TRI Sites and Air Pollution in California

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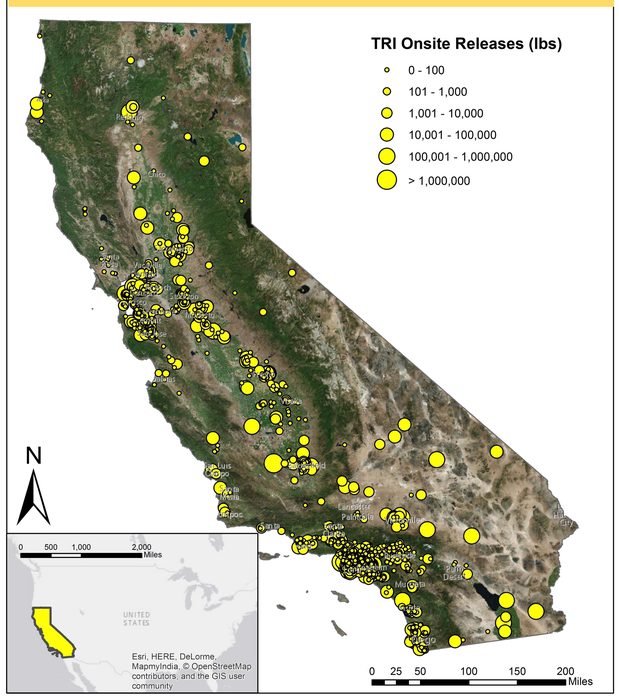
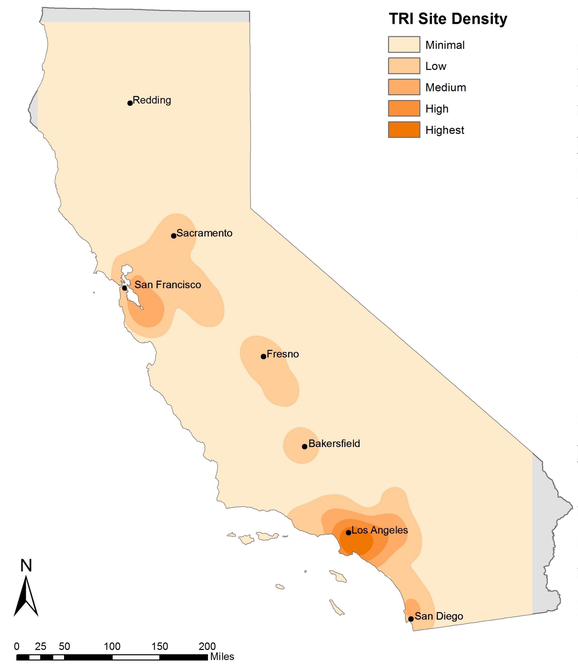
Background

The Toxics Release Inventory (TRI) is a government database that tracks and publishes information on facilities that release a variety of toxic chemicals. The program began in 1986, and was intended to increase public access to information on industrial pollutants. The system tracks only the largest polluters. Facilities that use more than 25,000 pounds annually of any of the 600 toxic chemicals monitored by the TRI program are required to submit reports on their chemical use, as well as the quantity of chemicals released onsite. Therefore, sites monitored by the TRI program comprise the largest point sources of toxic pollution in the country. There are a total of 21,709 TRI sites in the United States, and 1,262 are in California alone. This study examines the spatial distribution of TRI sites in California, as well as the association between TRI site density and air quality. The hypothesis is that TRI sites will be more densely clustered in large cities, and that air quality will also be lower in these locations.

TRI Site Locations



TRI Site Density



Methodology

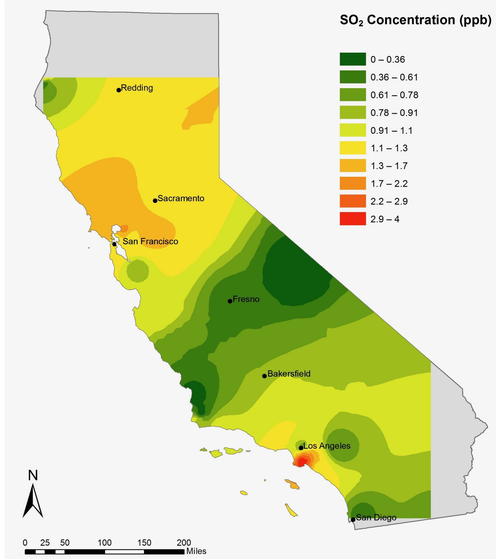
Current information on TRI site location and chemical releases is publically available from the U.S. National Institutes of Health website. This information was geocoded to obtain a map of all such locations in California. Each site was weighted based upon the amount of toxic chemicals that it released onsite, with larger circles representing higher pollution levels. In order to more easily visualize the spatial distribution of the TRI sites, a raster map displaying the density of TRI sites was created. Seven major cities were included in this map to provide a reference for the locations of the TRI sites. Next, air quality data was obtained from the Environmental Protection Agency website. Four major pollutants were used to gauge air quality: sulfur dioxide, ozone, PM (particulate matter) 2.5, and PM 10. These data were collected on January 1st, 2016, for the state of California. The locations of air measuring stations for each pollutant were geocoded, and each point also included information on pollutant concentration. These points were then interpolated to create raster maps indicating the estimated concentration of each pollutant across the entire state. Pollutant levels were divided into ten categories for easy visualization, with the highest concentration of pollutants shown in red and the lowest in dark green.

