

GIS Final Project:

Finding Historic Resources with Lead-Based Paint in LA Neighborhoods

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Background

Lead-based paint was widely used on the exterior and interior of building construction well into the twentieth century. Lead compounds were used to improve the durability and wear of paint over time. Lead-based paint is particularly beneficial for woodwork (such as exteriors or interior trim work), window components, door frames and painted metals. It was slowly discovered during the first half of the twentieth century that lead-based paint posed hazardous health risks, especially if the paint was deteriorated. In response to this developing awareness, the use of lead-based paint started to decline in the 1950s until the United States federal government banned it in 1978.

The use of lead-based paint is not only an important health topic but presents many challenges in the field of Heritage Conservation. Lead-based paint was not banned until 1978 so it is usually present in a historic resource. Given the extensive use of lead-based paint on woodwork, it puts the integrity of a resource's character defining features at risk, such as decorative trim or stylistic architectural details. There are several methods for the abatement, or removal, of lead-based paint in a home. These include the drastic approach of destroying or removing altogether painted components and the more conservative methods of solely removing paint. In order to preserve historic resources and their integrity, there are specific abatement guidelines for lead without jeopardizing the significant historic features of a place. In order to identify historic resources and protect their significance, it would be best to take a proactive approach to determine where resources that contain lead-based paint may be located. Geographic Information Systems (GIS) can be used to identify what residential areas need to be investigated for such resources.

The health hazard of lead-based paint has prompted research into how to identify residences that are most at-risk. A report sponsored by the Centers for Disease Control and

Prevention, states that “Children at greatest risk for lead poisoning are those whose families are poor and live in substandard housing built before 1950.” The report also links rental units with a higher risk of lead poisoning given the increased likelihood of deteriorated paint in a rental unit. For my GIS project, I have used these attributes to measure the likelihood of the presence of lead-based paint in various Los Angeles neighborhoods. Because historic resources containing lead-based paint exist throughout Los Angeles, the purpose of the map is to determine the hierarchy for which areas should be investigated for historic resources at risk of severe alteration or demolition because of the presence of lead-based paint. GIS is a valuable tool to combine the median year homes were built in an area, the median household income, and the percentage of homes occupied by renters, in order to compare different areas. GIS will reveal the neighborhoods with the oldest buildings, lowest incomes and highest percentages of renters that are therefore more likely to contain at-risk historic resources that require lead abatement.

Sources:

- “37 - Appropriate Methods of Reducing Lead-Paint Hazards in Historic Housing”. *National Park Service US Department of the Interior*. < <https://www.nps.gov/tps/how-to-preserve/preservedocs/preservation-briefs/37Preserve-Brief-LeadPaint.pdf>>
- “Using GIS to Assess and Direct Childhood Lead Poisoning Prevention”. *Lead Poisoning Prevention Program Geographic Information System Workgroup*. December, 2004 < <https://www.cdc.gov/nceh/lead/publications/UsingGIS.pdf>>

Data

- 1) “**Housing, Median Year Built, 2018**” was downloaded from Simply Analytics. The data is distributed geographically by census tracts. I also downloaded the data by zip code to compare but found the census tract organization contained more items and was more thorough. The data is limited as the median year range is from 1939-2001. I would have preferred if the data also included homes built before 1939.
- 2) “**Median Household Income, 2018**” was downloaded from Simply Analytics, also in the census tract organization by similar logic and to remain consistent. I decided to download the household income data rather than % in poverty because I wanted to capture low income households above the poverty line.
- 3) “**% Housing, Renter Occupied, 2018**” was downloaded from Simply Analytics, also in the census tract organization by similar logic and to remain consistent.

- 4) “**LA Neighborhoods**” was downloaded from the Los Angeles Times. I wanted to read the map by neighborhood rather than census tract and therefore required labels.

Building the Maps

Projections – Because I combined data from different sources, when I added the different layers to ArcMap I had to be sure there were aligned on the same projection. I used the Chapter 3 lesson on projections to convert all layers to “GCS_North_American_1983” geographic coordinate system.

