NATIONAL GEOGRAPHIC

Map
MEDIA SPOTLIGHT

For Teachers

Community Map

Oblique Birds'-Eye View

For the complete maps with media resources, visit:
http://education.nationalgeographic.com/education/maps/community-map/

Students in early elementary commonly draw their view of the world using the perspective seen in this map. Students can use maps with this perspective to begin to learn spatial concepts such as identity, location, and symbols. They should be given opportunities to practice with maps of familiar places, like a community. At this age, symbols should represent an object or place in the real world and be a recognizable icon to students. Abstract, unrelated symbols are not understood well at this age. Use the text and prompts below to explore the provided community map with students.

Try This!

A community is a place where people live, work, and have fun together. Look at this map of a community. It shows residential and business areas and some of the main streets and buildings in the community. It includes a map key with symbols.

Community buildings provide services for everyone who lives in the community. For example, everyone can borrow books from the library. Look at the map key to find the symbol for the library. Find the library on the map. What other places on the map provide services for the community?

Prompts:

- Name two streets that have a lot of houses.
- What does the paper bag symbol mean?
- This community has one bank. Find the bank on the map.
- Find the post office. Where is it located?
- Find the police station. Between what types of buildings is it located?
- In what direction would you travel to get from the post office to the farm?

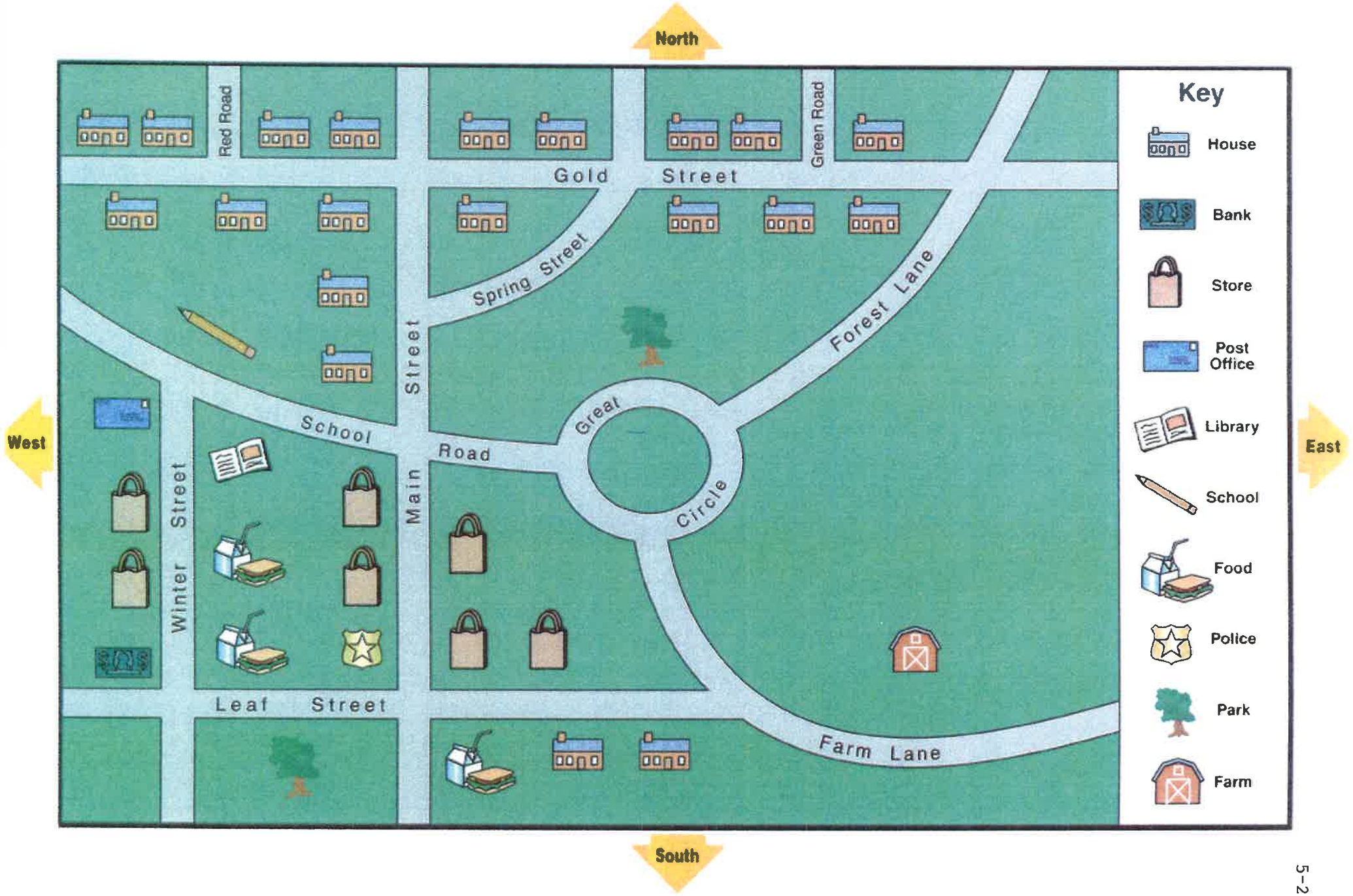
FOR FURTHER EXPLORATION

Books

- Sobel, David. *Mapmaking With Children: Sense of Place Education for the Elementary Years*. Portsmouth, NH: Heinemann, 1998.

NATIONAL GEOGRAPHIC

Community Map



NATIONAL GEOGRAPHIC

Map
MEDIA SPOTLIGHT

For Teachers

Neighborhood Map

Oblique Birds'-Eye View

For the complete maps with media resources, visit:
http://education.nationalgeographic.com/education/maps/neighborhood-map/

Students in early elementary commonly draw their view of the world using the perspective seen in this map. Students can use maps with this perspective to begin to learn spatial concepts such as identity, location, and symbols. They should be given opportunities to practice with maps of familiar places, like a neighborhood. At this age, symbols should represent an object or place in the real world and be a recognizable icon to students. Abstract, unrelated symbols are not understood well at this age. Use the text and prompts below to explore the provided neighborhood map with students.

Try This!

A neighborhood is a section of a town or city. Look at this map of a neighborhood. It shows residential and business areas and some of the main streets and buildings in the neighborhood.

Symbols on a map are drawings that stand for real things. This map doesn't have a key. How can you tell what the drawings mean?

Prompts:

- Find the grocery store. Where is it located?
- What street has no houses on it?
- The school is at the corner of two streets. What streets are they?
- Find the pet store. Between what types of buildings is it located?
- This neighborhood has a tall apartment building. Find it on the map.

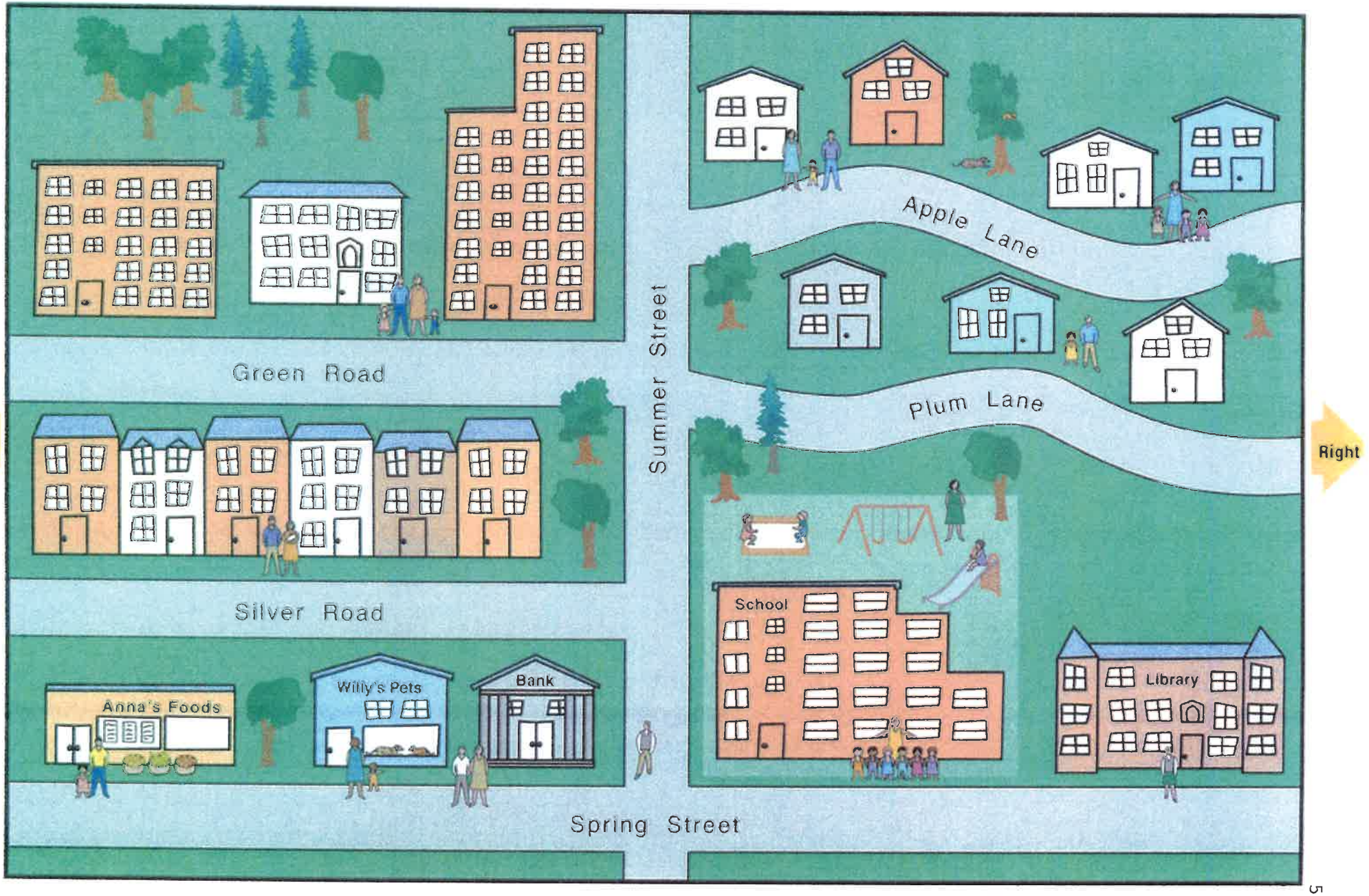
FOR FURTHER EXPLORATION

Books

- Sobel, David. *Mapmaking With Children: Sense of Place Education for the Elementary Years.* Portsmouth, NH: Heinemann, 1998.

NATIONAL GEOGRAPHIC

Neighborhood Map



Hopeville Map Questions

Grades 3-8
Time: 30 Minutes or more

This activity will help students with directions and reading maps. After practicing together through the first nine questions, challenge students with the remaining questions. Try pairing students up or in small groups to compete against each other.

1. What direction is Hopeville Library from the Angel Hotel?
2. How many parking areas are in Hopeville?
3. Approximately how far would you have to walk from Granville Primary School to Hope College?
4. Peter is outside the Council Offices in Sorrow Lane. What is his quickest route to the Hopeville Library?
5. Mark is at the Longhill Shopping Centre. What direction is the Tiddlers Nursery from him?
6. Where is the tourist information centre in Hopeville?
7. Sally is at the picnic site near to Green Park Road. What direction should she go if she wants to go to Hope College?
8. What is the shortest route from Hopeville Museum to the cathedral?
9. Dave has lost his cell phone. How many public phones are there for him to use in Hopeville?

Challenge Questions:

1. I am in Nursery Way facing west. If I go straight ahead at the roundabout, which road will I be on?
2. How many places of worship are there in Hopeville, including the cathedral?
3. Kate is in Cherry Park. What route should she take to get to the Council Offices?
4. What direction is the Green Park Visitor Centre from the parking area on Holy Street?
5. Approximately how far is Cherry Park from the Tiddlers Nursery?
6. Somebody stops you on Brooke Road asking how to get to Green Park Visitor Centre. What would you tell them?
7. The public telephone on Mango Lane is broken. What is the route to the closest public telephone?
8. Mark is on Joseph Street facing south. He turns right and then right at the next roundabout. Where is he now?
9. What route should Chris take to go from the Hopeville Library to the Angel Hotel?
10. Sally lives in Green Gardens. Approximately, how far is her house from the Longhill Shopping Centre?

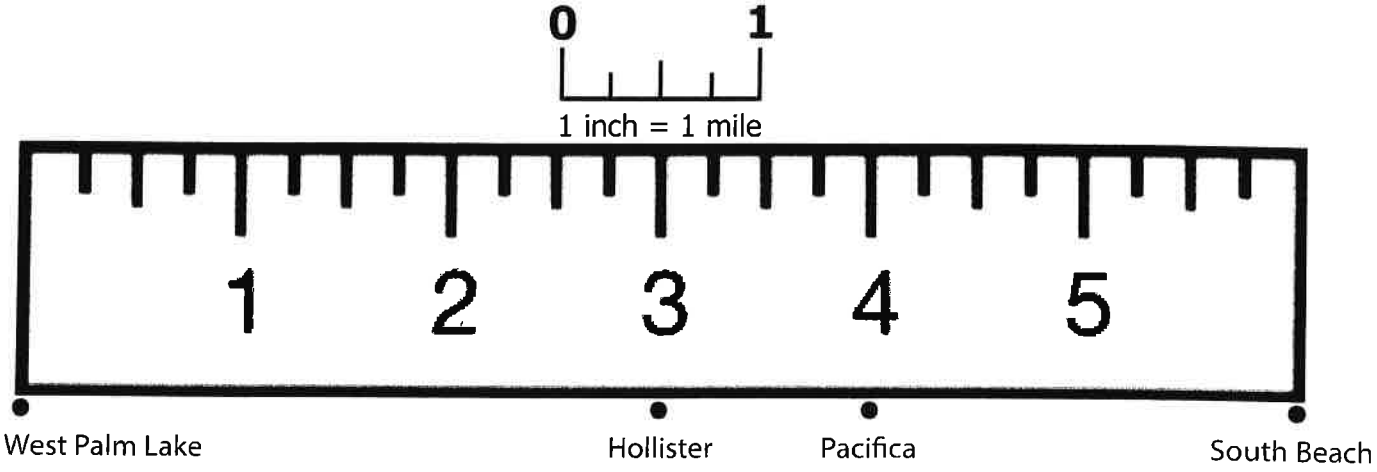
11. Derek is in the Mango Lange Car Park. He wants to go to the Golf Road Surgery. Which roads should he walk along to get there?
12. How many roundabouts are shown on this map of Hopeville?
13. Approximately how long is Windy Lane?
14. Steve is on Summer Street and he wants to go to the Leisure Centre. However, there is an accident on George Street outside the Primary School. What route should he take?
15. What direction is the Clean Lange parking area from Tiddlers Nursery?
16. What can be found on the corner of Cherry Road and Star Way?
17. Sam is at the Longhill Shopping Centre. Where is the nearest picnic area? What route will take him there?
18. What direction is the cathedral from Hopeville Museum?
19. What directions should the tourist information office give to people who want to go to Hopeville Museum?
20. Approximately how long is Merryweather Road?
21. Kerry is outside the public telephone on Merryweather Road. She goes south, turns right and then turns left. What road is she on now?
22. Paul has taken a wrong turn and is at the end of Regent Street. What directions should he take to the George Street Leisure Centre?
23. There are roadworks along Windy Lane. How can Matthew get from Jude Street to Cherry Park?
24. Kevin has to walk from Cherry Park to Hopeville Library and back. How far is his journey approximately?

Hopeville


Courtenay Industrial Estate
Courtenay Road
Clean Lane
Friend Road
George Street Leisure Centre
George Street
Hopeville Museum
Green Gardens
Dukes Place
Blue Way
Brooke Road
Narrow Road
Hipsley Street
Green Park Road
Pond Lane
Sharp Way
Green Park
Green Park Visitor Centre
Granville Primary School
Hopeville Library
New Road
Windy Lane
Hope College
Cherry Road
Cherry Park
Horse Road
Barton Street
Primrose Way
Turnmill Street
Pancake Road
Joseph Street
Jude Street
Helen's Lane
Mark Road
Autumn Lane
Brooke Road
Merryweather Road
Tiddlers Nursery
Nursery Way
Regent Street
Star Way
Archer Lane
Summer Street
Council Offices
Sorrow Lane
Buzz Gardens
Shallow Road
Cherry Road
Merryweather Road
King's Road
Holy Street
Longhill Shopping Centre
River Hope
Riverview
Mango Lane
Hope Way
East Way
Cross Avenue
Downs Road
Queen Street
Sherlock Hill
New Lane
Bendy Lane
Holland Street
Cup Street
Hatto Lane
Longhill Street
Low Road
Soul Street
Princes Road
Apple Road
Pod Street
Nameless Avenue
Golf Road
Golf Road Surgery
Angel Hotel
N
W
E
S
Key
Parking
Tourist Information
Picnic Site
Public Telephone
Public Convenience
Cathedral
Place of Worship
100m
© Teaching Ideas
www.teachingideas.co.uk
Map Background: © ThinkStock

Using a Map Scale

Maps use a scale to show sizes and distances in a way that people can understand.
A scale compares actual distance on the ground to distance on the map.
On the scale below, one actual mile is represented by one inch on the map.

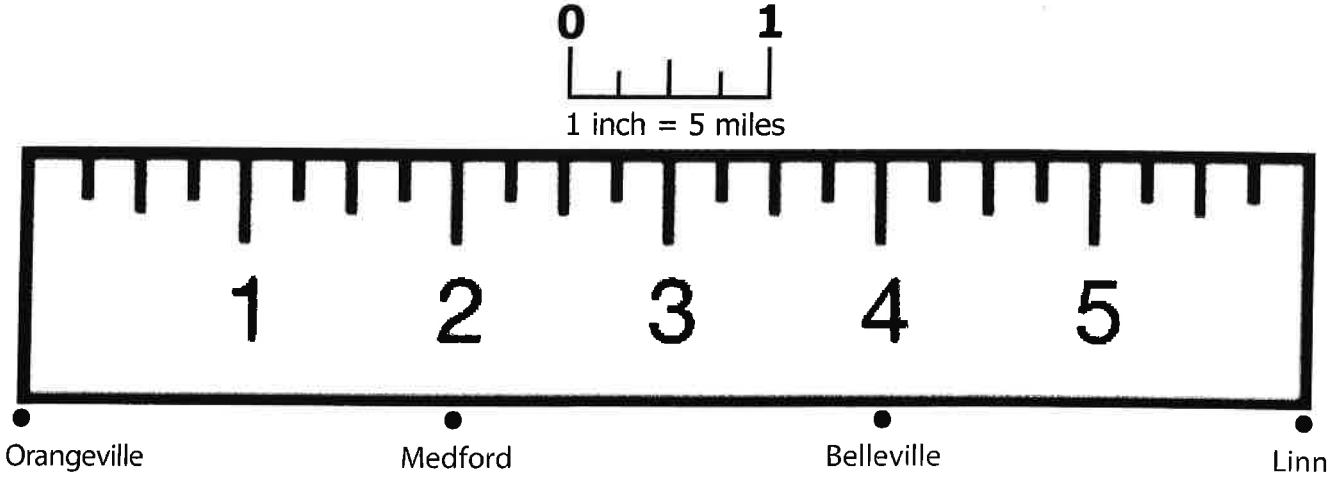


1. How many miles is it between West Palm Lake and South Beach?

2. How many miles is it between Hollister and South Beach?

3. How many miles is it between Pacifica and West Palm Lake?

On this scale, one inch on the map represents five miles.



4. How many miles is it between Medford and Belleville?

5. How many miles is it between Orangeville and Linn?

6. How many miles is it between Belleville and Orangeville?

Name: _____

Royal Castle Floor Plan

Write your name at the top of the Royal Castle Floor Plan map and follow the directions below.

1. When you enter the castle through the front door, you are in the living room.
Label this room LIVING ROOM and draw a sofa in it.

2. As you walk to the east from the living room, you enter the royal TV room.
Label this room TV ROOM and draw a television in it.

3. The largest room in the castle is the Queen's bedroom.
Label this room QUEEN'S BEDROOM and draw a bed in it.

4. Directly north of the Queen's bedroom is the queen's closet.
Label this room QUEEN'S CLOSET and draw a dress in it.

5. Directly west of the Queen's closet is the library.
Label this room LIBRARY and draw a book in it.

6. The smallest room in the castle is the bathroom.
Label this room BATHROOM and draw a bathtub in it.

7. Directly east of the bathroom is the kitchen.
Label this room KITCHEN and draw a stove and refrigerator.

8. The dining room is shaped like a circle.
Label this room DINING ROOM and draw a table in it.

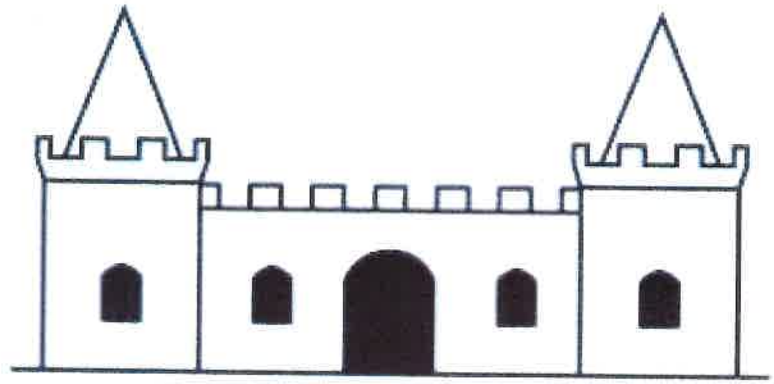
9. If you walk north from the kitchen, you enter the King's bedroom.
Label this room KING'S BEDROOM and draw a bed in it.

