



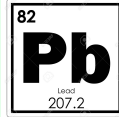
Lead and Arsenic Contamination in Benicia Soil



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Arsenic and Lead Background

Lead (Pb)



STANDARDS

- California EPA soil Pb levels standards: **80ppm (parts per million)**
- The U.S. EPA Standard for Pb in soil is **400ppm**.

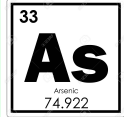
EXPOSURE

- Pb exposure can come from many sources such as manufacturing, old Pb-based paint, Pb gasoline, and old Pb pipes.

HEALTH EFFECTS

- Can be distributed to the brain, kidney, liver, and bones bringing detrimental effects such as slowed growth and development, learning and behavior problems, and hearing and speech problems.
- Children are particularly vulnerable to lead exposure because their developing brains are more susceptible to its effects in comparison to the adult brain.

Arsenic (As)



STANDARDS

- EPA soil As standards: **5-20 ppm**

EXPOSURE

- The most serious source of exposure to As is from ingesting/or inhaling contaminated soil/or dust.

HEALTH EFFECTS

- Arsenic (As) replaces phosphate in the body, causing neuromuscular damage, skin diseases, and cancer.

Soil Sampling Procedure



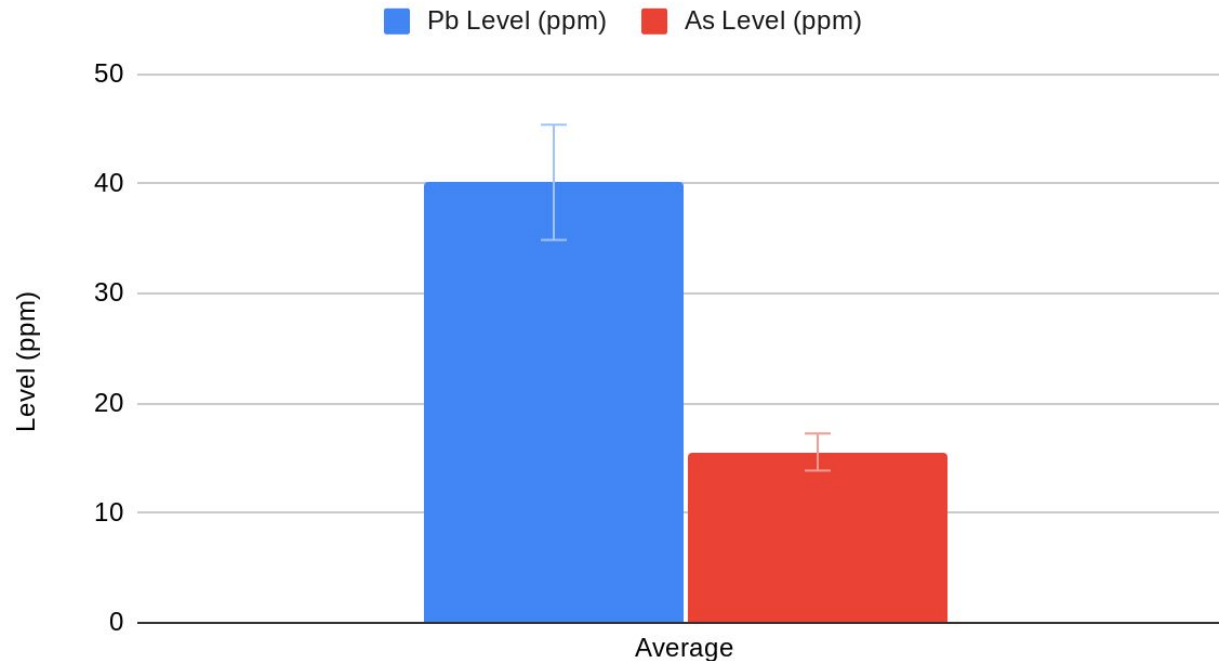
With help from the East Bay Academy For Young Scientists, a high school environmental justice program based at the Lawrence Hall of Science, fellows were able to collect soil samples at the Benicia Wooden Park, Benicia Community Center, and the Heritage Presbyterian Church.