Median Year Built Layer – I divided the median year built into 4 classes based on the likelihood of the use of lead-based paint. The ‘Pre 1950’ category captures the earliest housing available in the data. This housing was also built before the US population was aware of the hazards of using lead-based paint. The ‘1951-1960’ and ‘1961 to 1978’ categories capture two phases of housing where the use of lead-based paint significantly declined. The final category ‘1978 onward’ is the housing built after the federal government banned lead-based paint and therefore would not require investigation.

Median Household Income Layer – I divided the household income into 4 classes to best represent the lower income homes most likely to contain lead-based paint. The first category is income below the poverty line (\$25,100 for a house of 4 occupants). I found this number from the US Department of Health & Human Services. The US Federal Poverty Guidelines ranges from 1-8 members of the household so I decided that 4 occupations was the best representation. <https://aspe.hhs.gov/poverty-guidelines>. I was unable to find anything more concrete from the US Dept. of HHS or the US Census Bureau.

The next class ranges from the poverty line to the median income number from the data, \$40,336. The third class ranges from the median to the median + 20% (\$8,067). The final group is income greater than \$48,403.

Percentage of Housing Occupied by Renter Layer – I divided this layer in to 3 classes to focus on the highest percentages of rental units because owner occupied homes are more likely to have undergone any paint removal work, especially at the time of purchase. The classes are < 50%, 50%-75%, and 75%-100%.

My challenge in building this map was how to combine the Income and % Renter layer so they could be visible together and form a complete analysis. Using graduated symbols did not provide any clear readings from the map. I decided to use hatching for the renter layer because there were only 2 categories that needed to be represented.

The Simply Analytics organization by census tracts was helpful for providing substantial data however was difficult to work with in ArcMap. I find the census tract outlines very visually distracting and would have preferred if I could have grouped the data by neighborhood. It is unclear how this could have been accomplished while maintaining the accuracy of the data.

Score Map – In order to better decipher the map and its conclusions, I created a score map. I ranked the categories as below:

Median Year Built	Score
Pre 1950	9
1951-1960	6
1960-1978	3
1978 onward	0

Median Household Income	Score
Below Poverty line ($< \$25,100$ for 4 occupants)	4
$\$25,100 - \$40,336$	3
$\$40,336 - \$48,403$	2
$> \$48,403$	1

% of Housing occupied by Renter	Score
75% - 100%	8
50% - 75%	4
$< 50\%$	0

In the numeric field, I multiplied the categories together so that anything would a zero would not be included in my analysis because those areas would be irrelevant to finding locations that need to be investigated for lead-based paint (such as homes built after 1978 or areas with no renters).

These calculations gave me 12 different categories of areas that would require investigation, ranging from the lowest score of 0 to the highest score of 288. I decided that rather than having 12 levels, some of these categories were close enough in terms of urgency of investigation that

they could be grouped together. I examined what each of the 12 scores represented in terms of the three variables and I classified the score map layer into 7 levels.

The best way to express the 7 different levels of urgency was to use numbers (0-7) and rank them as such in the legend. The highest score (7) is labeled as high priority and is marked critical. The lowest score (1) is labeled as low priority. For benchmarking purposes 4 was labeled as medium priority. The 0 score is labeled as ‘No Review Required’ and defined by the color white because the categories are either irrelevant to my analysis or there was no data for those areas. Here is a categorical breakdown of the 7 levels and what scores they represent:

Level	Score(s)	Median Year Built	Median Household Income	% of Housing Occupied by Renter
7 – High Priority	288	Pre 1950	Below Poverty Line (<\$25,100)	75%-100%
6	216	Pre 1950	\$25,100 - \$40,336	75%-100%
6	192	1951-1960	Below Poverty Line (<\$25,100)	75%-100%
5	144	1951-1960	\$25,100 - \$40,336	75%-100%
5	144	Pre 1950	\$40,336 - \$48,403	75%-100%
5	108	Pre 1950	\$25,100 - \$40,336	50% - 75%
4 – Medium Priority	96	1951-1960	\$40,336 - \$48,403	75%-100%
4 – Medium Priority	96	1960-1978	Below Poverty Line (<\$25,100)	75%-100%
4 – Medium Priority	96	1951-1960	Below Poverty Line (<\$25,100)	50% - 75%
4 – Medium Priority	72	1960-1978	\$25,100 - \$40,336	75%-100%
4 – Medium Priority	72	1951-1960	\$25,100 - \$40,336	50% - 75%
4 – Medium Priority	72	Pre 1950	\$40,336 - \$48,403	50% - 75%
4 – Medium Priority	72	Pre 1950	>\$48,403	75%-100%
3	48	1951-1960	\$40,336 - \$48,403	50% - 75%

