Antigo Silt Loam
Wisconsin State Soil

Soil Science Society of America

Photo: Chip Clark/Smithsonian Institution

Introduction

Many states have a designated state bird, flower, fish, tree, rock, etc. And, many states also have a state soil – one that has significance or is important to the state. Antigo Silt Loam is the official state soil of Wisconsin. Let's explore how Antigo is important to Wisconsin.

Fig. 1 Antigo Silt Loam Seal. Credit: F.D. Hole, 1979

History

Antigo Silt Loam was named the official state soil of Wisconsin by the State Legislature in 1983, a declaration intended to remind us of the importance of our soil resources. The person instrumental in the process was Dr. Francis D. Hole, soil science professor at the University of Wisconsin in Madison. He lobbied heavily for a state soil and even made a state soil seal (**Figure 1**) and wrote a song about the Antigo Silt Loam! Antigo is named for the nearby city of Antigo, WI in Langlade County where it was first mapped in 1947.

> "Soil is the hidden, secret friend, which is the root domain of lively darkness and silence." Francis D. Hole

What is Antigo Soil?

Thousands of years ago, glaciers spread across the Midwest. The last of which is referred to as the Wisconsin Glaciation. When these last glaciers melted around 10,000 years ago they left behind all the mineral debris they had picked up while forming. Sand and gravel from the melting glaciers spread across the land and this was the basis for the Antigo soil which you can still see today in the subsoil (below the surface soil). Found above this sandy horizon, is a layer of clay and silt they blew over the exposed land surface and settled in Wisconsin. Plants and trees began to grow in the area eventually expanding into great forests. In forests, dead leaves, plants, and other organic matter tend to build up on the surface of the soil. This makes rain slightly acidic as it enters the soil which makes the horizon below the organic matter lighter in color (**Figure 2**).

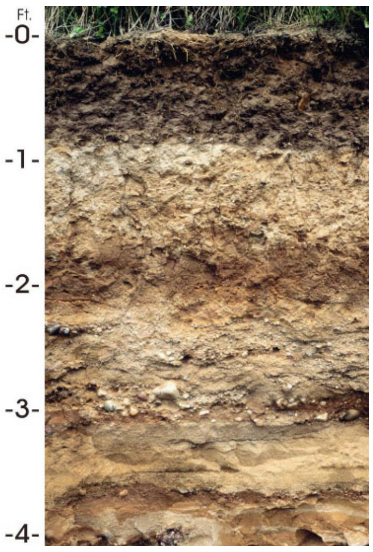

Fig. 2 Antigo soil profile. Credit: USDA-NRCS

Every soil can be separated into three separate size fractions called *sand*, *silt*, and *clay*, which makes up the *soil texture*. They are present in all soils in different proportions and say a lot about the character of the soil. The top three layers of Antigo (the dark one, the grayish one, and the next brown one) are all classified as "silt loam" which means it's a pretty good mix of sand, silt, and clay. The rest of the subsoil has more and more sand as you go deeper, transitioning from a sandy loam to a coarse sand.

Fig. 3 Distribution of the Antigo Series in Wisconsin. Credit: Smithsonian Institution.

Fig. 4 Antigo Silt Loam historical marker. Credit: Emily Fuger.

Where to dig Antigo

Yes, you can dig a soil. It is called a soil pit and it shows you the *soil profile*. The different horizontal layers of the soil are called *soil horizons*. This does not mean that other types of soil cannot be found there but that the Antigo is the most common Antigo occurs across the north central part of the state. Antigo can only be found in Wisconsin and Minnesota. The type location for Antigo is located 2 miles northeast of the City of Antigo, WI (**Figure 3**). A historical marker nearby marks its location **(Figure 4**). Antigo covers 300,000 acres of land in about 13counties of Wisconsin. In all, there are a total of 550 named soils (series) in Wisconsin.

Importance

Areas where the land has been cleared for farming remain rich in forest nutrients. This combined with the fact that the landscape is pretty flat due to the sand spreading out evenly makes this a fantastic soil for growing crops. Lot of potatoes are grown and lots of dairy cows are raised on Antigo. The forests still provide timber for foresters. Many gravel pits can be found in Antigo soil areas as it can also be a good source of sand and gravel (**Figure 5**).

Uses

In general, soils can be used for agriculture (growing foods, raising animals, stables); engineering (roads, buildings, tunnels); ecology (wildlife habitat, wetlands), recreation (ball fields, playground, camp areas) and more. Most areas of Antigo are cultivated. The principal crops are corn, small grains, and hay. In some places, potatoes and snap beans are important crops and some areas are pastured. Some areas are forested. The native vegetation is American basswood, sugar maple, yellow birch, white ash, big tooth aspen, quaking aspen, and black cherry.

