Mapping the Relationship between Pollution and Demographic Factors in Los Angeles County

Abstract

Our research and GIS analysis looks into the pollution concentrations in Los Angeles County, specifically pollutants derived from oil wells, industrialization, and its adverse effects on surrounding communities. With this information regarding negative health consequences from rapid industrialization, we mapped out where oil wells are located, the concentration of pollutants, and where people can receive medical services in Los Angeles County. This project bring awareness about Environmental Racism and how low income communities and communities of color continue to be neglected by pollution, and industrialization. This form of environmental racism is apparent in our result, where we show the relationship between communities of color and the heavier burden they experience from climate change, and exposures to toxic pollutants. Since exposure to high levels of pollutants like smog as a result of these wells can lead to respiratory problems and illnesses like asthma, we mapped out all relevant information to hazardous exposures. This information is for public awareness pertaining to issue, and encouraging individuals to act and respond to pollution and climate change. Areas with a high density of pollution, highways, oil wells, and manufacturing can dramatically impact the surrounding community. Certain communities are burdened with a disproportionate share of environmental problems, our research examines the factors of race and income within these envi. problems. Our goal is to inform the public of Los Angeles on factors affecting their health within the county boundary.

Introduction

Industrialization is occurs at a rapid rate, and in a world where we all share a finite of resources, all species are affected at the same rate but in different magnitudes. This creates a unequal threat to the earth's natural systems, that can alter species populations, resource availability, and create global ecological stress. For example, when industrialization proceeded and land-use patterns changed at an increasing rate, emission rates accelerated McMichael, A. J. (2003). It is apparent that human actions are the primary source for an increase in industrial greenhouse gases, and negative health consequences from climate change. Greenhouse gases and climate change affect human health. Disease for all species can be linked to climate change, such as cardiovascular morality, respiratory illness, and has created infectious diseases that can create

malnutrition from crop failures (Patz, J. A., Campbell-Lendrum, D., Holloway, T., & Foley, J. A. 2005). The U.S Government recognizes the individual rights to human health and the access to a clean environment. Since the creation of the U.S. constitution in 1787, this country has promised individual rights to its people.

The U.S Department of State, under its definition of human rights, states that this country will "promote greater respect for human rights, including women's rights, children's rights, and protection", as well as seeks "to hold governments accountable to their obligations under universal rights norms and international human rights instruments". Since Governments and climate change are interconnected, the U.S under its own call for protection of fundamental rights, should hold higher level corporations accountable. This highlights the negative consequences that are born by allowing such large corporations to pollute the environment and add to climate change by many Governments. Along with industrialization, also comes pollution that poses a threat to disadvantaged communities.

From the first American settlers to modern colonization (gentrification in Los Angeles), low income communities have continued to be pushed out of the nice neighborhoods and into crammed and less desirable properties. Government policies and shady practices like the Federal Housing Administration and blockbusters have resulted in the creation of ghettos. "African-Americans were crowded into neighborhoods in the ghetto because so much other housing was closed to them…" (NPR) Due to both government interference and racial inequity "ghettos" were created and left many low income families living in overcrowded neighborhoods. In our research we have discovered that LA County is home to approximately 3,000 active/non-active oil wells. Some of the highest concentrations of pollutants affect low income communities. As various factors of pollution contribute to the degradation of human health throughout Los Angeles, we have highlighted three specific features within health deprivation: asthma, low birth weight, and heart disease. Pollution throughout Los Angeles is a rising issue, and there are many communities who face health issues as a result of it. Below are figures of oil wells found in Los Angeles, and throughout other suburban areas. The reason these images were provided in the report was to highlight how easy it is to find an oil well in communities inside Los Angeles. This presents a real challenges to vulnerable communities that are financially burdened or already have high health issues.

Figure 1. Oil wells in Venice, California, bringing oil up from beach area in 1952.

Figure 2. A camouflaged oil derrick (center) in operation beside the athletic fields and buildings of a High School.

Figure 3. An oil well pump newly constructed in a neighborhood near Shell Oil Company Alamitos No. 1 discovery well on Signal Hill in Long Beach on May 30, 2003.

Figure 4. An oil well pump newly constructed in a neighborhood near Shell Oil Company Alamitos No. 1 discovery well on Signal Hill in Long Beach on May 30, 2003.

Methods

In order to move along with the research, we were required to collect data from the Los Angeles County GIS Data Portal, The Office of Environmental Health Hazard Assessment (OEHHA), and GeoHud, CalEnviroScreen 3.0, and ArcGIS. We downloaded most of our shapefiles from these two web pages which had substantial information on our topic. We extracted the files and imported them onto ArcMap. The shapefiles had different spatial references so we had to configure them to the same spatial reference by using the define tool. We gathered this information from the metadata that was provided with the files. The define tool can be accessed through the Arc Toolbox or by searching for it using the search tool on the right (the tab below Catalog). We projected and defined all the data to be in the same geographic coordinate system and spatial reference system. Once all files could be projected in the same GSC and CRS, the layers depicting asthma, low birth weights, and heart disease in LA county were defined by going into the

properties of the layer → **symbology** → **categories** → **unique values**. Attribute tables were up to date and correct.

We evaluate the burden of pollution using a pollution burden score, attained from the CalEnviroScreen 3.0, that sources in communities that account for potential vulnerabilities to adverse effects of pollution. We also identified oil wells, and health clinics inside Los Angeles and projected them into relation to the pollution burden score. (GeoHub) Data interpretation: 5 = Very High Priority for Green Infrastructure 4 = High Priority for Green Infrastructure 3 = Medium Priority for Green Infrastructure 0-2 = Low Value Values 3, 4, and 5 should be used when assessing highest prioritization from the model. The pollution burden score by zip code for California, ranging from 1 to 10. The score is derived by the EPA/OEHHA's CalEnviroScreen tool which calculates the average percentiles of six exposure indicators which indicate the potential human exposure to pollutants such as particulate matter, hazardous waste, and toxic releases and five environmental effects indicators which indicate effects on the environment including impaired water bodies and solid waste sites.

Results

To begin, our results found a locator map of Los Angeles County in relation to the greater area. This map identified the area that is under the jurisdiction of Los Angeles, that many local agencies and planners are to mitigate or alleviate issues pertaining to environmental racism. It is important to note for results that environmental equity requires analysis beyond demographic variables. Our research covers strictly demographic variables. We recognize that industries also include wide variety of factors and costs, including labor supply, access to market, power supply, location of raw mat, however our results display otherwise as well. For instance, in our research we found that land use is a significant variable in explaining the distribution of hazardous waste, that can lead to the disproportionate share of environmental problems (Boer et al. 1997).

Land-use decisions are a critical factor in understanding the development of Los Angeles as an industrial city. (Boone, C. G., & Modarres, A. 1999). Our results displays breathing air in Southern California can reduce one's life expectancy by one to two years. Exposure to air pollution at a young age, these studies showed, can lead to an array of long-lasting health problems, including asthma and autism. It's not just that polluted air can, say, trigger asthma attacks. Ritz, B., Wilhelm, M., Hoggatt, K. J., & Ghosh, J. K. C. (2007). The figure highlights the correlation between air pollutants and adverse pregnancy

including low birth weight (LBW) and infant mortality. Wilhelm, M., & Ritz, B. (2005). This information is displayed in our results.

