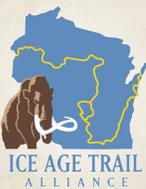


# TRAILING ICE AGE MYSTERIES





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*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 about 10,000 years ago. All this glacial activity shaped and deposited both the topography and soil types that we see today. Geologists can determine much about the geomorphology of a glaciated landscape by the prominent features that were formed during glaciation. Wisconsin presents a variety of relatively striking glacial features that can be identified by using field studies and various combinations of online maps. Knowing how to identify glacial features from maps helps students better understand how glacial activity helped shape the region's landscape.

## I. Enduring Knowledge:

Students will learn to appreciate the natural world through viewing glacial features. They will learn how to use the computer to find different sources and maps to gather information about glaciers.

### *Learning Targets:*

1. Students should learn basic information about glacial land features.
2. Students should learn to use websites to gather a variety of information about glaciers and glacial features. They will be able to put together a more complete picture.
3. Students will learn about drumlins, eskers, kames, and kettle moraines using this method.

## II. Teacher Background:

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, and 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.

As a glacier moves, it carves away land by erosion and also sculpts and deposits 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—a material that is made up of sand, gravel, rocks, and boulders—created and transported by the forces of the moving ice. Glacial melt water is a key ingredient in the creation of depositional features, and can also create rivers and lakes.

## SEARCHING GLACIAL FEATURES

Wisconsin's geology is greatly affected by glaciations that occurred during four distinct periods. These glaciations have impacted not only the soil but also many landforms around the state. These glacial landforms can be seen in Wisconsin as far north as Eau Claire and south in Kettle Moraine Park, west of Milwaukee. There are many jobs associated with glaciers, not only geologists, map makers, and hydrologists, but also park rangers who service the many areas where glacial landforms exist. Milwaukee hiking enthusiast and lawyer Ray Zillmer provided the vision for the Ice Age Trail in the 1950's by advocating for the protection of glacial landscapes in Wisconsin. Zillmer and countless other leaders helped develop the Ice Age Trail across Wisconsin.

Students will follow instructions and use computers to work with online resources to locate a glacial area. They will then look at a topographical view with contour lines and finally, will use grey relief to see the details of glacial features.

### *Online Resources:*

- <http://www.google.com/earth/download/ge/>
- Free QUADS plug in <http://www.metzgerwillard.us/quads/quads.html>

### *Additional Online Resources:*

- [www.iceagetrail.org](http://www.iceagetrail.org)
- [www.nps.gov/iatr](http://www.nps.gov/iatr)
- More info on drumlins <http://wisconsin Geological Survey.org/geology/drumlins.htm>
- [http://wisconsin Geological Survey.org/geology/wisconsin\\_geology.htm](http://wisconsin Geological Survey.org/geology/wisconsin_geology.htm)
- [http://www.nps.gov/history/history/online\\_books/science/2/contents.htm#figures](http://www.nps.gov/history/history/online_books/science/2/contents.htm#figures)

### *Vocabulary:*

1. **aerial image:** a view or photo from an aerial perspective
2. **topography:** the contours of physical features of a region
3. **contour lines:** lines on a map connecting points that are all at the same elevation
4. **Google Earth:** online map program that shows either an atlas view or satellite view
5. **Quads plug in:** online program that allows view of topographical map as a layer of Google Earth OR allows view of topography as a layer of Google Earth
6. **grey relief:** uses shading on a map to show elevation and land features
7. **drumlin:** long, teardrop-shaped glacial formation that runs parallel to the glacier's flow. It is unclear whether it forms from dragging sediment or from melt water movement.
8. **moraine:** a ridge-like landform consisting of glacial debris that is created along the edges of a glacier
9. **kettle:** a depression formed when glacial ice breaks off and is buried. Over time the ice melts, creating a small depression.

## SEARCHING GLACIAL FEATURES

10. **esker:** long ridge of gravel deposited in a tunnel under the glacier by its melt waters
11. **kame:** a steep-sided mound of loose, poorly sorted sand and gravel that forms in a depression on top of the glacier and is later deposited as the ice melts
12. **dell:** small valley
13. **foot:** the bottom edge of the glacier—the edge that creates the terminal moraine
14. **geomorphology:** the study of the physical features of the surface of the earth and how they formed or change
15. **terminal moraine:** a moraine deposited at the point of furthest advance of a glacier forming a ridge

### III. Before Viewing this Video:

Ask students to list all the ways they get information on a subject. Discuss and list on board. Ask them specifically, how do you find information online? Describe an Ice Age Trail experience? What can we learn from the trail? What did you gain by going for a walk on the trail?

Ask students to share anything they know about glaciers.

### IV. Viewing Guide:

Write down all the websites needed to do the activity (see pg.4).

### V. Discussion Guide:

In previous times, a geologist who wanted to view glacial features was limited to a map for location and a topographical map to show elevations. (Show a topographical map with contour lines, if possible.) But now anyone can use online sites to view features in a very simple and more accurate way.

*In a computer lab:*

Go over the steps and instructions from the video to view the Lebanon, WI drumlins.

*Demonstrate if needed:*

- Geology of Wisconsin website (lists places and features)
- Google Earth aerial (download. Zoom in on glacial area—be sure to pick early morning or before sunset)
- Topographic map
- Grey relief

## SEARCHING GLACIAL FEATURES

Now students follow the same steps to explore moraines and kettle lakes at Kettle Moraine State Forest on their own.

- Review esker, kame, kettle moraine, moraine
- Have students practice locating glacial features at various sections along the Ice Age Trail

**Reflection:** Why is the Trail important in helping protect glacial features? How can the Trail help us understand the benefit of these features and help educate others?

## VI. Evaluation:

1. Students must be able to demonstrate the ability to research and understand a glacial site on the Ice Age Trail using the four maps and online tools listed above, and be able to explain one of the four glacial features listed.
2. **Rubric would include:**
  - a. Ability to smoothly use all sites listed (use without assistance)
  - b. Ability to describe the feature from the maps (written from observations and using the terminology listed in the vocabulary)
  - c. Ability to explain how a glacier created the given feature (written from information on sites)

*Suggestions for extended learning:*

1. Go online and gather photos of land features created by glaciers. Develop a slide show to show to the class. Name and describe each feature.
2. Draw a diagram of a glacier feature, such as a drumlin, labeling the parts.
3. Take a field study to a glacier park or the Ice Age Trail and look at the various features.
4. Use the above online tools to demonstrate another geographical area of interest, like sedimentary rock layers in the Grand Canyon or volcanic structures in Yellowstone.
5. Write a letter to a political representative expressing the importance of preserving the glacial features in Wisconsin.
6. Spend a day volunteering for the Ice Age Trail Alliance.

*The following Wisconsin Student Proficiency Standards can be met by teaching Searching Glacial Features:*

## 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
5. **Science Application:** Interdependence of science & technology

## SOCIAL STUDIES

- A. **Geography:** “Students in Wisconsin will learn about geography through the study of the relationships among people, places, and environments.”
  - **8<sup>th</sup> grade:** A.8.1; A.8.6



LANGUAGE ARTS

**Reading—Informational Text**

- **Key Ideas and Details** • 8.Rit.3
- **Craft and Structure** • 8.Rit.4
- **Integration of Knowledge and Ideas** • 8.Rit.7, 8.Rit.9

**Writing**

- **Production and Distribution of Writing** • 8.W.6
- **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.5, 8.SI.6

**Language**

- **Conventions of Standard English** • 8.L.1
- **Knowledge of Language** • 8.L.3
- **Vocabulary Acquisition and Use** • 8.L.4, 8.L.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 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.