

Dirty Garden Soil: Practice Steps for Cleaner Backyard and Community Gardens Patrice Barrett, MPH, Baram Kim, MA MPH, Wendy Heiger-Bernays, PhD and Jade Tabony, MS Boston University School of Public Health Dept. of Environmental Health, Boston MA

Abstract

Community and backyard gardens created in residential areas provide people with opportunities to improve the overall quality of their lives and are often located on property with soil contaminated by lead, arsenic and/or polycyclic aromatic hydrocarbons (PAHs) from decades of human activity.

Unacceptable human health risks, especially for children and pregnant women, can result from exposure to soil contaminants through ingestion, inhalation and dermal routes. Risks from contaminated urban soils can be controlled using a set of Best Management Practices (BMPs) based on research and methods from academia, state and federal agencies, and environmental science experts.

Data from gardens soils in recently conducted fieldwork supports the need for remediation measures and allows a better understanding of the scope and focus of the contamination in terms of temporal and spatial distribution. Using these and other published data, growing practices for current and future gardeners that are practical, timely, cost effective and easily implemented, while maximally protective of the public health are stipulated.

The BMP steps consist of: 1)researching the property history to inform the successive management steps, 2)garden site planning, 3) elective soil testing for environmental contaminants and nutrient content, 4) interpreting soil test results, 5) re-mediating elevated contaminant levels with tested compost and soil to a distilled set of benchmark levels and constructing raised beds if needed, and 6) adhering to a set of good gardening practices.

The greatest part of the risk reduction responsibility rests with individual gardeners and their adherence to safe gardening practices introduced at proposed ongoing community gardener education sessions. These BMPs encourage a judicious use of resources in global residential areas to help ensure a balance in the benefits of locally grown and healthy produce with the risks of consuming food cultivated in contaminated soils.



Answering the Question





Concentrations of Select Contaminants Commonly Found in Urban Soils						
	Common Sources	Concentration Range				
Lead	Paint on Houses (pre 1978) Leaded Gasoline	400 - >2000 mg/kg ¹				
Arsenic	Pressure Treated Lumber (CCA) Pesticides (often used on trees)	0.1 - 99 mg/kg ²				
Polycyclic Aromatic Hydrocarbons (Total PAHs)	Burned Trash or Coal Street Sweepings	2.2 - 167 mg/kg ³				
¹ USEPA, Lead Safe Yards Program (2001). http://www.epa.gov/region1/leadsafe/pdf/entire_document.pdf						
² MassDEP, (2002). Technical Update: Background Levels of Polycyclic Aromatic Hydroca	rbons and Metals in Soil					
³ Bradley, L.J.N., et al., (1994). Journal of Soil Contamination, 3(4):349-361						



Residents want to start a garden in your community - should they just dig right in?

exposure pathways. Uptake through plants is generally not as important.

Rationale for Developing the Best Management Practices

Soil is contaminated due to historical activities. Yet gardening and consuming locally grown food is beneficial to health.

Soils used for growing food should meet health protective concentrations.

Testing and removing soil intended for gardening is prohibitively expensive.

Approach to Developing the Best Management Practices

. Conducted literature reviews using public health, agriculture, agronomy, soil science, hazardous waste, and environment health disciplines.

Reviewed analytical data from soil collected during community garden renovations, municipal compost testing and the scientific literature, as well as state, federal and international criteria and guidelines.

. Identified vulnerable and susceptible populations based on exposure potential and hazards evaluations.

Developed acceptable garden soil concentrations for lead, arsenic and PAHs.



Children can ingest soil with hand to mouth activity while playing in the garden area





Collecting soil samples



Determine the property history using city land records or Sanborn maps. *Gardeners may assume that soil is contaminated and skip directly to Step #4

2. Conduct soil testing for contaminants and nutrients. Soil sampling instructions and costs are available from state agricultural extension program web sites.

3. Review soil test results. Seek assistance from extension or public health professionals if needed to understand the results.

4. Plan the garden site. Decide on the types of plants to be cultivated or structures being built on the land.

- 5. Construct raised beds with geotextile fabric covering native soil and at least 12 inches of new tested soil if contaminant levels are higher than recommended levels OR remediate elevated contaminant levels without raised beds with tested compost and soil to meet safe benchmark levels
 - 6. Do not use street sweepings in garden compost or soils.
 - 7. Emphasize good gardening practices through education http://www.bostonnatural.org/cgGTips UrbanSoils.htm.

BOSTON UNIVERSITY

Key Recommendations—Best Management Practices Conduct Due Dilligenc **Develop Soil** Sampling Plan for existing soil Collect samples & send to lab Interpre Data Can Plant in existing soils Recommended analyses for community and commercial gardens. PAHs = Polycyclic Aromatic Hydrocarbon Gardening

Environmental Public Health Implementation

- Promote and support education on good gardening practices to help residents recognize and reduce exposures to soil contaminants.
- Design educational resources on garden soil safety for local residents based on these best practice recommendations.

Collaborate with other organizations to promote safe soil use protocols and encourage the locally grown food movement.



community garden after implementing the BMPs and cultivating plants

References

of State and Territorial Solid Waste Management Officials. 2012. Community Gardening on Brownfields Toolbox. sued October 2012. http://www.astswmo.org/Pages/Policies and Publications/CERCLA and Brownfields.htm Centers for Disease Control and Prevention. Agency for Toxic Substances and Disease Registry (ATSDR). 2011. Lead. http://

www.atsdr.cdc.gov/substances/toxsubstance.asp?toxid=22. Last updated 3-3-2011. Centers for Disease Control and Prevention. Agency for Toxic Substances and Disease Registry (ATSDR), 2011, Polycyclic Aromatic Hydrocarbons. http://www.atsdr.cdc.gov/substances/toxsubstance.asp?toxid=25. Last updated 3-3-201

ornell University Waste Management Institute. October 2009. Soil Contaminants and Best Practices for Health Gardens. http:// cwmi.css.cornell.edu/Soil Contaminants.pdf

f Environmental Protection. MCP Method 1: SOIL CATEGORY S-1 STANDARDS. Table 2. Plan updated in March 2008. http://www.mass.gov/dep/cleanup/laws/0975_6a.htm

nvironmental Protection, 2002, Technical Update: Background Levels of Polycyclic Aromatic Hydrocarbons and Metals in Soil. (http://www.mass.gov/dep/cleanup/laws/backtu.pdf. United States Environmental Protection Agency. Brownfields and Urban Agriculture: Interim Guidelines for Safe Gardening Practic-es. Summer 2011. <u>http://www.epa.gov/swerosps/bf/urbanag/pdf/bf_urban_ag.pdf</u>

United States Environmental Protection Agency. 2012. Chromated Copper Arsenate (CCA). <u>http://www.epa.gov/oppad001/</u> reregistration/cca/. Last updated 5-9-2012

Acknowledgements

Boston Natural Areas Network

NIEHS Superfund Research Program grant 2P42ES007381

BUSPH Exposure Biology Research Group Laboratory

Jade Tabony, MS Student - BUSPH, Caty Wilkey, BUSPH student

