

HONEOYE

New York State Soil



SOIL SCIENCE SOCIETY OF AMERICA



Introduction

Many states have selected symbols such as a state bird, flower, fish, tree, and rock. What may be less well known is that states also have a state soil – one that has significance or is important to the state. Soil is significant for many reasons: it is the source for most of our food, the foundation upon which our communities are built, and an integral part of the environment in which we live. Soils are separated into different types, or series, based on physical and chemical properties, and each type of soil is given a name. The Honeoye series is the state soil of New York. Let's explore how the Honeoye soil is important to New York.

History

The Honeoye soil series is shown on some of the earliest soil maps made in New York. It was established as a soil series in 1910, in a soil survey of Ontario County. Honeoye is designated as a Benchmark soil in recognition of its significance to soil science and the soil resource. The Honeoye series occurs only in New York State, making it a uniquely New York soil.

Honeoye was unofficially chosen as the New York State soil in the mid 1980's by a group of local, state, and federal soil experts. The word Honeoye is believed to have come from the Seneca word "Ha-ne-a-yeh" or "where the finger lies". The soil was named after the hamlet of Honeoye, NY, one of the places where these soils are found.

What is Honeoye Soil?

Soil is comprised of a mixture of minerals, organic matter, water, and air. From these seemingly simple source materials, through varying influences of climate, landscape, and living organisms, over time, a great diversity of soils have developed (see Soil Formation section, below). The Honeoye series consists of very deep, well-drained soils on drumlins, till plains, and hills. They formed in sediment deposited by a glacier. Over thousands of years, as the soil weathered and organic matter was added by plants and animals, the original material gradually developed into what we know as Honeoye soil.

Soil particles can be separated into three sizes called *sand*, *silt*, and *clay*, which make up the *soil texture*. They are present in all soils in different proportions and say a lot about the character of the soil. In a typical Honeoye soil, the surface, or *topsoil* (A horizon), has a loam or silt loam texture. The *subsoil* (B horizon) has an increase in clay content compared to the topsoil. The clay particles are the most significant for fertility and water-holding capacity of the soil. Textures in the subsoil are loam, silt loam, clay loam, or silty clay loam. The substratum (C horizon) has a texture of loam, silt loam, or fine sandy loam (**Figure 1**). The loamy textures, high water-holding capacity, good drainage, and fertility of Honeoye soil are all reasons why it is well-suited to most crops grown in New York.

Photo Soil Monolith: Chip Clark/Smithsonian Institution

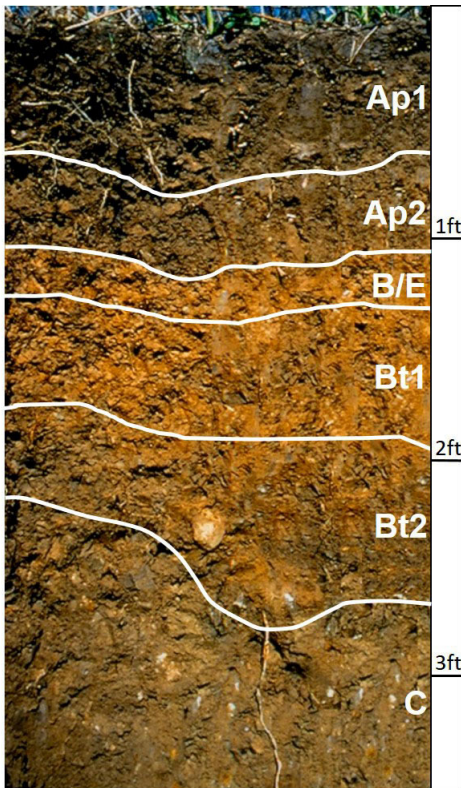


Fig. 1. Honeoye soil profile. Credit: USDA-NRCS and Cornell University



Fig. 2. Distribution of Honeoye soil series. Credit: Smithsonian

Where to dig Honeoye

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*. A Honeoye soil profile, with a typical sequence of horizons, is shown in Figure 1. Honeoye soil occurs in a band across western and central New York, extending into the eastern part of the state. Many other types of soil are found there as well, but Honeoye is one of the most common. Honeoye covers about 500,000 acres of land in 15 counties of New York (Figure 2). To give you an idea of how many different kinds of soil there are in New York State, the Honeoye soil is 1 of 561 named soils (series) in New York.

