APPROACHES TO IDENTIFYING DISADVANTAGED COMMUNITIES

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF ENVIRONMENTAL HEALTH HAZARD ASSESSMENT
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INTRODUCTION

The California Global Warming Solutions Act of 2006 required the Air Resources Board to adopt a statewide program that could include market-based compliance mechanisms to reduce greenhouse gas emissions in the state to 1990 levels by 2020. The Board subsequently developed several programs under this authorization, including a market based Cap-and-Trade Program. Funds received from the distribution of emissions allowances as part of this program are deposited in the Greenhouse Gas Reduction Fund and, upon appropriation by the Legislature, must be used to further reduce emissions of greenhouse gases.

In 2012, the Legislature passed SB 535 and directed that, in addition to reducing greenhouse gas emissions, 25 percent of the moneys allocated from the Greenhouse Gas Reduction Fund also must go to projects that provide a benefit to disadvantaged communities (SB 535 (De León), Chapter 830, Statutes of 2012). A minimum of 10 percent of the funds must be for projects located within disadvantaged communities. The California Environmental Protection Agency (CalEPA) was given the responsibility for identifying disadvantaged communities for purposes of this legislation based on geographic, socioeconomic, public health and environmental hazard criteria. These criteria may include, but are not limited to:

- Areas disproportionately affected by environmental pollution and other hazards that can lead to negative public health effects, exposure or environmental degradation.
- Areas with concentrations of people that are of low income, high unemployment, low levels of home ownership, high rent burden, sensitive populations, or low levels of educational attainment.

This report discusses several approaches that CalEPA may take to identify disadvantaged communities. All of them rely on information generated by the California Communities Environmental Health Screening Tool (CalEnviroScreen). This tool has been developed by the Office of Environmental Health Hazard Assessment (OEHHA) to identify communities in California most burdened by pollution from multiple sources and most vulnerable to its effects, taking into account socioeconomic characteristics and underlying health status. CalEnviroScreen is well suited for the purposes described in SB 535 because many of the factors used in the tool are nearly identical to those specified in the legislation.

This report discusses how disadvantaged communities might be designated using environmental pollution and population characteristics, including socioeconomic factors, found in CalEnviroScreen. It also presents several alternative approaches that might be used to identify disadvantaged communities. The options presented here will be discussed at workshops on the designation of disadvantaged communities that will be held in Fresno, Los

Angeles and Oakland in August and September. An opportunity will also be provided for the submission of written comments and for proposals on other approaches not considered below.

Based on the information discussed here, plus the comments received at the workshops and in writing in the next several weeks, it is anticipated that CalEPA will identify disadvantaged communities for purposes of implementing SB 535 by the end of September 2014.

CALENVIROSCREEN

CalEnviroScreen was developed by OEHHA at the request of CalEPA to identify California's most pollution-burdened and vulnerable communities. The most recent version, CalEnviroScreen 2.0, adopted in August 2014, uses a quantitative method to evaluate multiple pollution sources and stressors, and vulnerability to pollution, in California's approximately 8000 census tracts. Using data from federal and state sources, the tool is made up of four components in two broad groups. Exposure and Environmental Effects components comprise a Pollution Burden group, and the Sensitive Populations and Socioeconomic Factors components comprise a Population Characteristics group. The four components are made up of environmental, health, and socioeconomic data from 19 indicators (see Figure 1). The CalEnviroScreen score is calculated by combining the individual indicator scores within each of the two groups, then multiplying the Pollution Burden and Population Characteristics scores to produce a final score. Based on these scores the census tracts across California are ranked relative to one another. For more information on CalEnviroScreen scores, see the CalEnviroScreen 2.0 report.[1]

Figure 1. CalEnviroScreen 2.0 Indicator and Component Scoring

Pollution Burden			Population Characteristics		
Exposure Indicators	Ozone Concentrations PM2.5 Concentrations Diesel PM Emissions Drinking Water Quality Pesticide Use Toxic Releases from Facilities Traffic Density	×	*Sensitive Populations Indicators*	Children and Elderly Low Birth-Weight Births Asthma Emergency Departmental Visits	= CalEnviroScreen Score
Environmental Effects Indicators	Cleanup Sites (1/2) Groundwater Threats (1/2) Hazardous Waste (1/2) Impaired Water Bodies (1/2) Solid Waste Sites and Facilities (1/2)		*Socioeconomic Factors Indicators*	Educational Attainment Linguistic Isolation Poverty Unemployment	

[1] California Communities Environmental Health Screening Tool, Version 2 (CalEnviroScreen 2.0). Guidance and Screening Tool. Office of Environmental Health Hazard Assessment and the California Environmental Protection Agency, Sacramento, CA http://www.oehha.ca.gov/ej/ces2.html. Available in English and Spanish.

The public process for developing CalEnviroScreen was a multi-year effort that included consultation with other state agencies and stakeholders representing a wide cross-section of interest groups, multiple publicly released drafts, workshops and comment periods. The process ensured transparency and the meaningful participation of all stakeholders, including low-income and minority populations, by holding workshops at convenient locations and times and providing language translation services to facilitate discussion with non-English speakers. OEHHA considered all the comments received and prepared and published a summary of comments and responses.[2] As a result of the process, CalEnviroScreen 2.0 was improved and simplified and is substantially different, compared to earlier versions. For more information on prior versions of CalEnviroScreen, see the CalEnviroScreen archives page.[3]

The following sections describe methods to identify disadvantaged communities based on CalEnviroScreen. There are two broad considerations in identifying disadvantaged communities. One consideration is the cutpoint, which determines how many census tracts and how large a population is defined as disadvantaged. For many of the methods described below, we illustrate three cutpoints: 15%, 20%, and 25%. SB 535 requires the allocation of at least 25 percent of the available proceeds to projects that provide benefits to disadvantaged communities. Therefore, we present cutpoints up to 25% to ensure disadvantaged communities receive at least a proportionate share of funds when compared to the rest of the state. With a few exceptions these cutpoints generally correspond with those same percentiles of the approximately 8,000 census tracts in California and those same percentiles of the total California population of about 37 million.

In addition to the cutpoint, there are various potential ways to select the disadvantaged communities using the CalEnviroScreen tool. In this document we present five methods, including one that represents the approach in CalEnviroScreen itself and four that have been suggested by stakeholders. Disadvantaged communities may potentially be identified as those with the:

- Top scores (combined pollution burden and population characteristics) (Method 1)
- Top scores for pollution burden only (Method 2)
- Top scores for population characteristics only (Method 3)
- Top scores using equal cutpoints for pollution burden and population characteristics (Method 4) or
- High and medium high score categories (Method 5)

All of these methods require the choice of a percentile cutpoint. This document describes each of these five methods. Statewide and regional breakdowns of maps for the census tracts that would result from each method are shown for illustration purposes. The regional graphs include nine regions shown in Table 1.

[2] Comments received on the draft CalEnviroScreen Version 2.0; available at: http://oehha.ca.gov/ej/ces2comments.html

[3] CalEnviroScreen Archive; available at http://www.oehha.ca.gov/ej/archive.html.