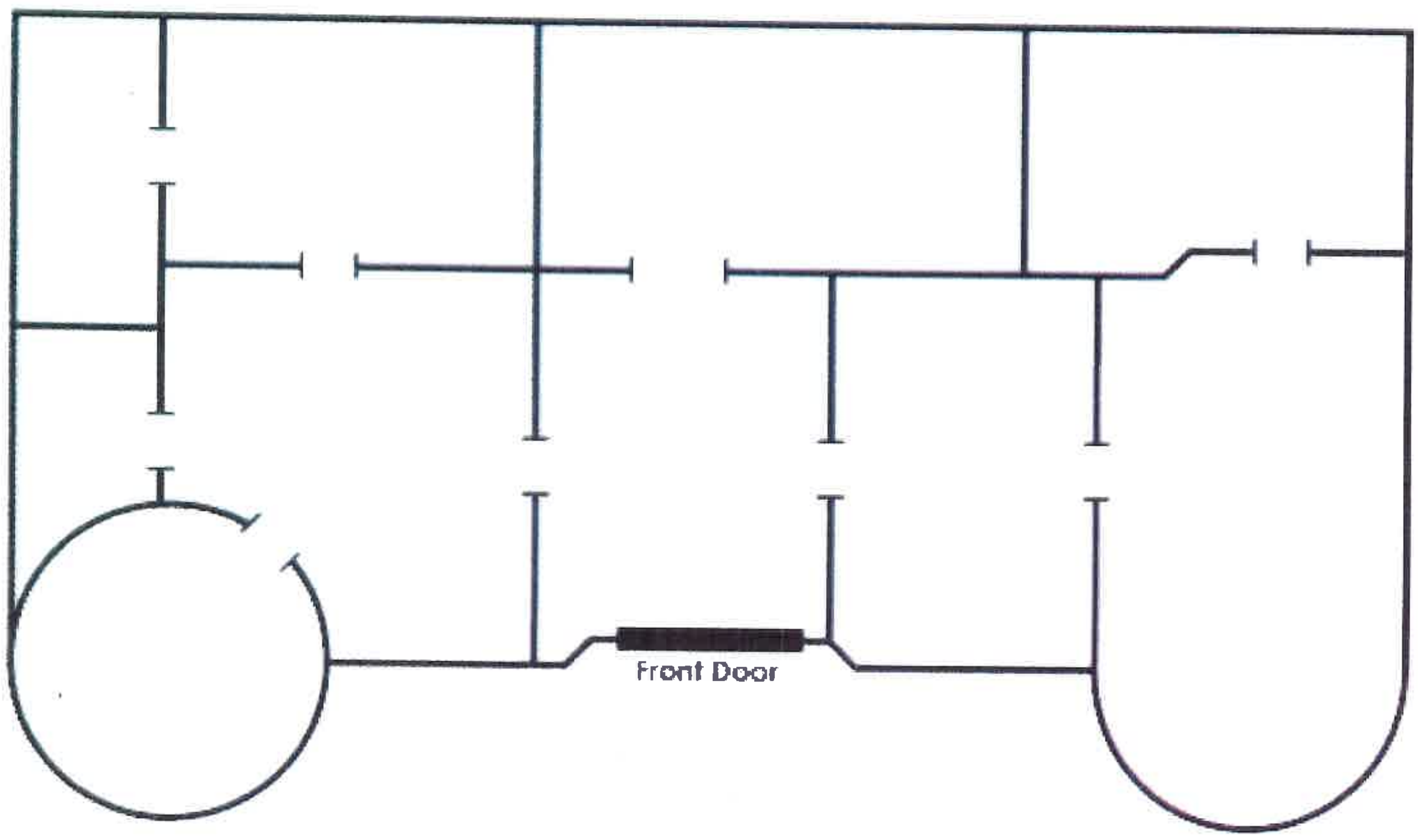
10. If you're in the King's bedroom and look to the west, you'll see the King's closet.
Label this room KING'S CLOSET and draw a shirt in it.

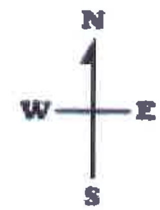
11. Outside the castle, just south of the front door, is a sidewalk.
Draw the sidewalk leading up to the front door.

12. The King and Queen decide to build a secret room in their castle. They will hide their jewels in this room. It will be a small room that is directly east of the queen's bedroom.
Draw the secret room and label it SECRET ROOM. Draw a crown in this room.

Royal Castle Floor Plan

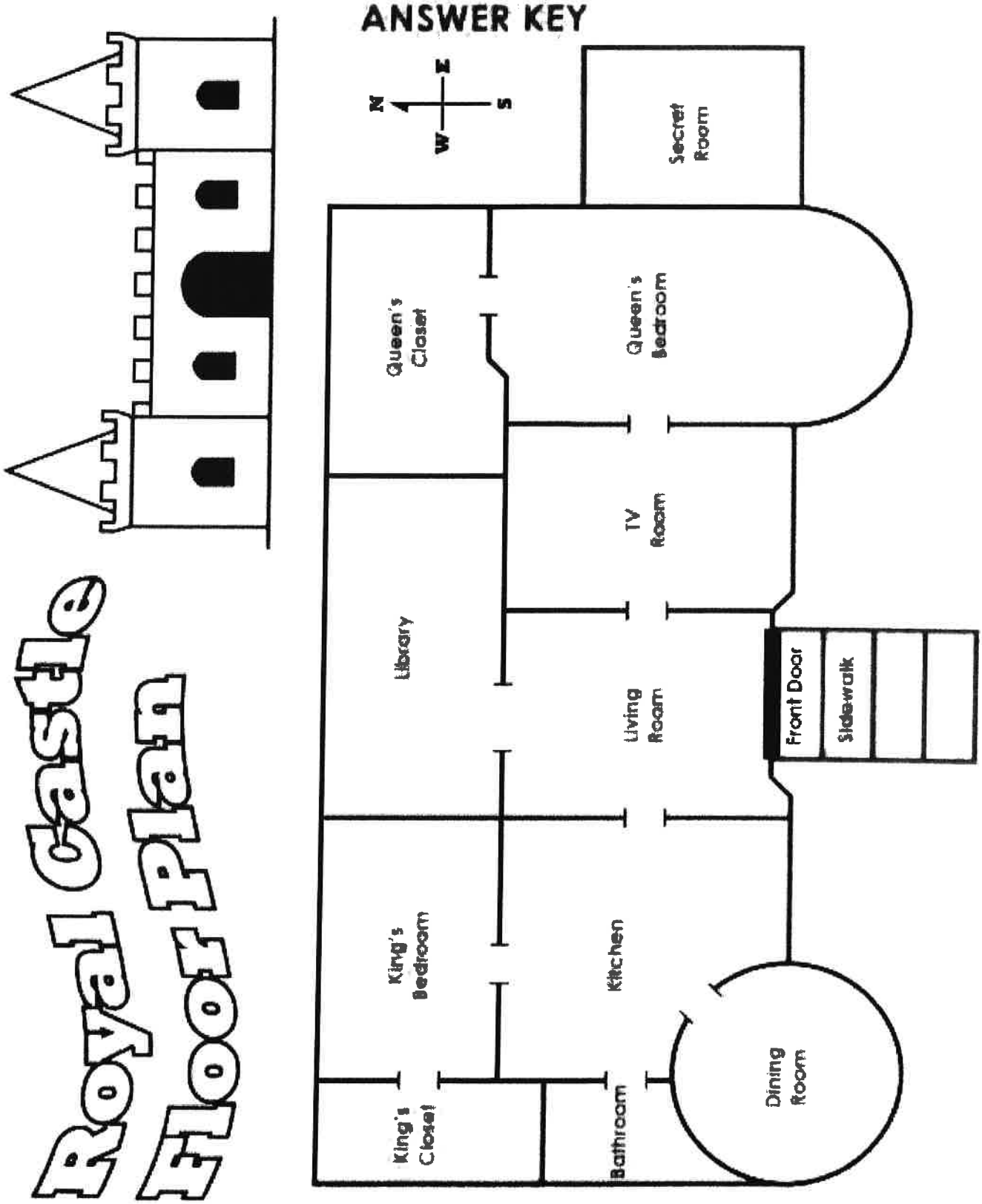






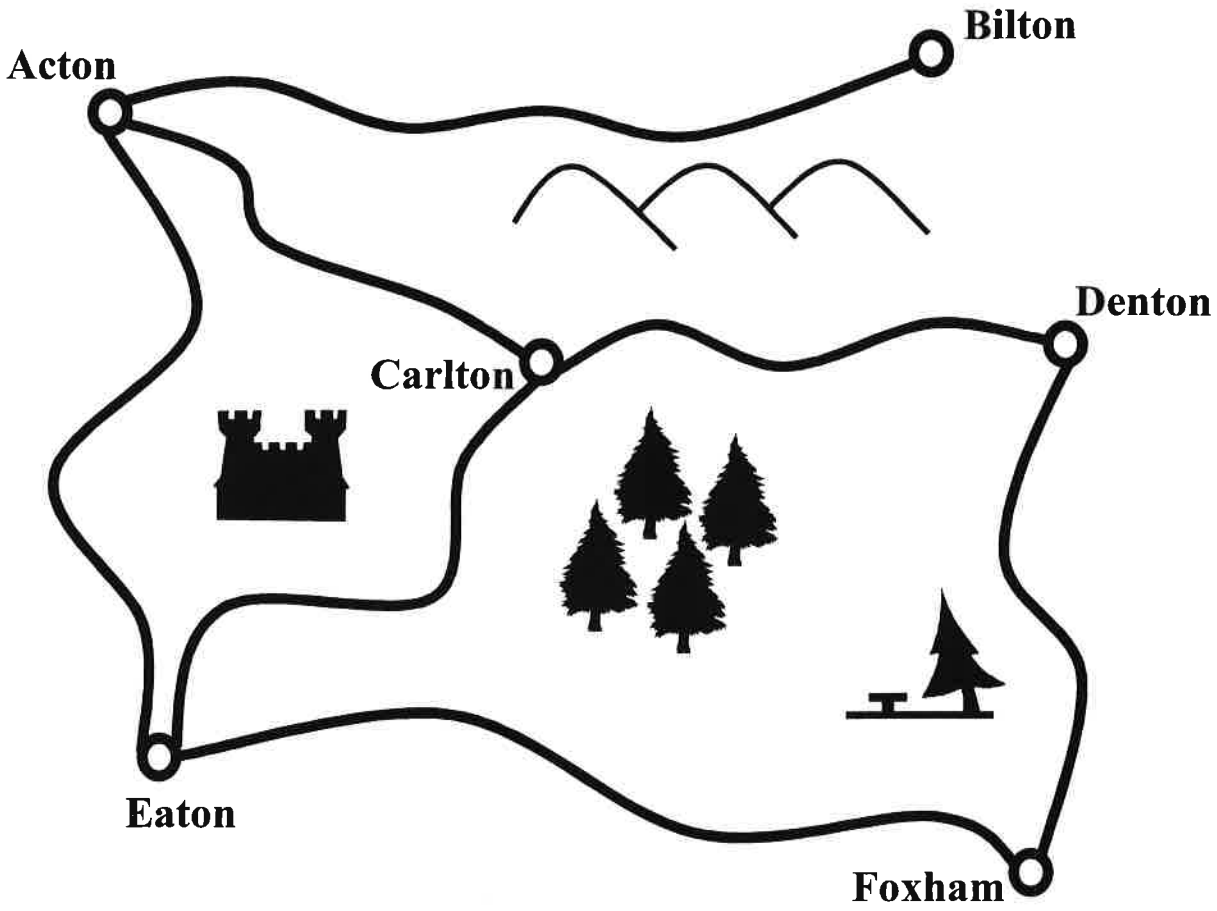
Royal Castle Floor Plan

ANSWER KEY



HOW FAR?

Scale: 1cm = 1km

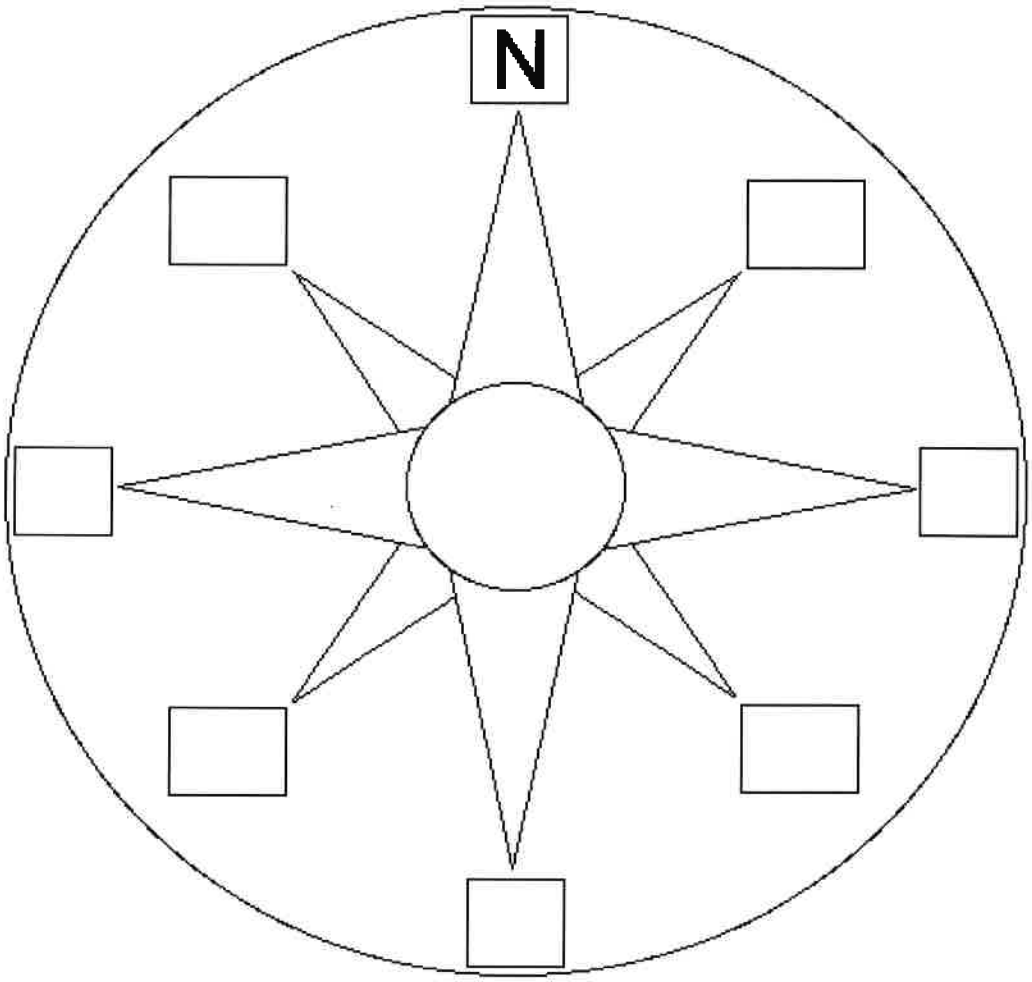


1. How far is it from Acton to Bilton? _____
2. What is the distance between Denton and Foxham? _____
3. How far is it from Eaton to Bilton? _____
4. What is the distance between Eaton and Foxham? _____
5. Which is the <u>shortest</u> distance between Carlton and Foxham?

   _____
6. What is the <u>difference</u> between the distance from Carlton to Denton, and the distance from Acton to Eaton? _____

Compass Rose

A compass rose is a design on a map that shows directions. It shows north, south, east, west, northeast, northwest, southeast, and southwest.



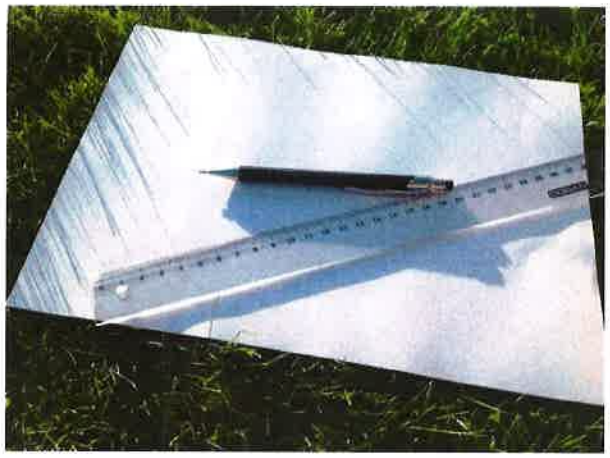
On the compass rose above, only north is filled in.

Fill in the rest of the directions on the compass rose, using the standard abbreviations:

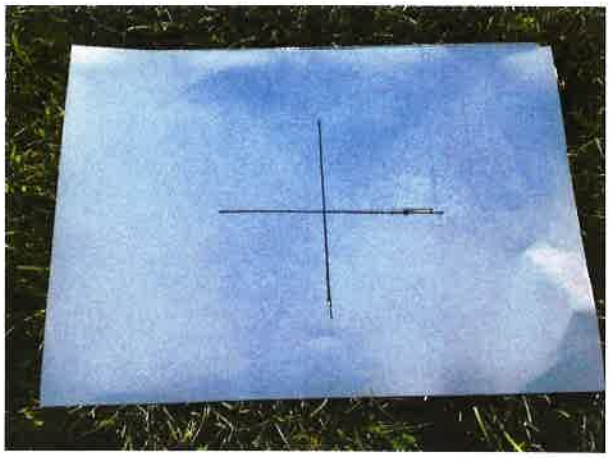
N=North, S=South, E=East, W=West, NE=Northeast, NW=Northwest, SE=Southeast, SW=Southwest.

HINTS: When north is at the top of the compass rose (as it often is), south is at the bottom, east is on the right, and west is on the left. Northeast is between north and east, orthwest is between north and west, southeast is between south and east, and southwest is between south and west.

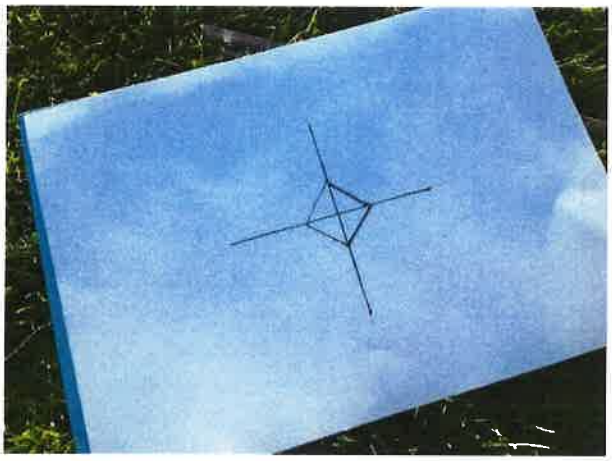
How to Draw a Beautiful Compass Rose



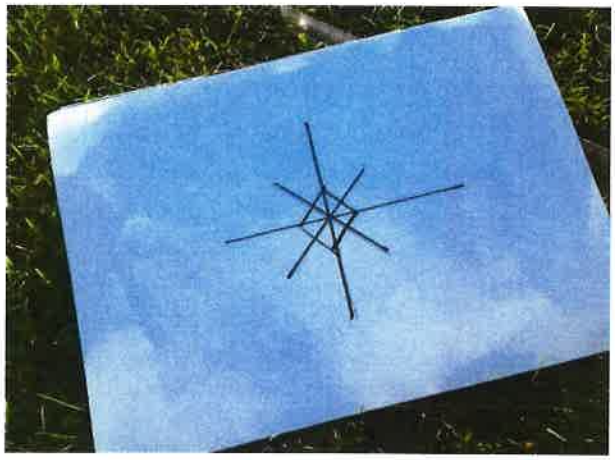
1. Supplies: Paper, eraser, color pencils, pencil, ruler, black pen



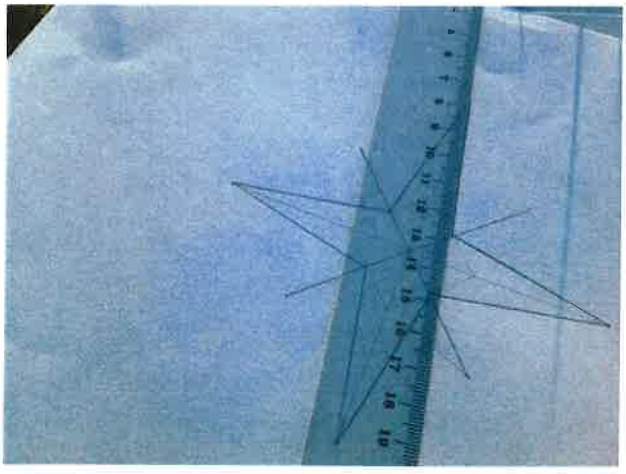
2. Draw a cross in the middle of the paper, use a ruler to make the lines straight and to measure the cross correctly. Each line is 6 centimeters from the middle.



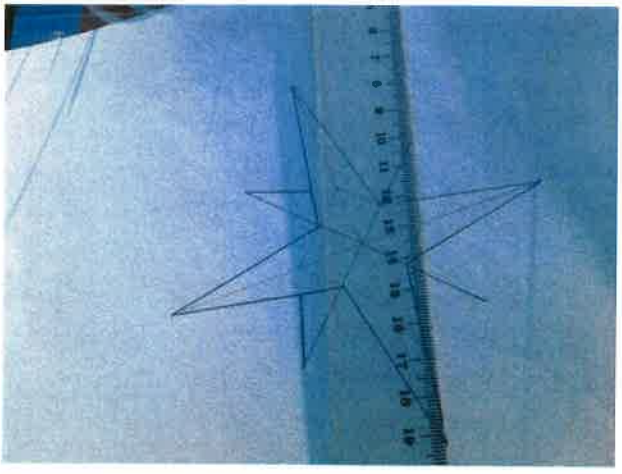
3. Make a perfect square using the ruler- measure 2 centimeters from the middle.



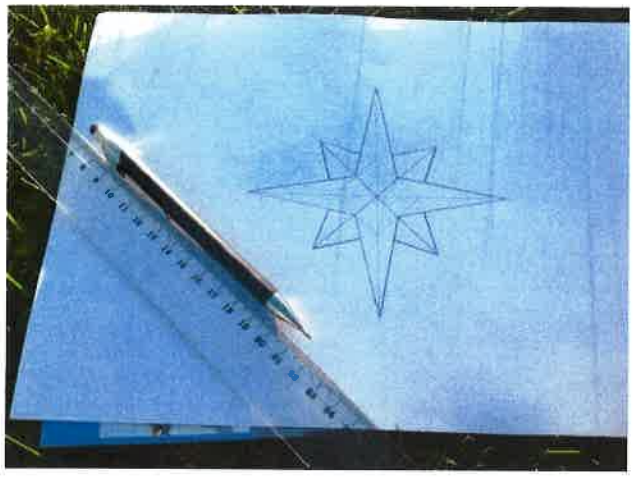
4. Measure the exact middle of each side of the square and mark it. Draw a straight line through the marks using the ruler. Each line should be about 4 centimeters from the middle.



