

The mountains of Nepal: Scientific investigations

This lesson introduces students to the mountain ecosystems of Nepal. Activities include a brainstorming activity, in which students think about ecosystems and biodiversity; a research activity, in which students use a variety of sources to gather information about the mountain ecosystems of Nepal; and a journal activity, in which students create journal entries based on the information gathered in their research.

A lesson plan for grades 5 and 7 Information Skills, Science, and Social Studies

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Mountains form a dominant feature of Nepal's physical landscape. Nepal's elevation ranges from about 197 feet above the sea level to the highest point on earth — Mount Everest, at 29,028 feet. In terms of biodiversity, Nepal is one of the richest countries in the world due to the unique variety of species found there. In this lesson, students will learn about the mountain ecosystem of Nepal and begin to understand the terrain, climate, and biodiversity of the mountain regions.

Learning outcomes

Students will:

- define *ecosystem* and *biodiversity*
- use scientific tools, personal research observation, and research logs to gather information about the ecosystems found in the Nepalese mountains
- identify key factors that have led to biodiversity in the Nepal mountain regions
- locate Nepal and particular mountains or mountain ranges on a map
- view photographs and research on the web, in reference materials, and from other sources and take notes on Nepalese mountain ecosystems
- create a five-entry journal of a short mountain "ecosystem" hike using research logs, images, and maps gathered



Nepal is sometimes called a "yam between China and India." (Map cc about the map)

Teacher preparation

TIME REQUIRED FOR LESSON

At least 120 minutes for all activities, preferably done over two or three class periods.

MATERIALS NEEDED

- Chalkboard
- Chalk
- Colored pencils or markers
- Scrap paper
- Scissors
- Glue
- Computers with internet access
- Access to your school's library catalog
- Computer with LCD projector
- Computer printer and paper
- Student handouts:
 - Brainstorm graphic organizer — one per student
 - Research log — one per pair of students
 - Journal page template — five per student
- Images of Nepal:
 - [Sunset view of Nilgiri mountain peaks, Nepal](#)
 - [Donkey on a mountain trail in Nepal](#)
 - [Dhaulagiri Mountain seen from Kaagbeni, Nepal](#)
 - [Annapurna mountain peaks seen from Poon Hill, Nepal](#)
 - [Dhaulagiri mountain seen from Muktinath, Nepal](#)
 - [Dhaulagiri Mountain seen from Ghorepani, Nepal](#)
 - [Herd animals and people on a narrow mountain trail in Nepal](#)
 - [Dhaulagiri Mountain seen from Naudanda, Nepal](#)
 - [Nepal mountain landscape](#)

Learn more

- ["Life in the Mountains"](#)
This lesson plan from *National Geographic Expeditions* explores life in the mountains of Colorado and Nepal.
- [National Geographic: Trekking Nepal](#) This travelogue documents sights, sounds, and stories recorded while trekking Nepal.

RELATED PAGES

- [Salt trading in Asia](#): In this interdisciplinary lesson, students explore the mineral salt from a variety of perspectives — scientific, geographic, and cultural. The lesson incorporates images of salt production in Nepal and Vietnam. It may be used with grade 4 or grade 7.
- [The Center for Education, Imagination and the Natural World at Timberlake Farm](#): Connect

Pre-activities

- Prepare images of Nepal (see “Materials needed” above) for student access. You may choose to project the images for the class, to make files available on student-accessed computers, or to make printed copies to hand out to students.
- Make copies of student handouts: One brainstorm graphic organizer for each student, five journal page templates for each student, and one research log for each pair of students.
- Familiarize yourself with Nepal, the Nepalese mountains, ecosystems, and biodiversity. Information can be found at the following sites:
 - Nepal:
 - [CIA World Factbook overview of Nepal](#)
 - [Nepal Country Profile](#) from the BBC.
 - mountains of Nepal:
 - [Geography of Nepal](#) article from Wikipedia
 - [“Mountain Ecosystem”](#) article from *Encyclopedia Britannica*
 - ecosystems:
 - [Resources for Science Learning](#) website from the Franklin Institute
 - See definition in [“Critical vocabulary”](#)
 - biodiversity:
 - [Biodiversity and Conservation](#) website from the Field Museum
 - See definition in [“Critical vocabulary”](#)

with the natural world through the programs offered at this Center situated on 165 acres of beautiful woodlands and meadows.

