



Recipe for: "Soil –Indiana Style"

- from Mother Nature's Cookbook –(serves an entire planet)

Ingredients: graham crackers, chocolate frosting, blue gel frosting, green sugar crystals, and gummies (other sprinkles to mark cities and towns are optional.)

Soil. Almost everything on our planet depends on it. Trees and other plants get the nutrients and water they need to grow from the soil. Animals eat plants or other animals that eat plants. People get their food, water, and shelter from the soil. We use soil as the support for the foundations of our homes.

There are four basic ingredients in soil:

1. Air –air is important to the plants and animals that live in the soil. Air spaces also make more room for the second ingredient in soil
2. Water – Plants rely on the soil for water, and soil cleans the water as it travels deep underground to the water table where our drinking water comes from. Soils that retain water help provide water for wildlife, and prevent flooding.
3. Minerals – small pieces of rocks provide nutrients for plants. The size of the mineral particles influences the texture and structure of the soil. Sand is the largest particle, followed by silt and clay. (The best soil for gardening is a combination of particle sizes called "loam" and has a structure that resembles chocolate cake!)

4. Organic matter – Living and dead plants and animals add the dark color to the soil. Dead material provides nutrients for living plants and animals. The living plants and animals help to provide air spaces that make room for the soil to hold more water.

The combination of these ingredients, and the five factors of soil formation, makes the soils different in different places. From the red clays in Georgia, to the white sands in New Mexico, to the rich black muck soils in northern Indiana all soils are formed from these ingredients and factors.

The five factors of soil formation are:

1. Parent material – the mineral base from which the soil is formed. This can be bedrock that has weathered and formed the base of the soil. Parent material can be igneous, sedimentary, or metamorphic rock. Sometimes glaciers deposit the parent material. If it is left in place after a glacier it is called glacial til. Water can deposit parent material. Outwash (deposited by ice and water from melting glaciers), alluvial (associated with stream deposits), and lacustrine (associated with lakes) are all materials deposited by water. The wind can also deposit parent material. The sand dunes in northern Indiana are examples of eolian soils formed by wind blown sand. Loess is the term used to describe wind blown silt deposits. Volcanic ash is also an example of wind blown deposits that become parent material for soil formation.
2. Relief –also called topography, affects the kinds of soils that form. Soils formed on top of a hill are different from soils formed in a valley. Relief determines how water moves both above and below the surface of the forming soil. Flat areas hold water; steep hillsides erode when water runs quickly off the surface, taking along soil particles to new places.

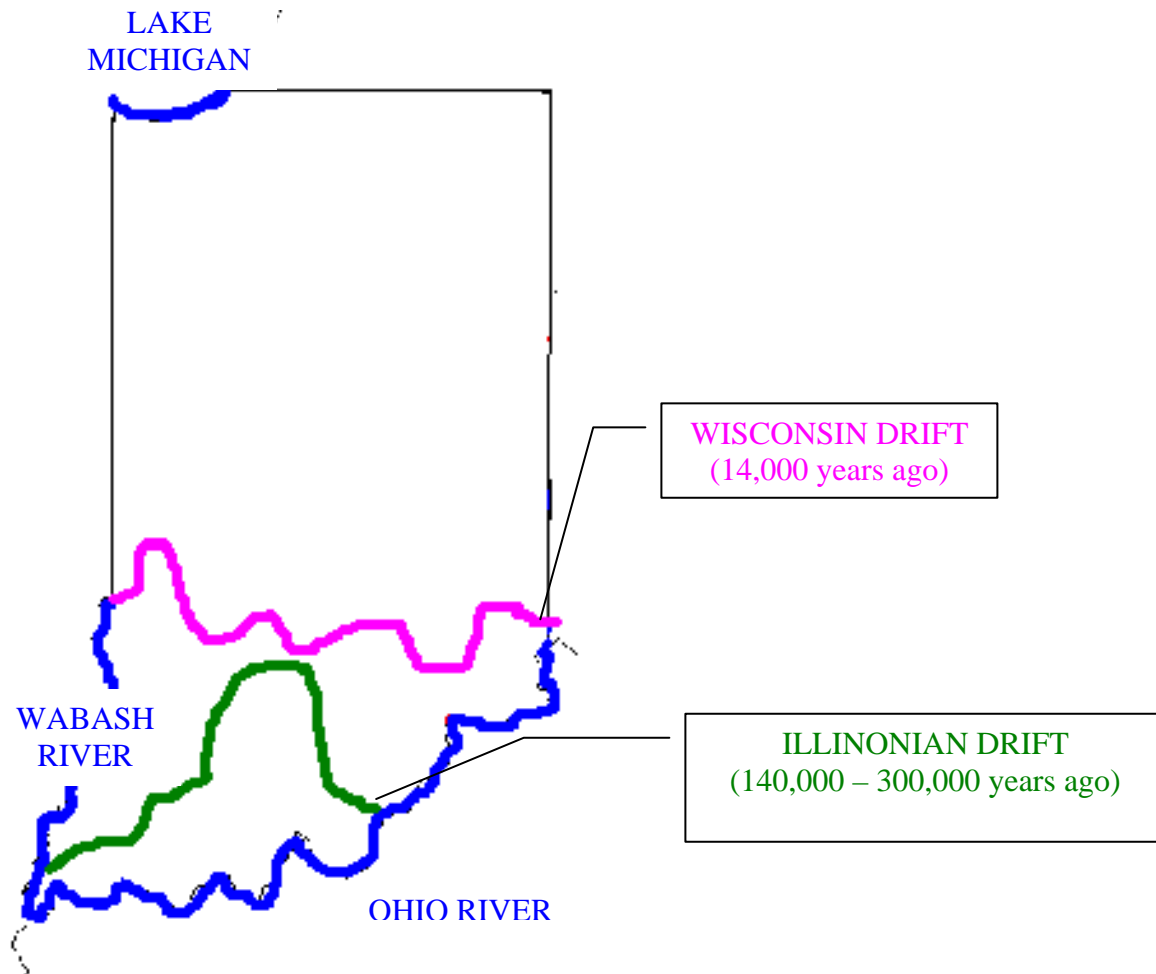
3. Climate – does the soil freeze and thaw? Does this place get a lot of rain and/or snow each year? How hot does it get here? How cold? All these things are part of the climate of a place, and all of them affect what the soils will be like.
4. Organisms – all the plants and animals, living and dead, large and small, affect the kind of soil that forms. An excellent example that we see in Indiana is the difference in soils that formed under prairie conditions and soils that formed under forested conditions. The soil formed where there is forest has a rich topsoil layer, but it is much thinner than the topsoil formed under prairie grasses. Prairie grass has an extensive, deep root system, and it grows very thick and tall every year. Every year all that top growth dies and decomposes, making the deep rich soils that made the American Midwest prime farmland.
5. Time – soil can be very young, as young as the silt deposited in a Wabash River flood plain just today. Many central and northern Indiana soils formed after the last glacier melted approximately 14,000 years ago. Even those soils are young compared to the soils in southern Indiana that were formed from bedrock. (The youngest bedrock in Indiana is believed to be 290 million years old!)

