

SINK CARBON IN YOUR GARDEN

Build Soil Health While Addressing Climate Change

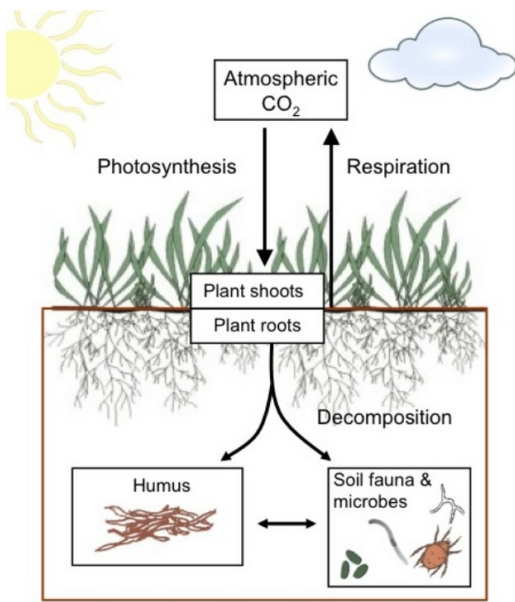
Harness the power of plants to move carbon out of the atmosphere and into the ground, one garden at a time...



Life on earth is based on carbon. It cycles continuously between major planetary pools: the atmosphere; bodies of water; and life forms of all kinds--both living and dead. Planetary forces strive to keep it in balance between these pools; but agricultural practices over millennia, and the more recent burning of fossil fuels, have allowed increasing amounts of carbon to flow into the atmosphere as carbon dioxide--one of the greenhouse gases contributing to our current climate crisis. Plants have the ability to restore this imbalance. Using energy from the sun, plants sip carbon from the air, add water, and turn it into food for life forms. We call this photosynthesis. More plants, of many different species, growing for longer periods of time, means more photosynthesis--and more movement of carbon out of the atmosphere into life forms.

Life forms eat the carbon-rich food produced by photosynthesis. As they live, excrete, and die, the carbon in their bodies cycles into organic matter. Organic matter is dead and decaying life forms. It is what allows soil to hold water and grow plants that are healthy and disease resistant--AND capable of storing carbon. Organic matter in soil is cycled and protected by a community of organisms that need food, air, and water to live. Use "Soil Health Practices" (see page 3) to give these soil organisms what they need to build more and more organic matter--and to store more and more carbon--while improving water-holding capacity and fertility in your garden.

Organic matter in the soil contains carbon in many forms. It may be in living soil organisms and plants; dead creatures of all kinds; "very dead" dark, complex humus compounds that resist further decomposition; or in between in more fluid forms. When soil is rich in carbon, and contains a balance of air and water, soil organisms can thrive and do the work of building more carbon-rich organic matter.



Increasing organic matter does many good things. It improves soil fertility because organic matter is a storehouse of plant-available nutrients; it increases water-holding capacity by making soil sponge-like; and it keeps carbon in the ground, helping to stabilize the climate. **We need more plants, of all sizes, growing for longer periods of time,** to increase the amount of carbon captured by photosynthesis; and **we need to support soil organisms to cycle more of that carbon into the soil.** Much of the planet is devoted to private yards. Using "Soil Health Practices" (see page 3) to support soil organisms and make our lawns and

gardens diverse and multi-layered will increase organic matter in our yards--and begin to solve the climate crisis.

When carbon is captured by a plant, some is used to build the plant's body, and some becomes carbon-rich food that seeps out through roots to feed microorganisms like bacteria, fungi, amoebae, nematodes, and protozoa. These organisms return the favor by mining nutrients for the plant. They are microscopic in size, and massive in numbers. A single teaspoon of healthy soil contains billions of them. Each one plays important roles in fostering the breathtaking complexity needed to populate a working ecosystem. They decompose waste, purify and store water, and break down pollutants. They cycle nutrients in the root zone where plants can access them as needed. They keep said nutrients from being lost by leaching. Soil organisms need air and water and the food excreted by plant roots to do their essential work.