Importance

What makes the Honeoye soil so important is its high productivity and significant value for agriculture in New York State. Honeoye soils support dairy farms, crop farms, vineyards, orchards, and other produce operations. The Finger Lakes region, where Honeoye soils are present, accounts for about 30 percent of the more than 5 billion dollars of total annual farm sales in New York. This area is home to about 95 wineries making it a favorite tourist destination (Figure 3). Visitors also enjoy picking apples, cherries, and other fruits grown on Honeoye soils.

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, play-



Fig. 3. Vineyard with grapes grown in Honeoye soils. Credit: Standing Stone Vineyards, Hector, NY.

ground, camp areas) and more. Honeoye soils are used to grow corn for silage and grain, soybeans, small grains, hops, and a variety of produce crops (Figure 4). More sloping fields are often used solely for hay production. In the Finger Lakes region, vineyards are on Honeoye soils on hillsides near the lakes. Steep areas of Honeoye are typically forested; woodlots contain sugar maple, white ash, red and white oak, hickory, black cherry, and associated species. Honeoye soils are also used as sites for houses, roads, and other types of development. Many communities in central and western New York are built in part on Honeoye soils.



Fig. 4 . Honeoye is one of the most productive soils in New York for growing corn and other crops. Credit: USDA-NRCS

Limitations

When a soil cannot be used for one or more of the described functions, it is referred to as a limitation. *Soil Scientists* studied Honeoye soil and identified that it has some limitations for specific uses. Honeoye has few limitations related to agriculture, however, these soils are subject to significant erosion if a vegetative cover is not maintained throughout the year. The risk of erosion is greater on more sloping fields.

Honeoye soils have some limitations related to community development. The rate of water movement can be slow in the lower part of Honeoye soils, so they are somewhat limited for septic tank absorption fields due to restricted permeability. Honeoye soils typically are not a good source for construction materials like sand or gravel. The main limitation for construction of houses and other buildings is the slope gradient on strongly sloping to steep landforms. A seasonal high water table at a depth of 2 to 3 feet in late winter and early spring is also a limitation in some areas of Honeoye soils.

Management

The most common use of Honeoye soils is for agriculture. Best management practices include the use of cover crops to keep soil in place, minimal tillage, and crop rotations. Most of the agricultural use of Honeoye soil is related to dairy farms so these soils tend to be managed with a crop rotation that includes a perennial crop like hay, which builds organic matter. During the row crop part of a rotation, it is important to use cover crops. Cover crops also help build organic matter in the soil which improves infiltration and prevents nutrient loss from the soil (**Figure 5**). Minimal tillage is recommended when possible in order to limit soil disturbance which reduces erosion and assists in building soil organic matter.

Honeoye Soil Formation

There are five factors recognized for influencing soil development. These are **Climate**, **Relief**, **Organisms**, **Parent material** and **Time** or CLORPT. These factors are responsible for the development of soil profiles and chemical properties that differentiate soils. So, the characteristics of Honeoye (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, sediments, and vegetative materials to form soils. The five factors of soil development formed Honeoye soils on landscapes similar to (**Figure 6**).



Fig. 5 Interseeded cover crop growing between rows of harvested corn silage on Honeoye and associated soils. Credit: USDA-NRCS

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. Honeoye soils were formed in a humid climate with cold winters and warm summers. The water in this humid environment moves down through the soil profile taking soil materials with it and dissolving others along the way. Honeoye soils have a subsoil horizon with an increase in clay content as compared to the topsoil. Clay was moved by water downward within the soil profile. Calcium carbonate dissolves in water, becomes part of the soil solution, and moves. Honeoye soils tend to have calcium carbonate in the lower part of the soil profile.