5. Next, make the big star. Use the ruler and make a straight line from the tip of the star to the middle of the square.

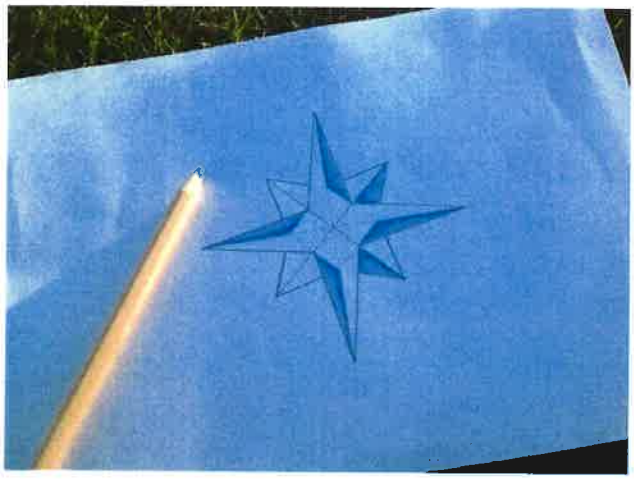


6. Now, the little star "behind" the big star. Make a straight line form the tip of the star to the corner of the square.

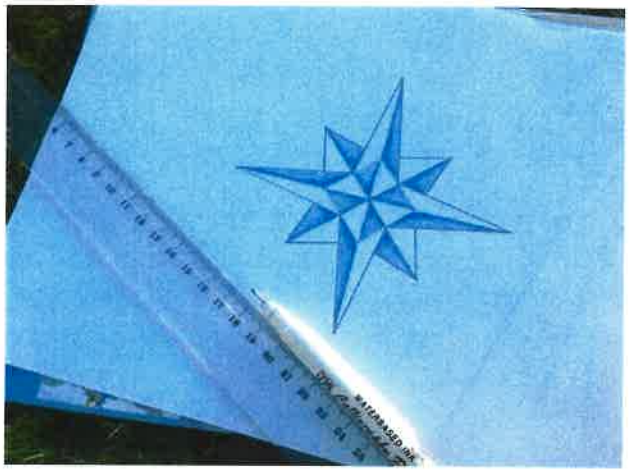


7. A very straight and nice compass rose, maybe some color???

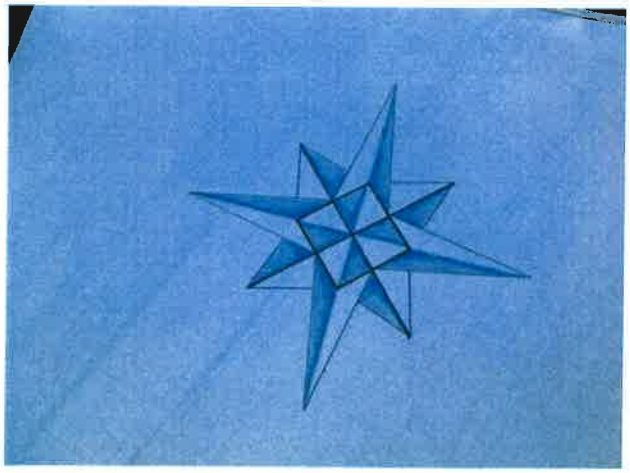
8. Markers are okay, but color pencils are best.



9. Press the pencil harder in the middle and then soften it up as you get to the edge of the star. This creates the illusion of depth, make it more vivid.



10. Continue the procedure in every other part of the star.

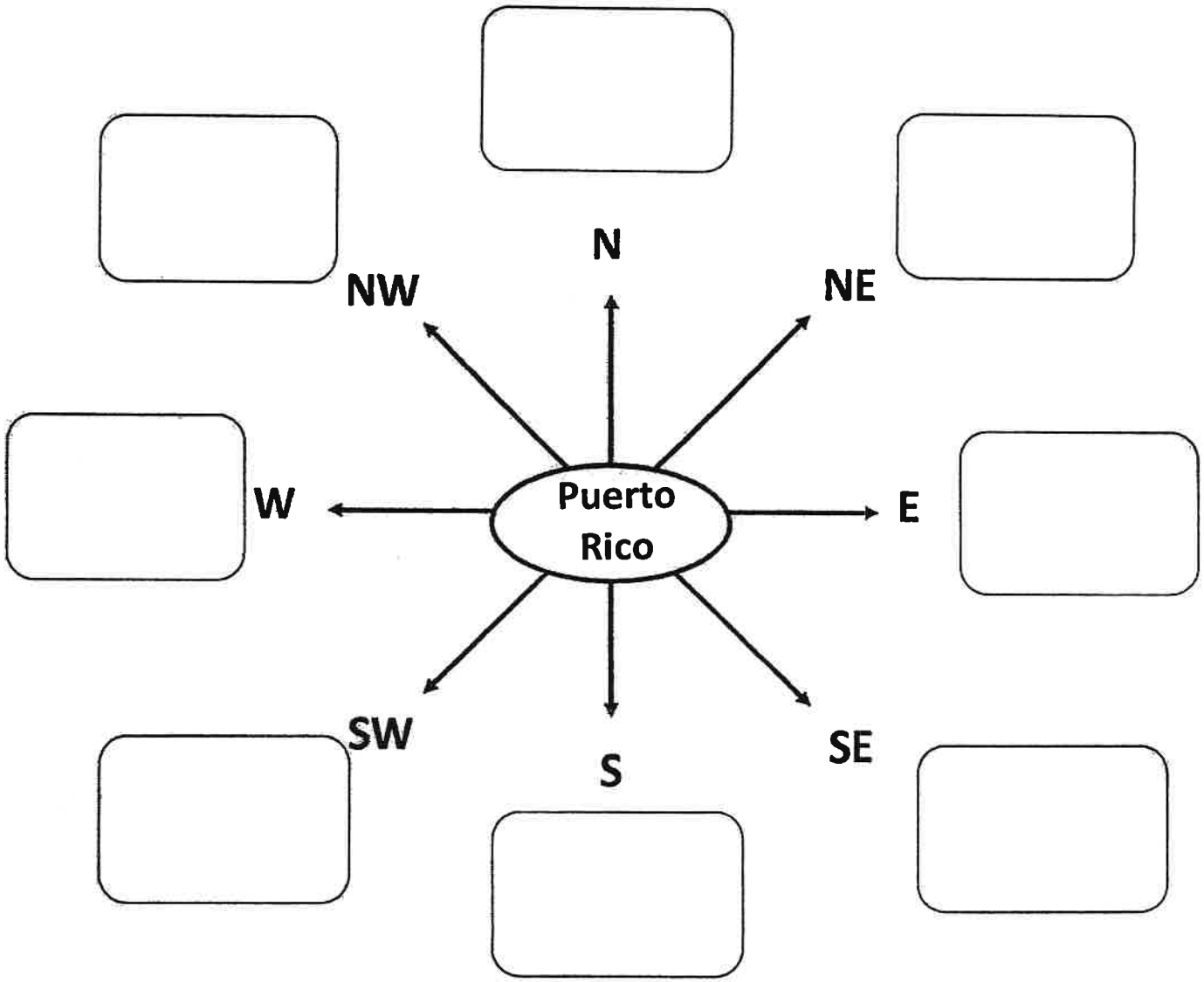


11. Last step, use a narrow black pen. Use a ruler to make line as straight as possible. Be careful not to smudge the black lines with your fingers.

12. Now, add N, NE, NW, W, E, S, SE and SW.

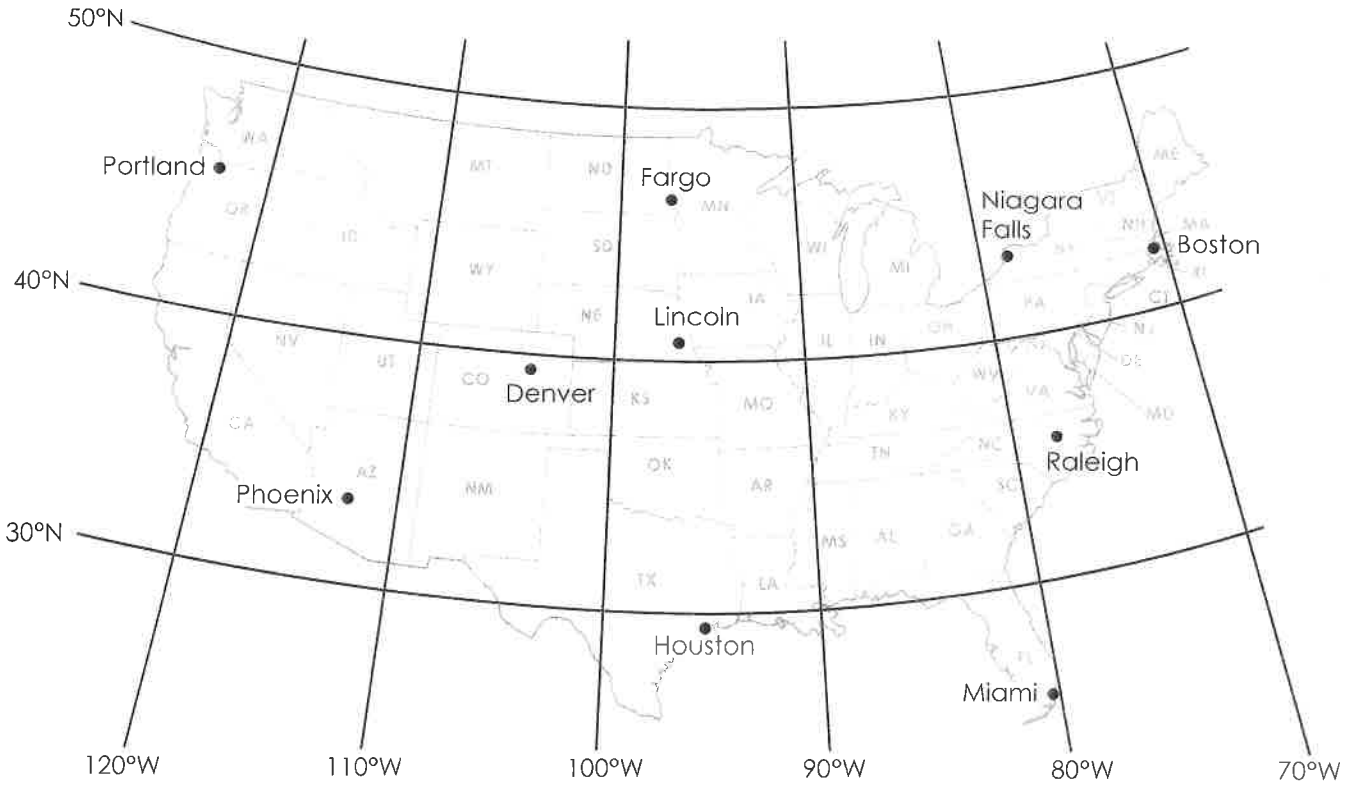
Compass Rose Map: Puerto Rico

For each direction on the compass rose, list geographical features that are located that direction from Puerto Rico.



Name: _____

Latitude and Longitude

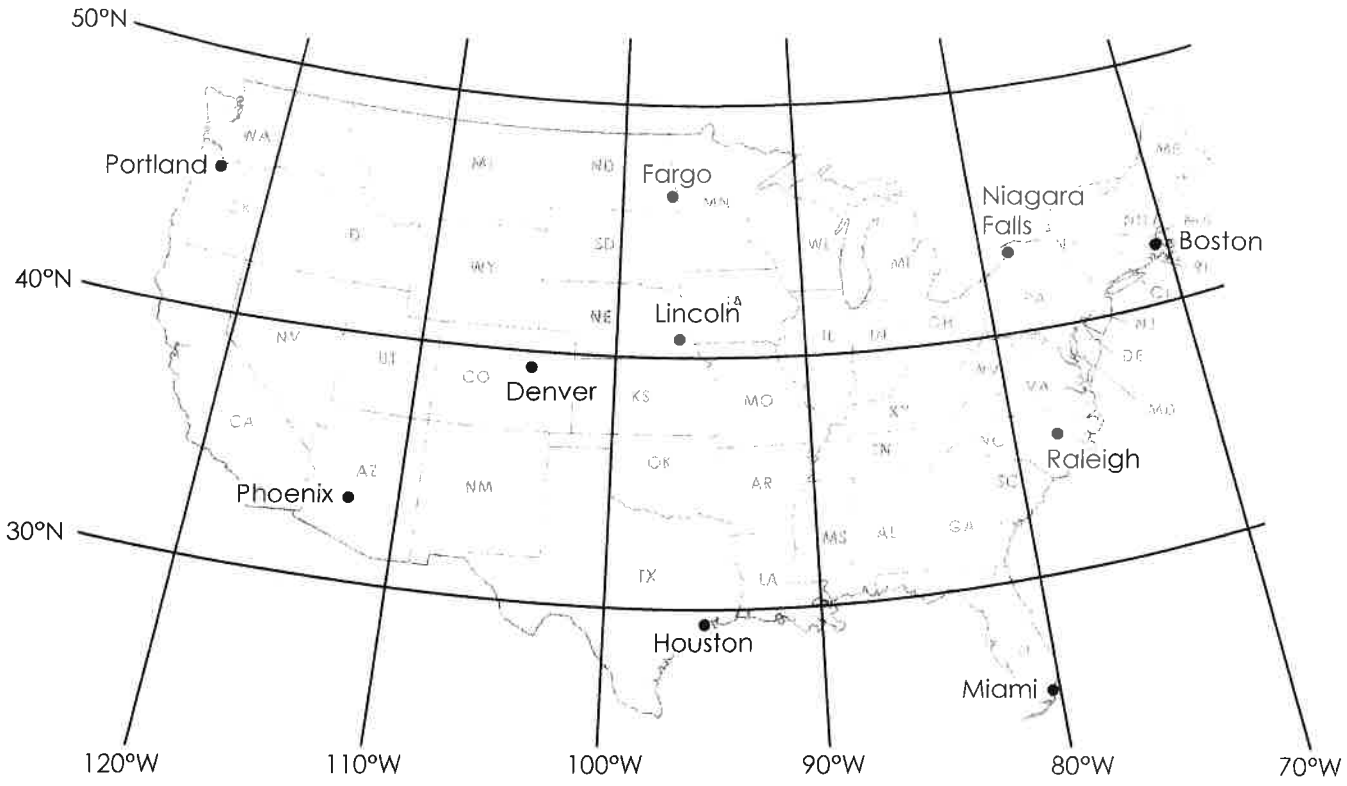


Write the name of the city and state found at the given latitude and longitude coordinates.

1. 33°N latitude, 112°W longitude _____
2. 35°N latitude, 78°W longitude _____
3. 46°N latitude, 96°W longitude _____
4. 45°N latitude, 122°W longitude _____
5. 29°N latitude, 95°W longitude _____
6. 43°N latitude, 79°W longitude _____
7. 25°N latitude, 80°W longitude _____

ANSWER KEY

Latitude and Longitude



Write the name of the city and state found at the given latitude and longitude coordinates.

1. 33°N latitude, 112°W longitude — **Phoenix, Arizona**
2. 35°N latitude, 78°W longitude — **Raleigh, North Carolina**
3. 46°N latitude, 96°W longitude — **Fargo, North Dakota**
4. 45°N latitude, 122°W longitude — **Portland, Oregon**
5. 29°N latitude, 95°W longitude — **Houston, Texas**
6. 43°N latitude, 79°W longitude — **Niagara Falls, New York**
7. 25°N latitude, 80°W longitude — **Miami, Florida**

World Latitude and Longitude Activity

NAME_____

Using the world longitude and latitude map printout, answer the following questions and mark the locations.

1. Draw a red line along the equator (0 degrees latitude).

2. Draw a purple line along the Prime Meridian (0 degrees longitude).

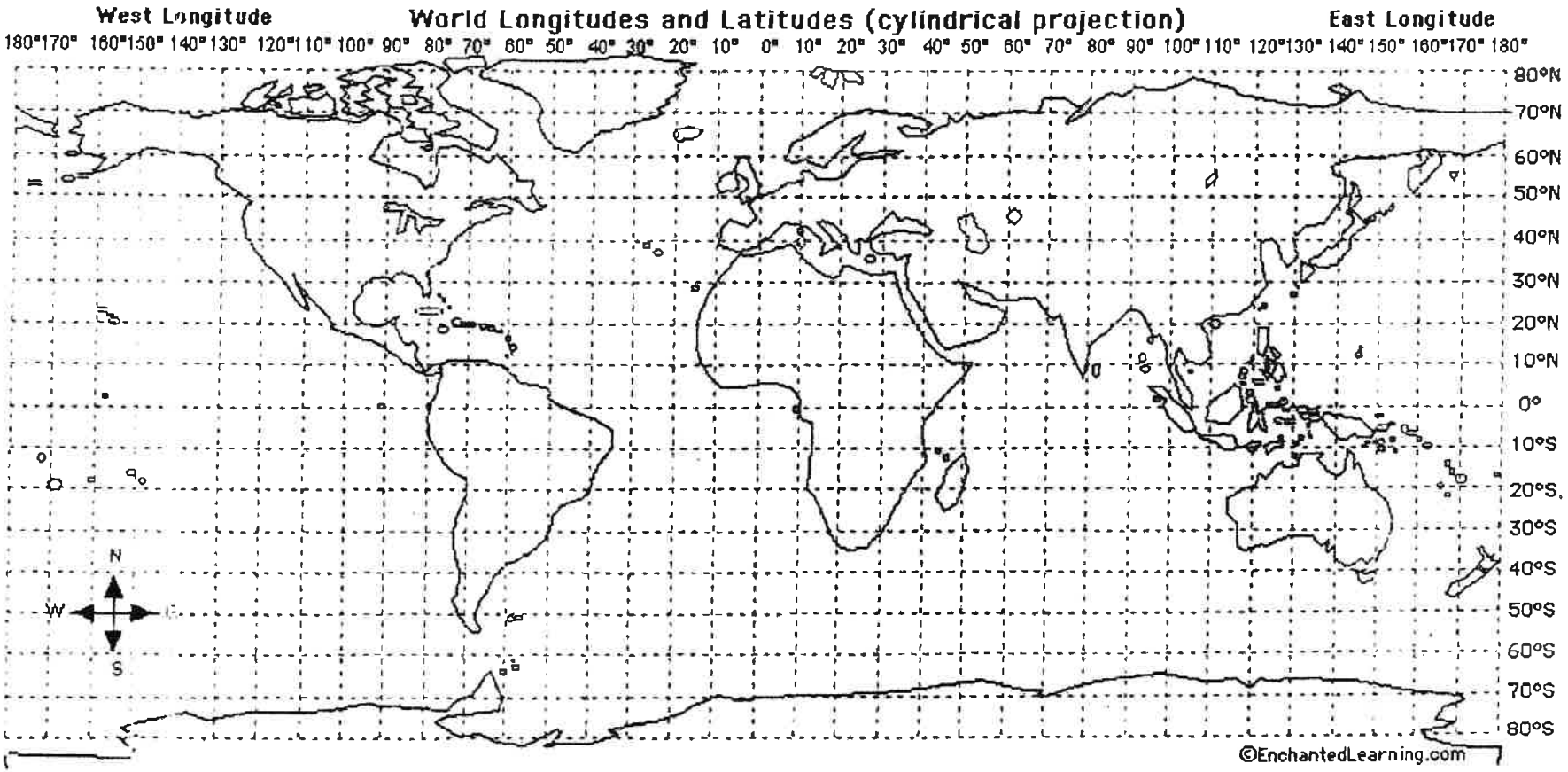
3. In which ocean is the location 10 degrees S latitude, 75 degrees E longitude located? Mark it on the map with a blue "X" and write the name of the ocean.

4. In which ocean is the location 30 degrees N latitude, 60 degrees W longitude located? Mark it on the map with a blue "Y" and write the name of the ocean.

5. Mark the following cities on the map in red:

B. Beijing: 40°N, 116°E
C. Cairo: 30°N, 31°E
CT. Cape Town: 34°S, 18°E
H. Hong Kong: 22°N, 114°E
J. Jakarta: 6°S, 106°E
LA. Los Angeles: 34°N, 118°W
LI. Lima: 12°S, 77°W
LO. London: 51°N, 0°W
MC. Mexico City: 19°N, 99°W
MO. Moscow: 55°N, 37°E
MU. Mumbai: 19°N, 72°E
NA. Nairobi: 1°S, 37°E
NO. New Orleans: 30°N, 90°W
NY. New York: 40°N, 74°W
R. Rio de Janeiro: 23°S, 43°W
SE. Seattle: 47°N, 122°W
SY. Sydney: 34°S, 151°E
TK. Tokyo: 35°N, 139°E
T. Toronto: 43°N, 79°W

Practice | A


West Longitude
World Longitudes and Latitudes (cylindrical projection)
East Longitude
180° 170° 160° 150° 140° 130° 120° 110° 100° 90° 80° 70° 60° 50° 40° 30° 20° 10° 0° 10° 20° 30° 40° 50° 60° 70° 80° 90° 100° 110° 120° 130° 140° 150° 160° 170° 180°
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Getting Geographic

Understanding Time Zones

Grade: 4th through 8th

Time: 30 minutes

Materials: Atlas or internet access

Is it really tomorrow in Tokyo? Understanding time zones is an important, but challenging concept for many students.

The need for standard time zones emerged with the spread of high speed transportation systems – first trains and later airplanes. In 1884, delegates from twenty seven countries met in Washington, DC at the Meridian Conference and agreed on a system of time zones that is essentially the one we still use today.

Time zones are based on the fact that Earth moves through 15 degrees of longitude each hour. Therefore, there are 24 standard time zones (24 hours x 15°=360°). Time zones are counted from the Prime Meridian (0° longitude), which runs through Greenwich, England. Each time zone is based on a central meridian, counted at 15° intervals from the Prime Meridian, and extends 7½° to either side of the central meridian. For example, New York City lies in the zone of the 75°W central meridian, and the time zone includes all locations between 67½°W and 82½°W.

Constructing a Time Zone Model

Distribute copies of the Activity #10 Handout to each student and instruct, as follows:

a) Turn the paper sideways so that the "holes" are at the top.

b) Use a colored pencil to trace over the line at the center of the paper and label this line "Prime Meridian.

c) Label the lines to the right (East) at 15° intervals up to 180°. Repeat to the left (West). Point out that each line represents one hour. Students should count hours plus to the east and minus to the west on their charts.

d) Use an atlas to determine the longitude of Stockton, CA and have students place a dot in the correct time zone on the chart.

e) Use an atlas to determine the longitude of Nairobi Kenya, Rome Italy, San Juan Puerto Rico and Tokyo Japan and have students place a dot in the correct time zone on the chart.

e) Use the chart (i.e., count the lines) to determine the time in each location labeled on the chart. Remind students that the new day begins when they pass midnight.

