OREGON ZOO

Threatened & Endangered Species

Chendra
Age 5

Teacher Resource Guide

Sponsored by Enron

Produced by the
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Oregon Zoo
4001 SW Canyon Road
Portland, OR 97221

September 2000
Metro Publication # 2000.10328.ZOO.e

Printed in the United States of America

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Introduction

The Oregon Zoo has designed this guide to help you create a Threatened and Endangered Species unit for your class. Throughout this packet, you'll find teacher background information along with student activities and reading exercises for grades 3-8.

An Emphasis on Elephants

You'll notice a focus throughout this booklet on the plight of the endangered Asian elephant. Elephants are excellent examples for teaching students about the issues facing all endangered species. And as you may know, the Oregon Zoo is world-renowned for its work with Asian elephants. For more than 40 years, the Oregon Zoo has bred these elephants in captivity, thereby helping ensure their survival.

What does this mean for your Threatened and Endangered Species curriculum? It's simple: you can make this topic larger than life for your students—literally! Instead of just reading about protecting animals, students can actually visit elephants and other endangered creatures on a field trip to the zoo.

Chendra's Story

True stories are a compelling way to teach young people about complicated topics. In this packet, you and your students will hear the tale of Chendra, an endangered Asian elephant who joined the zoo's family in November 1999.

Chendra was separated from her herd during a confrontation with plantation farmers in Malaysia, and was later found alone, hungry and injured. She is now living safely at the Oregon Zoo. While here, Chendra may participate in our research and breeding program, which helps diversify the genetic pool of North American elephants.

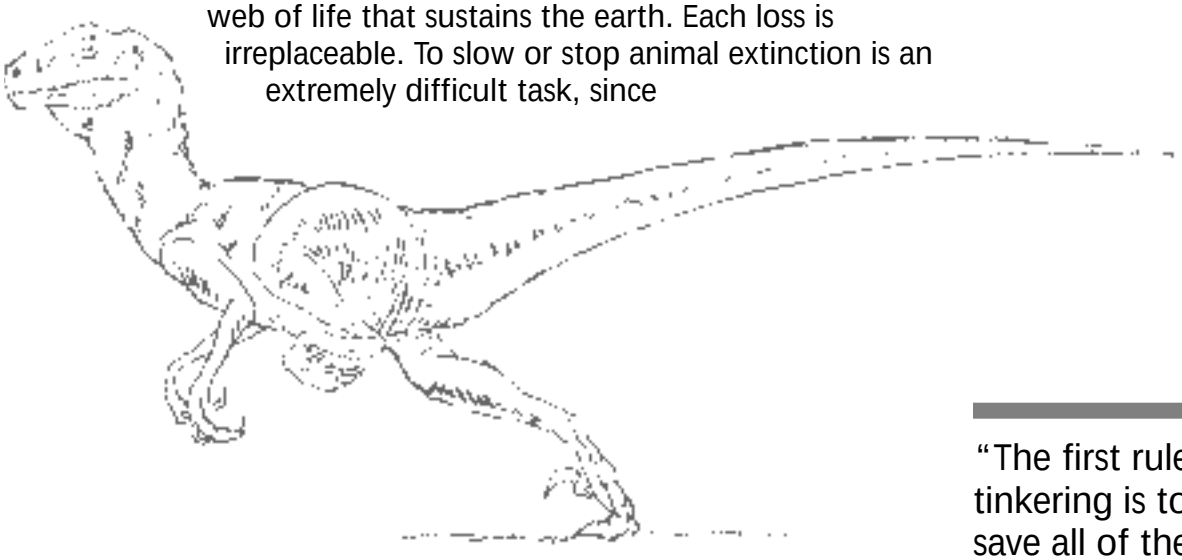
Once students grasp the problems of endangered animals through the real-life example of Chendra, this packet will help them learn about other animals that are being challenged, such as tigers.

This curriculum guide will do more than just tell good stories. Exercises in this booklet are specifically designed to reach Oregon state benchmarks (see page 42). If your students want to learn more about threatened and endangered species once you've completed this unit, refer to Resources, page 43. Of course, we also hope to see you soon at the Oregon Zoo.

Threatened and Endangered Species

The terms "threatened" and "endangered" are not just expressions of concern about an animal's status in the world. They are legal terms defined by state and federal law and international treaties. An endangered species is one that is in immediate danger of extinction, while a threatened species is in decline and is quickly approaching the threat of extinction.

Threatened and endangered species are strong warning signals of overall environmental decline. Each extinction leaves a gap in the web of life that sustains the earth. Each loss is irreplaceable. To slow or stop animal extinction is an extremely difficult task, since



many forces of human greed and need often work against the preservation of diverse life on earth.