3	48	1960-1978	\$40,336 - \$48,403	75%-100%
3	48	1951-1960	>\$48,403	75%-100%
2	36	1960-1978	\$25,100 - \$40,336	50% - 75%
2	36	Pre 1950	>\$48,403	50% - 75%
2	24	1960-1978	>\$48,403	75%-100%
2	24	1951-1960	>\$48,403	50% - 75%
2	24	1960-1978	\$40,336 - \$48,403	50% - 75%
1 – Low Priority	12	1960-1978	>\$48,403	50% - 75%
No Review Required	0	1978 onward	NA	<50%

Conclusions

Map 1 – From examining the first map, I decided to highlight three neighborhoods in Los Angeles that are the highest priority for investigation based on the factors of year built, household income and % renter occupied.

Vermont Square

- A majority of the neighborhood is at least > 50% renter occupied and in some cases > 75% renter occupied.
- The median household income of the renter occupied areas are in the Poverty – Median category.
- Most of the homes were built before 1950, some from 1961-1978.

This combination of factors warrants a survey of the specific census tracts areas in Vermont Square for historic resources that require abatement of lead-based paint.

Historic South-Central

- Majority of this neighborhood is > 75% renter occupied and the entire neighborhood is at least 50% renter occupied.
- The median household incomes are all in the Poverty-Median category except for one census tract area that is below the poverty line.
- The median year built for the homes are all pre-1978 with a majority before 1960.

This combination of factors warrants a survey of the specific census tracts areas in Historic South-Central for historic resources that require abatement of lead-based paint.

South Park

- Majority of this neighborhood is > 75% renter occupied and the entire neighborhood is at least 50% renter occupied.
- The median household incomes are all in the Poverty-Median category.
- The median year built for the homes are all pre-1960.

This combination of factors warrants a survey of the specific census tracts areas in South Park for historic resources that require abatement of lead-based paint.

Map 2- The Score Map allowed me to draw more accurate and thoughtful conclusions from my project. The darker the color blue of an area, the more likely that census tract includes potential historic resources that contain lead-based paint.

I was surprised to find there were only 3 census tracts in the high priority category (Median Year Built: Pre 1950, Median Household Income: Below Poverty Line, % of Housing Occupied by Renter: 75%-100%). These tracts are in the Westlake, Downtown and Pico-Union neighborhoods. These areas should be investigated first to identify if there are any historic resources in the area which still contain lead-based paint.

The original conclusion was correct in identifying **Historic South-Central** and **South Park** as two higher priority neighborhoods that require investigation. The amount of dark blue census tracts concentrated in those areas indicates they are more likely to contain historic resources with lead-based paint. Several of their census tracts fall into the 6 category (Median Year Built: Pre

1950 or 1951-1960, Median Household Income: Below Poverty Line or \$25,100 - \$40,336, % of Housing Occupied by Renter: 75%-100%).

Based on reading the selected map area, I would recommend surveying the following 8 neighborhoods for potential historic resources that contain lead-based paint: Downtown, Pico-Union, Westlake, Historic South-Central, South Park, Vermont Square, Downtown, Harvard Heights.

Limitations

Simply Analytics organized the data by Census Tracts so I was unsure how to reconcile this with the neighborhood organization while maintaining the most accurate data possible. I would have preferred to have the data from Simply Analytics determined by neighborhood instead of census tracts for visual improvement and alignment. However, reading by census tracts showcases a full range within the variable whereas by neighborhood might have diluted the full range of variables and my map would have displayed more median areas.

Both the “Housing Occupied by Renter” and “Median Income” data sets had roughly 500 more lines of data than the “Median Year Built” data set. A larger amount of data for “Median Year Built” would have provided more findings and conclusions for my map, and may have changed which areas were marked as critical or high priority.