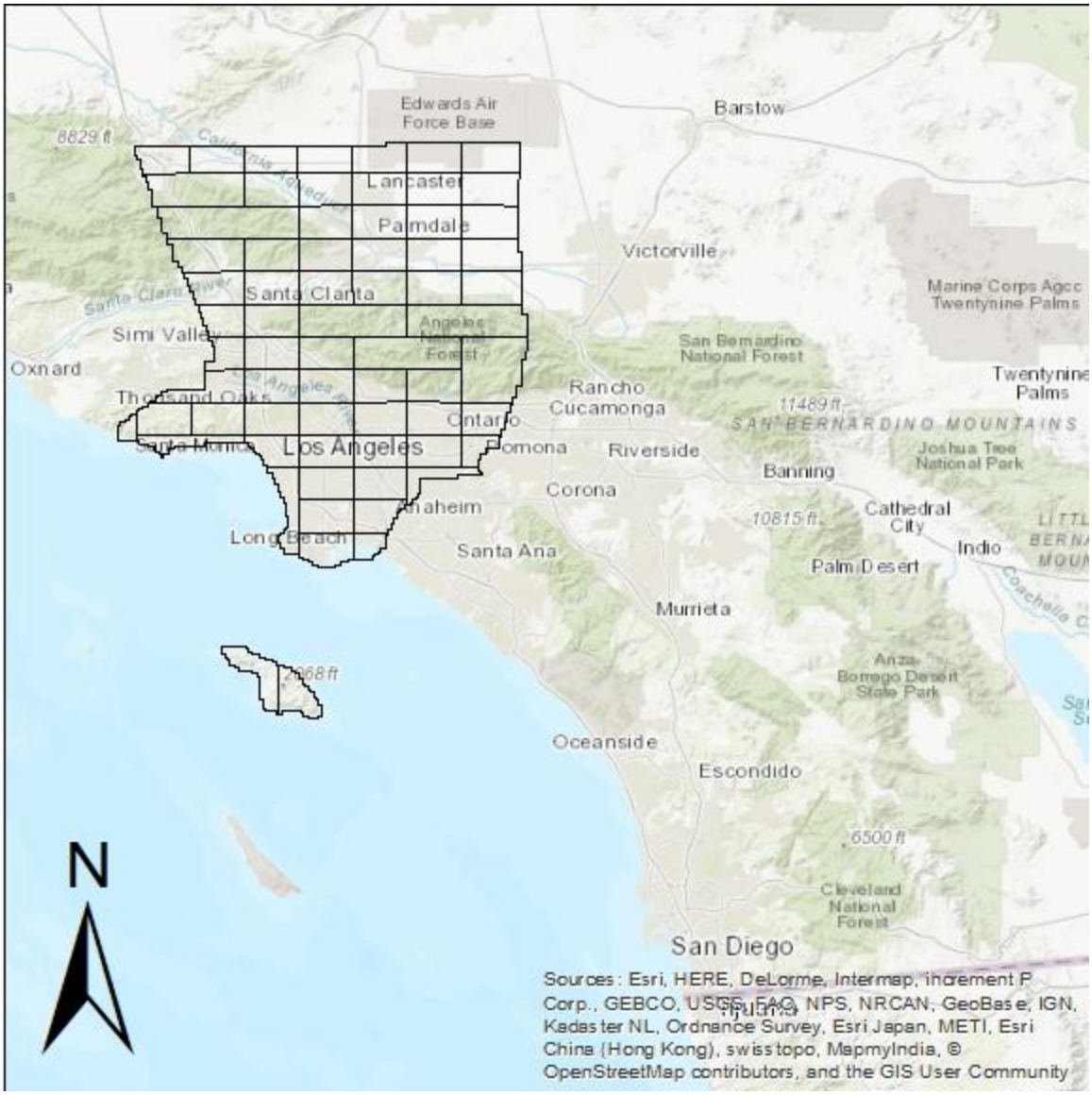

Figure 5: Locator Map of Los Angeles County

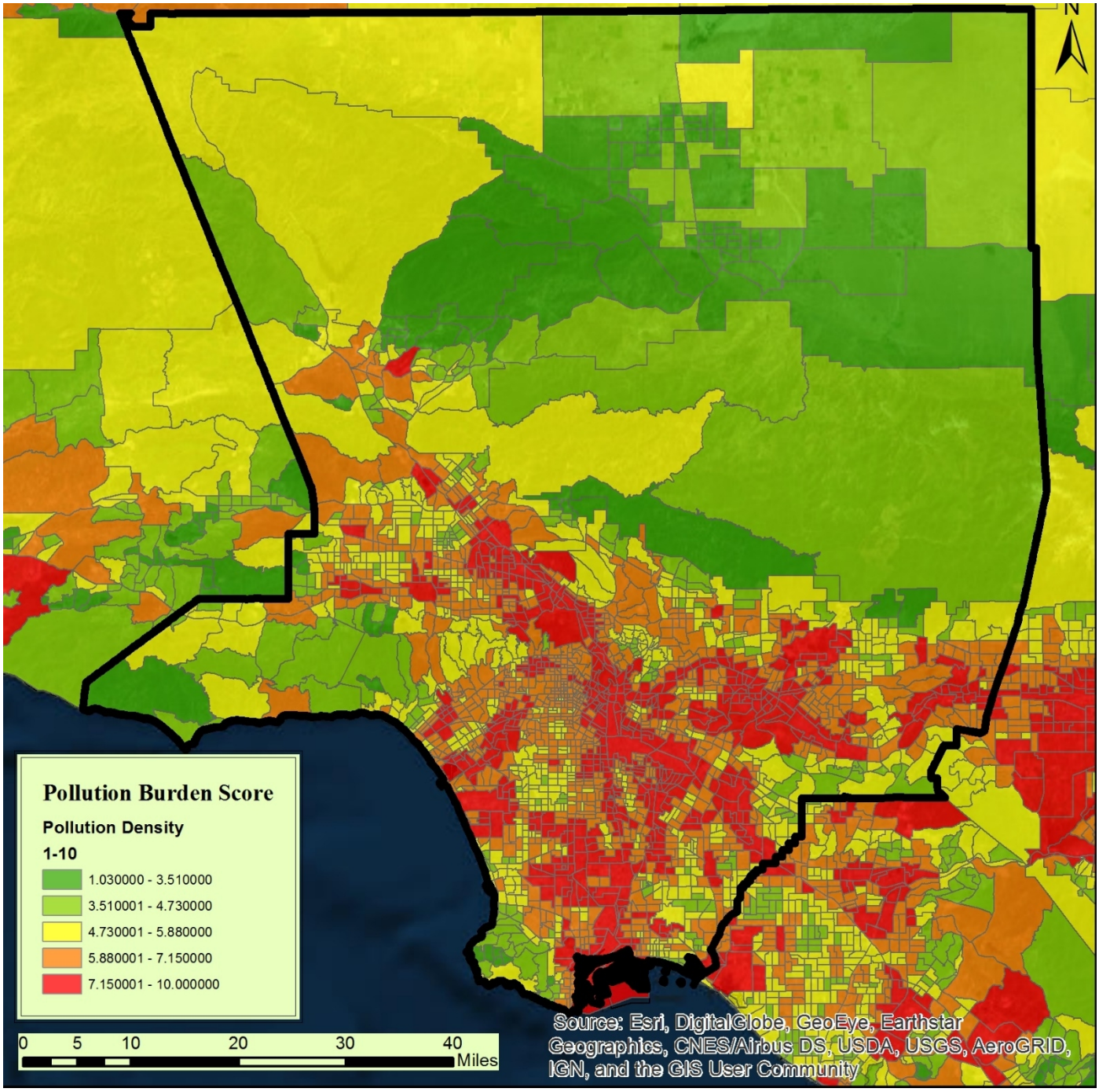

Figure 6: A map of pollution density measured by a burden