Topsoil and depth soil samples were collected at various sites within each location. Each soil sample was sifted through a 10 mesh sieve to remove coarse particles and other large chunks of debris for testing. An X-Ray Fluorescence Analyzer was used to analyze the chemical composition (Pb and As levels) in each soil sample.

Our goal, through testing soil samples, was to determine the quality of soil in Benicia and to see if levels fell within CalEPA standards.

Results of Soil Sampling in Benicia

Average Lead (Pb) and Arsenic (As) Levels At Benicia Sites



- CalEPA standards for Pb: 80 ppm
- 5 ppm up to 20 ppm of arsenic in soil viewed as safe
- As Limit in Benicia: above ~13 ppm

Results of Soil Sampling in Benicia

While on average, levels of As and Pb did not exceed standards, a few individual sites exceeded safe levels:

Location	Pb Levels (ppm)	As Levels (ppm)
Community Center	n/a	17, 21, 68
Benicia City Park	120, 96, 129, 105, 101, 103	14, 19,
Heritage Presbyterian Church	366	14, 23, 55, 23, 14

Arsenic & Lead in Playgrounds:

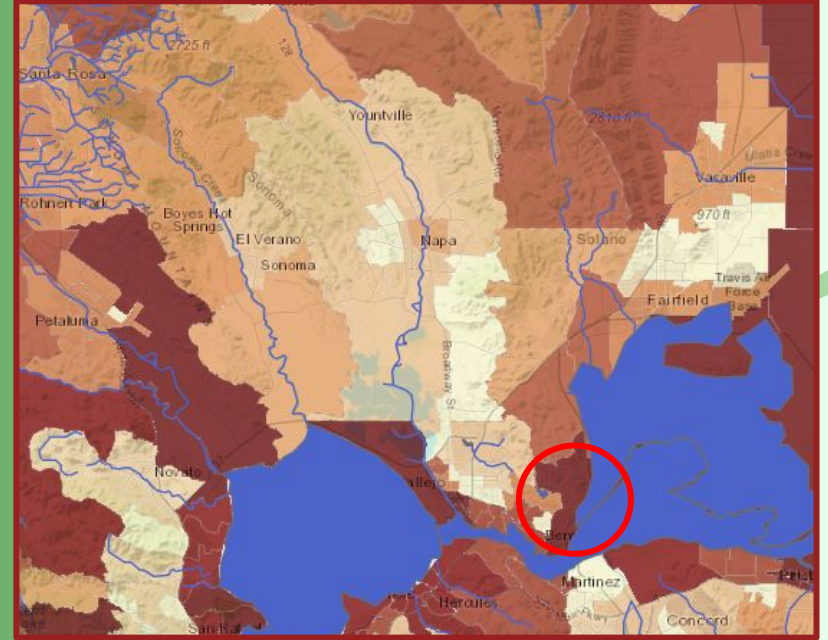
How it affects our children

- Playgrounds, that were built next to buildings that have high amounts of arsenic and lead are very dangerous because it exposes these harmful chemicals to our children.
 - Kids who play in the soil in and surrounding the playground are more likely to breathe in lead and arsenic
- High amounts of lead and arsenic can impair children's brain development severely, however, it can cause a list of other issues as well:
 - Lower IQ
 - Growth issues
 - Breathing problems
 - Bad immune system
 - Develop cancer as an adult
 - Behavioral problems(hyperactivity)
- What can we do? In short, not much but here are some things you can keep in mind!
 - If you do go to the park, make sure you take your shoes off before you step into the house, to keep the potentially contaminated soil from getting inside your house
 - WASH YOUR HANDS!!



Lead and Arsenic in our local Water System

- Data collected in 2018 shows citizens that Benicia sits in the 90-100 percentile for impaired waters.
- Out of Solano county, Benicia had one of the highest impaired water percentile.



Gathered from CaliEnviroScreen

How does this impact Benicia?