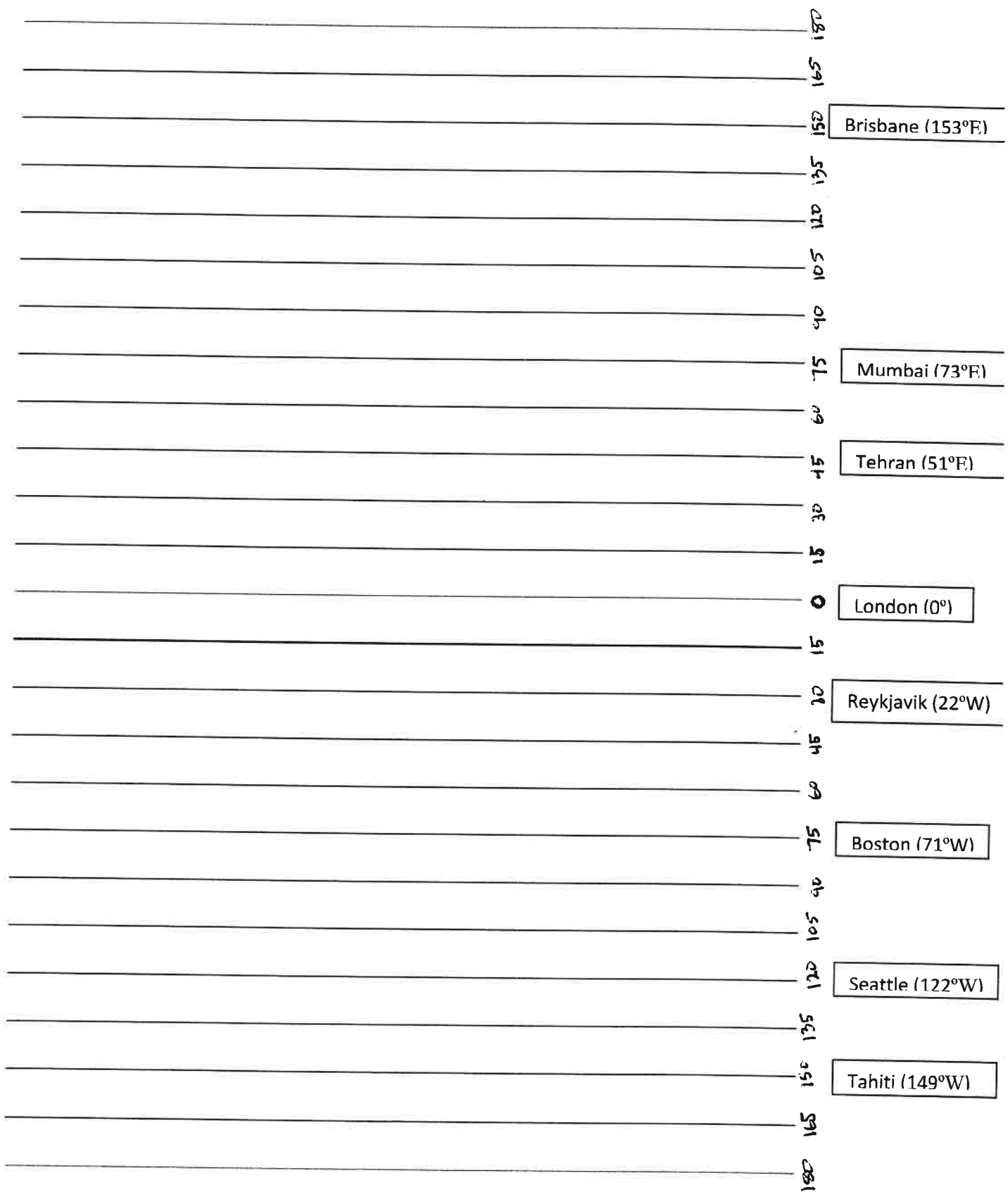
f) If it is 2pm on Monday in Stockton, CA what time will it be in Tokyo Japan? (7am Tuesday in Tokyo) So it really is tomorrow in Tokyo!

Extending the Activity

a) Explain that some countries adjust time zones for political reasons. Have students research actual time zones that vary from the model they have made (e.g., Australia, China, India, Liberia).

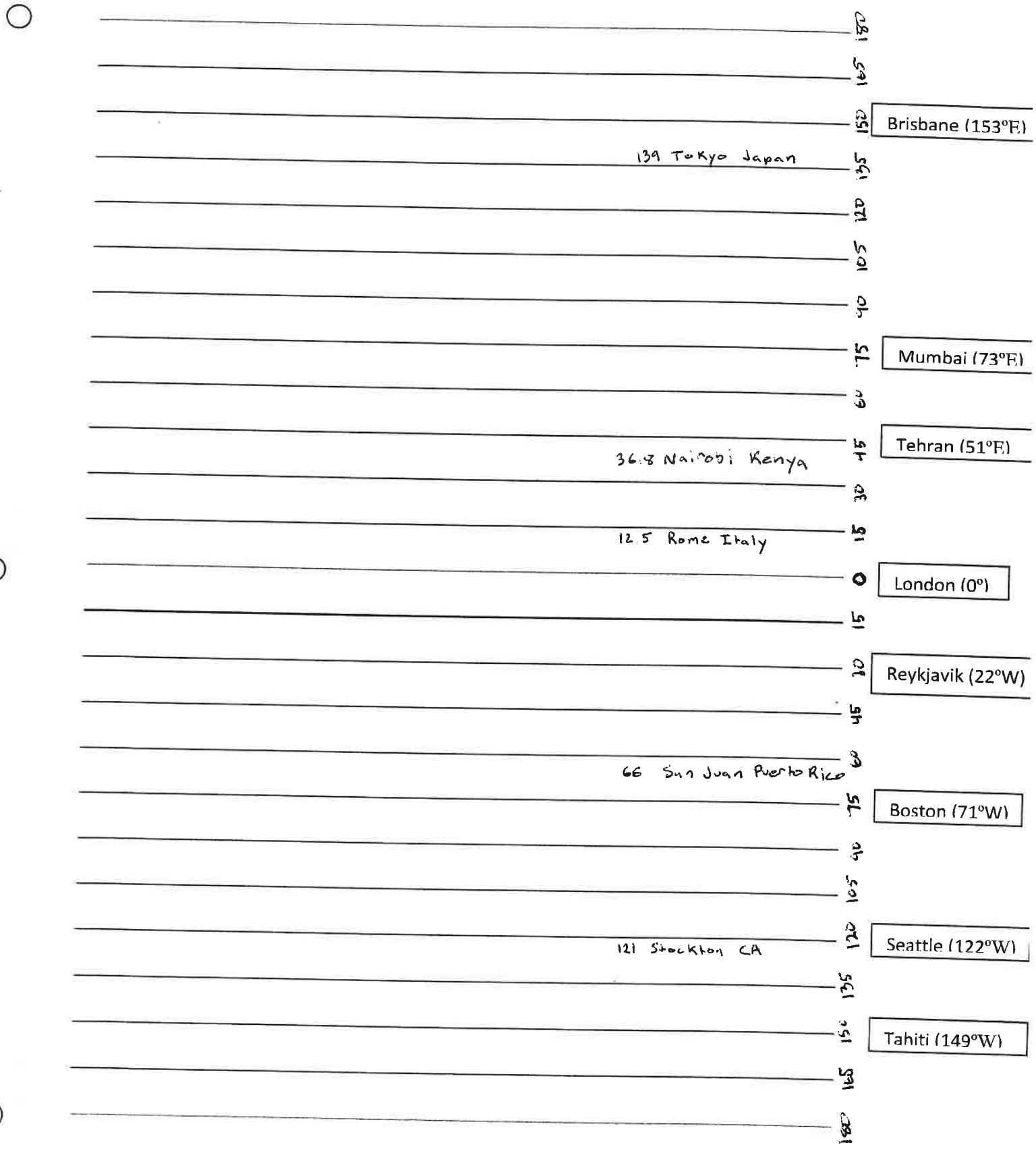
b) Have students research "daylight saving time."

Activity #10-HANDOUT



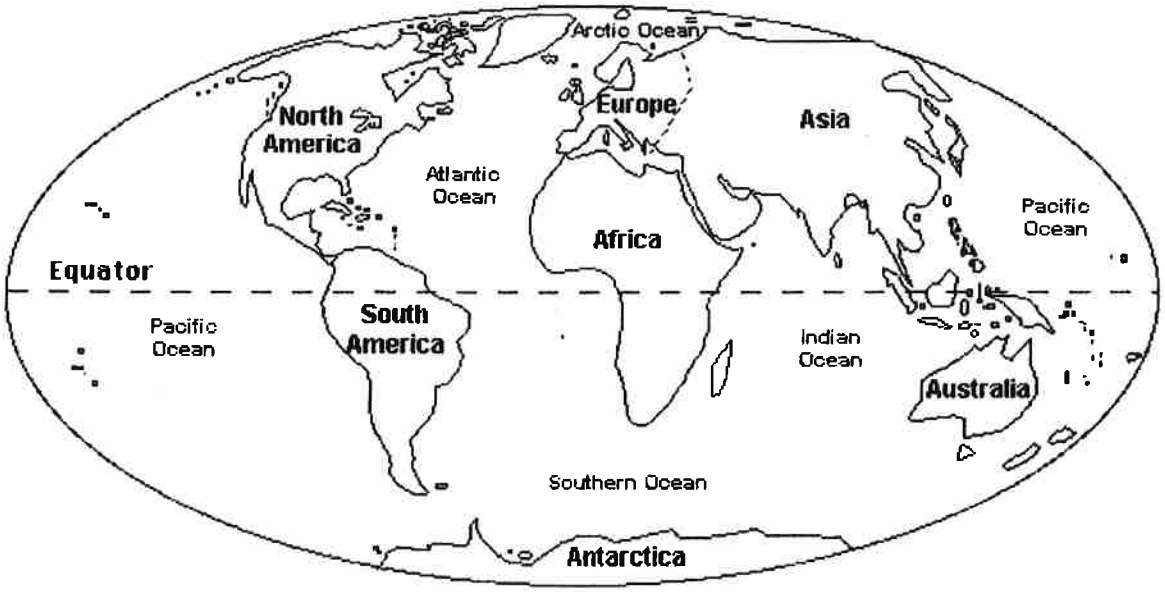
Key

Activity #10-HANDOUT



Continents

Follow the instructions below. **Name** _____



1. Color the continent of Africa green.
2. Color the continent of Antarctica white.
3. Color the continent of Asia yellow.
4. Color the continent of Europe red.
5. Color the continent of Australia brown.
6. Color the continent of North America orange.
7. Color the continent of South America pink.
8. How many continents are there? _____
9. Color the equator (a line) black.
10. Color the oceans blue.
11. I live on the continent of _____

_____

Label the Continents
Work with a partner

Read the definitions, and then label the map

□Africa
A continent that crosses the equator. It is south of Europe and is bordered by the Atlantic and Indian Oceans.

□Antarctica
The continent that surrounds the South Pole of the Earth.

□Asia
A continent in the Northern Hemisphere. Asia is attached to Europe (and east of it).

□Australia
A continent, an island, and a country in the Southern Hemisphere.

□Equator
An imaginary line that divides the Earth into Northern and Southern Hemispheres.

□ Europe
A continent in the Northern Hemisphere. Europe is attached to Asia (and west of it).

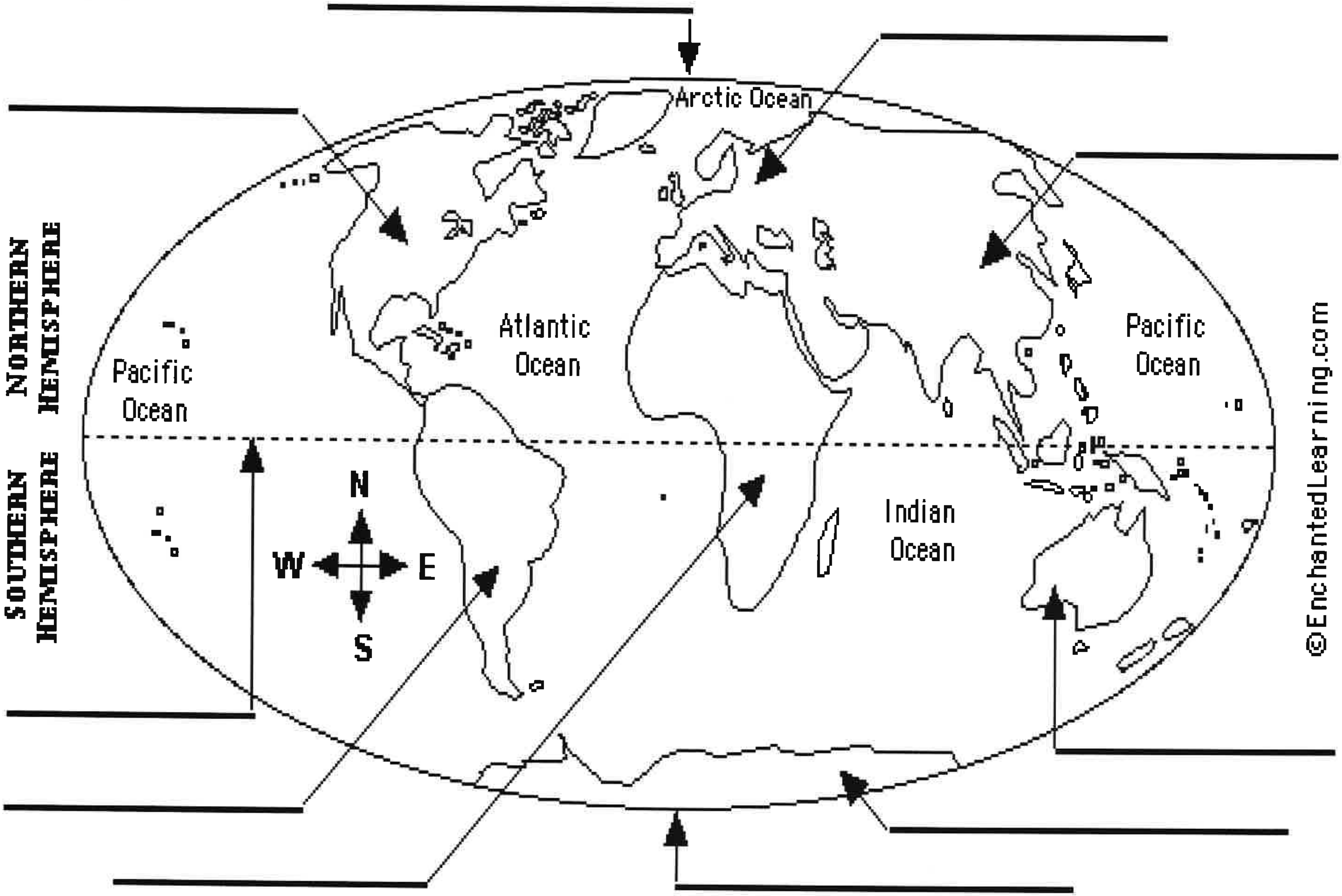
□North America
A continent in the Northern Hemisphere; it is north of South America. It is bordered by the Atlantic and Pacific Oceans.

□North Pole
The point that is the farthest north on Earth.

□South America
A continent that is mostly in the Southern Hemisphere. It is bordered by the Atlantic and Pacific Oceans.

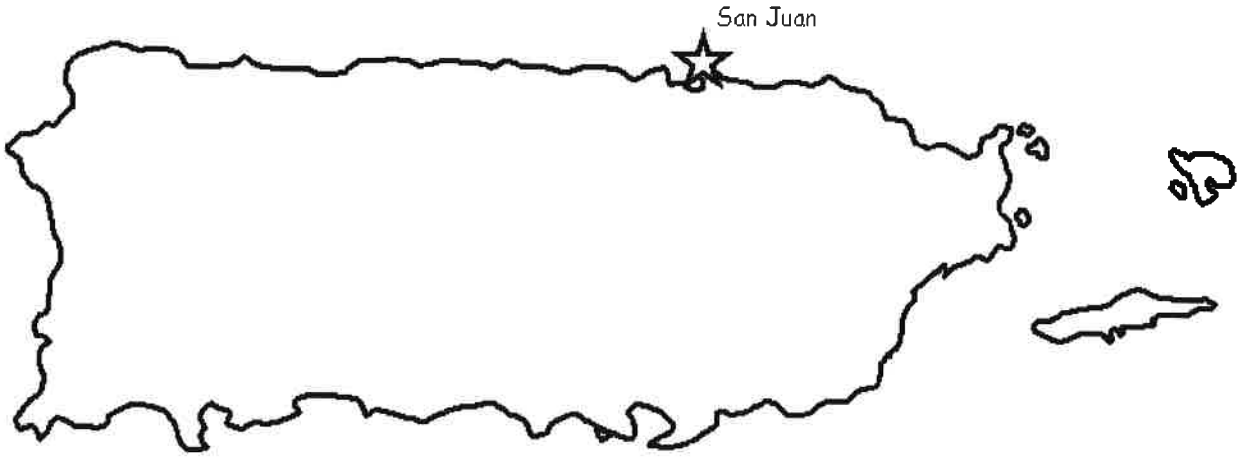
□South Pole
The point that is the farthest south on Earth

Where are Italy, Japan, Kenya and Puerto Rico located? On the map, write an "I" for Italy, "J" for Japan and "K" for Kenya, and a "P" for Puerto Rico.


Arctic Ocean
Atlantic Ocean
Pacific Ocean
Pacific Ocean
Indian Ocean
NORTHERN HEMISPHERE
SOUTHERN HEMISPHERE
N
W
E
S
©EnchantedLearning.com

Puerto Rico

Atlantic Ocean

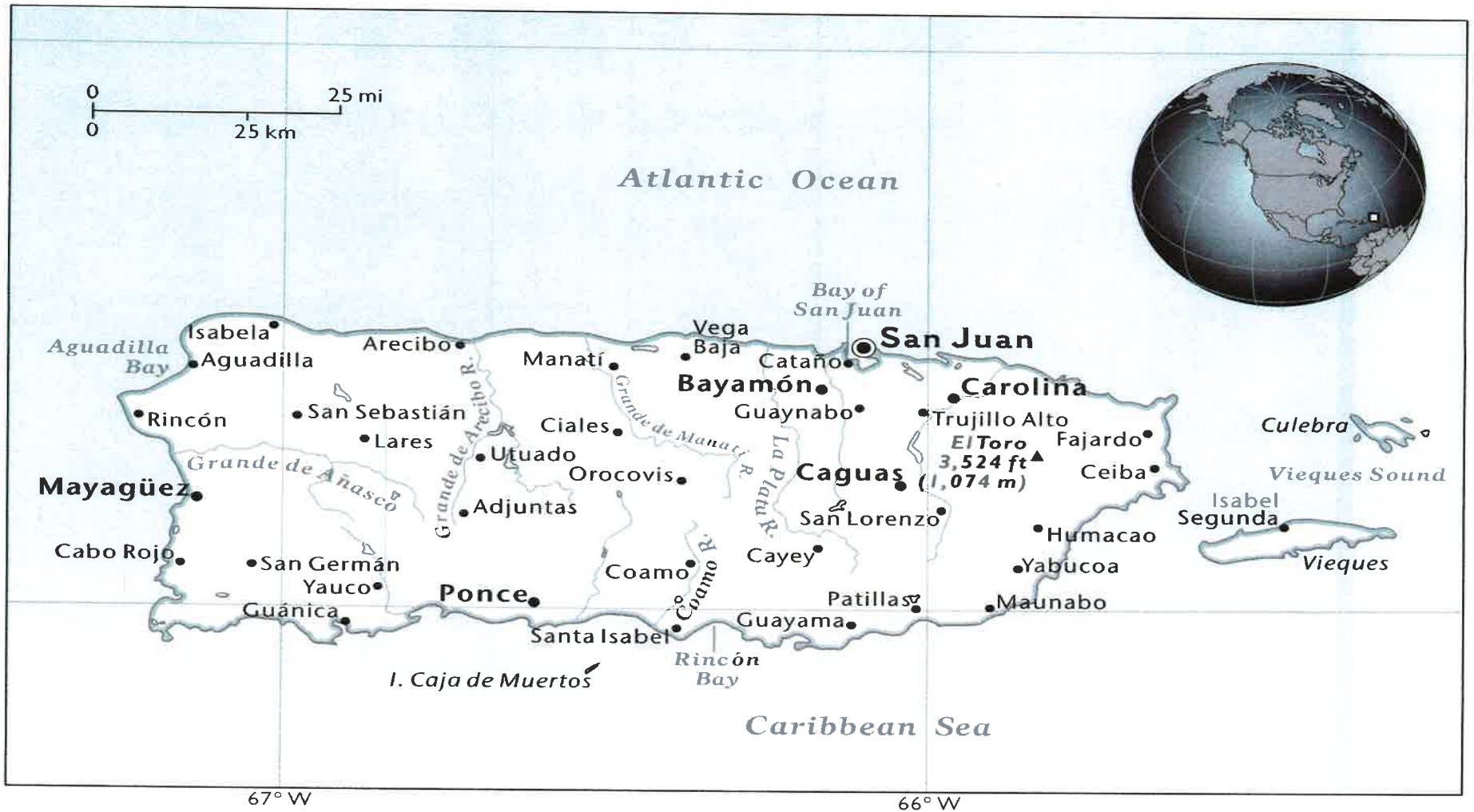


Caribbean Sea

Write some of the things you've learned about Puerto Rico below:

