



Environmental Justice Through Community Science

A Climate Science Literacy Project of



Healthy Soil, Healthy Trees, Healthy City!

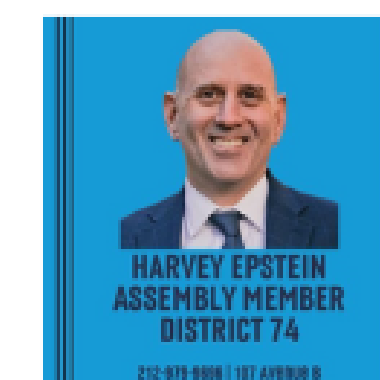
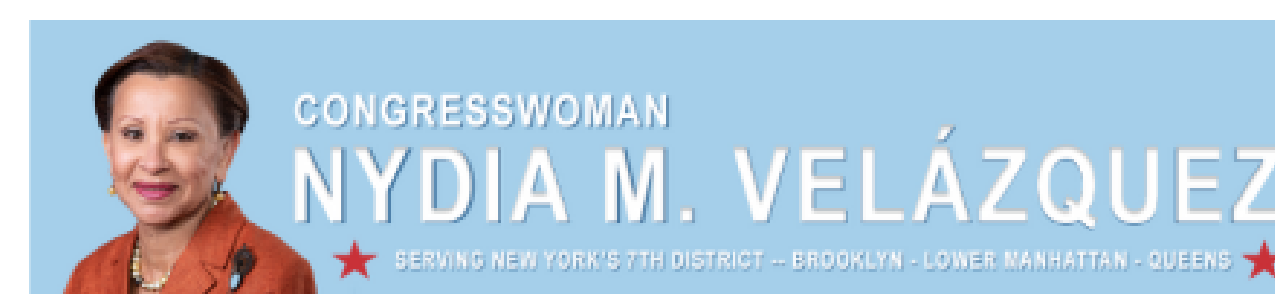
Earth Day: April 22, 2023



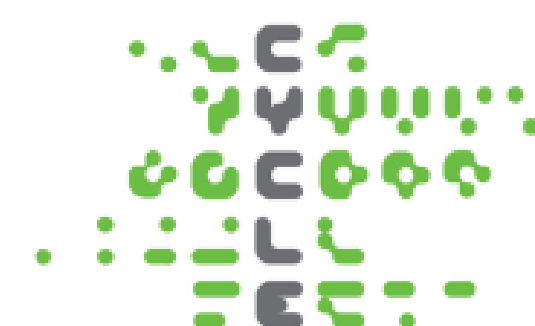
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Healthy Soil, Healthy Trees, Healthy City!

What is healthy soil?

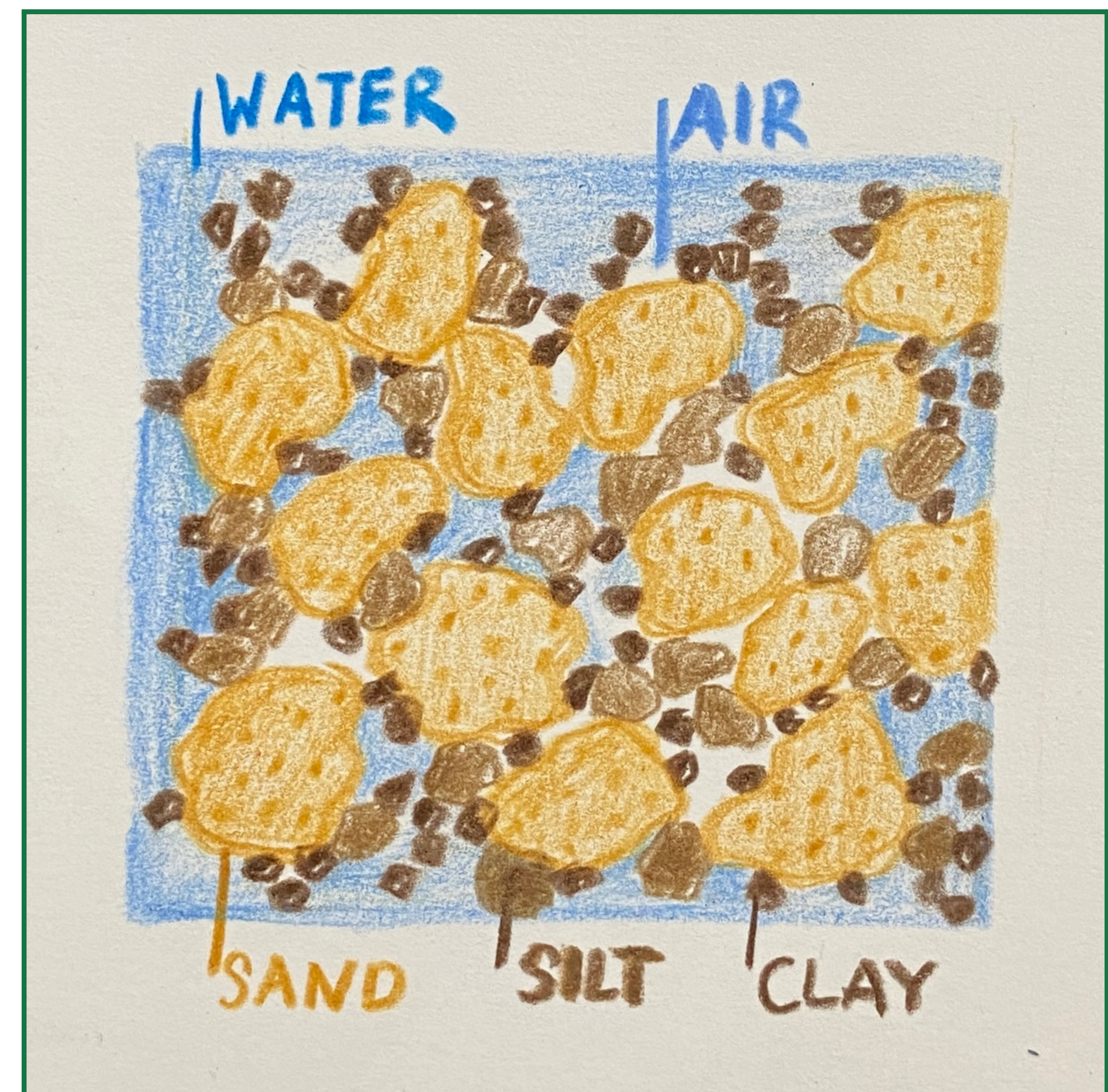
We must take into account **structure**, **texture**, **pH**, **organic matter**, and **nutrients**.

Structure

Most plants thrive in *loamy* soil, which is a mixture of sandy, silty, and clayey soils.

Sandy soil has the largest particle size (which allows for drainage) and clayey soil has the smallest particle size.

If a soil has too much sand, it will not be able to retain moisture, allowing it to dry out quickly. If the soil has too much silt/clay, it will retain moisture too well and drown the roots.



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What is healthy soil?

We must take into account **structure**, **texture**, **pH**, **organic matter**, and **nutrients**.

Texture

The depletion of water in soil will lead to cracky, condensed, and compacted soil. There will be little to no porous spaces and the soil will be too tough for the roots of dry plant to grow happily.



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What is healthy soil?