Table 1. Regions Used in Figures

Regions	Counties Within Region
San Diego and Imperial	San Diego, Imperial
Inland Valley	San Bernardino, Riverside
Los Angeles	Los Angeles, Ventura, Orange
Central Coast	Monterey, San Luis Obispo, Santa Barbara, Santa Cruz, San Benito
Bay Area	San Francisco, Marin, Sonoma, Napa, Solano, Contra Costa, Alameda, Santa Clara, San Mateo
Sacramento	El Dorado, Placer, Sacramento, Yolo, Sutter, Yuba
North State	Del Norte, Siskiyou, Modoc, Humboldt, Trinity, Shasta, Lassen, Tehama, Plumas, Sierra, Nevada, Butte, Glenn, Colusa, Lake, Mendocino
Central Valley	San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, Tulare, Kern, Mariposa, Tuolumne, Calaveras, Amador
Southern Sierra	Alpine, Mono, Inyo

CALENVIROSCREEN (METHOD 1)

Previous versions of CalEnviroScreen (e.g., CalEnviroScreen 1.1) used zip codes, rather than census tracts, to compare communities and focused on the top 10 percent of highest scoring zip codes, which captured about 20 percent of the total state population. The current version, CalEnviroScreen 2.0, focuses on census tracts, which are generally smaller and less populated than zip codes. A 20% cut point captures about the same proportion of the state population as the 10% cutpoint used in earlier versions of CalEnviroScreen. For comparative purposes, the following figures also identify the top 15% and 25% highest scoring census tracts in CalEnviroScreen 2.0 (Figure 2 and 3). Figure 2 displays each of the state's nearly 8,000 census tracts represented as a dot according to its Population Characteristics Score and Pollution Burden Score. Census tracts with highest pollution burden appear near the top of the figures, and those with greatest vulnerability due to population characteristics (health and socioeconomic) appear near the right hand side of the figures. In each figure, the red dots represent the top 15% scoring census tracts, the green dots represent those in the top 15-20%, and the orange dots are those in the top 20-25%. Thus the approach of choosing the top 20% of CalEnviroScreen scores for identifying disadvantaged communities would include census tract dots colored in red and green.

CalEnviroScreen scores are calculated by multiplying the pollution burden and population characteristics categories together into a single unified score which can be cut at any percentile. This approach is based on several scientific principles including:

1. Scientific Literature: Existing research on environmental pollutants has consistently identified socioeconomic, age and other sensitivity factors as "effect modifiers" that can increase health risk by factors ranging from 3-fold to 10-fold or greater, depending on the combination of pollutants and underlying susceptibilities.
2. Risk Assessment Principles: Some people (such as children) may be 10 times more sensitive to some chemical exposures than others. Risk assessments, using principles first advanced by the National Academy of Sciences, apply numerical factors or multipliers to account for potential human sensitivity (as well as other factors such as data gaps) in deriving acceptable exposure levels.
3. Established Risk Scoring Systems: Priority-rankings done by various emergency response organizations to score threats have used scoring systems with the formula: Risk = Threat × Vulnerability.

For these reasons, there is a scientific foundation for the CalEnviroScreen top scoring census tracts, and this approach is recommended for consideration as a method for identifying disadvantaged communities.

Figure 2. Using combined pollution burden scores and population characteristics scores to identify disadvantaged communities (Method 1)

Figure 2 Legend

- Red dots are in the top 15% of CalEnviroScreen scores
- Green dots have CalEnviroScreen scores in the top 15 to 20%
- Orange dots have CalEnviroScreen scores in the top 20 to 25%

Figure 3 provides a regional view of the top 15, 20, and 25% highest scoring CalEnviroScreen census tracts. The regions were broken up to show the collective distribution of pollution burden and vulnerability throughout the state. Seven of the nine regions have census tracts that are within the top 15 and 20% of CalEnviroScreen scores whereas eight of the nine regions have census tracts within the top 25% of CalEnviroScreen scores. The census tracts with the highest CalEnviroScreen scores are shown on the following page.

Figure 3. Using the top 15, 20, and 25% highest scoring census tracts to identify disadvantaged communities by region based on CalEnviroScreen scores (Method 1)

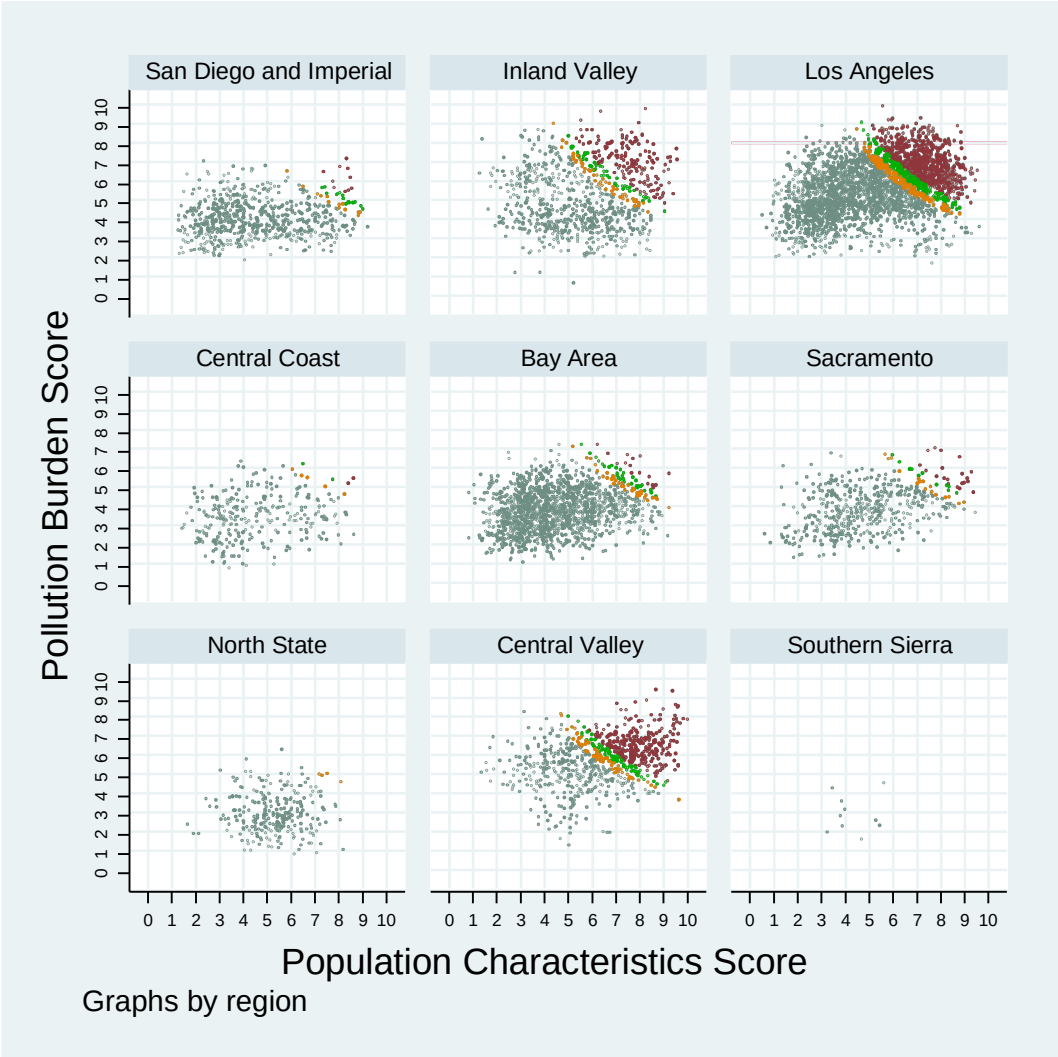
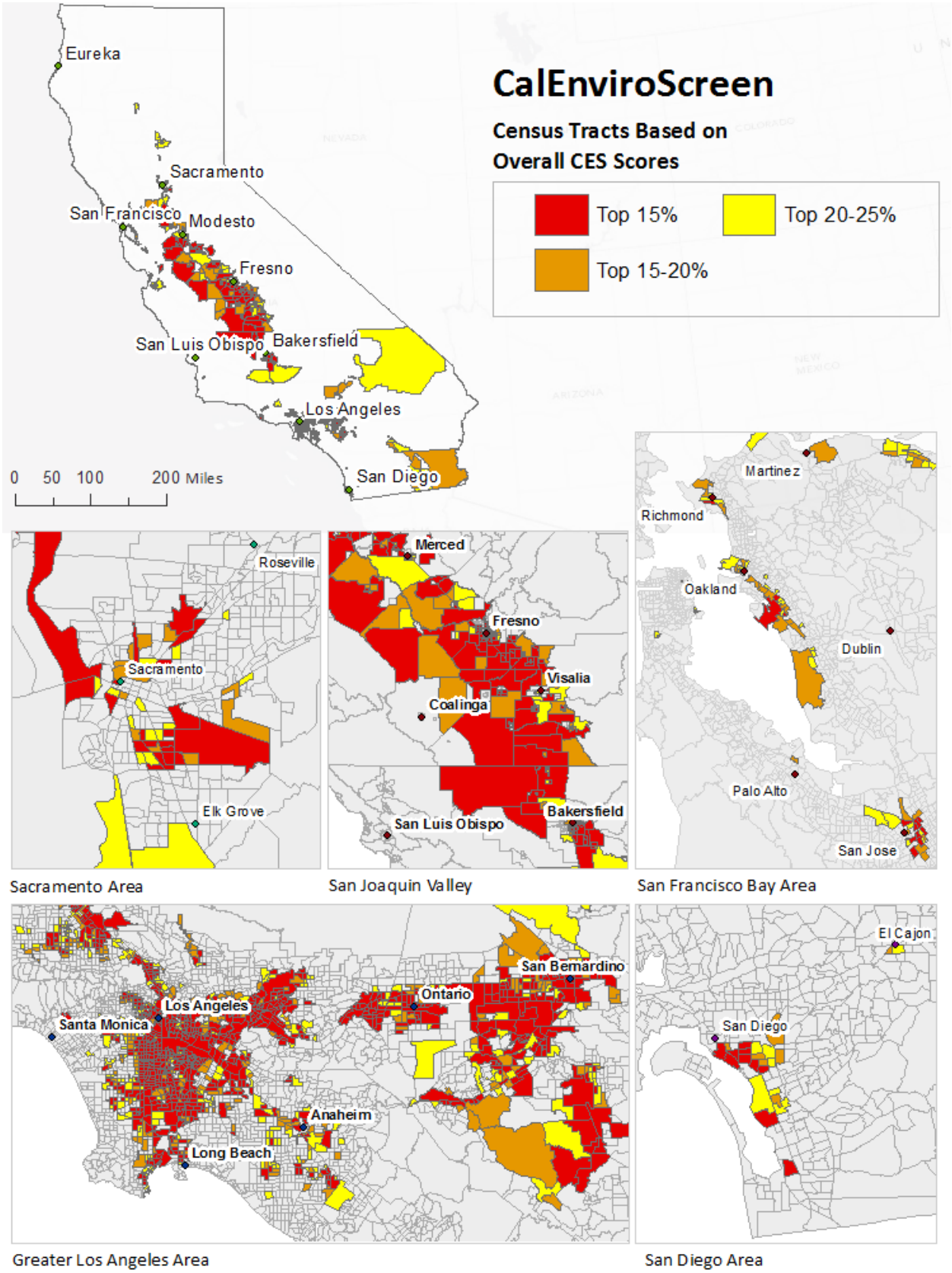


