Section 2 — Ape Environments

OVERVIEW

Apes live in a variety of biomes, from dense primary tropical forests to grasslands. They are found in Africa and Asia only. Apes play important roles in their habitats as predators and seed dispersers. In fact, studies have shown that chimpanzees and gorillas are essential seed dispersers in their habitats. Ape habitats are in peril today, as they are found in developing countries and sites of industry, including mining, logging, and unsustainable agriculture. As a result, ape habitats are becoming smaller and more fragmented.

Ape populations can be found living in a range of **biomes**, from dense primary tropical forests (original tropical forest, compare to secondary forests that have been cut down and reforested), to grasslands, to swamps, to montane forests and several habitats in between. See page 27 for a map of the earth showing eight major biomes.

Role of Apes in their Environments

Apes interact with their environments in several essential roles: as competitors, predators, and seed dispersers.

While it has been observed that apes may prey on insects, eggs, and, in the case of chimpanzees, hunt some mammals for food, apes can also be plant predators. Plant predation refers to the destruction of plants through feeding on structural or reproductive parts, as opposed to non-destructive feeding such as some leaf-browsing. Such predation restricts the ability of plants to reproduce, and is not a sustainable practice. Though apes use plant materials for food and for nesting, this practice of plant predation is not as common among apes as it is in some other primate species.

Instead, apes generally aid plants in their environment by acting as important seed dispersers. Seed dispersal is essential to an ecosystem, assuring the spread of plant species over a wide distance. By spreading seeds away from parent plants, parent plants avoid being overcrowded by new plants. This also lessens the direct competition between new and parent plants for the same natural resources. Seeds are dispersed mainly by wind, water and animals. The role of gorillas, chimpanzees and orangutans in seed dispersal has been well researched. Their year-round, habitat-wide foraging behavior makes them significant contributors to wide seed dispersal, and has led some to describe them as keystone species to their environments.

Apes primarily disperse seeds through their excretion. Some chimpanzee populations contribute to seed dispersal at a disproportionately large percentage. Chimpanzees in one forest in Uganda, for example, make up only 2% of the population of frugivorous primates, but are responsible for approximately 45% of the seed dispersal. In Gabon, gorillas play an essential role as the sole seed dispersers of a dominant tree species in Lopé National Park. Gorillas are able to use their massive jaw muscles to chew large, tough seeds that others cannot. In doing so, they crack open the tough seed coats, freeing the seed inside to then be dispersed.



Concerns for ape habitats

Ape habitats overlap with developing nations' expanding infrastructure, and sites of industry and agriculture (often unsustainable). As a result, ape habitats have faced serious deforestation, and avenues have been opened into ape habitats allowing for poacher access. Ape habitats are not only shrinking in size, but are also becoming fragmented. This potentially disturbs population ranges, and can result in isolated fragments that can support only small populations, which may be more prone to extinction. Further, habitat destruction and alteration can result in additional stress to ape species, including noise disturbance and increased human presence.

For more information on ape habitat destruction, see "Section Five: Ape Conservation" in this packet.

2.1: Where do apes and other primates live? (G,R)

Materials: Per student: access to an atlas, color pencils, one copy of each of the following: "Earth Biome Map" and "Continents Map" OR: access to an atlas; color markers; two copies of transparencies of "Continents Map" and one paper copy of "Earth Biome Map"; one sheet of paper

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Objective: The student will be able to interpret and label a map and distinguish among biomes in order to present an accurate reflection of ape geographic distribution (biogeography) in the context of primate biogeography.

Procedure:

- Discuss the geographic distribution of wild apes and other primates. You may want to consider distribution in terms of hemisphere, continents, or biomes. (Alternative: Have students research this information).
- Hand out the maps to each student. Students will use the map handouts and supplementary material such as an atlas to interpret and label the maps.
- Students must do the following:

Step One: On the "Continents Map," shade in the areas in which apes live using one color pencil or marker.

Step Two: On the same map (or second copy of map if using transparencies), shade in the areas in which other non-human primates live using another color pencil or marker. Shading may overlap. If students have used transparencies, they can combine their pages to see the overlapping effect.

Step Three: Using the "Earth Biome Map" as a reference, students should identify the biomes in which apes and other nonhuman primates live. Students may record this information on the back of their individual "Continents Map" page or a blank piece of paper.

Step Four: Using an atlas or other reference material, students should list five countries in which apes live. Also, they can list up to five countries in which other non-human primates live for each of the following: South & Central America, Africa and Asia. They may record this information on the back of their individual "Continents Map" page or piece of paper as well.

Assessment Criteria: The student demonstrates an accurate interpretation of the geographic distribution of apes in the context of non-human primate biogeography by synthesizing information from all of the materials.

