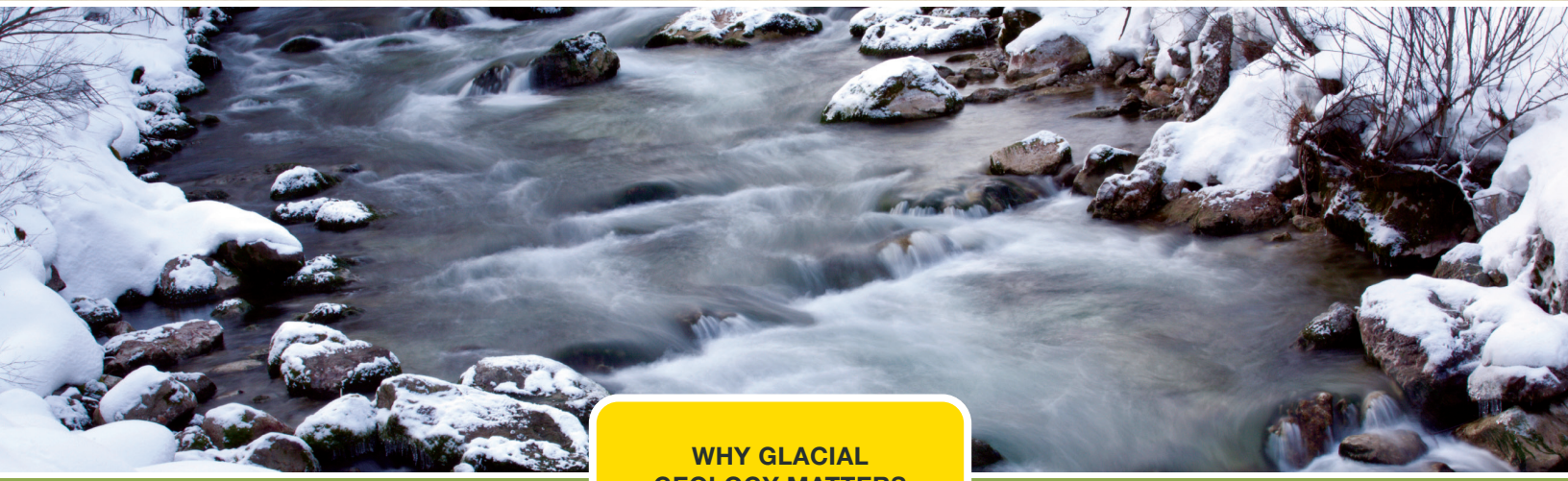
MIDDLE SCHOOL
CURRICULUM

TRAILING ICE AGE MYSTERIES

ICE AGE TRAIL ALLIANCE

NATIONAL PARK SERVICE



WHY GLACIAL GEOLOGY MATTERS

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Curriculum Standards ..... i, ii, iii

Note:

This topical must be accompanied with the Overview for complete understanding.

Overview:

During the past 2.5 million years, numerous continental glaciers advanced and retreated across much of the upper Midwest. All this glacial activity shaped and deposited both the topography and soil types that we see today. Combined, they greatly influence regional water cycle activity, lakes, rivers, forest cover, and land use. So, in the end, what happened during the Ice Age affects how and where we use the land today. That's why understanding the effects of glacial geology helps students better understand a great many things in their state or region, plus how that glacial geology might impact their lives.

I. Enduring Knowledge:

Students will learn how science concepts are interconnected. In this case, how glacial geology affects the water cycle and land use.

Learning Targets:

1. Students should learn that while a glacier changed the shape of the land, it also deposited sediment.
2. Students should learn that when the last glacier melted, it left both sandy and clay soil determined by landscape and melt.
3. Students should learn that different types of soil affect water percolation, forests, and crops that can be grown.

II. Teacher Background Material:

A glacier is made of thick layers of compressed ice formed from accumulating snowfalls that has the ability to move. It flows like a slow river of putty and changes the shape of the land in the process. Glacier size can vary from as small as a football field to hundreds of kilometers. As a glacier moves, it carves away land by erosion and also sculpts and deposits new landforms such as moraines, kettles, drumlins, and eskers. The glacial melt water is a key factor in the creation of depositional features, and can also create rivers and lakes.

There were four periods of glaciation in Wisconsin, ranging in time from 2.3 million years ago to the last melt 12,000 years ago. Each glacial period changed the landscape. The most recent glacial advance was the Wisconsin glaciation. The Wisconsin glaciation is responsible for the landscape seen today.

Besides changing the surface of the land, the glaciers deposited sand and gravel in some areas, creating sandy soil, particularly if the pre-glacial clay was washed away. In other areas, some of the clay remained. These differences in soil composition have influenced the water, forests, and crops in Wisconsin. For example, sandy soil has more pore space and therefore absorbs more rain, which sifts through the sand to the water table, purifying itself along the way. Clay soil has less pore space, and therefore, more water runs off rather than through it.

