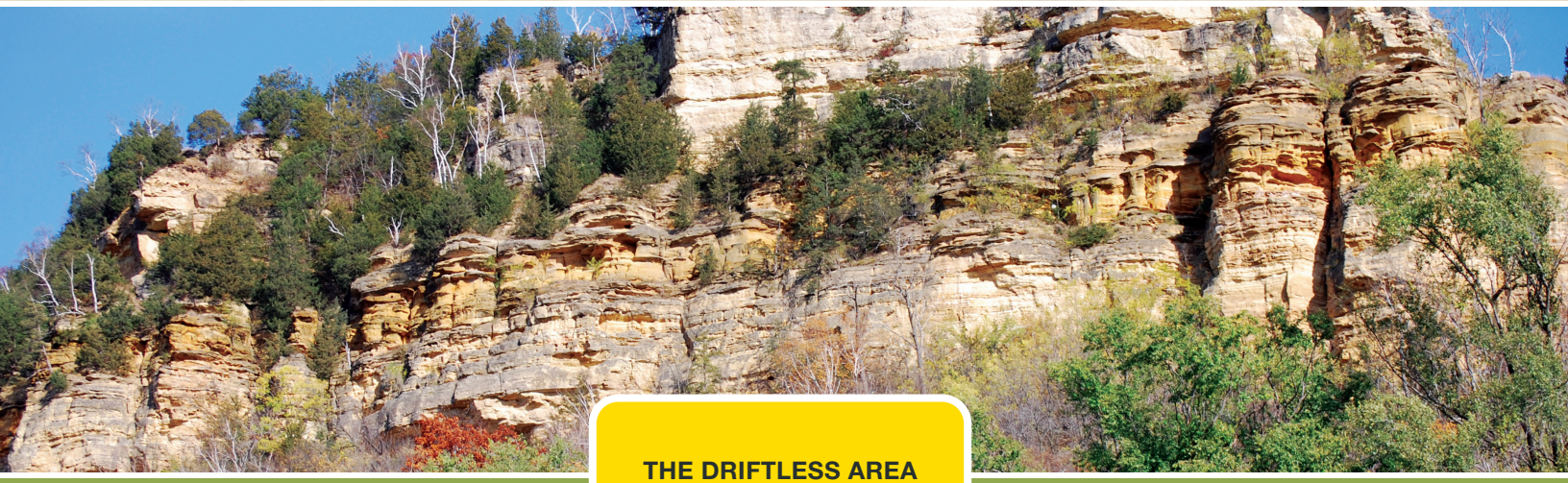
MIDDLE SCHOOL
CURRICULUM

TRAILING ICE AGE MYSTERIES

ICE AGE TRAIL ALLIANCE

NATIONAL PARK SERVICE



THE DRIFTLESS AREA

CONTENTS

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, with the last melting some 12,000 years ago. Four major periods of glacial activity shaped and deposited both the topography and soil types that we see today across much of Wisconsin. However, one area in Western Wisconsin along the Mississippi River somehow escaped the scouring and depositional effects of glaciation. Scientists believe that glacial lobes of ice during different periods came from different directions, completely surrounding yet somehow missing this area. Because the area wasn't covered with glacial drift (sand/gravel) it was named "The Driftless Area". Saved from the impacts of glaciation, The Driftless Area gives scientists a rare look at pre-glacial geology that also harbors rare species that are true Ice Age relics.

I. Enduring Knowledge:

Students will see how various landforms have been created over millions of years, including the role of glaciers in shaping the land. They will know that variations in glacial activity result in different landforms.

Learning Targets:

1. Students should learn the difference between glacial drift and driftless areas and the resulting land features of each.
2. Students should learn that by looking at maps and soil samples, scientists discovered relative dates of glaciers and movement characteristics of ice.
3. Students should learn factors that influenced the glacial movement.
4. Students should learn the implications of no glacial activity on the land, as well as which plants and animals are likely to thrive in that area.

II. Teacher Background:

A glacier is made up of thick layers of compressed ice formed from repeated snowfalls that has the ability to move. It flows like a slow river of putty and physically changes the shape of the land in the process. The size of a glacier can vary from as small as a football field to hundreds of kilometers.

A glacier forms when the amount of accumulating snow is greater than the amount that melts. This accumulation remains year-round and compresses the lower layers into ice. The extreme weight of the glacier deforms the lower layers of ice similar to putty. This characteristic, along with the pull of gravity, causes the ice to move through mountain valleys or across plains. It can change speed and at times retreat, altering the land beneath by a combination of forces.

THE DRIFTLESS AREA

As a glacier moves, it carves away land by erosion and also deposits and sculpts new landforms. Erosion creates u-shaped valleys, fjords, and horns. Sculpting and deposition can form moraines, kettles, drumlins, and eskers. These depositional features are formed with glacial drift that is made up of sand, gravel, rocks, and boulders created and transported by the forces of the moving ice.

