

Knowing Your Soil

Know your soil before you grow

Urban gardening and farming can significantly improve access to fresh and healthy food in cities. Gardening improves neighborhood engagement and increases healthy choices among participants. Health and wellness impacts for children are substantial; research has suggested that kids who garden are more likely to try and enjoy vegetables and to eat more of them. Gardening can also offer many health and environmental benefits, including creation of green spaces in cities, filtration of water and nutrient cycling, and the support of natural habitats, among others.

Why is testing important?

Most US cities have sites called *brownfields*, parcels or areas of land that contain, or are thought to contain, hazardous substances, pollutants, or contaminants. Contamination may be due to historical or recent industrial, commercial, or residential land uses or practices as diverse as on-site waste burning or disposal to backyard car or boat repair to past unsafe removal of lead paint. There are currently over 450,000 known brownfields in the United States. Many pollutants may be completely invisible without testing. Not all urban soils are brownfields, yet they may still have levels of contaminants that need to be addressed or require gardener awareness.

If soil is contaminated, the property may require cleanup and soil management. Provided a site is cleaned up for use as a garden or for food production allowed by local rules, it can be utilized to cultivate food or as a green space, but gardeners and farmers must take steps to minimize exposure to contaminants. Each site has a unique context, and



Photo: beavela. Flickr Creative Commons

growing practices will need to reflect it. See the handout **Best Practices for Food Production in Areas Suspected of Contamination** for more information on safety and precautions.

When should one test?

Soils in urban environments should always be tested to help protect gardeners from health risks. The degree of testing will vary based on the unique history and context of the area, as well as previous on-site land uses. Standard testing often focuses on soil health, which is important for plants; however, in urban spaces, it is vital to test for relevant contaminants as well. If testing is not possible, it is recommended that gardeners exercise additional precautions.

Cities have historically been used for a diverse range of activities, many of which carry associated risks of contamination. Residential areas, transportation, and industry, among others, may lead to the presence of many different types of contaminants in the soil, even decades after a lot has been abandoned. Researching your site and area will help you understand what contaminants may be in the soil.



Photo: fcastellanos. Flickr Creative Commons

Researching your site

Learning about your site's history can be done through your local library or county records office, as well as internet research and conversations with those who have been in the community for a long time. The following resources may give you insight into your property's prior uses:

- Sanborn maps, which include building information for 12,000 US towns and cities since 1867
- Historical aerial photos
- Historical property assessments
- City and county records
- Interviews or conversations with neighbors who may know about the area's history
- Environmental databases, such as the EPA "Cleanups in my Community" database, which lists brownfield sites addressed through EPA grant funds and other sites identified for cleanup or regulation. However, it does not capture all brownfields or contaminated properties:
<https://www.epa.gov/cleanups/cleanups-my-community>
- USDA Agricultural Extension Services local branch:
<https://nifa.usda.gov/partners-and-extension-map>

What are common urban land uses and associated contaminants

The common land uses and their associated contaminants below offer a sense of types of soil tests to run. The list is not exhaustive; contact your local USDA and EPA offices for more detailed information on regional concerns. (See **Testing Resources** on page 4 for more information.)

Agriculture and Green Space

Pesticides. Pesticides include insecticides, herbicides, fungicides, rodenticides, poisons, and arsenic, among others. These compounds may last for a long time on site, or may move quickly into groundwater.

Fertilizers. Fertilizers may be used for lawns and gardens. They can include a range of heavy metals in both phosphorus and manure, as well as Persistent, Bioaccumulative, Toxic (PBT) chemicals.

Automobiles and Machinery

Repair of cars and machines. Spillage, breakdown of metals, and dumping can release petroleum, PAHs, and solvents in rubber products, as well as a range of heavy metals.