We must take into account **structure**, **texture**, **pH**, **organic matter**, and **nutrients**.

pH

Most trees enjoy a pH of around 6–6.5. This is because at different pH levels, different essential micro and macro nutrients become soluble and ready for the plant's roots to intake.

When the pH is higher, plants tend to be lacking in micro nutrients. When it's lower, toxic elements like aluminum dissolve and will be taken in via the roots.



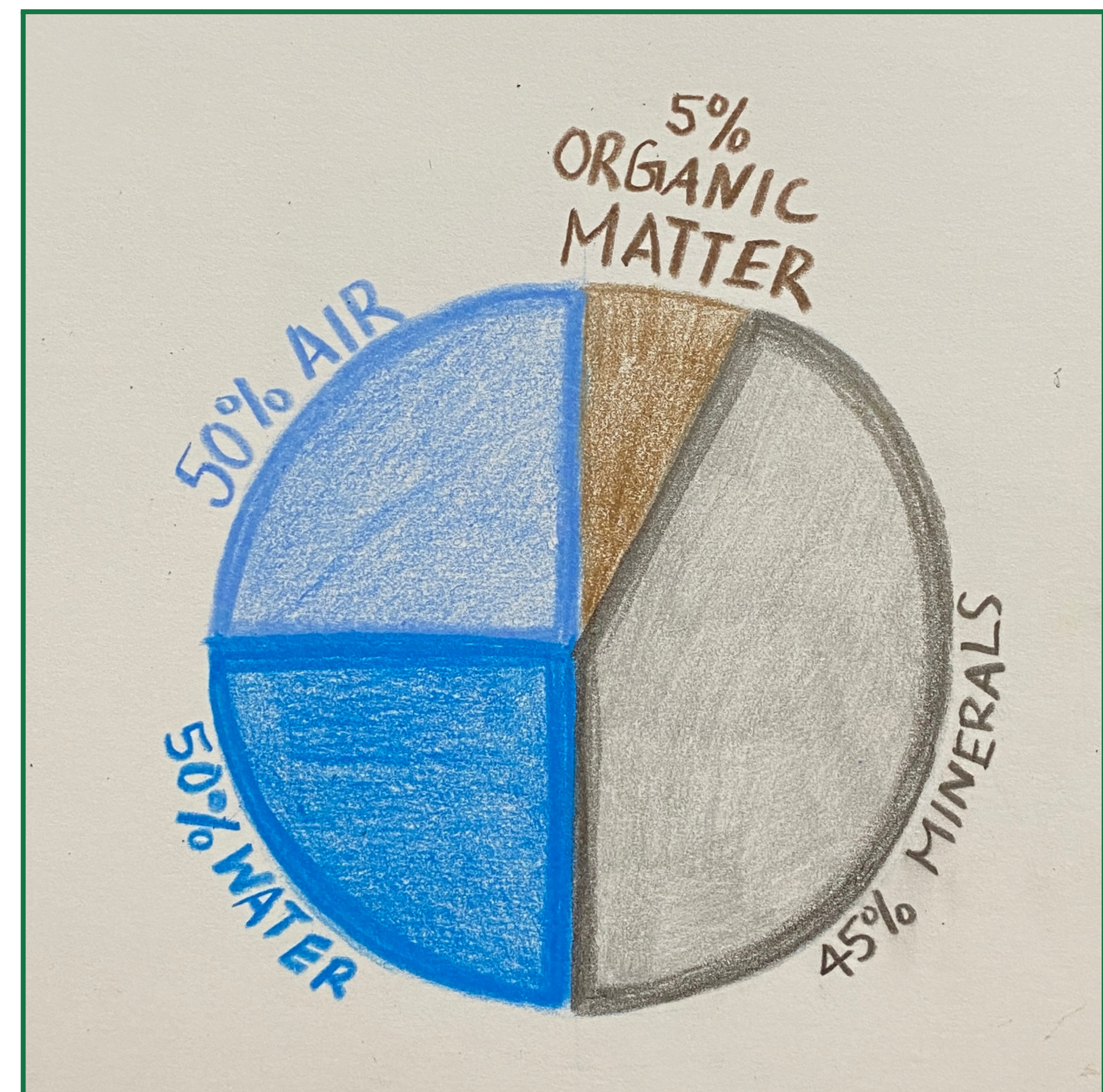
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What is healthy soil?

We must take into account **structure, texture, pH, organic matter, and nutrients.**

Organic Matter

Although organic matter only comprises 5% of soil, it provides the vast majority of nutrients that plants rely on soil for. They are reservoirs of nutrients and water that slowly release as the plants demand them.



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Nutrients

Nutrients come from a variety of different sources, as mentioned previously. However, there must be an adequate amount, and every plant will like different ratios.

