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# Coastal Geology

## Lesson Plans

- Use with the **Coastal Geology** module.
- Use with the **Coastal Geology** worksheets.
- Appropriate for grades **4** and higher.

These lesson plans include references and activities dealing with coastal sediments. If coastal sediments are not readily available, teachers may substitute a sediment sample from a local stream or a local soil sample. If a local soil sample is used, teachers should discuss the differences between coastal sediments and local soil.

**Sediment** - In general, sediment is solid fragmental material transported by wind, water, or ice, chemically precipitated from solution, or secreted by organisms, and that forms in layers in loose unconsolidated form, e.g., sand, mud, till. Source: Bates and Jackson (1984)

**Soil** - Soil is a dynamic resource that supports plants. It consists of mineral particles of different sizes (sand, silt, and clay), organic matter, and numerous species of living organisms. Soil has biological, chemical, and physical properties, some of which change in response to how the soil is managed. Source: Natural Resources Conservation Service (2001)

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# The Big Idea (or Central Theme)

What is the overall concept that we would like students to understand after exploring this module?

## **Earth and Space Science**

- The surface of the earth changes. Some changes are due to slow processes, such as erosion and weathering, and some changes are due to rapid processes, such as landslides, volcanic eruptions, hurricanes, and earthquakes.

## **Science in Personal and Social Perspectives**

- Changes in environments can be natural or influenced by humans. Some changes are good, some are bad, and some are neither good nor bad.

Step One

# Essential Questions

What questions will encourage student inquiry?

- 1.** Is it more important to preserve coastal areas in their natural states, or to make them available to people for recreation? What would be the impacts to either course of action?
  
- 2.** How have the history and culture of coastal areas been affected by their geology?

# Assessment

What evidence is there that students have achieved understanding of the Big Idea?

## ◆ Performance Tasks / Projects

1. Students will write a script for a fictional television news magazine show, describing a process affecting coastal geology.
2. Students will examine samples of local sediment (or soil) and write an explanation of the make up of those sediments (or soils) based on evidence gathered.
3. Students will create, as a group, a Picture Dictionary of Coastal Environments by summarizing and illustrating information found in the Coastal Geology module.

## ◆ Quizzes / Tests

1. Vocabulary quiz, if desired.

## ◆ Prompts

1. Students will write a letter to the editor of the fictional “Coastal Times” supporting their opinion and addressing the issue: “Do you think it is more important to preserve coastal areas in their natural states, or to make them available to people for recreation?”

## ◆ Observation Data

1. Observation data will be collected during class discussions and during work on the performance tasks and projects.

## ◆ Self-assessments

1. Students will self-assess their performance tasks, projects, and prompts.

Step Three

# Planning Lessons

Lessons should take teachers and students step-by-step through the modules. There will be several lessons per module.

**Lesson One: Introduction and Parks**

**Lesson Two: Processes**

**Lesson Three: Materials**

**Lesson Four: Environments**

# Introduction and Parks

## Curriculum Standards

- ◆ National Science Education Standards
  - Earth Science
  - Science and Technology
  - Science in Personal and Social Perspectives
  
- ◆ Standards for the English Language Arts
  - #1 – Students read a wide range of texts...
  - #4 – Students will adjust their use of written language...
  - #6- Students apply knowledge of language structure...
  
- ◆ National Council for the Social Studies Curriculum Standards
  - People, Places and Environments
  - Science, Technology and Society

## Objectives

Students Will Be Able To defend a position (in writing) in the form of a “letter to the editor.”

SWBAT describe the characteristics of a coastal area.

## Inquiry Question

Do you think it is more important to preserve coastal areas in their natural states, or to make them available to people for recreation?

## Materials

- ◆ *Views of the National Parks* CD
  
- ◆ Sample letters to the editor of a local newspaper
  
- ◆ [Letter to the Editor Rubric](#)
  
- ◆ [Coastal Geology Parks Worksheet](#)

**Procedure (Part One)**

1. If students have not had a chance to explore the *Views* CD, allow them some time to explore on their own or in small groups.
2. After students have looked at the disc in general, ask them to find and explore the **Coastal Geology** Knowledge Center. (At the Visitor Center, click on "**Knowledge Centers**," then on the "**Coastal Geology**.")
3. Direct students' attention to the "**Introduction**" page. Read the introduction individually or as a group.
4. Ask: Why do you think the National Park System has preserved so many coastal areas? What kinds of things pose dangers to our coastal areas? Do you think it is more important to preserve coastal areas in their natural states, or to make them available to people for recreation? Is it possible to do both? Why or why not?
5. Ask students to click on "**Parks**." Allow students some time to explore the various parks described.
6. Instruct students to choose a park to consider more in-depth. Keep in mind that links to some parks provide quite a bit of information, while others provide far less. Encourage more able students to choose more lengthy links.
7. Students should read the information provided in their chosen links, filling out the **Coastal Geology Parks Worksheet** as they read.
8. Allow time for students to share the information gathered with their classmates. If desired, play "Mingle, Freeze, Group." At your signal, students should mingle about the classroom. Say, "Freeze," then, "Group." At this time students should form groups of two or three (your choice), and share the information from their **Coastal Geology Parks Worksheet** with their groups.
9. Repeat this process several times, so that students have an opportunity to share their work with several classmates.

