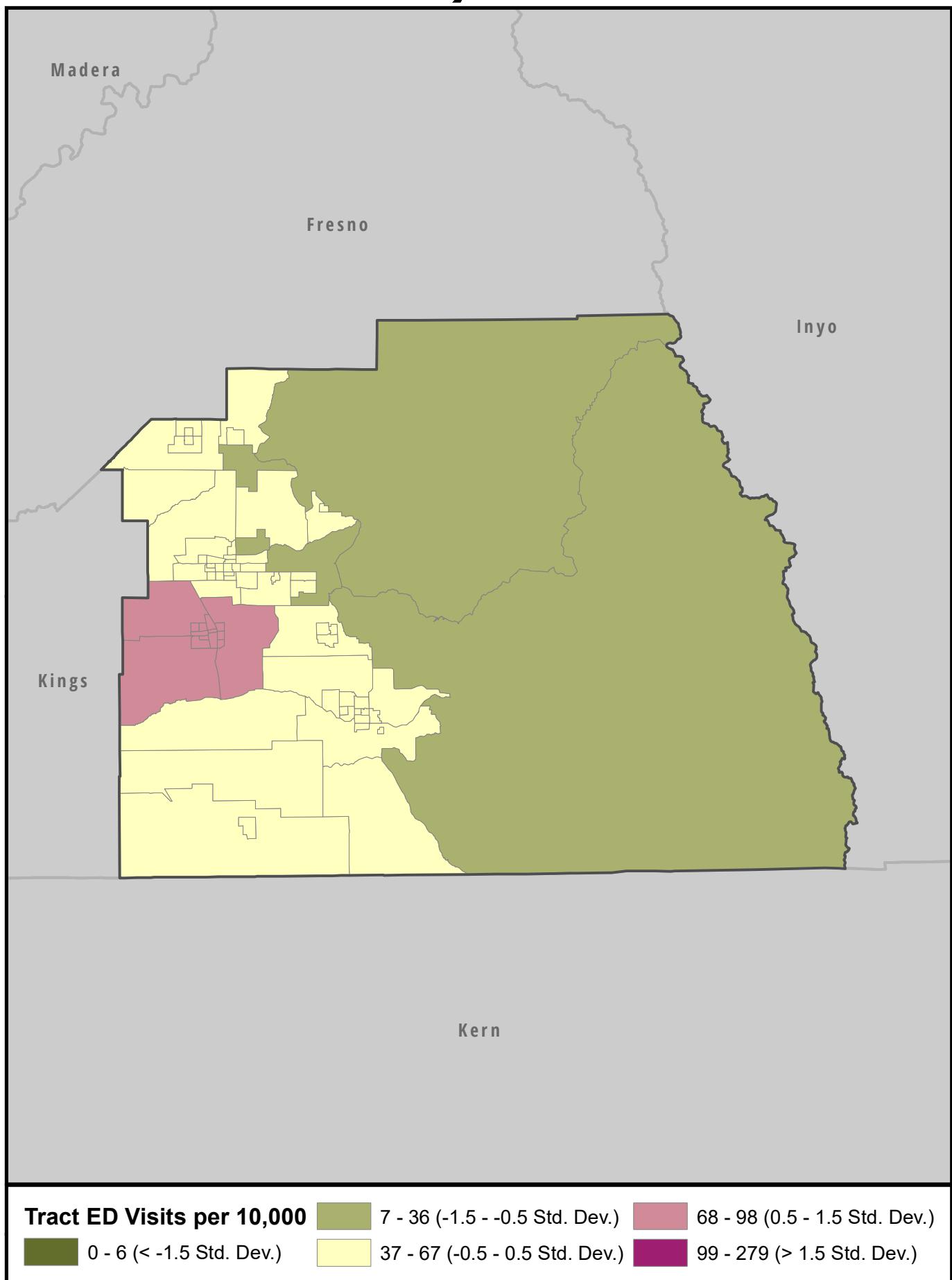
Tehama County



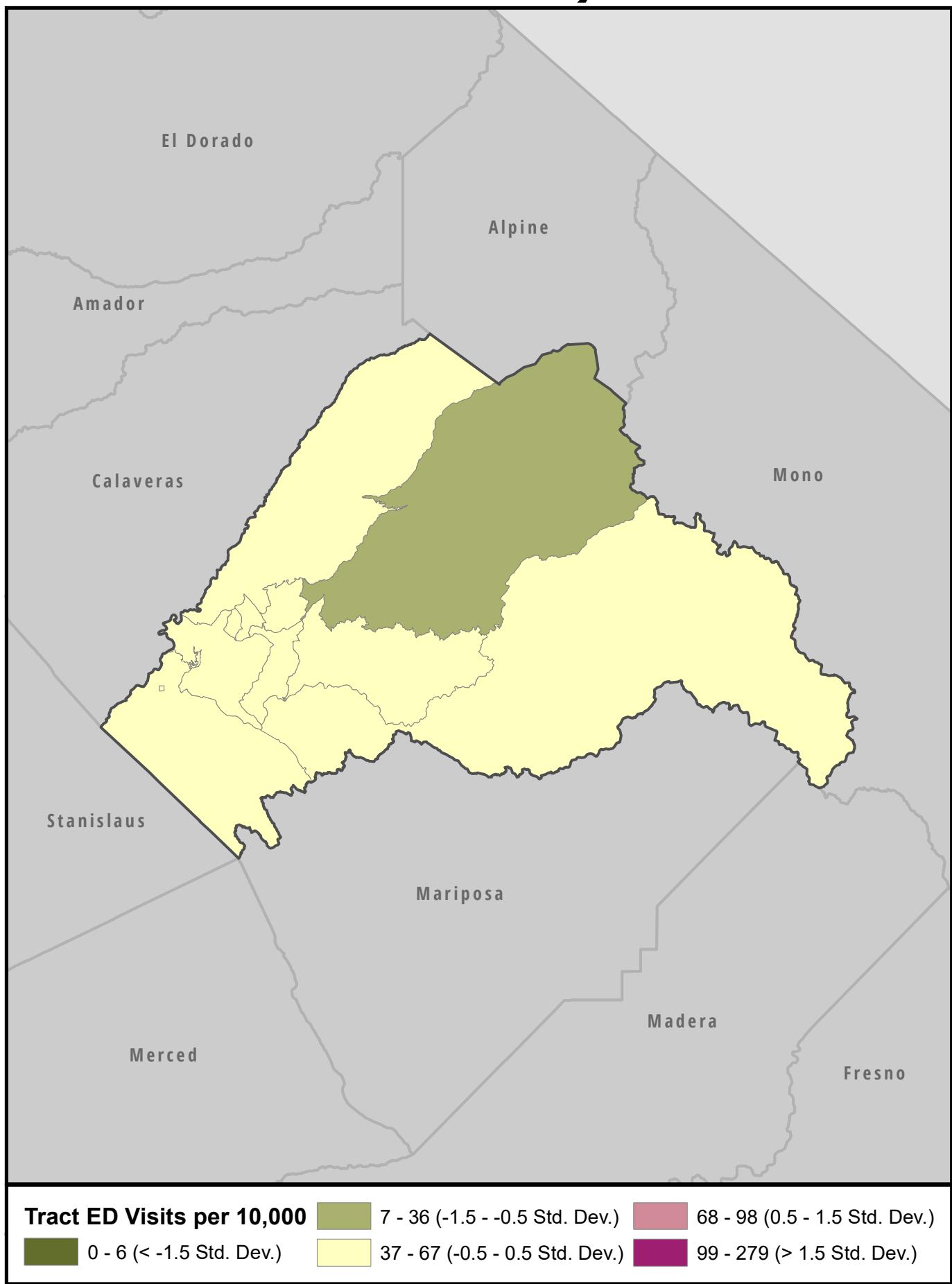
Trinity County



