

What is soil?

SOIL IS THE “SKIN OF THE EARTH” THAT SUSTAINS LIFE



WHAT DO WE USE SOILS FOR?



HOW ARE SOILS BEING DAMAGED?



HOW CAN WE HELP PRESERVE SOILS?

SOIL: THE SKIN OF EARTH



What is soil?

Soil is a mixture of organic and inorganic materials, gases, liquids, and living organisms. Soil is capable of supporting plant life.

Soils make the “skin of the earth” and plants grow in and from soils, so life on earth depends heavily of specific qualities of local soils. Soils also filter water, capture and release gases.

There are thousands of kinds of soils all over the world, each with unique origins and subject to different environmental conditions.

Then, what is dirt?

Dirt is soil that lost the ability to sustain life

Soil components

Soils are made of a number of ingredients including minerals (derived from the parent material), organic materials (dead and live organisms), air, and water. Different combinations of these elements produce different types of soils. These soils are also exposed to different climates and to graphic relief resulting in more varieties of soils.

Soils are born from the interaction of the parent materials with wind, water, and with the microorganisms living in it. Soils take a very long time to form, especially the productive top soil that helps plants grow. Soils also change and age, as the minerals in it are moved or exposed by the weather.

C L O R P T

CL = Climate

R = Relief

T = Time

O = Organisms

P = Parent Material

Because soils are more than just dirt, they keep changing over time. Soils breathe and age naturally, but the changes brought by human intervention can be very dramatic and not always ideal for sustained used of the land.

Hawaiian soils are very diverse, especially for such as small area. The great variety in soil types is due to a diversity in soil origin, as well as differences in age between the islands. This means that the soils on the older islands have been exposed to weathering agents for a lot longer than the soils in younger islands. In addition, rainfall, a critical element in soil evolution, is variable across the islands. The College of Tropical Agriculture and Human Resources (CTAHR) of the University of Hawaii at Manoa, has produced a comprehensive review of soil types in Hawaii. This publication includes soil maps for the main islands and can be accessed at <http://www.ctahr.hawaii.edu/oc/freepubs/pdf/SCM-20.pdf>.

Soil type classification helps understand soil origin but is different from testing soils to determine nutrient deficiencies with the hopes of fertilizing appropriately. Instructions of how to collect a soil sample for nutrient analysis can be found at

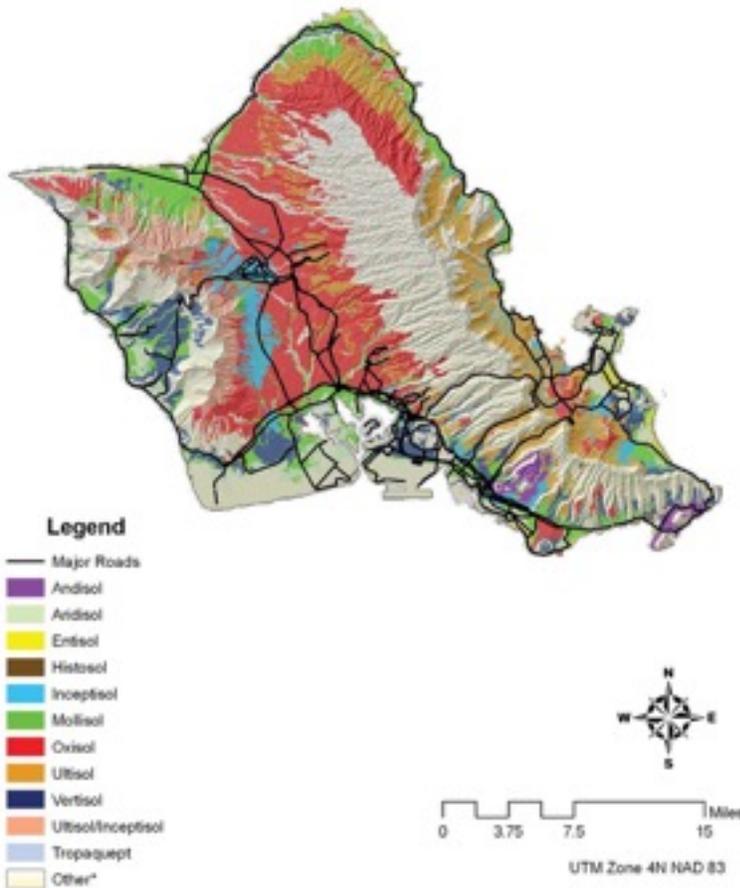
<http://www.ctahr.hawaii.edu/oc/freepubs/pdf/SCM-9.pdf>