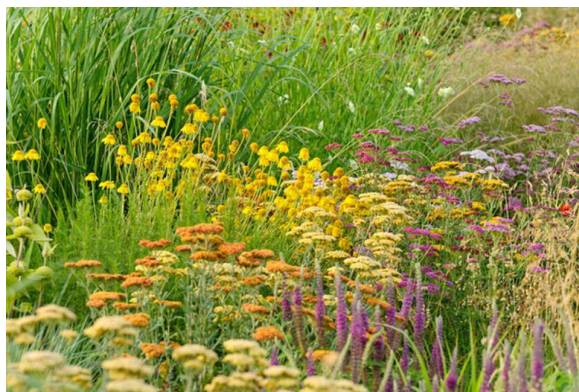
When microorganisms digest the carbon-rich food received from a plant, they excrete it into slimes and glues that build soil structure and make soil dark, crumbly, and rich with aggregates. Aggregates are stable clumps of soil that resist erosion. When aggregates of many sizes are bound together by soil organisms and root hairs, they form a porous, spongy structure with lots of spaces for air and water in which soil organisms can thrive. This soil carbon sponge is the underground setting for the alchemy that transforms carbon into the "very dead" complex humus compounds that keep it in the ground over the long term, eventually becoming fossil fuels like coal and oil. "Soil Health Practices" offer ways to garden with the health of soil organisms in mind, giving them what they need to cycle more and more carbon, water, and nutrients to build soil fertility and to help stabilize our climate.



Soil Health Practices

Use these practices to extend the growing season, support the carbon cycle, and increase water-holding capacity and the amount of the earth's surface that supports soil fertility--one garden at a time!

- **FEED soil life by keeping living roots in the ground for as much of the year as possible.** Consider trees, shrubs, perennials, cover crops, and **lawn alternatives** to maximize the volume of space and the amount of time available for photosynthesis.
- **Preserve AIR space for soil life. Minimize tilling and soil disturbance** to avoid damaging the fragile air spaces in the soil, and to prevent bringing weed seeds to the surface. Till soil only when it is too compacted to contain air space.
- **Conserve WATER for soil life.** Capture rainwater, and shape garden beds to avoid runoff and to encourage water to slow, spread, and sink into the ground.
- **Conserve carbon and nutrients, and build organic matter, by sheet mulching, composting,** and spreading spent plants on the surface as mulch. When harvesting or weeding, leave roots of annual plants in the ground.
- **Keep soil covered year-round** with a multi-layered canopy of living plants--or mulch--to protect the soil surface from pounding rain, wind, and heat, and to prevent erosion and the loss of organic matter.
- **Encourage biodiversity by planting a variety of plants of all sizes--especially natives--and avoiding monoculture.** A diversity of plants fosters a diversity of soil organisms, insects, birds, reptiles, etc, because different plants provide food and/or habitat for different types of creatures. Each one of these creatures performs specific ecosystem roles, and each of their roles is essential to ecosystem well-being. Focus on native plants. They support many more creatures than non-native plants do because of co-evolution over millennia, and because they are well-adapted to our environment. ***Biodiversity is essential for ecosystem health. A diverse population of species ensures that all ecosystem roles are filled, so that all nutrients are available as needed by plants and no one species can overpopulate and become a pest.***
- **Eliminate all synthetic fertilizers, pesticides, herbicides, and fungicides** and chlorinated irrigation water. Synthetic chemicals and chlorine are harmful to soil life. ***Plan for biodiversity--the essential factor preventing the need for chemical inputs because it helps conserve nutrients and keep pest populations low.***





IN A NUTSHELL--SUPPORT SOIL LIFE

Keep living roots in the ground for as much of the year as possible.

Preserve air space in the soil by minimizing disturbance.

Conserve water by harvesting rainwater and preventing runoff.

Conserve carbon and nutrients by recycling spent plants into compost or mulch.

Keep the ground covered. Avoid bare soil.

Encourage biodiversity. Grow a variety of plants--especially natives. Avoid monoculture.

Use only organic soil amendments. Avoid all synthetic inputs.

Every piece of land is unique. Get to know yours.



Resources

- The Soil Story, Kiss the Ground: <https://www.youtube.com/watch?v=nvAoZ14cP7Q>
- Fisher, Adrian Ayres, "Carbon Gardening, A Natural Climate Solution that Can Help Reduce CO2 Emissions While Restoring Biodiversity": <https://www.ecolandscaping.org/02/developing-healthy-landscapes/climate-change/carbon-gardening/>
- Kittredge, Jack, "Soil Carbon Restoration: Can Biology Do the Job": https://www.nofamass.org/wp-content/uploads/2020/12/2015_White_Paper_web.pdf
- Pershouse, Didi, "Soil Health Principles": <https://www.didipershouse.com/soil-health-principles.html>
- Written by Dorothea Sotiros. Questions or comments? Email: [<gfabings@gmail.com>](mailto:gfabings@gmail.com)