



Soil carbon, soil health, and the role of organics

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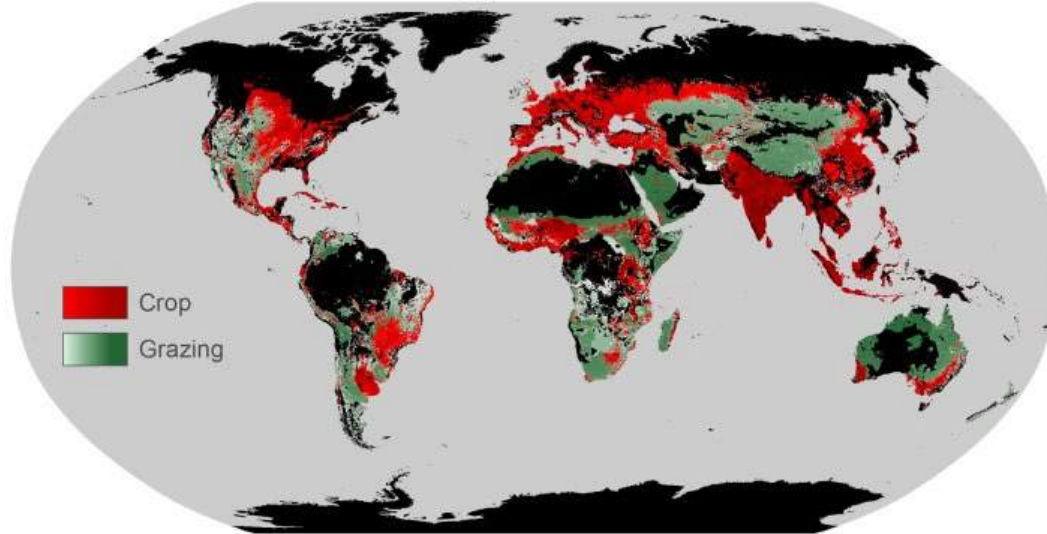
**Seattle
Public
Utilities**