Parent material, climate, and relief influence soils



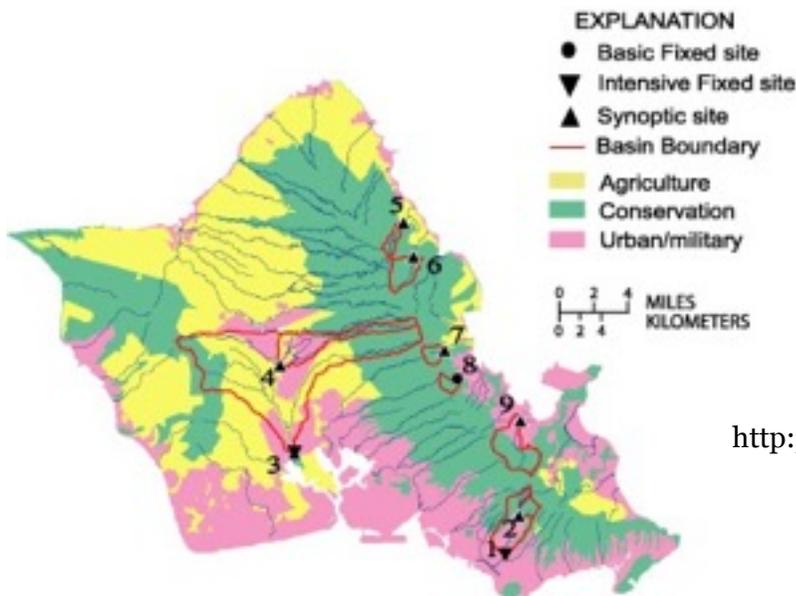
Soil's parent material and climatic conditions work together to produce unique soil profiles that in turn support unique vegetation. From top to bottom: a silversword in Haleakala Maui, a desert landscape in Arizona, and a rainforest in Costa Rica.

Soil types



Map of soil types found on Oahu helps visualize the diversity of soils and their location (taken from Soils of Hawai'i by Deenik and McClellan - CTAHR publication 2007).

Compare the soil map to the map below of land use. Note the extensive overlap of oxisols, ultisols, and mollisols with agricultural use.



Also note the presence of andisols and inceptisols in urban areas.

An extremely important resource is the “Hawaii Soil Atlas” found online at :

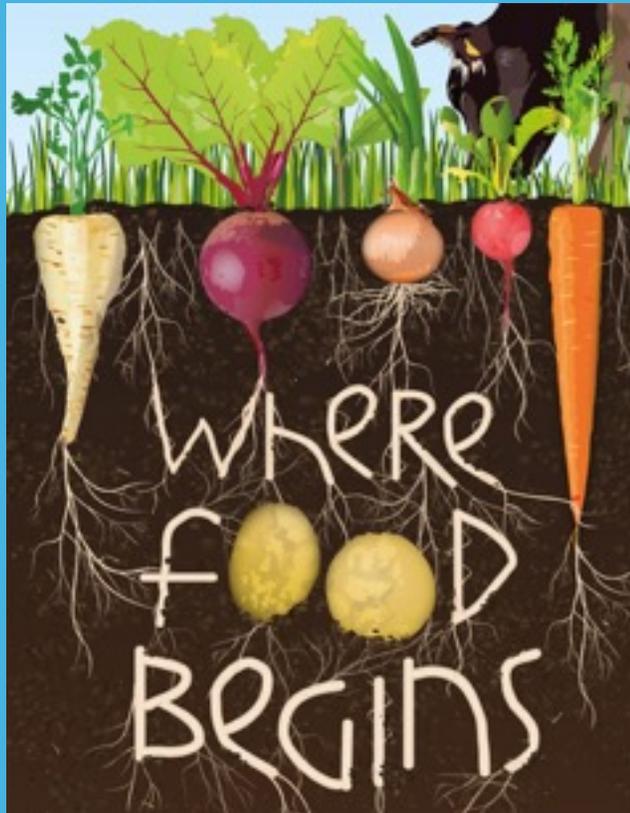
<http://gis.ctahr.hawaii.edu/SoilAtlas#useSoil nutrients>

Soil use : <http://hi.water.usgs.gov/studies/nawqa/>

Soil nutrients

Soil nutrients are the elements that plants need to grow.

Some nutrients are needed in larger quantities than others but all are important. Carbon (C), Hydrogen (H) and Oxygen (O) are the most important elements needed by plants. Other essential nutrients included Nitrogen (N), Phosphorous (P) and Potassium (K). These 3 elements, often called **NPK**, are considered **primary macronutrients** because they are needed in large quantities. Most commercial fertilizers deliver these 3 macronutrients and many micronutrients needed for plant growth including chlorine (Cl), Iron (Fe), Zinc (Zn), etc.



Infographic from FAO

Soil conservation

There are a few simple rules to soil conservation:

- 1- Provide ground cover: protect the soil from losing important elements due to erosion due to exposure to wind and water.
- 2-Plow less to get more: no-till agriculture helps preserve important top soil.
- 3-Fertilize wisely : use compost to return fertility to the soil, plant legumes which help capture N from the atmosphere,
- 4-Irrigate wisely: excess water can pull up salt from the lower layers making soils infertile.

Soils are not renewable resources. Soils are indispensable for life. Soils need care.