

Glacial Geological Formations: Theories and Evidence

http://www.nps.gov/akso/ParkWise/Teachers/Nature/KEFJ_Glaciers/activities/GeologicalFormations.htm

Focus on Inquiry

The student will make visual observations of images of various rock formations that indicate the presence of past glacial activity. The student will compile visual evidence and the reasoning behind the evidence for past glacial activity.

Lesson Overview

Students will understand the importance of historical human records as evidence to support theories of geological formations, and the connections between glaciation and resulting geological formations.

Duration Two to three - 45 minute class periods	Setting Classroom with Internet access	Grouping Whole class or cooperative groups of 4	PTI Inquiry Subskills 4.2, 5.2, 5.3, 7.2
---	--	---	--

Lesson Components	Estimated Time	Inquiry Subskills Used	Technology Used	Level of Student Engagement	Brief Description
<i>Engage</i>	10 min	4.2	None	1	Students are engaged in a discussion on glaciers
<i>Explore</i>	1 day	5.2, 5.3	Internet (optional)	3	Students propose theories to explain the landforms shown.
<i>Explain</i>	30 min	7.2	None	3	Students use evidence and observations to explain their theories.
<i>Expand</i>	15 min	4.2, 5.2	Internet (optional)	2	Students identify features on a topographic map.
<i>Evaluate</i>	Varies	None	None	N/A	Teacher can evaluate student presentations.

Level of Student Engagement

1	Low	Listen to lecture, observe the teacher, individual reading, teacher demonstration, teacher-centered instruction
2	Moderate	Raise questions, lecture with discussion, record data, make predictions, technology interaction with assistance
3	High	Hands-on activity or inquiry; critique others, draw conclusions, make connections, problem-solve, student-centered

National Science Education Standards – Inquiry

Develop descriptions, explanations, predictions, and models using evidence.
Think critically and logically to make the relationships between evidence and explanations.
Communicate scientific procedures and explanations.



National Science Education Standards – Earth Science

Water, which covers the majority of the earth's surface, circulates through the crust, oceans, and atmosphere in what is known as the "water cycle." Water evaporates from the earth's surface, rises and cools as it moves to higher elevations, condenses as rain or snow, and falls to the surface where it collects in lakes, oceans, soil, and in rocks underground.

Louisiana Grade Level Expectations – Inquiry

Gr. 8, Inquiry GLE#11 - Construct, use, and interpret appropriate graphical representations to collect, record, & report data (e.g., tables, charts, circle, bar and line graphs, diagrams, scatter plots, symbols) (SI-M-A4)
Gr. 8, Inquiry GLE#12 - Use data and information gathered to develop an explanation of experimental results (SI-M-A4)
Gr. 8, Inquiry GLE#22 - Use evidence and observations to explain and communicate the results of investigations (SI-M-A7)



Louisiana Grade Level Expectations Earth Science

Gr. 8, GLE#14 - Distinguish between chemical and mechanical (physical) weathering and identify the role of weathering agents (e.g., wind, water, ice, gravity) (ESS-M-A4)
Gr. 8, GLE#21 - Read and interpret topographic maps (ESS-M-A9)

Materials List

- Internet access
- **Student Handouts #1-3**

Advance Preparation

1. Obtain materials listed in the materials list.
2. Download and print the teacher instructions for Activity 2: Geological Formation: Theories and Evidence (URL is at the top of this lesson overview). The lesson is well-written and can be followed as is.
3. Download and make copies of **Student Handout #1: Evidence for Glaciation** and **Student Handout #2: Seeing is Believing** (URL is at the top of this lesson overview).
4. Make a copy of **Student Handout #3** (attached to this overview) for each student.

Other Information

Objective

The learner will:

- examine and assess the evidence for glaciation.

Prior Knowledge Needed by the Students

- This activity reviews the basic geological formations that result from glacial movement and presence. It would be helpful for students to understand how glaciers form, advance, and retreat.
- Students should understand basic topographic map interpretation.

Procedure

Engage

1. Show students pictures of the Grinnell Glacier and Grinnell Lake at Glacier National Park taken in 1910 and 1997. Discuss the differences between the two pictures. Discuss the features seen in these two pictures. (Lesson, Step #1). Use **Student Handout #1: Evidence for Glaciation** to help identify these features and how they formed. (Lesson, Step #2)

Explore

1. Have students read **Student Handout #2: Seeing is Believing**. Have students propose theories to explain the landforms described in the excerpts or shown in the pictures. Have students identify the evidence that supports their theory. They may use additional text support and Internet resources to support their theories. Be sure students cite the evidence properly. (Lesson, Step #4)

Explain

1. Have students share their theories, citing evidence from Student Handout #2 and other resources students have available. (Lesson, Step #5 beginning)

Expand

1. Have students identify the four features of alpine glaciation as shown on the topographic map in **Student Handout #3: Alpine Glaciation**. Do they find any similar features as on the historical accounts (Student Handout #2)? How might these features have formed?
2. There is an additional topographic map that shows moraines on a glacier of Mount Rainier. The URL is http://raider.muc.edu/~mcnaugma/Topographic%20Maps/alpine_glaciationver2.htm - scroll almost to the bottom of the page.

Evaluate

1. Evaluate student presentations of evidence for their theories of features described in Student Handout #2.
2. Determine if students can correctly identify the alpine glaciation features on Student Handout #3.

