USDA Natural Resources Conservation Service
U.S. DEPARTMENT OF AGRICULTURE

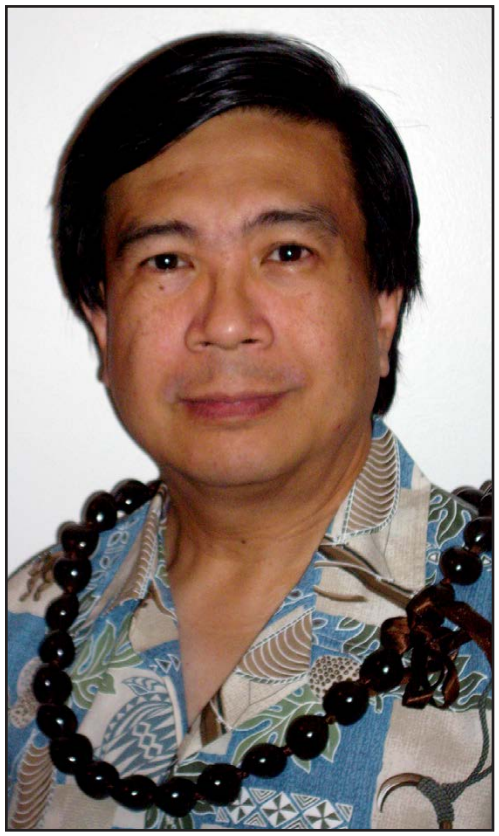
2022 Soils Planner

Agriculture and Beyond: Other Stories of the Soil

Musings From the Deputy Chief

Are soil surveys scientific publications, such as botanical or oceanographic surveys, or are they utilitarian documents that provide practical advice? In fact, they have included both research and applied science since the early days of Soil Survey in the late 1890s. Over time, both aspects expanded and merged. Today, soil surveys are clearly both formal scientific publications and sources of practical information. To make accurate maps, scientists must understand soil formation as a natural phenomenon. At the same time, the soil maps are a major tool for agriculture, especially conservation planning, and are a critical asset for many non-agricultural uses.

This Soils Planner showcases 12 non-agricultural uses of soil surveys. Currently, U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) provides over 500 interpretations based on soil information. These interpretations present (1) a *limitation*, such as a severe limitation for crop production because of a high water table, or (2) a *suitability* or *favorability*, such as fair favorability for habitat of hazardous microorganisms (for example, *Coccidioides* species that cause Valley Fever). This rating system is useful to a variety of consumers, including research and teaching institutions; engineering companies; Federal and State highway agencies; Federal, State, and local health departments; banks; real estate companies; Federal and State forestry agencies; private timber companies; and agencies involved in managing natural resources, such as the USDA Forest Service, the U.S. Department of the Interior, and the U.S. Fish and Wildlife Service.



Luis M. Tupas, Ph.D.

In the future, interpretations will be developed to address new needs, such as identifying which soils have the greatest potential to sequester carbon and which best promote biodiversity.

Soils Information

People have acquired and used soils information for centuries all over the world. As more soils information became available, civilizations developed and thrived by applying that knowledge to build safe structures and healthy ecological systems and by developing foods, medicines, and other consumer products from the minerals found in the soil.

As the knowledge of soils evolved, so has the role of soil scientists within the NRCS Soil and Plant Science Division. Today, gathering soils information involves not only soil scientists, but also agronomists, botanists, cartographers, chemists, climatologists, ecological specialists, geologists, geographic information system specialists, information technologists, researchers, and technical editors.

Scientists and specialists use soils information to maintain healthy habitats (top), evaluate soils and their properties (middle), and interpret soil capabilities and limitations for building structures (bottom)—information needed to conserve, build, and maintain the civilizations of today.

Forensics

Because of their diverse properties and characteristics, soils can be used as evidence in criminal investigations. Soils information can help law enforcement investigators understand a crime scene, determine the location of a burial or clandestine grave, and identify the origin of a scent when using human-remains-detection dogs. It can help forensic scientists assess the condition and age of bones, assess the potential preservation of bone suitable for DNA testing, estimate time since death, assess the relative completeness of a skeleton, and identify soil provenance, or soil "fingerprints." Soil fingerprints are unique enough that a particular site or soil type can be determined from a soil sample of unknown origin.

Forensic soil science uses soil morphology, mapping, mineralogy, chemistry, geophysics, biology, and molecular biology to address legal questions, problems, and hypotheses. Knowledgeable field soil scientists have much to offer the forensic communities. Because of the scientists' unique ability to read the landscape and describe and compare soil details, they can recognize natural versus disturbed soils and the extent of disturbance in a field and can test soil properties to identify unmarked or mismarked graves.