The portion of western Wisconsin that was not covered by glaciers and the resulting glacial drift is called "The Driftless Area." The preserved land features in this area include deeply-cut, v-shaped river valleys and rugged bluffs that were not affected by glaciers. The Driftless Area is surrounded by land that was glaciated at different times in history. Scientists have discovered that the Driftless Area was formed in stages by glaciers advancing from different directions during four different periods ranging from 2.2 million to 12,000 years ago. The movement of the ice that missed the Driftless Area was affected by depressions in the Earth's surface, in particular the Lake Superior trench. The Driftless Area is rich with historic and geologic information free from glacial impact. There are fossils found here revealing the existence of Ice Age animals living in Wisconsin.

Online Resources

- http://nsidc.org/cryosphere/glaciers/questions/what.html
  - glacial facts
- http://curiosity.discovery.com/question/how-are-glaciers-formed
  - glacial facts
- http://www.untamedscience.com
  – glacial interactive and video source
- http://www.iceagetrail.org
  - background information
- www.nps.gov/iatr

Vocabulary:

1. **Glacial drift:** material (sand, gravel, rocks, boulders) created by, transported, and left over after a glacier melts
2. **Driftless Area:** area without glacial drift deposits that reveals pre-glacial landscapes such as deep cut river valleys and sharp edged bluffs
3. **Lobe:** curved or rounded shape of glacial ice flow that is affected by topography
4. **Great Lakes depressions:** topographic low areas that exist under the Great Lakes that affected the flow of glacial ice
5. **Lake Superior trench:** a long, deep depression area in the Lake Superior region that affected the direction of glacial flow

III. Before Viewing this Video:

Discuss the following questions using a topographic map of Wisconsin:

1. What are land features you know in this state? (Give clues if needed like Wisconsin Dells, Wildcat Mountain, Blue Mounds, Kettle Moraine.) Point them out on a map. Make a list on the board.
2. How do you think these land features were formed? (See if students are aware of the effect of glaciers.)
3. Point out the Driftless Area. What would happen (or not happen) to land not covered with glaciers?
4. How do scientists solve a mystery? What are their tools and strategies? (Students might know about carbon testing, ice cores, soil cores)

IV. Viewing Guide:

Provide the following questions for students to answer while watching:

1. What is the Driftless Area of Wisconsin?
   (Area where the Wisconsin glaciation didn't cover the land)
2. What is the mystery of the Driftless Area? Why did the glaciers surround but not cover it?
3. Describe two tools and how they are used to explain what happened here.
   (Maps of the land and study of the soil composition)
4. What animals lived in Wisconsin in prehistoric times?
   (Mammoth, mastodons, giant beaver, Dire wolf)

V. Discussion Guide:

1. Review video questions in small groups. Using shared information from discussion, students may rewrite their answers to hand in.
2. Demonstrate (or in small groups) show how a thick slushy (coarsley ground ice cubes) moves via gravity down uneven surfaces (e.g. crumpled paper taped to trays). Describe the movement. (Moves slowly at different speeds and makes lobes)
3. Have students write up their observations from this experiment using a scientific format (See Evaluation section)
4. Discuss how a topographic map of the Driftless Area looks different from a topographic map of the rest of Wisconsin. (Contour lines closer together in river valleys)

VI. Evaluation:

1. Students hand in questions and participate in discussion.
2. Students write up lab report about slushy demonstration as follows:
   - **Problem:** What forces or properties affect how a glacier moves?
   - **Hypothesis:** Guess answer to above question
   - **Experiment:** Steps to complete above slushy activity
   - **Observations:** Describe what happened to the slushy in tray.
   - **Conclusions:** How did the slushy/glacier actually move?

Suggestions for extended learning:

1. Go online and find photos of: 1) glacial land features and 2) features from the Driftless Area. Put together a slide show. Explain one such feature from each.
2. Research the different ways fossils are formed. Explain why a glacier could impact fossils in different stages. Write a report.
3. Research some of the animals and plants that lived in Wisconsin in pre-glacial times.
4. Draw a picture showing the front end of a moving glacier and landforms that might affect its flow.
5. Take a hike in the Driftless Area and record your observations.

The following Wisconsin Student Proficiency Standards can be met by teaching
The Driftless Area:

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 of the land and resulting features."

- **8th grade**: A.8.1, A.8.2, A.8.4, A.8.6

B. **History:** "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**: B.8.8, B.8.12

D. **Economics:** "Students in Wisconsin will learn about production, distribution, exchange, and consumption so that they can make informed economic decisions."

- **8th grade**: D. 8.7, D. 8.11

LANGUAGE ARTS

Writing

- **Research to Build and Present Knowledge** • 8.W.7, 8.W.8

Speaking and Listening

- **Comprehension and Collaboration** • 8.SI.1, 8.SI.2
- **Presentation of Knowledge and Ideas** • 8.SI.4, 8.SI.6

Language

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

MATH

Expressions and Equations

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

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 2: Broad range of ability
This curriculum provides instruction that supports their intellectual, social, and personal development.

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 promotes 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.