**Procedure (Part Two)**

1. After students have had an opportunity to share what they have learned about a coastal area, as well as learn from their peers, ask once again: Why do you think the National Park System has preserved so many coastal areas? What kinds of things pose dangers to our coastal areas? Do you think it is more important to preserve coastal areas in their natural states, or to make them available to people for recreation? Is it possible to do both? Why or why not? Based on what you have learned about coastal areas, have your opinions changed?
2. Show students examples of letters to the editor of a local newspaper.
3. Ask: What is the purpose of these letters? What makes them effective in achieving this purpose?



4. Assign the writing prompt: Write a letter to the editor of the fictional “Coastal Times” addressing the issue: “Do you think it is more important to preserve coastal areas in their natural states, or to make them available to people for recreation?” Letters should contain at least five reasons to support the writer’s opinion. (Students can include more or fewer reasons, based on ability.)
5. Distribute copies of the [Letter to the Editor Rubric](#). Ask students to self-assess their work before turning it in for your assessment.

### Key Vocabulary

- ◆ Fisheries
- ◆ Commerce
- ◆ Recreation
- ◆ Navigation
- ◆ Estuary
- ◆ Wetlands
- ◆ Decapods
- ◆ Dunes
- ◆ Barrier islands
- ◆ Reefs
- ◆ Berms
- ◆ Habitat encroachment

(Vocabulary will vary depending on which park students choose)

### Discussion Questions

1. Why do you think the National Park System has preserved so many coastal areas?
2. What types of things pose dangers to our coastal areas?
3. Do you think it is more important to preserve coastal areas in their natural states, or to make them available to people for recreation?
4. Is it possible to do both? Why or why not?
5. Based on what you have learned about coastal areas, have your opinions changed?

**Assessment**

Students Will Be Assessed On ...

1. Completed [Coastal Geology Parks Worksheet](#).
2. Completed Letter to the Editor.
3. Participation in classroom activities and discussions.

**Differentiation**

To best meet all students' needs, we suggest ...

1. Assigning partners or providing sentence starters or fill-in-the-blank sentences on the worksheet.
2. Encouraging students to choose appropriate parks to explore for the [Coastal Geology Parks Worksheet](#).
3. Varying the required length of the Letter to the Editor.

# Processes

## Curriculum Standards

- ◆ National Science Education Standards
  - Earth Science
  - Science and Technology
- ◆ Standards for the English Language Arts
  - #1 – Students read a wide range of texts...
  - #4 – Students will adjust their use of written language...
  - #6- Students apply knowledge of language structure...
- ◆ National Council for the Social Studies Curriculum Standards
  - People, Places and Environments
  - Science, Technology and Society

## Objectives

Students Will Be Able To describe how a particular coastal process affects landforms.

SWBAT organize and summarize information about a coastal geology process gathered from reading expository text into a graphic organizer.

SWBAT synthesize information learned about coastal processes into writing a script for a news magazine.

## Inquiry Questions

1. Are coastal areas static? Or do they change over time?
2. Are the forces that affect our coastal areas constructive or destructive?

## Materials

- ◆ *Views of the National Parks* CD
- ◆ Sample report from a television news magazine show (If possible, the report should be about a natural process.)
- ◆ [Two Column Notes Worksheet](#)
- ◆ [News Magazine Script Rubric](#)

**Procedure**

1. Allow students to explore the “Processes” section of the Coastal Geology Knowledge Center.
2. Divide the class into 10 heterogeneous groups. Assign each group one of the processes found in this section.
3. Allow students some time to thoroughly explore their assigned process. Encourage note taking. Use [Two Column Notes Worksheet](#), if desired.
4. There is quite a bit of vocabulary in this module. Consider having students complete a [Vocabulary Definition Map](#) using at least one new term from their assigned coastal geology process. See the [Vocabulary Lesson Plan](#) in the [Teacher Resource Center](#) of Views.
5. Ask: Is the coastal geology process your group is exploring constructive or destructive? Why do you think so? Is it possible for it to be both? How are the two related?
6. Show students a sample report from a television news magazine. Ask: What made the report interesting? What made the report informative?
7. Assign the project: Students will write a script (10-15 minutes long, or your desired length) that explains their assigned coastal geology process. Along with the written script, each group is required to turn in at least one visual aid.
8. Brainstorm possible visual aids. (Examples might include an experiment or demonstration, a model, a poster, etc.) Encourage students to be creative!
9. Remind students that the work on this project is to be evenly divided among team members. Discuss what this might look like. Again, encourage teams to be creative, sharing work in ways that showcase individual talents. Students should attach a statement of their “division of labor” along with their script.
10. Distribute the [New Magazine Script Rubric](#). Ask students to self-assess their work before turning it in for your assessment.
11. If desired, students may turn in a tape of their group “performing” their script, or you can ask students to perform scripts in class.

