

Revealing soil science at the State Fair

SOIL is physical, chemical, and biological

Soil is a dynamic, interacting mix of mineral particles, air, water, organic matter, and life.

45% Mineral 25% Air 25% Water
5% Organic Matter

PHYSICAL

The physical properties of soil include:

- Color
- Texture (sand, silt, clay)
- Density
- Cohesiveness
- Structure
- Aggregate stability
- Porosity
- Temperature

These properties affect processes such as infiltration, erosion, nutrient cycling, and biologic activity.

CHEMICAL

The chemical components of soil are inorganic and organic, including the pH, nutrients (such as nitrogen, phosphorus, potassium), salts, and water. A correct balance of these ingredients is key to supporting soil function and biological properties.

BIOLOGICAL

The **soil biome**, both the organisms we can and cannot see, makes up the largest and most diverse concentration of living biomass on the planet. These organisms help to shred and break down plant materials and cycle their nutrients into the soil.

Soil organic matter is a diverse mix of plant, animal, and microbial debris. Organic matter provides food and habitat for microbes, protects soils from erosion, captures and filters water, and retains nutrients.

A teaspoon of soil can contain over a billion living organisms including bacteria, fungi, and others.

Meet Minnesota's SOIL TYPES

Understanding soil types can help farmers, gardeners, and builders know what to expect so they can make good decisions about land uses. Here are some general characteristics of the main soils found in Minnesota.

MOLLISOLS

Characteristics: Deep, dark surface layer and nutrient and organic matter-rich. Under native conditions, it can be soft, mellow, and have low-density at the surface.

Where to find it: Prairies, 32.1% of MN

ALFISOLS

Characteristics: Rich in aluminum and iron with clay leaching from the surface into the subsoil. Light grey or brown at the surface level.

Where to find it: Forests, 27.4% of MN

ENTISOLS

Characteristics: Wet, shallow, sandy, poorly developed soil. Soil properties change very little with depth.

Where to find it: Slopes, rock outcrops, sand plains, floodplains, forests, 18.4% of MN

INCEPTISOLS

Characteristics: Rocky and low-lime with moderate degrees of soil weathering and development. Most commonly found in Northeast Minnesota and are formed from glacial and river deposits (till, outwash, and alluvium).

Where to find it: Mixed conifer-deciduous forests, 9.4% of MN

These educational panels are part of the "Dig it! The Secrets of Soil" exhibit, which includes information about Minnesota's soil types, the relationship between climate change and soils, and conservation practices that enhance soil health. **Graphic Credit:** Minnesota Department of Agriculture

FALCON HEIGHTS — A new exhibit being planned for the Minnesota State Fair aims to reveal the ways soils are crucial to people's everyday lives. "Dig it! The Secrets of Soil" invites fairgoers to meet Minnesota's soils and discover a new world beneath their feet.

The exhibit is based on a Smithsonian National Museum of Natural History do-it-yourself exhibit of the same name. The Smithsonian provides participating organizations with a toolkit that contains ready-to-display content, which organizations



can tailor to fit their missions, geographic regions or exhibit purposes. Minnesota's "Dig it!" exhibit will include nine Smithsonian panels and 11 Minnesota-specific panels including information about Minnesota's soil types, conservation practices that promote soil health, and the relationship between soils

and climate change.

"Our main goal is to make soil science accessible to all State Fair visitors," said Mary Juhl, Minnesota Board of Water and Soil Resources' (BWSR) communications coordinator, who serves on the "Dig it!" planning team. "We hope to spark an interest in soil

health in people from many different backgrounds by emphasizing the ways soils impact people's lives both here in Minnesota and on a global scale."

Exhibit organizers include staff from BWSR, the Minnesota Department of Agriculture (MDA) and MDA's Minnesota Agricultural Water Quality Certification Program (MAWQCP) — a voluntary program for landowners to implement conservation practices that protect water quality. More than 1,200 producers across the state have been MAWQCP-certified to date.

Volunteers from research institutions and organizations that work with soil health — including the University of Minnesota (U of M), the USDA's Natural Resources Conservation Service (NRCS) and the Land Stewardship Project — will staff the exhibit. These volunteers will lead demonstrations and activities, and field questions about soils.

Additionally, "Dig it!" will feature the results of a recently conducted "Soil

Soil health resources

Can't make it to the state fair this year or just want to learn about soil health now? Check out the following resources curated by one of BWSR's soil scientists, Southern Regional Training Conservationist Kristin Brennan.

- [BWSR Online Training Library](#): Search the keywords "soil" or "soil health" on this webpage to access dozens of free learning opportunities.
- [Unlock the Secrets in the Soil](#): This video series from NRCS offers profiles of farmers working to improve their soils, plus tips for keeping soils healthy and productive.
- ["How Soil Unites Us," TED Talk](#): Hear University of Minnesota pedology professor Nic Jelinski discuss the ways soil connects us all.
- [BWSR Cover Crop Training Series](#): Explore more than 40 webinars about cover crops.
- [Soillife.org](#): A collaboration between NRCS and the University of California-Davis, this website aims to raise awareness about the value and importance of soil.
- [Soil Health Nexus](#): Partners from universities in 12 north central states collaborate to make webinars and learning tools available on this interactive website.
- [Why Soil is One of the Most Amazing Things on Earth](#): In under five minutes, BBC Ideas explains the ways soils are vital to our everyday lives.
- [Soils 4 Teachers](#): The Soil Science Society of America offers lessons and activities for high school and college students.

Your Undies" experiment. With assistance from the Minnesota Office for Soil Health (MOSH) and the U of M's Minnesota Agricultural Experiment Station, exhibit organizers buried five pairs of men's white cotton underwear for 10 weeks in different fields and soil types. The healthier the soil, the more deteriorated the underwear should appear, because healthy soils contain bacteria, fungi and other organisms that consume materials such as cotton. The exhibit will feature the unearthed undies, which illustrate the ways in which tillage practices, soil types and the presence (or absence) of cover crops affects soil organic matter.

Find "Dig it!" in the Eco Experience building throughout the fair, which runs Aug. 25-Sept. 5. The Eco Experience is a large annual exhibit hosted and organized by the Minnesota Pollution Control Agency (MPCA). It includes hands-on activities, demonstrations and resources centered on environmental and ecological topics.



Attendees participate in activities at past years' Eco Experience exhibits. **Photo Credits:** MPCA