A ground penetrating radar (GPR) survey identified a coffin nail and linear dark stain denoting the edge of a coffin at Old Newgate Prison Cemetery, East Granby, CT. The soil was acidic enough to dissolve most of the coffin and its contents, even teeth.

January 2022

December 2021

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February 2022

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						1 New Year's Day
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9 ◐	10	11	12	13	14	15
16	17 ○ Birthday of Martin Luther King, Jr.	18	19	20	21	22
23 30	24 31	25 ◑	26	27	28	29

Archaeology

NRCS soil scientists (top right) conduct a survey with ground penetrating radar (GPR) on Runway 33 at Bradley International Airport, CT, where they located the 1941 crash site of a military aircraft.

A GPR survey (bottom right) conducted at the Naval Station in Newport, RI, to locate unmarked graves and buried foundations from past residential structures. More specifically, this survey attempted to locate the unmarked grave of Mary Dyer (1611–1660). The survey was completed in support of NRCS's commitment to protect and enhance our Nation's historic properties.

Archaeologists and soil scientists work together to extract clues from soils about past climates and land uses. They also determine whether artifacts are stratigraphically intact, and they estimate the age and state of preservation of prehistoric structures.

February 2022

January 2022

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March 2022

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Society for Range Management Annual Meeting February 6–10						
13	14	15	16 ○	17	18	19
20	21 Washington's Birthday	22	23 ◑	24	25	26
27	28					

Bioremediation

Bioremediation is the use of living organisms, mainly microorganisms and plants, to remediate contaminated media, including water, soil, and other material. In many cases, bioremediation is less expensive and more sustainable than other remediation alternatives. Soil microorganisms are used to decompose oil and gasoline from spills and leaky tanks as well as to decompose liquid and solid industrial wastes. Some plants, such as *Brassica* spp. and *Eichornia* spp., have the ability to extract uranium and other heavy metals from contaminated soils and water.

The microorganism *Acidithiobacillus ferrooxidans* (top) is used to remediate acid mine drainage and mine tailings. Both the *Brassica* species and the *Eichhornia* species (middle) have the ability to extract uranium and other heavy metals. Colonies of iron-loving *Acidithiobacillus ferrooxidans* (bottom) thrive on oxidized iron in water, reducing contamination from acidic mine drainage.

March 2022

February 2022

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April 2022

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6	7	8	9	10 ◐	11	12
13 Daylight Saving Time Starts	14	15	16	17	18 ○	19
20 Vernal Equinox	21	22	23	24	25 ◑	26
27	28	29	30	31		

Flood Control

Soils play an important role in flood control. They absorb water and are used as construction material for flood-control structures. Soils that are covered with vegetation absorb more water and have less runoff than bare soils.

Runoff water is commonly managed by floodwater-slowing dams. Flood-control structures protect communities from catastrophic damage during flooding events and provide a stable environment for wildlife. A stream dam designed with a fish ladder (top right) allows fish to migrate through the structure.

The Soil Climate Analysis Network (SCAN) and Snow Telemetry (SNOTEL) stations (bottom left and right) are important sources of information for flood control. NRCS scientists and specialists maintain the sites and monitor the data. SCAN sites monitor soil moisture content at several depths, air temperature, relative humidity, solar radiation, wind speed and direction, rainfall, and barometric pressure. SNOTEL sites monitor snow water equivalent and snow depth. This information allows scientists to predict drought- or flood-prone years.

April 2022

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May 2022

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17	18	19	20	21	22	23 ◑
24	25	26	27	28	29	30 ●

Pollinator Habitat

Soils support plants that support and depend on pollinators, such as bees, birds, butterflies, bats, and ants. Bees are among the best-known pollinators. Some bees nest below ground. The rusty-patched bumblebee (top) lives in abandoned rodent burrows. Cellophane bees, or polyester bees (bottom middle), build their nest about 4 to 6 inches into sandy soil. They line their hive with a secretion that looks like clear plastic when it dries. The secretion keeps the hive dry and has a natural fungicide and bactericide.

Other important pollinators include hummingbirds and butterflies. They build their nests in trees and shrubs and thrive in areas of clean water and healthy plants.