score in Los Angeles County.

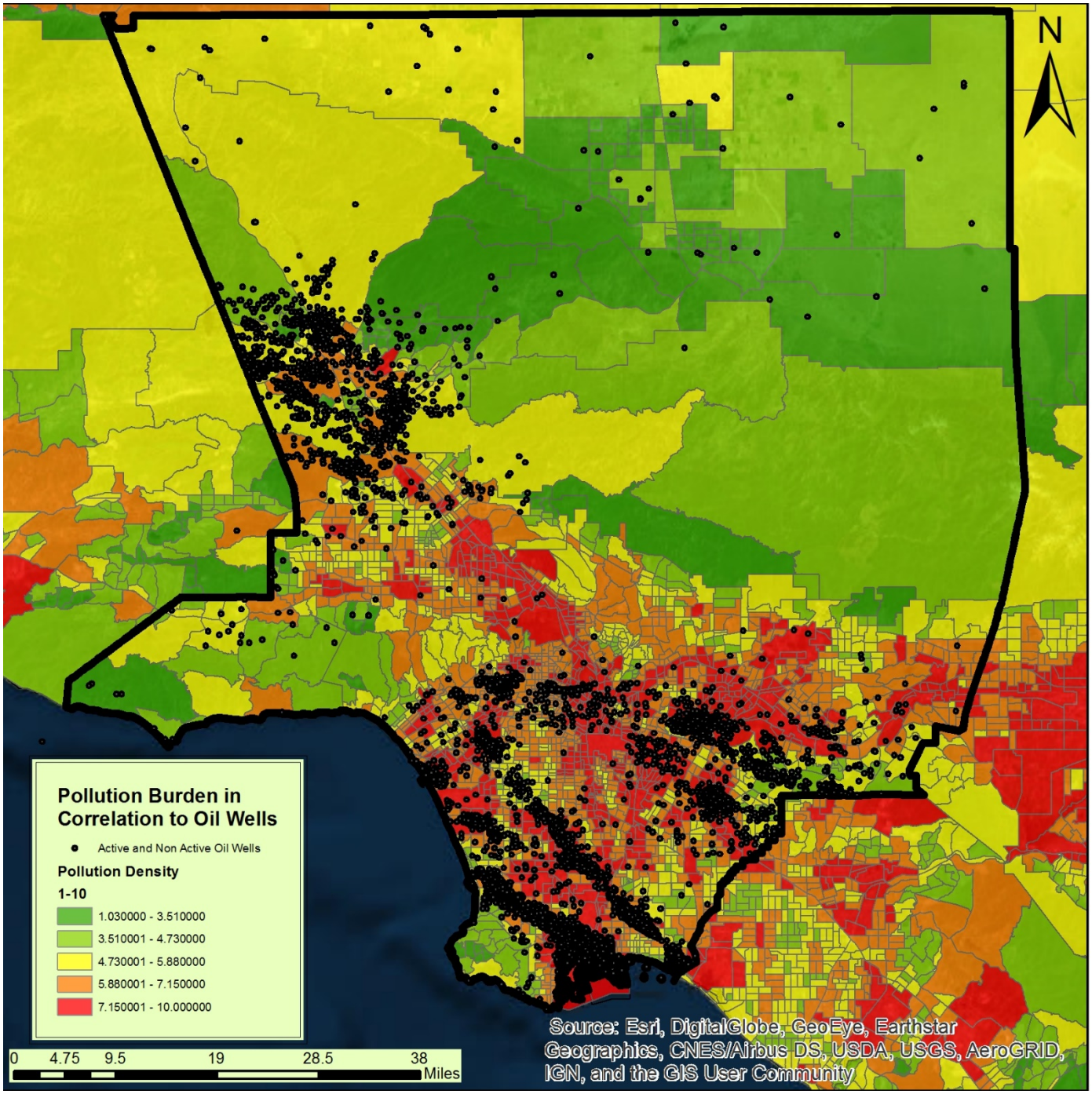

Figure 7: Amount of oil wells throughout Los Angeles in relation to the pollution burden score Los Angeles.