Figure 3 Legend

- Red dots are in the top 15% of CalEnviroScreen scores
- Green dots have CalEnviroScreen scores in the top 15 to 20%
- Orange dots have CalEnviroScreen scores in the top 20 to 25%


CalEnviroScreen
Census Tracts Based on
Overall CES Scores
Top 15%
Top 20-25%
Top 15-20%
Eureka
Sacramento
San Francisco
Modesto
Fresno
San Luis Obispo
Bakersfield
Los Angeles
San Diego
0 50 100 200 Miles
Roseville
Sacramento
Elk Grove
Merced
Fresno
Visalia
Coalinga
San Luis Obispo
Bakersfield
Martinez
Richmond
Oakland
Dublin
Palo Alto
San Jose
Sacramento Area
San Joaquin Valley
San Francisco Bay Area
San Bernardino
Ontario
Los Angeles
Santa Monica
Anaheim
Long Beach
El Cajon
San Diego
Greater Los Angeles Area
San Diego Area

POLLUTION BURDEN ONLY (METHOD 2)

During the public comment period, there were suggestions to use only Pollution Burden to identify disadvantaged communities. This approach would have the disadvantage of omitting any consideration of socioeconomic factors and underlying vulnerabilities, criteria required by SB 535, including multiple factors specifically mentioned in SB 535, such as unemployment, low income, educational attainment, and sensitive populations. Figure 4 was created to show the highest 15, 20, and 25% scoring Pollution Burden census tracts as an alternative approach to identifying disadvantaged communities. The census tracts with the highest pollution burden scores are shown on page 11.

Figure 4. Using highest scoring pollution burden scores to identify disadvantaged communities

Figure 4 Legend

- Red dots are in the top 15% of Pollution Burden scores
- Green dots have Pollution Burden scores in the top 15 to 20%
- Orange dots have Pollution Burden scores in the top 20 to 25%

Figure 5. Using highest scoring pollution burden scores to identify disadvantaged communities by region