- [StreamWatch](#): This lesson is intended as a long term project to determine the overall health of a stream or wetland. Students identify seasonal changes that occur within the ecosystem, ideally with a minimum of bimonthly or monthly monitoring.

RELATED TOPICS

- Learn more about [Asia](#), [Himalayas](#), [Nepal](#), [biodiversity](#), [ecology](#), [ecosystems](#), [environmental science](#), [mountains](#), [photograph analysis](#), [science](#), and [world cultures](#).

Activities

ACTIVITY ONE: ECOSYSTEMS AND BIODIVERSITY

1. Hand out the brainstorm graphic organizer. Ask your students if they know what the word *ecosystem* means. Ask them to close their eyes and think of the word *ecosystem*. What words do they think of? Have the students list as many words as they can. Students can write their ideas down on their graphic organizers as they think. As the students generate ideas, write them on the chalkboard.
2. Read the following introduction to mountain ecosystems and biodiversity to your class:

An ecosystem is a community of living organisms interacting with each other and their environment. Ecosystems occur in all sizes. A tidal pool, a pond, a river, an alpine meadow and an oak forest are all examples of ecosystems. A community of living things (plants, animals, insects, fungi, and bacteria) along with non-living things (sunlight, clouds, soil, water, rocks) makes up an ecosystem.

Even a small area of land can offer wide biodiversity in plant life; that is, an ecosystem is composed of many different organisms. Biodiversity or biological diversity is the variation of life forms within a given ecosystem or biome — or for the entire Earth.

Mountains are one of the world’s greatest sources of biodiversity. That means that in mountains there are many different kinds of plants and animals that live in the wild or are grown by farmers. Because of the rapid changes in altitude and temperature along a mountain slope, multiple ecological zones exist, sometimes ranging from dense tropical jungles to glacial ice within a few kilometers.

The extraordinary number of ecological niches possible in mountains is typified by the Makalu region of east Nepal, which is estimated to harbor more than 3,000 plant species. This includes 25 species of rhododendron, 50 species of primroses, 45 species of orchids, 80 species of fodder trees and shrubs, and 60 species of medicinal plants.

3. Lead a discussion about local and mountain biodiversity by posing these questions:
 - What is biodiversity?
 - Why are mountains home to so many different living things?
 - Does the area around your community have many different ecosystems where different kinds of plants and animals can live, or does it have just a few?
 - What factors or activities threaten mountain biodiversity?

ACTIVITY TWO: WHAT IS A MOUNTAIN?

1. Share with students the following background information about mountains:

Mountains are the most conspicuous landforms on earth. They are found on every continent from the equator to the polar regions. Mountains are three-dimensional in nature (i.e., they extend north-south, east-west, and vertically), and contain the most extensive and varied climatic conditions, vegetation, wildlife, and human cultural diversity of any landform on earth. Nepal is filled with mountains and mountain ranges.

2. With the students, locate Nepal on a large wall map of the world or on the [National Geographic Map Machine](#). Then

Help

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show students a more detailed [map of Nepal](#). (Tip: Click on the link below the image to find the largest version, and zoom in.) Point out Nepal's size relative to its surrounding countries, and tell students it is sometimes described as "a yam between two rocks" because of its location between India and China.

- Tell students that Nepal is a landlocked country 563 miles east to west, and 160 miles north to south. Find your own town, city, or state on the National Geographic Map Machine or [Google maps](#), and compare its size to the size of Nepal. Switch between map views (road map, satellite, etc.) for both locations.
- Have students study the maps, readings, and other reference materials for this lesson to answer the following questions:
 - What are the borders of Nepal?
 - What is the terrain and elevation?
 - What are the variations of climate in Nepal?
 - How many mountain ranges are in Nepal and where are they located?

Nepal mountain ecosystem and biodiversity

- Refer back to your previous brainstorming on ecosystems and biodiversity. Tell students that they will now do partner research on the particular ecosystems found in the Nepalese mountains and the biodiversity there.
- Put students into pairs and give each team a copy of the research log. Go over the instructions on the research logs and share any needed computer use information. Have students use the library catalog, databases, and internet resources to find the requested information. Instruct students to take notes, which will be used later in the lesson as a basis for an ecosystem hike journal in activity three. Tell students to select a mountain range in Nepal and gather descriptions, facts and images, and references of:
 - Mountain range or mountain name and location
 - Climate
 - Plants
 - Animals
 - Insects
 - Terrain
 - Maps

You may have your students conduct their research on any site you find appropriate. For suggestions, see "[Resources for student research](#)" below.