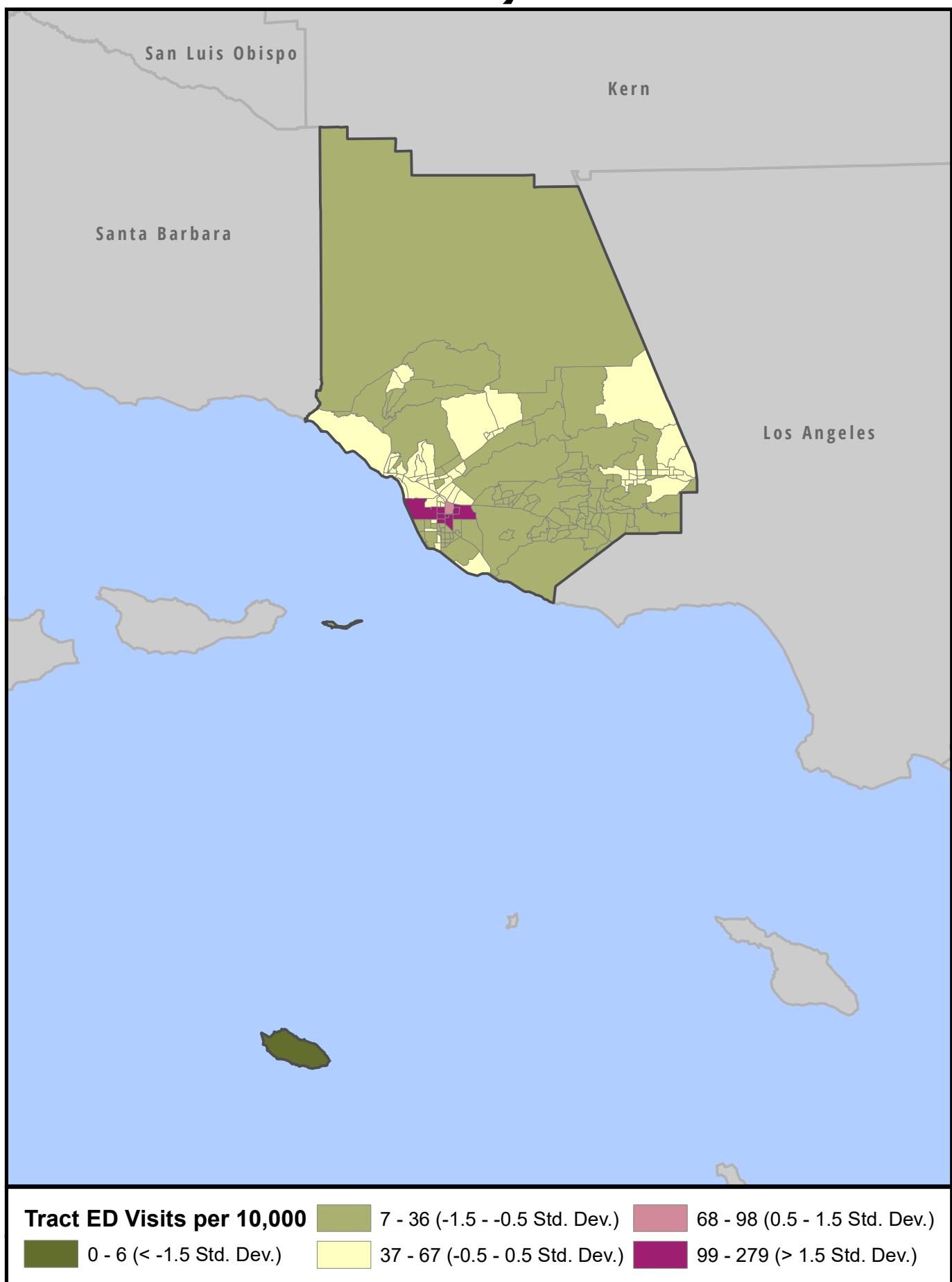
Tulare County



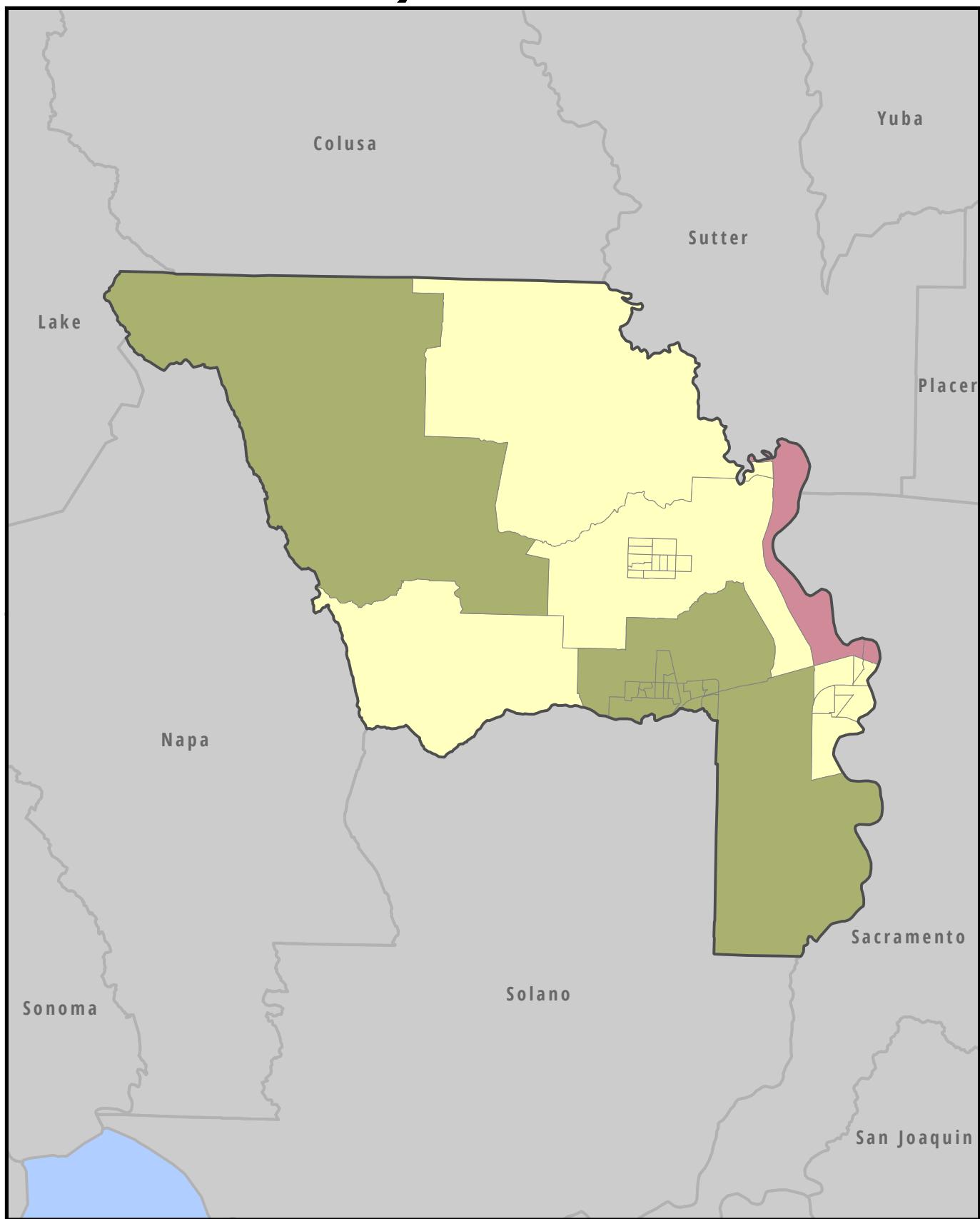
Tuolumne County



Ventura County



Yolo County



Tract ED Visits per 10,000

Dark Green	0 - 6 (< -1.5 Std. Dev.)	Light Green	7 - 36 (-1.5 - -0.5 Std. Dev.)	Pink	68 - 98 (0.5 - 1.5 Std. Dev.)
Magenta	37 - 67 (-0.5 - 0.5 Std. Dev.)			Magenta	99 - 279 (> 1.5 Std. Dev.)

Yuba County