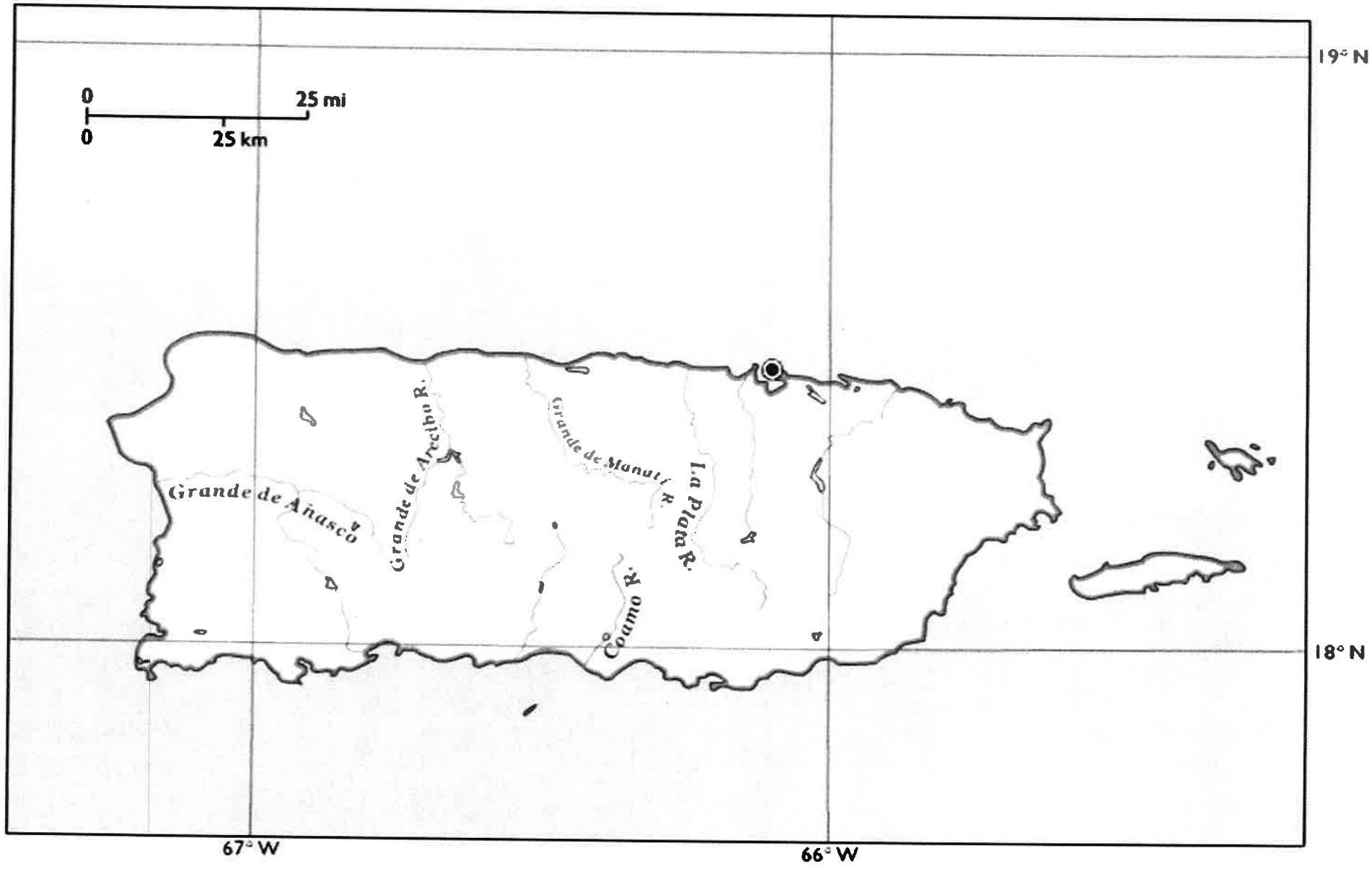
Take from <http://www.kidzone.ws/geography/usa/puerto_rico/map.gif > Oct 27, 2015

ddd



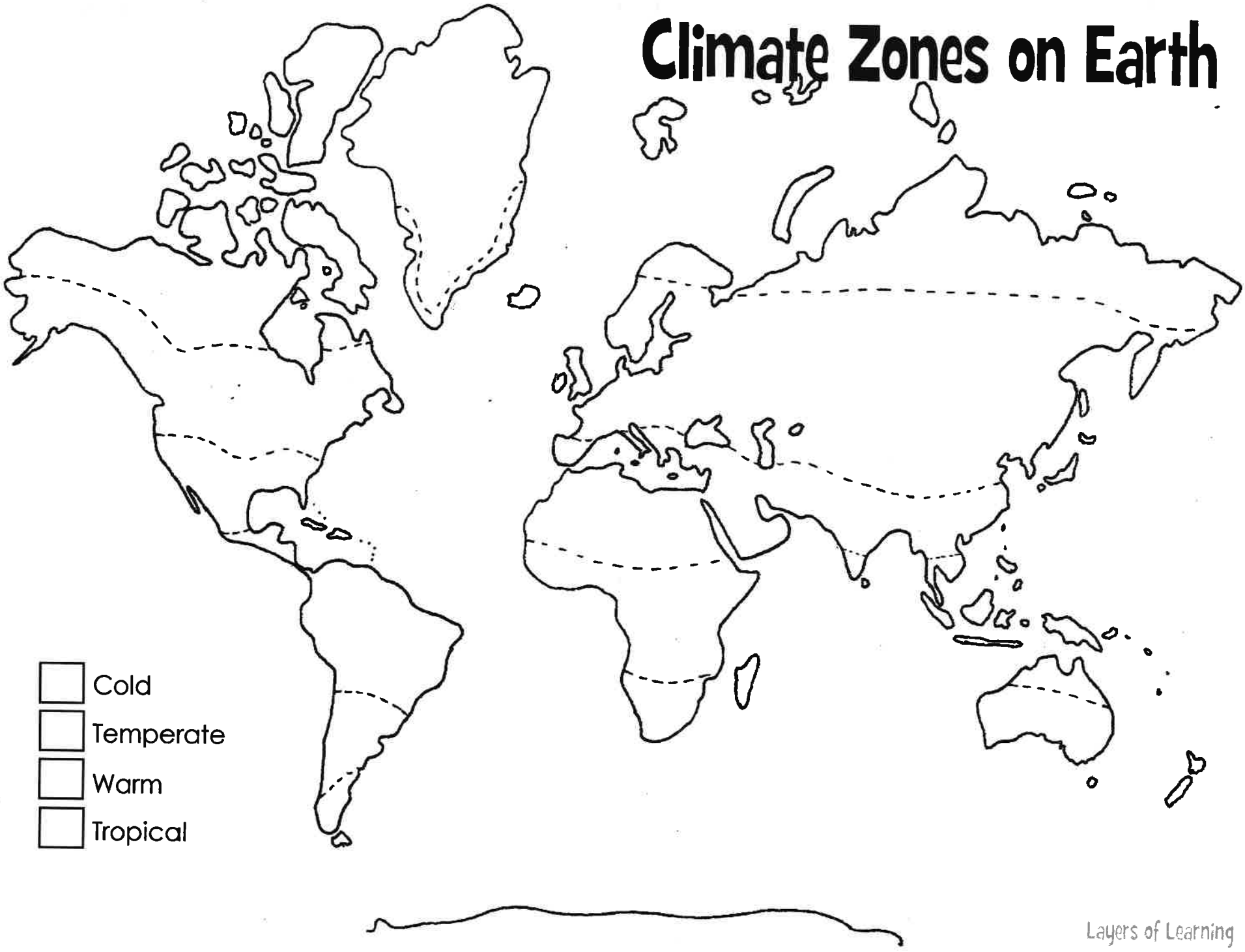
NATIONAL GEOGRAPHIC education

PUERTO RICO (United States)



Puerto Rico – Locate the following places on the map: Atlantic Ocean, Caribbean Sea, Bayamon, Culebra, El Yunque, National Forest, Ponce, San Juan, Vieques

Climate Zones on Earth



Biome Description

Biome Name

Locations Worldwide

Weather
(Temperature & Precipitation)

Plants and Animals

Plants:

Animals:

Examples of Food Chain:

Describe the Biome:

Climates: Charting the Statistics

Directions: Choose 3 climates and write them in the first row of boxes below. Then, fill out each category with facts and details about these climates.

Categories	Climate #1	Climate #2	Climate #3
What is the average temperature?			
What kinds of plants are there?			
Where in the world is this climate found?			
How do living things adapt to this climate?			

My favorite climate is _____ because _____

_____

_____

Comparing Climates

Directions: A venn diagram helps you compare (find things that are the same) and contrast (find things that are different) two or more items. Write the name of each climate in the three circles below. Fill out the intersections of the circle with facts and details that are the same; write the facts that are different for each animal on the outer parts of the circles.

Habitats/Biomes

The Earth has many different environments, varying in temperature, moisture, light, and many other factors. Each of these habitats has distinct life forms living in it, forming complex communities of interdependent organisms. A complex community of plants and animals in a region and a climate is called a **biome**.

Tundra

LOCATION: The tundra biome is the coldest of all biomes. It is also quite big. The tundra covers about one fifth of the land on earth. The word tundra comes from a Finnish word that means treeless plain, which is a good description of the biome. Tundra biome is located in the artic circle, which is a circle that surrounds the north pole, but this is not the only place we can find freezing cold temperatures and a few animals. In Antarctica, and other cold environments, there are areas that can be described as part of a tundra biome as well.

WEATHER: The tundra is the coldest and the driest of all the biomes on Earth. There is very little rainfall in the tundra; it rains less than ten inches a year. Winters here are long, and summers short, sometimes they last for only 6 - 10 weeks. In the winter the temperature can reach -50°F (-45.5°C). And we think our winters are bad! Because the tundra is so close to the north pole, summer days are 24 hours long! Summer temperatures rarely get above 50°F (10°C), just enough to thaw the surface of the ground. What a place for a summer vacation! In the summer the soil becomes very soggy from melted snow and rain. The moisture sinks into the ground, which is called permafrost. The permafrost lies six inches below the ground, and is frozen for most of the year. The top layer of the permafrost thaws, but the bottom layer of gravel and finer material stays frozen all year which keeps moisture from rain on the surface of the ground.


Charles Webber © California Academy of Sciences

PLANTS: You would think that plants would never live or survive in this biome, but the answer is quite a surprise. There is low diversity in organisms that live here, but many still flourish. Many lichens, mosses, and small shrubs flourish in the arctic tundra. The plants that live in the harsh permafrost soil usually adapt to the weather by being short and grouped together to resist winds and to be protected. The growing season in the tundra is short and lasts up to 60 days. Tundra plants get their energy from the sun through photosynthesis like all other plants, but have adapted to low temperatures and low light intensities. Compared to plants in other biomes they use a minimal amount of energy.


Dr. Lloyd Glenn Ingles © California Academy of Sciences

ANIMALS: You may think that the tundra is too chilly for animals, but guess what - it's not. There are actually animals that live in this harsh biome! You might find lemmings, caribou, and arctic hares in the tundra. These animals seem pretty nice, but can you guess which the largest and most dangerous animal is that lives in the tundra? THE POLAR BEAR. Polar bears love to eat fresh, fatty meat. Fatty foods might not be good for humans, but polar bears need the energy from fat to survive the cold tundra. Seals, at times walrus, and sometimes even belugas trapped in open water pockets surrounded by ice are some of the polar bear's favorite meals. They will also eat berries and eggs in the summer. Polar bears hunt by the power of scent and can smell their food at 20 miles (32 km) away. The stomach of an adult polar bear is so big that it can hold more than 150 pounds (68 kilos) of food! Other predators of the tundra are arctic foxes and wolves. Some migratory birds also live in the tundra during part of the year.

Animals who live in the tundra have special adaptations to survive. Some animals in the tundra are adapted to the climate by breeding and raising their young in the summer. Many animals hibernate, or sleep during the worst part of winter to minimize

energy loss. Because animals of the tundra are generally migratory, this biome's population is constantly changing. Resident animals have to change what they are hunting and eating as the seasons change. The food chain in the Arctic Tundra consists of predators such as owls, foxes, wolves, and polar bears at the top of the chain. Predators hunt herbivores, plant eating animals, such as caribou, lemmings, and hares. Mosquitoes, flies, moths, grasshoppers, arctic bumblebees, and other insects are at the bottom of the arctic food chain. Many birds feed on these insects.

Rainforest

LOCATION: There are two types of rainforest biomes: temperate and tropical rainforests. Temperate rainforests are found along coasts in temperate regions. The largest temperate rainforests are on the Pacific coast in North America, stretching from Alaska to Oregon. Other temperate rainforests are found along the coast of Chile, the United Kingdom, Norway, Japan, New Zealand, and S. Australia. Tropical rainforests are generally found between 30°N and 30°S latitudes, covering 6 - 7% of the Earth's land surface. Tropical rainforests can be found around the world: In Central and South America; in Western Africa, eastern Madagascar, and the Zaire basin; and in Indo-Malaysia along the west coast of India, Assam, Southeast Asia, New Guinea, and Queensland, Australia.

WEATHER: Rainforests are important because they help maintain global weather patterns and rain. Water that evaporates from trees falls in other areas as rain.

Tropical rainforests are lush and warm all year long! Temperatures don't even change much between night and day. The average temperature in tropical rainforests ranges from 70 to 85°F (21 to 30°C). The environment is pretty wet in tropical rainforests, maintaining a high humidity of 77% to 88% year-round. The yearly rainfall ranges from 80 to 400 inches (200 to 1000 cm), and it can rain hard. It can downpour as much as 2 inches (5 cm) in an hour!

Temperate rainforests are also wet, but not as rainy as tropical rainforests. It rains about from 60 - 200 inches (150 - 500 cm) each year, while the other moisture comes from the coastal fog that lingers on the trees. The fog provides about 7 - 12 inches (18 - 30°C) of rain each year. Temperate rainforests are a lot cooler than tropical rainforests, but the temperatures are still mild. They often have two distinct seasons: one long wet winter, and a short drier summer.

PLANTS: One type of plant often found in a rainforest is an epiphyte. Epiphytes are plants that live on the surface of other plants, especially the trunks and branches. They often grow on trees to take advantage of sunlight in the canopy. In temperate rainforests common epiphytes are mosses and ferns, while in tropical rainforests there are many kinds of epiphytes, including orchids and bromeliads. There are more than 20,000 varieties of orchids found in the rainforest.

There are about 10 -2 0 species of trees in temperate rainforests that are mostly coniferous, meaning they have needles. Trees in temperate rainforests can live much longer than humans, some live for up to 1000 years! Tropical rainforests have a bigger variety of trees, hundreds of species in fact! These trees are mostly broadleaf trees and have a shorter lifespan. They usually live for 50 - 100 years.

F. Albert Ellis © California Academy of Sciences

Most trees in tropical rainforests have thin, smooth bark. They don't need thick bark to keep them from drying out because the rainforest is so wet. Also, smooth bark makes it difficult for other plants, such as epiphytes, to grow on the tree surface. Trees often have buttresses, large branching ridges near the base, for support because their roots are often shallow and they grow tall to reach the sunlight. Prop roots also help support trees in shallow soils. Many plants in the rainforests have adapted leaf shapes that help water drip off the plant to avoid too much moisture, which might make bacteria and fungus grow.

Tropical rainforests are so big that they are divided into four zones. The top layer of the rainforest is called the emergent layer. Giant trees grow here that are much taller than the trees below. The next layer is the

Habitats/Biomes

canopy. It contains trees standing 60 to 150 feet (18 to 45 meters) tall. Their branches form a canopy, like a big beach umbrella that shades the forest floor. Thick, woody vines are found in the canopy. Over 2,500 species of vines grow in the rainforest. Some vines, called lianas, are sometimes as big around as a person! They climb the trees in the canopy to reach for sunlight. The next layer, the understory, is a dark, cool area below the canopy, but above the ground. The understory is shaded from much of the sunlight by the canopy. The forest floor is the bottom layer of the rainforest. This is the area where fallen, decomposing plants and trees lay on the ground. Many insects live here. Temperate rainforests have all of these zones except the emergent layer. The tallest trees in the temperate rainforest canopy grow to be about 300 feet (90 meters) tall.

ANIMALS: Tropical rainforests are home to half the plant and animal species on Earth. Scientists believe that there is such a great diversity of animals in tropical rainforests because they are one of the oldest ecosystems on earth. Some forests in Southeast Asia have been around for at least 100 million years, ever since dinosaurs roamed the earth. Animals in the tropical rainforest are specially adapted to live in this unique environment. A common characteristic found among mammals, birds, reptiles and amphibians, is an adaptation to living in trees. One example is New World monkeys that have prehensile tails that curl around branches allowing the monkey to hold onto the tree with its tail! Other animals are brightly colored, sharply patterned, have loud vocalizations, and like to eat lots of fruit. Most of the animals in the tropical rainforest live in the canopy. There is so much food available up there that some animals never go down to explore the forest floor! Birds are important to rainforests because they like to eat seeds and fruit. Their droppings grow into new plants and help rainforests to survive. In turn, tropical rainforests are important to birds because they provide winter grounds as migratory destination. Parrots are not the only type of birds you will see in the rainforest. In fact, about 27% of the bird species in the world live in tropical rainforests. Insects make up the largest single group of animals that live in tropical forests. They include bright beautiful butterflies, menacing mosquitoes, camouflaged stick insects, and colossal colonies of ants.


Dr. Lloyd Glenn Ingles © California Academy of Sciences

In temperate rainforests you'll find a different set of amazing animals. Most of these animals live on, or near the forest floor where they are protected from the wind and rain by the trees above. Many birds and small mammals, such as chipmunks, like to eat seeds that fall on the forest floor. Lots of insects live in the temperate rainforest. Most of them live in tree bark, decomposing dead plant matter, or mossy areas. Birds and amphibians like to eat these insects. Some mammals in the temperate rainforest include deer and bobcats. Cougars and bobcats are the top predators in this biome.

Savana


Arthur J. Emmrich
© California Academy of Sciences

LOCATION: Savannas are comprised mostly of grasses and a few scattered trees. They cover half the surface of Africa, large areas of Australia, South America, and India. That is a lot of the earth's surface! Savannas can result from climate changes, soil conditions, animal behavior, or agricultural practices. Humans create savannas by burning grasslands and cutting down trees so they can plant crops. Large animals, like elephants, can turn a forest into a savanna by knocking trees down, stripping the bark from the trees, and tramping on tree seedlings.

WEATHER: An important factor in the savanna is climate. The climate is usually warm and temperatures range from 68° to 86°F (20 to 30°C). Savannas exist in areas where there is a 6 - 8 month wet summer season, and a 4 - 6 month dry winter season. The annual rainfall is from 10 - 30 inches (25 - 75 cm) per year. During the dry season, lightning often strikes the ground, igniting the dry grasses that cover the savanna.

PLANTS: The savanna is dominated by grasses such as Rhodes grass, red oats grass, star grass, lemon grass, and some shrubs. Most savanna grass is coarse and grows in patches with interspersed areas of bare ground. You won't see many trees in the savanna because of

Habitats/Biomes

little rainfall. Occasionally, you'll find individual trees or small groves of trees. These mostly live near streams and ponds. The Acacia tree is an interesting plant in the savanna. It has an umbrella shape, with branches and leaves high off the ground that giraffes like to eat. Baobab trees also live in the savanna. They deal with dry conditions by storing water between the bark and meat of the tree.

ANIMALS: There are many different types of animals that live in the savanna. The species found in savannas vary by the geographic location of the biome. Animals native to African savannas include African elephants, zebras, horses, and giraffes. Many animals in the savanna are herbivores, which means they eat plants, and there is plenty of grass in the savanna. During the rainy months animals thrive in the savanna, but the rainy season is only half the year. During the dry season, surface water from the rain is quickly absorbed into the ground by thirsty soils. The competition for water during the dry season is so intense that most birds and many of the large mammals migrate elsewhere in search of water. Depending on the severity of the drought, the migration may be to a place nearby, or far away. The dry season is often associated with fires. Many insects with short life spans die in these fires, but the birds and larger animals are usually able to fly or run to safety. Although small burrowing animals probably can't outrun the flames, they often survive the fire by digging deep into the ground and remaining there until the flames are gone. Some birds, such as the Fork-tailed Drongos, don't flee the fires; they actually fly to the fires. For these birds fire means dinner. They eat the fleeing or flame-roasted insects.

TAIGA

LOCATION: Taiga, also known as coniferous or boreal forest, is the largest terrestrial biome on earth. It extends in a broad band across North America, Europe, and Asia to the southern border of the arctic tundra. It is also found at cool, high elevations in the more temperate latitudes, for example, in much of the mountainous western region of North America. Much of the taiga in North America was once covered with glaciers. As the glaciers receded, cuts and depressions were left in the landscape that have since filled with rain creating lakes and bogs.


Charles Webber
© California Academy of Sciences

WEATHER: Long, cold winters, and short, mild, wet summers are typical of this region. In the winter, chilly winds from the arctic cause bitterly cold weather in the taiga. The length of day also varies with the seasons. Winter days are short, while summer days are long because of the tilt of the earth on its axis. Fire is not uncommon in the taiga during the summer. Fires may seem destructive, but they actually help this biome by removing old sick trees, making room for new growth. Precipitation is relatively high in the taiga and falls as snow during the winter and rain during the summer. The total yearly precipitation in the taiga biome is 10 - 30 inches (25 - 75 cm).

PLANTS: Compared to other biomes, the taiga has less diversity in plant life. The most common type of tree found in the taiga is the conifer, or cone-bearing tree. Conifers, also known as evergreens, include pines, spruces and firs. There may also occasionally be deciduous species present, such as oak, birch, willow, or alder, in a particularly wet or disturbed area. The soil in the taiga is thin, acidic and not very nutrient rich. It also is rocky. Due to these factors, plants in the taiga have different adaptations than the plants we find around Santa Barbara.

The< name, evergreen, describes an important adaptation of conifers. Just like Kermit, they are always green! Because they don't drop their leaves in the winter, they don't have to regrow them in the spring. This is good for trees in a tough environment because growing new leaves takes a lot of energy. Another adaptation of conifers to live in the taiga has to do with their needles. Although the taiga has moderately high precipitation, the frozen winter ground makes it difficult for trees to get water. Having thin needles with a waxy coating limits water loss of the conifer through transpiration. The dark color of the pine needles is also important. What happens when you where a dark T-shirt on a sunny day? You get hot, right? This is because your dark shirt is absorbing energy from the sun. Well, the dark needles do the same thing for the evergreen. They help the tree absorb the maximum amount of energy from the sun for photosynthesis. Conifers also have that pointy shape for a good reason. The winter snow slides right off of their branches. Without this shape the heavy snow might break or damage the conifer branches.

Habitats/Biomes


Gerald and Buff Corsi
© California Academy of Sciences

ANIMALS: The cold climate of the taiga makes it a difficult place for many animals to live. Many have thick coats of fur to insulate against the cold, and some hibernate. Others migrate to warmer areas in the chilly winters. Animal populations are mainly seed-eating squirrels and jays; small mammals like ermine and moles; and larger browsing animals such as deer, moose, elk, and snowshoe hare. The bogs and ponds in the taiga provide a great summertime breeding place for many different insects. Migratory birds often come to the taiga to nest and feed on all these insects. The typical predators for this area are grizzly bears, wolves, lynxes and wolverines. These are pretty ferocious, so their prey must adapt to flourish. Some animals hide from predators by changing color to blend into the different summer and winter habitats. For example, the ermine is dark brown in the summer, but in the winter it turns white. What excellent camouflage!

