

Lead and Fluoride Monitoring in Water and Soil Samples from Claiborne Corridor

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Background

- Environmental contaminants such as **lead and fluoride** from industrial and natural sources pose significant risks to human health.
- Lead exposure is associated with neurodevelopmental deficits and behavioral disorders in children, and kidney damage and hypertension in adults.
- Excessive fluoride intake can result in dental and skeletal fluorosis and related neurological disorders.
- The **U.S. Environmental Protection Agency (EPA)** has set a soil lead hazard standard of **200 ppm for recreational area**, and **100 ppm** for sites containing **multiple sources of lead exposure**. The water fluoridation level set in the U.S drinking water supply is **0.7 ppm** (U.S. DHHS, 2015).
- The study area** is the **Claiborne Corridor section of Interstate 10** in New Orleans is a high-traffic urban area where residential neighborhoods may be at increased risk of exposure to environmental contaminants.
- The objective of the study is to determine the concentrations of lead and fluoride in soil and water samples along the Claiborne Corridor and assess their pollution risk in the area.

Methods

Soil Sample Collection: A total of 396 soil samples were collected in a grid pattern from 11 parks using plastic shovels. After each sample collected the plastic shovels were wiped clean with a Kimwipe. Between each park, the plastic shovels were rinsed with distilled water to prevent contamination.

Samples were stored in Ziplock bags and air-dried on the lab bench for at least four days before analysis. GraphPad Prism and Excel were used for statistical analysis. ArcGIS was used for spatial mapping of lead contamination in soil samples.

Water Sample Collection: Water samples were collected from public park fountains into clean bottles after letting the fountain run for at least 5 seconds.

Lead and Fluoride Measurement

- Water Lead:** Water Samples were analyzed for lead using the Palintest SA1100.
- Water Fluoride:** Water samples were tested for fluoride levels using Ion Selective Electrode. First, 2 mL of the water sample was added to an Eppendorf tube and mixed with 2 mL of Total Ionic Strength Adjustment Buffer II (TISAB II). The electrode from the Ion Selective Electrode was then place into the Eppendorf tube.
- Soil Lead:** Soil samples were analyzed by the X-ray fluorescence (XRF) analyzer (XRF-550).



Figure 1: Image of Thermo Orion Star A329 used for fluoride analysis.



Figure 2: Image of XRF-550 used for soil analysis.

