



The Zoological Society of San Diego's
WILDLIFE WIZARDS

An after-school program providing wildlife activities and
conservation action projects for
students ages 8-11



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Introduction to the Zoological Society of San Diego's

WILDLIFE WIZARDS

An after-school program providing wildlife activities and conservation action projects for students ages 8-11

The living world around us has so much to offer, from the beaches of San Diego to the bamboo forests of China. The Earth gives us our water to drink, our air to breathe, and the food we eat. By learning how the Earth works, we can better understand how we can give something back to the planet that gives so much to us. The Zoological Society of San Diego (ZSSD) has created a fun way for students to learn about the world around them—the Wildlife Wizards program.

The ZSSD operates the San Diego Zoo, the San Diego Wild Animal Park, and the Center for Reproduction of Endangered Species (CRES). CRES is where researchers work to help save endangered animals all over the world. Wildlife Wizards are going to discover where these researchers are working, what they are doing, and what kinds of things the Wildlife Wizards can do to help.

Employees from different ZSSD departments work together to help save endangered animals at home and abroad. For example, biologists from CRES recently visited the Michoacán area of Mexico to study monarch butterflies. They learned that the forest where the butterflies live is being cut down for firewood and farming. A team of conservation-minded employees followed the biologists on their next visit to Mexico to work with the local people who live near the forests. The team hoped to help the people find ways to use less wood from the forest to cook and build their homes. Employees also helped out by doing workshops and community outreach programs on conservation issues and how to live a sustainable life. Both ZSSD employees and the local people living in monarch butterfly habitat learned the importance of conserving all of the world's natural resources. After all, our planet is one large, connected ecosystem. What we do today will effect our planet tomorrow.

The Wildlife Wizards' Mission

- To learn about worldwide biodiversity and culture.
- To learn how to be leaders and problem solvers for the environment and the community.
- To develop an understanding of wildlife conservation and biodiversity through local action, reading field notes from researchers, and through informal discussions.

Format of Activities

The Wildlife Wizards packet is designed to support after-school programs that are led by an adult coordinator. Each module provides information and activities for two months of after-school meetings. In addition to the meeting activities, additional activities and field trip extensions are given to enhance each module.

An introduction activity presents an overview of what students will learn and participate in during the program. Following the introduction activity there are four two-part modules. The theme of each module is based on a ZSSD field researcher and their recommendations on how students can help conserve biodiversity worldwide through local action.

Each module has two parts:

A) Meet a Researcher

- Overview
- Introduction
- Activity Suggestions
- Researcher's Biography
- What You can do to Help
- Activity(s)
- Wrap Up

B) Local Action Project

- Overview
- Introduction
- Activity(s)
- Activity Suggestions
- Wrap Up



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INTRODUCTION TO PROGRAM

Activity: What in the World is a Wildlife Researcher?

Overview

Students will explore field research equipment and learn about the researchers their group will support.

Materials

- Backpack Discovery Worksheets
- Four backpacks (Each backpack represents a different part of the world. Below is the list of areas and animals, and suggested items for each backpack).

Backpack #1: China, Giant Panda Bear — Binoculars, map of China, waterproof marker, clipboard, stopwatch, compass, heavy sweater, image of giant panda

Backpack #2: Turks and Caicos Islands, Island Iguana — Binoculars, map of Caribbean, waterproof marker, clipboard, medium-size fishing net, compass, sunscreen, image of island iguana

Backpack #3: Argentina, Owl Monkeys — Binoculars, map, waterproof marker, clipboard, flashlight, compass, hiking boots, image of owl monkey

Backpack #4: Southern California, Desert Bighorn Sheep — Binoculars, map, waterproof marker, clipboard, earplugs, compass, hat, image of desert bighorn sheep

Procedure

1. Ask students, *“Who here has been to the San Diego Zoo or the Wild Animal Park? What favorite animals did you see? There are animals at the Zoo and Wild Animal Park from all over the world: pandas from China, condors from California, iguanas from Fiji, and elephants from Africa. There are also people who take care of the animals at the Zoo and the Park. Did you know that the Zoological Society of San Diego has people working all over the world to learn more about these animals in the wild to help conserve or save them? We call these people ‘researchers.’*

“To start off your first meeting, we need to bring out the researcher in you. A researcher needs many things when going out on a journey or exploration. Can anyone guess what some of those items may be?”
(Take a few answers).

2. Break students into four teams. Each team gets a backpack.
3. Students need to designate a recorder to write down their answers.
4. Each team has 15-20 minutes to review the items in their backpack. They write the items on the worksheet and guess what the researcher is studying and in what part of the world.
5. Students will have one person on their team announce their answers to the group when all teams are done with the activity.

Backpack Discovery Answers

(for the coordinator)

In general:

Compass

Binoculars — To observe a variety of wildlife

Waterproof marker and clipboard — To collect data on animals and plants in the field

Map — Indicates location of study site

Images — Indicates species being studied

Backpack #1: China, Giant Panda

Stopwatch: Researchers record the behavior of pandas by using a stopwatch and writing down the time at which each behavior occurs.

Warm sweater: The panda is found in regions of China where it snows.

Backpack #2: Turks and Caicos Islands, Island Iguana

Net: Researchers use a net to catch iguanas on these islands in order to take blood samples and place tracking equipment on the animals.

Sunscreen: Turks and Caicos Islands are in the Caribbean, which gets a lot of sun because it is close to the equator.

Backpack #3: Argentina, Owl Monkeys

Flashlight: Researchers who study owl monkeys, a nocturnal primate, do their data collecting in the evenings.

Hiking Boots: The habitat where the owl monkey lives, the Chaco, has a difficult and often muddy terrain.

Backpack #4: Southern California, Desert Bighorn Sheep

Earplugs: Researchers track bighorn sheep populations by observing them from a helicopter. Earplugs help block the noise so they can focus on their data collection.

Hat: The desert habitat is a hot and sun-filled environment that requires a hat to block the sun's harmful rays.



Activity: Researchers' Relay Game



Overview

Students will participate in a relay race and practice working as a team.

Materials

- Backpacks from previous activity (with equipment)

Procedure

1. **Review Teams:** Students will stay in the same groups and prepare for the Researchers' Relay.
2. **Preparing Students:** Tell students to imagine that they are preparing for an expedition to visit the area of the world their backpack represents to study their animal. The problem is that only one team will be able to go at a time, and the coordinator of all the research teams does not know which team should be picked to go first.
3. **Strength and Endurance in Research:** Researchers need to be quick and in good physical shape to work in the field for long periods of time. Knowing this, the coordinator decides to have a relay race with the teams to decide which one of them will get to go on their expedition first.
4. **Researchers' Relay:** Students will pretend to be those teams and prepare for a relay race where they need to do much more than just running.
5. **The Relay:**
 - Each team will place their backpack and its contents on the other side of the running field.
 - Each team member will run out, one at a time, and grab an item. (ONLY ONE ITEM.)
 - The team member then runs back and hands the item to the next person, who will run out and grab another item. (Does the next person wear all the stuff grabbed so far?)
 - The object is for the last person to be wearing the backpack and all of its contents at the end of the relay.
6. **Some Simple Rules:**
 - The first person out MUST grab the backpack.
 - ONLY one item at a time can be grabbed.
 - All items that can be worn MUST be worn (clothing, binoculars).
 - All items that cannot be worn MUST be put in the backpack SECURELY.Let's see who gets to go on their expedition first!

Wrap Up (For coordinator to communicate to students)

In the next few after-school adventures students will be introduced to new researchers and local projects they can do to help as a team. They will find out what the "researcher of the month" works on, what animals they study, and do lots of fun activities so they can discover what it takes to help save animals and their habitats. They will work on crafts, dramas, and science experiments, and perhaps go on some field trips.

Researcher's Riddle

At the end of each meeting, a Researcher's Riddle will be presented that highlights the next meeting's topic. Next time, students will meet a CRES researcher from Argentina who studies owl monkeys. The nocturnal owl monkeys live in pairs for life; in other words they just have one mate. They do not choose their mates based on looks, but something else. How can researchers use this information to study the monkeys and their habitat?

It's dark when looking for a date,
That is the owl monkey's fate.
How else, but sight to choose a mate?
Well, they have found a way that's great!

We look forward to hearing your answers at the next meeting.....

Field Trip Extension

Students can participate in one of two field backpack programs developed by the Zoological Society of San Diego. At the Wild Animal Park call the Education Department at 760-738-5057 to learn more about the Safari Backpacks program. The Chula Vista Nature Center offers the Sweetwater Safari program, which explores a wetlands habitat. Call 619-409-5903 for more information.



MODULE 1-A

EXPLORING THE GRAN CHACO HABITAT AND OWL MONKEYS

Researcher: Eduardo Fernandez-Duque
Country: Argentina, South America



Overview

Students will learn about a researcher who works in northern Argentina studying owl monkeys. Activities will include a dramatization and outdoor game.

Introduction

Dr. Eduardo Fernandez-Duque works in the province of Formosa, located in the northeastern region of Argentina. Seven to eight thousand years ago, the first people to live in Formosa were the Toba, the Pilagá, and the Wichi Indians. Today, there are four different kinds of people living in Formosa: the three Indian groups just mentioned, and the “criollos,” people descended from the Spanish who came to South America during the 16th century.

Some of the criollos live in a city and never ride a horse or go to the forest. But some of the criollos are called “gauchos.” Most gauchos work and live on cattle ranches. These people spend every single day riding a horse, sometimes from dawn to dusk. The horse is very important, since it helps them manage the cattle.

Many of the Indians of Formosa also live in the city. They are bilingual; they speak their own language at home and Spanish at school. Indian families of Formosa have not adopted many of the criollos’ customs, and still live close to the forest where they hunt, fish, and collect fruits to eat. They do not hunt or fish for fun, like some people do in the United States or other developed countries. The Indians rely on the forest to survive. One of their favorite food items is honey. Since there are many different types of bees in the area, there are many types of honey: some very sweet, some very watery. Toba and Pilagá women make beautiful baskets with dry palm leaves. Wichi women make useful string bags with fibers from a forest plant. When they go to the forest to collect “algarroba” fruits, they carry the string bags on their backs, hanging them from their foreheads.

The Gran Chaco, an alluvial plain covering an area the size of Poland, consists of a mosaic of grasslands, savannahs, drought-tolerant thorn forests, and narrow bands of forests along streams. The region shows significant seasonal variation in climate, rainfall, and food availability. This is the habitat that the people and wildlife of Formosa share.