ACTIVITY THREE: NEPAL ECOSYSTEM TREK

- In this activity, students will use their imaginations to describe the natural world as they investigate the Nepal mountain ecosystem. Begin with a discussion of students' prior experiences with mountains. Ask students if they have ever been to the mountains. Did they hike? When did they go? What was the weather like? What plants and animals did they encounter?
- Have students view the images of Nepal listed above under "Materials needed," and instruct them to read the captions. (You may choose to project the images on a screen, have students view the images online, or print copies of the images and hand them out to students.)
- Tell students they will plan a Nepal mountain trek using the images of Nepal and their brainstorming sheets and research logs from the previous activities. Students will create a five-entry journal of a short mountain ecosystem hike using the gathered materials.
- Dictate the following questions/prompts, and have students write their answers on scrap paper, drawing on what they have learned about Nepal. Give students time to write their answers about their imagined Nepal hike.
 - Site name/location
 - Date
 - Time of day
 - Temperature
 - Weather conditions (For example: is it cloudy, sunny, windy, raining?)
 - Wind conditions
 - Soil conditions (For example, is it moist or dry?)
 - Imagine that you are standing on a mountain trail in Nepal. Close your eyes and imagine what you can see around you. Visualize a pathway that you will travel over five days. For each day of your hike, take note of the following:
 - What do you see from where you are?
 - What sounds do you hear?
 - If you were to eat a meal of wild plants or animals there, what kind of food would it be?
 - What distinctive smells might you notice in this place?
 - Are there are fruits or flowers on individual trees or plants?
 - Are there interactions among insects or animals, like mating or fighting, or between insects and plants, like feeding and pollinating?
- Hand out the journal page templates (five for each student), and have students use their answers to the questions above to develop their five journal entries. Remind students that while this is a creative exercise, all of their entries should be grounded in facts about Nepal and its mountain ecosystems. Emphasize the importance of using concrete

detail taken from research, and instruct students to record references from their research logs on the journal page in the space provided. For each of the five days, have students write a draft of a six-to-eight-sentence paragraph describing their trek destinations, with the goal of making their treks sound very appealing to a reader. Encourage students to be creative in any of the following ways: record data; scribble questions; make sketches, drawings, diagrams, graphs, or flowcharts; and use the images gathered in research. Have students transfer all of the notes, drafts, and images to the journal page template.

Assessment

- Activity one: Assess by completion of the graphic organizer and participation in discussion. Because the graphic organizer reflects student brainstorming, it should not be checked for correct/incorrect responses.
- Activity two: Assess by student research logs: Did students follow instructions? Did they cite sources correctly? Did they take useful and meaningful notes? Did they find information for the requested elements of Nepal's mountain ecosystems?
- Activity three: Assess by student journal entries: Did students complete five separate entries of sufficient length? Did they answer all of the questions/prompts? Were the entries grounded in research-based facts? Did students use supplemental resources like data, drawings, etc.?

Alternative assessments

- Have each research team write a two-paragraph essay about preserving biodiversity in the mountains. You can pose the following questions as guidelines for writing the paragraphs:
 - Paragraph 1: Why do you think biodiversity in the mountains of Nepal should be preserved? Give two reasons.
 - Paragraph 2: Of the reasons you listed for preserving biodiversity, which do you think would be the most likely to convince people that biodiversity should be preserved? Why?
- Have students research organizations that are dedicated to preserving biodiversity. Many of these organizations have websites. Assign each research team to find an organization, give its web address, a brief overview of what the organization, its activities and history.

Extensions

You may extend this lesson by having students record information about local ecosystems. Ask students to copy the example of the recording chart below. Tell students to take this home and find an area around their neighborhood to observe as an ecosystem. Give the students the following instructions:

- Record the name of each different type of living thing they see in the first column. For example, if they see red ants, they should record "red ants" in the first column.
- Record the quantity of this life form in the second column. For example, if they saw ten red ants, they should record the number ten.
- Describe what they saw, what it looked like, sounded like, smelled like, and felt like in the third column. Students should never taste the living things that they are observing. (Students should also use caution when feeling the flora and fauna in their ecosystem.)
- Ask students to look carefully for living things to record on their chart. Tell them to look up in the sky for birds and to look closely at the ground for insects.
- Ask students to record every different kind of living thing they see, even if they do not know the name or the quantity of what they see. Ask them to describe the living things as thoroughly as possible.