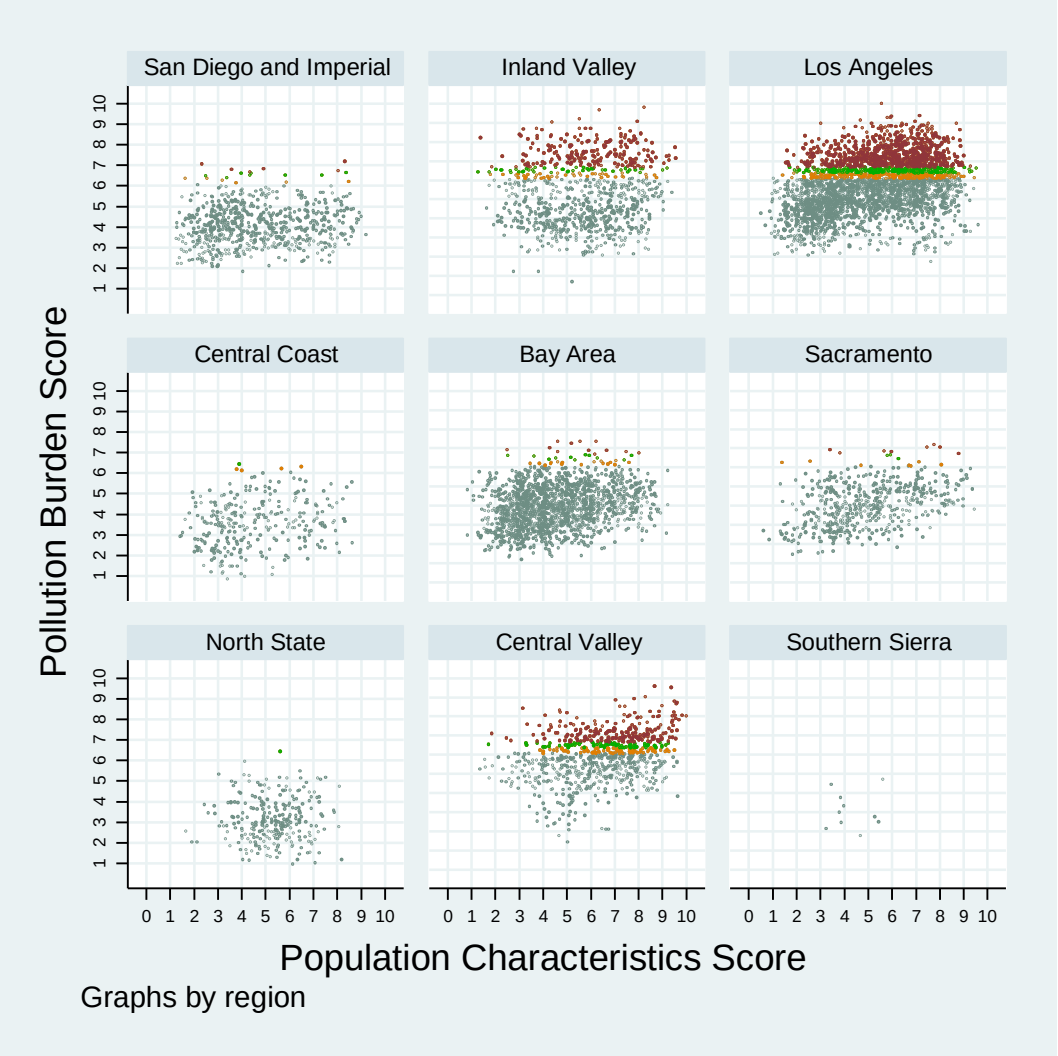
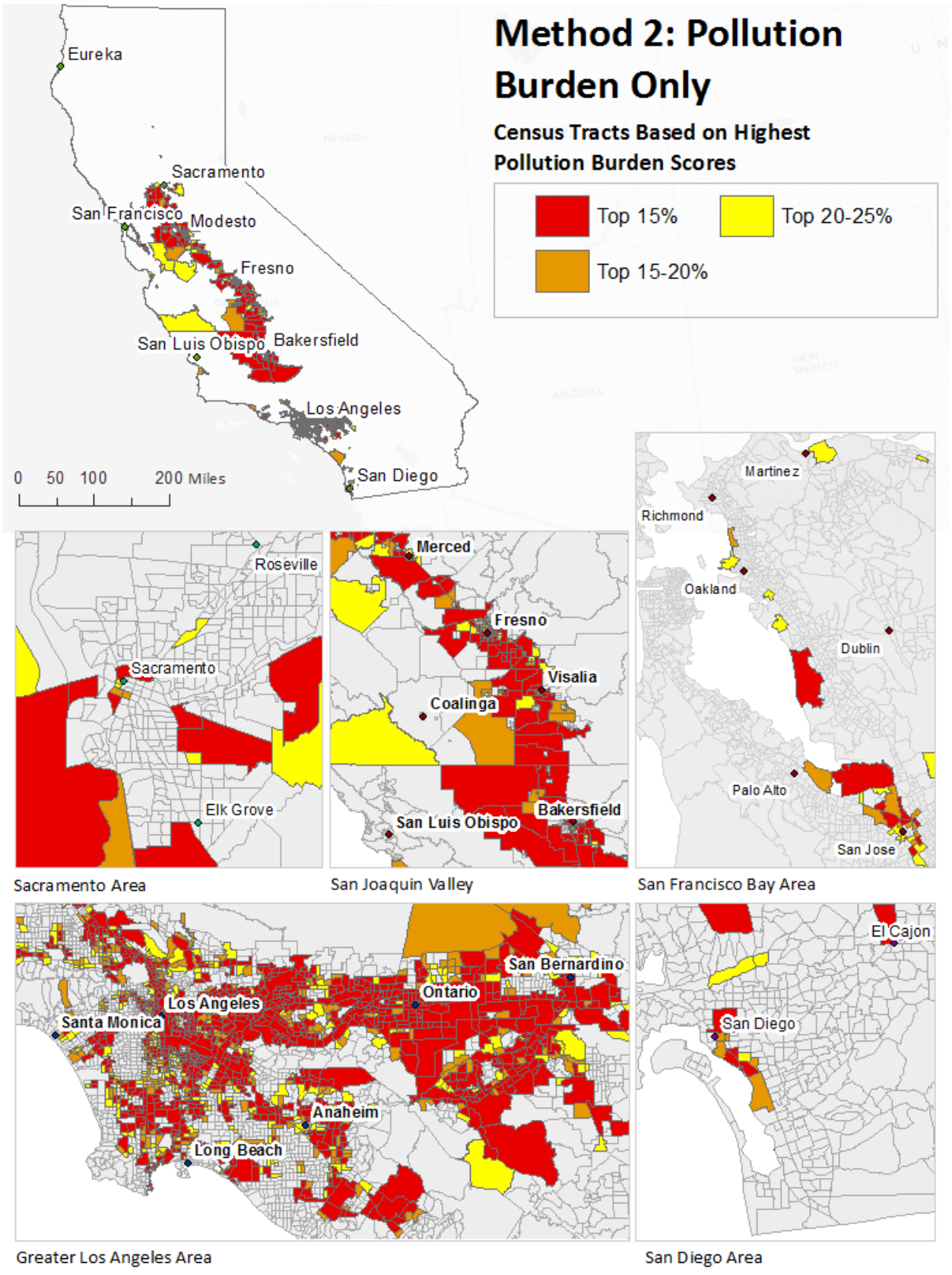


Figure 5 Legend

- Red dots are in the top 15% of Pollution Burden scores
- Green dots have Pollution Burden scores in the top 15 to 20%
- Orange dots have Pollution Burden scores in the top 20 to 25%


Method 2: Pollution Burden Only
Census Tracts Based on Highest Pollution Burden Scores
Top 15%
Top 20-25%
Top 15-20%
Eureka
Sacramento
San Francisco
Modesto
Fresno
San Luis Obispo
Bakersfield
Los Angeles
San Diego
0 50 100 200 Miles
Roseville
Sacramento
Elk Grove
Merced
Fresno
Visalia
Coalinga
San Luis Obispo
Bakersfield
Martinez
Richmond
Oakland
Dublin
Palo Alto
San Jose
Sacramento Area
San Joaquin Valley
San Francisco Bay Area
San Bernardino
Ontario
Los Angeles
Santa Monica
Anaheim
Long Beach
El Cajon
San Diego
Greater Los Angeles Area
San Diego Area

POPULATION CHARACTERISTICS ONLY (METHOD 3)

During the public comment period there was also the suggestion to use only population characteristics to identify disadvantaged communities. This approach would have the disadvantage of omitting any consideration of pollution factors, a criterion required by SB 535, including completely omitting considerations of exposure and environmental degradation. To further investigate this alternative approach Figure 6 was created to visualize how census tracts would score in population characteristics if pollution burden was not included. The census tracts with the highest population characteristics scores are shown on page 14.