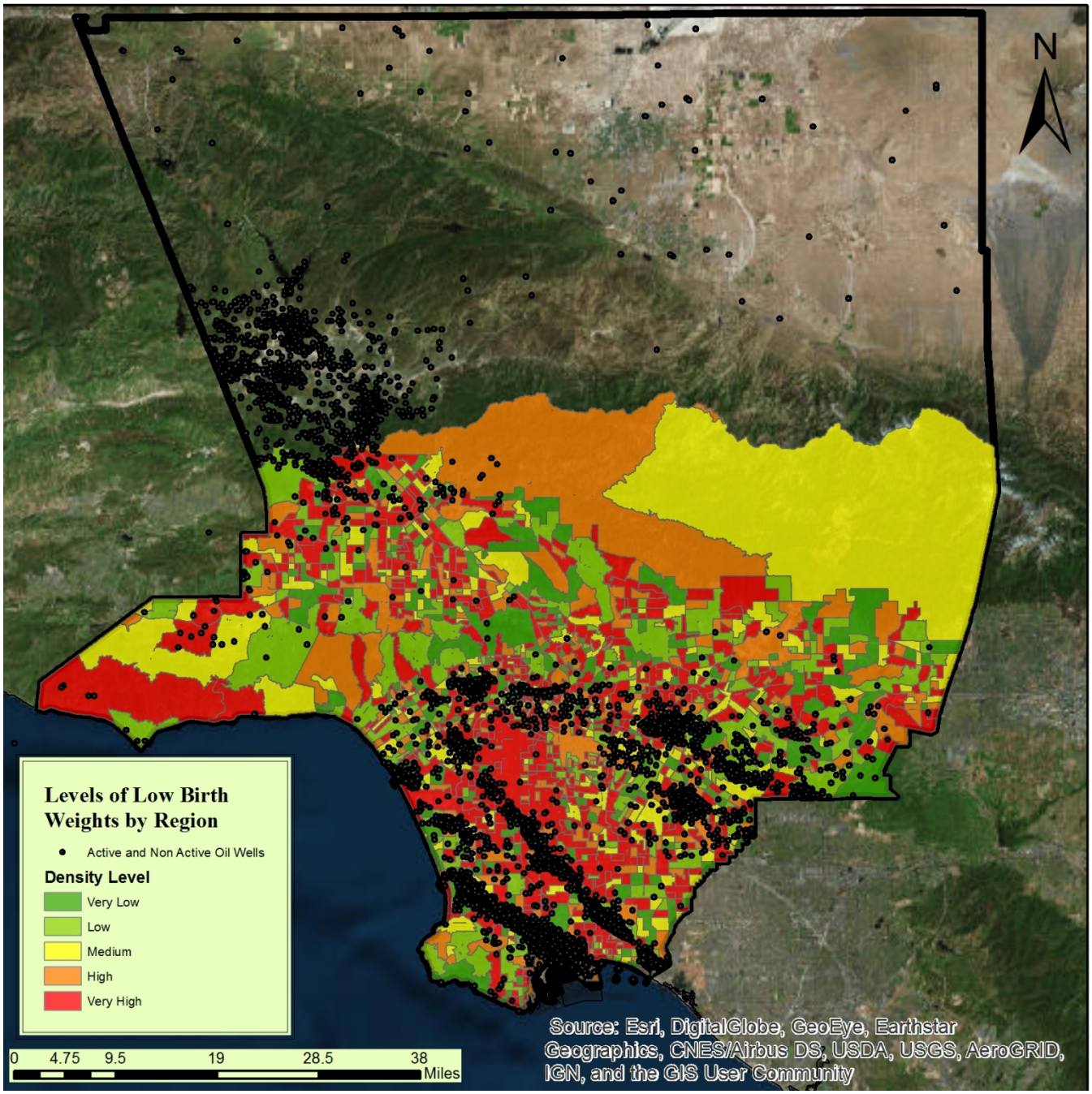

Figure 8: Levels of low birth weights in relation to the pollution burden score Los Angeles.

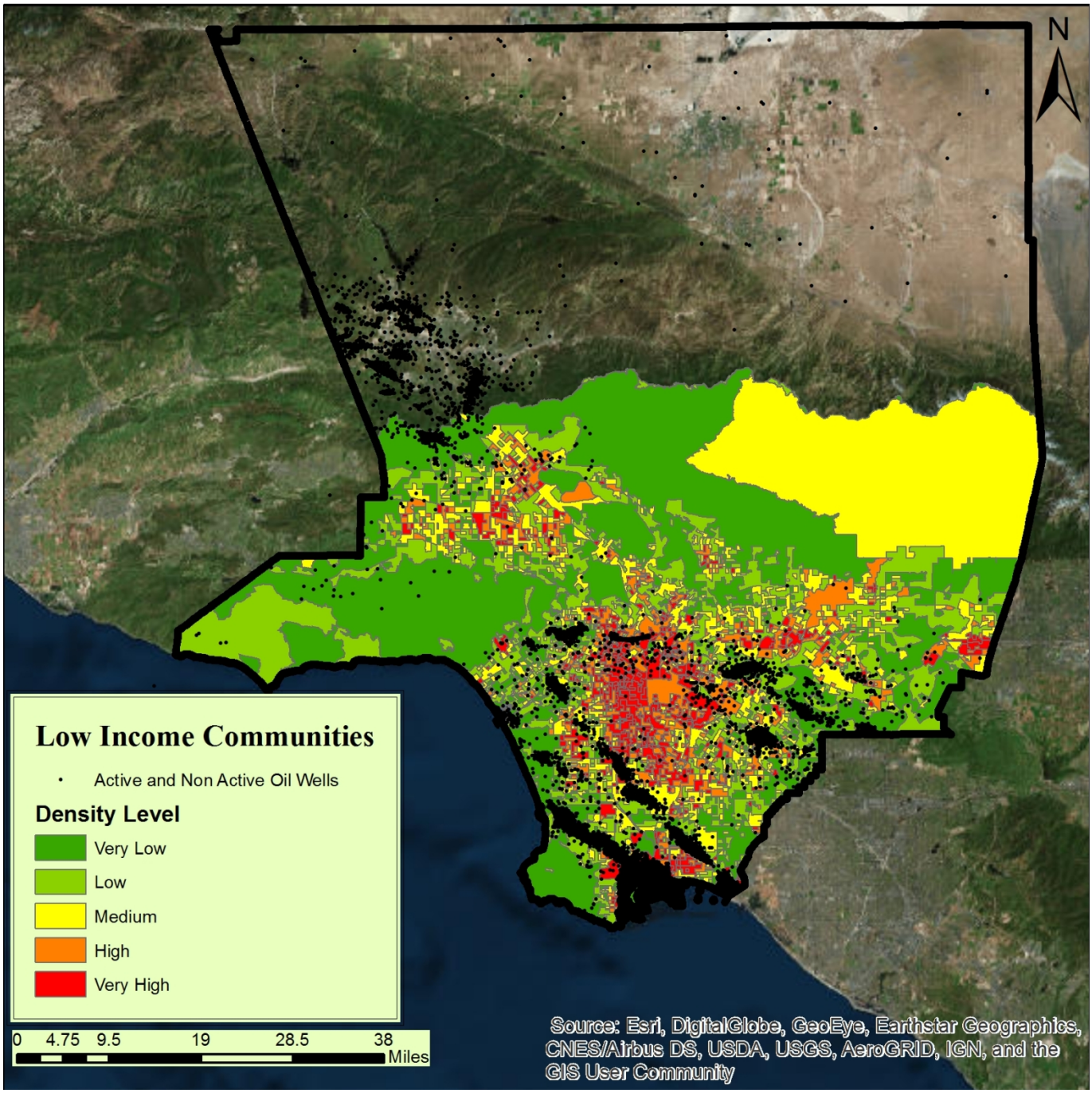

Figure 9: Low income communities in relation to the pollution burden score Los Angeles.