The soil also determines what kind of trees will grow. Sandy soil supports pine, oak and jack pine. Clay soil supports maple and basswood. Furthermore, farmers determine the type of crops based on the soil type. Alfalfa grows better in clay soil, while potatoes and cranberries grow better in sandy soil.

http://www.colonialdistrictroses.org/sitebuildercontent/sitebuilderfiles/soilcharacteristics.pdf
(soil facts)

Vocabulary:

1. **water cycle:** the circulation of the earth's water, in which water evaporates and rises into the atmosphere where it condenses to form clouds. The water then falls as precipitation in the form of rain or snow, returning to the earth and beginning the cycle again.
2. **percolation:** the slow passage of a liquid through a filtering medium; e.g. the percolation of rainwater through the soil
3. **water table:** level below the surface where the ground is saturated with water If you dig a hole in the ground where the soil is permeable, and that hole goes below the water table, water will fill the hole to the level of the water table
4. **groundwater:** water that is found in the ground, usually in the water table or an "aquifer" at a depth where the soil is saturated with water
5. **outwash:** sediment deposited by streams flowing away from a melting glacier
6. **glacial advance:** the furthest point or terminus that a glacier advanced during a glacial period

III. Before Viewing this Video:

Discuss the following questions with the students:

1. What is soil composed of? How is it important to Wisconsin economy?
   (Small rocks, decayed bio material. Soil determines crops)
2. What do glaciers have to do with soil?
   (Glaciers moved ground cover by scraping it away in some places and pushing it together in others)
3. What is the water cycle? What are some major water features in Wisconsin?
   (Movement of water through the atmosphere to the land as gas and liquid.)
4. How can soil types impact your hiking experience?

IV. Viewing Guide:

Have students pay special attention to the experiment by writing notes about the following:

- What are the steps in the experiment?
- What is the purpose?
- What does it have to do with glaciers?

V. Discussion Guide:

Ask students to complete the experiment and connect the purpose to glaciers.

For each group you will need: 2 paper cups, sand, clay soil (found near riverbank), and a graduated measuring cup with spout.

Follow these instructions:

1. Fill one cup with sand, up to 1 inch from top.
2. Fill one cup with clay, up to 1 inch from top.
3. Fill measuring cup with 1 cup water.
4. Slowly pour into sand to the top.
5. Write down how much water is left in the measuring cup.
   Subtract that amount from the original 1 cup to see how much water is in the sand.
6. Repeat with clay.
7. Which material holds more water?
8. What did you see happening to the water inside the cup?

Help students set up a lab report as follows using the information they gathered in the experiment:

- **Problem**: Which material holds more water?
- **Hypothesis**: Take a guess and tell why.
- **Experiment**: List the steps you took.
- **Observations**: Show your math for each material.
- **Conclusion**: Which material did hold more water? Why?

VI. Evaluation:

1. Hand in lab report:
   - Students should be able to write the lab report as outlined above.
2. Informal evaluation:
   - Check students' participation in discussion and also their note-taking.

Suggestions for extended learning:

1. Research Wisconsin's forests, identifying what type of trees are found in certain areas. Find location. See if soil matches tree type. Write a 1-page report.
2. Complete a plant inventory of two 100-foot sections of Ice Age Trail that have different soil types and compare the species. Why did one plant grow in a sand area but not in the clay soil?
3. Make a diagram of the water cycle.
4. Research the main crops grown in Wisconsin and the location of each. Find out about the soil type in that area. Write a 1-page report.
5. What is a wetland? What causes it? Why is it important to the environment? How common are they in Wisconsin? What is the law concerning preservation?

The following Wisconsin Student Proficiency Standards can be met by teaching
Why Glacial Geology Matters:

SCIENCE

1. **Connections:** How evidence explains phenomena
2. **Inquiry:** Understanding how questions direct research
3. **Earth Science:** Earth history & structure of Earth
4. **Physical Science:** Motion & forces

SOCIAL STUDIES

A. **Geography:** "Students in Wisconsin will learn about geography through the study of the relationships among people, places, and environments."

- **8th grade**: A.8.6

B. **Economics:** "Students in Wisconsin will learn about the history of Wisconsin through the study of geology. They will examine change and continuity over time in order to develop historical perspective, to explain historical relationships, and analyze issues that affect the present and the future."

- **8th grade**: A.8.7

LANGUAGE ARTS

Reading - Informational Text

- **Key Ideas and Details** • 8.RIT.3, 8.RIT.6, 8.RIT.7, 8.RIT.9

Writing

- **Text Types and Purposes** • 8.W.1, 8.W.2, 8.W.3
- **Production and Distribution of Writing** • 8.W.4
- **Research to Build and Present Knowledge** • 8.W.7, 8.W.8, 8.W.9

Speaking and Listening

- **Comprehension and Collaboration** • 8.SI.1, 8.SI.2
- **Presentation of Knowledge and Ideas** • 8.SI.5, 8.SI.6

Language

- **Conventions of Standard English** • 8.L.1, 8.L.2
- **Vocabulary Acquisition and Use** • 8.L.4, 8.L.5, 8.L.6

MATH

Expressions and Equations

- **Understand the connections between proportional relationships, lines and linear equations** • 8.EE.5, 8.EE.7

Functions

- **Use functions to model relationships between quantities** • 8.F.5

Wisconsin Teacher Standards which can be met with this curriculum

Standard 1: Subject matter
This curriculum provides information not readily available in other forms.
A teacher using this material will be well-informed about the subject matter.

Standard 3: Adapt instruction
This curriculum provides suggestions for learners with a variety of intelligences and levels of ability.

Standard 4: Instructional strategies
This curriculum includes the use of technology to gain information and suggestions for using research in extending learning.

Standard 5: Individual and group motivation
Both prior knowledge and carefully designed group projects promote motivation for students to learn.

Standard 6: Verbal and nonverbal communications
Instructional media and technology that promote active learning are key parts of this curriculum.

Standard 7: Organizes and plans systematic instruction
This curriculum is organized to support teacher knowledge, to draw on and motivate students to engage in active learning, and promotes active inquiry, collaboration, and supportive interaction in the classroom.

Standard 8: Formal and informal assessments
Suggestions for a variety of assessments, both formal and informal, are offered in the curriculum.