Globally soils are being depleted and GHG emissions are rising



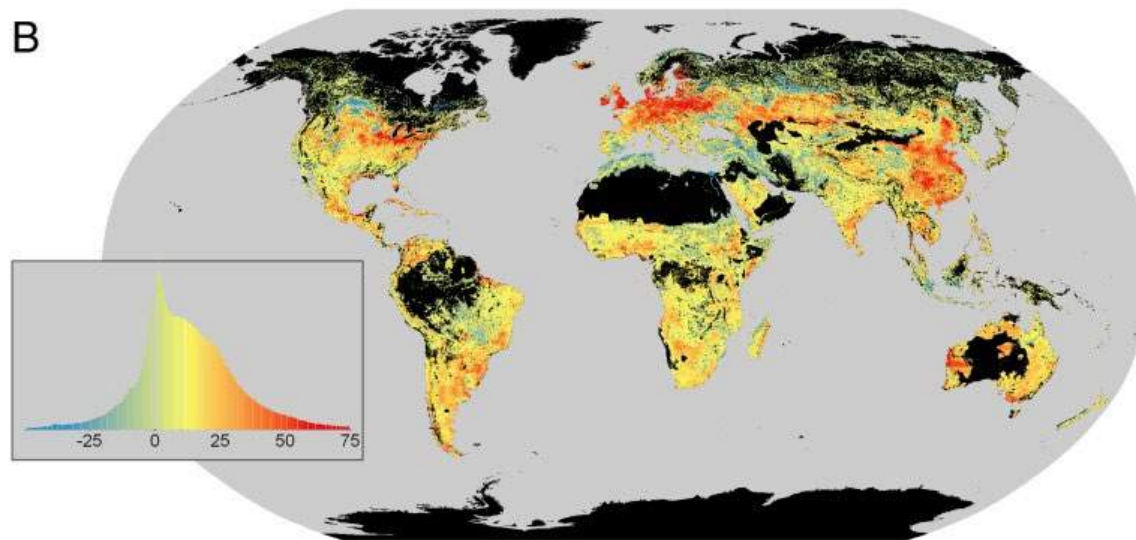
Courtesy WA Dept of Ecology

A

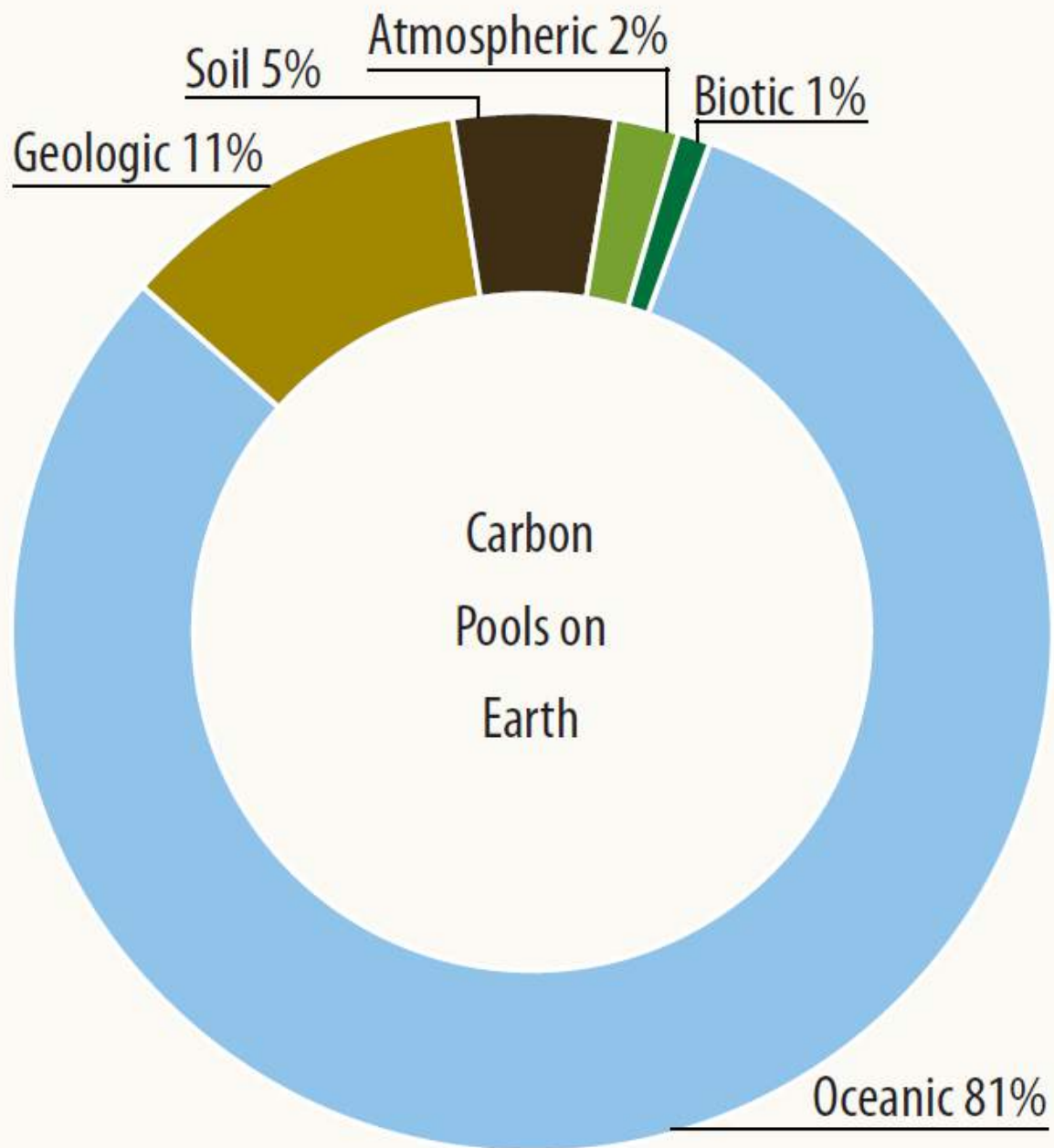


Proceedings of the
National Academy of
Sciences U.S.A. 2017. Soil
carbon debt of 12,000
years of human land use

B



Global distribution of cropping and grazing in 2010 from (A) HYDE v3.2 and (B) modeled SOC change in the top 2 m. In A, color gradients indicate proportion of grid cell occupied by given land use. In B, legend is presented as histogram of SOC loss ($\text{Mg C} \cdot \text{ha}^{-1}$), with positive values indicating loss and negative values depicting net gains in SOC.



A person wearing a dark long-sleeved shirt with thin green horizontal stripes and blue jeans is kneeling in a field of dry, golden-brown straw. They are using a manual soil coring tool, which has a long metal handle and a circular base, to take a sample from the ground. The person's hands are visible, gripping the handle. The background is filled with the same dry straw, creating a textured, natural setting.