Limitations

When a soil cannot be used for one or more of the described functions, it is referred to as a limitation. The Antigo soil readily absorbs water but does not act as a good filter because it is so coarse. This means pollutants can travel easily to the groundwater. So one of Antigo's limitations is that it is not suitable for septic tanks. Also, soil pits are more likely to cave in due to Antigo's coarser texture. So care needs to be taken when building homes, roads, and other structures. Plowing, irrigation and compaction of these soils tends to result in a lower infiltration rate, causing the soil to crust and water to pond and runoff. Also, Antigo soils can often have rocks on the surface that make plowing difficult.

Fig. 5 A quarry pit in Langlade County, Wisconsin. Credit: Emily Fuger.

Fig. 6 Windbreaks block the wind from drying out fields and detaching small soil particles that can blow away. Credit: Mike Pennington (Creative Commons Attribution ShareAlike 2.0)

Management

Historically farmers pick the biggest rocks out of their fields before tilling or planting the soil. Because Antigo soils are susceptible to erosion, conservationists recommend leaving crop residue on fields and planting cover crops to protect the soil from water and wind erosion. Planting trees as windbreaks also protects Antigo soils from wind erosion (**Figure 6**).

Antigo Formation

Before there was soil there were rocks and in between, ClORPT. Without ClORPT, there will be no soil. So, what is ClORPT? It is the five major factors that are responsible for forming a soil like the Antigo series. It stands for **Cl**imate, **O**rganisms, **R**elief, **P**arent material and **T**ime. ClORPT is responsible for the development of soil profiles and chemical properties that differentiate soils. So, the characteristics of Antigo (and all other soils) are determined by the influence of ClORPT. Weathering takes place when environmental processes such as rainfall, freezing and thawing act on rocks causing them to dissolve or fracture and break into pieces. ClORPT then acts on rock pieces, marine sediments and vegetative materials to form soils.

Climate – Temperature and precipitation influence the rate at which parent materials weather and dead plants and animals decompose. They affect the chemical, physical and biological relationships in the soil. The Antigo soil developed under a cool humid climate with mild temperatures and abundant rainfall. The influence of the two resulted in the depletion of organic matter and *leaching* nutrients.

Organisms – This refers to plants and animal life. In the soil, plant roots spread, animals burrow in, and bacteria break down plant and animal tissue. These and other soil organisms speed up the breakdown of large soil particles into smaller ones. Plants and animals also influence the formation and differentiation of soil horizons. Plants determine the kinds and amounts of *organic matter* that are added to a soil under normal conditions. Animals breakdown complex compounds into small ones and in so doing add organic matter to soil. Antigo developed under hardwood or pine forests which deposit leaves, twigs, roots and other plant remains on the surface but these readily degrade and leach through the sandy soil.

Relief – Landform position or relief describes the shape of the land (hills and valleys), and the direction it faces which makes a difference in how much sunlight the soil gets and how much water it keeps. Deeper soils form at the bottom of the hill rather than at the top because gravity and water move soil particles downhill. Antigo soil is well drained because it is formed on the higher position of the landscape.

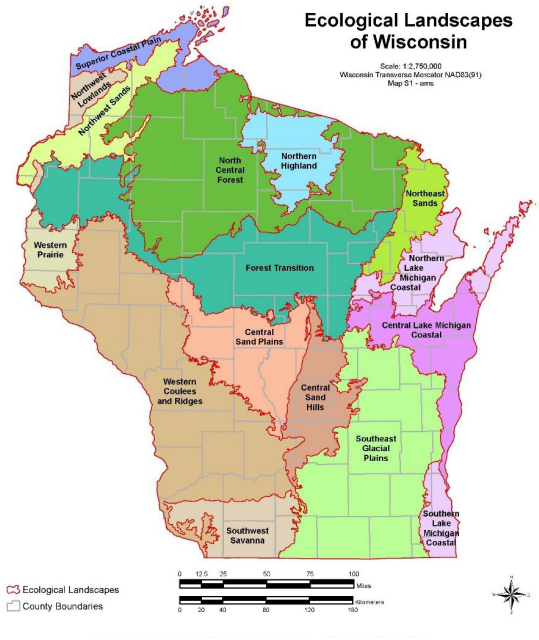

Fig. 7 Ecological Landscapes of Wisconsin. Credit: WI Department of Natural Resources.

Parent material (C horizon) – Just like people inherit characteristics from their parents, every soil inherits some traits from the material from which it forms. Some parent materials are transported and deposited by glaciers, wind, water, or gravity. Antigo soils developed from water-transported materials and material left behind by glaciers.