Within the dry forest of the Argentinean Chaco, Dr. Eduardo Fernandez-Duque studies the genetics of mate choice by owl monkeys, one of the few monogamous primate species in the world. Owl monkeys are nocturnal and make extensive use of chemical communication, but it’s unknown what role chemical cues play in reproductive decisions. This species of monkey also lives in family groups of three to seven individuals in small home ranges.

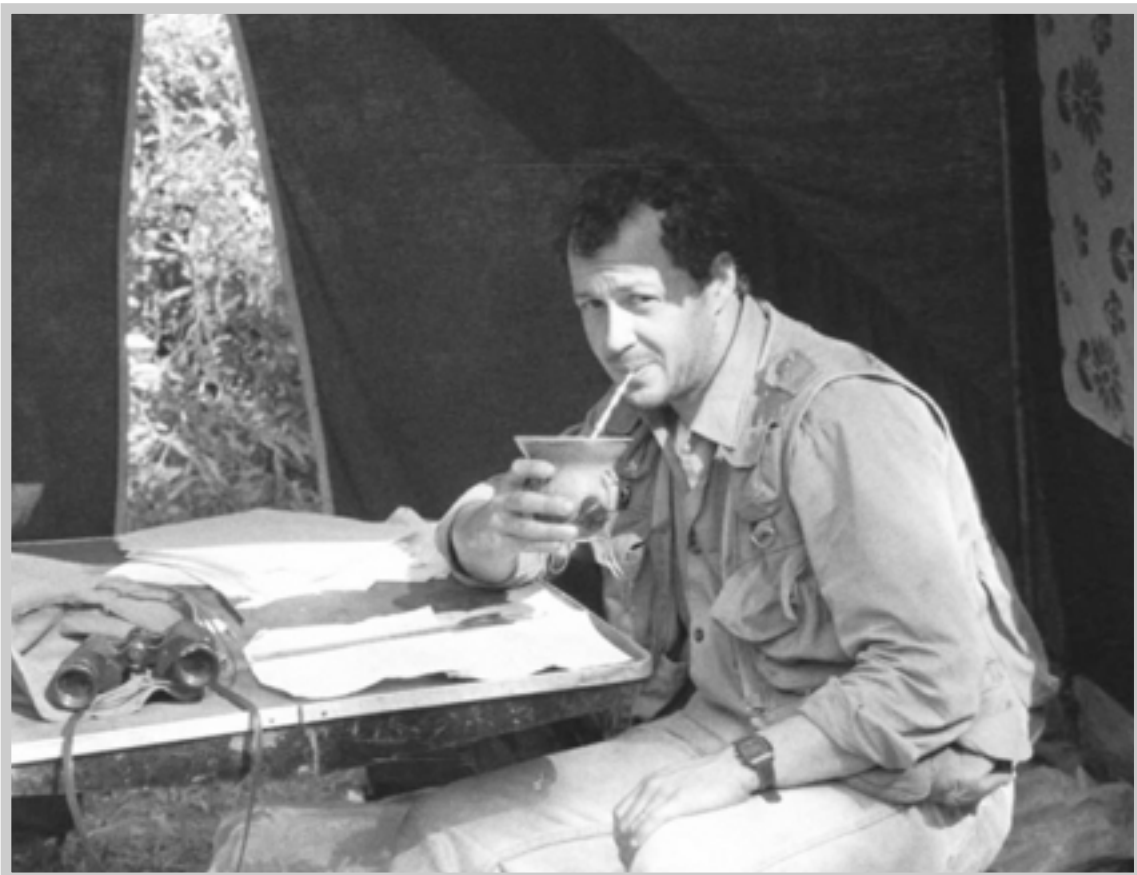
Dr. Fernandez-Duque's mission is to conduct radio-tracking studies of behavioral ecology, coupled with genetic studies of paternity and the immune system in wild owl monkeys. He is also involved in efforts to set up a 5,000 hectare (19 square-mile) wildlife reserve at his field site, and wishes to organize an outreach program with the ZSSD's Education Department.

Before Activity

Discuss with students their answers to the researcher's riddle. (*Answer: Researchers are still learning how owl monkeys choose their mate. They have some data that seems to show the monkeys use sound and smell, but they are not completely sure.*)

Activity Suggestions

- Read the first paragraph of the biography and then ask for volunteers to help read individual paragraphs.
- Expand on the "What do you love?" question. Have the students share the things they know and love.





BIOGRAPHY

My name is **Eduardo Fernandez-Duque** and I'm a researcher for the Zoological Society of San Diego. I work in Argentina studying owl monkeys. These monkeys are unusual because they are active at night. Most monkeys are awake during the daytime, like us.

People sometimes want to know why I started studying animals. When I was young, two of my favorite television programs were *Daktari* and *Animal World*. *Daktari* was a veterinarian. He lived in Africa and took care of wild animals. He had some unusual friends, too. One of his friends was a cross-eyed lion named Clarence. Another animal friend was Judy, a chimpanzee. *Animal World* was mostly about the big grazing animals of the African savannah. Twenty years ago we did not know very much about animals that live in trees, such as monkeys.

As I grew older, my adventures with wild animals became much more exciting. When I was 10 years old, I went to a zoo in Argentina. It had an animal show where one of the children in the audience was picked to walk into the tigers' enclosure, pick up a tiger cub, and bring it to the tiger mom. Guess who was picked to do that? Yes, they chose me!

I decided to study animals, so I went to college at the University of Buenos Aires in Argentina. The first animals I studied were crabs. I wanted to know how crabs learn and how they respond to danger. After that, I went to school at the University of California at Davis. This is where I started studying monkey behavior. I've had some pretty wild things happen to me during my research in the field.

Sometimes people ask me if my work really helps the world around us. I think it does. "We only love what we know," is a popular saying. Think about it for a moment. What are the things you love? What are the things you care about? It is ALWAYS things you know very well.

The problem is that most children in Argentina do not know about the wonderful forest they have in their own backyard. Owl monkeys are not endangered, but the forest where they live is. I believe that people will not help conserve the forest until they know more about it. Through my work I have been able to show the forests to many students in Argentina. I want to make sure that every child in Formosa, Argentina gets out into the forest. If they love it, then we have a better chance of saving it.

What You Can Do to Help Eduardo

1. **Butterfly Farming or Ranching:** Students in Formosa, Argentina would love to learn how to help the habitat of the owl monkey. One way they can help is by raising pollinators, such as butterflies. You can help the animals in your area by raising butterflies too, and sharing your information with students in Formosa.
2. **Trash and Recycling:** We must stop being wasteful. Here's an idea: go through your school and make a list of items that could be reused. Paper is a good example. If it's only got printing on one side, the clean side could be used again! Think about the paper your school uses. Reusing paper could save your school some money and save some trees too!

Activity: Night of a Hundred Peccaries!

Overview

Through a dramatization, students will relive one of Eduardo's most adventurous moments in the field.

Character Roles

- Eduardo
- Research Assistant (choose a female, if possible)
- Voice of Eduardo
- Peccaries (as many as you want!)

Sound Effects Roles

- Spooky sounds, like an owl hooting
- Creepy screams or thunder claps. Encourage creativity!
- Sound of the flashlight dying



Materials

- Flashlight
- Hiking boots
- Clipboards—for Eduardo and the research assistant
- Pens
- Backpack
- Pretend loud speaker—for voice of Eduardo
- Feathers—for owls
- Script (10 copies)

Procedure

1. Assign students a character or sound effect role.
2. The characters of Eduardo and the research assistant can carry and use the items out of the backpack.
3. "Voice of Eduardo" reads the script. Allow a few moments for each of the actions in *italics* to be acted by the students.
4. You will need to dim the room if possible.

Activity Suggestions

- After reading the story, add your own "props" to enhance the tale and interest your students.
- Indicate to each group of students how long each action should occur. This will help the "Voice of Eduardo" highlight the story and allow time for the actions to take place.

SCRIPT:

A NIGHT OF ONE HUNDRED PECCARIES

E: I had just started working with owl monkeys and my research assistant and I were coming back to camp at night.

(Eduardo and research assistant walk around in the dim room.)

E: Although I had my flashlight, it was quite dark and kind of spooky.

(Students make spooky noises.)

E: As we approached camp, we heard some very loud noises between us and our tents.

(Students who are peccaries make some loud noises.)

E: There are no big cats like jaguars or tigers in our forest, but there are white-lipped peccaries. Peccaries are like big pigs with huge tusks. When they walk around in the forest they stay in groups of up to 100 animals.

(Have students make finger tusks and pig-like noises.)

E: Trust me—you do not want to find yourself in the middle of 100 white-lipped peccaries running wild. They can be very dangerous!

Since we thought the noises could be the peccaries, we decided to wait in the dark until they had left camp. And then my flashlight died! Yes, it went dead without any warning at all.

(Have a student dramatically create the sound of a flashlight dying!)

E: I thought the batteries were dead, so I put in some new ones, but no luck. No flashlight, no moonlight, but lots of wild peccaries a few yards away. We climbed up the nearest tree and I told my assistant to make sure she would not leave without me.

(Have Eduardo and research assistant climb up on a chair or desk to escape the peccaries.)

E: After a while, the noises stopped and we decided it was safe to go back to camp.

(The students who are the peccaries wander off to the far side of the room. When they are quiet, Eduardo and the research assistant can climb down.)

E: Since then, I always bring a spare flashlight with me!

 **Activity: You Smell Good!****Overview**

Students can pretend to be owl monkeys!

Introduction

Owl monkeys are thought to be monogamous, which means they only have one mate at a time. This relationship is similar to being married. Researchers are not sure how the monkeys choose their mate, but they think it has something to do with smell, not looks. Remember that owl monkeys are nocturnal, so it would not make much sense for them to have brightly colored fur as a way to tell each other apart.

Materials

- Scented oils or scented markers*
- Index cards (all the same color)
- String
- Hole punch

* If scented markers are used, students will need to be blind folded or the room darkened, so they are unable to identify the marker color.

Preparation

1. Punch a hole in two corners of each card and thread the string through the holes so that each index card can be worn like a necklace.
2. On the back of each pair of cards, write a number on one card and a symbol on the other. Small printing in the lower corners works well.
3. Create a code chart to match up pairs of cards.
4. Put a different scent on each pair of cards.