Soil is a
shared
natural
resource

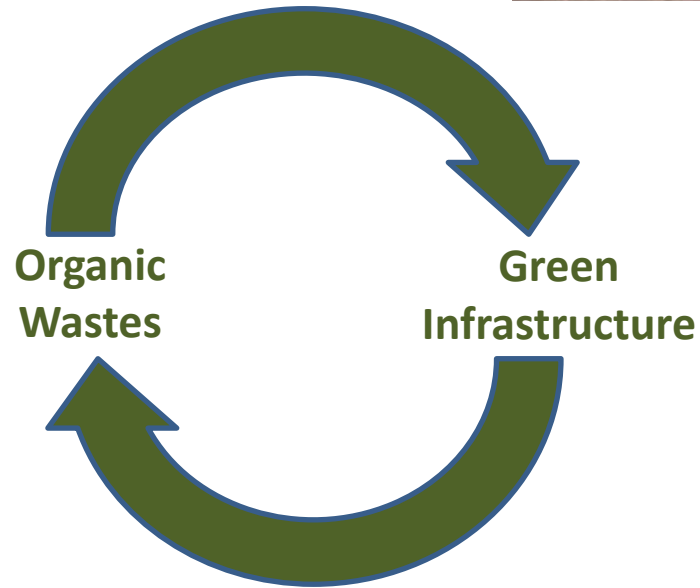
- Climate
- Food security
- Air quality
- Water quality & quantity

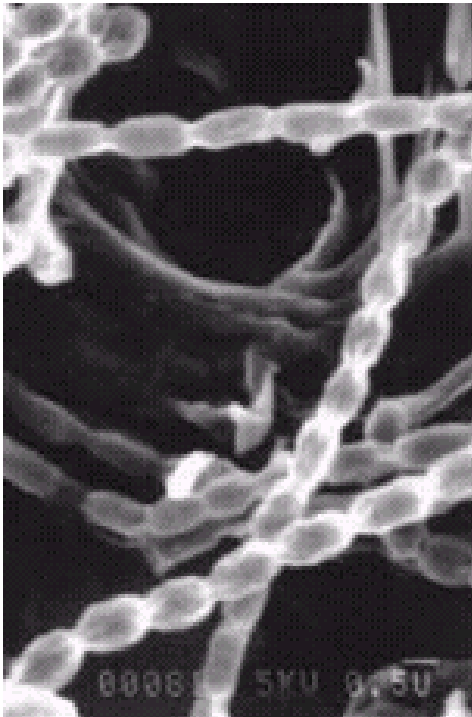
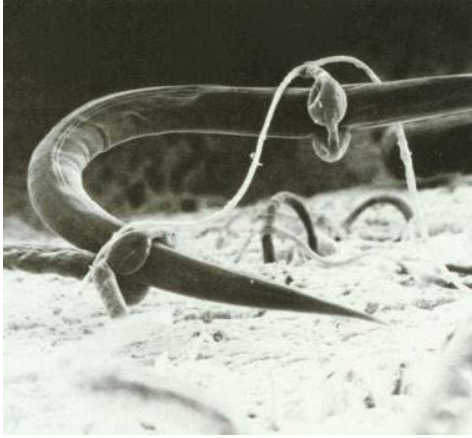


Each ton of food waste that is landfilled is estimated to produce approximately 0.76 tons of CO₂ equivalents as methane.

Emissions associated with yard waste vary.