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. Honeoye soils were formed under forest vegetation which created

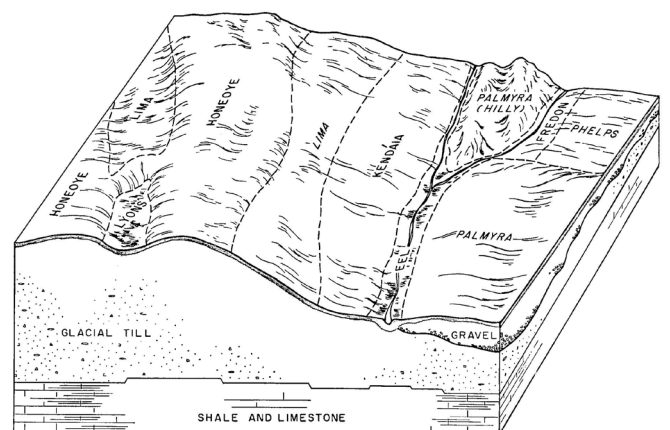


Fig. 6. Typical pattern of landforms, parent material, and soils in the Honeoye-Lima association. (Soil Survey of Cayuga County, New York; 1971)

organic-rich surface horizons (top soil). Many Honeoye soils are now used for agriculture, which has created a plow layer at the surface and mixed the darker topsoil with the subsoil material immediately below. Honeoye soils now support a variety of agriculture, including orchards and vineyards as well as some wooded areas.

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. Honeoye soils were formed at the higher locations on the landscape which provides them with good drainage. They are found on gentle and steep slopes, which means the surface of the soil can get eroded if tilled and exposed to raindrop impact (**Figure 6**).

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. Almost all of New York was glaciated, or covered by ice, during the last glacial period. As the ice melted it left behind *glacial till* in many places. Glacial till tends to be composed of a variety of particle sizes and rock fragments. Honeoye soils formed in loamy glacial till that resulted from glaciers scraping over bedrock high in calcium carbonate and mixing it with the soil materials. This calcareous till is naturally higher in pH than other glacial tills that scraped over more acidic bedrock. The glacial deposits are very deep so digging into the bedrock itself is not an issue for most land uses.

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 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. Glaciers receded from New York about 12-14 thousand years ago. Once the ice melted, parent materials were exposed and soils like Honeoye began to form. Therefore, Honeoye soils are around 12,000 years old!

Ecoregions, Soils and Land Use in New York

New York State is diverse and has nine major ecoregions ranging from mountain highlands to coastal areas (**Figure 7**). The Northeastern Highlands, Northern Allegheny Plateau, and Eastern Great Lakes Lowlands cover the most acres in the state. The Northeastern Highlands are dominated by the Adirondack Mountains, Catskill Mountains, and Tug Hill Plateau, which are predominantly forested. The Northern Allegheny Plateau consists of Devonian aged shale, siltstone, and sandstone bedrock which was glaciated. It is a mixture of agricultural and forest lands. Honeoye soils occur in the Eastern Great Lakes Lowlands ecoregion which contains some of the most productive agricultural land in the state. It has more agriculture than surrounding areas and even though it supports a variety of agricultural uses, a large percentage of agriculture is associated with dairy operations. Areas closer to the Great Lakes experience longer growing seasons with more cloudiness and snowfall.

Overall, soil is extremely important and diverse. Soils support agriculture, buildings, and forestlands, sequester carbon, and filter and buffer pollutants. Many great minds throughout history have written and commented on the importance of soil. Hopefully, this booklet has provided you with information to get you excited about the Honeoye soil and realize how important soils are to each of us.