TEMPERATE FOREST

LOCATION: Most temperate, deciduous (leaf-shedding) forests are located in the eastern United States, Canada, Europe, China, Japan, and parts of Russia. Deciduous forests are broken up into five zones. The firstzone is the tree stratum zone. It is the tallest zone and trees here range from 60 to 100 feet (18 to 30 meters) tall. Maple, elm, and oak trees are just some examples of trees found in this zone. The second zone is the small tree and sapling zone. Younger, shorter trees characterize this zone. The shrub zone is the third zone. Shrubs include mountain laurel, huckleberries, and many others. The fourth zone is the herb zone, and contains short herbal plants, like ferns. The Ground zone is the final zone where plants grow directly near the ground. Some plants that grow here are lichens and mosses.


Dr. G Dallas and Margaret Hanna
© California Academy of Sciences

WEATHER: This biome has four changing seasons including winter, spring, summer, and fall. These seasons happen because of the tilt of the Earth's axis. Throughout the year, rays from the sun hit different parts of the world more directly than others, causing varying temperatures, or seasons. If the Earth were not tilted on an axis, temperatures around the globe would always be the same. Temperate deciduous forests also have quite a wet environment. Following rainforests, temperate deciduous forests are the second-rainiest biome. The average yearly precipitation is 30 - 60 inches (75 - 150 cm). This precipitation falls throughout the year, but in the winter it falls as snow. The average temperature in temperate deciduous forests is 50°F (10°C). Summers are mild, and average about 70°F (21°C), while winter temperatures are often well below freezing.

PLANTS: Trees and plants in deciduous forests have special adaptations to survive in this biome. Deciduous trees are trees with leaves rather than pine needles, and they dominate temperate forests. As the seasons change each year, so do the leaves. Each year deciduous trees loose their leaves, and grow them back. In the summer their broad green leaves capture sunlight and help the trees make food through photosynthesis. As temperatures cool in the fall, the chlorophyll (green pigment in leaves) breaks down, causing the beautiful red, yellow and orange leaf colors of fall. In the cold winter, deciduous trees and plants go into dormancy, kind of like sleep. It is too cold for them to protect their leaves from the damage of freezing in the winter, so they simply loose them and seal up the places where the leaves attach to the branch. The warmer spring days signal to the trees that they can grow new leaves again, and restart the cycle.

Habitats/Biomes


Gerald and Buff Corsi
© California Academy of Sciences

ANIMALS: Animals in temperate deciduous forests have to adapt to changing seasons. They must be able to cope with cold winters and hot summers. Some animals hibernate or migrate during the winter to escape the cold. Animals who do not hibernate or migrate must have special adaptations to deal with higher exposure to predators in the winter. When leaves fall, there is less cover for animals in this biome to hide from predators.


Dr. Lloyd Glenn Ingles © California Academy of Sciences

The black bear is an animal that is well adapted for the temperate deciduous forest biome. It has a heavy coat made of many layers of fur to deal with the winter cold. Black bears have long claws that help them to climb trees.This is an essential adaptation because black bears often live in hollowed trees. Black bears are omnivores, so they eat plants and animals. Most of their diet is composed of plant material, so their long claws are useful to get their food from trees and shrubs. They also hibernate to avoid having to find food in the snowy, frozen winter.

GRASSLAND

LOCATION: The name for this biome, temperate grasslands, is a great description for what it is like here. The most important plants in this biome are grasses! Temperate grasslands have some of the darkest, richest soils in the world (not in wealth, but in nutrients). People who live in grassland regions often use these soils for farming. In North America we call temperate grasslands prairies. Major grasslands in North America are the Great Plains of the Midwest, The Palouse Prairie of eastern Washington State, and other grasslands in the southwest. In Eurasia temperate grasslands are known as steppes and they are found between the Ukraine and Russia. In South America they are called pampas, and are located in Argentina and Uruguay. In South Africa temperate grasslands are known as veldts.


Helen H. Johnston © California Academy of Sciences

WEATHER: Temperatures in this biome vary greatly between summer and winter. The summers are hot and the winters are cold - much colder than Santa Barbara! With cold winters, it's surprising how hot the grassland summers can get! Sometimes the temperature is more than 100°F (37.8°C). Rain in the temperate grasslands usually occurs in the late spring and early summer. The yearly average is about 20 - 35 inches (55 - 95 cm), but much of this falls as snow in the winter. Fire is not foreign in temperate grasslands. They are often set by lightning or human activity. Fire regularly swept the plains in earlier times, and to some extent still does today.


Gerald and Buff Corsi © California Academy of Sciences

PLANTS: Grasses dominate temperate grasslands. Trees and large shrubs are rarely found in grassland areas. There are many species of grasses that live in this biome, including, purple needlegrass, wild oats, foxtail, ryegrass, and buffalo grass. Many animals munch on these grasses, but they survive because the growth point on the grasses is very close to the ground. Also, with underground stems and buds, grasses are not easily destroyed by fire. Shrubs and trees that live in temperate

Habitats/Biomes

grasslands are not as good as grasses at coping with the flames, and often are destroyed by fire. Wildflowers also grow well in temperate grasslands. Popular flowers that you might find growing on grasslands are asters, blazing stars, goldenrods, sunflowers, clovers, and wild indigos.

ANIMALS: All grasslands share a lack of shelter from predators, and an abundance of grass for food; therefore, grassland animal populations are similar throughout the world. The dominant vertebrates in grasslands are herbivorous or plant-eating grazers called ungulates. Ungulates are mammals with hoofs, like horses and deer. Their long legs help them run fast to escape grassland predators. The temperate grassland does not have much animal diversity, especially compared to the Savannah. Some animals that inhabit temperate grasslands in North America are bison, antelope, birds, gophers, prairie dogs, coyotes, and insects. On the steppes you'll find similar animals to the Great Plains including lynx, antelopes, falcons, and fox.


Gerald and Buff Corsi © California Academy of Sciences

ALPINE

LOCATION: What do you think of when you hear the word "alpine"? Perhaps mountains or skiing? Well, you are right. Alpine biomes are found in mountain regions worldwide, including the Andes, Alps, and Rocky Mountains. The alpine biome usually lies between an altitude of about 10,000 feet (3,000 meters), and the place where the snow line of a mountain begins. Combined, the Alpine and Arctic biomes cover 16% of the earth's surface area.


Glenn & Martha Vargas
© California Academy of Sciences

WEATHER: In the summer average temperatures range from 40 to 60°F (4.5 to 15.5°C). In the winter the temperatures are well below freezing. Generally, as the altitude increases, the temperature gets colder. Temperatures in the alpine biome are dynamic and can also change from warm to freezing in one day. The winter season lasts from around October to May. The summer season may last from June to September. The alpine biome is fairly dry with an average precipitation of 12 inches (30 cm) each year.

PLANTS: The alpine biome is a tough place for plants to live. It's windy, cold, and the sunlight at these high altitudes is very strong. There are only about 200 species of alpine plants. At the high altitudes where these plants live, there is very little carbon dioxide, which is necessary for plants to carry on photosynthesis. Because of the blustery weather, most plants are small groundcover plants, which grow and reproduce slowly. They protect themselves from the cold and wind by hugging close to the ground. When plants die the cold weather makes it hard for them to decompose quickly. This makes for poor soil conditions. Most alpine plants are adapted to grow in sandy and rocky soil. Plants have also adapted to the dry conditions of the alpine biome. Some of the plants found here are tussock grasses, small-leafed shrubs, and dwarf trees. The bristlecone pine is an amazing plant of the alpine biome. It lives in scattered, arid mountain regions of six western states of America ranging from Colorado to California. Many are found in the Ancient Bristlecone Pine Forest in the White Mountains of California. These trees only grow to about 60 feet (18 meters). That may seem tall, but for its age 60 feet (18 meters) is short! Bristlecone pines can live to be over 4,000 years old. That is almost as old as the Great Sphinx of Ancient Egypt!

Habitats/Biomes


Gerald and Buff Corsi
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ANIMALS: Can you imagine living in a cold, windy place without much shelter? Animals that live in the alpine biome must have special adaptations to survive the cold, snowy conditions. They also have to deal with high UV light exposure from the sun and thin atmosphere. Mostly warm-blooded animals live here, but a few types of insects also make the alpine biome home. Alpine animals adapt to the cold by hibernating, migrating to warmer areas, or insulating their bodies with layers of fat and fur. Their bodies tend to have shorter legs, tails, and ears, in order to reduce heat loss. Alpine animals also have larger lungs, more blood cells, and blood that can deal with the lower levels of oxygen at higher altitudes. Some animals in the alpine biome are mountain goats, sheep, elk, beetles, grasshoppers and butterflies. Which of these animals do you think leaves the alpine biome in the winter?

One interesting alpine animal is the chinchilla. Maybe you've seen one of these small, gray, furry creatures in a nature center or zoo. In the wild, chinchillas live in the Andes alpine regions, but they are not easily found. Chinchillas are herbivores. Their diet in the wild consists of plants, roots, and grasses. As altitude increases, the temperature decreases, so in these regions the chinchilla has even denser fur. Chinchillas used to be hunted for their soft, beautiful fur. People used their pelts to make coats until they became nearly extinct in the 1940s. It takes over 100 pelts to make one chinchilla coat! Now they are on the endangered species list, and protected by law from hunting and people. The snowshoe rabbit and ptarmigan bird are also alpine animals. They are adapted to be less visible when snow covers the ground through camouflage. The showshoe rabbit has brown fur in the summer, but in the winter it turns white. What do you think the ptarmigan does to camouflage? It's like the snowshoe hare! In the summer the ptarmigan has brown feathers and in the winter its feathers are white to hide in the snowy environment.

CHAPARRAL


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LOCATION: The chaparral biome is found in small sections of most continents, including the west coast of the United States, the west coast of South America, the Cape Town area of South Africa, the western tip of Australia and the coastal areas of the Mediterranean. In Europe it is called the maquis, Australia has the mallee, Chile the matorral, and South Africa calls it fynbos. It is also called the Mediterranean Forest, Woodland, and Scrub biome. The chaparral biome has many different types of terrain. Some examples are flat plains, rocky hills and mountain slopes.


Jo-Ann Ordano
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WEATHER: The chaparral is characterized as being very hot and dry. The winter is very mild and is usually about 50°F (10°C). Most of the rain in this biome comes in the winter. The summer is hot and dry at up to 100°F (37.5°C). This makes fires and droughts very common.

Habitats/Biomes

PLANTS: Most chaparral plants have large, hard leaves, which hold moisture. The plants are also very well adapted to fires. Plants in the chaparral often have root systems designed to get as much water as possible. Shallow roots extend horizontally under the surface of the soils and are good at catching water when it falls as rain; taproots extend deep into the soil to capture groundwater. Some examples of plants in the chaparral are toyon, chamise, poison oak, scrub oak, Yucca and other shrubs, trees and cacti. The maquis contains plants such as myrtle, hawthorn, and broom. The Australian mallee is more open than these other types of chaparral and consists mainly of dwarf eucalyptus trees. The fynbos is also composed mainly of scrub and shrubs, such as heathers and protea plants.

ANIMALS: The animals are all mainly grassland and desert types adapted to hot, dry weather. A few examples from California are: coyotes, jack rabbits, mule deer, alligator lizards, horned toads, praying mantis, honey bees and ladybugs. In Europe one might find wild goats, sheep, cattle, mouflon, horses, lynx, wild boar, rabbits, vultures and eagles. There are also many small mammals, reptiles and insects, just like in California. The fynbos of South Africa also has many butterfly species that rely on this habitat.


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DESERT


Robert Potts
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LOCATION: Although few animals and plants are adapted to the extremely dry desert life, the desert is a vital biome. The desert is important because it covers about a fifth of the earth's surface! There are both hot and cold deserts. Antarctica is the largest desert in the world, while the Sahara in Africa is the largest of the hot deserts. There are also deserts close to Santa Barbara, such as the Mojave the Colorado Desert which encompass parts of Southern California. In North America, there are four major hot, dry deserts, including the Mojave and the Great Basin. Outside the U.S. hot, dry deserts are found in the Southern Asian realm, South and Central America, Ethiopia and Australia.

Another type of desert is the coastal desert, for example, the Atacama Desert in Chile of South America. And then there are cold deserts. That sounds pretty silly! If deserts are supposed to be hot, how can there possibly be a cold desert? Well these deserts are in places like Antarctica and Greenland where vegetation is sparce, just like the more commonly known hot, dry deserts.

WEATHER: Weather is not the same in all deserts. The seasons in hot and dry deserts are usually very hot during the summer and warm during the rest of the year. During winter these deserts get little rainfall. Rain is often light, or in short concentrated bursts. Most of the time evaporation rates are faster than rainfall rates. Sometimes the rain evaporates before even hitting the ground. This is the reason for the dry characteristic of this type of desert. Coastal deserts are in moderately cool to warm areas. Coastal deserts usually have cool winters followed by fairly long, warm summers. The temperature in the winters is generally 41°F (5°C) or below. In the summer the weather heats up to between 55° and 75°F (12 and 24°C). Average rainfall is usually 3 - 5 inches (8 - 13 cm). The Atacama is the Earth's driest desert. In the Atacama 1 millimeter or more of rain falls every 5-20 years. Cold deserts have short, moist and moderately warm summers, and long cold winters like one could expect in Antarctica. The winter temperature ranges from -5°F to -110°F (-20.5 to -79°C), and in the summer it can be a nice, balmy, 32°F (0°C). The coldest day recorded in Antarctica was -113°F (-80.5°C)!

Habitats/Biomes

PLANTS: Deserts plants have many adaptations to survive in such a dry environment. They are good at storing and finding water. Some plants have seeds that can stay dormant in the sand for a long time, until there is enough rain for them to grow. In hot deserts, you'll often find Cacti. Cacti are great at storing water. With their waxy coating, water can't escape and their spines protect them from being desert dinner. Their roots are shallow, and widely spread so that any rain can be absorbed immediately! Some other plants you might find in the hot desert are creosote bush, sagebrush, and ocotillo. Coastal deserts house a variety of plants. These plants must adapt to minimal rainfall by having extensive root systems that come up to the surface to absorb any possible rainfall, and go far down to absorb any water saturated in the ground. These plants also have very thick leaves that can absorb and store water whenever it is available. The plants that live in coastal deserts include salt bush, rice grass, black sage and chrysothamnus. Plants can even live in cold deserts, but you won't find as many here as in other types of deserts. Plants in cold deserts include algae, grasses, and plants with spiny thin leaves. Usually these plants grow only in the summer.

ANIMALS: Deserts are a very important biome. No, not because of all the sand! Mostly because of all the plants and animals that call the desert "home". Some animals that live in the hot desert are cold-blooded, like snakes, insects, and lizards. Mammals that live in the desert are usually small, such as the kangaroo rat and kit fox. Sometimes it's hard to survive in the desert. Some mice build their home out of fallen cactus spines to protect themselves from predators like coyotes and hawks. In the Eritrean coastal desert in Djibouti, Africa, animals like gazelles, skinks, geckos and dikdiks roam the desert. Fewer animals live in the cold desert. In Antarctica, most of the animals live near the ocean shore. Because of their ice home, seals, penguins, and other birds rely on fish, squid and other sea creatures for their food.

EL YUNQUE - Tropical Rain Forest

El Yunque is the local name for The Caribbean National Forest in Puerto Rico.

A tropical rain forest is found in warm climates in the tropics close to the equator. There are many tropical rain forests around the world. El Yunque is the only Tropical Rain Forest in the United States' National Forest System.

A rain forest is a quiet place. The ground is wet and muddy and is shaded by tall trees. The trees have huge trunks with small plants growing on them. There are vines hanging from their branches. There are small insects flying in the rain, fog, or mist. On the trees you might see colorful birds, and butterflies. Many other animals hide in the branches and even under leaves on the ground. The abundant rainfall is shed through rocky rivers creating many cascades of waterfalls and pools. Everywhere you look, is green. Orchids (some only the size of a fingernail) and bromeliads perch in the trees.

"Yuke" means white lands and refers to the mountain tops usually covered by clouds. The Taíno Indians of Puerto Rico considered their mountain range sacred. Taíno petroglyphs are sprinkled throughout the sacred Luquillo mountain range. El Toro, at 3533 Ft is the tallest peak.

Up to 240 inches of rain per year have been recorded on the higher peaks. More than 100 billion gallons of rainwater fall on the Forest per year. Here it rains about 4 times a day. The result of such heavy rainfall and the warm tropical climate is a dense evergreen forest containing 240 native tree species (26 found only at El Yunque), and masses of vines, 50 native orchids, epiphytes, giant ferns, and mosses. Air plants such as orchids, grow on the trunks and branches of the trees. Woody air plant vines called, lianas, hang from and often wrap around tree trunks and limbs.

The roots of rain forest trees do not go down very deep, so they can take up only water and food found near the top of the soil. The thick parts on the tree trunks are called buttresses and keep the large trees from falling over.

The top layer of a tropical rain forest is called the **canopy**. The canopy is the tops of the trees which are the branches and leaves. Many rain forest animals live in the canopy. Below the canopy is the layer called the **understory**. This layer is made up mostly of tree trunks, young trees and air plants. The bottom layer of the forest is called the **forest floor**. The forest floor has few plants growing because the soil is very thin. It is made up mostly of dead plant parts, fallen tree trunks covered with moss, ferns, and fungi.

The rain forest is home to many species of animals. Frogs and spiders hide under leaves. Ants, spiders, beetles, and even termites live under tree bark or in the soil. Snakes slither along the ground or wind around tree branches. Rodents and other small animals abound. Here you can find snails with shells as big as a child's fist. At night the forest comes alive. Millions of insects fill the air. Moths suck nectar from flowers, bats fly

EL YUNQUE - Tropical Rain Forest

out of their nesting place to feed. Millions of coquíes climb tree branches to feed on the insects. The forest is lit by thousands of cucubanos. Bats and owls fly from their nests.

At El Yunque there are 50 species of birds, 11 species of bats, 8 species of lizards, and 13 species of coquí (a tree frog). Also found here are several species of shrimp and fish. Snakes are rare. The Puerto Rican Boa, which can reach a length of 90 inches, can be found. El Yunque is a small rain forest and there are no large primates such as gorillas or monkeys. There are no wild pigs or alligators.

The Puerto Rican parrot is a small amazon parrot, about 11 inches in length and weighing about 10 ounces. Its tail is a short and squared-off, as opposed to the long, pointed tail of a parakeet. The overall color of the Puerto Rican parrot is green. The wing tips are blue and usually are visible only when the bird is in flight. It has a white ring around the eyes and a red blaze above its beak.

"Higuaca" is the name given by the Taíno Indians to the native parrot. The parrots are usually heard before they are seen as they emit loud repetitive bugle-like call when they fly. The Puerto Rican parrot is the only endemic or native parrot in Puerto Rico. It is one of the rarest birds in the world.

Tropical rain forests provide us with beautiful woods such as mahogany, teak, and rosewood. At El Yunque, majestic tabonuco trees drape the lower forest while giant tree ferns fan in the wind. Rain forests are also important for the environment by taking large amounts of carbon dioxide out of the air and giving us fresher cleaner air.

El Yunque Tropical Rain Forest is in danger of being destroyed. Too many trees have been cut. Civilization is getting too close to the forest. When the forest disappears the animals that live there will also disappear.

El Coqui: Small frog…Big voice.

Activity Ideas:

- See KidzMath book ***Actual Size*** and guide Grade 3rd – 6th
- Listen to the croak of El Coqui. Go to You Tube and type "El Coqui".
- El Coqui puppet Go to You Tube and type in "El Coqui by Hobey Ford"
- See El Coqui activities in this binder

EL YUNQUE - Tropical Rain Forest

Iguana

Water-Fall Climbing Fish

See El Yunque Critter Cards for pictures of more animals. (Section 4)

http://www.elboricua.com/BK_ElYunqueLesson.html

El Yunque Critter Cards

On the following pages are cards which show the different types of creatures found in El Yunque National Forest. There are five categories: aquatic, birds, bugs, mammals, reptiles.

The cards can be used in a variety of ways.

- Demonstration
  - Show picture and go over information about creature
  - Can go over all creatures or select a few
- Writing
  - Give each student / pair of students a card
  - Students create a story about their creature
    - Let students have fun. The creatures can have human characteristics, have special powers, live in a different time period or place, etc.
- Research
  - Give each student / pair of students a card (Cards contain great "Key Words" to help students search – See Research Process in section 3)
  - Students research creature
  - Students report to group or write paper
- Charades
  - All students learn about the creatures
  - Create signals to indicate if the creature is aquatic, birds, bugs, mammals, or reptiles.
  - Place students into 2 groups
  - Review Charades rules with students
- Trivia Pursuit
  - Place students into 2 groups
  - Students guess creature based on facts
- Concentration
  - Cut cards along "Fold" and "Cut" lines
  - Place students in groups of 2 or 3
  - Since there are only 20 cards, play this when you can make two different groups. Best played when you only have 6 or fewer students.
  - Divide the cards based on the number of groups; Make sure you have the matching pictures and information cards in the same pack.
    - Students shuffle cards and place cards face down.
    - 1st student turns up two cards to find matching pairs. If pairs match, picks up cards and takes another turn. If pairs don't match, 2nd student takes turn.
    - Student with most pairs wins.

FOLD

Scientific name: Anolis evermanni

Common name: English: Emerald Anole
Español: Lagartijo Verde

Habitat/range: Throughout the central range and also at lower elevations in Puerto Rico.

Diet: Insects

Fun fact: Anolis evermanni can change color from green to black when excited.

CUT

CUT

FOLD

Scientific name: Eleutherodactylus cochranae

Common name: English: Whistling Coqui
Español: Coquí Pitito

Habitat/range: Native, Puerto Rico, US & British Virgin Islands. Nocturnal, found in Bromeliad plants & leaf litter in daytime.

Diet: Insects

Fun fact: Call is a rising whistle followed by up to three "clicks".

FOLD

Scientific name: Leptodactylus albilabris

Common name: English: White-lipped Frog
Español: Sapito de Labio Blanco

Habitat/range: Found in muddy areas in ditches and near streams. Puerto Rico, US & British Virgin Islands.

Diet: Insects, millipedes, snails.

Fun fact: Female frog lays eggs in foam nest which is washed away by rain. Tadpoles develop in temporary pools.

CUT CUT

FOLD

Scientific name: Epicrates inornatus

Common name: English: Puerto Rican Boa
Español: Culebrón

Habitat/range: On the ground or in trees hanging from branches or vines. Puerto Rico.