**Key Vocabulary**

- ◆ Geomorphic

(Vocabulary will vary depending on which park students choose)

**Discussion Questions**

1. Is the coastal geology process your group is exploring constructive or destructive?
2. Why do you think so?
3. Is it possible for it to be both?
4. How are the two related?

**Assessment**

Students Will Be Assessed On ...

1. Participation in classroom activities and discussions.
2. Completed [Vocabulary Definition Map](#), if desired.
3. Completed News Magazine Script and visual.
4. [News Magazine Script Rubric](#).

**Differentiation**

To best meet all students' needs, we suggest ...

1. Providing sentence starters or fill-in-the-blank sentences on the [Vocabulary Definition Map](#) or [Two Column Notes](#).
2. Heterogeneous grouping for the [Vocabulary Definition Map](#), and the News Magazine script.

# Materials

## Curriculum Standards

- ◆ National Science Education Standards
  - Science as Inquiry
  - Earth Science
  - Science and Technology
  - Science in Personal and Social Perspectives
  
- ◆ Standards for the English Language Arts
  - #1 – Students read a wide range of texts...
  - #4 – Students will adjust their use of written language...
  
- ◆ National Council for the Social Studies Curriculum Standards
  - People, Places and Environments
  - Science, Technology and Society

## Objectives

Students Will Be Able To apply their knowledge of coastal geology materials to the examination and description of local sediments (or soils).

SWBAT draw conclusions about local sediment (or soils) based on evidence gathered through observation and examination.

## Inquiry Questions

1. What kinds of processes affect coastal geology materials (such as sand and rocks)?
  
2. How do scientists classify coastal geology materials?

## Materials

- ◆ *Views of the National Parks* CD
  
- ◆ [Coastal Sediments Worksheet](#)
  
- ◆ [Local Sediment \(or Soils\) Lab Worksheet](#)
  
- ◆ Samples of various local sediment (at least two types of sediment or soil)
  
- ◆ Magnifying glasses (1 per student, if possible)

**Procedure (Part One - Background)**

1. Allow students to explore the “**Materials**” section of the Coastal Geology Knowledge Center.
2. Individually or in small groups, read the information on the first page of “**Materials.**”
3. Ask: What kinds of materials make up coastal sediments? How can coastal sediments be described?
4. Divide the class into heterogeneous groups of three. Each student will need a [Coastal Sediments Worksheet](#).
5. Within each group of three, ask one student to read about “Color,” one to read about “Size,” and one to read about “Sorting,” filling out the appropriate section of the worksheet as they go.
6. After all three group members have filled out their portions of the worksheet, ask them to explain their section to their teammates. When groups are finished, all members should have filled out all three portions of the worksheet.

**Procedure (Part Two - Lab)**

1. Ask students to brainstorm in pairs or small groups answers to the Discussion Questions posed on the [Local Sediment \(or Soils\) Lab Worksheet](#). Share answers.
2. Ask students to predict what kinds of materials make up the sediment (or soil) that can be found in their area. They should write their predictions on their worksheets.
3. Give each pair or small group a sample of each local sediment (or soil) you have collected, as well as a magnifying glass per student.
4. Review safety procedures.
5. Ask groups to examine their sediment (or soil) samples, specifically looking for color, size and sorting. Use the white paper as a workspace. Students should record their observations on the worksheet.
6. Ask students to write explanations of their observations, including supporting evidence. This can be done individually or in small groups, and should be modeled first.
7. Discuss students’ findings. Ask:
  1. What does it mean to say that, “Scientific explanations emphasize evidence?”
  2. Did you notice any similarities between the two samples you studies? Any differences?
  3. What conclusions did you draw about the sediment (or soil) that you examined?
  4. What evidence did you base those conclusions on?



