

SOIL TESTING DATA

Heavy Metals in Garden Soil

Our Analytical Service

You probably have noticed that our fees are significantly lower than most providers on the market. This affordable service is part of Brooklyn College's commitment to public service for the community. Despite of the low fees, we strive to make available high quality data through stringent quality control procedures. The heavy metal analysis follows EPA standard methods 3050B, 3051A and 6020A.

How do your numbers compare to overall New York City levels and New York State Department of Environmental Conservation's Soil Cleanup Objectives

The following table provides a starting point to compare your numbers with.

	Mean	Median	Range	NYS Baseline	NYSDEC Unrestricted	NYSDEC residential restricted	USEPA SSL
Cr	62±38	54	9-248	13	30 (89%)	180 (3%)	120000
Ni	38±28	29	3-178	17	30 (47%)	310	1600
As	20±16	15	2-79	5.0	13 (57%)	16 (46%)	0.4 (100%)
Cd	3.0±2.4	2.5	0.5-22.5	0.5	2.5 (49%)	4.3 (25%)	70
Pb	565±527	411	11-2526	19	63 (87%)	400 (51%)	400 (51%)

Note: units are ppm; numbers in parentheses are percentages that exceed limits.

The Mean, Median and Range values are summary of data compiled for all samples, sent in from New York City five boroughs and analyzed at the Environmental Sciences Analytical Center. These values will be updated monthly. We also receive some samples from upstate NY and other states. In general, suburban or rural area samples have much lower toxic metal levels.

The New York State Soil Baseline levels are based on soils collected from central and western New York. In urban environments higher values are very common. It should be noted that there is currently no specific regulation or guideline values that exist for garden soils. The New York State Department of Environmental Conservation (NYS DEC) developed the Soil Cleanup Objectives (SCO) to guide Brownfield remediation, and these values are probably the most relevant and can be applied for garden soils.

The unrestricted use soil cleanup objectives represent the concentration of a contaminant in soil which, when achieved at a site, will require no use restrictions on the site for the protection of public health, groundwater and ecological resources due to the presence of contaminants in the soil.

(i) "Residential use" which is the land use category which allows a site to be used for any use other than raising live stock or producing animal products for human consumption. Restrictions on the use of groundwater are allowed, but no other institutional or engineering controls are allowed relative to the residential use soil cleanup objectives. This is the land use category which will be considered for single family housing;

NYS DEC defines that "Restricted-residential use" is the land use category which shall only be considered when there is common ownership or a single owner/managing entity of the site. Restricted-residential use: (a) shall, at a minimum, include restrictions which prohibit: (1) any vegetable gardens on a site, although community vegetable gardens may be considered with Department approval; and (2) single family housing; and (b) includes active recreational uses, which are public uses with a reasonable potential for soil contact;

Recommendations regarding Fruits and Vegetables

The University of Connecticut Soil Nutrient Analysis Laboratory suggested different actions for four different ranges of soil Pb levels. Based on this and the NYS SCO, we recommend that (1) for Pb levels below ~100 ppm, no precautions are necessary; (2) for Pb levels between 100 and 400 ppm, follow best management practices for garden soils containing lead, don't grow green leafy vegetables or root crops, kids shouldn't play in areas of bare soil, further investigation is suggested about lead distribution, and that children blood lead levels be tested; (3) for Pb levels above 400 ppm, the soil should not be used for growing food plants, and that remedial actions be taken for residential use.

We also recommend that food plants not grown in soils containing As, Cd, Ni and Cr levels above the "Residential, restricted" values, where further investigation and remedial actions should be taken. Otherwise, follow best management practices.

It should be noted that heterogeneities are prevalent in soils. Since your submitted soil sample represents an average of soils from several sites and different depths, a low average doesn't mean that at every site or depth the contaminant levels are below the respective levels for unrestricted use. Surface soils (1-2 inches at the surface) and soils closer to a building or a high traffic road are likely to be more contaminated. There are also possibly "hotspots" due to historical burial or dumping activities. If your soil sample contains high levels of heavy metals, or the levels are marginally below the thresholds, further testing and investigation is highly recommended.

What to do when you find high levels of contaminants in your garden soil?