Additional Maps and Data

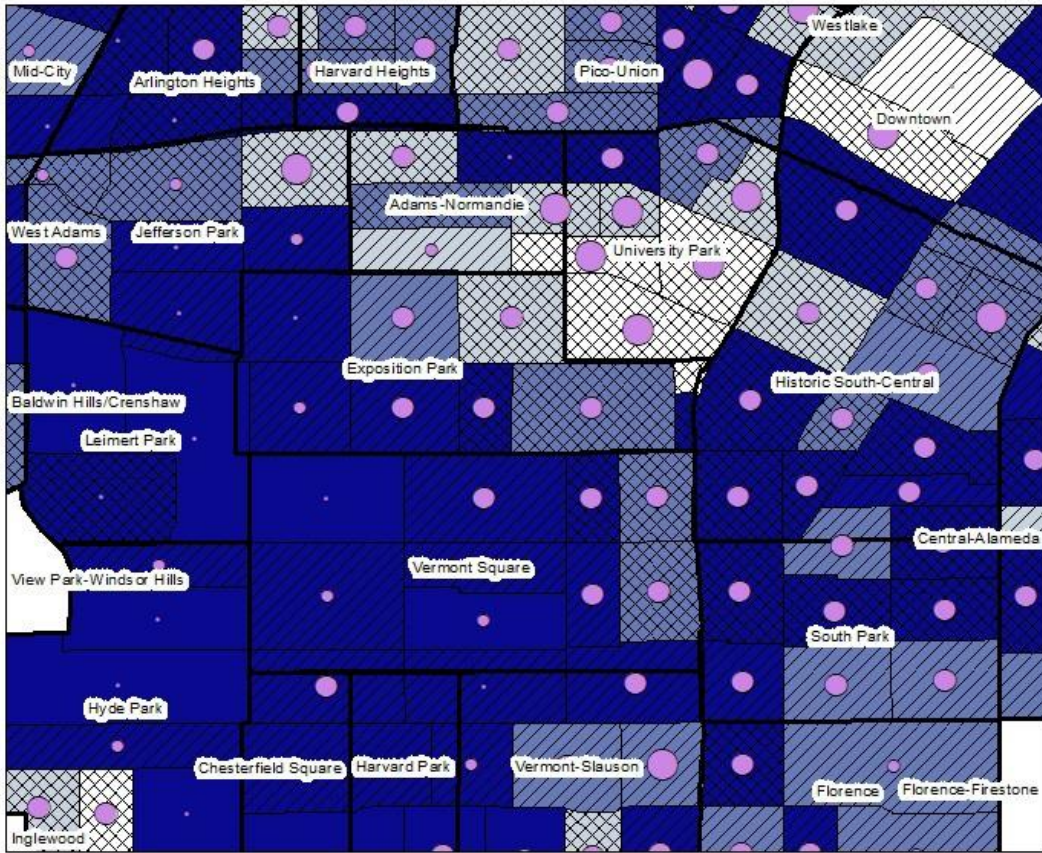
My vision for this map is to use it to inform what neighborhoods require investigation. I would then take a more detailed approach to map out each neighborhood by block so that the neighborhood could be surveyed. That map would contain:

- Each individual building
- Year built
- Most recent renovation work and if the property has undergone lead abatement
- Renter or owner occupied
- Number of rental units

I doubt it's possible to pull data on each household's income. The median household income for the larger neighborhood should be sufficient to determine what blocks require investigation. The purpose for this detailed map would be to identify the individual properties that require analysis of whether they are a potential historic resource and require lead abatement.

Map 1

Finding Historic Resources with Lead-Based Paint in LA Neighborhoods



Median Year Built

- Pre-1950
- 1951 - 1960
- 1961 - 1978
- Post-1979

Median Household Income

- Below Poverty (< \$25,100)
- Poverty - Median (\$25,100 - \$40,336)
- Median - Median +20% (\$40,336 - \$48,403)
- Above Median +20% (>\$48,403)

% Housing Occupied by Renter

- < 50%
- 50% - 75%
- 75% - 100%

Map 2 – Score Map

Finding Historic Resources with Lead-Based Paint in LA Neighborhoods