Diet: Rats, mice and bats. Young Boas eat lizards and insects.

Fun fact: Boas engulf their prey intact, starting with the head, after asphyxiating them with their body coils.

FOLD

Scientific name: Saurothera vielloti

Common name: English: Puerto Rican Lizard Cuckoo
Español: Pájaro Bobo Mayor

Habitat/range: Forest thickets, wood lands, coffee plantations. Puerto Rico (endemic).

Diet: Lizards, spiders. Beetles, Caterpillars.

Fun fact: The Lizard Cuckoo's call is a Rapid, Ca-ca-ca-crk, like the laugh of a Halloween witch.

CUT CUT

FOLD

Scientific name: Dendroica angelae

Common name: English: Elfin Woods Warbler
Español: Reinita de Bosque Enano

Habitat/range: Dense vines of the forest Canopy. Puerto Rico (endemic) High mountains.

Diet: Insects

Fun fact: A new species discovered in 1971.

FOLD

Scientific name: Amazona vittata

Common name: English: Puerto Rican Parrot
Español: Cotorra de Puerto Rico

Habitat/range: Upper western Luquillo Mountains, Puerto Rico (endemic).

Diet: Seeds and fruit ot the Sierra Palm and Tabonuco trees.

Fun fact: Mating pairs of Puerto Rican Parrots stay together for life.

CUT

CUT

FOLD

Scientific name: Todus mexicanus

Common name: English: Puerto Rican Tody
Español: San Pedrito

Habitat/range: Damp and arid forests of Puerto Rico on low tree branches.

Diet: Insects

Fun fact: Todies nest by making curved burrows in earth banks.

FOLD

Scientific name: Anguilla rostata

Common name: English: American Eel
Español: Anguila de Río

Habitat/range: Live in freshwater streams but spawn at sea. Worldwide except Antarctica.

Diet: Crustaceans, worms, fish and frogs.

Fun fact: American Eels can breathe through their skins, and can live out of the water for up to 3 hours!

CUT CUT

FOLD

Scientific name: Epibolocera sinuatifrons

Common name: English: Freshwater Crab
Español: Buruquena

Habitat/range: Occupies pools in fresh-water streams and can move on land at night. Central/South America, Caribbean islands.

Diet: Scavenger/bottom feeder.

Fun fact: Freshwater crabs can breathe out of water as long as they remain moist!

FOLD

Scientific name: Agonostomus monticola

Common name: English: Mountain Mullet
Español: Dajao, Lisa de Río

Habitat/range: Upper streams and rivers in mountainous areas. Greater/Lesser Antilles Islands.

Diet: Mollusks, small shrimp, spiders and insects.

Fun fact: Although when fully-grown they weigh only 4 oz., mullets are fished for sport.

CUT CUT

FOLD

Scientific name: Macrobrachium carcinus

Common name: English: Big-clawed River Shrimp
Español: Camarón de Río, Langostino

Habitat/range: Freshwater pools in rivers and streams. Greater/Lesser Antilles islands.

Diet: Omniverous; algae aquatic insects, mollusks, and other.

Fun fact: Important food source for River crabs, fish and wading birds!

FOLD

Scientific name: Stenoderma rufum darioi

Common name: English: Red fig-eating Bat
Español: Murciélago Frutero Nativo

Habitat/range: Solitary, roosting among leaves in the forest canopy. Puerto Rico (Luquillo Forest-El Yunque).

Diet: Fruits of the Trumpet-wood, Bullet-wood and Sierra Palm trees.

Fun fact: Despite its name, this bat does not eat figs!

CUT CUT

FOLD

Scientific name: Monophyllus redmani

Common name: English: Greater Antillean Long-tongued Bat
Español: Murciélago de Flores

Habitat/range: Roosts in wet cave chambers. Greater Antilles Islands and Bahamas Islands.

Diet: Fruits and nectar from flowers.

Fun fact: This bat comes out to feed on fruits and nectar in the early morning and late afternoon.

FOLD

Scientific name: Herpestes auropunctatus

Common name: English: Small Indian Mongoose
Español: Mangosta

Habitat/range: Shelters in hollow logs or dens in the ground. Asia (India, Malay peninsula), Africa, Caribbean.

Diet: Insects, snakes, frogs and birds.

Fun fact: Mongooses can live up to 40 years!

CUT CUT

FOLD

Scientific name: Rattus rattus

Common name: English: Black rat, Roof rat, Ship rat
Español: Rata de Tejado

Habitat/range: Black rats shelter in nests built in forest trees. Originally thought to be from Asia, now worldwide.

Diet: Seeds, nuts, vegetables, insects, invertebrates.

Fun fact: Female Black rats can have as many as 140 offspring per year!

FOLD

Scientific name: Lamponius portoricensis

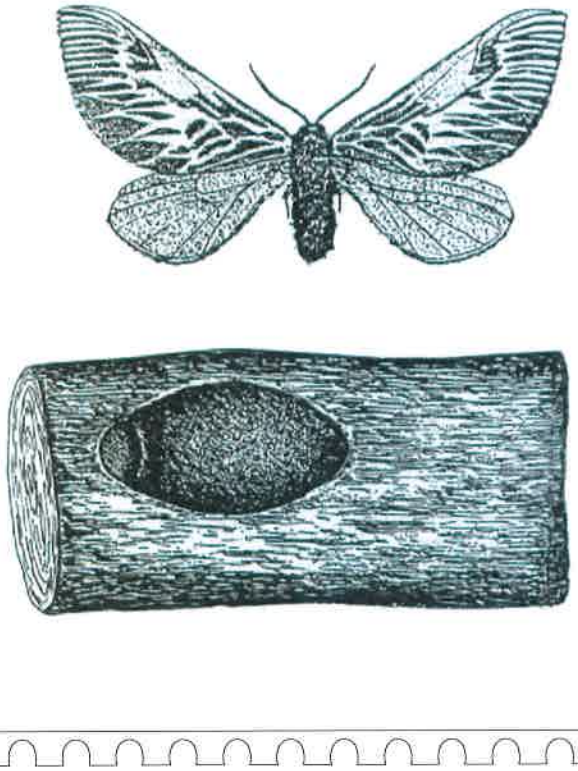
Common name: English: Walking Stick
Español: Palito Viviente

Habitat/range: Plant and tree leaves. In upper forest. North/ Central/South America, Greater/Lesser Antilles.

Diet: Folivores; plant and tree leaves.

Fun fact: Walking Sticks can change color; Light green in the day-time, dark green at night!

CUT CUT



FOLD

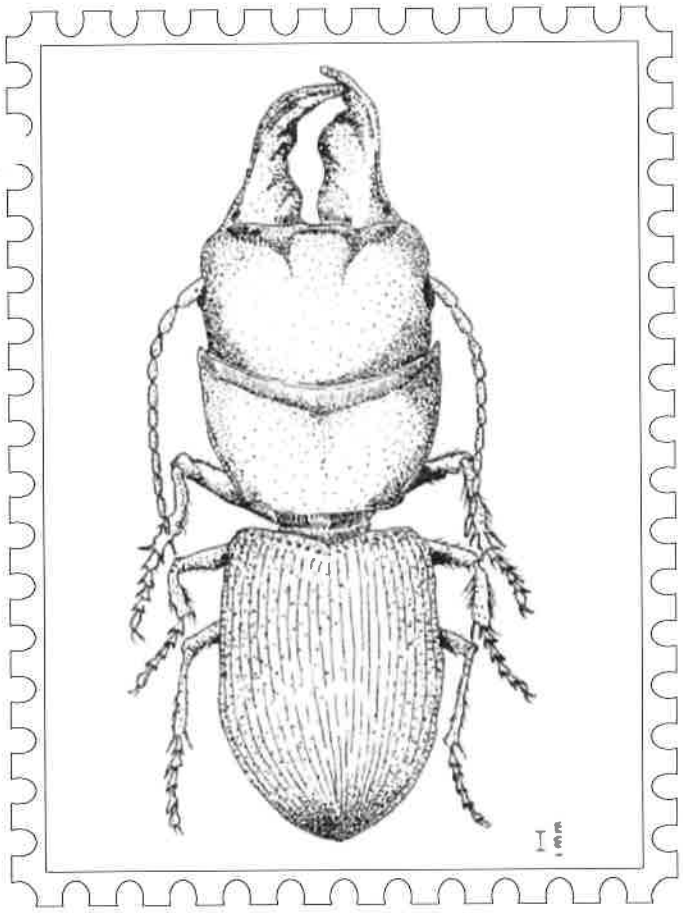
Scientific name: Megalopyge krugi

Common name: English: Flannel Moth
Español: Plumilla

Habitat/range: Plants and flowers in Mid-level/Upper forest. Throughout North/South Central America, Caribbean Islands.

Diet: Larvae eat leaves, adults feed on flower nectar.

Fun fact: Flannel moths can "coil' their proboscis (feeding tube) when not in use sucking nectar from flowers!



FOLD

Scientific name: Antilliscarus megacephalus

Common name: English: Ground Beetle
Español: Escarabajo

Habitat/range: In wet forests at high elevations. Native, Puerto Rico.

Diet: Dead insects, caterpillars, beetle larvae, maggots.

Fun fact: The biggest beetle in the Antilles Islands, they hide under leaf litter during the day an come out to feed at night!

CUT CUT

FOLD

Scientific name: Schitzocerina krugii

Common name: English: Sawfly
Español:

Habitat/range: Found on or near the leaves of the Seagrape plant. Puerto Rico, Luquillo forest.

Diet: Plant leaves.

Fun fact: Adult Sawflies look like wasps, but they don't sting. Fore and back wings hook together when flying!

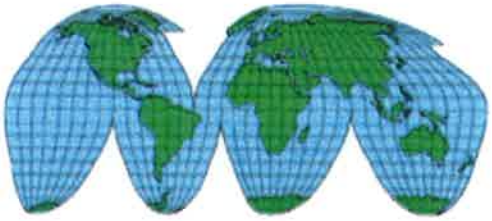
The Rain Forest: An Introduction

What is a tropical rain forest?

A tropical rain forest is a forest that receives 4 to 8 meters of rain each year.

Where are tropical rain forests located?

Rain forests are located within a narrow region near the equator in Africa, South and Central America, and Asia.



Why are tropical rain forests important to our earth?

Rain forests play an important role in the climate control of our planet by having an affect on the wind, rainfall, humidity, and temperature. Within the rain forest, water, oxygen, and carbon are recycled. This natural recycling helps to reduce flooding, soil erosion, and air pollution.
The rain forests support over one half of the plant and animal life on Earth, even though they cover only 2% of the Earth's surface.
Approximately one fourth of the pharmaceuticals (medicines) we use come from plants of the tropical rain forests. According to the National Cancer Institute, 70% of the plants from which we make medicines and that are effective in the treatment of cancer can only be found in the rain forests.

What is happening to our rain forests?

27 million acres of the Earth's rain forests are destroyed each year due to man. The activities which threaten the rain forests are: agriculture, clearing and developing of land, beef cattle ranching, logging, and the building of dams and hydroelectric plants. This results in a loss of 100 acres of rain forest per minute and 80% of the rain forests in the world are now gone. The destruction of the world's rain forests at this rate causes 10,000 plant and animal species to become extinct each year.

Rainforest in Our Classroom—A Biome Mural 5-49

Objectives

Students use scientific inquiry to identify and sketch plant and animal organisms living within a tropical or temperate rainforest environment.

Students analyze each other's drawings and then develop a class watercolor resist mural based on those drawings.

Students (K-2) select and draw a simple plant, animal, or water feature representative of a rainforest.

Students (3-4) choose three features found in a rainforest and illustrate how they are connected to each other.

Students (5-6) research and represent the biodiversity, health, and culture of a rainforest.

Multiple Intelligences

Interpersonal
Naturalist
Spatial

What Does It Mean?

Biome: a complex ecosystem of plants, animals, and climate located in a defined geographic area

Crayon resist: art technique in which crayon is applied to parts of a surface and paint is applied on top so that the crayon wax resists the paint

Digitized image: computerized representation with pixels (number of dots in a given area)

Understory: plants growing beneath the main canopy of a rainforest

National Standards

Visual Arts Standard #5
Reflecting upon and assessing the characteristics and merits of their work and the work of others

Science Standards
Unifying Concepts and Processes
Evidence, models, and explanations
Science as Inquiry
Understanding about scientific inquiry
Life Science
Organisms and environments

Background Information

Rainforests are found in many different places on Earth. Most rainforests, located around the equator, are tropical. Temperatures in tropical rainforests range between 75 and 80 degrees F. Temperate rainforests, which are found in places such as the northern Pacific Coast of North America and in New Zealand, are cooler, but they rarely freeze. About 80 inches of rain falls each year in rainforests. Temperate rainforests have both dry and wet seasons, but it rains most of the time in tropical rainforests.

Tropical rainforests have more diverse plants and animals than any other biome. Rainforest ecosystems are very important in maintaining a balance in the Earth's ecology, because plants generate oxygen and remove carbon dioxide from the air.

Different animals and plants live in each part of the rainforest. The *canopy*, which is formed by most of the treetops, is where a variety of birds, insects, reptiles, and mammals live. Giant trees, called *emergents*, grow even higher than the canopy. Birds and insects live in these immense trees, too. It is dark and cooler in the *understory*, below the tree leaves. The largest animals and many insects live on the *forest floor*.

Resources

A Walk in the Rainforest by Kristin Joy Pratt
Stunningly illustrated environmental alphabet book. Each letter features a rainforest animal or plant accompanied by an explanatory paragraph. Written for ages 4 to 8, includes compelling warnings about the plight of our planet.

Garden of the Spirit Bear: Life in the Great Northern Rainforest by Dorothy Hinshaw Patent and Deborah J. Milton
Delicate watercolor illustrations. Basic information about the extraordinary flora and fauna found in the layers of British Columbia's coastal rainforest. Familiarizes third to fifth graders with the interrelationships that form a delicate environmental balance.

Tropical Rainforests (Biomes of the Earth) by Michael Allaby and Richard Garratt
Colorful illustrations, including maps, diagrams, and photographs. Reveals the diversity of animals and plants present in this biome. Explains importance of forest layers and food chains, threats to the environment, and ways to promote conservation. Illustrations and photos provide valuable insights for all ages.

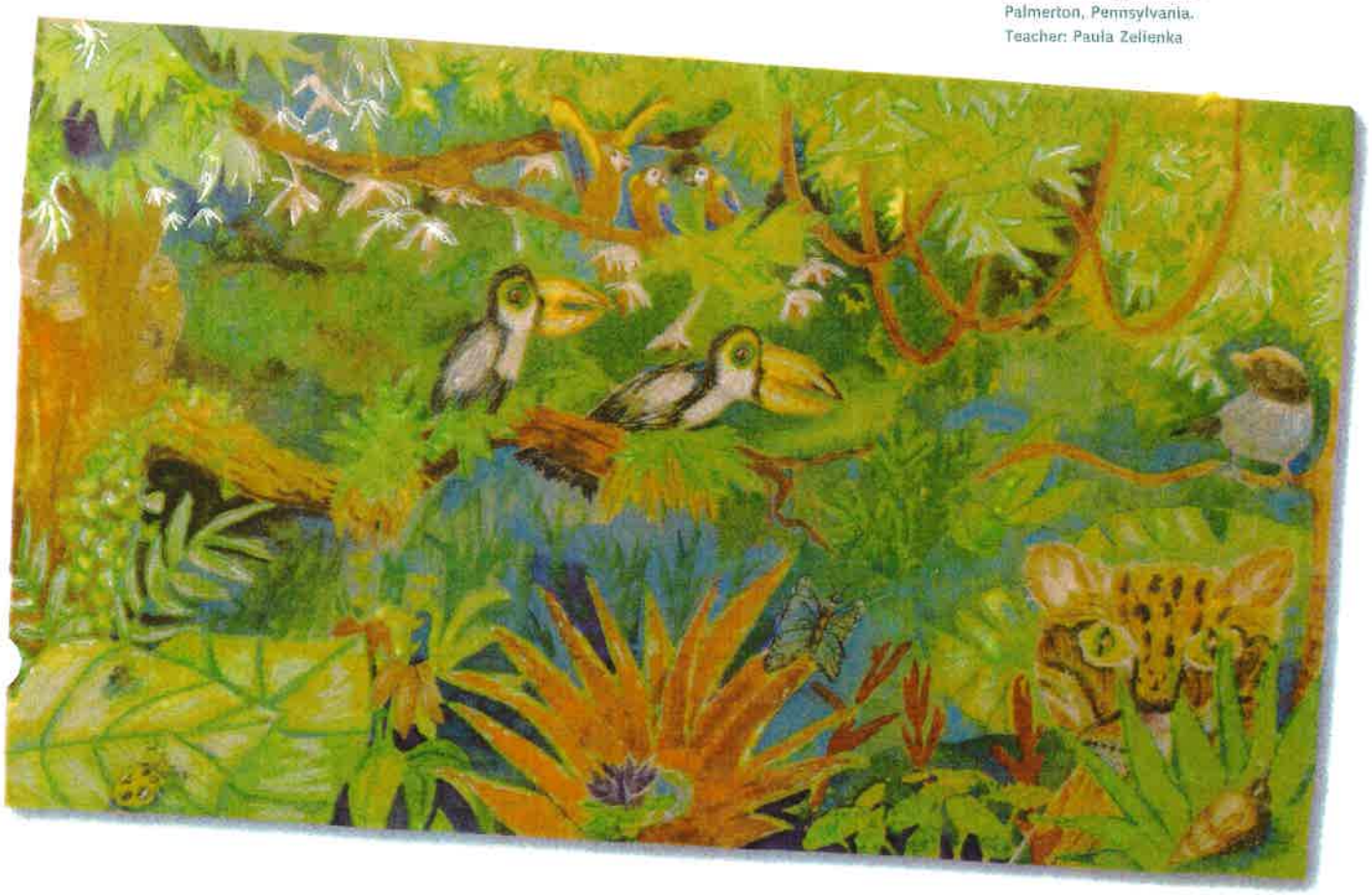
Vocabulary List

Use this list to explore new vocabulary, create idea webs, or brainstorm related subjects.

Biome
Canopy
Carbon dioxide
Conclusion
Conservation
Digitize
Diversity
Ecology
Emergent
Environment
Equator
Experiment
Food chain
Forest floor
Forest layers
Hypothesis
Indigenous
Model
Mural
Oxygen
Phenomenon
Rainforest
Repetition
Resources
Scientific inquiry process
Temperate
Texture
Tropical
Understory

Palm Tree in Tropical Rainforest
Costa Rica
Photo by I. McCracken

Artwork by students from
St. John Neumann School,
Palmerton, Pennsylvania.
Teacher: Paula Zelienka



Tropical Rainforest Flower
Costa Rica
Photo by J. McCracken

Rainforest in Our Classroom—A Biome Mural

	K-2	3-4	5-6
Suggested Preparation and Discussion	With children, use the scientific inquiry process to conduct a simple outdoor experiment related to rainforests, such as measuring the evaporation rate of puddles in the sun and shade. Choose a question to be answered, form a hypothesis, predict what will happen, perform experiment, observe and record results, compare prediction and results, and decide to form a new hypothesis or retain the original. Ask students what they know about rainforests. Who has been to a rainforest or a simulated one? What do you imagine it would be like to be in a rainforest? What kinds of plants and animals would you see? Would it be sunny?	With students, prepare a chart showing the scientific inquiry process: identify a natural phenomenon, pose a question, form hypothesis, develop an experimental plan, predict results of experiment, conduct experiment, observe and record results, compare prediction and results, draw conclusions, and determine whether hypothesis was correct or incorrect. Use a K-W-L chart (columns with what students Know, topics they Want to explore, and what they Learn during their study) to begin to research knowledge about tropical and temperate rainforests. What do you know about the environment of rainforests? Who has been to a rainforest or a simulated one? What would your surroundings look like if you were standing on the forest floor? What animals and plant life would you encounter? List students' unanswered questions about this biome. Compare and contrast the two types of rainforests. Ask students to select an area of the world that is rainforest. Use scientific inquiry to research that biome.	
	Find and display photographs of temperate and tropical rainforest images and reproductions of paintings, such as Henri Rousseau's "Surprised! Storm in the Forest." How do artists use texture, repetition, and line to convey the lushness of the rainforest? Are these realistic depictions? Why or why not? Explain that students will make a wall-size watercolor-resist mural depicting a rainforest.		
Crayola® Supplies	• Colored Pencils • Crayons • Paint Brushes • Watercolor Colored Pencils • Watercolors		
Other Materials	• Overhead projector • Paper towels • Recycled newspaper • Rolled craft paper • Transparency • Water containers • White paper		
Set-up/Tips	• Cover painting surface with recycled newspaper. • Make a transparency of digitized image of the chosen drawing. Use an overhead projector or computer to enlarge it for the class mural. • Ask small groups of children to work on specific sections of the mural at one time.		
Process: Session 1 30–45 min.	1. As a class discuss the similarities and differences between a tropical or temperate rainforest. List findings.		
	2. Students select one feature found in a rainforest such as an animal, a plant, or a water feature. 3. Students draw a detailed crayon picture of their feature. Show the work in progress to classmates. 4. Reflect on opinions of others and add any features to enrich the drawing.	2. Students select three features found in a rainforest that have a direct relationship to each other. For example, a student might draw a frog, salamander, snake, or lizard eating an insect while sitting in the rainforest canopy. 3. Students draw a detailed picture of their combination of features using colored pencils. 4. Discuss the drawings in progress with others to assure accuracy in detail.	2. Students research the biodiversity, health, and culture of a rainforest. 3. In teams, students select one topic to focus on in a mural that showcases what they discovered. 4. Students sketch their research findings.