Results

• Map of Parks & Playgrounds Sampled

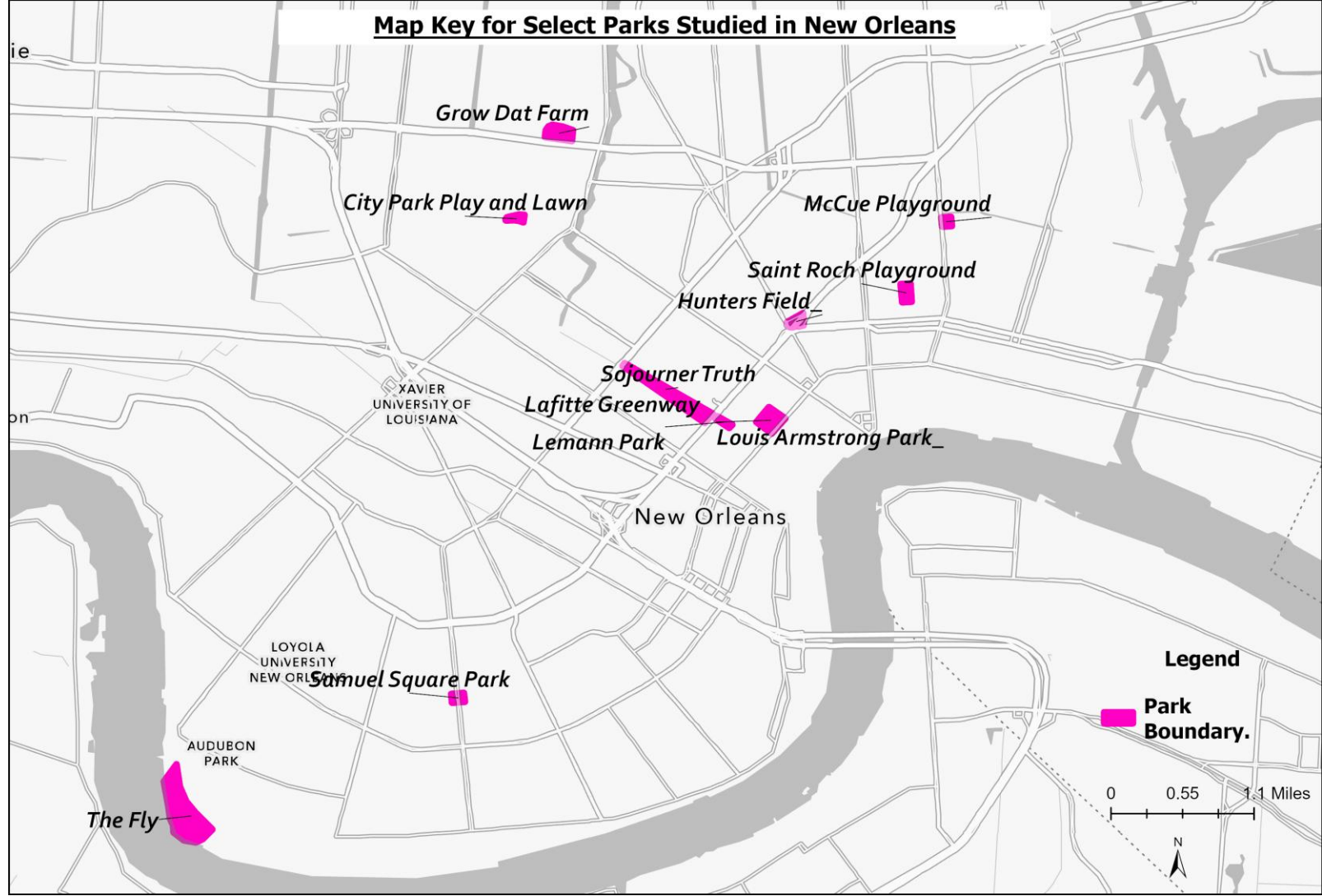


Figure 3: Location map of all 11 parks sampled.

Lead Concentration of Parks Along the Claiborne Corridor

- The mean lead concentration of all soil samples collected was 93.16±161.55ppm.

Corridor and Non-Corridor	
Mean (ppm)	93
Min (ppm)	5.1
Max (ppm)	1331
0-100 (ppm)	295/396
100-200 (ppm)	40/396
>200 (ppm)	47/396
Non-Detected	14/396

