PRIVATE LAND PARTNERSHIPS
WORKING TOGETHER FOR WILDLIFE

KNOWING YOUR SOILS

What does your property's soil have to do with wildlife? In a word -- everything. Life on land begins with soil. The type of soil, along with climate, determine what plant communities will grow in an area. Together the soils and plant communities provide the habitats that give animals the requirements they need to survive: food, shelter, space, and water. All plants and animals need minerals and nutrients to survive, and wildlife obtain them from food. Plants absorb minerals and nutrients from the soil, which then pass through the food chain to plant eaters and eventually to meat eaters.

Michigan's diverse landscapes are the result of many different kinds of soil. The Natural Resources Conservation Service (NRCS) has categorized in wetlands alone about 2,000 different soils within the United States, and these wetland soils support some 5,000 different kinds of plants. This chapter will help you to identify three major soil types that may occur on your property. Included are suggestions for creating wildlife habitats based on soil characteristics.

Soil Systems

The reason that the supply of minerals in nature never runs out is because they are constantly being recycled. When plants and animals die they decompose. Organisms like mushrooms and other fungi, as well as bacteria, feed on the dead material and help to break it down until it is released to the atmosphere and soil. This decomposition process eventually creates topsoil, which is the richest in minerals and nutrients. The process takes a long time, creating only an inch of topsoil every one hundred years. The minerals and nutrients in the topsoil are leached into the subsoil where the roots of long-lived plants find them and store them into their tissues providing the base of the food chain.

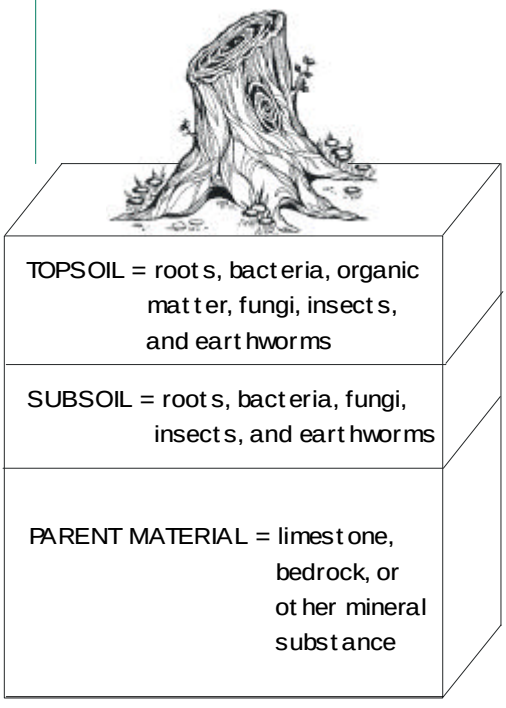
This natural process sustains ecosystems and the well-being of all wildlife. Therefore, soil is much more than dirt. It is a living ecosystem. The soil of a typical acre of grassland habitat, for example, will include 15,000 pounds of plant roots, 400 to 4,000 pounds of bacteria, 500 to 5,000 pounds of fungi, 250 to 1000 pounds of earthworms, and 10 pounds of insects, all of which interact to sustain life.

However, soils and plant communities are easily abused through careless management that allows erosion to occur. The natural process may also be upset by the improper use of herbicides that destroy plants, and insecticides that may kill certain soil organisms that act as decomposers which provides a key part of the food chain.

Soil Textures

The soils that comprise your property developed slowly over a long period of time. The physical and chemical composition of the parent material played a major role in what kind of soils developed. The the effect of climate and the plants and animals that lived and died there are other contributing factors.

Although soil contains many living things, it is also composed of non-living matter such as minerals, water, and air. How much water and air found in soil depends upon weather, water uptake by plants growing there, the lay of the land, texture of the topsoil and subsoil, and groundwater levels. As weather, seasons, and land-use change, the level of the groundwater and soil moisture fluctuates. Wet sand in spring, for example, may be dried out in fall. Moisture content of topsoil also depends on the type of subsoil.