This activity is designed to help us remember these five factors, and learn a little about how they influence the soils of Indiana. Although the geography of the state is much more complex than we will show on our cracker, we can begin to understand the many factors that have an influence on the formation of soils and have formed the Hoosier state. Let's take it step by step:

Indiana's Soil in a Graham Cracker snack

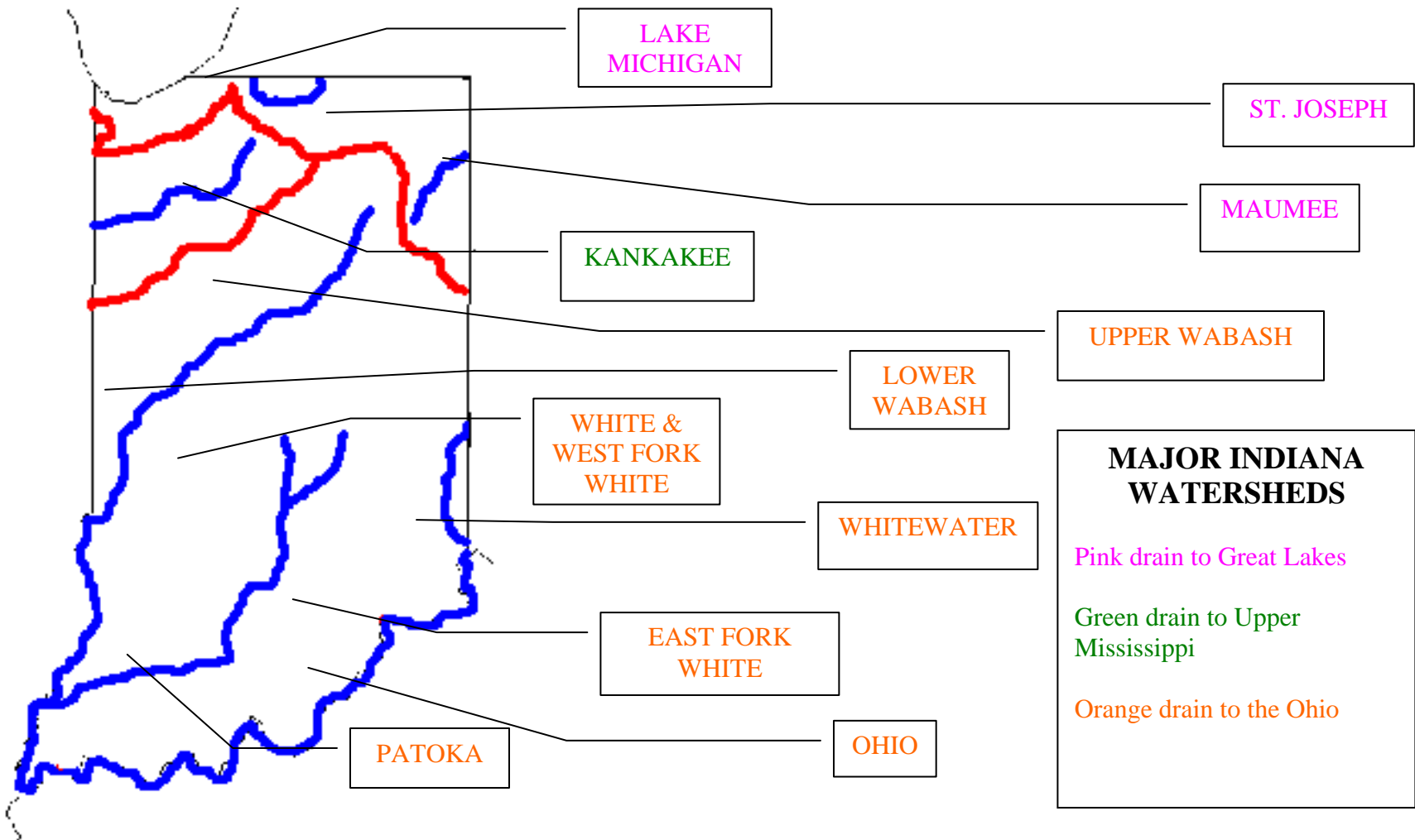
Parent Material: A graham cracker represents the parent material. Take a bite out of the "northwest corner" to represent Lake Michigan ([blue on the map below](#)), and chew the bottom of the cracker to represent the border made by the Ohio River on the south and the Wabash River on the southwest corner ([both also blue](#)). Soils in the northern two-thirds of the state start with fresh glacial til, delivered by the last