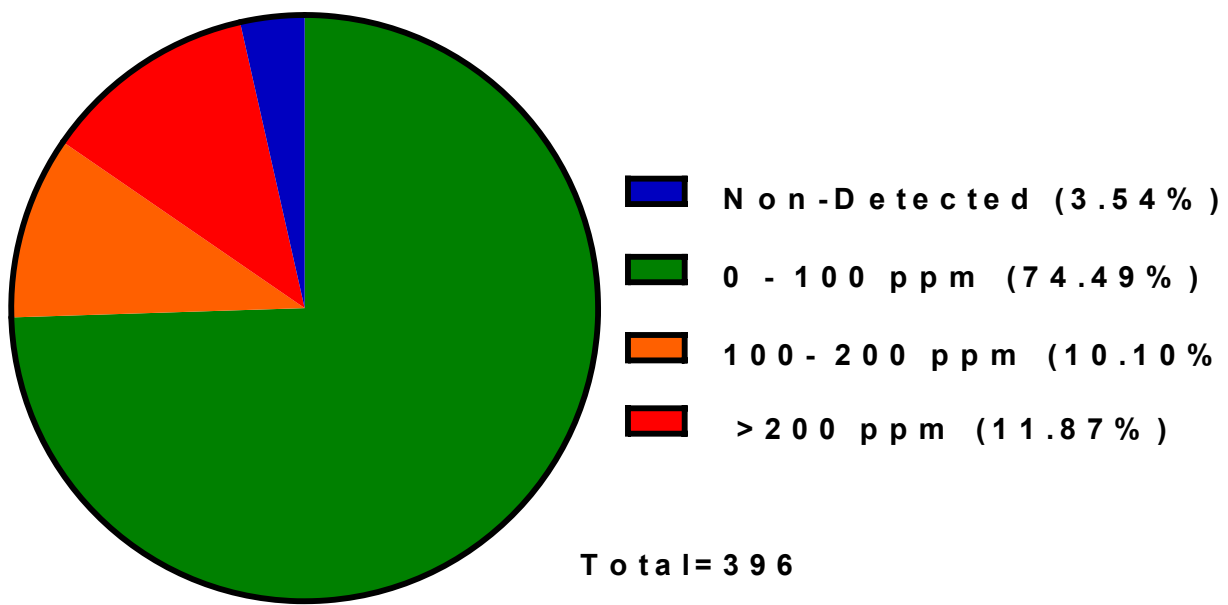


Figure 4: Pie Chart of soil lead concentrations that fall in either <100 ppm of Pb, 100-200 ppm of Pb, >200 ppm, or not detected.

Table 1: Descriptive statistics of 396 soil samples collected in the study.