Procedure

1. Dim the lights and distribute a card necklace to each student.
2. Tell them they are owl monkeys and have to find another owl monkey with the same smell that is on their card by using only their noses! (Some students may be allergic to certain smells and oils. Advise students not to touch the oily spots on the card, just smell them.)
3. Once they find their match, have them sit together until all the monkeys are paired up.
4. Discuss what role scent plays in the lives of nocturnal animals.

**Wrap Up** (For coordinators to communicate to students)**Researcher's Riddle**

What crafts, field equipment, or art can you make from stuff thrown away in the trash?

Use your imagination to turn someone's unwanted item into something useful and bring your ideas to the next meeting.

The San Diego Zoo's Wild Ideas Web site at www.sandiegozoo.org/wildideas has some great ideas for you in their Kid Territory/crafts section.

Activity Extension

Learn about local nocturnal species, such as bats. Contact *Wild Birds Unlimited* to find out how to create bat houses for local reserves.

Field Trip Extension

Eduardo asks that you learn about local butterflies and how to create a garden habitat for them. Helping local butterflies is important not only to your own neighborhood, but to habitats all over the world.



MODULE 1-B

OWL MONKEY RESEARCHER

Local Action Project: Recycling for Wildlife and People

Overview

Activity Part I: Students will discuss with their teams the trash item on their table and how that item can be reused, as well as reasons why it is important to reuse, recycle, and reduce waste.

Activity Part II: Students will conduct a recycle audit of their school to determine possible ways to improve their school's recycling efforts.

Activity Part III: Students will interview an administrator or janitor on how the waste is collected at their school and develop a proposal as a group.

(NOTE: Each part will require approximately 45 minutes to one hour to complete. It is suggested that four group meetings be held to complete the recycle project.)

Introduction (Information also appears on Answer Cards)

ALUMINUM: Where does aluminum come from?

Aluminum comes from cutting huge holes in the ground, usually in places that contain forests. The forests are cut down or burned. Then deep holes are dug to get a substance called bauxite. Bauxite is used to make aluminum. When the bauxite is all gone, the miners leave. The land they dug up may never recover. There's already enough aluminum to go around. If we recycle all those aluminum cans, then there won't be a reason to dig for more bauxite. And the forest areas where the bauxite is found would be safe! If you throw a soda can in the trash, you're throwing away a little piece of wild habitat. The Zoological Society of San Diego has one great way to help with aluminum recycling: the **Cans for Critters** program. It's a fun way to get your whole school and even your community involved, and you're all helping to save wild habitats.

WHY HELP: ALUMINUM CANS TAKE **80 YEARS** TO DECOMPOSE!!!! BY RECYCLING ALUMINUM CANS YOU HELP ANIMALS SUCH AS THE GIANT RIVER OTTER, WHO LIVES IN THE HABITAT WHERE BAUXITE IS MINED.

PAPER: What type of paper can be recycled?

We can recycle cardboard boxes, newspapers, computer paper, catalogs, magazines, and food packages like cereal boxes. They can all be recycled and made into paper again, without cutting down any more trees. But you can go one step further: you can buy, and tell your family and friends to buy, products that USE that recycled paper for their packaging. Look for a note on a box or package that says, "Made with at least 30% POST CONSUMER waste." The higher the percentage, the better. This means that paper stuff we already used in one form has been made back into paper pulp and turned into the package you're looking at. No trees were cut down!

WHY HELP: IF ALL SAN DIEGANS RECYCLED THE PAPER FROM ONE SUNDAY EDITION OF OUR LOCAL NEWSPAPER, WE WOULD SAVE ABOUT 75,000 TREES. SAVING TREES HELPS PROVIDE FORESTS FOR ANIMALS LIKE THE THICK-BILLED PARROT.

PLASTIC: Where do most Americans receive a plastic item every week?

The grocery store puts your food in plastic bags every week! You can recycle clear plastic, like soda and juice bottles; “white” plastic, like milk and water bottles; and colored plastic, like detergent bottles, shampoo bottles, margarine containers, vitamin bottles, and lots of other colored items. And again, when you go back to the store to buy a new bottle of something, look for “Made with POST CONSUMER waste” on it. It means that the company takes recycling seriously and uses recycled plastic to make its packages.

WHY HELP: ONE PLASTIC BAG TAKES 15 YEARS TO DECOMPOSE. RECYCLING PLASTIC BAGS CAN HELP SAVE ANIMALS LIKE SEA TURTLES, WHO THINK THAT PLASTIC BAGS FLOATING IN THE OCEAN ARE TASTY JELLYFISH.

GLASS: Where does glass come from?

Glass comes in a variety of colors, shapes, and sizes. But best of all, glass is recyclable. Glass is one of the easiest things to melt down and reuse. It is made from a mixture of sand, silicone, and minerals. Some recycling places even give you money for it.

WHY HELP: GLASS TAKES MORE THAN AN ENTIRE LIFETIME TO DECOMPOSE!! RECYCLING GLASS REDUCES GARBAGE GOING INTO LANDFILLS, AND LEAVES MORE HABITAT FOR ANIMALS LIKE THE ROSY BOA SNAKE.

ORGANIC MATERIALS: What are some organic materials that we eat?

Organic materials are natural products such as fruits and vegetables. About 25% of the trash in our homes is made up of food and yard wastes. Fruit peels, vegetable scraps, and grass clippings can all be composted* to create fertilizer for plants.

WHY HELP: ORGANIC MATERIALS TAKE TWO YEARS TO DECOMPOSE IN A LANDFILL. USING THESE PRODUCTS FOR COMPOST CAN HELP YOUR GARDEN GROW AND PROVIDE A HOME FOR LOCAL WILDLIFE.

**Compost — A rich, soil-like mixture that is produced when organic materials such as yard, garden, and kitchen wastes break down.*

Before Activity

Review *Researcher's Riddle* project in 15 minutes. Go around the room and ask each table group to QUICKLY explain: 1) what their trash item is, and 2) what it is made out of. If possible, take a photo of each item.



Activity Part I: Recycling for Wildlife

Overview

Students will review where plastic, paper, glass, aluminum, and organic materials come from and the importance of recycling.

Materials

- Cardboard (for example, from a recycled cereal box) or newspaper
- Plastic grocery bag
- Glass jar or bottle
- Aluminum can

- Banana or orange peel
- *Recycling for Wildlife and People* worksheet
- Answer cards (five total) (photocopy pages 20-25)
- Five pens or pencils

Preparation

1. Place one item on each table (five items total).
2. Photocopy five copies of *Recycling for Wildlife and People* worksheet.
3. Separate students into five teams. Each team will discuss one of the items outlined in the materials.

Procedure

1. Explain to students that they will have ten minutes to answer the questions on their worksheet about the item on their table.
2. Once they are done with their worksheet, they are to ask you for an answer card.
3. The students should then compare their answers with the answer card and prepare to explain their results and the answer card to the class.
4. Before they begin, assign the roles of recorder, timekeeper, and announcer to each team member. (If there are more than three students in each team, assign the same role to two or more students).

Activity Part II: Recycle Audit of School Grounds

Overview

Students will review a sample of trash bins at their school to determine the current status of the school's recycling program, and possible improvements that can be made.

Materials

- Plastic gloves (one per team)
- Make five copies of the Recycle Audit of School Grounds worksheet
- Five pens or pencils
- Clipboards (five)
- Flip chart
- Cameras (one per team, if possible)

Preparation

1. Ask permission from the principal, as well as from those who monitor the chosen sites (i.e. teachers, janitor, secretary) if the students can review items in their trash and recycling bins before the wastes are collected that day. Explain that the students are auditing the school to determine the current status of their recycling program and possible improvements that could be made.
2. Ask the principal or janitor to attend the end of the next meeting to be interviewed about the recycling program.
3. Outline worksheet information on a flip chart to prepare to review the total items found for each waste product.

Procedure

1. Divide students into four or five groups, depending on how many audit sites you have chosen. Explain to students that they are going to help review the recycling program at their school through an audit (see definition above).
2. Ask students to name some of the items they can recycle or reuse that they perhaps discussed in the previous activity.
Recall: plastic, paper, aluminum, glass, organic material for composting.
3. Ask students to choose a recorder, timekeeper, collector, and counter.
 - Recorder: writes down the findings during the audit
 - Timekeeper: makes sure only 15 minutes is spent at the audit site
 - Collector(s): sort items one at a time from the trash and recycle bins (gloves required)
 - Counter: helps the recorder tally how many items of each waste product were found. (See worksheet).
4. Assign each team an audit site and confirm that they know where the site is.
5. Review the directions outlined at the top of their audit sheet and ask the students to explain their mission.
6. Remind students that they have 15 minutes to conduct their audit and report back for a ten-minute review of their findings.
7. Take the class out to one of the sites to show an example of how they will conduct their audit.
8. Ask each group to take a photo of their audit site and the waste bin they sampled from.
9. When the groups return, ask each to report their numbers and summarize all the findings on the flip chart.
10. If time allows, ask students to come up with questions to ask a school leader or the janitor in regards to their findings.

Activity Suggestions

- Choose six audit sites that provide a good sample of your school's recycling program. (For example, one room from each grade level, the office, and one trash can at the lunch area.)
- Demonstrate to students what they will be doing at one of the sites.
- Define "audit" for students. (Audit is an inspection or review of a program or situation. It calls for data collecting and sometimes interviews.)

Activity Part III: The Interview and Proposal

Overview

Students will develop questions and interview the principal, janitor, or a school leader who will answer the questions they developed regarding their recycle audit findings. Students will summarize their findings and information to be presented to the principal for review.

Materials

- Flip chart
- Summary of data collected from audit
- Markers for flip chart
- Paper
- Photos from audit
- Glue or staples

Procedure

1. Ask each team to review the summary of the data on the flipchart.
2. On a piece of paper, ask each team to write down two positive things about their school's recycling program, two things that need improvement, and two ways that the group can increase awareness and involvement in reducing waste at the school and in the community. (Some ideas may include: a school newsletter on the findings; an added component to the recycling program, such as vermicomposting; or a contest for the best craft made from recycled products.)
3. Ask each group to share their information and write it down on the flip chart.
4. From the information gathered, brainstorm five to ten important questions to ask the principal, janitor, or school leader. The questions should help determine if the improvements suggested would be possible actions to take at the school, and how the group could implement their suggestions.
5. Assign a student from each group the task of asking one of the questions to the interviewee. (The coordinator should take notes during the interview in order to follow up with the students.)
6. Once the students are ready, invite the interviewee to join the meeting and be interviewed by the students.
7. Ask them to thank the interviewee, and let the students know that they will be completing their proposal to submit to the principal for review.
8. Review the information with the students. Assign each team the task of reviewing the information that pertains to the item on their original Answer Card in Part I (i.e. glass, paper, etc.). Each team will write what they learned about their trash item and how it is or is not recycled at their school based on the data collected by the group. Each team will also offer suggestions for improving the recycling of their product; and suggest a way to educate other students at their school about the benefits to wildlife when recycling this product. Provide students with paper from the flipchart and markers to create this final proposal. Remind them to use their photos and the information they collected to create their proposal for the principal.
9. Flipchart information should be presented to the principal by the coordinator. Ask the principal to review the information and respond to the students' suggestions at their earliest convenience.