Time – All the factors act together over a very long period of time to produce soils. As a result, soils vary in age. The length of time that soil material has been exposed to the soil-forming processes makes older soils different from younger soils. Generally, older soils have better defined horizons than younger soils. Less time is needed for a soil profile to develop in a humid and warm area with dense vegetative cover where the Antigo soil is than in a cold dry area with sparse plant cover. More time is required for the formation of a well-defined soil profile in soils with fine textured material than in soils with coarse-textured soil material. Antigo has taken over 10,000 years to form.

Ecoregions, Soils & Land Use in Wisconsin

Ecoregions denote areas of general similarity in ecosystems and in the type, quality, and quantity of environmental resources; they are designed to serve as a spatial framework for the research, assessment, monitoring, and management of ecosystems and ecosystem components. In Wisconsin, there are six major ecoregions: Western Corn Belt Plains, Northern Lakes and Forests, North Central Hardwood Forests, Driftless Area, Southeastern Wisconsin Till Plains, and Central Corn Belt Plains. Antigo is primarity in the Northern Lakes and Forests ecoregion (**Figure 7**).

Generally, the Northern Lakes and Forests is an ecoregion of relatively nutrient poor glacial soils, coniferous and northern hardwoods forests, undulating till plains, morainal hills, broad lacus-

trine basins, and areas of extensive sandy outwash plains. Soils, of this ecoregion, are formed primarily from sandy and loamy glacial drift material and generally lack the arability of those in adjacent ecoregions to the south. Ecoregion 50 also has lower annual temperatures and a frost– free period that is considerably shorter than other ecoregions in Wisconsin (Hole, 1976; U.S. (NOAA, 1974, Hole 1976). These conditions generally hinder agriculture; therefore, woodland and forest are the predominant land use/land cover.

The numerous lakes that dot the landscape are clearer, at a lower depths, and less full of life than those in ecoregions to the south. Streams of ecoregion 50 are mostly present year-round, originating in lakes and wetlands; however, the number of streams is relatively low compared to ecoregions to the south. The Northern Lakes and Forests region is the only ecoregion in Wisconsin where acid sensitive lakes are found.

Glossary

Clay: A soil particle that is less than 0.002 mm in diameter. Clay particles are so fine they have more surface area for reaction. They hold a lot of nutrients and water in the soil. A clay soil is a soil that has more than 40% clay, less than 45% sand and less than 40% silt.

Ecoregion: Represents areas with similar biotic and abiotic characteristics which determine the resource potential and likely responses to natural and man-made disturbances. Characteristics such as climate, topography, geology, soils, and natural vegetation define an ecoregion. They determine the type of land cover that can exist and influence the range of land use practices that are possible.

Horizon: see Soil horizons

Leaching: The removal of soluble materials from one zone in soil to another via water movement in the profile. See also eluviation.

Organic matter: Material derived from the decay of plants and animals. Always contains compounds of carbon and hydrogen.

Sand: A soil particle between 0.05 and 2.0 mm in diameter. Sand is also used to describe soil texture according to the soil textural triangle, for example, loamy sand.

Silt: A soil particle between 0.002 and 0.05 mm diameter. It is also used to describe a soil textural class.

Soil Horizon: A layer of soil with properties that differ from the layers above or below it.

Soil Management: The sum total of how we prepare and nurture soil, select type of crops that suitable for a type of soil, tend the crop and the soil together, and determine fertilizer types and other materials to be added to soil to maintain productivity and preserve soil.

Soil Profile: The sequence of natural layers, or horizons, in a soil. It extends from the surface downward to unconsolidated material. Most soils have three major horizons, called the surface horizon, the subsoil, and the substratum.

Soil Scientist: A soil scientist studies the upper few meters of the Earth's crust in terms of its physical and chemical properties; distribution, genesis and morphology; and biological components. A soil scientist needs a strong background in the physical and biological sciences and mathematics.

Soil Texture: The relative proportion of sand, slit, and clay particles that make up a soil. Sand particles are the largest and clay particles the smallest. Learn more about soil texture at www.soils4teachers.org/physical-properties

Subsoil: (B horizon) The soil horizon rich in minerals that eluviated, or leached down, from the horizons above it. Not present in all soils.

Additional Resources

Soil! Get the Inside Scoop. David Lindbo and others. Soil Science Society of America, Madison, WI.

Know Soil, Know Life. David L. Lindbo, Deb A. Kozlowski, and Clay Robinson, editors. Soil Science Society of America, Madison, WI.

Web Resources

Soils for Teachers—www.soils4teachers.org

Soils for Kids—http://www.soils4kids.org/

Have Questions? Ask a Soil Scientist—https://www.soils4teachers.org/ask

Soil Science Society of America—https://www.soils.org/ /

Web Soil Survey—websoilsurvey.nrcs.usda.gov/

NACD—www.nacdnet.org/education

Wisconsin Society of Professional Soil Scientists—www.wspss.org

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