Figure 6. Using highest scoring population characteristic scores to identify disadvantaged communities

Figure 6 Legend

- Red dots are in the top 15% of Population Characteristic scores
- Green dots have Population Characteristic scores in the top 15 to 20%
- Orange dots have Population Characteristic scores in the top 20 to 25%

Figure 7. Using highest scoring population characteristic scores to identify disadvantaged communities

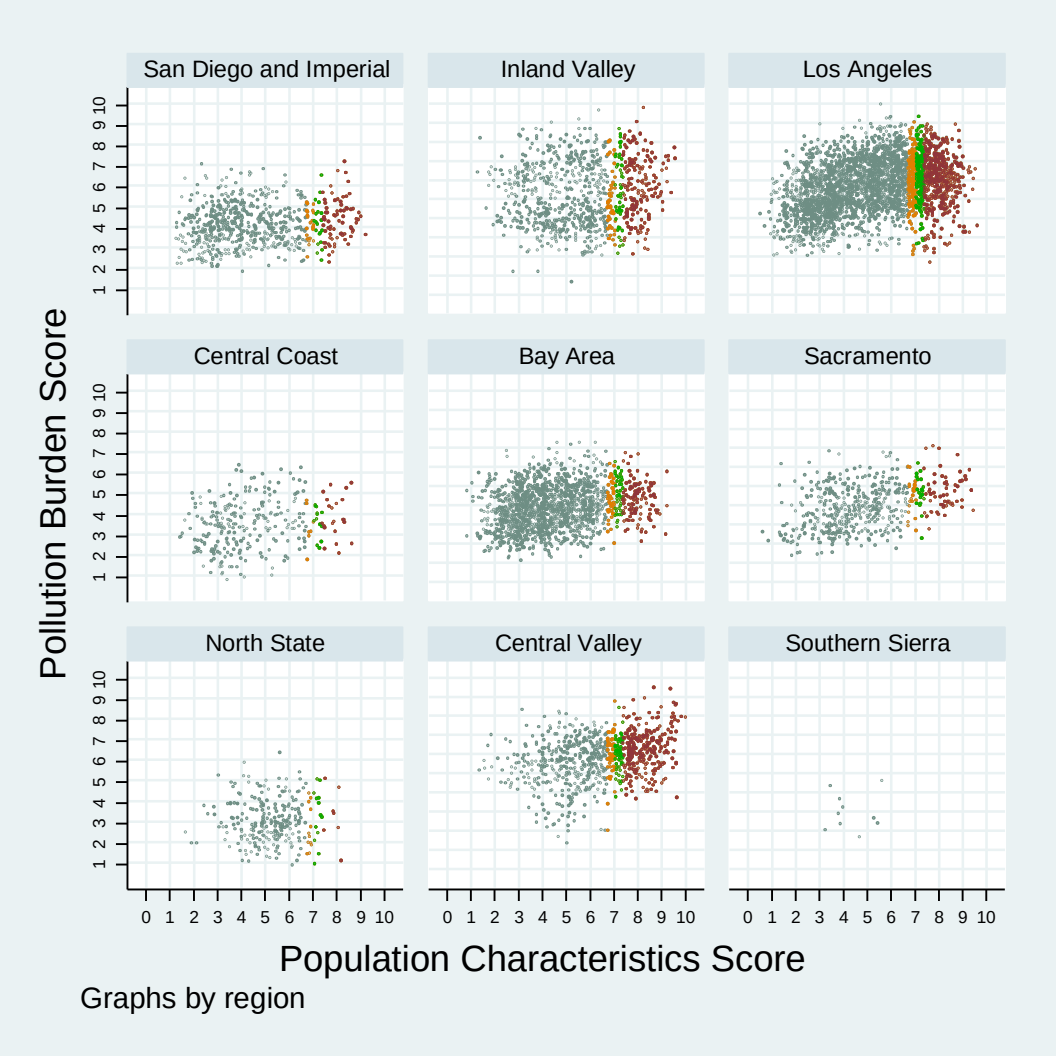
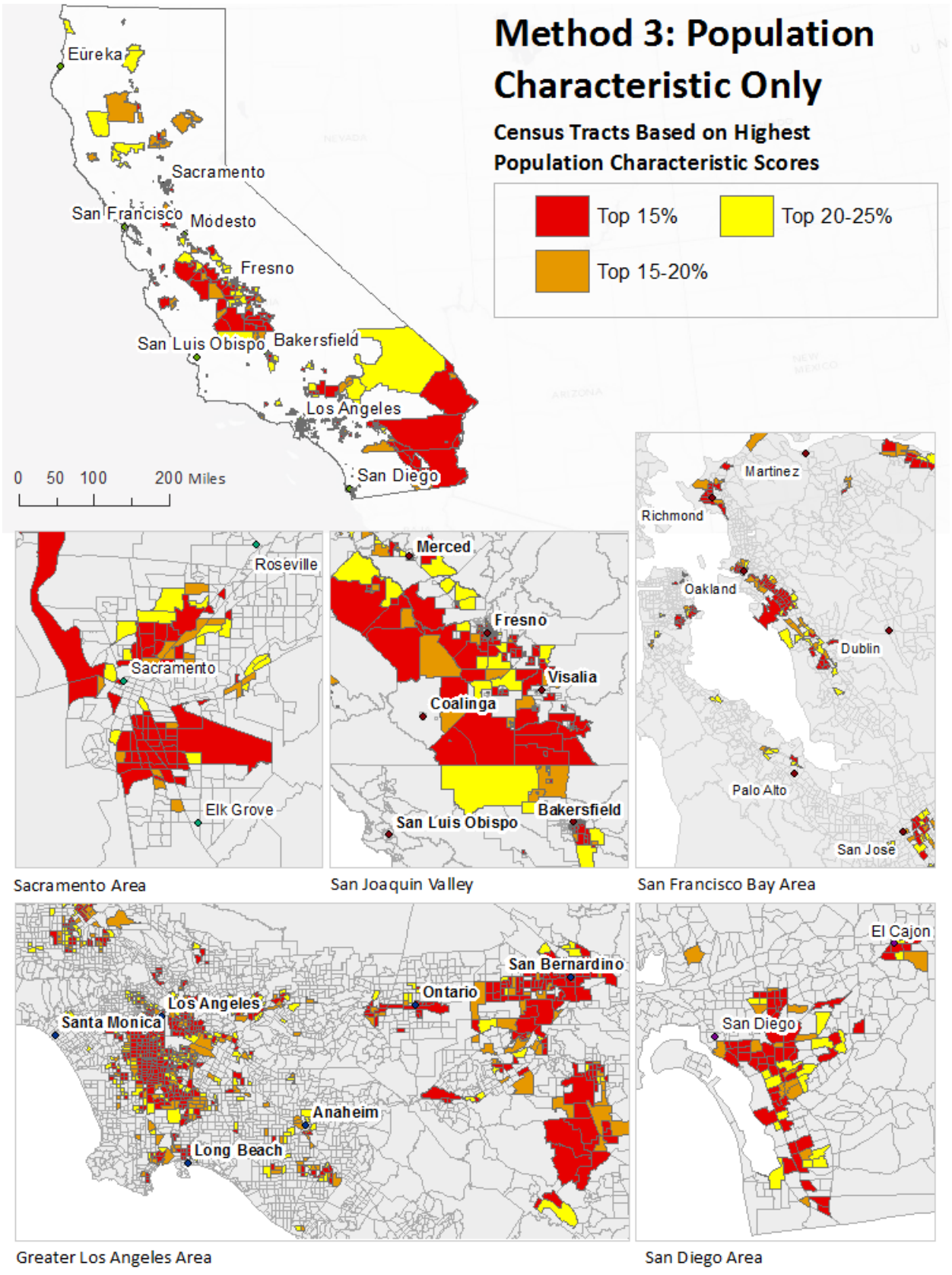