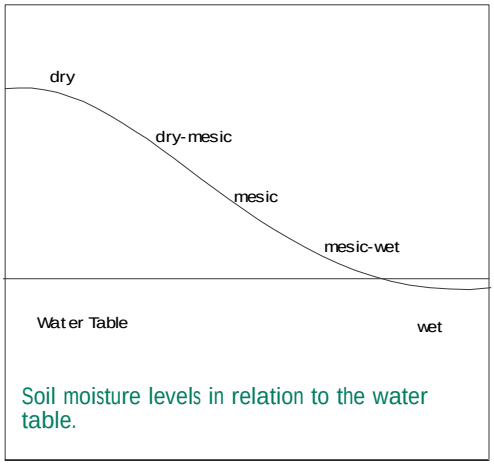
soil profile

A rich loam topsoil, for instance, may not be especially productive if the subsoil is moisture-leaching gravel.

Texture is also a common way to classify soils. It is determined by the amount of sand, silt, and clay found in the soil. Sand particles are the largest, and clay particles are the smallest. Silt particles fall between sand and clay for size. As you might expect, clay is capable of holding much more water than sand because the clay particles are so much smaller and do not leave as many spaces for the water to leach through.

Sandy soils are loose, light soils that are easy to work with. They usually drain water readily and are low in nutrients. Sandy soils dry out quickly as they do not hold water. Instead they absorb it, at a rate of more than two inches of water per hour, and it leaches through to lower layers. Therefore, sandy soils support drought-resistant vegetation such as that found in Jack pine barrens, savannas, and dry prairies. They are also generally well suited for planting wildflowers, native grasses, and pine trees in open-land or woodland habitats.

Clay soils are heavy soils rich in nutrients but difficult to work with. They absorb less than a quarter-inch of water per hour, and therefore are capable of holding a lot of water. Therefore clay soils are associated with vegetation communties that tolerate high water content in the soil such as swamps and floodplain forests, and plant species such as bulrushes, smartweed, duck potato, and pondweed.



Soil moisture levels in relation to the water table.

Loamy soils are intermediate between sands and clays. Composed of many different-sized soil particles, they combine fertility with moisture-holding capacity (a quarter-inch to two inches of water absorption per hour). Therefore, these soils are able to support a wide variety of vegetation, especially hardwood forests and, in a few favored sites, prairies. Areas with these soils offer many management possibilities.

Here's a simple test to determine soil texture on your property: Squeeze a moist (but not muddy) ball of soil in your hand. Then rub the soil between your fingers. Sandy soil feels gritty and loose. It won't form a ball and it falls apart. Clay soil, on the other hand, is smooth and sticky and has a somewhat plastic feeling. It forms ribbons when pressed between fingers. Loamy soil is a combination of clay and sand particles. It is smooth, slick, partially gritty and sticky, and forms a ball that crumbles easily.

For most soils, the amount of organic matter comprises less than five percent of its total weight. Exceptions are peats and mucks, which are special classifications of soil that contain more than 80 percent organic matter. Although high in nitrogen, such wet soils are often low in other nutrients. Frequently drained for growing vegetables or mining peat, these organic soils at one time supported wetland habitats, including bogs and fens. Unfortunately, these communities may be very difficult to restore and should be protected whenever possible.

Most of Michigan's counties now have a published Soil Survey which is available from your local Conservation District office. The survey contains maps that describe soil types on your property along with potential uses including food and cover needs for wildlife.

Soil Fertility

What the maps won't tell you, however, is how fertile your soil is. This information is obtained by taking soil samples from your property. Information about your soil fertility is important if you want to improve soil that has been degraded to produce wildlife habitat. First, though, it helps to know what you are looking for.

