AGRI CULTURE & NATURAL RESOURCES

Southern University Agricultural Research and Extension Center

Soil Remediation from Arsenic and Lead

OVERVIEW

Heavy metal contamination of urban soils is of great concern in the New Orleans, Louisiana Metro Area. Arsenic and lead are two heavy metals commonly contaminating urban soils. This contamination is potentially due to previous industrial or commercial operations using arsenic and lead based products in daily operations, as well as the natural disasters that have disturbed soil's chemical and physical characteristics. As a result, heavy metal contaminated soils can pose operational obstacles and human health challenges through exposure to farming operations in urban areas.

HUMAN ARSENIC AND LEAD POISONING CAN OCCUR IN FOUR WAYS:

- TOUCHING CONTAMINATED SOIL
- EATING FOOD FROM CONTAMINATED SOIL
- DRINKING WATER SOURCED FROM CONTAMINATED SOILS
- BREATHING THE DUST FROM CONTAMINATED SOILS

HOW LEAD AND ARSENIC BEHAVE IN CONTAMINATED SOILS

Lead can accumulate in the plant roots, leaves, and stems. Therefore, iRoot crops such as potatoes, carrots or beets, should not be grown in lead contaminated soils. Furthermore, vegetable and herb plant's, such as lettuce and cabbage, can accumulate lead in their leaves and stems. Therefore, these are crops that should not be grown even in moderately contaminated lead sites *(100–400 ppm total lead)*. The U.S. EPA has set levels of concern for lead in soils. Urban soils that contain 400 parts per million total lead are considered a risk in children's play areas and those containing 1200 parts per million total lead are considered a concern for all users.

OPTIONS FOR DEALING WITH LEAD CONTAMINATED SOILS:

1. ***Removal and replacement with noncontaminated soil***
2. ***Physically covering the soil with temporary or permanent barriers***
3. ***Diluting the contaminated soil with lead-free soil***
4. ***Using the site for low maintenance tree and shrub plantings***
5. ***Building raised beds***
6. ***Changing the soil chemistry to facilitate lead immobilization.***
7. ***Phytoremediation whereby plants that accumulate lead from the soil are grown and periodically harvested***

Arsenic can harm the human neurological, pulmonary, hematologic, cardiovascular, and gastrointestinal systems. There are several ways arsenic can contaminate soils, such as treated lumber, industrial and municipal dumps, and agricultural lands treated with arsenical pesticides in the past. Soil's physical and chemical properties control how arsenic behaves in urban soils. Soil ph, water levels, particle structure *(% of sand, silt, and clay)* play a role in the availability and mobility of arsenic to impact human health.

TECHNIQUES FOR REDUCING LEAD AND ARSENIC BIOAVAILABILITY IN CONTAMINATED URBAN SOILS

Phytoremediation or ***Physical Remediation*** of soils are some potential techniques for reducing lead and arsenic bioavailability and human health threat in contaminated urban soils. However, these techniques may not rid the soil of lead and arsenic contamination. Contaminated soils may be amended to lessen the amount of lead available for plant uptake by maintaining the soil pH around 6.5, maintaining adequate phosphorus in the soil, and increasing organic matter levels. Phosphorus and arsensic enter the plant using the same plant circulation system. The plant cannot tell the difference between phosphorus and arsenic. Therefore, in theory, whichever has the highest concentration in the soil, phosphorus or arsenic, the plant will absorb the most of. Adding organic matter to the soil will reduce the lead available for plant uptake due to the organic compounds in the organic matter which will chemically react with the lead and make it insoluble. After using this technique, you should have your soil retested every year to monitor nutrient, pH levels, arsenic levels, and lead levels for potential contamination occurrences.

ESSENTIAL SOIL HYGIENE PRACTICES

While the information on heavy metal contamination increases your awareness of urban soil contamination, you should always be mindful of these essential hygiene practices while farming and gardening.

1. ***Make sure your site is given a full and thorough investigation by the local USDA-NRCS soil scientist for determination of soil conditions.***
2. ***Make sure to send your soil samples to the Louisiana State Soil Testing laboratory for verification of potential contamination threats.***
3. ***Do not bring food or drink into the garden or farm workspace.***
4. ***Wash your hands and all gardening or farming tools after use.***
5. ***All produce should be washed thoroughly to remove any soil particles before consumption.***
6. ***Wipe your shoes on a utility mat or remove them before entering a home.***
7. ***Clean your pet's feet as well if they are muddy to avoid transporting soil into the house.***

TARGET AUDIENCE

Any future/beginning community, or current/ future farmers in the state of Louisiana. However, we also specialize in small, socially disadvantaged, or limited-resource farmers.

TARGET AREAS

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Delaware.gov states, *"Children may eat dirt while playing, dust can be brought into the home from outside, and you could be exposed by breathing air containing sawdust or burning smoke from wood treated with arsenic."* Contaminated soils can be remedied in a variety of ways. The most effective and expensive method is to excavate the contaminated soil, take it to a landfill, and replace it with clean soil; the second method is to treat the soil using elemental inactivation chemicals.

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