Figure 7 Legend

- Red dots are in the top 15% of Population Characteristic scores
- Green dots have Population Characteristic scores in the top 15 to 20%
- Orange dots have Population Characteristic scores in the top 20 to 25%


Method 3: Population Characteristic Only
Census Tracts Based on Highest Population Characteristic Scores
Top 15%
Top 20-25%
Top 15-20%
Eureka
Sacramento
San Francisco
Modesto
Fresno
San Luis Obispo
Bakersfield
Los Angeles
San Diego
0 50 100 200 Miles
Roseville
Sacramento
Elk Grove
Merced
Fresno
Visalia
Coalinga
San Luis Obispo
Bakersfield
Martinez
Richmond
Oakland
Dublin
Palo Alto
San Jose
Sacramento Area
San Joaquin Valley
San Francisco Bay Area
San Bernardino
Ontario
Los Angeles
Santa Monica
Anaheim
Long Beach
El Cajon
San Diego
Greater Los Angeles Area
San Diego Area

EQUAL CUTPOINTS FOR POLLUTION BURDEN AND POPULATION CHARACTERISTICS (METHOD 4)

The fourth method to consider for identifying disadvantaged communities can be seen in Figure 8. This approach looks at only high pollution burden and population characteristic scores, thus preventing census tracts that are below average in either pollution burden or population characteristics from being classified as disadvantaged. This approach captures census tracts not included in Method 1 that are in the medium range for both indicators.

Figure 8. Using equal cutpoints for pollution burden and population characteristic scores to identify disadvantaged communities

Figure 8 Legend

- Red dots are in the top 15% using equal cutpoints for pollution burden and population characteristic scores
- Green dots are in the top 15 to 20%
- Orange dots are in the top 20 to 25%

The percentage of census tracts and population covered for each region using Method 4 is also provided (Figure 9). Seven of the nine regions have census tracts that are within the top 15 and 20% of CalEnviroScreen scores whereas eight of the nine regions have census tracts within the top 25% of CalEnviroScreen scores. The census tracts with the highest scores based on the equal-cutpoints approach are shown on the following page.

Figure 9. Using a high pollution burden score and population characteristics score to identify disadvantaged communities by region

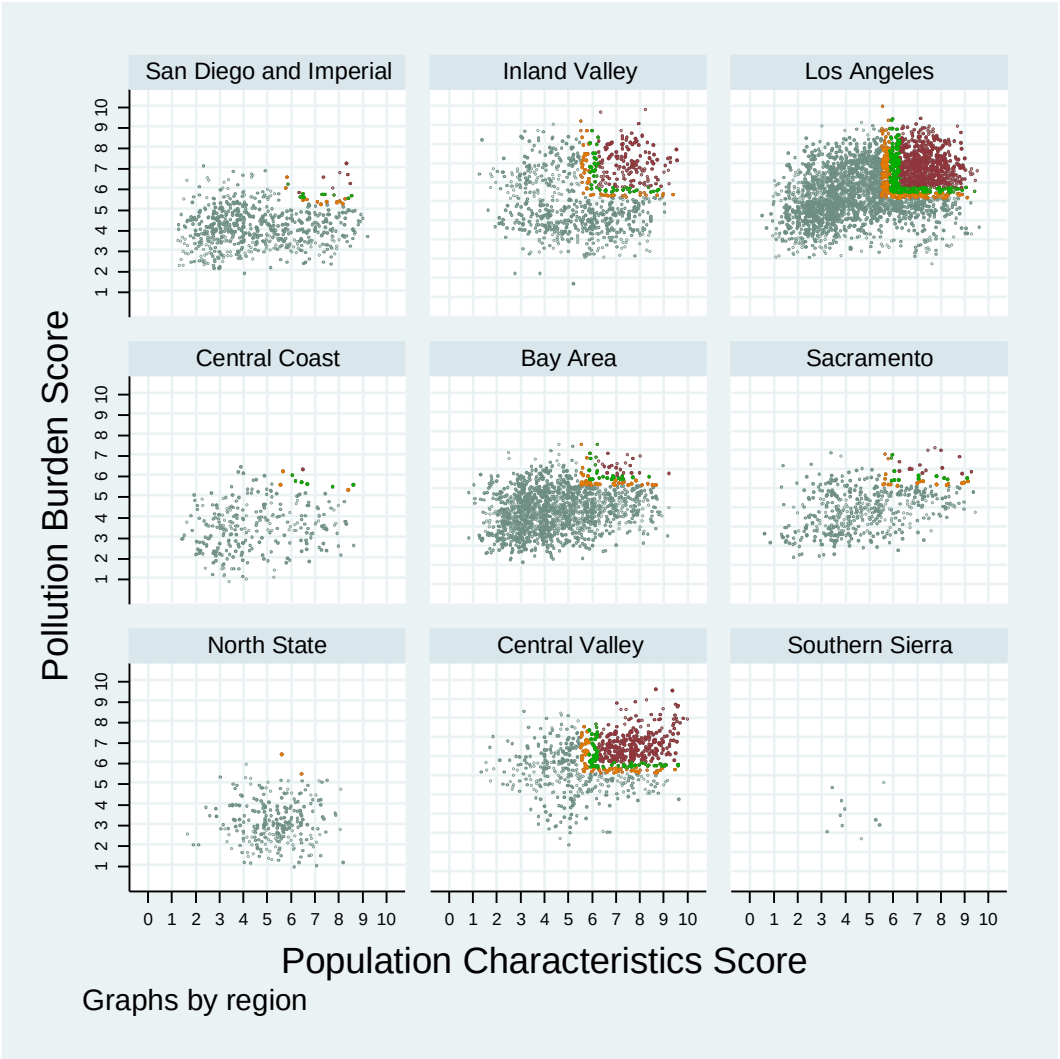
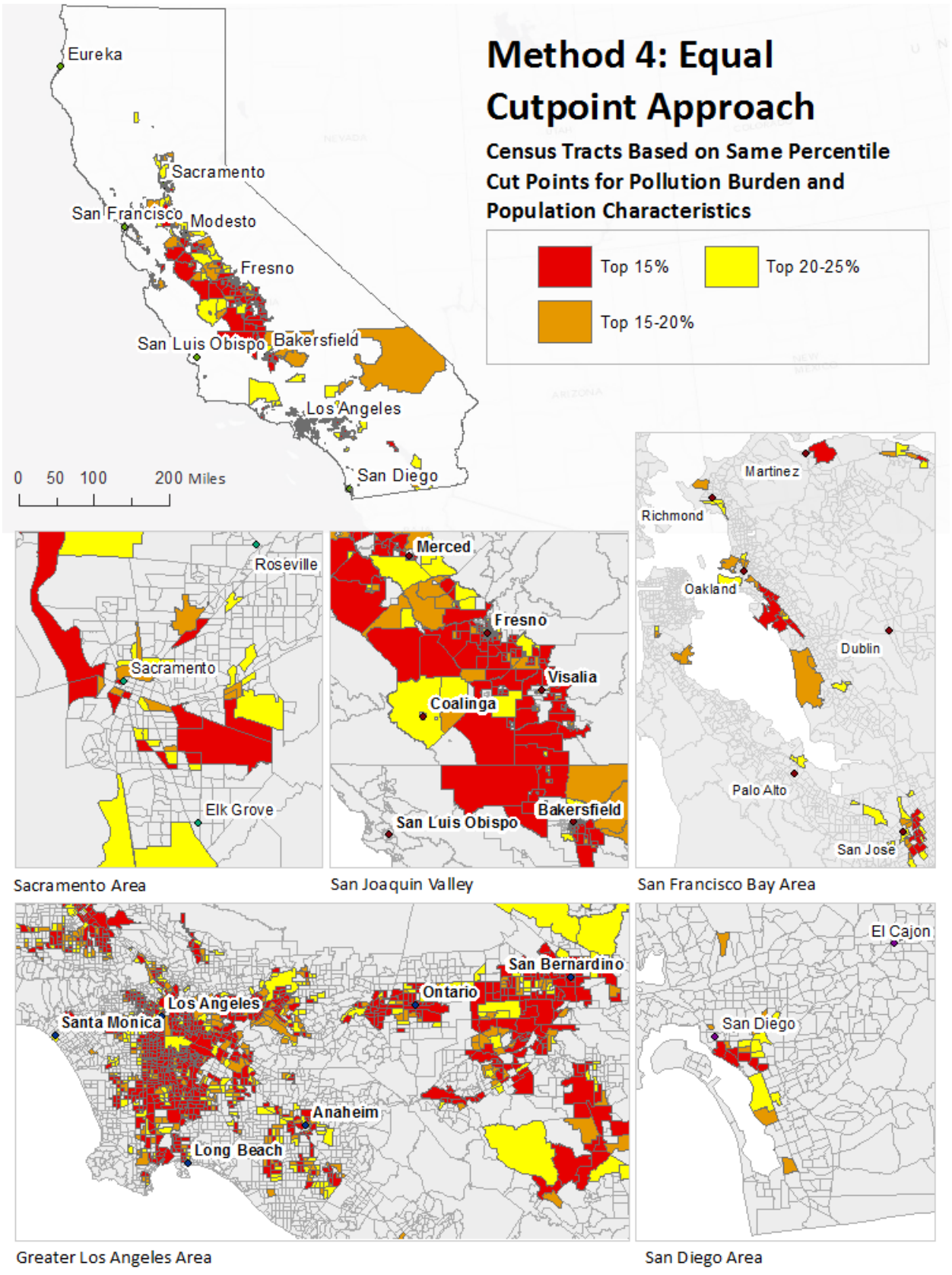