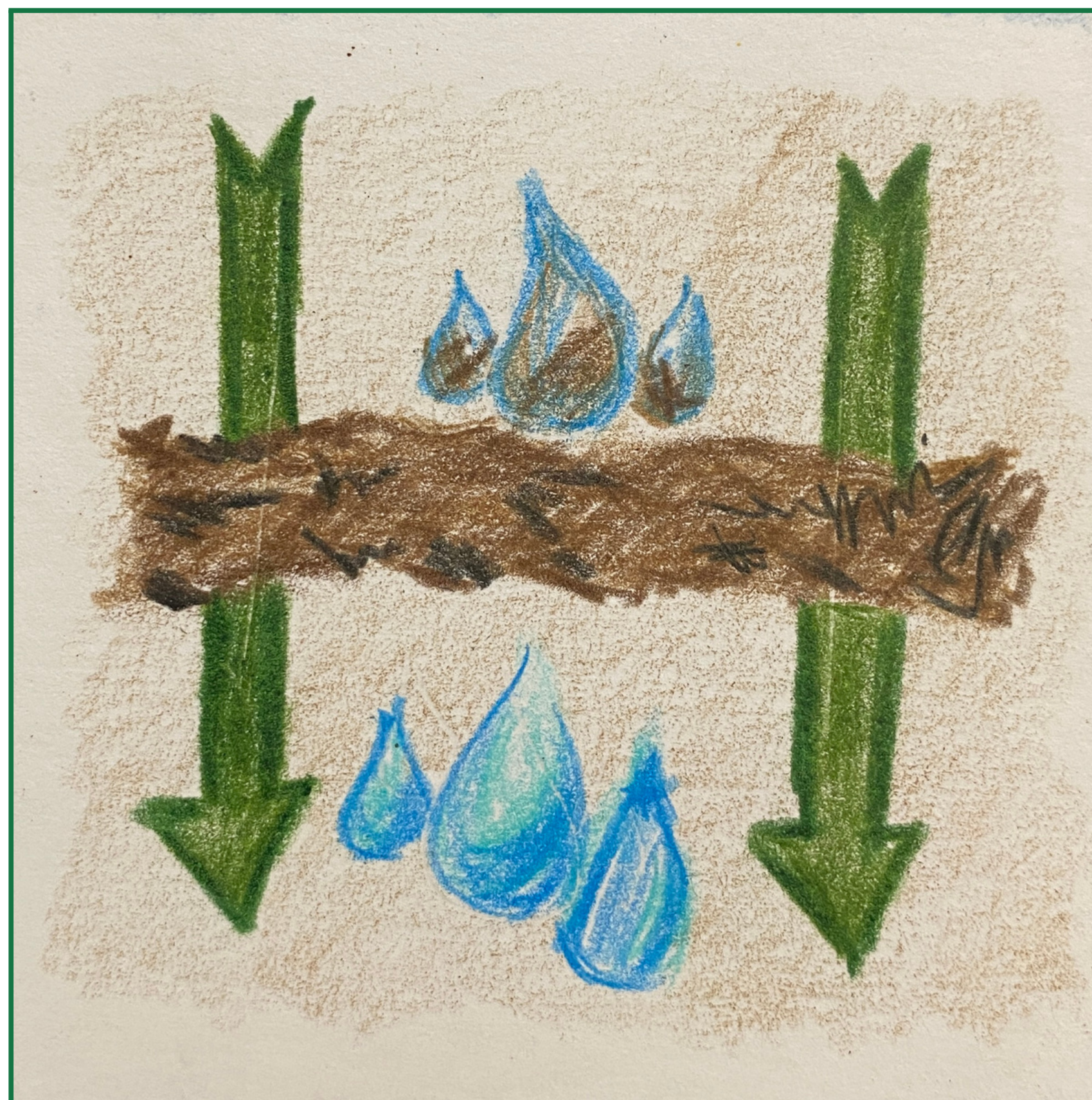


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How does healthy soil in urban tree beds create a healthy environment?

Healthy soil, as previously defined, provides the necessary nutrients for plants to grow. These plants provide us with a number of ecological services such as:

Filtration of the Air & Water



Storm Water Control (root erosion control)



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How does healthy soil in urban tree beds create a healthy environment?

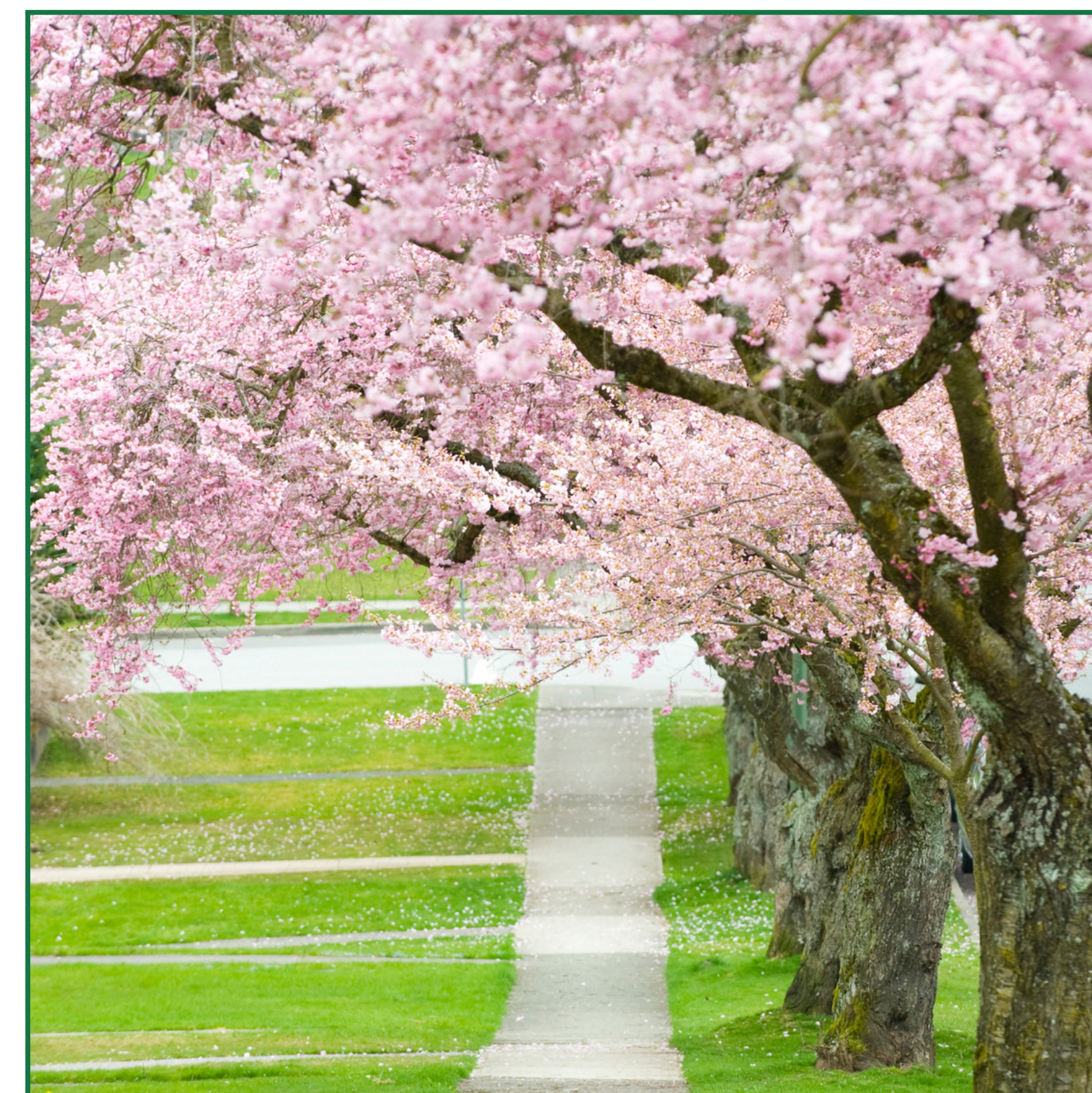
Healthy soil, as previously defined, provides the necessary nutrients for plants to grow. These plants provide us with a number of ecological services such as:

Habitats for City-Dwelling Animals



Aesthetic Attraction

(looks good, and produces revenue for local businesses and parks)