Don't panic! You are not alone. In New York City there are many gardens like yours that had been contaminated due to historical reasons: paint chips in old houses, gasoline emission prior to 1980's, arsenic-bearing pesticides for lawns or from pressure-treated wood, or industrial activities at the site or nearby. Contaminants can enter human body through many different pathways, therefore what you do with the soil, and the extent to which you work with the soil controls the risk posed by these contaminants. Ingestion and inhalation are probably the two main forms of major risk in urban gardens. Most

heavy metals don't pose health risk with dermal exposure – therefore touching soils are usually not a great risk, but washing hands is particularly important. Children are at much higher risk than adults to contaminants not only because that their systems are weaker, but also their tendency to ingest soil.

Follow the Best Management Practices (BMP) for Garden Soils Containing Lead (taken from SOIL LEAD INTERPRETATION SHEET by Dawn Pettinelli, Manager, Soil Nutrient Analysis Laboratory at the University of Connecticut)

- Gardens should be located away from older, painted structures and heavily traveled roads.
- Give planting preference to fruiting crops like tomatoes, squash and peppers on soils with elevated lead levels.
- Remove outside leaves of green leafy vegetables, peel root crops, and wash all vegetables thoroughly to remove soil particles.
- Maintain the soil pH at 6.5 to 7.0 by applying limestone at recommended rates to reduce the availability of lead uptake by plants.
- Maintain soil organic matter levels between 5 and 10 percent. Organic particles will bind with lead making it less available for plant uptake.
- Maintain soil phosphorus levels by applying the recommended amounts of fertilizer to garden plots. Phosphorus can reduce lead uptake by plants.
- Minimize dust and exposure to bare soil through use of mulches.
- Wash hands thoroughly after contact with lead contaminated soil.
- Do not bring food or drinks into areas of contaminated soil.
- Soil on tools, gloves and shoes will have elevated levels of lead also. Clean before storing or bringing indoors.
- Consider raised beds or containerized plantings in soils with elevated lead levels.

Where to find more information?

1. Cornell Waste Management Institute, <http://cwmi.css.cornell.edu/soilquality.htm>. The fact sheets near the bottom of the page provides lots of useful information on contaminants, how to interpret the data, as well as best practices in a garden.
2. Frank J. Peryea. Washington State University. Gardening on lead and arsenic contaminated soils. Available at <http://cru.cahe.wsu.edu/CEPublications/eb1884/eb1884.pdf>
3. Penn State College of Agricultural Sciences. Lead in Residential Soils: Sources, Testing, and Reducing Exposure. Available at <http://cropsoil.psu.edu/extension/facts/Lead%20in%20Soil.pdf>
4. Prevent Lead Poisoning From Soils Around Homes. <http://aginfo.psu.edu/news/1999/11/lead.html>
5. Oregon State University. Evaluating and Reducing Lead Hazard in Gardens and Landscapes. Available at <http://extension.oregonstate.edu/catalog/pdf/ec/ec1616-e.pdf>
6. Stephanie Hamel, Joseph Heckman, Stephanie Murphy. Rutgers University. Fact Sheet: Lead Contaminated Soil - Minimizing Health Risks. Available at <http://njaes.rutgers.edu/pubs/publication.asp?pid=FS336>

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7. Ontario Ministry of the Environment programs and initiatives. Fact Sheet: Frequently asked questions about lead contamination. Available at <http://www.wdghu.org/tytler/docs/MOE%20Soil%20Pb%20Factsheet.pdf>
8. Heavy Metals in Soil. Available at http://www.dig-itmag.com/departments/print/274_0_14_0/
9. Brooklyn Botanic Garden (www.bbg.org) recently published a book “Healthy Soils for Sustainable Gardens,” in which there is a chapter dedicated to contaminants. It is worthy of a read for beginners.
10. For those who are more interested in the details of New York State Department of Environmental Conservation Soil Cleanup Objectives, please visit <http://www.dec.ny.gov/regs/15507.html>. Go to subpart 375-6: Remedial Program Soil Cleanup Objectives.
11. For those who are interested to know more about US EPA’s Soil Screen Levels, please visit <http://www.epa.gov/superfund/health/conmedia/soil/>