May 2022

April 2022

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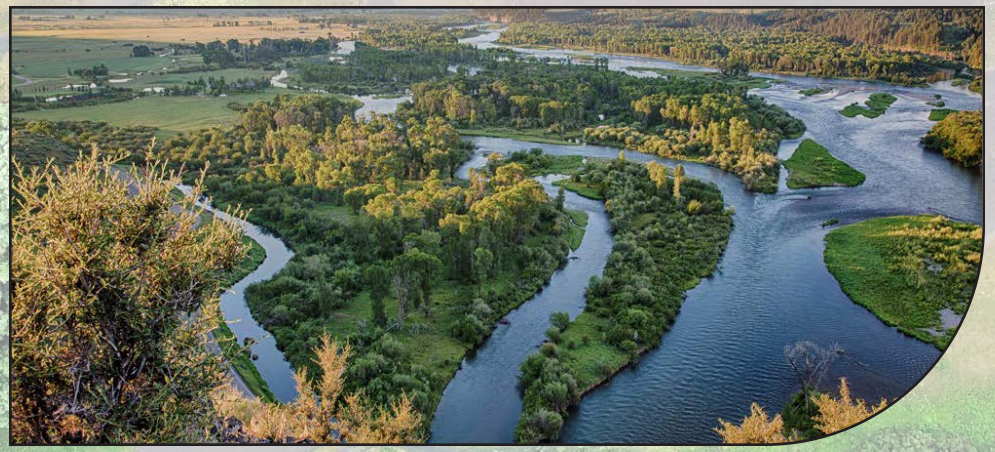
8 ◐	9	10	11	12	13	14
15	16 ○	17	18	19	20	21
22 ◑	23	24	25	26	27	28
29	30 ● Memorial Day	31				

Wetlands

Wetlands are among the most productive ecosystems in the world. They provide many ecosystem services; for example, they offer critical habitat for a wide array of wildlife species, protect and improve water quality, filter pollutants, store floodwater, sequester carbon, and trap sediment (top).

Land managers and conservation planners use information about soils and ecological sites to maintain or restore healthy wetlands. These areas provide clean water and natural habitat to migratory waterfowl and mammals. Soils information is used by planners to ensure clean waterways, safe food sources, and viable habitats for migratory birds and animals (middle).

The U.S. Fish and Wildlife Service identifies the South Fork of the Snake River (bottom) as the highest quality cottonwood riparian zone in the Western United States. Along the banks and on in-stream islands, wetland mosaics provide food and living space for bald eagle, elk, moose, mule deer, white-tailed deer, muskrat, and dozens of bird species.



June 2022

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July 2022

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Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
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	National Cooperative Soil Survey South Regional Conference June 6–10					
12	13	14 ○	15	16	17	18
	National Cooperative Soil Survey Northeast Regional Conference June 13–16					
19 Juneteenth	20 ◑	21 Summer Solstice	22	23	24	25
	National Cooperative Soil Survey North-Central Regional Conference June 20–23					
26	27	28 ●	29	30		
		National Cooperative Soil Survey West Regional Conference June 28–July 1				

Structural Support

Engineers have a long history of using soils information when selecting building sites and designing structures. Soils information is used to limit damage to foundations and other structures (top) and to address safety hazards. Soil tests are performed to identify soil properties, such as shrink-swell potential, bearing strength, particle size, terrain, and drainage. These factors are important considerations for the design of buildings, roadways (middle), railways (bottom), and airport runways. Soils can affect the feasibility, longevity, and economic impact of many structures.

July 2022

June 2022

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August 2022

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Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
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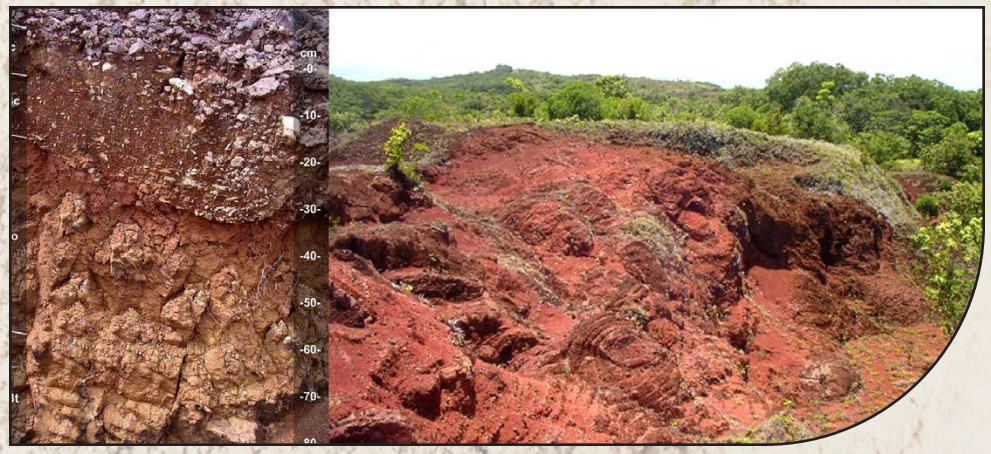
3	4 Independence Day	5	6 ◐	7	8	9
10	11	12	13 ○	14	15	16
17	18	19	20 ◑	21	22	23
24 31	25	26	27	28 ●	29	30

Consumer Products

Bentonite, which is clay composed dominantly of the mineral smectite, has natural binding properties and antiviral and antibacterial properties. It is used in a wide variety of consumer products, such as food additives, skin care products, arts and crafts, and kitty litter. Its antiviral and antibacterial properties make it useful in medicines.