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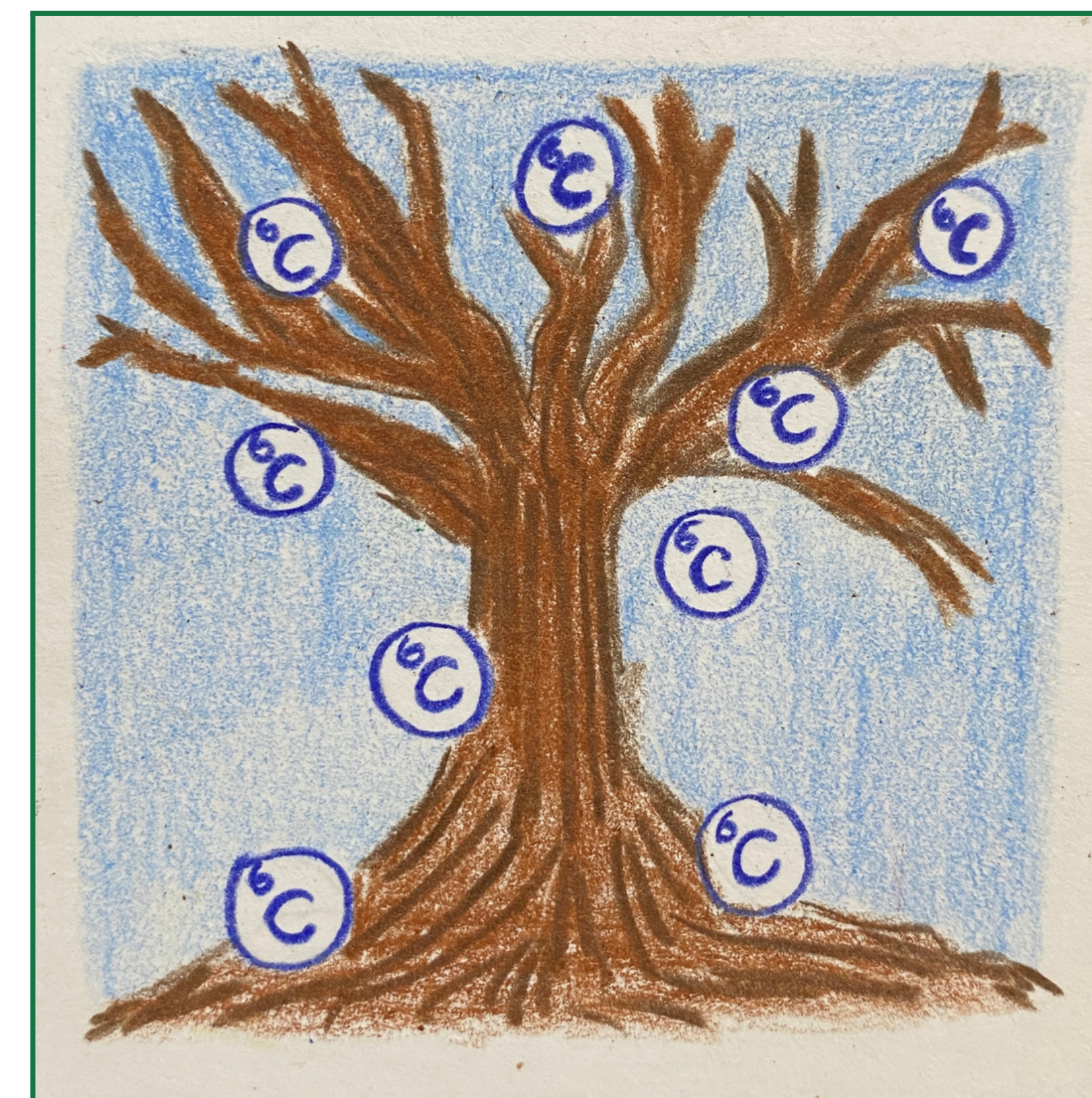
How does healthy soil in urban tree beds create a healthy environment?

Healthy soil, as previously defined, provides the necessary nutrients for plants to grow. These plants provide us with a number of ecological services such as:

Shade Cover
(reduces direct sunlight)



Natural Carbon Sinks
(which are lacking in urban areas)



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Why is compacted, nutrient depleted, and tainted soil bad?

Compacted soil inhibits root growth in urban tree beds. Without the space to grow their roots, the tree will either die, or find some place else to put their roots. Roots will often spill over onto sidewalks/the curb, which is a physical hazard to pedestrians and bikers.



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Why is compacted, nutrient depleted, and tainted soil bad?

Furthermore, compacted soil actually gets more easily eroded by wind and water. So if it contains contaminants, they could easily be inhaled by living organisms, or consumed (when the contaminants run off and pollute water sources/ground water).

Airborne Contaminants



Contaminated Water



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Why is compacted, nutrient depleted, and tainted soil bad?

Common contaminants of urban soil include:

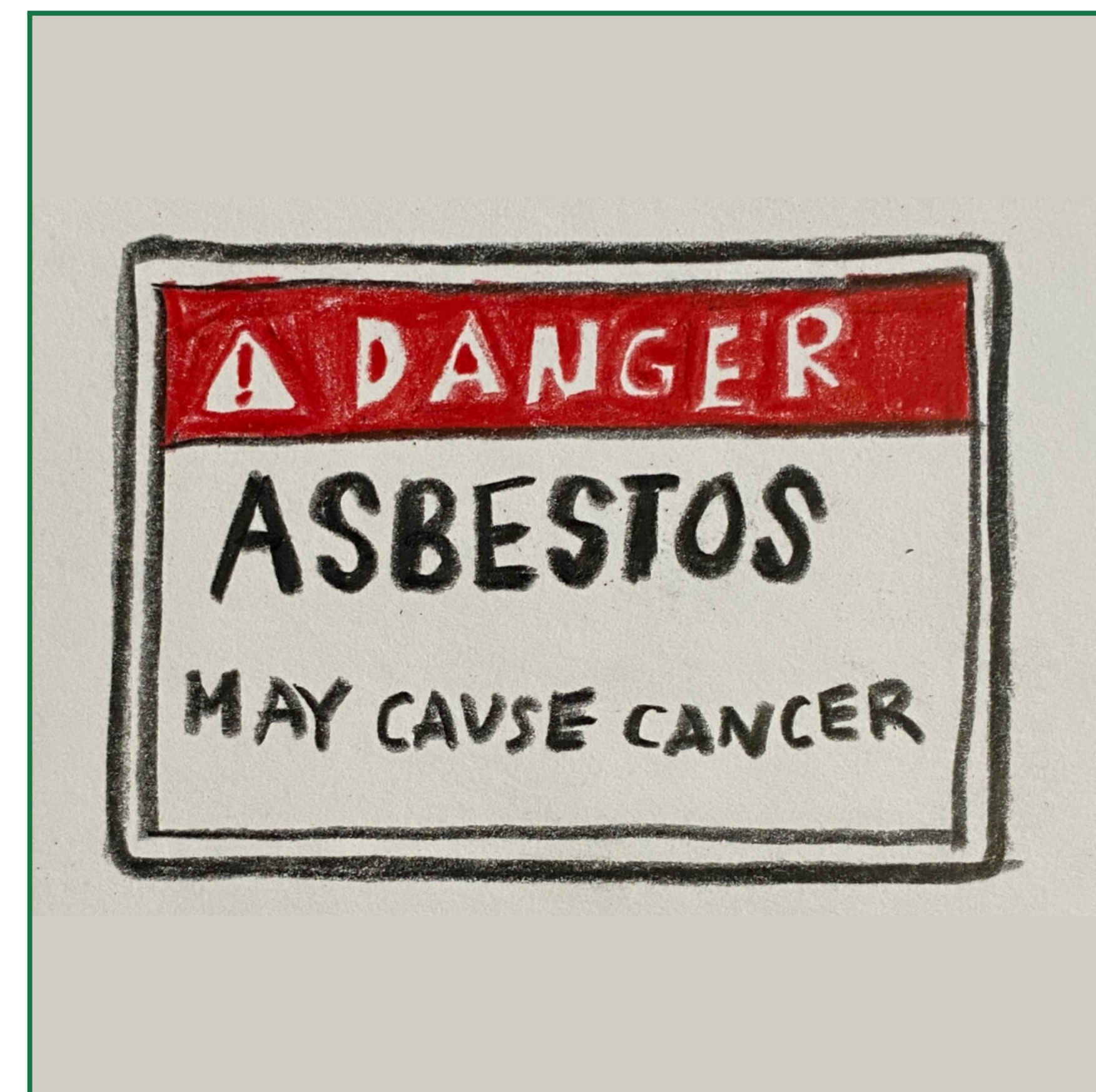
Pesticides

(includes herbicides & insecticides)



