

Hypothesis

It is well known that lead from combustible gasoline emissions concentrate and can reside in soils for long periods of time. Lead concentrations were eliminated from gasoline in the mid-1980's. Prior to this time lead concentrated in soils from gas emissions in high traffic areas in the city of Springfield, Mo. Most of the gas emissions would be carried downwind in respect to the prevailing wind direction, which is W-SW. My hypothesis is the lead concentrations in the soils on Elementary School properties should be higher in those areas where the traffic density was the greatest prior to the mid-1980's. I also believe the lead concentrations in the soil should be highest in the area on school property, which is downwind and closest to the traffic concentration.

Procedure

I obtained a location map of the R-12 Elementary Schools and the permission to collect soil samples on school properties from the R-12 School District Office. I chose 8 Schools for this study. I selected three Elementary Schools, each located in a high-density traffic area during the time of lead gasoline usage. These schools are: **Rountree**, located near and downwind from the intersection of Grand Street and National Avenue; **Portland**, located near and downwind from Sunshine Avenue; **Sunshine**, located downwind and on the corner of Sunshine and Jefferson Avenues. I also selected **Watkins**, which is located downwind from a street with high traffic density, Kearney, but in a location farther away from the "Center City Area" of Springfield. I selected four Elementary Schools each of which was located in lower density traffic area during the time of lead gasoline usage. These schools are: **Disney**, **Cowden**, **Hickory Hills** and **Pleasant View**.

Each soil sample from each school was collected with a hand hoe and placed in a small appropriately labeled sandwich bag. Two or three soil samples were collected from each school property. I collected samples from three areas when available. These areas were: (1) the closest area on the property facing downwind from a major road or intersection; (2) on the soccer field; (3) on the swing, slide or Jungle Gym area. Some of these swing, slide or Jungle Gym areas were covered with wood chips. When this occurred, the closest exposed soil sample to the activity area was taken. The above-mentioned [collection areas on each school property are coded](#). Next, the samples were taken to the lab to dry.

Each sample was dried, disaggregated with a mortar and pestle and shaken on a 63-mesh size stainless steel sieve. A portion of each sample passing through the sieve was weighed to approximately 0.5000 grams and transferred to a centrifuge bottle to which 10 milliliters of 3N nitric was added. The samples were placed in a hot water bath, shaken at 80 degrees C for 12 hours and centrifuged. The liquid portion of each sample was placed in a small analysis bottle. The concentration of lead in PPM was determined using the Shimadzu Atomic Absorption Analyzer. Microsoft Front Page and Excel were used to generate table listings and lead concentration trend charts for the purpose of analyzing the results of the data generated from the chemical analysis.

Results

The concentration (PPM) of lead in each sample used in this study and the mean concentration (PPM) of lead in all samples from each school is shown in the [first table](#). The [lead concentration trend chart](#) for

all study samples are shown. The trend chart showing the mean concentration of lead in the soil samples for each school is shown.

The results from the lead concentration tables and trend charts indicate the lead concentrations in the soils of Rountree, Portland and Sunshine Elementary Schools are the highest. The next highest is that found in the soils at Watkins. The lead concentrations in the soils of the remaining schools are appreciably lower. For samples collected at Rountree, Portland, Sunshine, and Disney, the highest lead concentration at each site was clearly nearest the W-SW corner or closest to major road area. This was not so apparent for the samples at Watkins, Cowden, and Hickory Hills and was not true for the samples at Pleasant View.

The concentrations of lead in the soils of Elementary Schools in this study is well below the toxic limits set by the Environmental Protection Agency (EPA) and the U. S. Department of Housing and Urban Development (HUD). The acceptable concentrations set by these 2 agencies are 500 PPM and 500-1,000PPM respectively. It is interesting to note that the concentrations of lead in the soils of all samples representing Rountree, Portland and Sunshine Schools are well above the toxic level of lead in soils for school playground areas in Sweden established by the Swedish government.

Conclusions

The concentrations of lead in the soils of the Elementary School properties in Springfield Missouri was found to be highest in the area of highest traffic density present during the time when lead was an ingredient in gasoline. The lead concentrations were low in the soils of Elementary Schools in the areas of low traffic-density present during that same time. Lead concentrations in the soils decrease from the source within the same Elementary School property. All of the above results agree with my original hypothesis concerning this project. The concentrations of lead in the soils of Rountree, Portland and Sunshine Elementary Schools could be considered toxic by some national agencies.

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