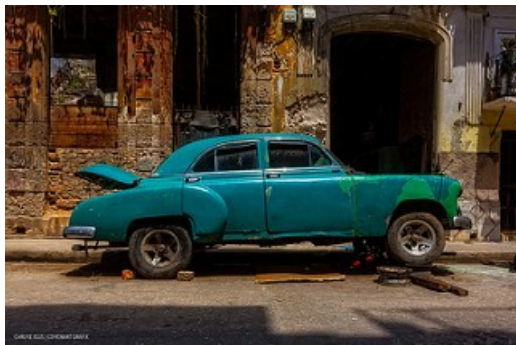


Photo: Carlyle Ellis Photography/Human Quotient
Flickr Creative Commons

High traffic areas. Lead was used in gasoline until the 1970s, and legacy particulate molecules may remain in the soil. PAHs are also a current concern.

Petroleum spills. Gas stations may lead to the dumping of volatile chemicals, including benzene, toluene, and xylene. Though they might not be active at the soil surface, they may leach deeper into the soil.

Dry Cleaning

Solvent releases. Toxic solvents are often used in dry cleaning, including Stoddard solvents and tetrachloroethylene.

Residential areas

Paints. Paints manufactured before 1978 are likely to contain lead—and as they age and peel off, they can get into soil surrounding buildings. Concentrations are the highest near buildings and pipes and decrease with distance from the source. In urban areas it is typically very important to test for lead.

Landfills and garbage. Proximity to a garbage dump can lead to leaching into the groundwater, and contaminants may include petroleum, solvents, pesticides, lead, and a range of heavy metals. Historical records can help give a better sense of exposures.

Burning, construction and demolition. Intentional or unintentional burning of houses, garbage, synthetic substances, or other materials can lead to the release of PAHs, dioxins, or other chemicals. Insulation, pipes, and shingles may contain asbestos.

Wood Preserving and Furniture Refinishing

Pressure-treated wood and railroad ties. Pressure-treated lumber may be found in industrial uses—it can lead to arsenic leeching from wood to soil, usually in a close range. It may have been used in decks, swing sets, play areas, or other structures. Rail ties may contain heavy metals, pesticides, and creosote and should not be used in a garden.

Furniture refinishing. Chemical strippers may be used in refinishing furniture, including methylene chloride and solvents such as toluene and methanol. These can contaminate soils and groundwater.

Stormwater Drains

Contaminated runoff. Roads and industrial areas may drain rapidly in downpours, causing PAHs and heavy metals to enter garden sites. The “first flush” often contains highest contamination, and management should work to prioritize rapid runoff.

Testing Resources

Choosing tests and taking action

Once you know a site's history you can plan tests accordingly. While testing and remediation can be expensive and require coordination, there are many resources available for urban farmers to make good decisions and seek support. Once results are known, gardeners and farmers can take action based on their particular site. Many services exist to support urban gardeners and farmers:

Brownfields assistance

After researching the site, if it is believed to be a brownfield—a site with hazardous substances, contaminants, or pollutants—EPA's Brownfields program is an important resource. The Brownfields program offers extensive assistance and grants to prevent, assess, safely clean up, and sustainably reuse brownfields for many uses, including urban agriculture. If it is suspected that a site is a brownfield with contamination and pollutants, gardeners may be able to utilize EPA support. <https://www.epa.gov/brownfields>

Cooperative Extension Services

The United States Department of Agriculture (USDA) National Institute of Food and Agriculture funds the Cooperative Extension Services, a network of locally based educators and researchers that are typically familiar with the unique history and context of the communities in which they work. Local branches can supply materials and instructions for testing and can help interpret results of tests for gardeners. Find your local branch at: <https://nifa.usda.gov/partners-and-extension-map>

Groundwork USA's Brownfields Technical Assistance Program

Groundwork USA operates a technical assistance program and supports a community of practice for nonprofit and local government practitioners working to achieve equitable development and environmental justice in brownfield-affected communities. For those in need of "brownfield for community benefit" strategies, including development of a campaign to build will and gather resources for urban ag/greening projects on former brownfields, Groundwork USA can help: <http://groundworkusa.org/ta-services/equidev-brownfields-planning>

USDA Urban Agriculture Toolkit

This guide offers a breadth of information that emphasizes the importance of soil quality. The toolkit offers extensive federal and local-scale financial and technical resources on testing, interpreting results, and taking steps toward remediation and cleanup. <https://www.ams.usda.gov/sites/default/files/media/urbanagriculturetoolkit.pdf>