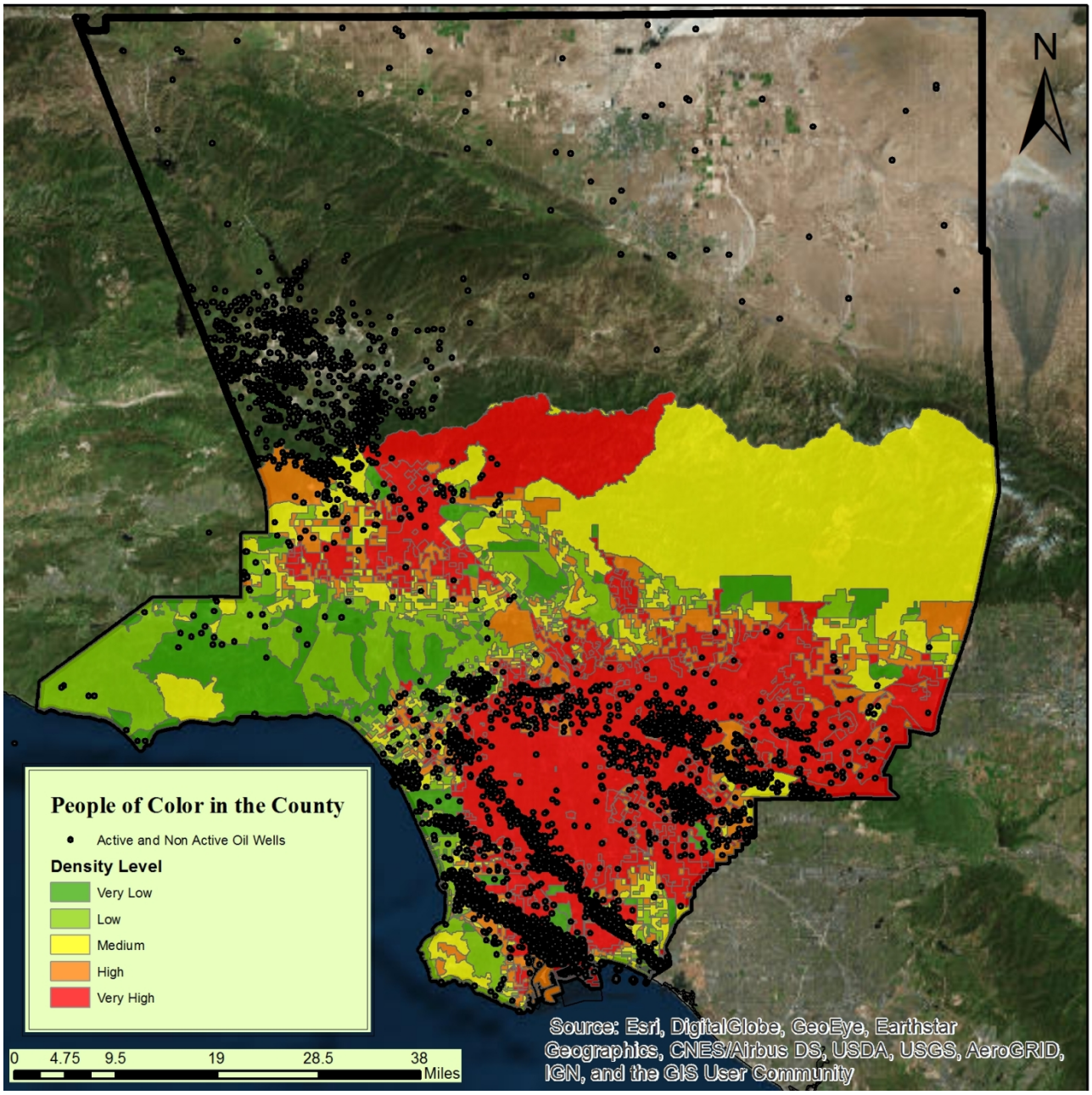

Figure 10: Communities of color in relation to the pollution burden score in Los Angeles.

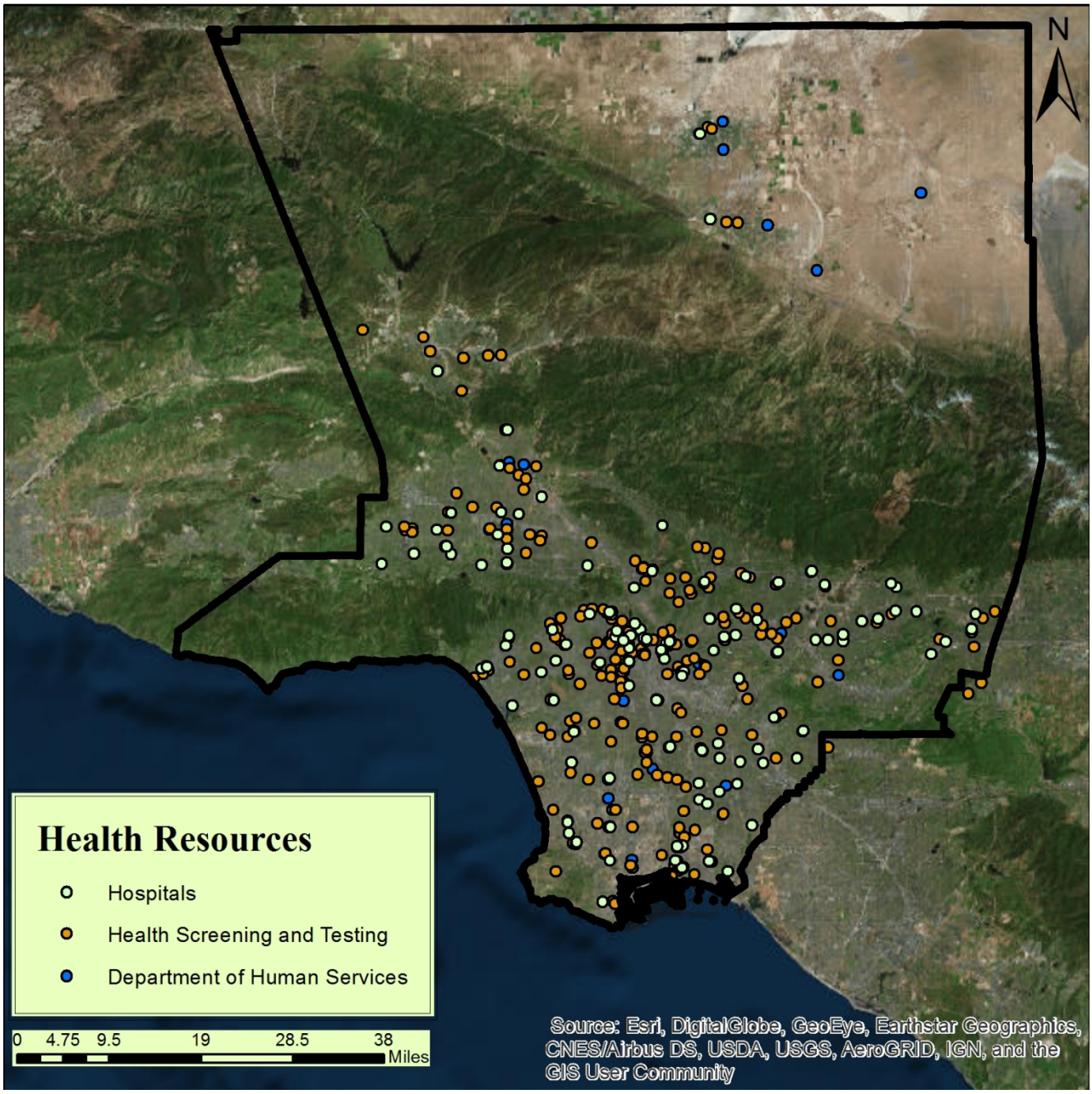

Figure 11: Health resources available for the residents of Los Angeles County.