Compost builds healthy soil



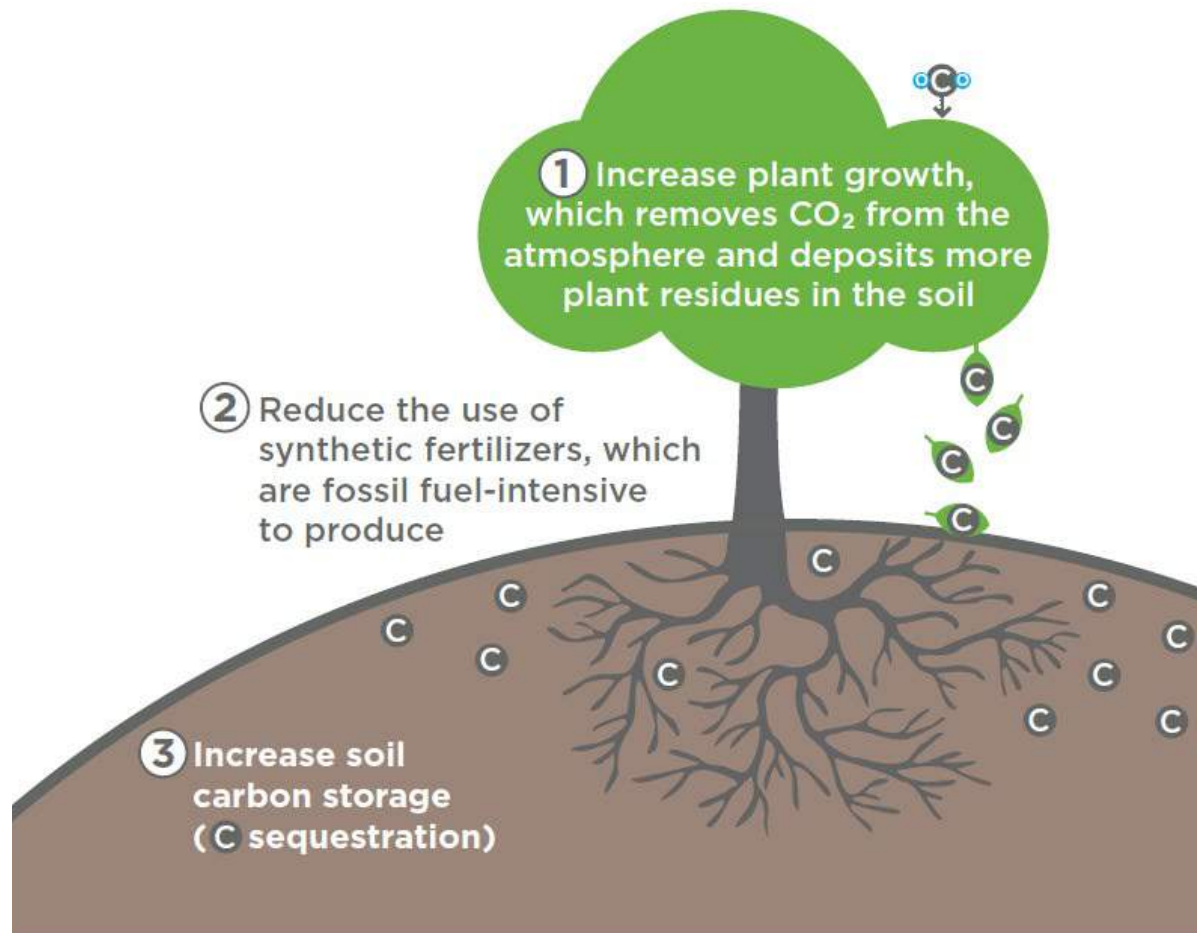


Compost restores soil life and soil functions

Soil organic matter improves:

- microbial communities
- soil structure
- fertility = nutrient cycling
- water holding capacity
- plant disease protection
- erosion control
- bio-filtration