Flowering Plant in Tropical Rainforest
Costa Rica
Photo by J. McCracken

	K-2	3-4	5-6
Process: Session 2 30 min.	5. Hang artwork. Discuss the merits of each sketch. Choose the most accurate and detailed elements of these sketches to scale up into a class mural. 6. Project the chosen images on mural paper or create a grid scale to enlarge the images. Together, enlarge the sketch.		
Process: Session 3 30-45 min. or more	7. As a group, color parts of the mural with crayons to block out areas that will not be painted. 8. Paint over the design with watercolors. For subtle effects, wet the surface before painting. Try mixing colors, using more or less water, and other watercolor techniques as well. Air-dry the paint.		
Process: Session 4 30-45 min.	9. Use watercolor colored pencils, wet and/or dry, to add details to the biome. Hang it for display.		
Assessment	• Did students depict a plant, animal, or water feature representative of a temperate or tropical rainforest? • Did students work together to create the mural?	• Did students combine three or more related elements in their sketches? Students summarize what they learned by discussing the relationship of the elements. • Students review the finished mural. Are all four layers of the rainforest shown? What animals and plants are included? Complete the K-W-L chart. Were all student questions answered? Is all information accurate and clearly depicted?	• Ask students to reflect on the team murals and to identify what topic each team selected to showcase in their work. • Summarize what the students learned about the biodiversity, health, and culture of a rainforest. Make list to compare and contrast.
	• Ask students to reflect on this lesson and write a DREAM statement to summarize the most important things they learned.		
Extensions	Children choose a favorite rainforest creature to draw and color. Cut out and add to the mural with accordion-fold strips to make the animals "pop" out of the background. Children explain to the class why they chose their creatures. Create individual miniature rainforest biome dioramas in recycled shoeboxes. Sculpt animal replicas with Crayola Model Magic®.	Students choose a favorite rainforest creature. Research and prepare a report to present to the class. Include information about its appearance, food, habitat (layer of the rain forest), and unusual facts. Present reports in first person ("Hello, I am a ___") along with a visual aid such as a poster or puppet. Compare and contrast in detail the differences between temperate and tropical rainforests.	Learn about threats to the rain forest and ways to promote its conservation. Investigate the healing properties of rainforest plants. Which are currently being harvested to provide new drugs that fight disease? Present findings to the class using posters, brochures, or pamphlets. Gifted students research the economic and environmental implications of deforestation of the world's rainforests.

Trouble in Paradise
1965
Artist: Mary Helsaple
Transparent watercolor on paper
36" x 48"
Collection of the artist.

ACTIVITY

27

Create A Creature

Students in teams invent an animal that is specially adapted to the rain forest environment. They create a tear-art picture of the creature and present it to the class.

Cooperative Structures

- RoundTable
- Team Project

Content Areas

- Science
- Language Arts
- Art

Materials

- Create a Creature worksheet (1 per team)
- 12" x 18" sheets of white construction paper (1 per team)
- Colored construction paper
- Glue
- Paper and pencil

Multiple Intelligences

- Verbal/Linguistic
- Visual/Spatial
- Naturalist
- Interpersonal
- Intrapersonal

Steps . . .

1. List Adaptations

"What adaptations, or special features, do animals have that help them to survive? For example, a porcupine's sharp quills protect it from its enemies. Student #1, write one animal and its adaptation on a sheet of paper. Then pass the paper to Student #2. Keep passing the paper and listing animals and adaptations until I call time."

2. Discuss Creatures

"Think about the special environment of the rain forest. It's a warm, wet jungle, filled with trees, vines, and living creatures. The understory is damp and dark. The canopy is warm and sunny. I want your team to invent an animal that could survive in the rain forest. Your animal must have at least four special features that help it survive in a tropical environment. Talk over your ideas, discussing colors and adaptations. Be sure to think of a name for your creature."

3. Create Creatures

When each team has thought of an animal, say, *"Send one person to the materials table to get one sheet of white construction paper for the background and any other colors you need. For this activity, you may not use scissors, pencils, or markers. You may only tear the sheets of construction paper and glue them to create your animal. You may tear many small pieces and layer them, or tear out a smaller number of large pieces. Everyone must be actively working until the creature is finished."*

4. Describe Adaptations

Give each team one Create a Creature worksheet and ask one person to write the creature's name at the top. *"I want you to pass the worksheet around the team. Each person completes one part by describing one of your creature's adaptations."*

Create A Creature

5. Present Creatures

Let each team come forward and show their creature. Ask each member of the team to explain one of its special features. Post the creatures and descriptions for everyone to view.

Journal Idea

In their journals, have each student draw a picture of their team creature. Ask them to write a brief description of the animal under the picture.

Create A Creature

Creature Name _____

Adaptations

1. _____

2. _____

3. _____

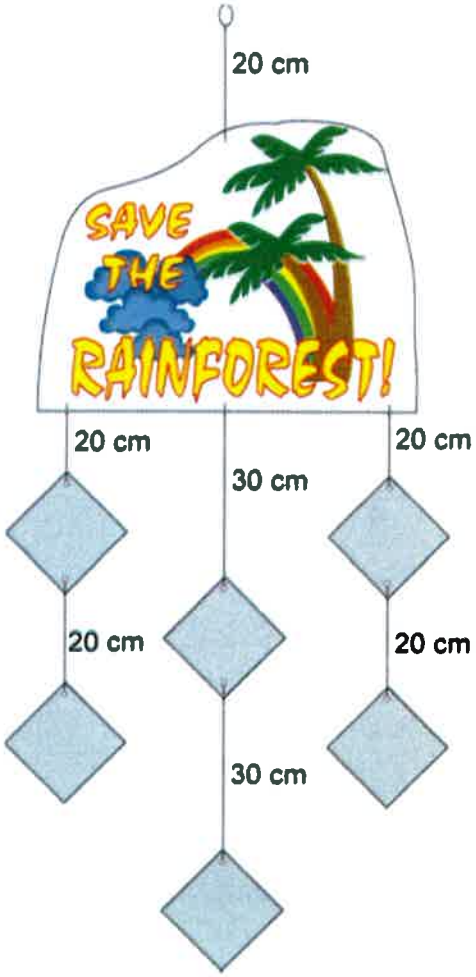
4. _____

Grades K-1 Science Through Art Activity: Rain Forest Mobile

In this activity students can learn the names of some of the animals that live in the rain forest. They will do this by cutting out and coloring the pictures of various animals, which are provided.

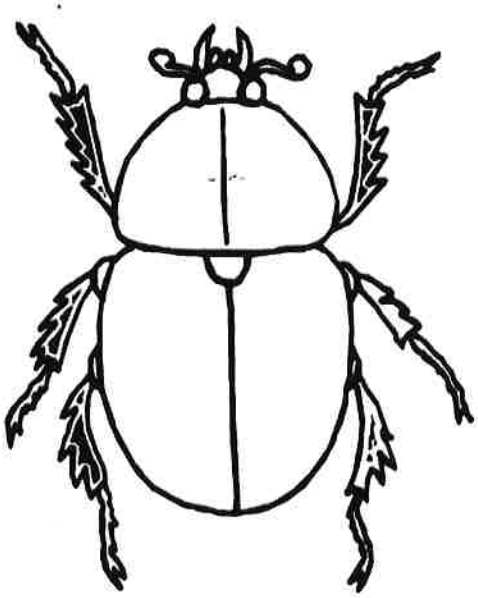
Materials:
Printouts of rain forest animals, crayons or markers, scissors, glue, yarn or heavy string, colorful construction paper, hole punch.

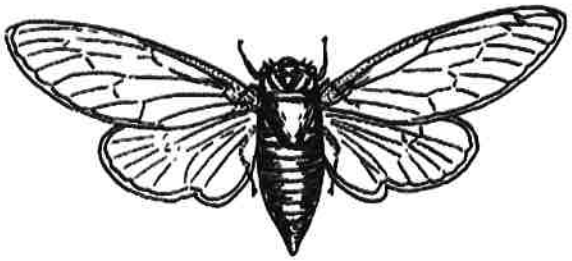
Procedure:
There are numerous ways to construct a mobile. This is a very simple version which takes the guesswork out of balancing the mobile.

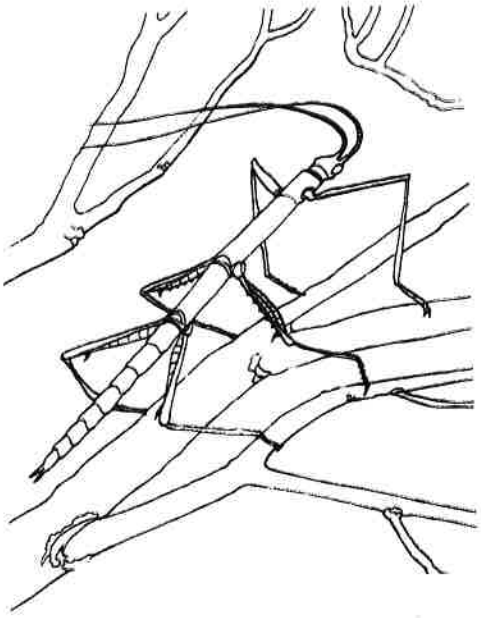


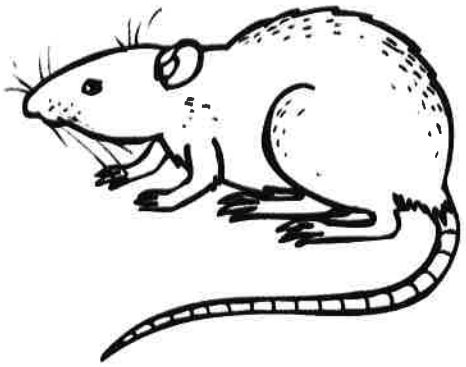
1. Precut twelve construction paper squares of diameter 11 cm on a side for each student (using the paper cutter at your school will save time).
2. Print the pictures of the animals from this web site for the students to color and cut out. Allow the students to select ten construction paper squares in the colors of their choice.
3. Each student will need to paste two paper squares together, back-to-back, so that they have six doublethick squares, perhaps green on one side and yellow on the other, all the same color, or a variety.
4. Three of the double-sided paper squares will need a hole punched at the top and the bottom (with the squares in an orientation which makes them diamond-shape as in the diagram) and three of them will require a hole punched at the top only.
5. The students can now paste the animals they have colored and cut out on both sides of the paper squares. They can use different animals on each side, or the same animals on each side, but they should have a variety.
6. Print two "Save the Rain Forest" designs for each student. This design will form the top of the mobile. Have students paste the copies of the design on both sides of card stock or two thicknesses of construction paper. Punch three holes across the bottom and one at the top, as in the diagram.
7. Precut the yarn or heavy string for each student in the following lengths: two pieces of approximately 30 cm and five pieces of approximately 20 cm. Lengths may vary from these values, as long as they are the same on both sides of the mobile.
8. One of the 20 cm pieces will require a loop tied at one end so that the mobile can be suspended from the ceiling. Tie the other end through the hole at the top of the "Save the Rain Forest" design.
9. Tie the strings to the bottom of the "Save the Rain Forest" design as shown in the diagram. Construct the mobile by tying the paper squares to the strings as shown.

PUERTO RICAN
RAIN FOREST ANIMALS

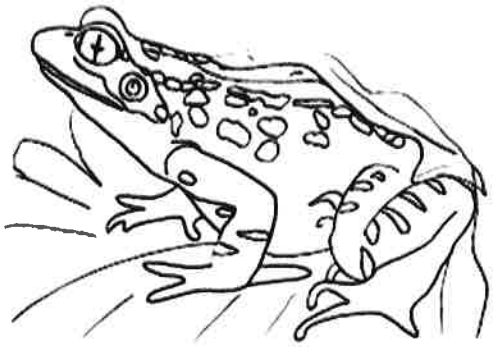


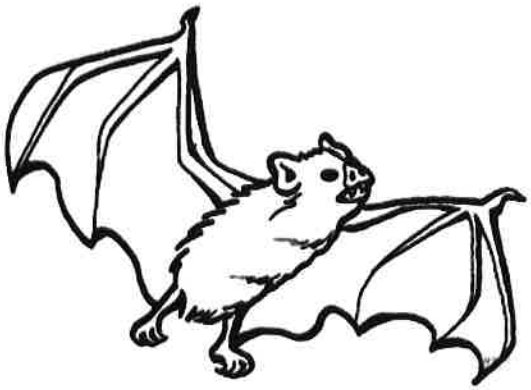


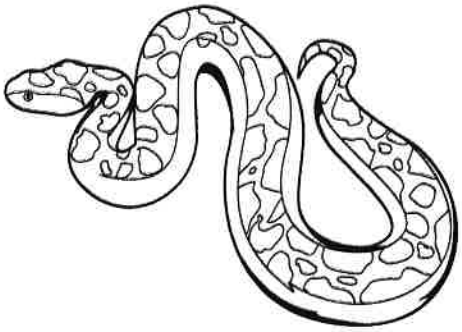


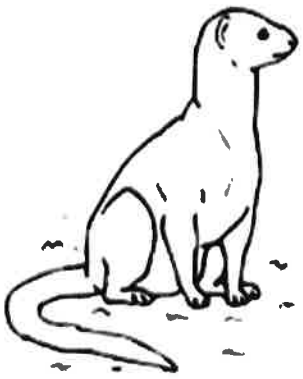


PUERTO RICAN
RAIN FOREST ANIMALS










SAVE
THE
RAINFOREST!

Grades K-1 Outdoor Activity: Leaf Hunt

Students often overlook plants and their importance. This activity stimulates students to closely observe leaves and identify their characteristics. This simple activity also builds on students' counting and sorting skills.

Materials:
Paper or plastic sacks to collect leaves, magnifying glasses, chart paper and marker pens.

Procedure:

1. Take the students out to the campus to collect leaves (or ask them to bring leaves from their own yards).

2. Once inside, the students can sort the leaves by various characteristics, such as:

   - rough or smooth edges
   - veins in one direction, or branched
   - light or dark green pigment
   - leaves of colors other than green
   - thick or thin
   - lobed or not lobed

3. Using chart paper and marker pens, chart and graph the leaf hunt results.

Grades K-1 In-Class Demonstration: Rainbow

One of the most beautiful displays of physical science in the rain forest is the rainbow, which appears when there are droplets of water in the air. This demonstration allows you to create a rainbow on the ceiling of your classroom, so that all students can see it.

Materials:
Clear plastic cup, water, overhead projector.

Procedure:

1. Fill the cup with water and place it on the glass of the overhead projector. Turn on the projector.
2. As the water settles down after being placed on the overhead projector, you will see a large circular rainbow on the ceiling of the classroom.

Questions for Students:

1. Which color is on the outside of the rainbow? Which is on the inside?
2. In a real rainbow, which color is on the top?
3. What shape would the classroom rainbow have if a square plastic container were used? (Try it!)

Grades 1-2 Science Through Art Activity: Leaf and Flower Prints

In this activity, making leaf and flower prints as an art project will give the students an opportunity to carefully observe leaves and flowers.

Materials:
White or light colored construction paper sheets (any size), poster paint, a variety of leaves and flowers.

Procedure:
Caution should be taken to keep hands as free of paint as possible to avoid smearing the paint and to create sharp images of the plant material.

1. Using poster paint and paint brushes, paint the underside of leaves (this is where the veins are the most pronounced) and then press the painted leaves, one at a time, on the paper, being careful not to smear the paint.

2. Repeat the process with flowers. When painting and pressing the flowers, the open blossom can be painted and then pressed onto the paper, or a closed blossom can be painted and pressed, giving a "side view" of the flower.

3. Allow the prints to dry thoroughly. If the prints are made on 11" by 17" paper and then plastic laminated, they make very attractive table place mats.

Grades 2-3 Outdoor Activity: Flower Hunt and Dissection

As a follow-up to the flower construction in the 1-2 activity section, students collect flowers and bring them inside the classroom for dissection and identification of the structures in this activity.

Materials:

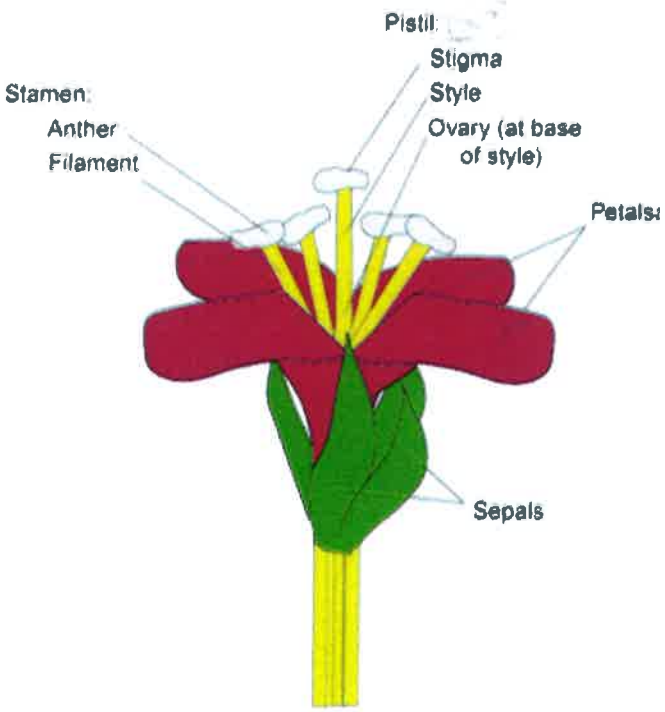
Flowers brought in by students, forceps, tape, and construction paper

Procedure:

1. Using forceps, have the students dissect the flower completely and lay out the structures on a piece of paper.

2. Have students secure the flower structures to the paper with clear tape, then label the structures.

3. Have students identify the structures by comparing to the diagram

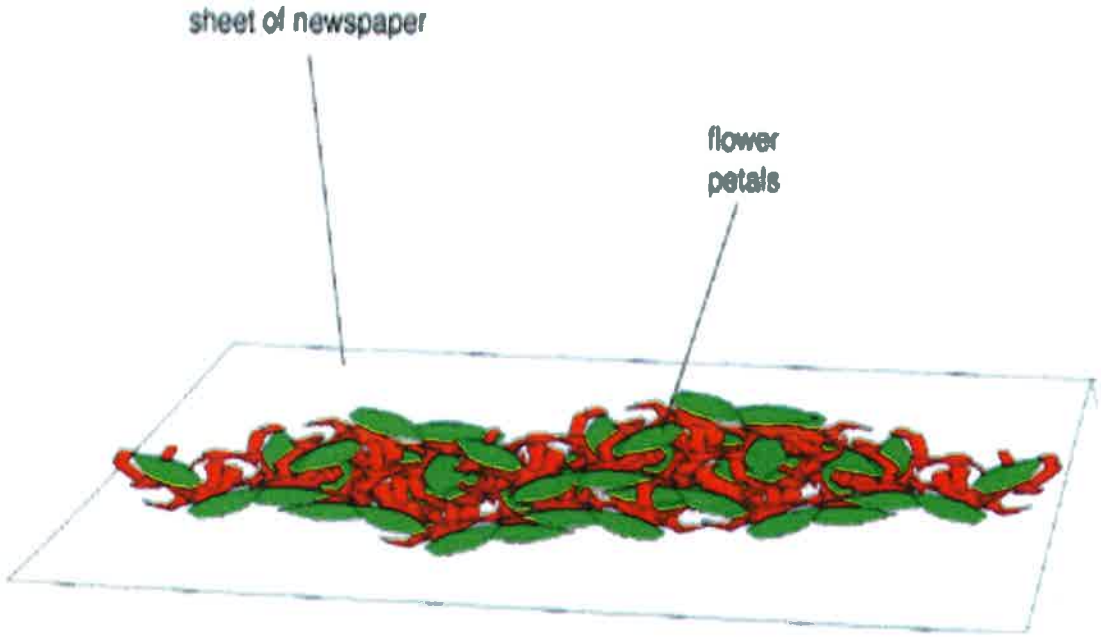


Grades 3-4 Outdoor Activity: Drying Flower Petals for Use in a Sachet

Go out of doors either at home or at school and collect flowers. These will be used to make the sachet in the Science through Art activity. Supermarkets and florists are also often willing to give away old flowers for school projects. This project does not require that the flowers be at their freshest! For this project, rose petals are best, as they retain some fragrance. Other petals can be incorporated for color.
By taking the flowers apart to remove the petals, students can observe the different structures of the flowers and note their similarities and differences. Materials and information located on this website at the 2-3 grade level under "Flower Construction" in the Science through Art section would be helpful and a good review of the flowering structures of plants.

Materials:

Plastic or paper sack, newspaper, dry environment, flower petals.



Procedure:

1. Collect flower petals in a sack (or obtain from supermarket or florist discards).
2. Spread flower petals out in a thin layer over newspaper in a dry environment.
3. Depending on the humidity in the room and the type of flowers, the flower petals will dry in 1 to 4 days. They are now ready to be made into the sachet.
4. Ask the students why the petals appear darker in color when they are dry. They should be able to conclude that the loss of water during the drying process causes the color (pigment) of the petals to be darker because the pigment is now more concentrated without the water. Oxidation from the air has also occurred, however, one would not expect students at this grade level to have this knowledge!

Lesson 3
Deforestation

The Lorax can be found in KidzLit 3rd - 5th, Set 3

Concept

One element of a complex ecosystem may provide essential components to the survival of many species of plants and animals.

Essential Question

How can the clearing of trees destroy a community?

Step 1: Connect (the concept to prior knowledge)

Challenge

Students will identify and connect with the benefits of trees.

Procedure

1. As a class, brainstorm the relationship between trees and humans.
   - How do we benefit from trees?
   - How do they benefit from us?
2. Discuss oxygen/CO_2 exchange, soil stabilization and protection from erosion, animal habitat, shade, medicine from the rainforest, etc.

Step 2: Literature/Discuss (give expert information book; ask questions)

Challenge

Students will be challenged with opposing viewpoints of the relationship and attitudes between humans and the forest.

Materials

- book: *The Lorax* by Dr. Seuss

Procedure

1. Read *The Lorax* by Dr. Seuss.
2. Discuss the two main characters. Explore students' thoughts and reactions to what these characters represent in our society.

Step 3A: Practice (math and learning centers)

Challenge

Students will use their knowledge of the forest to predict a deforestation scenario.

Materials

- paper, pencils

Procedure

1. Students will create a story that shows what they think would happen if all the trees were cut down in their neighborhood.
   - Who would be affected?
   - What changes would occur? And so on...
2. Students will act out their stories for the class and/or the whole school.

Lesson 3
Deforestation

Step 3B: Create (performance tasks related to standard indicators)

Challenge

Students will organize a community tree planting day.

Procedure

1. Have students pretend they have replanted a forest that was cut down for coffee production. Predict how long it would take to look like a forest again.

2. Students will organize a community tree planting day.

3. Students will monitor the growth of their trees throughout the year.

Step 4: Present (edit work/students orally present projects)

Challenge

Students will put on an open house to present their service project to the community.

Materials

- recycled or Forest Stewardship Council-Certified paper

Procedure

Students will make and distribute invitations, on recycled or tree-free paper, for an open house where they will describe to the community their goals and objectives for their tree planting service project.

Additional resources: "Find Certified Products" (www.rainforest-alliance.org/green-living/marketplace); Forest Stewardship Council® (www.fsc.org)