Blackline Master

1. **Student Handout #1: Evidence for Glaciation is found on the website.**
2. **Student Handout #2: Seeing is Believing is found on the website.**
3. **Student Handout #3: Alpine Glaciation is ATTACHED BELOW.**

Supplementary Resources**Teachers**

Rockwell, David. 2002. **Exploring Glacier National Park**. Falcon Press Publishing, 336 p.

Discusses the geological development of Glacier national park, as well as the plants and animals that live in the park.

Students

Gallant, Roy. 1999. **Glaciers**. Scholastic Library Publishing, 64 p.

Discusses the formation and movement of glaciers, how they reflect the history of the earth, and how they affect life around them.

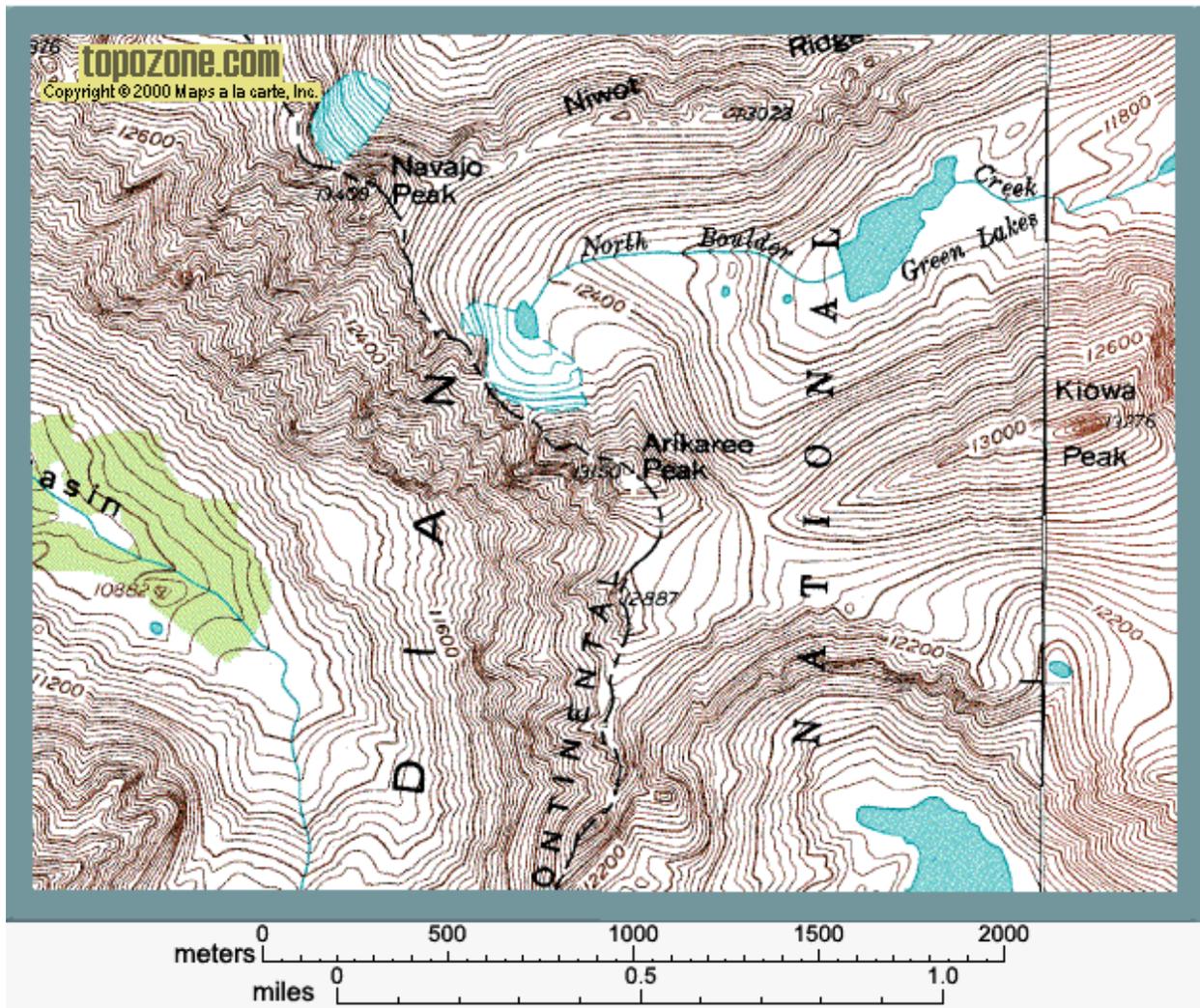
Gordon, John E. 2001. **Glaciers**. Voyageur Press, 72 p.

Introduces the formation, flow, changing nature, and effects of glaciers.

Student Worksheet #3: Alpine Glaciation

This is a topographic map of a section of the Colorado Rocky Mountains that has been eroded by mountain glaciers in the past. Using what you know about glacial formations, identify the following mountain glacier features on the topographic map below.

- "U" Shaped Valley
- Cirque
- Horn
- Arête



Activity taken from *Features of Alpine Glaciation*, January 8, 2007, at http://raider.muc.edu/~mcnaugma/Topographic%20Maps/alpine_glaciationver2.htm