Wrap Up (For coordinators to communicate to students)

Researcher's Riddle

Next time we will be introduced to another researcher who works right here in Southern California on desert bighorn sheep. She needs your help. Bighorn sheep of the Peninsular ranges are rapidly declining. You can help her figure out what is going on. Next time we meet, bring your ideas on why desert bighorn sheep are on the brink of extinction.

Extension

Start a vermicompost bin at your school.

Field Trip Extension (Recommended as a pre- or post-activity)

Visit a local recycle or waste center for a tour of the facility. Sites to visit locally: EDCO Waste Management; Solana Beach Recyclers

Part I Worksheet

RECYCLING FOR WILDLIFE AND PEOPLE

Item: _____

What is the item made out of?

Where does the material to make this item come from?

If you recycled or reused this item, what animal might be helped and why?

Do you recycle this item? (Write down how many on your team do recycle this item and how many do not.)

Does your school recycle this item?

When your team is done with the worksheet, ask your coordinator for an answer card to review the information about your item.

Part II Worksheet

RECYCLE AUDIT OF SCHOOL GROUNDS

Team: _____

Recorder: _____

Timekeeper: _____

Collector(s): _____

Counter: _____

Instructions

- Your team has 15 minutes to review your audit site.
- Collector(s): Look for the items in the list below that are in the trash and recycling bins of the audit site Show the items you found to the counter.
- Counter: Tell the recorder what items the collector(s) found, how many of each item, and if the item was found in a trash bin or a recycle bin.
- Recorder: Write down all the information the counter gives you on the chart below. Be prepared to report this information to your club.
- Timekeeper: Make sure this activity is finished in 15 minutes.

Audit Site: _____

Material	Number of each item TRASH CAN	Number of each item RECYCLE BIN
Example: Paper	10 one-sided 30 two-sided	50 one sided
ORGANIC MATERIAL		
GLASS		
PAPER		
ALUMINUM		
PLASTIC		
OTHER		



PLASTIC

Where do most Americans receive a plastic item every week?

The grocery store puts your food in plastic bags every week! You can recycle clear plastic, like soda and juice bottles; “white” plastic, like milk and water bottles; and colored plastic, like detergent bottles, shampoo bottles, margarine containers, vitamin bottles, and lots of other colored items. And again, when you go back to the store to buy a new bottle of something, look for “Made with POST CONSUMER waste” on it. It means that the company takes recycling seriously and uses recycled plastic to make its packages.

WHY HELP: ONE PLASTIC BAG TAKES 15 YEARS TO DECOMPOSE. RECYCLING PLASTIC BAGS CAN HELP SAVE ANIMALS LIKE SEA TURTLES, WHO THINK THAT FLOATING PLASTIC BAGS IN THE OCEAN ARE TASTY JELLYFISH.

PAPER

What type of paper can be recycled?

We can recycle cardboard boxes, newspapers, computer paper, catalogs, magazines, and food packages like cereal boxes. They can all be recycled and made into paper again, without cutting down any more trees. But you can go one step further: you can buy, and tell your family and friends to buy, products that USE that recycled paper for their packaging. Look for a note on a box or package that says, “Made with at least 30% POST CONSUMER waste.” The higher the percentage, the better. This means that paper stuff we already used in one form has been made back into paper pulp and turned into the package you’re looking at. No trees were cut down!

WHY HELP: IF ALL SAN DIEGANS RECYCLED THE PAPER FROM ONE SUNDAY EDITION OF OUR LOCAL NEWSPAPER, WE WOULD SAVE ABOUT 75,000 TREES. SAVING TREES HELPS PROVIDE FORESTS FOR ANIMALS LIKE THE THICK-BILLED PARROT.



ALUMINUM

Where does aluminum come from?

Aluminum comes from cutting huge holes in the ground, usually in places that contain forests. The forests are cut down or burned. Then deep holes are dug to get a substance called bauxite. Bauxite is used to make aluminum. When the bauxite is all gone, the miners leave. The land they dug up may never recover. There's already enough aluminum to go around. If we recycle all those aluminum cans, then there won't be a reason to dig for more bauxite. And the forest areas where the bauxite is found would be safe! If you throw a soda can in the trash, you're throwing away a little piece of wild habitat. The Zoological Society of San Diego has one great way to help with aluminum recycling: the **Cans for Critters** program. It's a fun way to get your whole school and even your community involved, and you're all helping to save wild habitats.

WHY HELP: ALUMINUM CANS TAKE **80 YEARS TO DECOMPOSE!!!!** BY RECYCLING ALUMINUM CANS YOU HELP ANIMALS SUCH AS THE GIANT RIVER OTTER, WHO LIVES IN THE HABITAT WHERE BAUXITE IS MINED.

GLASS

Where does glass come from?

Glass comes in a variety of colors, shapes, and sizes. But best of all, glass is recyclable. Glass is one of the easiest things to melt down and reuse. It is made from a mixture of sand, silicone, and minerals. Some recycling places even give you money for it.

WHY HELP: GLASS TAKES MORE THAN AN ENTIRE LIFETIME TO DECOMPOSE!! RECYCLING GLASS REDUCES GARBAGE GOING INTO LANDFILLS, AND LEAVES MORE HABITAT FOR ANIMALS LIKE THE ROSY BOA SNAKE.



ORGANIC MATERIALS

What are some organic materials that we eat?

Organic materials are natural products such as fruits and vegetables. About 25% of the trash in our homes is made up of food and yard wastes. Fruit peels, vegetable scraps, and grass clippings can all be composted* to create fertilizer for plants.

WHY HELP: ORGANIC MATERIALS TAKE TWO YEARS TO DECOMPOSE IN A LANDFILL. USING THESE PRODUCTS FOR COMPOST CAN HELP YOUR GARDEN GROW AND PROVIDE A HOME FOR LOCAL WILDLIFE.

MODULE 2-A

LIFE IN THE DESERT: BIGHORN SHEEP

Researcher: Esther Rubin

Country: Southern California, United States



Overview

Students will learn about a local researcher who works in the southern California desert studying bighorn sheep. The activity will be a dramatization.

Introduction

For many southern Californians, the term “desert” inspires images of relaxation, vacationing, hiking, wildflowers, sports, and sun. The desert is also home to a growing number of people. But for some, the word “desert” arouses the false image of a barren region or wasteland. Many people do not realize that the desert is a unique place where you can find a diversity of people, wildlife, and plants.

Over 600 species of plants, and over 350 species of vertebrate animals, are adapted to the harsh, arid conditions of our desert. These species are part of an ecosystem in which all species are linked to each other and their habitat through a complex web of relationships. For example, native desert plants provide important water, food, and nesting sites for a variety of reptiles, birds, and mammals.

Unfortunately, many native desert species are threatened or endangered. In our local desert, animals such as desert pupfish, desert tortoises, and a population of bighorn sheep struggle to survive the natural conditions, as well as impacts brought on by humans. Many of the native plant species are being replaced by introduced grasses and invasive plant species.

The desert bighorn sheep of the Peninsular ranges is an example of an animal that requires large tracts of undisturbed habitat. These bighorn sheep were listed as an endangered population by the United States Fish and Wildlife Service (USFWS) in 1998. The sheep population, which is found in our local deserts from the San Jacinto Mountains near Palm Springs to the United States-Mexico border, currently includes only about 400 animals. Female sheep are distributed in at least eight sub-populations, or “ewe groups,” which are connected by the movement of rams.

Data collected since the 1970s suggest that a number of these ewe groups have declined considerably. Disease likely played an important role in the past, and continues to threaten some groups. However, predation by mountain lions and human influences (such as habitat loss) also threaten the recovery of this population. The Zoological Society of San Diego (ZSSD) is working with other members of the USFWS’s recovery team for Peninsular bighorn sheep to identify the best conservation strategies for these majestic animals.

A key ingredient to the successful recovery of our local bighorn sheep population may be to gain a better understanding of their habitat needs and relationships with other species in this desert ecosys-

tem. In fall 2001, Esther Rubin, a researcher at the Center for Reproduction of Endangered Species (CRES), will begin a field project on the habitat use and behavior of these animals. One of the project's goals is to better understand how male and female bighorn sheep use their habitat and how this influences their social structure. In addition, Esther is working in collaboration with researchers from the University of California at Davis, the California Department of Fish and Game, and the California Department of Parks and Recreation, who are monitoring mountain lions and mule deer along the desert's edge. It is hoped that this joint effort will teach us more about the bighorn sheep's relationships to these species. Ultimately, this information may be used by state and federal agencies to improve conservation strategies.

Before Activity

Discuss with students their answers to the Researcher's Riddle and watch the video clip, "Bighorn Sheep." Use www.sandiegozoo.org/virtualzoo/videos/index.html.

Activity Suggestions

- Read the first paragraph of the biography and then ask for volunteers to help read individual paragraphs.
- Discuss how the choices students make each day affect others and their environment. Have the students share a few examples of how their daily choices make a difference.





BIOGRAPHY

My name is **Esther Rubin**. I am a researcher for the Zoological Society of San Diego. I study desert bighorn sheep in southern California. If you go out to the desert here in San Diego, you may get to see a desert bighorn sheep.

Why do I study these sheep? I've always loved wildlife. As a kid, I knew I wanted to work with animals. After getting a college degree in zoology, I got a great job working as an animal keeper at the San Diego Wild Animal Park and San Diego Zoo. I loved this job because I was able to work directly with animals.

I even got to hand-raise babies like gorillas, orangutans, and snow leopards. But I was interested in learning more about animals and how they lived in the wild. I knew that many of them were in trouble in the wild.