Kaolinite is another common clay that has a variety of uses. Because of its low shrink-swell potential, kaolinite is used for making ceramics, bricks, and tile. It is also the source of white pigment in paper, light bulbs, and paint and an active ingredient in digestive medicines.

Gibbsite, which is used to produce aluminum, is a very insoluble soil mineral that forms in highly weathered tropical soils (bauxite). Unlike other metals that are mined from veins in rock, aluminum is mainly derived from oxide ores in soil (bottom). Aluminum is perhaps the major consumer product from soil.



August 2022

July 2022

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September 2022

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Soil and Water Conservation Society Annual Meeting July 31–August 3						
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Subaqueous Soils

Knowledge of subaqueous (underwater) soils is important for improving aquaculture, managing marine ecosystems, understanding the hurricane-buffering effects of coastal zones, and promoting carbon sequestration.

Coastal subaqueous carbon, also known as blue carbon (top right), stores a large amount of carbon. This carbon is being studied to better understand how it pulls and stores carbon dioxide from the atmosphere.

Subaqueous soils affect the stability of moorings, which are structures that anchor boats and include a float or buoy (bottom right). The safety of a boat on a mooring depends on a number of factors, including the type of soils in the bottom material. A mushroom anchor, which is buried in the soil, works best in loamy to organic soils with specific properties or in other areas where the bottom material is soft. In contrast, a deadweight anchor works best in rocky or gravelly soils or in areas where the bottom material is hard.

September 2022

August 2022

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October 2022

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4	5 Labor Day	6	7	8	9	10 ○
11	12	13	14	15	16	17 ◑
18	19	20	21	22 Autumnal Equinox	23	24
25 ●	26	27	28	29	30	

Recreation

Picnic areas, walking and biking trails, and waterways used for swimming, boating, and fishing benefit from management based on information about soils and ecological sites (top and middle). This information can be used to overcome limitations affecting areas that are susceptible to flooding and to predict the impact of developments on vegetation and wildlife habitat. The use of the flood-prone areas for green spaces instead of for houses is becoming increasingly popular.

Developers of golf courses can also benefit from an understanding of reclaimed land and flood zones. Soil mapping, soil testing, and ecological site evaluations can be used for maintaining the optimal condition of the course (bottom).

October 2022

September 2022

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November 2022

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9 ○	10 Columbus Day	11	12	13	14	15
16	17 ◑	18	19	20	21	22
23 30	24 31	25 ●	26	27	28	29

Construction Materials

Soils are potential sources of gravel, sand, reclamation material, roadfill, and topsoil. The soils are treated with compaction, minor processing, and other standard construction practices.

Gravel and sand are natural aggregates suitable for commercial use with a minimum of processing (top). They are used in many kinds of construction. Specifications for each use vary widely.

Reclamation material is used in areas that have been drastically disturbed by surface mining or similar activities (middle). When these areas are reclaimed, layers of soil material or unconsolidated geological material, or both, are replaced in a vertical sequence. The reconstructed soil favors plant growth.

Roadfill is soil material that is excavated in one place and used in road embankments in another place (bottom). NRCS rates the soils as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

November 2022

October 2022

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December 2022

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Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1 ◐	2	3	4	5
6 Daylight Saving Time Ends	7	8 ○	9	10	11 Veterans Day	12
	Soil Science Society of America International Annual Meeting November 7–10					
13	14	15	16 ◑	17	18	19
20	21	22	23 ●	24 Thanksgiving Day	25	26
27	28	29	30 ◐			

Wildlife Habitat

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

Habitat for rangeland and openland wildlife (top) consists of areas of grasses, shrubs, and trees, as well as planted crops and pasture lands.

Backyard wildlife habitat (middle) provides food and shelter for birds, butterflies, ladybugs, and small mammals, such as squirrels.

Habitat for woodland wildlife (bottom) consists of areas of deciduous and coniferous plants and associated grasses, legumes, and wild herbaceous plants. Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas.

December 2022

November 2022

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January 2023

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11	12	13	14	15	16 ◑	17
18	19	20	21 Winter Solstice	22	23 ●	24
25 Christmas Day	26	27	28	29 ◐	30	31

2022 Soils Planner

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Cover Photo

Looking southwest across an area of the Kansas State University Agriculture Center toward the main campus in Manhattan, Kansas.

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