Figure 9 Legend

- Red dots are in the top 15% using equal cutpoints for pollution burden and population characteristic scores
- Green dots are in the top 15 to 20%
- Orange dots are in the top 20 to 25%



Sacramento Area

San Joaquin Valley

San Francisco Bay Area

Greater Los Angeles Area

San Diego Area

LOW-MEDIUM-HIGH CATEGORIES APPROACH (METHOD 5)

Method 5 sorts census tracts into high, medium, and low categories for both pollution burden and population characteristics. Census tracts are each sorted into the high-high (for both components), medium for one component and high for the other, then vice versa, and then one category for all of the remaining tracts. The cutpoint for the high score for each component is at the top 75th percentile, and for the medium score is between the 50th and 75th percentiles. Figures 10 and 11 illustrate this approach. Selecting census tracts to identify as disadvantaged would include selecting categories shown in color on the graph. If only the top category, shown in red on the graph, were chosen, it would represent 9.8% of the population. Each of the categories that include medium and high scores, are shown in green and orange on the graph. High pollution burden and medium population characteristics would include an additional 7.7% of the population. High population characteristics and medium pollution burden would capture 7.1% of the population. If all three of the highlighted categories were included, that would capture approximately 25% of the tracks and population..

Figure 10. Identification of disadvantaged communities using a categorical approach

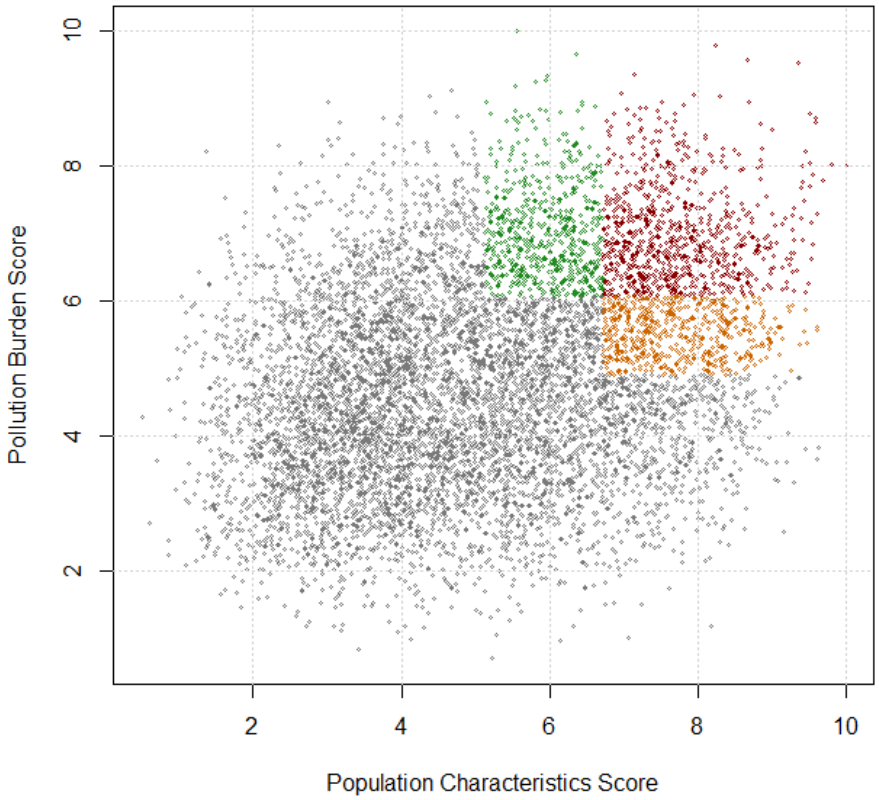


Figure 10 Legend
• Red dots score high for both Pollution Burden and Population Characteristics
• Green dots score high for Pollution Burden and medium for Population Characteristics
• Orange dots score high for Population Characteristics and medium for Pollution Burden

Figure 11. Identification of disadvantaged communities using a categorical approach, by region