- most of the chemicals that are providing this toxicity to local water sources is Arsenic, a highly toxic element known for causing cancer.
- Benicia wildlife are directly impacted by the impaired waters, reducing the amount of natural biodiversity within our city.
- contaminated fish and shellfish that is locally caught can cause food poisoning and harm citizens of Benicia.
- Native animals that rely heavily on water in Benicia suffer as a result of toxicity in water.



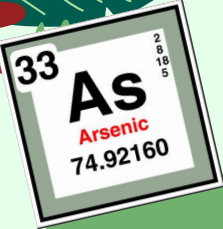
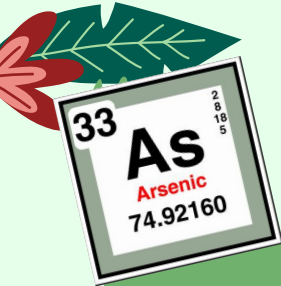
clark's Grebe (native species)



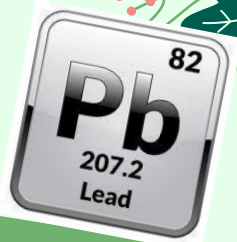
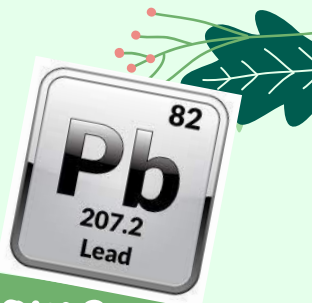
Snowy Egret (native species)

canvasback (native species)





Environmental Justice:



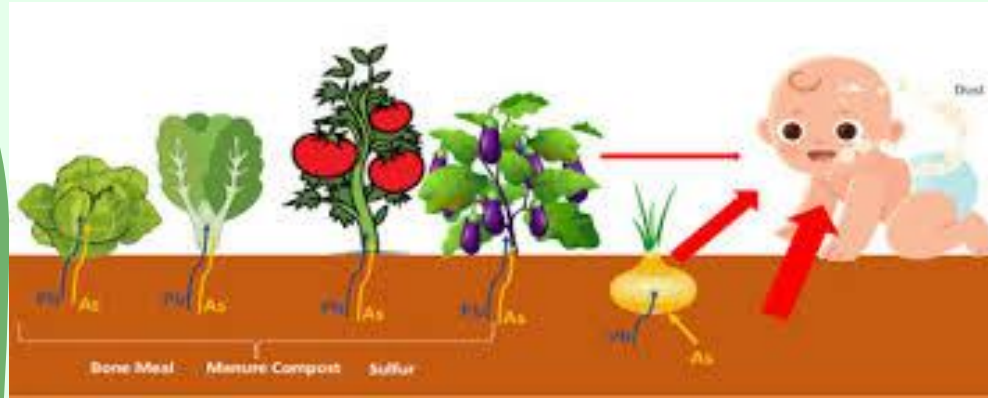
How do Arsenic and Lead levels relate to lower income areas?

- Lower income neighborhoods are at greater risk for potential Lead and Arsenic exposure
- Lead paint on older building contributes to lead contaminated soil
- Lower income neighborhoods may not have the resources to remove such contaminants from buildings resulting in environmental inequality
- we need to work together to create an environmentally just society in which every individual is able to live in a clean and healthy environment regardless of income



Lead and Arsenic in your Backyard

- Lead and Arsenic in garden soil can have potential to harm plants.
- The Lead and Arsenic is in the soil due to the erosion of old water pipes as well as old house paint.
- Generally though, minimal levels of As and Pb are not too bad (less than 1.56 ppm)