Results and Conclusions

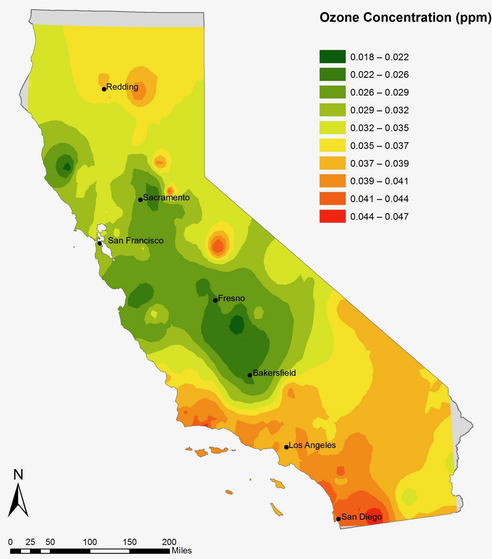
As seen in the TRI Site Density map, areas with a high density of TRI sites align closely with the locations of major cities. The Los Angeles area has the highest density of TRI sites in the state, followed closely by San Diego and the San Francisco Bay Area. Elevated density can also be seen near Bakersfield, Fresno, and Sacramento. All of these sites are major urban areas, suggesting that TRI sites are more likely to be located near large cities than in rural areas. New patterns emerge when the TRI Site Density map is compared with the raster maps of air pollutants. While the four pollutants of interest do not vary directly with each other, the spatial distribution of PM 2.5 and PM 10 are comparable, with the highest levels in the center of the state and lower concentrations to the North. SO_2 and ozone display a contrasting pattern, with the lowest concentrations in the center of the state. Ozone levels appear elevated near Redding, Los Angeles and San Diego, and SO_2 concentration is elevated near Redding, Sacramento, San Francisco, and Los Angeles. PM 2.5 and PM 10 are both highly elevated near Fresno and Bakersfield, and somewhat elevated near San Diego, Los Angeles, and Sacramento. Six of these cities are locations of elevated TRI site density, and all seven cities display higher than average air pollution levels for at least one of the pollutants. Most notably, all four pollutants are at medium to high levels in Los Angeles, which also had the highest density of TRI sites in the state. These observations support the hypothesis that TRI site density is higher near large cities and that TRI sites are associated with lower air quality. While the association between TRI sites and poorer air quality may not be a causal one, these findings still have implications for health research, as poor air quality in urban areas can contribute to increased medical ailments.

Air Pollution Levels

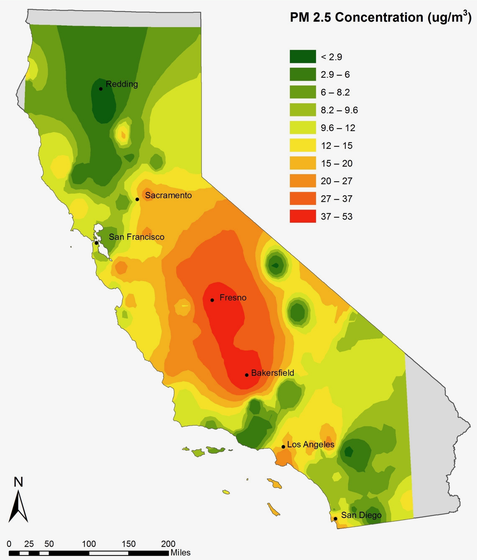
Sulfur Dioxide



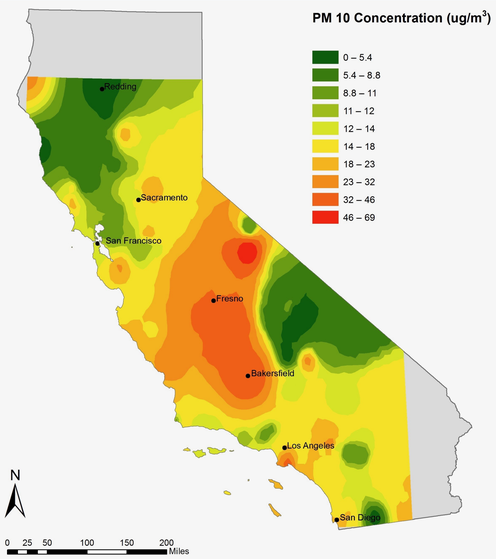
Ozone



PM 2.5



PM 10



Cartographer: Dylan Guydish

Coordinate System: NAD 1983 (2011) State Plane California III FIPS 0403 (US Feet)

Projection: Lambert Conformal Conic

Data Sources: Toxmap Environmental Health Maps, U.S. National Library of Medicine, National Institutes of Health, 2016; Outdoor Air Quality Data, US Environmental Protection Agency, 2016; Cartographic Boundaries Shapefiles, United States Census Bureau, 2015