glacier, about 14,000 years ago (the pink line on the map). Glaciers covered all but the central portion of southern Indiana 140,000 to 300,000 years ago (the green line on the map). The southernmost soils are formed from bedrock or particles deposited by water in the flood plains.



Relief: As the glaciers melted in the northern two-thirds of the state, riverbeds were carved, gravel outwash deposits were formed, sand was blown about and the high and low points of our topography were

formed. With chocolate frosting form the highs (red places on the map below) and lows (blue lines on the map below) of Indiana's topography. The southern third of the state generally slopes to the Ohio River, so spread your frosting accordingly. The blue lines on the map below represent the low-lying riverbeds. The red places represent the ridges that separate watersheds.



Climate: The amount of rain and the range of temperature effects soil formation. In our snack rivers represent climate, because that is where precipitation is most visible. Using blue gel frosting, fill in your riverbeds with “water”. The map above will help you.

Organisms: Plants and animals living in and on the soil affect the type of soil that develops. Sprinkle your cracker with green sugar sprinkles to represent plants and add gummy worms to represent animals that live in the state, and affect the way our soils have formed, and continue to develop.

Time: Mother Nature needs 100 to 600 years to develop an inch of soil from parent material. But don't wait that long to enjoy your snack! Hopefully you have learned a lot about Indiana soils in the time it took you to assemble your masterpiece!

This activity is provided to you courtesy of the Elkhart County Soil and Water Conservation District, and was developed by Nancy Brown, Elkhart County SWCD Program Manager, 2001

References and Resources

Soil Science Simplified, Fourth Edition by Helmut Kohnke and D. P. Franzmier (ISBN 0-88133-813-3) For information write or call: Waveland Press, Inc., P. O. Box 400, Prospect Heights, IL 60070 847.634.0081

Earthworms, Dirt, and Rotten Leaves by Molly McLaughlin Avon Books for details write or telephone the office of the Director of Special Markets, Avon Books, Dept. FP, 105 Madison Avenue, New York, New York 10016, 212.481.5653

The Amazing Dirt Book by Paulette Bourgeois (ISBN 0-201-55096-2) Addison-Wesley Publishing Company, Redding Massachusetts

Indiana Geology Today at: <http://adamite.igs.indiana.edu/indgeol/index.htm>

United States Geological Survey at: <http://www.usgs.gov>

Hoosier Riverwatch is Indiana's statewide volunteer stream monitoring and education program. It raises public awareness of water quality issues through training workshops, grants for monitoring equipment, and support for streambank cleanups. To learn more contact Hoosier Riverwatch, Ft. Harrison State Park – Natural Resources Education Center, 5785 Glenn Road, Indianapolis, Indiana 46216-1066 (phone: 317-541-0617) or: www.state.in.us/dnr/soilcons/riverwatch)

Contact Your Local Purdue-Cooperative Extension Service for copies of *Understanding and Judging Indiana Soils* and the *4-H Soil and Water Conservation Manuals*.

Also contact your local Soil and Water Conservation District for resource people, education materials, and possible assistance in your classroom! (You can find usually them in the phone book under of U.S. Government, Department of Agriculture, Natural Resources Conservation Service. Some Districts list their phone numbers under County Government, Soil and Water Conservation District.)

You may call me with questions or comments:

Nancy Brown, Elkhart County Soil & Water Conservation District, 17746-B County Road 34, Goshen, IN 46528
219-533-3630, extension 3 FAX: 219-533-4620 nancy-brown@iaswcd.org