
CARY SCIENCE CONVERSATION
Stressed out Soils
Presented by
Drs. Jane Lucas and Joshua Ginsberg
www.caryinstitute.org/events

FIELD STUDY SITES

Barro Colorado Island, Panama

Moscow, ID

Cary Institute, Millbrook, NY

UConn, CT

Gainsville, FL

Helsinki, Finland

SOIL ECOSYSTEM SERVICES

CARBON SINK

HABITAT FOR ORGANISMS

WATER PURIFICATION

NUTRIENT CYCLING

FLOOD REGULATION

SOIL CONTAMINANT REDUCTION

CLIMATE REGULATION

FOOD PRODUCTION

95% of food comes directly or indirectly from soil

THREATS TO SOIL HEALTH

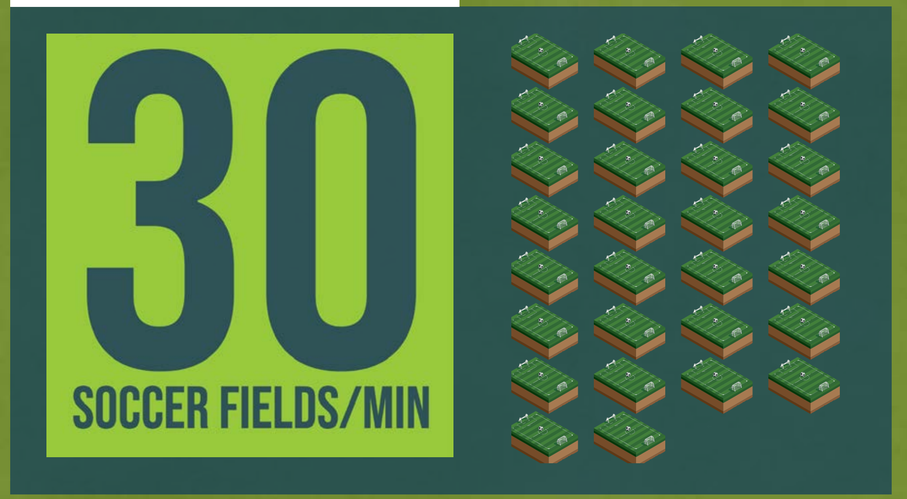
LOSS OF SOIL BIODIVERSITY

EROSION

GLOBAL DEMAND FOR FOOD

PESTICIDES, HERBICIDES, AND FERTILIZER USE

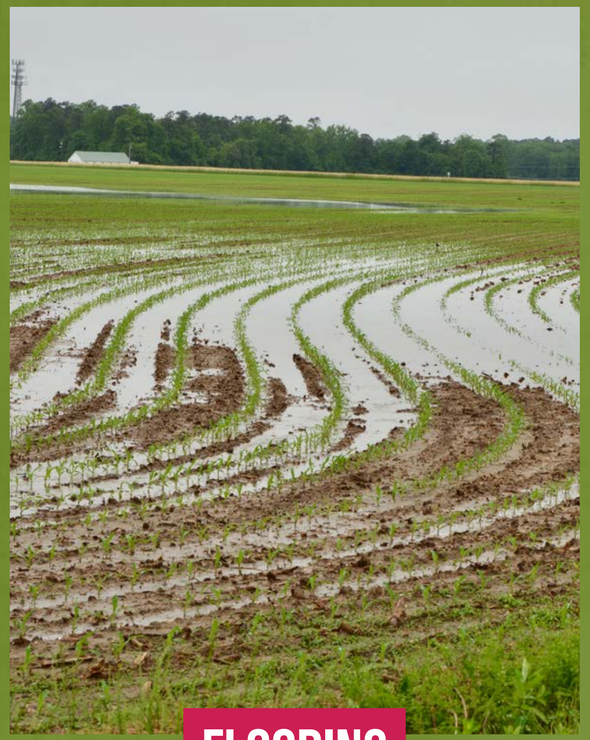
GLOBAL SOIL LOSS



DUST STORM: ILLINOIS, MAY 1, 2023

GLOBAL ENVIRONMENTAL CHANGE

DROUGHT



FLOODING

PESTS

POLLINATORS

RESEARCH PROJECT: STRESSED OUT SOILS

TESTING HOW 5 VARIABLES INTERACT TO SHAPE SOIL HEALTH

- DROUGHT
- WARMING
- FUNGICIDES
- ANTIBACTERIALS
- PESTICIDES

Cary Institute, Millbrook, NY

SOILS ON DRUGS

GLOBALLY

~80%

OF ANTIBIOTICS ARE USED TO REAR LIVESTOCK

CASE: MONENSIN

An antibiotic widely used in ruminant animal feeds.