Asbestos

(punctures lungs)



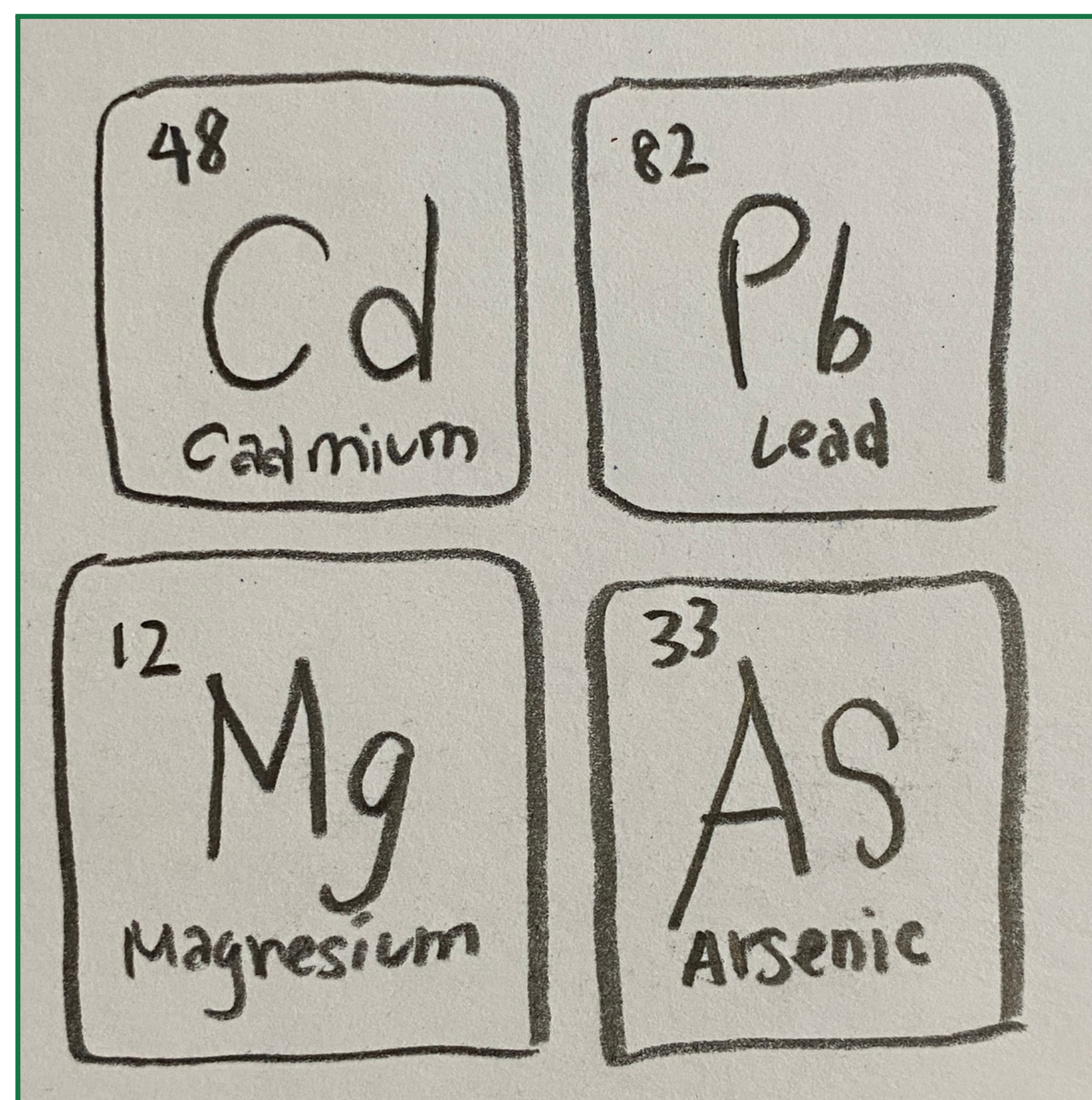
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Why is compacted, nutrient depleted, and tainted soil bad?

Common contaminants of urban soil include:

Lead

(causes nervous system damage)



Petroleum Products

(such as gasoline)



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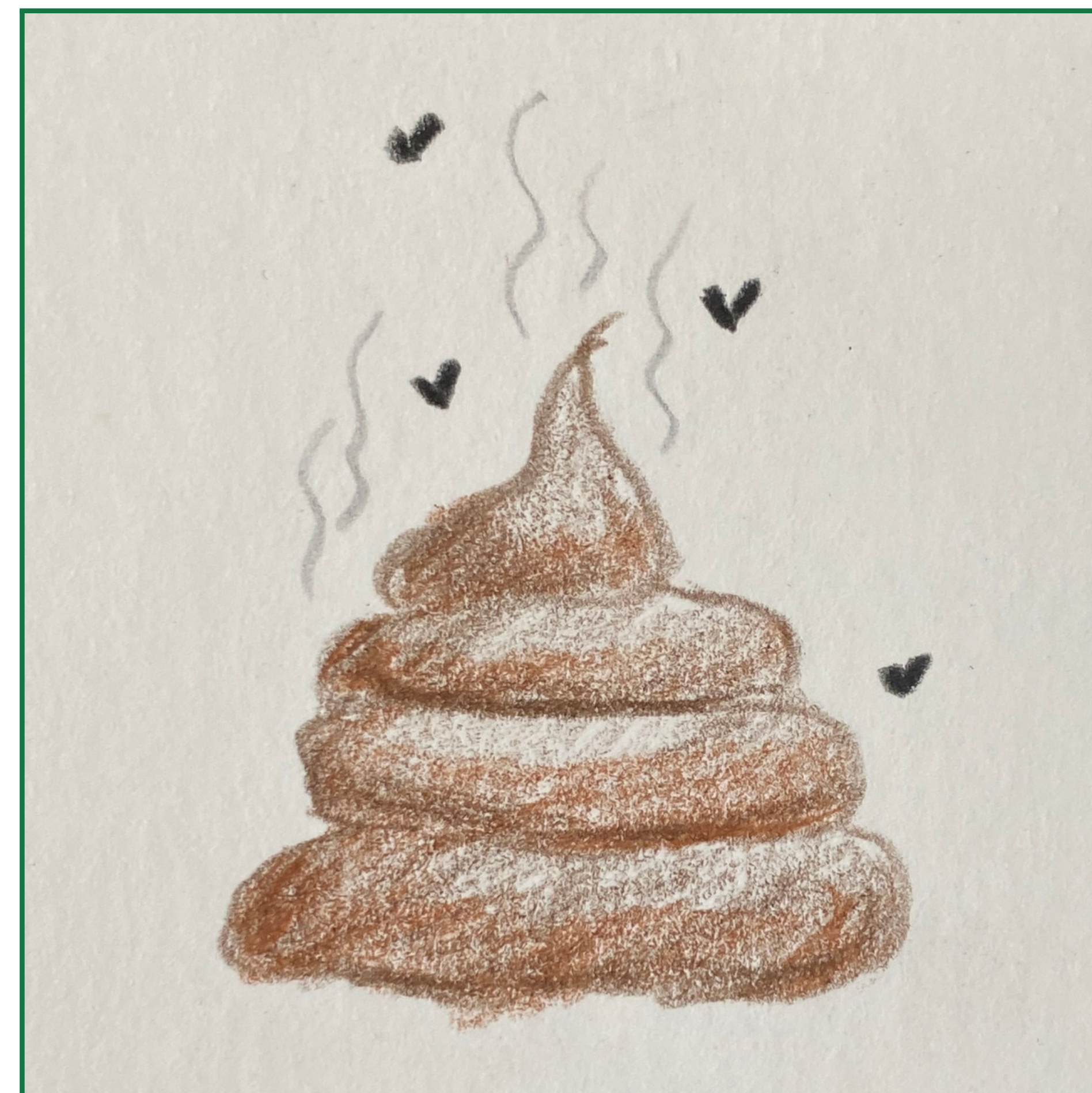
Why is compacted, nutrient depleted, and tainted soil bad?