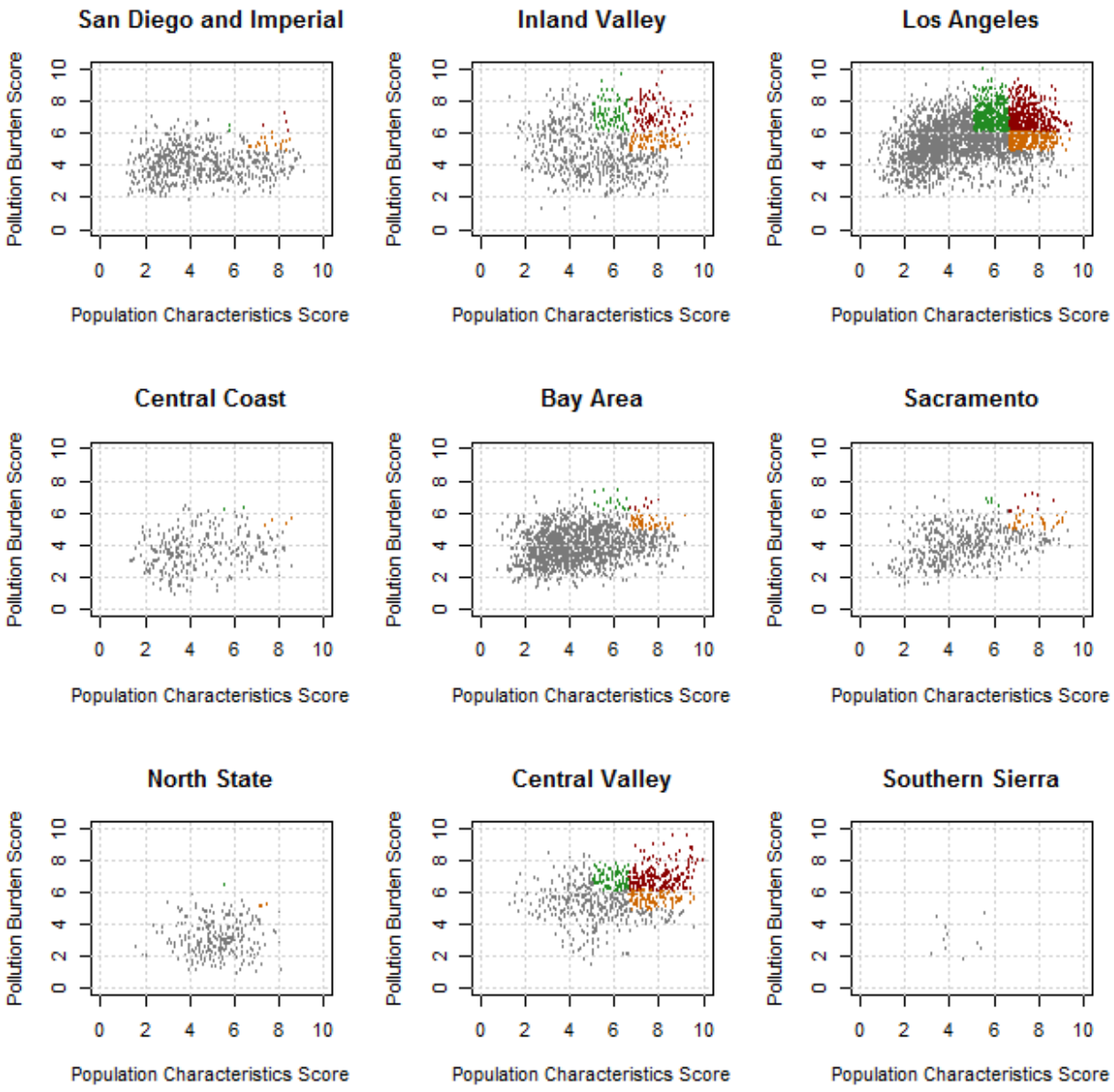
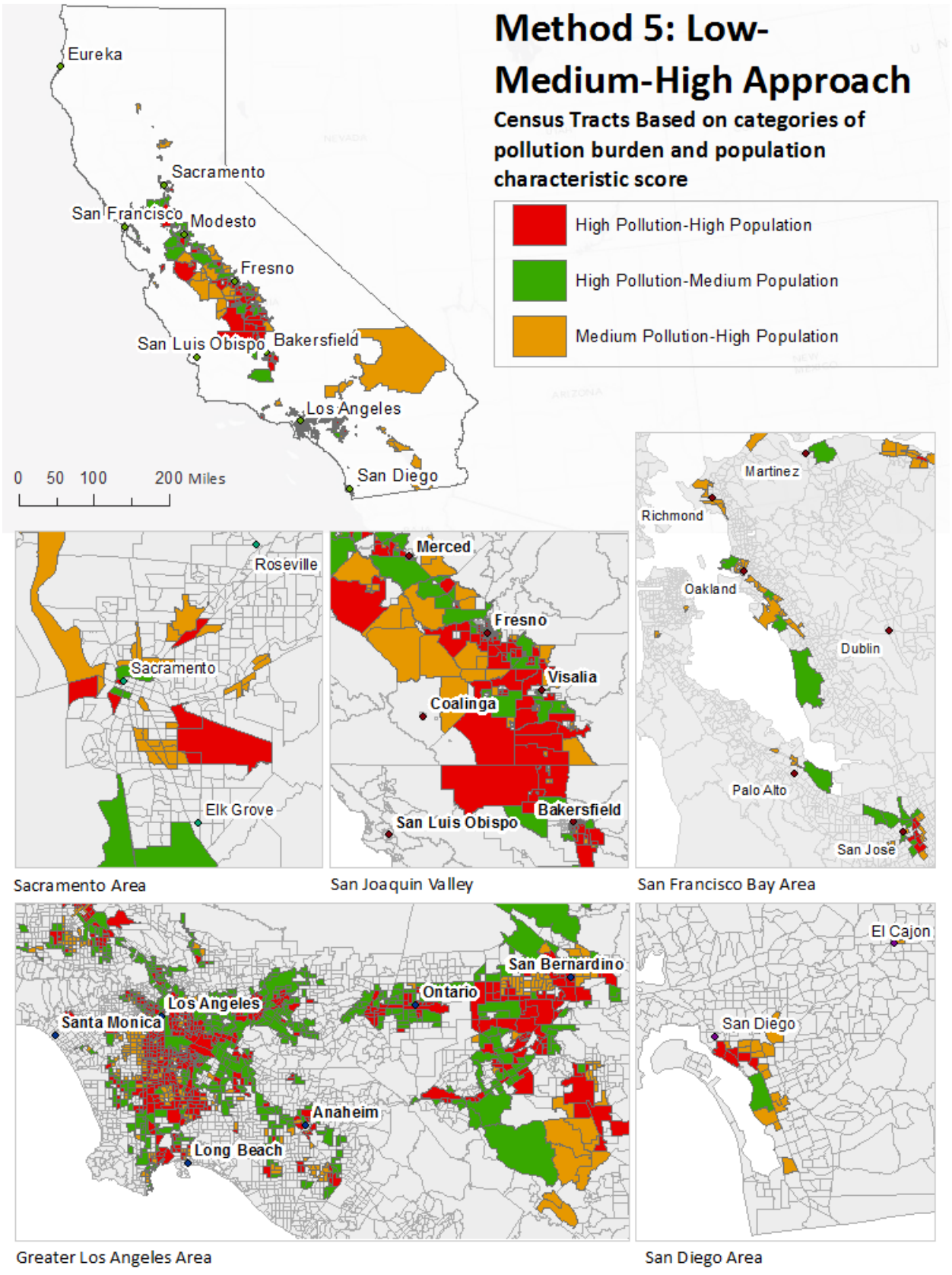


Figure 11 Legend
• Red dots score high for both Pollution Burden and Population Characteristics • Green dots score high for Pollution Burden and medium for Population Characteristics • Orange dots score high for Population Characteristics and medium for Pollution Burden


Method 5: Low-Medium-High Approach
Census Tracts Based on categories of pollution burden and population characteristic score
High Pollution-High Population
High Pollution-Medium Population
Medium Pollution-High Population
Eureka
Sacramento
San Francisco
Modesto
Fresno
San Luis Obispo
Bakersfield
Los Angeles
San Diego
0 50 100 200 Miles
Roseville
Sacramento
Elk Grove
Merced
Fresno
Visalia
Coalinga
San Luis Obispo
Bakersfield
Martinez
Richmond
Oakland
Dublin
Palo Alto
San Jose
Sacramento Area
San Joaquin Valley
San Francisco Bay Area
San Bernardino
Ontario
Los Angeles
Santa Monica
Anaheim
Long Beach
El Cajon
San Diego
Greater Los Angeles Area
San Diego Area