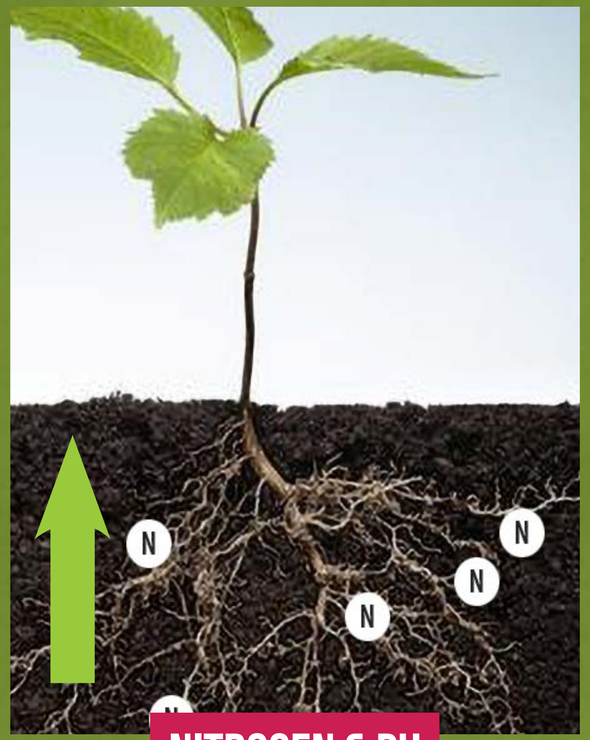
ALTERED MICROBIOME

FEWER ACTIVE MICROBES BY

25%-50%

ALTERED FOOD WEB

CHANGES TO SOIL HEALTH

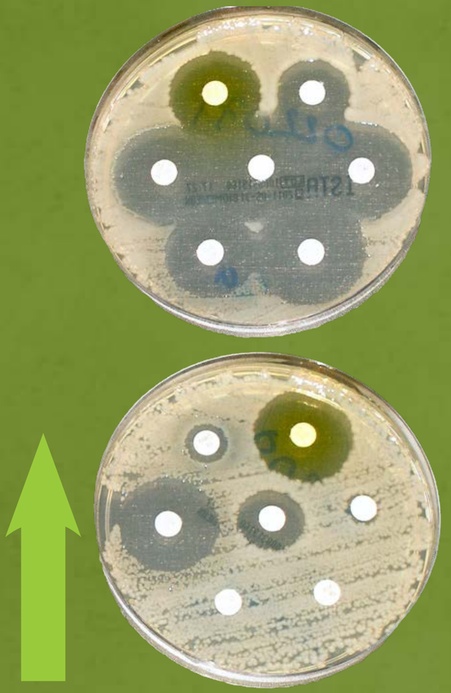


NITROGEN & PH

WATER HOLDING CAPACITY

LESS EFFICIENT MICROBIAL ACTIVITY

CARBON STORAGE CAPACITY



ANTIBIOTIC RESISTANCE

ANTIBIOTIC RESISTANCE: MAPPING THE RESISTOME

UNMANAGED SOILS

Temperate forest
Grassland
Boreal forest
Shrubland
Dryland

ANTIBIOTIC RESISTANCE GENE (ARG) ABUNDANCE

MANAGED SOILS

Lawn
Pasture
Cropland

MANAGED VS UNMANAGED

46.7%
INCREASE IN AVERAGE ARG ABUNDANCE

WHAT CAN YOU DO?

Compost and decrease food waste.

Keep land covered with deep rooted plants, cover crops, or mulch.

Rotate crops in your garden and incorporate compost.

Opt for more deep rooting lawns in line with the natural prairie system in your region.

Reduce lawn chemicals.

Make choices that reduce your climate burden.