Common contaminants of urban soil include:

Microplastics



Animal Feces



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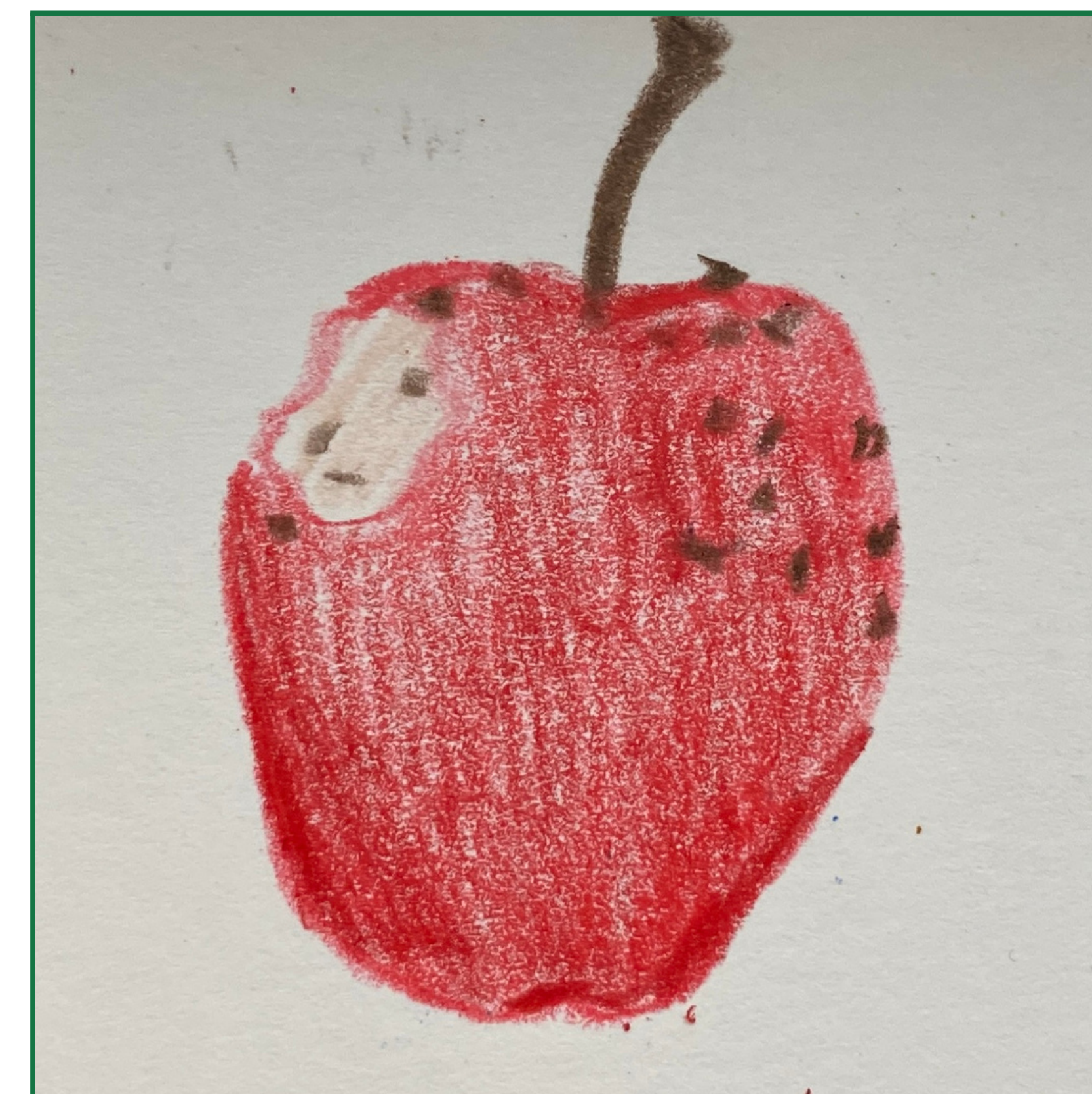
Why is compacted, nutrient depleted, and tainted soil bad?

Soil is tainted in various ways such as through manufacturing, industrial dumping, land development, and excessive pesticide use. Contaminated soil can also harm humans when food is grown on land that's tainted, if a playground has exposed contaminated soil, if contaminants are tracked into the home via shoes, etc.

Food Grown in Contaminated Soil



Eaten Contaminated Food



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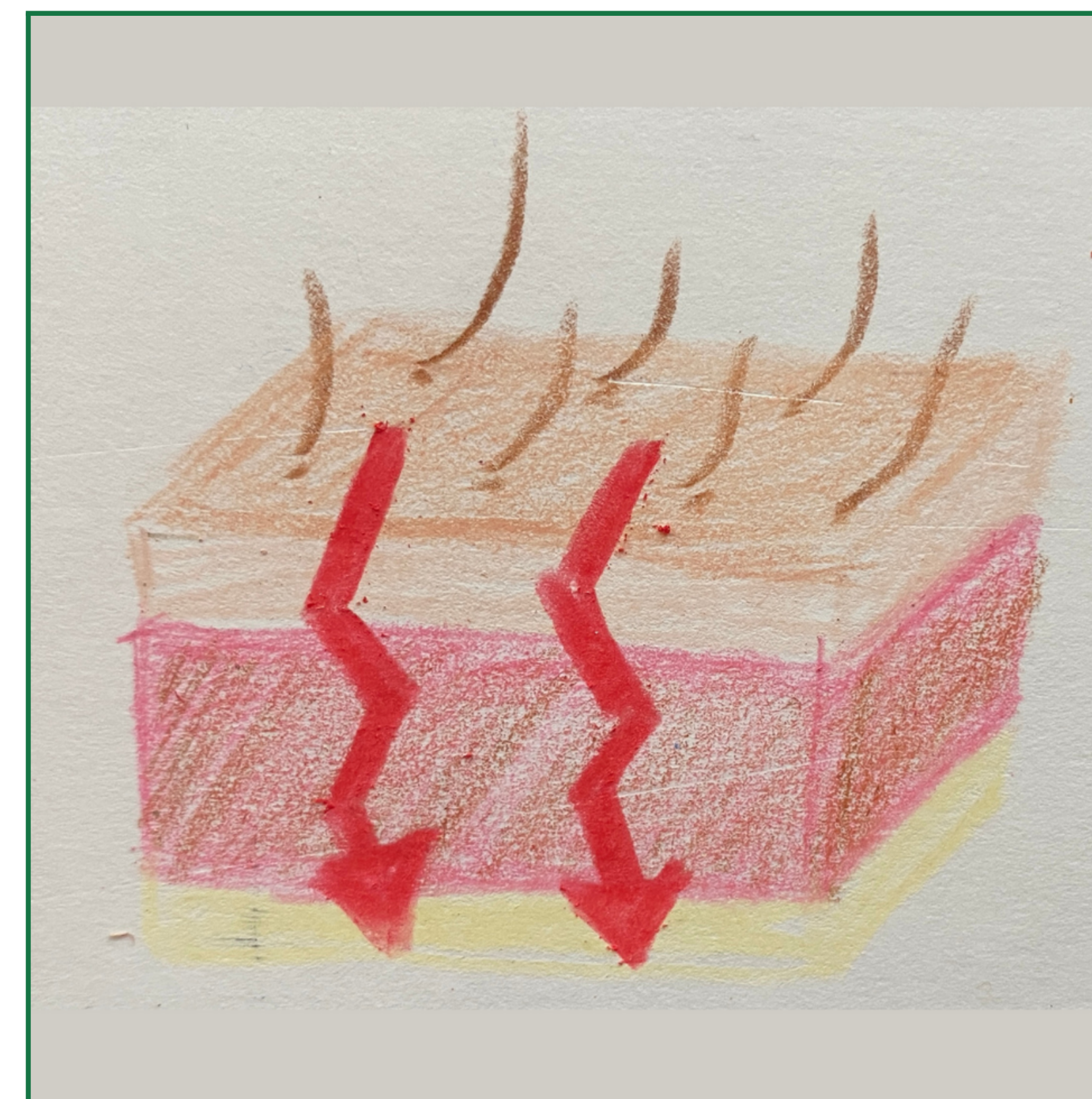
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Contaminants Tracked Into the Home