Type of living thing	Quantity	Observations
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Lead a discussion with the students about their findings:

- Why is biodiversity important?
- Why are mountains important for biodiversity?
- Ask your students to estimate the number of different kinds of living things they observed.

You may extend activity three by having the students bind their journals into books using Susan Kapuscinski Gaylord's [Making Books with Children](#) website.

Websites

- Nepal:

- [CIA World Factbook overview of Nepal](#)
- [Nepal Country Profile](#) from the BBC.
- [National Geographic Map Machine](#)
- Mountains of Nepal:
 - [Geography of Nepal](#) article from Wikipedia
 - ["Mountain Ecosystem"](#) article from *Encyclopedia Britannica*
- Ecosystems:
 - [Resources for Science Learning website](#) from the Franklin Institute
- Biodiversity:
 - [Biodiversity and Conservation website](#) from the Field Museum
- Other websites:
 - [Google maps](#)

Resources for student research

- General:
 - [KidsClick! Web Search](#)
 - [Internet Public Library Kidspace](#)
 - [American Library Association's Great Web Sites for Kids](#)
 - [Ask Kids](#)
- Specific:
 - [Natural History Notebooks: Asia](#)
 - ["Mountain Ecosystem,"](#) from the *Britannica Online Encyclopedia*
 - [Wikipedia: Geography of Nepal](#)
 - ["Plants, Animals, and Birds of Nepal"](#) from Nepal Vista
 - [Animals of Nepal](#) — images from the Wikimedia Commons
 - ["Plants of Nepal"](#) from the Royal Botanic Garden Edinburgh
 - [Plants and People of Nepal](#), by N P Manandhar and Sanjay Manandhar
 - [Field Guide to the Mammals of the Indian Subcontinent : Where to Watch Mammals in India, Nepal, Bhutan, Bangladesh, Sri Lanka, and Pakistan](#), by K. K. Gurung and Raj Singh

Critical vocabulary

biodiversity

According the U.S. Agency for International Development, biodiversity is the variety and variability of life. Biodiversity can be conceived as a system consisting of many elements or aspects: genes, species, ecosystems, and ecological processes that both support and result from this diversity. All of these elements of living systems interact with each other to produce the web of life on earth, a whole much greater than the sum of its parts.

ecosystem

A community of organisms and the physical environment in which they interact

Himalayas

Mountain range extending 1500 miles on the border between India and Tibet; this range contains the world's highest mountain, Mt. Everest.

mountain

An elevated landform of high local relief (the elevational difference between the lowest and highest points in an area), with much of its surface in steep slopes, and displaying distinct variations in climate and vegetation zones from its base to its summit.

trekking

A form of walking, undertaken with the specific purpose of exploring and enjoying the scenery.

• North Carolina Essential Standards

◦ INFORMATION AND TECHNOLOGY SKILLS (2010)

■ Grade 5

- 5.RP.1 Apply a research process as part of collaborative research. 5.RP.1.1 Implement a research process by collaborating

effectively with other students.

- **Grade 7**

- 7.RP.1 Apply a research process to complete given tasks. 7.RP.1.1 Implement a collaborative research process activity that is group selected. 7.RP.1.2 Implement an independent research process activity that is student selected.

- **SCIENCE (2010)**

- **Grade 5**

- 5.L.2 Understand the interdependence of plants and animals with their ecosystem. 5.L.2.1 Compare the characteristics of several common ecosystems, including estuaries and salt marshes, oceans, lakes and ponds, forests, and grasslands). 5.L.2.2 Classify the...

- **SOCIAL STUDIES (2010)**

- **Grade 7**

- 7.G.2 Apply the tools of a geographer to understand modern societies and regions. 7.G.2.1 Construct maps, charts, and graphs to explain data about geographic phenomena (e.g. migration patterns and population and resource distribution patterns). 7.G.2.2 Use...

North Carolina curriculum alignment

INFORMATION SKILLS (2000)

Grade 5

- **Goal 4:** The learner will EXPLORE and USE research processes to meet information needs.
 - **Objective 4.05:** Gather information.
 - **Objective 4.07:** Organize and use information.
 - **Objective 4.09:** Present information in a variety of formats (print, graphical, audio, video, multimedia).

SCIENCE (2005)

Grade 5

- **Goal 1:** The learner will conduct investigations to build an understanding of the interdependence of plants and animals.
 - **Objective 1.03:** Explain why an ecosystem can support a variety of organisms.