Inverse Distance Weighted Interpolation for Soil Lead Concentration

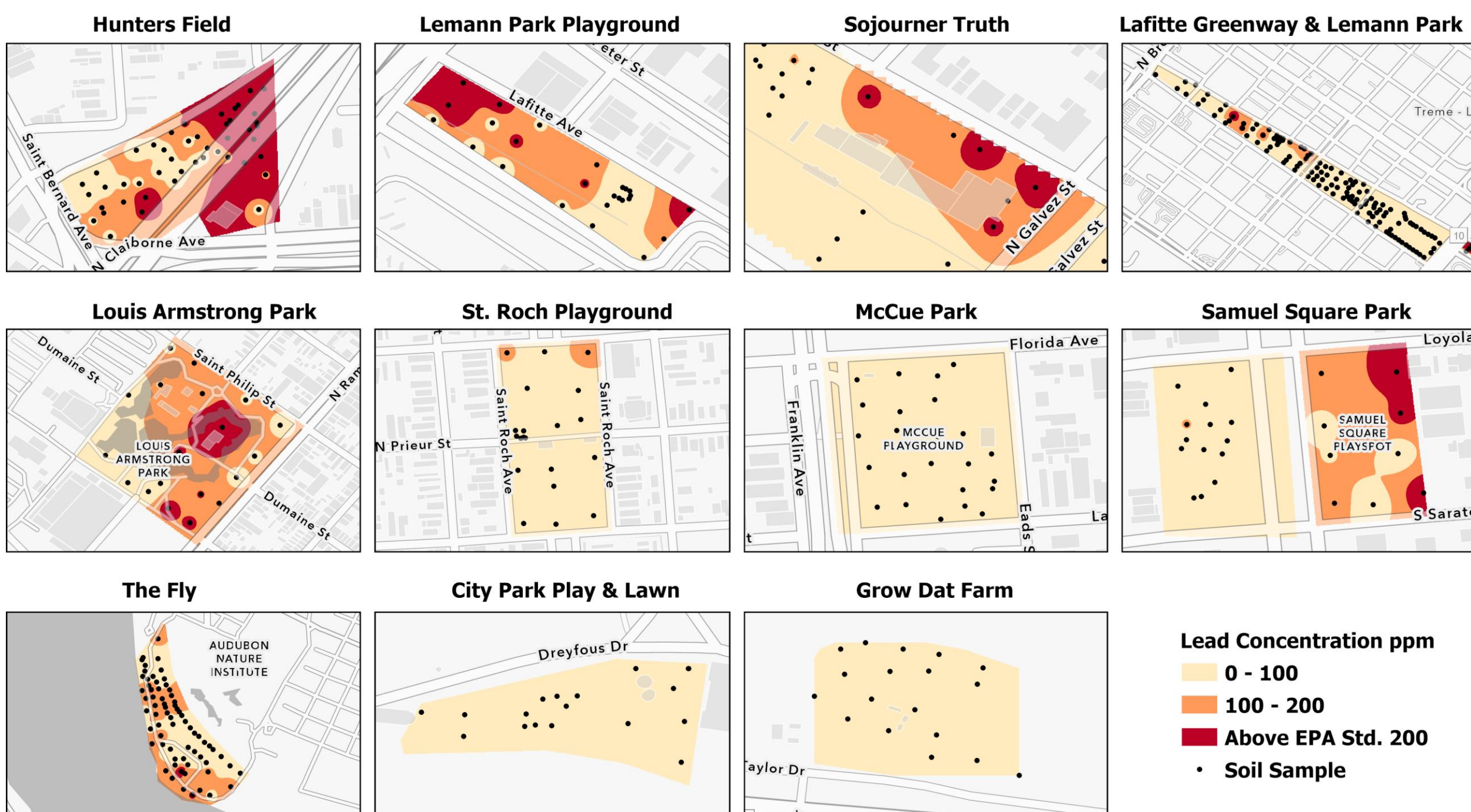


Figure 5: GIS map of lead concentration of parks along the corridor

Lead Concentration Comparison between Corridor and Non-Corridor Parks

ppm	Mean	Min	Max	0-100	100-200	>200	Non-Detected
Non-Corridor	75	6.9	654	83/107 77.6%	14/107 13%	9/107 8.4%	1/107 0.93%
Corridor	100	5.1	1331	212/289 73.4%	26/289 9.00%	38/289 13.2%	13/289 4.50%

Table 2: Descriptive statistics of soil samples separated into Corridor and Non-Corridor.