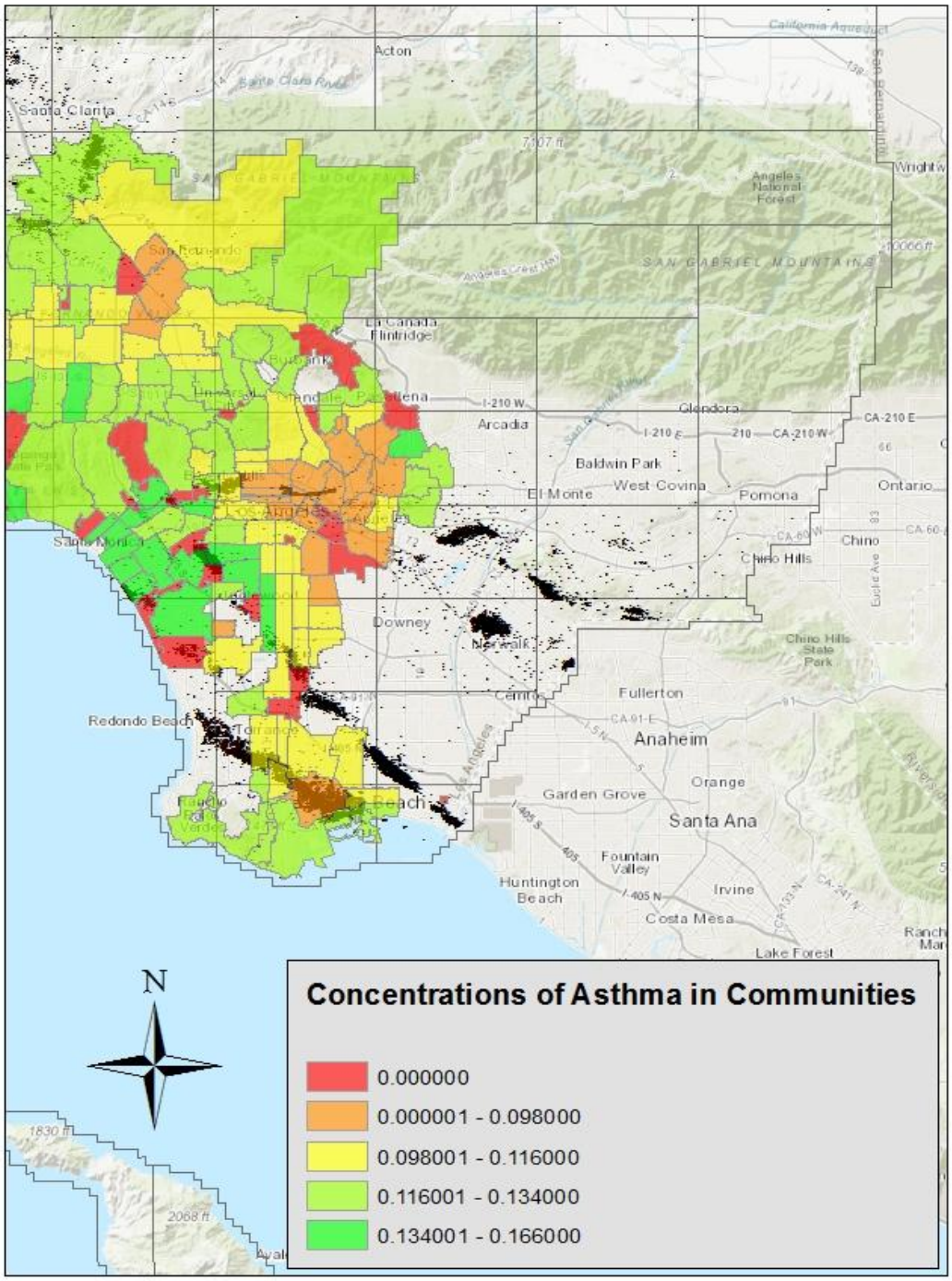

Figure 12. Levels of Asthma in relation to oil wells.

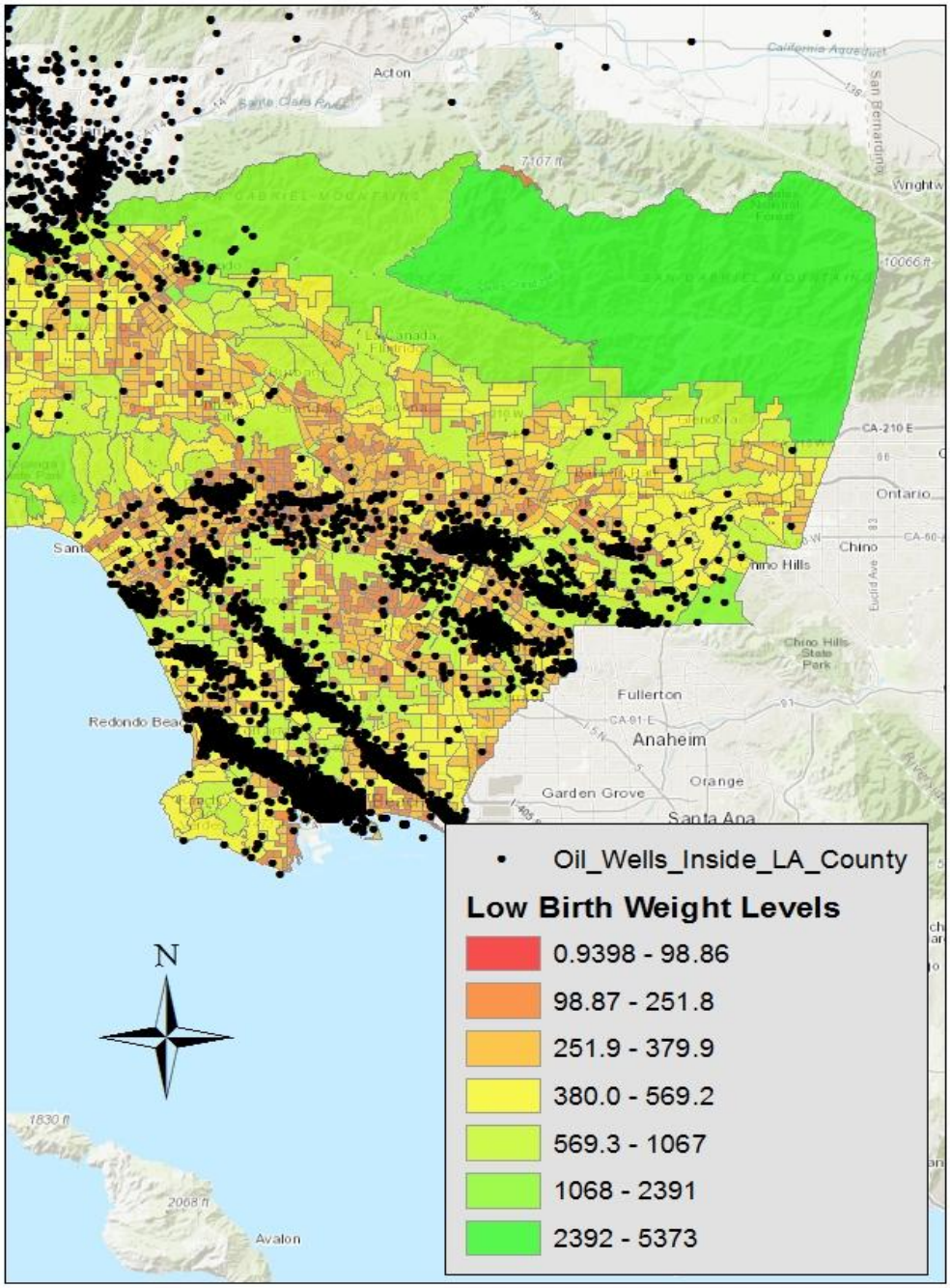

Figure 13. Concentrations of Low Birth Weights in Los Angeles in relation to oil wells.