Soil pH is a measurement of relative acidity. In the soil pH scale, each number represents a ten-fold increase or decrease in acidity from the number before or after it. For example, a soil with a pH of 5 is 10 times more acid than a soil having a pH of 6. The pH range for most Michigan soils is 4 (acid) to 9 (alkaline), with 7 being neutral. It is important to know the pH of your soil because too much acidity or alkalinity in the soil prevents plants from absorbing nutrients. Maximum availability of most nutrients for plants occurs when the pH falls within the neutral range (6 to 7). Soil pH can be raised or lowered to desired levels by applying either lime or specific fertilizers. These applications, when applied to degraded soils, will increase the activity of microbes, improve nutrient availability, and improve overall soil structure. The pH of acidic soils can be raised by apply-

ing lime. The pH of alkaline soils can be lowered by adding specific fertilizers. Therefore, it is important to know the pH of your soil before applying anything to improve it. For example, adding fertilizer to soil with a pH of 5 won't help most plants to grow any better.

Soil fertility is measured by the amount of nitrogen, phosphorus, and potassium present. If the soil needs them, adding these nutrients as fertilizer at the correct rates helps plants to grow to their maximum potential. Commercial fertilizers are labeled according to the content of elemental nitrogen, available phosphorus, and soluble potash (potassium). The analysis of a blended fertilizer, for example, might read 12-12-12. The figures refer to the percent of nitrogen, phosphorus, and potash (in that order), which is contained in the fertilizer. In the above example, each 100-pound bag contains 12 pounds each. If a soil analysis calls for 24 pounds of nitrogen per acre for the crop or vegetative cover you intend to plant, you would need to apply 200 pounds at the rate in the example. Secondary nutrients of calcium, magnesium, and sulfur are supplied naturally in soil or may be added to soil as needed. Plants also need small amounts of boron, iron, zinc, manganese, copper, molybdenum and chlorine, all of which usually occur naturally. The only way to know what your soil needs is to do a soil test.

In addition to this, it is helpful to know the requirements of the plants you are trying to grow. Clover, for example, grows best in soils with a pH of 6.5 to 7.0. Prairie grasses and wildflowers are not as restrictive--

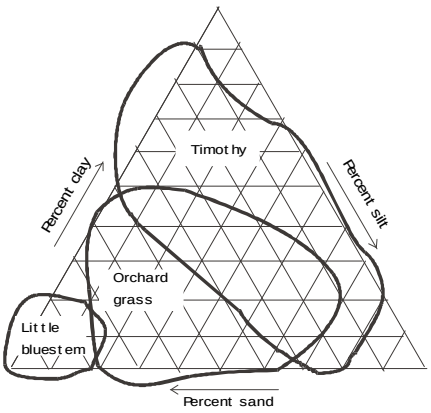


Chart showing the optimal soil texture for three common Michigan grasses.

they will grow in a pH range of 5.0 to 7.5.