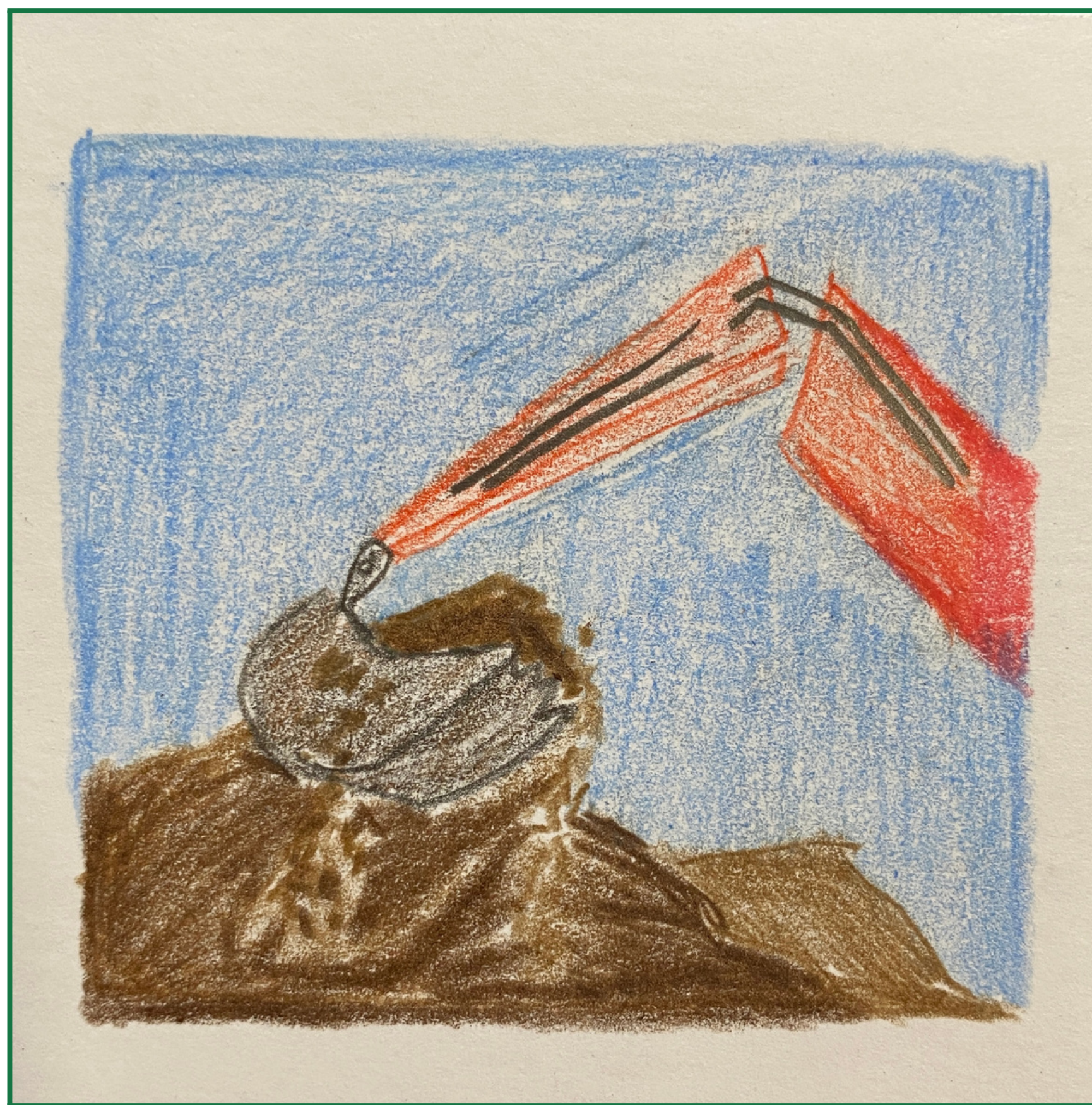
Contaminants Absorbed Through Skin



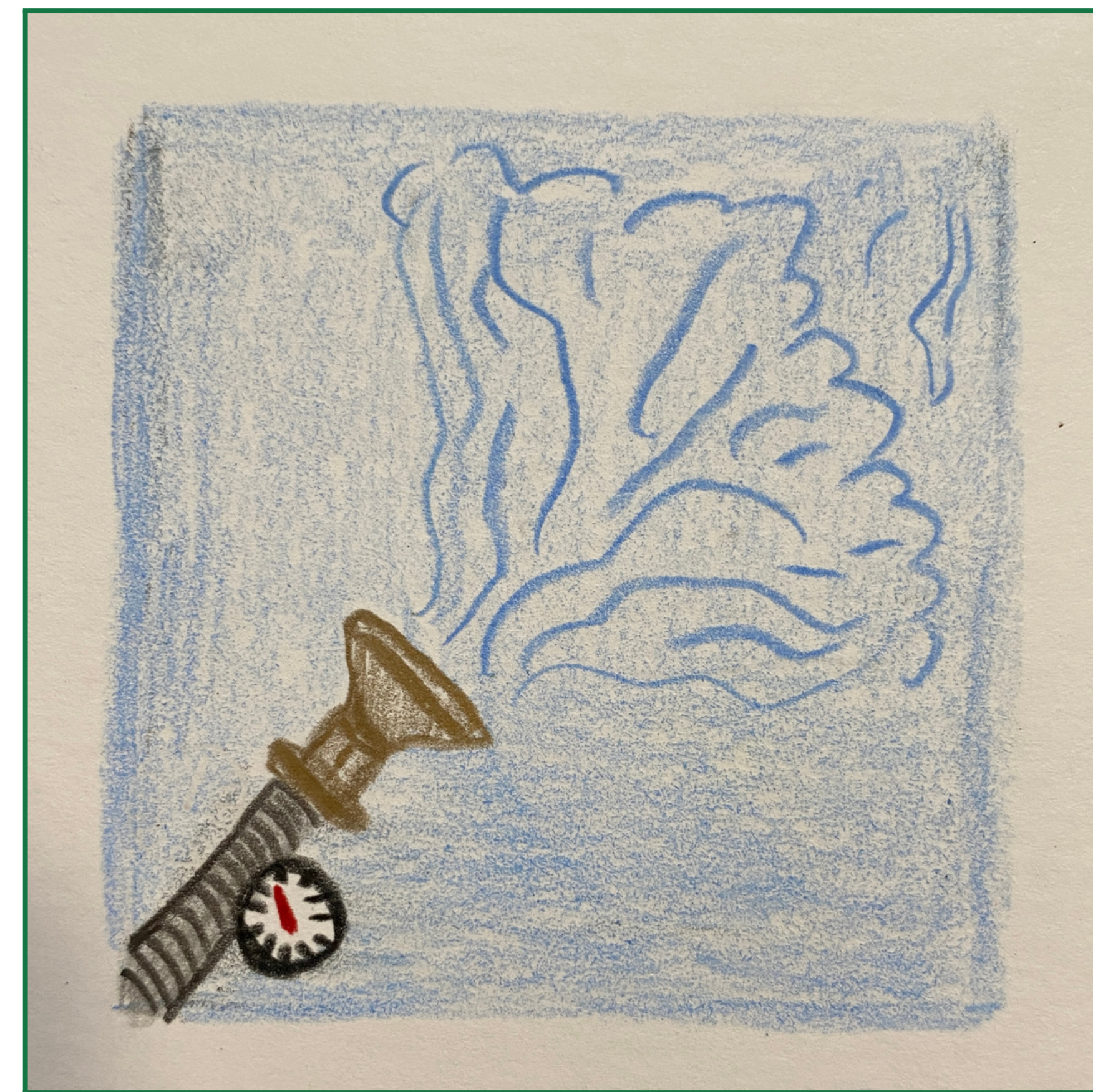
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Ways to improve soil health/remove toxins

Mechanically Loosen Compressed Soil



Pressurize Soil Aeration



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Ways to improve soil health/remove toxins

Full or Partial Replacement of Soil



Introduce Worms/ Other Burrowing Soil Organisms



Or select tree species that are adapted to compact soil/nutrient depleted soil.
But my favorite method is...

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Ways to improve soil health/remove toxins