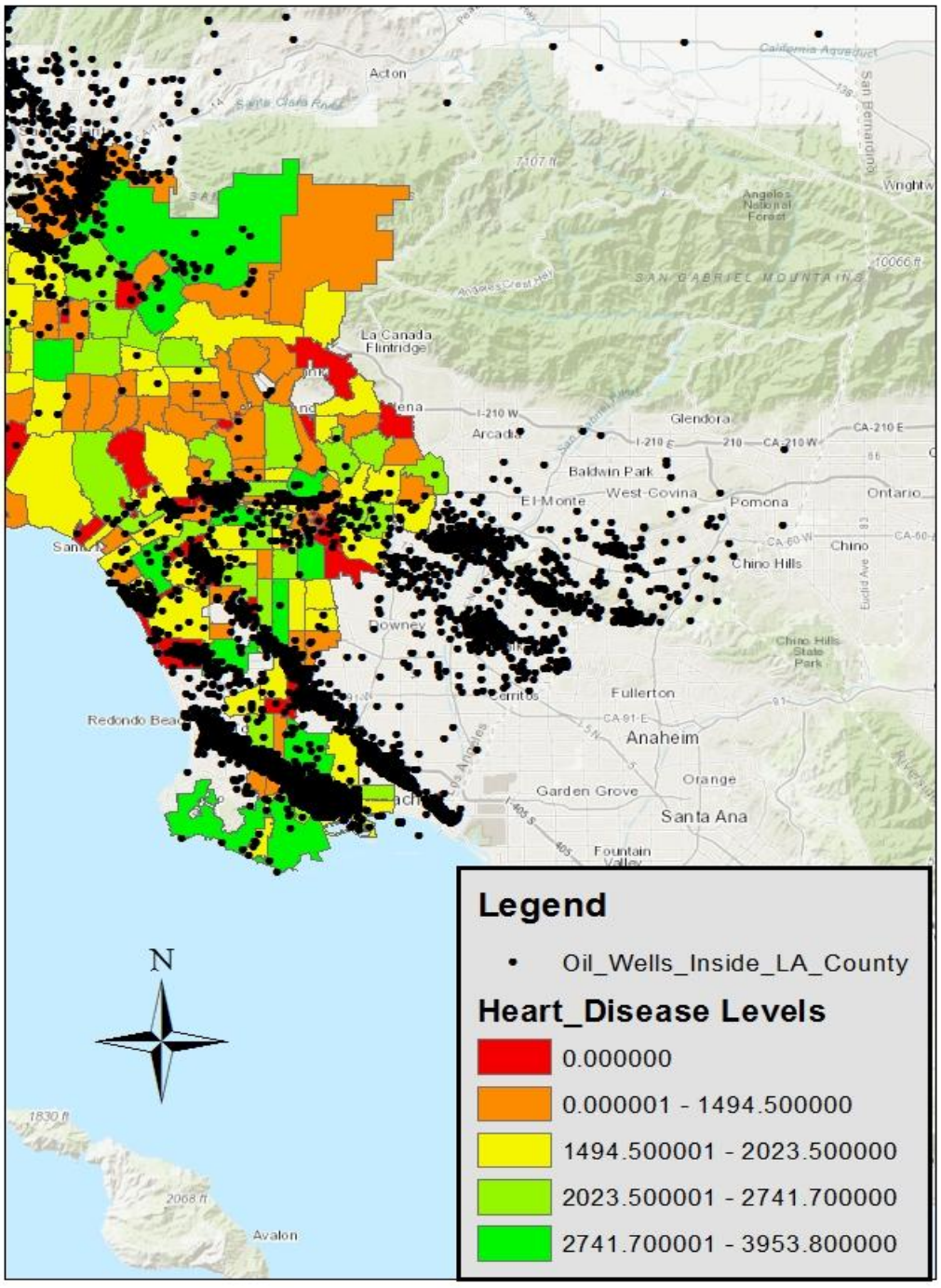
Acton
Angeles National Forest
SAN GABRIEL MOUNTAINS
La Canada Flintridge
Arcadia
Glendora
Baldwin Park
West Covina
El Monte
Pomona
Ontario
Chino
Chino Hills
Downey
Fullerton
Anaheim
Orange
Garden Grove
Santa Ana
Redondo Beach
Avalon
N
Legend
Oil_Wells_Inside_LA_County
Heart_Disease Levels
0.000000
0.000001 - 1494.500000
1494.500001 - 2023.500000
2023.500001 - 2741.700000
2741.700001 - 3953.800000

Figure 14. Concentrations of heart disease levels in relation to the oil well industry. Figjgng