Extension: Consider the biogeography of humans. Does our biogeography overlap with that of the non-human primates? What might be some implications of this?

Skills used in this activity

- Skills used in this activity:
- Reading and interpreting maps
- Distinguishing biomes
- Integrating information to track a model of biogeography

Earth Biome Map





Continents Biome Map



2.2: How can we study primates in their natural habitats? (R, S, W)

Materials: Per student: access to library; optional: construction paper, access to computer and printer, scissors, glue, tape, pens and pencils.

Objective: The student will be able to read and interpret biographic and scientific literature in order to report on and compare the history and development of methodology (systems of scientific methods and procedures) in primate studies.

Procedure:

- Discuss with students their ideas about how animals are studied in the wild. Can they think of any famous wildlife scientists?
- Create a list of technology your students think may be helpful in studying animals. What do they think scientists did before some of this technology was available?
- Have students pick a primate scientist's biography. The students must read their chosen biography, and write a report on the methodology of their scientist.
- In this report, students should include the following information, if possible:
 - Who is the scientist?
 - What background does the scientist have? (Primate scientists work in many different fields, including, for example, anthropology, psychology and zoology.)
 - What animal did the scientist study?
 - How long did the scientist study the animal?
 - What was the scientist's research question? (Students may pick one if there are several)
 - How did the scientist study the animal for this research question?
 - What technology, if any, did the scientist use?
 - What information did the scientist learn using this methodology?
- Alternative: Students may present this information in the form of a bookmark instead of a written report. Have students
 answer the above questions with one to two sentences. Students can type up and print out their answers to cut and paste
 onto a construction paper bookmark form, or may handwrite it onto the bookmark. Ask students to exchange the bookmarks
 in class, or pass around their bookmarks and individually present on their findings. You may ultimately leave the bookmarks in
 the school library for other students to see and use.

Biography Suggestions:

- I. Fossey, Dian. Gorillas in the Mist. Boston: Houghton Mifflin Co., 1983.
- 2. Galdikas, Birute M. Reflections of Eden: My Years with the Orangutans of Borneo. Boston: Little, Brown & Company, 1995.
- 3. Gallardo, Evelyn. Among the Orangutans: The Birute Galdikas Story. San Francisco: Chronicle Books, 1993.
- 4. Goodall, Jane. My Life With The Chimpanzees. New York: Pocket Books, 1988.
- 5. Jerome, Leah. Dian Fossey. Changing Our World Series. New York: Bantam Skylark, 1991.
- 5. Mowat, Farley. Woman in the Mists: The Story of Dian Fossey and the Mountain Gorillas of Africa. New York: Warner Books, Inc., 1987.
- 6. Powzyk, Joyce A. In Search of Lemurs: My Days and Nights in a Madagascar Rain Forest. Washington, D.C.: National Geographic Society, 1998.

Assessment Criteria: The student is able to extract essential information from a literary text, and write a summary to impart information to an audience.

Extensions:

- You may select wildlife scientist biographies that are unrelated to primate studies to broaden the list of possibilities for students.
- Start a class discussion with your students about the work of their chosen primatologists. How has this exercise affected their perception of science research in the field? What kind of challenges did they identify for field research? Are they excited by the challenges of field work or turned off by them? Why?

Skills used in this activity

- Analyzing, interpreting, and synthesizing information from a literary text
- Writing to impart information to an audience
- Identifying and assessing scientific methodology

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2.3: How does environmental disturbance affect an ape population? (M, G, S)

Materials: Per student: one sheet of graph paper, one copy of "How does environmental disturbance affect an ape population?" worksheet, pencil

Objective: The student will be able to translate the given data into graph form and analyze his or her graph in order to explain the consequences of environmental disturbance on an ape population.

Procedure:

- Give each student one sheet of graph paper and one copy of the accompanying worksheet.
- You may want to review with students the concept of an activity budget, and speculate with the class on why it might be important to researchers to have this information. An activity budget shows the proportions of time a population or individual animal spends doing different activities, such as resting, feeding and traveling.
- As a class, or on their own, students should read and answer worksheet part one.
- Now, review instructions for worksheet part two. Emphasize the list of expected information for their final graph product.
- When students have completed graphing their data, have them read and answer worksheet part three. You may want to discuss their answers as a class.

Assessment Criteria: The student creates a fully labeled graph of a reasonable scale that accurately reflects the given data. The student assesses the meaning of the data and supports any explanations offered.

Extension: How many years have passed since this data was collected in 1986? Pretend that you are a group of researchers returning to Malaysia to create an activity budget for this population. What new information will you want to research before starting your observations? What predictions do you have for the results of the new activity budget you will create from your observations?