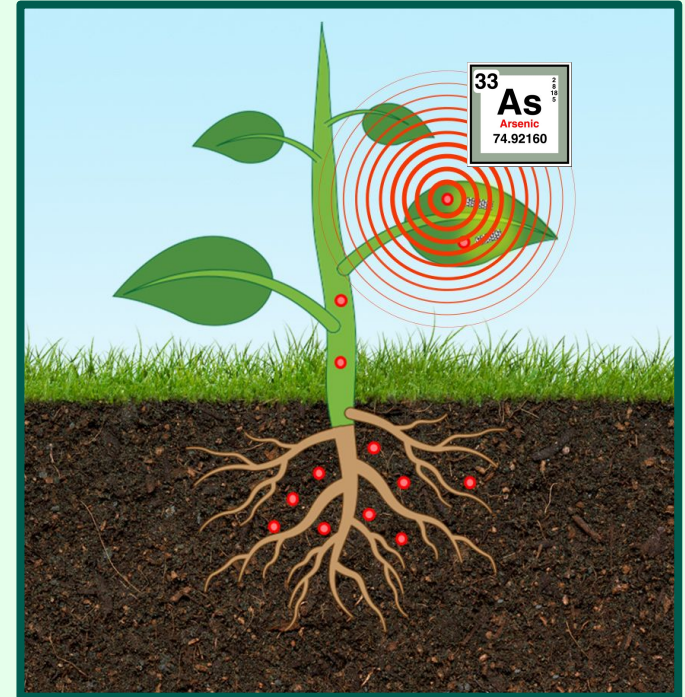




How do the veggies get affected?



- Fruit-type veggies like tomatoes concentrate Arsenic in their roots and very little taken up in the fruit portion so it's safe to plant them.
- Leafy vegetables also store arsenic in roots while some is stored in stem and leaves
- Root crops (beets, turnips, potatoes) absorb Arsenic in their skins.

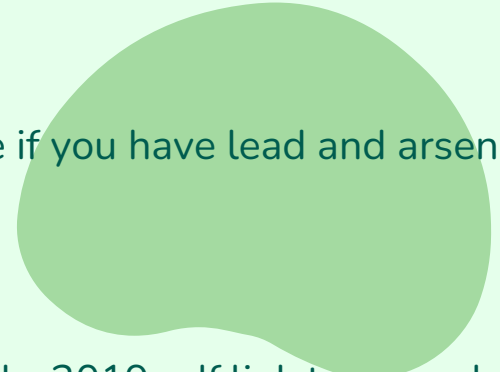




Handling Lead and Arsenic in the Garden



- Use raised beds with store-bought soil and wear protective clothing like gardening gloves
- Test your soil by going to your local nursery for soil testing kit to see if you have lead and arsenic in the soil. Ordering some online work as well.
- <https://clf.jhsph.edu/sites/default/files/2019-03/suh-soil-testing-guide-2019.pdf> link to a good resource by John Hopkins for soil testing
- Note that if you have some lead and arsenic in your soil, avoid growing leafy vegetables but it is fine to grow crops like tomatoes and fruit like crops in your garden because they don't directly have the contaminants



Results at Benicia Waterfront:

In November 2020, outside of the fellowship program, soil samples were collected along the Benicia waterfront. Here are the results:

Location	Pb Levels (ppm)	As Levels (ppm)
Benicia Turnbull Park	0, 0, 0, 0	0, 0, 0, 0
Benicia Point/E B Street	441, 43, 72, 220, 72, 76, 202, 220	0, 0,0,0, 49, 78
Ninth Street Park	0,0,0,0	0,0,0,0

What can the Community do?

- Get involved in Citizen Science!
- Attend City Council Meetings to get your voice heard
- Educate others about the negative effects of Lead and Arsenic



Call to Action

- Future research should be conducted at these sites to continually improve the As and Pb levels in our environment and maintain high quality soil
- Stay safe when planting veggies by making sure not any indicators of As and Pb pollution in the soil
- Educate others and spread the word.

Resources

https://docs.google.com/presentation/d/1dza4soFyxkYkTnr6BfgwlvGHifTL072LkGvb33aPLGo/edit#slide=id.g1105563a115_0_16491 (EBAYS slides)

<https://docs.google.com/spreadsheets/d/1hvFng9QazJcNco4g8DundkQ5srkekIncl2mJrcadT8U/edit#gid=0> (lead and arsenic data spreadsheet)

<https://drive.google.com/file/d/1PN3Z4IDloonlb-vYauYHcolru5Ry1lSF/view> (arsenic background)

<https://drive.google.com/file/d/1mTmEZ1HS9EFhwjzPqdzbPMVGP6vRHbv/view> (arsenal soil removal plan from 2010)



Thank you!