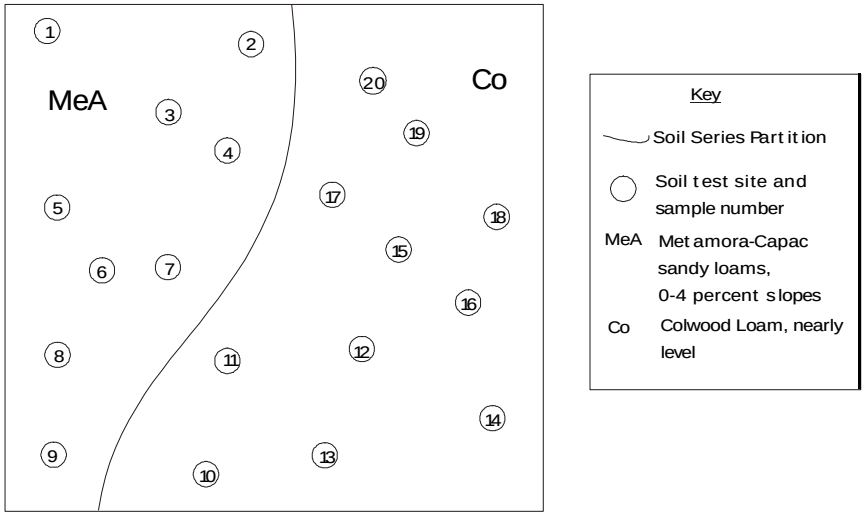
Soil ph

pH ranges for some Michigan plants (1-6.9 is acidic, 7 is neutral , 7.1-14 is basic)		
Type of vegetation	Species	pH
Grasses & legumes	Big bluestem	5.5-7.0
	Little bluestem	5.5-7.0
	Switchgrass	5.5-7.0
	Indian grass	5.5-7.0
	Alfalfa	>7.0
	Red Clover	6.0-7.0
	Orchard grass	5.5-7.0
Shrubs	Chokecherry	6.5-7.5
	Crabapple	5.0-6.5
	Nannyberry	6.1-7.5
	Red-osier Dogwood	<7.5
Hardwoods	Aspen	7.5-8.0
	White Ash	5.0-7.5
	Green Ash	6.1-7.5
	Red Maple	6.5-7.0
	Sugar Maple	3.7-7.3
	White Oak	5.5-7.5
	Red Oak	4.8-6.5
Conifers	Hemlock	6.0-8.0
	Jack Pine	4.6-6.5
	White Pine	4.5-6.5
	White Spruce	4.5-7.5
	White Cedar	<7.0

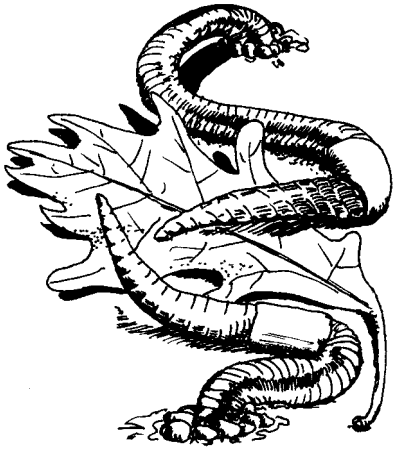
Testing Your Soil

Planting anything on your land without first getting a soil test is like trying to create a new meal without a recipe. It is impossible to know, for example, why a certain site will not grow grass or sunflowers without first sampling the soil for nutrients and pH. Depending on the size of your management site, be sure to collect several samples because different locations may be the same soil type but vary widely as to fertility.

Before testing your soil for fertility, consider its recent past history. For example, the use of pesticides may have greatly reduced the amount of micro-organisms. Nutrient value of the soil may be somewhat depleted if the land was used to produce row crops for many years. If the property was a long-time pasture, the soil structure might be tightly impacted due to animals walking over it. These considerations will help to explain why the test results come back the way they do, and they will also help you to understand the range of your management options.



Sample soil survey map of a 10 acre backyard with soil test sites.



On the Soil Survey map of your property, or on a sketch you've prepared yourself, divide your land into soil types. Plan to take twenty to thirty samples for each 10-acre site. If your property is an acre or less, two to four samples might be sufficient. Backyards and other small parcels might require a single sample. Number all site samples and record them on the map or sketch.

Use a soil probe, spade or trowel, and a clean plastic pail to take from each site soil samples 6 to 8 inches deep (no grass, sod or other plants are needed). Mix the sample thoroughly in the pail and collect one pint for testing and take it to your county Michigan State University Extension office, which will charge a nominal fee for analysis. Furnish site information on any history of cropping, liming and fertilizing, and include the soil type listed in the Soil Survey. You should also explain what you want to plant because recommended fertilizer rates vary widely for different food plots and habitats.

Soil test results can be interpreted by knowledgeable people at the Michigan State University Extension office, Conservation District office, or farm supply dealer. Keep the results with your wildlife management plan and refer to it before future plantings. The success of your overall plan depends greatly on how well you know your soils and what they can and cannot do for wildlife habitat.

FOR ADDITIONAL CHAPTERS CONTACT:
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PRIVATE LAND PARTNERSHIPS
WORKING TOGETHER FOR WILDLIFE

Private Land Partnerships: This partnership was formed between both private and public organizations in order to address private lands wildlife issues. Individuals share resources, information, and expertise. This landowner's guide has been a combined effort between these groups working towards one goal: Natural Resources Education. We hope this manual provides you with the knowledge and the motivation to make positive changes for our environment.

FOR ADDITIONAL ASSISTANCE: *CONTACT YOUR LOCAL CONSERVATION DISTRICT*