Skills used in this activity

- Translating data into new form
- Designing a graph with multiple sets of data
- Comparing sets of data
- Making connections between environmental and behavioral phenomena of a population

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Worksheet: How does environmental disturbance affect an ape population?

An **activity budget** shows the proportions of time a population or individual animal spends doing different activities, such as resting, feeding and traveling.

I. What factors might affect an animal's activity budget on a given day? Consider how your behavior might differ on a sunny day from on a rainy day, for example. List two daily factors that might affect an animal's behavior, and what effect they might have.

Environmental Disturbance And Activity Budgets

Major habitat disturbance can have a significant effect on an activity budget for a wild population of a species.

Below you will find the activity budget for a population of white-handed gibbons, *Hylobates lar*, a species of lesser ape found in Malaysia. This population suffered a major habitat disturbance as a result of selective logging.

- 2. Using the "Before Logging" and "After Logging" data below, construct one double bar graph that incorporates both sets of data.
 - I. Title your graph
 - 2. Determine and name your axes
 - 3. Design an appropriate scale
 - 4. Construct a key to differentiate the data sets
 - 5. Graph your data

Activity Budgets for Hylobates lar

Before Logging

Activity Type	Activity Time
Rest	60%
Feed	10%
Travel	20%
Sing	10%

After Logging

Activity Type	Activity Time
Rest	80%
Feed	5%
Travel	10%
Sing	5%

Resource: Johns, Andrew D. June 1986. "Effects of Selective Logging on the Behavioral Ecology of West Malaysian Primates." Ecology, Vol. 67, No. 3. The Ecological Society of America, 684-694.

3. CRITICAL THINKING: How do you explain the changes in their activity? How do you think these changes might affect the reproductive success and/or survival of this species? What other information might be important for analyzing the impact of logging on gibbon activity?

2.4: How is an ape's diet related to the diet of other organisms sharing the same habitat? (**R**, **S**)

Materials: Per group: access to research materials, including computer, Internet, library, or animal fact sheets from Woodland Park Zoo (available at www.zoo.org); paper; pen.

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Objective: The student will be able to describe a food web in which a chosen ape species serves a role in order to contextualize ape diet and environmental interactions.

Procedure:

- Begin by discussing as a class the concept of a food chain. Food chains generally start with **producers**—organisms that can produce their own food. Ask students to name several producers. The amount of energy available is greatest at this **trophic level**.
- Have students identify the next step in the food chain. Introduce the term **consumer**—an organism that cannot produce its own food, and must obtain its energy by feeding on other organisms. What kinds of consumers are there? Discuss herbivores, omnivores, and carnivores. It may be useful to help students classify terms such as "frugivore" (fruit eater), "folivore" (leaf eater) and "insectivore" (insect eater) into these three main categories. Where do students fit into this chain? How do they classify their personal diets?
- Finally, introduce the concept of decomposers, who are essential to the food chain because they break down dead and decaying animal and plant matter, recycling nutrients into the soil for producers to use.
- Each level of consumption within the food chain represents a trophic level, and as the food chain continues, the general amount of energy level diminishes. Can students explain why this happens?
- Now ask students to describe a food chain of local wildlife, describing at least a five-link chain that includes producers, primary, secondary, and tertiary consumers, and finally decomposers.
- Expand the concept of the food chain by introducing the concept of the food web to your students. Most food chains within a community are interconnected, as organisms often have variation in their diet. A food web is the interconnections of food chains within a habitat.

Student Task:

- Ask students to pair into groups. Have students research the diet of a chosen ape species. Students should record this in the form of a food chain.
- Now ask students to identify at least two other organisms sharing a habitat with the chosen ape species. Students will create a food chain for these organisms as well. They will then combine this information, diagramming a food web showing all of the possible interconnections between the identified organisms. Each organism should be labeled clearly, and lines and arrows should be drawn so that the arrow points to the animal that does the consuming.

Extensions:

- Ask students to share their food webs with another group who used the same ape species. How many different organisms are represented between the two food webs being compared. Can they work together to create one food web that combines both?
- Conclude with some discussion questions:
 - I. What would happen if all organisms were consumers? How would the world be different?
 - 2. What would happen if all organisms were producers? How would the world be different?

Skills used in this activity

- Drawing scientific models
- Classifying organisms by diet
- Identifying interconnections and relationships among organisms within a given habitat

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Thinking Ahead

In order to begin the process of connecting environmental phenomena with physical phenomena, discuss the following with your students:

How might an ape's habitat relate to or affect its physical characteristics?

Consider, for example, where an ape makes its shelter, where it finds its foods, and its predator/prey relationships.