Lots of people want to help animals but don't always know HOW. That's why I became a researcher. I wanted to learn why animals become endangered and how we could help them survive in the wild. I study where the animals live, how they behave, what they eat, and much, much more. I also share this information with others so they can help these animals, too.

Desert bighorn sheep live in the desert mountains in southern California. Sometimes I get to do some pretty cool stuff to study them. It's fun flying in a helicopter to count the bighorn sheep. I can see their home from the air and get to fly over the tops of mountains. But it's hard work, too, because we have to keep looking at the ground all the time so we do not miss any sheep as we fly by.

Does my work really help the world around us? I think it does. I share the information I've learned about the bighorn sheep with the people who make decisions about how to take care of their habitat. The more information they have, the better they can protect the sheep and the other animals and plants that live in the desert.

What You Can Do to Help Esther

1. You can tell other people about the desert bighorn sheep. I bet most people don't know they are out there!
2. You can decorate a recycled cotton* shopping bag with pictures and cool information about the bighorn sheep. Use fabric markers or fabric paint to draw a desert scene on the shopping bag. Include a simple message about how the bag cuts down the use of plastic and paper bags since it is reusable.

(*Canvas bags can be used in place of this item but they are not made from recycled products.)

3. Show your friends and family how the choices we make every day really do make a difference. Always keep these questions in mind when buying things:
 - Can you recycle this packaging? If so, you just helped keep more trash out of a landfill!
 - Can you use the backside of this paper? If so, you just helped save a tree!
 - Can you wash out the plastic bag and reuse it? If so, you cut down on pollution and saved some money!
 - Can you recycle that aluminum can? If so, you helped save some rainforest!

Activity: Bouncing Baby Sheep

Overview

This is a dramatization of an actual event that happened to Esther while she was studying bighorn sheep.

Materials

- The script
- A few carrots or celery sticks for the mother sheep to munch on

Procedure

1. Assign one or more students to read the script as the “Voice of Esther.”
2. Assign two students to be the “mother sheep.”
3. The other students are the “lambs” and perform the actions described in the text.
4. Go outside and find a grassy area or use the playground where there are a few items for the kids to climb on. Safety is paramount! Encourage the kids to have fun but be safe.
5. The “Voice of Esther” begins to read.
6. The *italicized* words are the descriptions of the actions. Allow 20-30 seconds for the “lambs” to perform the actions.

Wrap Up (For coordinators to communicate to students)

Researcher’s Riddle

Next time we meet we will be talking about ways to use less plastic in our daily lives.

Mark Harris of Los Angeles has used and reused canvas shopping bags for over seven years. How many paper or plastic bags has he saved in one year if he buys four bags of groceries each week?

Activity Extension

Bighorn sheep are a local animal that many people do not know is endangered; they also don’t know that people can help save this animal from extinction. Ask students to design posters or other public awareness materials to be displayed at the school. The purpose of the materials should be to encourage other students to participate in conserving the bighorn sheep by learning about it, and recycling and reusing consumer products.

Field Trip Extension

Visit Anza Borrego State Park with your students and participate in an educational program. To find out more information on interpretive programs call: (760) 767-4205 or check out their website at: www.anzaborrego.statepark.org

SCRIPT:

“One of my favorite experiences was watching two bighorn sheep mothers with their newborn babies. I found this little group on the side of a mountain one morning in March. Each female had a baby that was probably only one week old. They didn’t see me because I was watching them with my binoculars from far away. The mothers were eating and resting and just taking it easy. **(Have the “mother sheep” sit and munch on the veggies.)** But the two lambs were full of energy and put on a fun show for me for almost an hour. They were practicing running in circles around their mothers **(have the “lambs” run around the “mothers”)**, jumping on rocks **(“lambs” jump carefully on and off items that may be in the playground)**, spinning in circles **(“lambs” spin around)**, and chasing each other **(“lambs” chase each other)**. It looked like they had just realized they could do all these things and were busy practicing every move they could think of. **(Have the “lambs” do all of the activities listed above at one time.)** And they were still wobbly on their legs, so the practice was probably a good thing! **(Now have the “lambs” do all of the activities listed above again, but have them do it with “wobbly legs.”)** It was pretty cute, and I thought of this every time I saw these two lambs in the following months.”

MODULE 2-B

BIGHORN SHEEP RESEARCHER

Local Action Project: Reusable Shopping Bags Save Habitat

Overview

Students will design their own artwork to be featured on a cloth bag for their families to use at the grocery store.

Introduction

You can help the desert bighorn sheep. Decorate a cloth or canvas shopping bag that you can use again and again.

“Paper or plastic?” We hear that question every time we go to the grocery store. But which bag is better for the environment? Paper bags are made from trees that are cut down. New trees can be planted to take their place, but this takes time. Plastic bags are not made from trees. They are made from oil. Oil is not something we can replant. It comes from under the ground. Once the oil is used up it can't be replaced.

Both paper and plastic bags can be used for other things after you bring home your groceries. They can also be recycled. But guess what? People recycle the paper bags much more than they recycle the plastic bags. What happens to the rest of the bags? They get thrown away. And where does trash go? It goes to large landfills to be buried. Many landfills are on land where wild animals lived. These animals lost their homes for our trash!

What if there was a bag we could use over and over again at the grocery store? There is! This bag is made of canvas or cloth. A reusable bag can make a big difference.

Before Activity

Review students' answers to the Researcher's Riddle on plastic bags. Which students answer is closest to the correct answer? (*The Answer: 208.58 bags*)

Activity: Illustrating Personal Shopping Bag

Materials

- Cloth or canvas bag (recycled cotton bags are perfect)
- Fabric markers or fabric paint
- Paintbrushes of various sizes
- Scratch paper for practice
- Colored pencils
- Old newspapers to lay down on the tables
- Magazines or photos highlighting bighorn sheep and its habitat

Procedure

1. Show the students a completed bag so they can get an idea of what they are going to make.
2. Remind students that the purpose of their illustration will be to show others what the bighorn sheep, its habitat, or other desert animals look like, as well as convey a message about how they are in need of conservation.
3. Have students sketch ideas on the scratch paper.
4. When they have the idea they want, they can use a pencil to draw their design on the canvas bag.
5. Use the fabric pens or paint to color in the drawing.

NOTE: This activity may take two meetings to complete.

Activity Suggestions *Helping Students Create Illustrations*, by Joe Nyiri

Use the following points to guide your students while they are creating their illustrations:

- Decide what you are going to draw
- Look at basic shapes
- Create a light outline
- Work large
- Look and draw, look and draw
- Ask yourself questions about what you are doing
- Review the background
- Fill in the details
- Review color questions
- Draw what you see, not what you think you see



Wrap Up (For coordinators to communicate to students)

Researcher's Riddle

Next time we meet we will be talking about some big iguanas in the Caribbean that have to be moved. Here's a puzzle to get you thinking about moving things around:

A biologist has a goat, a cabbage, and a wolf that he needs to move from one island to another. He can only take one of the three in his boat at one time. He cannot leave the goat and the cabbage alone or the goat will eat the cabbage. He cannot leave the goat and the wolf alone or the wolf will eat the goat. How does he get all three from one island to another?

MODULE 3-A

THE DRY FOREST OF THE CARIBBEAN AND ISLAND IGUANAS

Researcher: Glenn Gerber
Country: Turks and Caicos Islands



Overview

Students will learn about the rock iguanas of the Turks and Caicos Islands. They will work on a conservation problem and participate in a physical game.

Introduction

The West Indian rock iguanas include a unique group of eight species (genus *Cyclura*) inhabiting tropical dry forest and scrub habitats in the Bahamas and Greater Antilles. These species of iguanas are the most endangered lizards in the world because of the loss of habitat on their island homes. This loss is primarily due to human development and the introduction of non-native species like house cats. The loss of rock iguanas, an important seed disperser of native island plants, consequently means the loss of a critical island ecosystem.

The Turks and Caicos iguana (*Cyclura carinata*), one of eight species of West Indian rock iguanas, is the smallest of these iguanas and is also the most vulnerable to introduced mammalian predators. This species once was found throughout the Turks and Caicos Islands; today it lives within five percent of its historical range.

Big Ambergris Cay, one of the Turks and Caicos islands, is privately owned and will be extensively developed in the next few years. Of the 18,500 iguanas living on this island, the majority will be destroyed because of the development.

The Ambergris Cays are named after the valuable whale deposits of ambergris, a waxy secretion from sperm whale intestines used in the perfume industry. In the past, this substance used to wash up on the islands' shores. The Big Ambergris Island (Cay) is four miles long and one mile wide. It was purchased in 1811 from the Bahamas and has since been re-purchased by three different private owners. Its second owner, Horatio Stubbs, purchased the island in exchange for salt. At the end of the 1800s the island was used to grow a plant called sisal. The farming of conch meat has also provided for the island's residents.

Dr. Glenn Gerber, a field biologist at the Center for Reproduction of Endangered Species (CRES), is currently conducting studies on the Turks and Caicos iguana. Dr. Gerber will be relocating 900 iguanas from Big Ambergris Cay (which is currently under development) to eight suitable, uninhabited islands (cays) within the Turks and Caicos reserve system. Dr. Gerber will undertake long-term ecological studies of the translocated iguanas. This will include a nutritional analysis of food plants on Big Ambergris and the translocation cays, pre-and post-release health screenings to examine parasite level and blood chemistry, and endocrine analyses to assess reproductive condition and "stress" hor-

mones. This project will involve collaborative studies with a number of scientists and with Dr. Mark Edwards, nutritionist for the Zoological Society of San Diego (ZSSD), and with the ZSSD's Education Department.

Activity Suggestions

1. Read the first paragraph of the biography and then ask for volunteers to help read individual paragraphs.
2. Discuss with students after reading the biography how we can help balance our environment. Ask them why an island habitat is affected more than other habitats when an animal or plant is introduced*.

*Introduced —not native to the natural habitat of the island.





BIOGRAPHY

My name is **Glenn Gerber**. I am a field researcher for the Zoological Society of San Diego. I work off the coast of Florida in the Caribbean Sea on a group of islands called Turks and Caicos. My job is to study rock iguanas and find out how these animals and their habitat can be helped. These iguanas are special because they are one of the most endangered species of lizard in the world!

When I was just three years old I began my quest for learning in the great outdoors. I lived in New York and my days were spent searching for creatures in this huge dirt hole in my backyard. My parents could hardly get me out of there for dinner. I loved searching for frogs, lizards, and snakes. You see, I have been a reptile guy from the start! I believe you can never catch enough frogs or learn enough about how many different kinds of reptiles live all over the world.