**Key Vocabulary**

- ◆ Sediment
- ◆ Chondrules
- ◆ Parent Rock
- ◆ Mud
- ◆ Sand
- ◆ Gravel
- ◆ Silt
- ◆ Cobbles
- ◆ Boulders
- ◆ Igneous
- ◆ Metamorphic
- ◆ Sedimentary
- ◆ Well-sorted
- ◆ Poorly sorted

**Discussion Questions**

1. What kinds of things make up coastal sediments?
2. How can coastal sediments be described?
3. What does it mean to say that, “Scientific explanations emphasize evidence?”
4. Did you notice any similarities between the two samples you studies? Any differences?
5. What conclusions did you draw about the sediment (or soil) you examined?

**Assessment**

Students Will Be Assessed On ...

1. Participation in classroom activities and discussions.
2. Completed [Coastal Sediments Worksheet](#) and [Local Sediment \(or Soil\) Lab](#).

**Differentiation**

To best meet all students' needs, we suggest ...

1. Providing sentence starters or fill-in-the-blank sentences on the [Coastal Sediments Worksheet](#) and [Local Sediment \(or Soil\) Lab](#).
2. Heterogeneous grouping for the [Coastal Sediments Worksheet](#) activity and [Local Sediment \(or Soil\) Lab](#).

# Environments

## Curriculum Standards

- ◆ National Science Education Standards
  - Earth Science
  - Science and Technology
- ◆ Standards for the English Language Arts
  - #1 – Students read a wide range of texts...
  - #4 – Students will adjust their use of written language...
- ◆ National Council for the Social Studies Curriculum Standards
  - People, Places and Environments
  - Science, Technology and Society

## Objectives

Students Will Be Able To summarize information read about coastal environments.

SWBAT compare and contrast various coastal environments.

## Inquiry Questions

1. What is a coastal environment?
2. What kinds of coastal environments can be found within the National Park System?
3. How are these environments alike? How are they different?

## Materials

- ◆ *Views of the National Parks* CD
- ◆ Samples of various picture dictionaries

**Procedure (Part One - Background)**

1. Allow students to explore the “**Environments**” section of the Coastal Geology Knowledge Center.
2. Individually or in small groups, read the information on the first page of “Environments.”
3. Discuss what students already know about coastal environments such as beaches and coastal dunes.
4. Invite students to spend some time exploring the Environments section.
5. Tell students that as a class they will be creating a Coastal Environments Picture Dictionary.
6. Give students some time to explore samples of picture dictionaries.
7. Assign each student (or group of two students) one of the following terms: (Keep in mind that links to some terms provide quite a bit of information, while others provide far less. Encourage more able students to choose more lengthy or difficult terms.)

◆ Fjord	◆ Pocket Beach
◆ Sea Cave	◆ Sea Arch
◆ Sea Stack	◆ Sea Cliff
◆ Tidewater Glacier	◆ Sandy Coast
◆ Barrier Island	◆ Barrier Spit
◆ Beach	◆ Dune
◆ Tombolo	◆ Estuary
◆ Delta	◆ Tropical Coast
◆ Reef	◆ Lakeshore
8. Explain that some of the terms can be found by clicking on one of the links listed on the Environments page, and then clicking on “**Features.**”
9. Once all of the terms have been found, ask students to read the information presented about their assigned term.
10. Explain that students will need to summarize the information presented into an easy to understand definition for the picture dictionary.
11. Students will then need to create an illustration to go along with their summary definition.
12. Discuss how the dictionary entries should be organized. Should all of the terms be listed in alphabetical order? Or should the dictionary be divided into categories, putting all of the terms associated with Rocky Coasts together, for example. Decide as a group how your class dictionary will be organized.
13. Assemble the dictionary. If desired, your Coastal Environments Picture Dictionary can be donated to a class of younger students!
14. Optional alternative assignment: Groups of 4 to 5 students can each create their own dictionaries. In this case, each student would have to summarize 4 to 5 terms.

**Key Vocabulary**

- ◆ Fjord
- ◆ Pocket Beach
- ◆ Sea Cave
- ◆ Sea Arch
- ◆ Sea Stack
- ◆ Sea Cliff
- ◆ Tidewater Glacier
- ◆ Sandy Coast
- ◆ Barrier Island
- ◆ Barrier Spit
- ◆ Beach
- ◆ Dune
- ◆ Tombolo
- ◆ Estuary
- ◆ Delta
- ◆ Tropical Coast
- ◆ Reef
- ◆ Lakeshore

**Discussion Questions**

1. What do you already know about coastal environments such as beaches, coastal dunes, or islands?
2. How are these coastal areas alike? How are they different?

**Assessment**

Students Will Be Assessed On ...

1. Participation in classroom activities and discussions.
2. Completed Picture Dictionary entry.

**Differentiation**

To best meet all students' needs, we suggest ...

1. Heterogeneous grouping for the Picture Dictionary activity.
2. Encouraging students to choose appropriate terms to summarize for the Picture Dictionary activity.