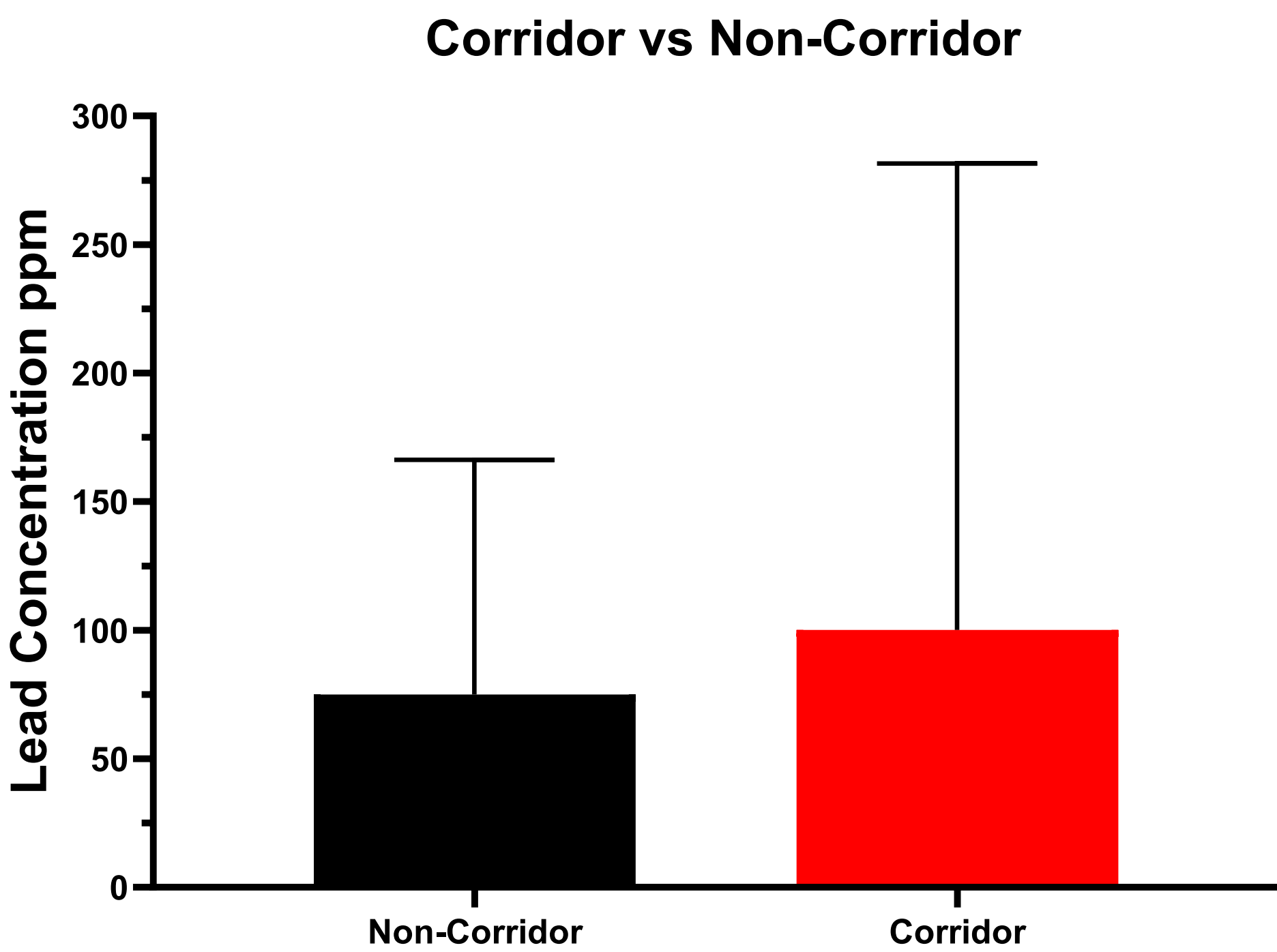


Figure 6: Graph Comparison of Lead Concentration between Corridor and Non-Corridor Parks.

Lead and Fluoride Concentration in Water Samples

- Water lead concentrations ranged from <2 ppb to 8 ppb but none exceed the 15 ppb standard set by the EPA in drinking water.
- The mean concentration of fluoride in the 11 water samples was 0.65 ppm (0.29–0.84 ppm).
- All but one sample from Orleans Parish, Leman Park was fluoridated (0.29 ppm)

Conclusions

- In parks along the corridor, lead soil concentration was not uniform. Some parks particularly in the Hunter's Field have areas where lead level exceeded the EPA standard of 200 ppm in soil samples.
- About 12 % of soil samples exceeded the EPA's lead concentration standard of 200 ppm.
- Parks that contain soil samples with lead concentrations below 100 ppm may reflect prior remediation efforts.
- Samples exceeding 100 ppm, particularly those above 200 ppm warrant continued monitoring and targeted interventions to reduce potential exposure risks for surrounding communities.

References

U.S. Department of Health and Human Services, Federal Panel on Community Water Fluoridation. (2015). U.S. Public Health Service recommendation for fluoride concentration in drinking water for the prevention of dental caries. *Public Health Reports*, 130(4), 318–331. <https://doi.org/10.1177/003335491513000408>

U.S. Environmental Protection Agency. (2024). Explainer: Updated residential soil lead guidance for CERCLA sites and RCRA corrective action facilities. Office of Land and Emergency Management. <https://semspub.epa.gov/work/HQ/100003437.pdf>