Does my work help the animals around us? I think it does. I study iguanas and try to help save them from extinction. In the process I will help the other native plants and animals that live in the Turks and Caicos Islands. How? When we look at what the iguanas need to survive, we also look at the other living things on the islands that the iguanas need. This helps keep a healthy balance for all the animals and plants on the islands. Conservation is also about communities. Helping the iguanas also helps the island way of life for the people who live there, and helps them learn to protect their resources.

What You Can Do to Help Glenn

1. The biggest threat to the Turks and Caicos iguanas are the house cats that have been brought to the islands. You guessed it—the cats eat these small iguanas! People need to think about what pets they keep and how they care for these pets.

House cats are predators, with teeth and claws. It is hard for small islands, such as the Turks and Caicos, to support all the house cats that are left to roam outdoors. An outdoor cat also has a shorter life-span because of things like disease, automobiles, and pollution. The cats naturally hunt when they are let outside. The Turks and Caicos Islands are small and do not have any native predators. If we do not act as good cat caretakers, then the cats will only do what comes natural to them—hunt. It is important to think about the safety of cats and the safety of native wildlife as pet owners. Have the students think of ways to make a happy indoor cat.

2. Students can also research and learn about our local iguanas (chuckwallas and desert iguanas). They are not endangered but have similar needs as the Turks and Caicos iguanas. Research why these local species are not endangered and why the Turks and Caicos iguanas are. What situations are driving island iguanas to extinction? How are island habitats different from mainland habitats?

Before Activity

Review Researcher's Riddle. Recall that you could only bring one item over at a time and you cannot leave items together that would eat each other unless you are there.

THE ANSWER: 1. Take the goat over first. 2. Then take the cabbage over but bring back the goat. 3. Take the wolf over, leaving the goat on the first island. 4. Finally take the goat back across.

Activity: The Iguana Problem

Overview

Students will explore what is happening to the Turks and Caicos iguanas in the Caribbean in order to get a better understanding of how or why an animal may be affected by human activities.

Materials

- Detailed map of the Turks and Caicos Islands (showing Big Ambergris Cay and surrounding islands)
- The Iguana Challenge Worksheet
- Pencils

Procedure

1. Read the following to the students: (This is also at the top of the student worksheet for them to follow along while the coordinator reads it out loud.)

The Caribbean is a beautiful place! It has warm water and a mild climate. There are lots of islands in the Caribbean where people go to take vacations. When they go, they spend money and support the people who live on the islands. This is like when you go to the Zoo and spend money. That money you spend helps support the animals and plants at the Zoo.

Along with being a nice place for people, the Caribbean islands are a nice place for animals. There are coral reefs for fish, forests for wildlife, and on the land there are lots of lizards. In fact, there are eight different kinds of rock iguanas in the Caribbean that live in the dry forest and scrub habitats of the islands. The rock iguanas are the most endangered lizards in the world!

On one island, named Big Ambergris Cay, there are Turks and Caicos iguanas. They are the smallest of the rock iguanas. The people who live on Big Ambergris Cay with the iguanas have plans to develop the island to attract tourists. If that happens, the iguanas will probably die. What do you think can be done to help save the iguanas and support the lives of the people living there?

2. Ask students to take a close look at the map and see if they can figure out what our ZSSD researchers are doing to help save the iguanas.
3. Let students work in teams to brainstorm solutions for saving the iguanas. (Remember that the island will be developed, no matter what.)
4. Have each team share their solutions with the group.
5. Let each team vote on what they think is the best solution. Write each team's best selection on the board.

The next step:

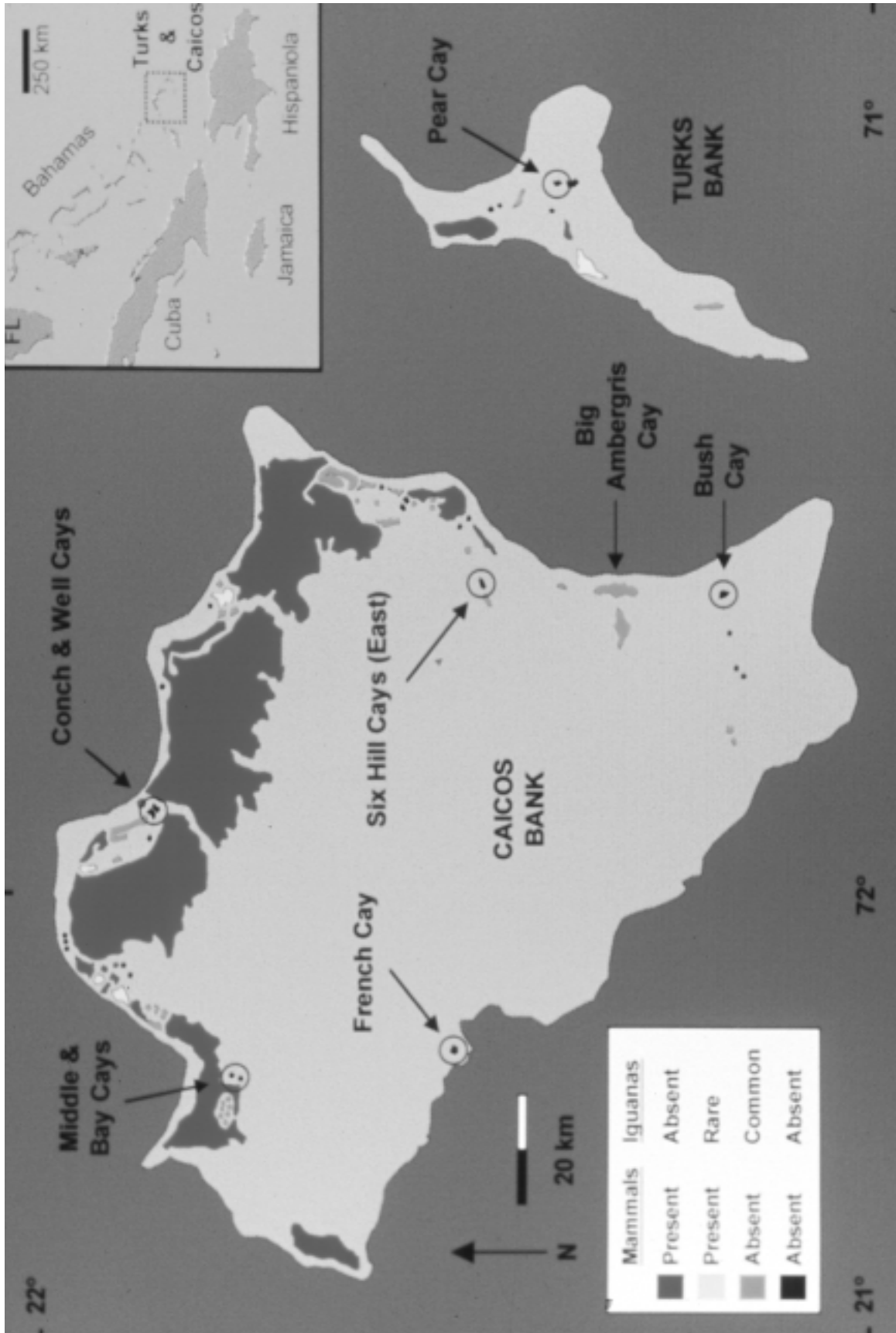
1. Have the whole class vote on what they think is the best solution.
2. Write it up on the board.
3. Have the whole class do a "Pro-and-Con" list for this solution.

Be sure to discuss:

- Where is the money going to come from to support what is proposed by students?
- Who is going to do the work?
- Where will the supplies come from?



Map of the Turks and Caicos Islands



THE IGUANA CHALLENGE

Team Members:

The Caribbean is a beautiful place! It has warm water and a mild climate. There are lots of islands in the Caribbean where people go to take vacations. When they go, they spend money and support the people who live on the islands. This is like when you go to the Zoo and spend money. That money you spend helps support the animals and plants at the Zoo.

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1. Take a close look at the map and see if you can figure out what our ZSSD researchers are doing to help save the iguanas.
2. Work in teams to brainstorm solutions to saving the iguanas. (Remember that the island will be developed, no matter what.)
3. Have one person on your team share your solutions with the group.

Activity: Iguanas Everywhere!

Overview

Students will learn about the process of managing a group of animals on an island habitat through a fun, physical activity.

Introduction

In this activity, students will get a taste of what field researchers have to deal with. Managing a group of animals is the task at hand. Teamwork is part of the activity, and decisions to be made on certain actions. The idea that there are consequences to particular actions is also encompassed in the activity.

Materials

- Chalk
- Situation cards
- Play money: \$100 (in small bills: ones, fives, and tens)
- Colored stickers

Procedure

1. On the playground draw seven circles with the chalk: one big circle and six smaller ones. These circles represent the "islands." Number each island, from one to six.
NOTE: If a playground and chalk are not options, use string and tape in a large classroom to mark off your "islands."
2. Assign two to four students to be a team of researchers. The rest of the students are Turks and Caicos rock iguanas.
3. Place the "iguanas" on the largest "island." There needs to be enough room for the iguanas to walk quickly and dodge the researchers. The iguanas CANNOT step out of the circle, but the researchers can. An iguana is caught when one of the researchers tags them with a colored sticker on their shoulder.
4. The researchers work as a team to catch one iguana at a time and move the iguana from the big island to any of the little islands. They have to decide how many iguanas they will put on each island. Each time they move an iguana it costs them two dollars. The money is paid to the coordinator.
5. After about half of the iguanas are moved, the coordinator reads a Situation card and the students have to react accordingly. It will help the game if there is at least one iguana on each island.
6. After each Situation card is read and acted out, the researchers continue to move more iguanas off the main island and onto the smaller islands. After two or three more iguanas are moved, another Situation card is read and acted out. Continue this pattern, with researchers moving two or three more iguanas, then the coordinator reading another card. A Situation card can be read more than once.
7. The game is over when the coordinator reads the "Final Situation Card." The timing is at the discretion of the coordinator.

Activity Suggestions

Safety is important. Advise students there is no roughhousing or intentional hurting of the "iguanas." Also, while the "iguanas" are wild animals, they want to move since their habitat is about to be destroyed.