Organics help us build soil health and fight climate change

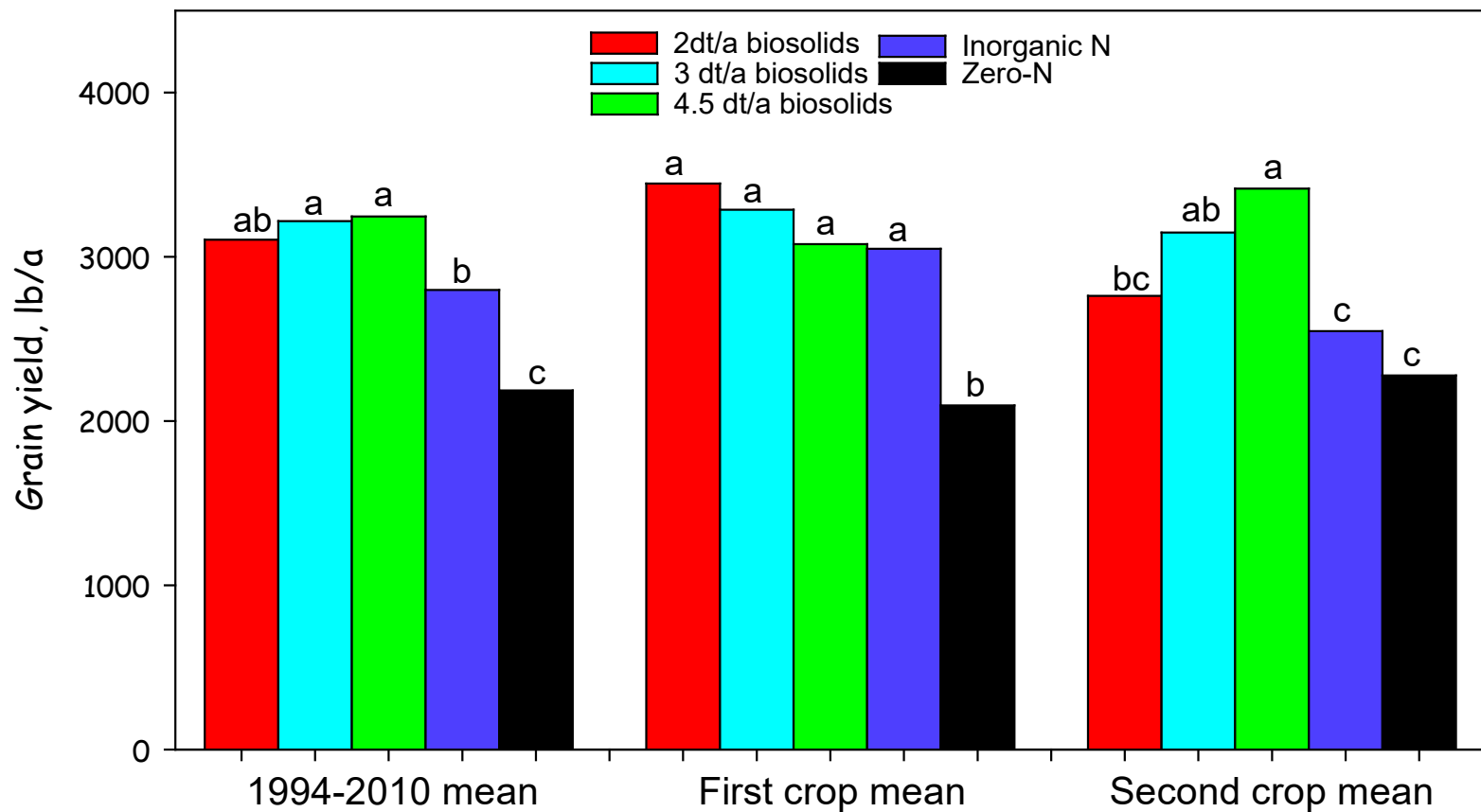


Credit: King County Wastewater Treatment Division

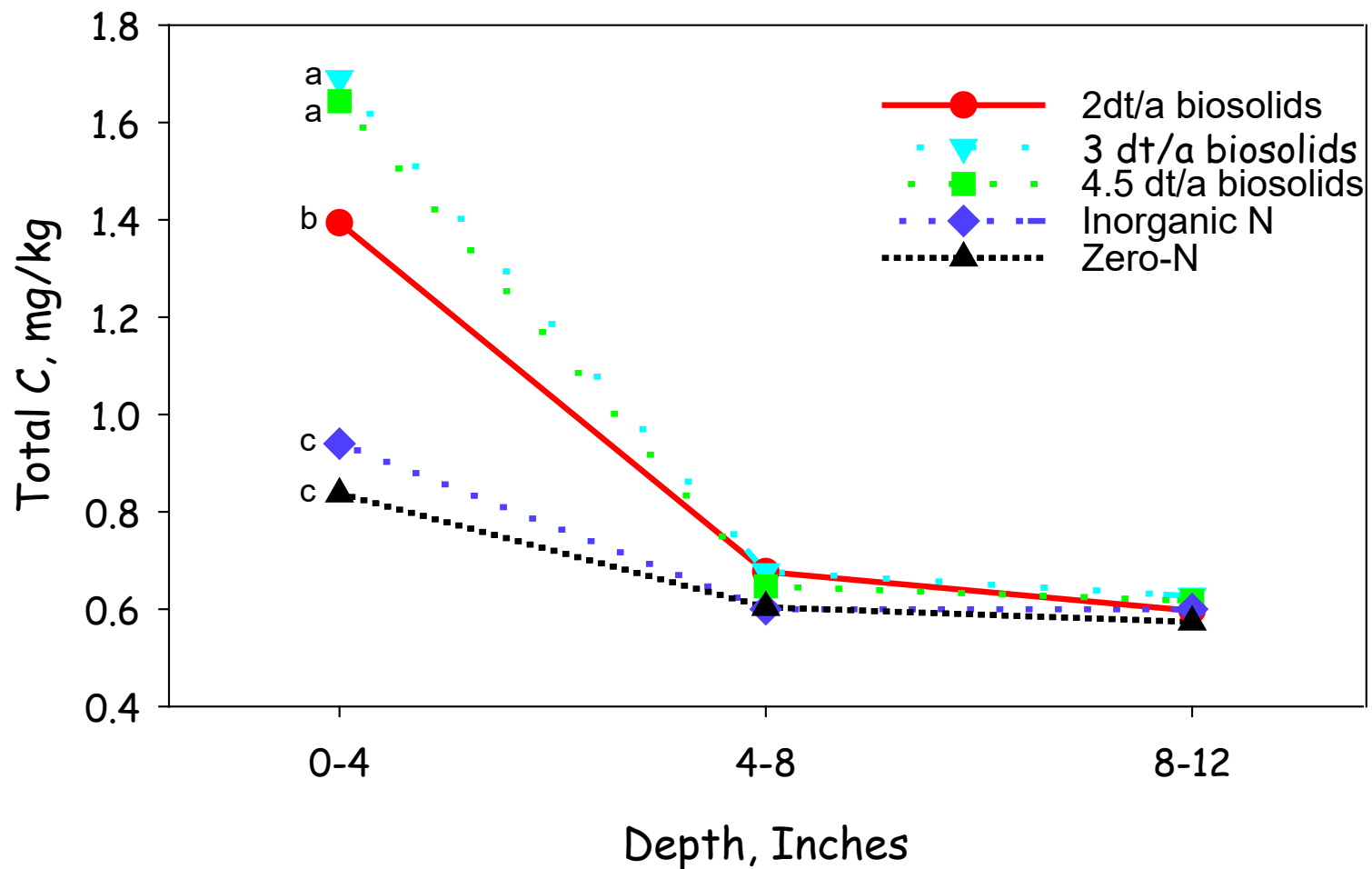
Dryland wheat long-term research

- Douglas County, WA 1994-present
- Alternating winter wheat and fallow, dryland
- Biosolids applied every 4th year (2 harvests per application)
- Biosolids rates:
2, 3, 4.5 dry tons/acre
each application
- Inorganic N 50 lb/a each crop
- Zero-N control





Biosolids had equal or greater grain yields than inorganic N treatment (chemical fertilizer)



All biosolids application rates increased organic matter in the upper 4 inches of soil