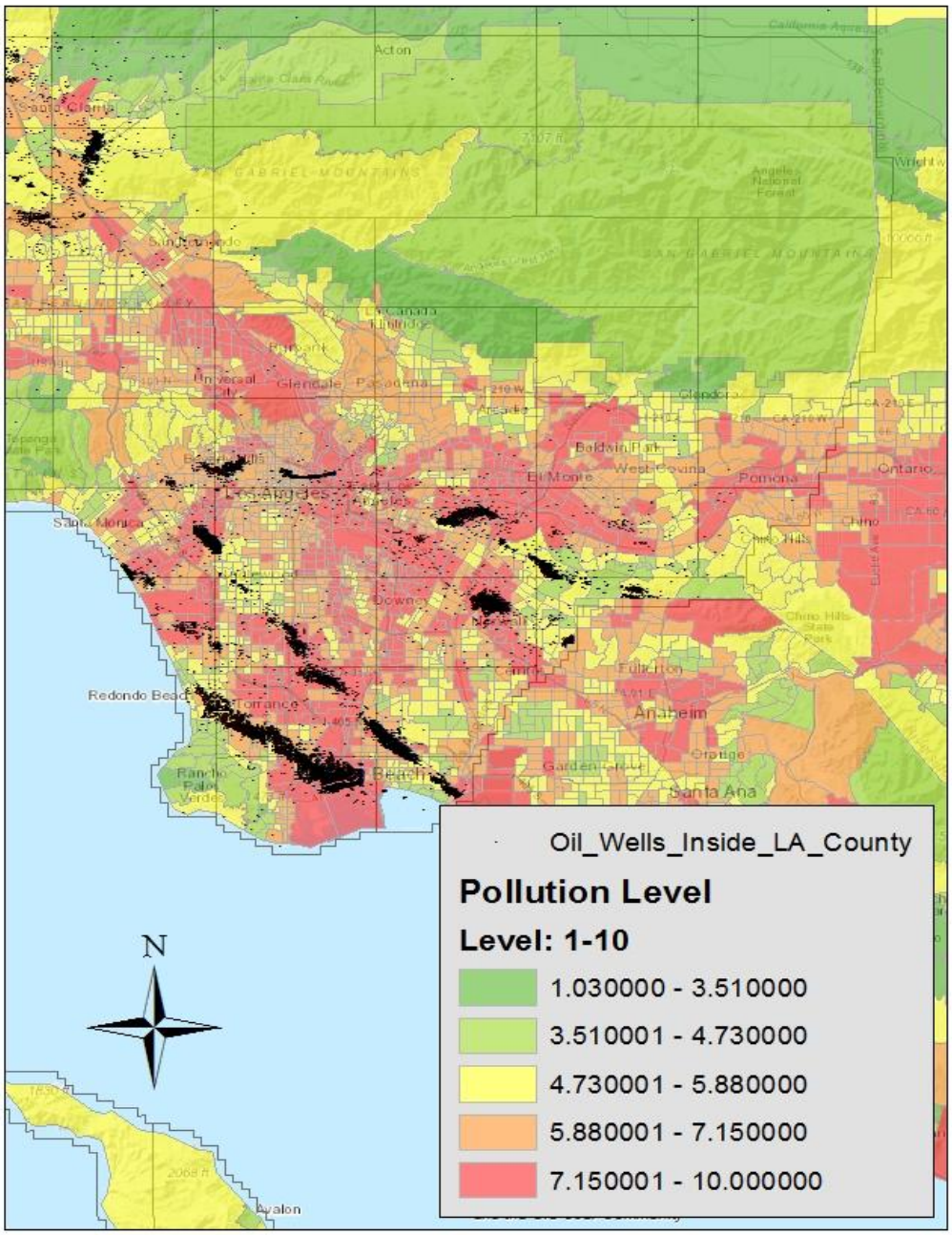

Figure 15. Pollution burden score in relation to oil wells in Los Angeles County.

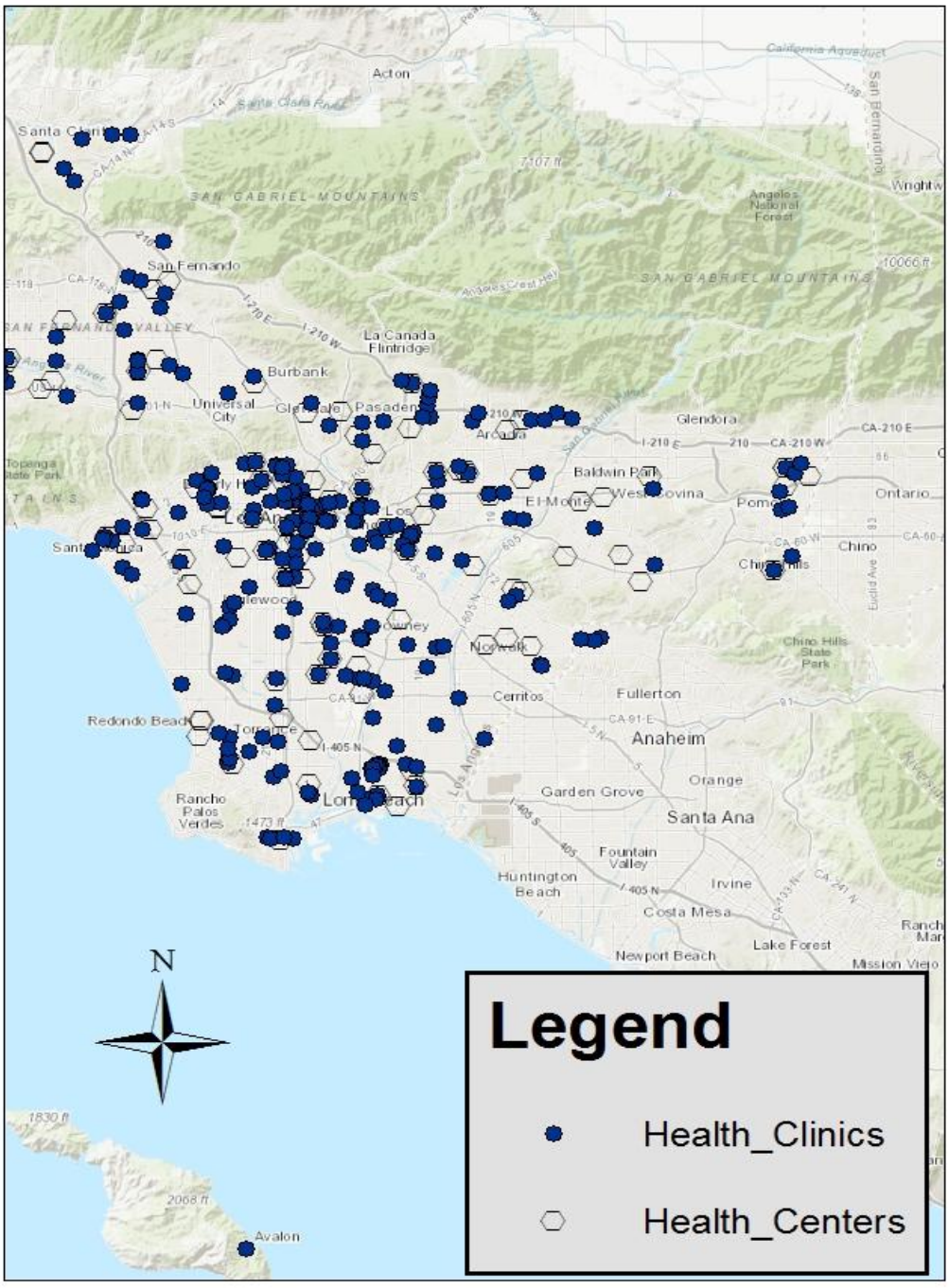

Figure 16. Health clinics and centers available for the residents of Los Angeles County.

Conclusion

From our data we have found some correlations in the illnesses that are caused by the pollution in Los Angeles county by the oil wells. We were shocked to find out about the amount of wells that are in the county alone and how close they are to residential areas. We would like to explore more research in the future and perhaps get more concrete details from our findings. The term disadvantaged communities, or low income communities defines a group of people living in a region within a larger city, that faces inequity and challenges in gaining access of resources. Accessibility to proper healthcare is well-defined as having breathable air quality within the region, food security, drinkable water for the public, and the correlation between one person's individual income and the suitable health care they obtain.

This project really focuses on disadvantaged communities who have a harder time accessing proper health care, here we simply define those two terms as they apply to our project.Some mechanisms that the county of los angeles can take to help alleviate the issues shown in this project include identify resources throughout the county, renewable energy, sustainable development, increasing fuel economy standards, hybrid-electric vehicles (HEVs), alternative commuting patterns, support Investment into renewables, and support clean technologies research.

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