**All the food on Island #2 is eaten by the iguanas. One of the iguanas dies.
You need to move the iguanas or plant more food for them.
Planting more food costs one dollar per iguana on the island.**

A storm hits Island #5 and all the iguanas die.
(A dead iguana costs the researchers one dollar. When an iguana dies, the student is removed from the game and sits by the coordinator.)

**A disease attacks Island #3 and three iguanas die.
The medicine to help the rest of the iguanas on Island #3 costs five dollars per iguana.
Or, you can move the iguanas. But they could be infected with the disease.**

After you move some iguanas onto Island #4, the researchers notice that two of the young ones are missing. One of the older ones has a bad wound. (The "missing" iguanas come out of the game; the wounded iguana has to hop on one leg.) A group of feral or wild cats is discovered on the island and they have been attacking your iguanas! You can either move the iguanas or remove the cats. It costs five dollars to remove the cats AND five more dollars for the permit from the local government to remove the cats.

**The motor for the boat that transports the iguanas from one island to another
needs repairs. Pay five dollars.**

**Congratulations, the iguanas on Island #6 have had babies!
(Send over a few of the previously "dead" iguanas.)
But now they need more food. Plant more food for the new iguanas, one dollar per iguana.**

FINAL SITUATION CARD

You have set up an education station on one of your islands. It costs you five dollars. But the local school-children who come to visit have such a good time learning about the iguanas that they donate money to help you. (Have any remaining "dead" iguanas be the local schoolchildren and give each of them a dollar to donate. They then go to the researchers and give them the money.) Everybody cheers!

Wrap Up (For coordinators to communicate to students)

Researcher's Riddle

What situations are driving island iguanas to extinction?
How are island habitats different from mainland habitats?

Extension

Students can research and learn about our local iguanas (chuckwallas and desert iguanas). They are not endangered but have similar needs as the Turks and Caicos iguanas. Research why these local species are not endangered and why the Turks and Caicos iguanas are.



MODULE 3-B

ISLAND IGUANA RESEARCHER

Local Action Project: Caring for Pets and Wildlife

Overview

Students will learn how to be good cat owners and how to help local wildlife in their area.

Introduction

In the United States, there are an estimated 60 million cats that people have “claimed” to own. Many of these cats venture outdoors and face many risks that shorten their lives. Automobiles, poisons, diseases, and other animals threaten the survival of pets that are free-roaming. Cats are also natural predators. It is their instinct to hunt other animals when they are outdoors. This is a concern for wildlife researchers, pet owners, and environmental leaders. In fact, an individual free-roaming cat kills an estimated 1,000 wild animals a year.) Many of the animals killed include endangered species such as California least terns and loggerhead shrikes.

(See worksheet “Why Allowing Cats Outdoors is Hazardous to Cats, Wildlife, and Humans,” by American Bird Conservancy, for more background information to share with students.)

Before Activity

Review Researcher’s Riddle with students on why island animals are becoming extinct and how their habitats are different from mainland habitats.

Activity: Cat Indoors!

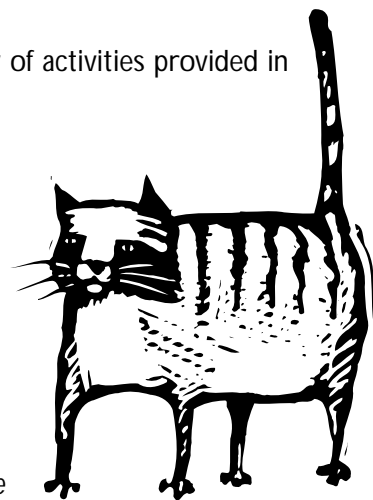
Materials

Review individual lists provided in **Cat Indoors! Educator Guide**, by American Bird Conservancy, specific to the activity you choose to do with your students. Visit www.abcbirds.org to download the materials.

Procedure (May take two meetings to complete)

Choose one of the following activities to do with students (overview of activities provided in **Cat Indoors! Educator Guide**):

- The Great Outdoors is No Place for Cats
Coloring worksheet and discussion with students
- The Great Indoors is Fun for Cats
Making enrichment “toys” for an indoor cat
- You Can Help Birds and Other Wildlife
Attracting and observing birds in the wild
- Dangerous Numbers
Solving word problems
- And the Survey Says...
Surveying people about their attitudes toward outdoor cats and wildlife



1. Students will be sharing their results from the activity with other students who are also working to improve the lives of their cats and wildlife.
2. Brainstorm ways the students can share what they learned with others. Some possibilities may be: photo essays of their activity; postcards with illustrations, posters, or a short video on what they learned.
3. Write student ideas on a flip chart or chalkboard.
4. Decide as a group how you would present your findings to students in Turks and Caicos.
5. Discuss materials needed for the next meeting to present to other students in their area.

Wrap Up (For coordinators to communicate to students)

Researcher's Riddle

Next time, we are going to meet a researcher who studies pandas. She is working with a team of researchers on studying how pandas react to enrichment items—new things in their environment. It's like when you get a new toy or your family gets a new piece of furniture. She wants to know if enrichment items will have a positive effect on the pandas' lives.

Below are a list of enrichment items she has put in with the pandas.

1. Bark scented with pine oil
2. Piles of wood chips, pine shavings, and soil
3. A refrigerator-sized cardboard box

What do you think the pandas would do with each of these items?



MODULE 4-A

GIANT PANDAS AND THE PEOPLE OF CHINA

Researcher: Valerie Hare
Country: China



Overview

Students will learn about a researcher who works in Southwest China, studying giant pandas at the Wolong Nature Reserve for the Zoological Society of San Diego (ZSSD). Activities will include an opinion statement and a math project.

Introduction

The ZSSD has a partnership with the China Research and Conservation Centre for the Giant Panda, Wolong Nature Preserve in the Sichuan province of Southwest China. In 1996, giant pandas Shi Shi and Bai Yun came to the San Diego Zoo from Wolong for a 12-year research loan. Scientists at the Zoo are studying giant panda scent marking, enrichment, reproduction, and general biology. Along with the work at the Zoo, researchers travel to China to study the giant pandas at Wolong.

Giant pandas are a primitive member of the bear family. It was thought they may have been related to raccoons, but the most recent genetic analysis links them with bears. Pandas live in the mountains of Sichuan province. A panda needs to eat 25-30 pounds of bamboo every day, and therefore each panda needs a considerable amount of bamboo forest to support itself. Habitat loss is the main reason why the panda is an endangered species. Over 95% of its habitat has been destroyed. Very little is known about giant panda biology, and opportunities to study pandas are very rare. One researcher for the ZSSD was in the field for two years and never saw a panda!

Whether they live in the cities or in small mountain villages, the Chinese people are all highly family oriented. The adults respect and care for the elderly relatives and involve their children in all aspects of their lives. Frequently the entire extended family lives in the same home. As in our country, the housing situation varies greatly depending on where you live and what you do.

There is an elementary school (through grade six) in the village of Sa Wan with 300 students. After sixth grade students often need to go to another village to continue their studies.

At first glance, China is certainly different! But it doesn't take long to realize that, in so many ways, there's really no difference at all! China's people want what we want: a happy, healthy life for ourselves and for our children; and to be valued and respected as individuals. The staff at the conservation center is all passionately dedicated to the conservation of the giant panda.



BIOGRAPHY

My name is **Valerie Hare**. I am a research assistant for the Zoological Society of San Diego. I work with the giant pandas at the San Diego Zoo and at a giant panda research center in China. Pandas are endangered. Our goal is to learn as much as we can about them so we can help save them.

I have always known that I would work with animals. I grew up with cats, gerbils, snakes, lizards, and horses. The way animals behave has always interested me.

I do remember the moment I realized I wanted to study exotic animals. When I was about nine years old, my mother took my brothers and me to a wild animal farm. There, I saw my very first okapis. I had never even heard of these magnificent creatures! There were three of them and they were very shy. They kept hidden in the bushes. My family got bored trying to observe them and moved on. My mother said I could stay and watch them by myself. Well, after they left, one of the okapis came over to me. I leaned over the railing and patted him through the fence. Whenever people came by, the okapi would go back to the bushes. But when the people moved on, one or more okapis would come over and stand near me, letting me touch them. I was fascinated! I don't know how long I was there, but I think it was at least two hours! I had more questions than answers from that experience. It wasn't until much later that I learned that having more questions than answers is the way research projects should start and end!

We are studying giant pandas in the China Research and Conservation Centre located within the Wolong Nature Reserve. There is a famous panda research field station not far called Wuyipeng. (Woo-yee-pung). To get there you must first cross the river on a rickety bridge that looks like something from an Indiana Jones movie! Zhou Xiao Ping was my guide to Wuyipeng. He used to work at the field station and has climbed the twisting trail many times. Once, he slid in the snow over a cliff face! Fortunately, after tumbling and sliding down about the length of a football field, he was able to stop himself. He was lucky. Several people have died over the years on this trail. The day I went, the ground was covered with several inches of new snow. It was beautiful! But the path was steep, slippery, and narrow.

Wuyipeng is still used as a base camp for panda researchers. They count how many pandas are in the area, and study their behavior and habitat. Wild pandas are rarely seen around Wuyipeng. But we did find clues that they still visit the area—panda droppings!

Does my work really help the world around us? I think it does. My research is part of a program to help giant pandas in the wild. Many different people and organizations are working to save pandas for many years to come. One thing wild pandas need is enough habitat to live in. Golden monkeys, takins, musk deer, and monal pheasants also need the same habitat to survive.

What You Can Do to Help Valerie

1. By practicing good conservation habits such as recycling and reusing items and encouraging others to do the same, you can increase people's environmental awareness all over the world.
2. Share your knowledge of what you learn about conservation worldwide, such as the work we are doing in Wolong. As more people learn and care about conservation of wildlife they will start to help us solve problems in the environment. With knowledge comes understanding and solutions!

Before Activity

Review Researcher's Riddle.

ANSWER:

1. The Zoo's female panda, Bai Yun, will pick up the bark scented with oils and rub it on her face, on her chest, and on her back.
2. The pandas roll in the substrate piles. Bai Yun loves pine shavings. She will sit in the middle of a pile and scoop up paw fulls of the shavings and rub them on herself. The Zoo's male panda, Shi Shi, likes the soil. He will roll and roll in it and in the end, looks like a big black bear. Then he likes to sit in the water and looks like a big, black muddy bear!
3. Shi Shi loves the cardboard box. He will lay on the inside of it and bat at the top. Even after it partially collapses, he'll still sit and sleep in it.