Composting!

Compost

Compost can add extra drainage and pore space if you have large organic matter in your mix. It can also help retain moisture if your soil is very sandy, and doesn't hold water well.

Also, compost can be used as a buffer, to change the level of the pH, and make the soil's pH more stable. There's so many uses!



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Other Benefits of Healthy Soil

Biodiversity



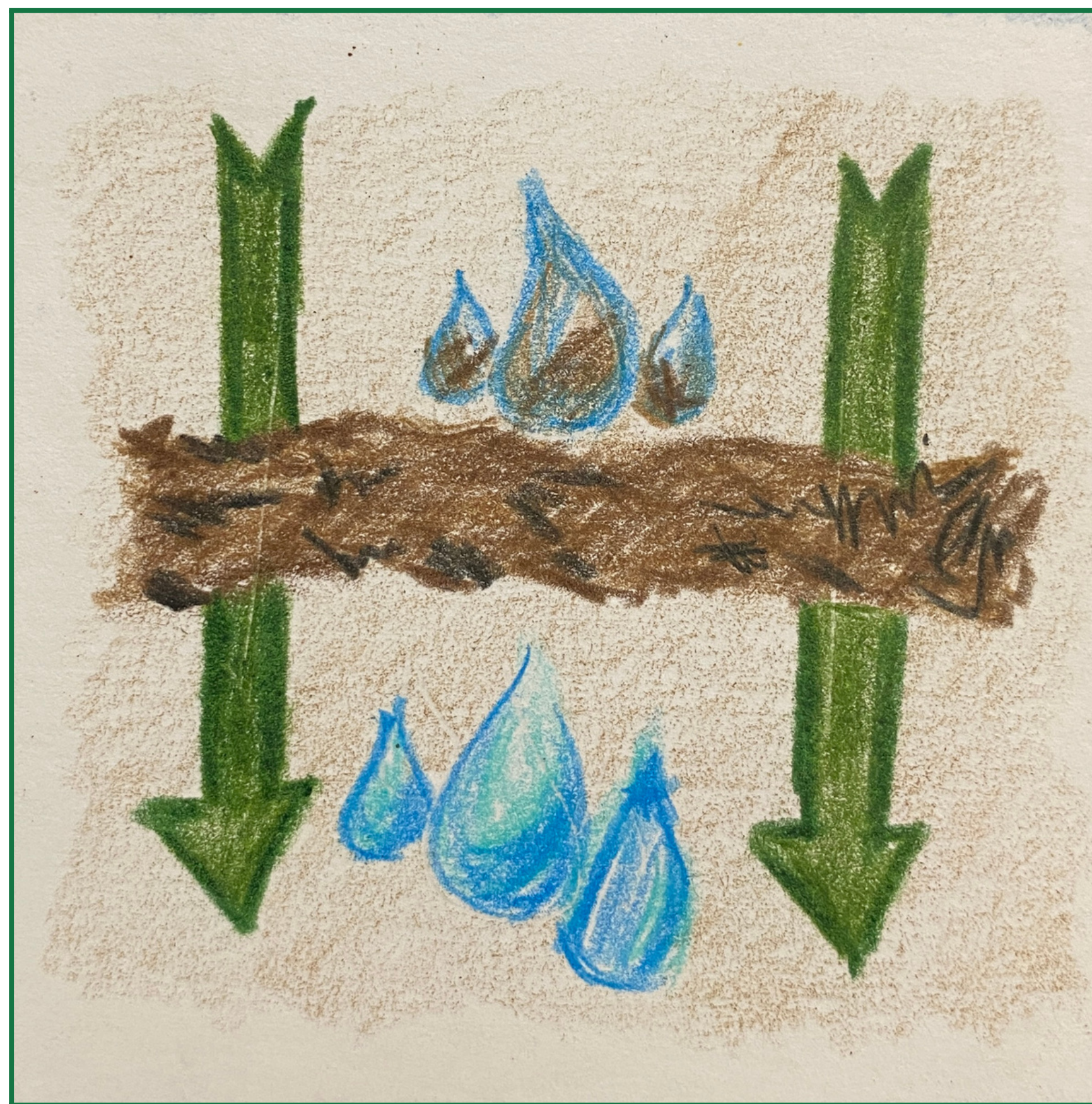
Erosion & Flood Control



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Other Benefits of Healthy Soil

Water Filtration



Nutrient Cycling