All rates of biosolids applications decreased soil bulk density



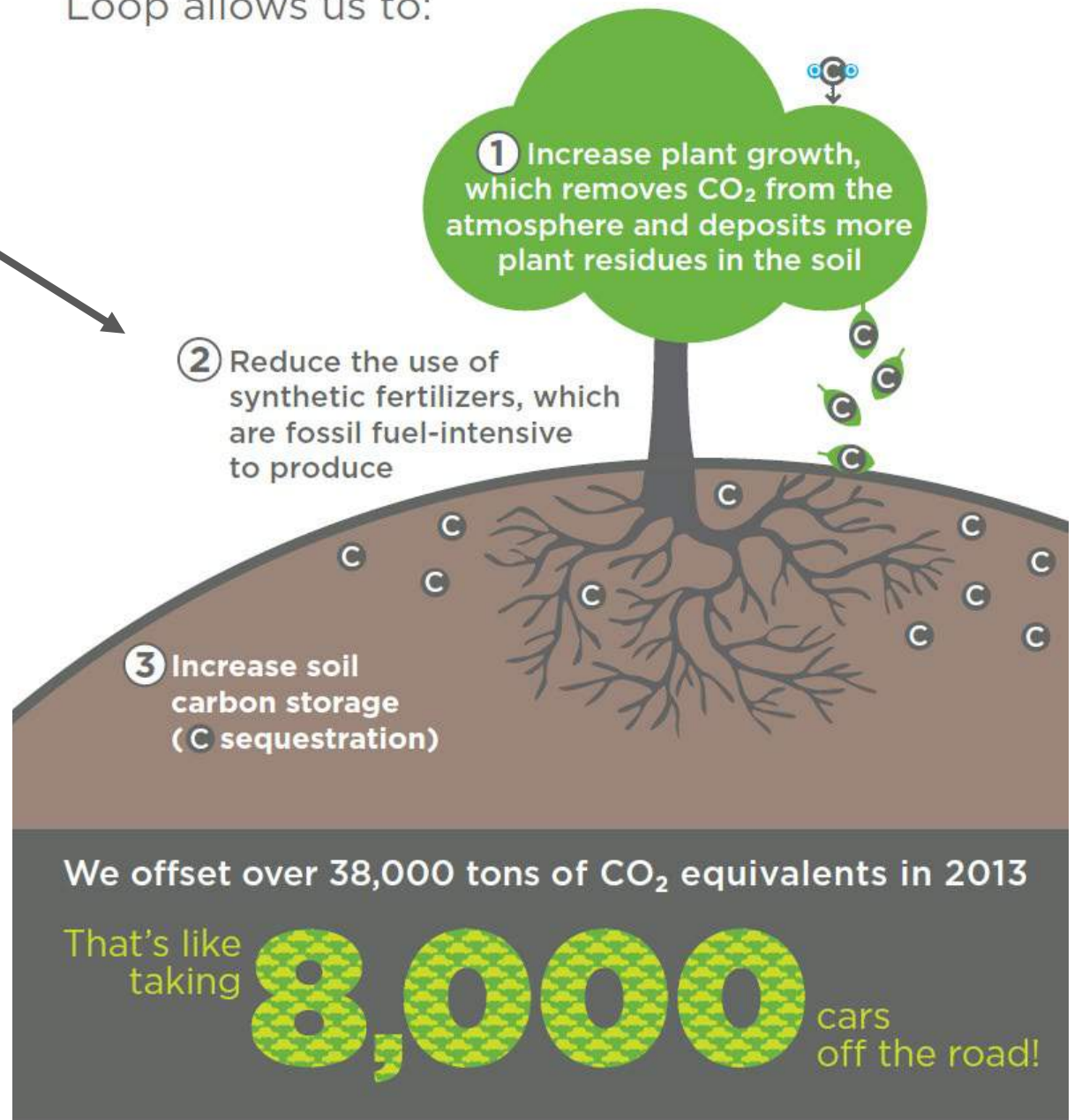
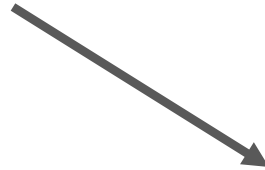
Collecting bulk density sample in
3 dry ton/acre biosolids treatment

Bulk density is a proxy measurement for soil health:

Lower bulk density means less compaction and a better environment for plant growth, better structure for water storage.

Fertilizing with carbon-rich
Loop allows us to:

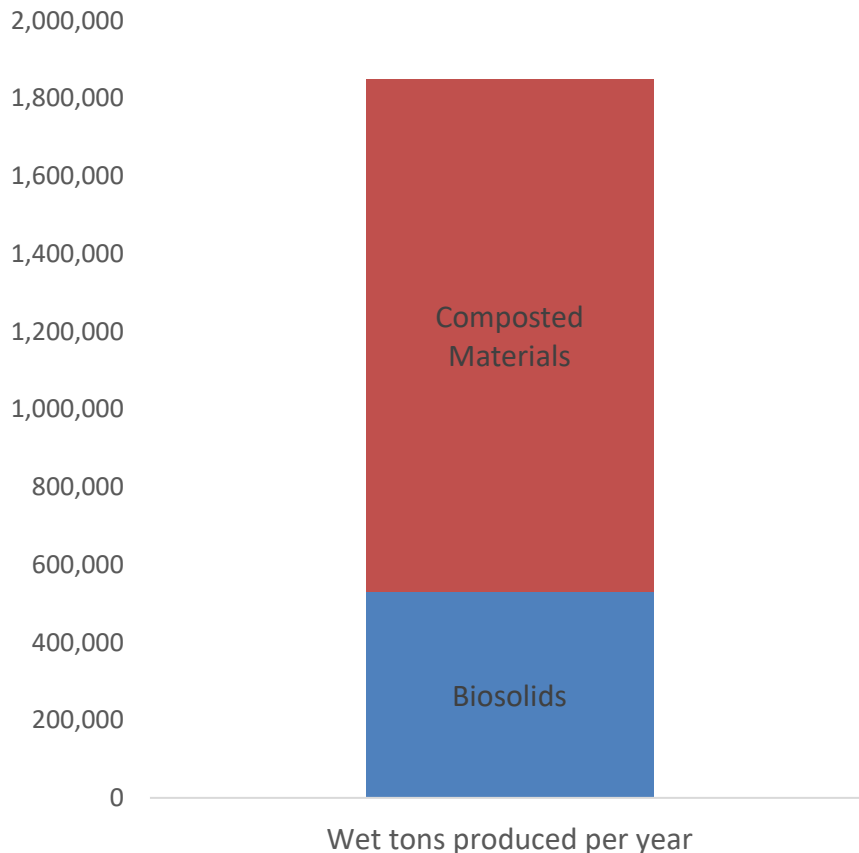
mechanism



impact

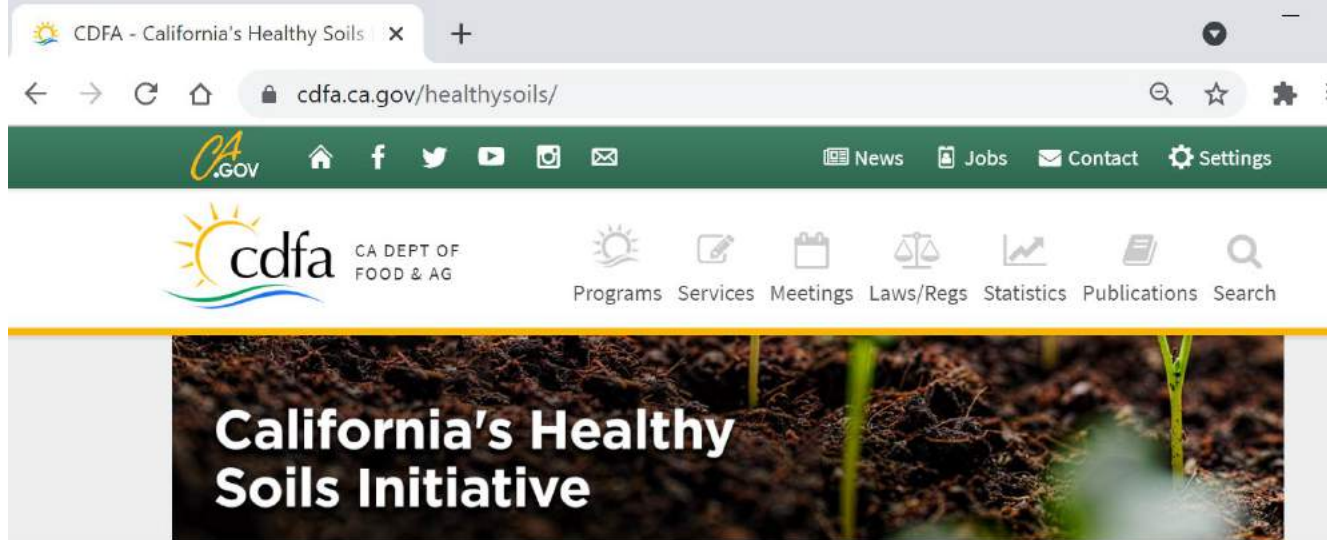


What is the larger impact for WA?



Leverage these materials:

- Soil Health
- Climate
- Food security
- Air quality
- Water quality & quantity



[CDFA Home](#) | [California's Healthy Soils Initiative](#)

California's Healthy Soils Initiative

California's Healthy Soils Initiative is a collaboration of state agencies and departments, led by the California Department of Food and Agriculture, to promote the development of healthy soils. A combination of innovative farm and land management practices contribute to building adequate soil organic matter that can increase carbon sequestration and reduce overall greenhouse gas emissions.

Healthy Soils Partnership Workshops

The California Department of Food and Agriculture (CDFA) and California Air Resources Board are announcing a series of stakeholder workshops on the development of a framework for public-private partnerships to invest in scaling up healthy soils practices. In addition to CDFA and CARB, staff from USDA Natural Resources Conservation Service (NRCS) will also participate in the workshop....

[More information ►](#)

Why Soils?



Improve plant health and crop yields*

Soil organic matter suppresses disease organisms and increases plant nutrient availability and uptake.



Increase water retention and infiltration*

Healthy soil can hold up to 20 times its weight in water. Increasing soil organic matter 1% can increase soil available water holding capacity by 3.7%.



Prevent erosion and reduce sediment and dust*

Soil organic matter helps build soil aggregate stability and structure and make it more resistant to wind or water erosion.



Sequester carbon and reduce greenhouse gas emissions*

Soils contain approximately 75% of the carbon pool on land—three times more than the amount stored in living plants and animals.



Improve water quality*

Increasing soil organic matter increases infiltration and biological activity that make soil a more effective filter.



Improve biological diversity and wildlife habitat*

At least a quarter of the world's biodiversity is in the soil; healthy soils improve habitat for native