Activity: Take a Stand!

Overview

Students will be presented with a real-life situation happening in China. They will give their opinion and defend their position.

Materials

- Five 8 1/2 x 11 pieces of paper (recycled)
- One marker
- Masking tape

Preparation

1. Write "Strongly Agree" on one of the pieces of paper. Follow with "Agree," "Disagree," and "Strongly Disagree" on separate sheets.
2. Tape the signs up around the room. Leave space between the signs to ensure students can tell they are separate.

Procedure

1. Read the following to the students: "There is a major construction project, a dam, being built in China. This dam will take 10 years to build. It will change the landscape for many miles. Many valleys will become flooded, and whole cities will have to move. But, when the dam is completed, it will provide energy to hundreds of thousands of people. This energy is expected to stop people from cutting trees for wood to burn. The dam could help save more habitats."
2. Ask the students if they think the dam should be built and to stand under the sign that best describes how they feel about the situation. Once everyone is in place, ask the students to justify their choice.
3. Summarize that sometimes meeting the needs of people and conserving habitat is difficult. It requires creative thinking and compromise. Often times not everyone is in agreement. What are some things that a government might have to do in order to make both sides happy? Brainstorm solutions.

Activity Suggestion

Each student will raise their hand if they want to share their opinion, rather than just shouting out.

Activity: How Much is Left?

Overview

Students will participate in an activity that illustrates habitat loss and fragmentation for the giant pandas.

Materials

- Long tape measure
- String or yarn
- Masking tape
- Bag of candy (your choice) or some other snack that is easy to hold.
- Habitat puzzle (5-10 sets)

Preliminary Activity

Link to ZSSD Web site ABC Endangered Species Report:
www.sandiegozoo.com/special/abcnews/index.html to view.



Preparation

- Measure the area of the room with a tape measure (length x width).
- Determine what is 5%, 2.5%, and 1.25% of the room's area.
- Precut string the length of each of the three percentages.
- Photocopy and cut out the habitat puzzle (make 5-10 sets).

Procedure

1. Explain to students that they are going to learn why loss of habitat has caused pandas to become endangered.
2. Handout the habitat puzzle to groups of students. Demonstrate how much habitat for pandas is left by asking students to figure out how many pieces they should take away if only five percent of the habitat puzzle was left. (Only one puzzle piece out of the 20 should be left.)
3. Walk students through the math problem that results in one puzzle piece equaling five percent of the total area of the habitat puzzle.
4. Ask students to imagine what would happen if all the pandas in China had to live in that small amount of space (*Possible answers: there would be a lack of food, water, space, and shelter for each individual panda.*)
5. Tape down the longest piece of string into the shape of a square and have all the students stand inside it. Tell them they are all pandas, standing in panda habitat. Ask them which habitat size they like better, the classroom-size habitat (which was once all of the habitat in China that existed for pandas,) or the square-size habitat (which represents the current available habitat).
6. Now tape down the two remaining pieces of string into squares on opposite sides of the classroom. The second square is half the size of the first one, and the third square is half the size of the second one. Have the students decide which square they want to stand in. Ask them which "habitat" would be more comfortable.
7. Now tape down the three pieces of string in squares as far from each other as possible. Have the students choose a square to stand in.
8. Ask the students which square is more comfortable.

9. Tell them that they cannot move to another square. There is a city in their way. Give each "panda" a handful of candy or other snack. This is their "bamboo" for a year. But suddenly all of the bamboo in one of the habitat fragments dies off. (Take away what's left of the "bamboo" in one of the squares.) What are the pandas going to do?
10. Ask them to brainstorm solutions for helping the pandas. They can come up to the board and write down what they think.

The ZSSD is helping China create forested corridors for pandas to safely move from one habitat area to another.

Wrap Up

Activity Extension

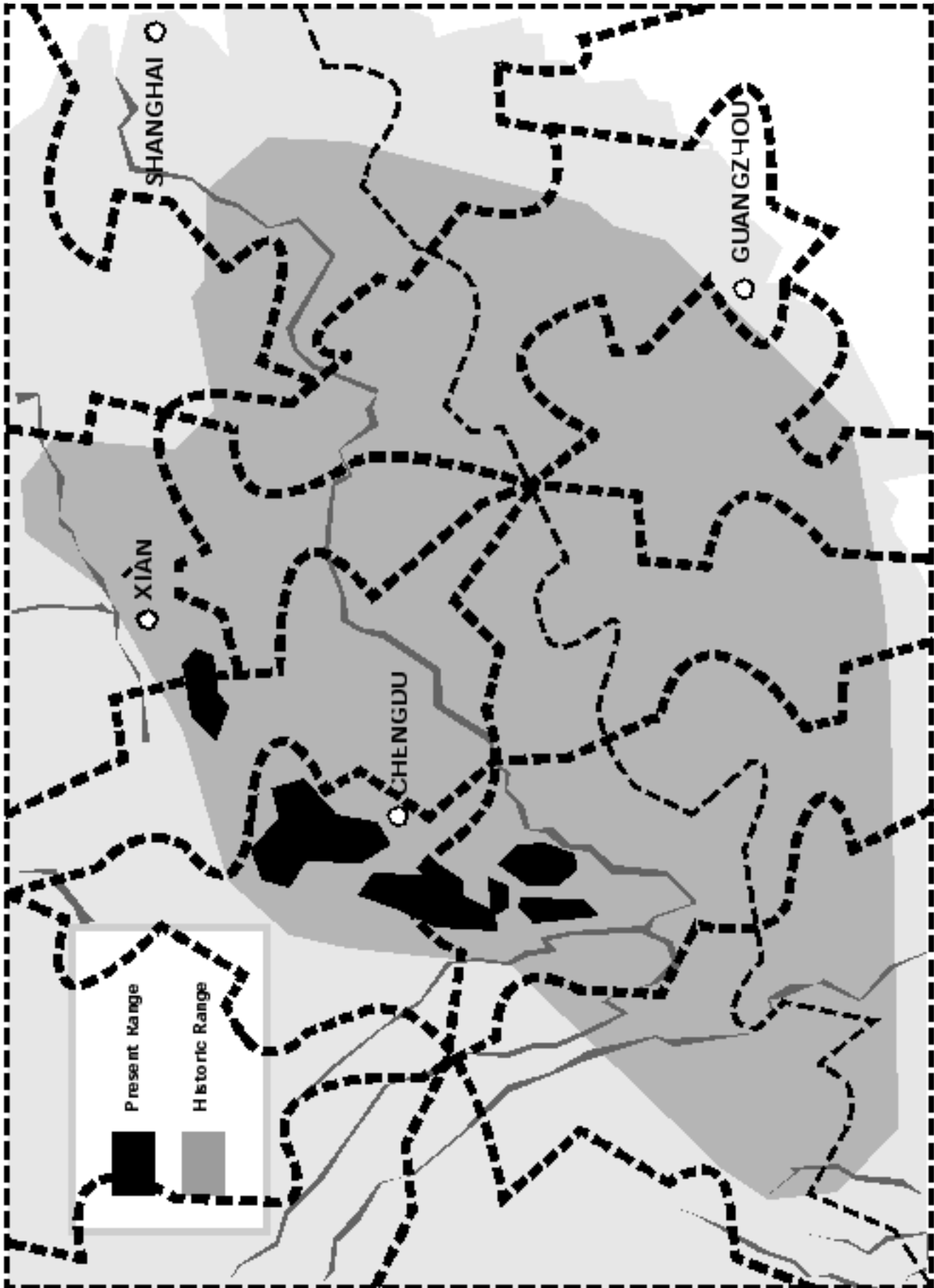
Many other animals and plants live in the bamboo forests of China. Go to your library or search on the Internet for other animals or plants that you think are interesting. Next time we meet, bring a picture of the animal or plant and be ready to share with the rest of the group what you found out!

Field Trip Extension

Where can you see some giant pandas in San Diego? At the San Diego Zoo, of course! Take a field trip to the Zoo and visit our giant pandas. Call 619-557-3963 to make field trip arrangements. Please have your transportation arranged before you call.



INSTRUCTIONS: Make one copy per pair of students and cut along dashed lines into 20 pieces.



MODULE 4-B

PANDA RESEARCHER

Local Action Project: Habitat Mural

Overview

Students will draw a habitat scene and actions they can take to help keep that habitat safe. For example, a student can draw a salt marsh habitat and show how they recycle motor oil rather than putting it down the drain.

Introduction

There are approximately 7,000 people living in the Wolong Nature Reserve. Many of these people make a living as farmers or have jobs related to tourism. The activities related to daily survival and tourism have a negative effect on the environment in general and panda habitat in particular. Although there are efforts to educate the local adults about conserving the habitat, the children are not exposed to the concepts of conservation. The local elementary school lacks materials to educate its nearly 300 first- to sixth-graders about nature and wildlife around the world, and the danger of habitat destruction to both wildlife and human populations. Yet these children will most likely spend their entire lives living in the Wolong Nature Reserve. It would be beneficial for them to understand the value of their surroundings and, as adults, to work towards the habitat's conservation, rather than its destruction. The key is knowledge.

Activity: Local Habitat Mural

Materials

- Mural paper or blank postcards
- Pencils
- Paints
- Brushes
- Colored pencils
- Leaf material for making leaf prints. Collect the leaves outside on the ground; do not pull off of plants.

Procedure

1. Have the students do a brainstorm session with the question, "What do you do to help the local habitat and wildlife right here in San Diego?" Give examples such as: recycling, keeping trash out of the environment, turning off the water faucet when brushing teeth. Have them write their ideas on recycled scratch paper.
2. Ask students to think about what they would convey to people around the world about what they need to do to conserve one of their local habitats. What message would they want to share with students in other countries?
3. With scratch paper and pencils have them draw a rough sketch of their ideas. Encourage them to make more than one sketch, to try more than one idea.
4. Collect the pencil sketches and notes for the next meeting.



Wrap Up (For coordinator to communicate to students)

At the next meeting

1. Remind students of the big picture: they are making a mural or postcard about their local habitat and what they need to do to conserve it. Return the sketches and notes and remind students to review them before they go on to the next step.
2. Students can draw their picture on the card or mural.
3. Color in the drawing and add text that is appropriate.
TO DO A LEAF PRINT: Paint the leaf and then blot the excess paint. Place the leaf on the paper, rub gently then remove. Practice on scrap paper.
4. Post your murals around the school or help students mail their postcards to someone they would like to share this information with.