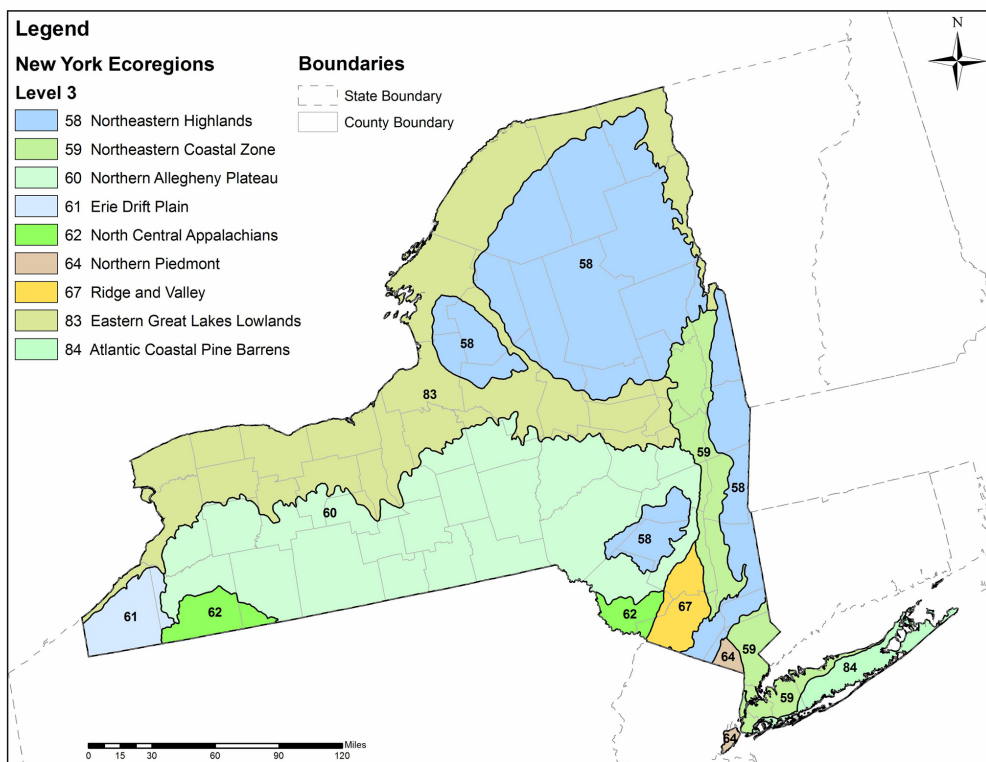


Fig. 7. Level III Ecoregions of New York. Credit: USEPA: <https://www.epa.gov/ecoresearch/level-iii-and-iv-ecoregions-state>

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. Clay is also one of the texture classes – a soil that has more than 40% clay, less than 45% sand and less than 40% silt has a clay texture.

Drumlin: A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. Drumlins were formed underneath a glacier.

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.

Glacier: A large mass of ice formed on land by compaction and recrystallization of snow, creeping downslope or outward due to stress of its own weight. During the last continental glaciation, an ice sheet up to two miles thick covered most of New York State.

Glacial till: Unsorted and unstratified earth material, deposited by glacial ice, which consists of a mixture of clay, silt, sand, gravel, stones, and boulders in any proportion.

Horizon: see Soil horizons

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 texture 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 types of crops that are 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 sustain the 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, silt, 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 moved downward, from the horizons above it. It is usually brighter in color than the topsoil. Not present in all soils.

Topsoil: (A horizon) The horizon that formed at the land surface. Mostly weathered minerals from parent material, with accumulated organic matter.

Water table: The top layer of ground water where the soil is filled with water. It can move up or down during different seasons.

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.soils.org/ask>

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

Natural Resources Conservation Service, Soils—<https://www.nrcs.usda.gov/wps/portal/nrcs/site/soils/home/>

Natural Resources Conservation Service, Soil Education—<https://www.nrcs.usda.gov/wps/portal/nrcs/site/soils/home/>

Natural Resources Conservatoin Service, Soil Health—<https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/soils/health>

References

United States Department of Agriculture, Natural Resources Conservation Service. Representative and State Soils <https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/edu/?cid=stelpdrdb1236841>.

United States Department of Agriculture, Soil Conservation Service; Cornell University Agricultural Experiment Station. 1971. Soil Survey of Cayuga County, New York.

Bryce, S.A., Griffith, G.E., Omernik, J.M., Edinger, G., Indrick, S., Vargas, O., and Carlson, D., 2010, Ecoregions of New York.

Authors: Amy N. Langner, Soil Scientist, USDA-NRCS;
Stephen Page, Soil Scientist, USDA-NRCS

Reviewers: Jonathan Russell-Anelli, Senior Lecturer and Extension Associate, Cornell University; Olga Vargas, Steve Sprecher, Jerry Smith, Matt Havens, Soil Scientists, USDA-NRCS



5585 Guilford Road
Madison WI 53711-5801
Tel. 608-273-8080 • Fax 608-273-2021
www.soils.org • headquarters@soils.org

This state soil booklet was developed under the auspices of the Soil Science Society of America's K-12 Committee—their dedication to developing outreach materials for the K-12 audience makes this material possible.