"The first rule of tinkering is to save all of the parts."

-Aldo Leopold

What is Extinction?

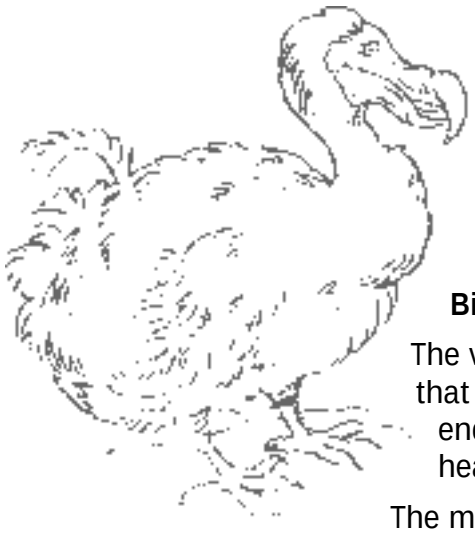
Extinction is the disappearance of an animal or plant species so that it no longer exists.

Natural Extinction

This process refers to the dying out of a species by natural means. When a species becomes extinct, it usually occurs so slowly that it leaves a space in nature that can be occupied by a newly evolving species or a replacement species. An example is the disappearance of dinosaurs 65 million years ago, which left space for mammals to develop.

Human-Influenced Extinction

In this case, a species dies out due to direct human interference. Extinction caused by human interference usually occurs so quickly that it leaves little opportunity for a new species to replace those that are lost. This kind of loss is irreplaceable.



Examples of human-influenced extinction are the dodo bird, which was wiped out within 62 years of discovery by European explorers; the passenger pigeon, which was exterminated over a 50-year period (originally this bird numbered in the billions); and Steller's sea cow, which became extinct a mere 27 years after its discovery in 1767.

Biodiversity

The vitality of the earth is reflected in the variety of the species that inhabit it. At the same time, the high number of currently endangered species is a clear indicator that the planet isn't as healthy as it should be.

The more than 30 million species of plants and animals in the world today represent an incredible variety of life forms. Over the earth's history, they have evolved into millions of shapes and sizes, developed a wide range of behaviors, and taken up residence in every habitat on the planet.

This biodiversity is important because of the interdependence of all life on earth. Many of the connections, such as "ecosystem services"— clean water, breathable atmosphere and natural climate controls—are not even fully understood. However, we do know that a complex interaction of plants, animals and microorganisms help maintain a constant supply of fresh water on the planet. Other organisms help remove wastes from the air, help prevent erosion and flooding, and help maintain the balance of carbon dioxide in the atmosphere.

Various plants and animals are also the source of products we use every day, such as fibers, paper and plastics. Others provide the source of medicines used to treat cancer, heart disease and other illnesses. Scientists have also cross-bred many wild plants with domestic ones to create more disease-resistant crops that have improved and revitalized older, more vulnerable plant strains.

Some scientists like to compare the earth to a giant airplane. The plants and animals are like the rivets that hold the airplane together. If enough rivets are lost, the airplane will fall apart. If enough plants and animals are lost, life for those left (including humans) could be in great danger. Most of the species estimated to become extinct every year are animals and plants that have never been described, identified or catalogued. In other words, we don't even know what we are losing.

Extinction is nothing new

Species extinctions have occurred naturally for hundreds of millions of years. However, the loss of special animals due to human influences is causing extinction rates to increase rapidly. Scientists now estimate that at least 10,000 species of animals become extinct each year.

Human/Wildlife Conflict

The accelerated rate of animal extinction is directly linked to the increase in human population. More people take up more space with their homes, shopping centers, farms, and grazing lands. That means less habitat for wildlife. People also destroy habitat to obtain lumber, minerals, oil and other products from the land. As the human population grows, there will undoubtedly be more conflicts for space and resources between humans and animals.

The loss of habitat is currently the most significant factor affecting plant and animal extinction.

Pollution, illegal and excessive wildlife trade, introduced species, and other human-related activities also take a definite toll on wildlife.

What can you do to help wildlife?

1. Support your local zoo .

Zoos throughout North America are working hard to protect wildlife. Zoo scientists in the field are studying animals and their habitats. Zoos also sponsor education programs in range countries to teach people how to protect their precious animal and natural resources. By supporting your local zoo's conservation programs you can directly help animals in the wild.

2. Take care of your own backyard.

Sometimes it is difficult to directly help animals on the other side of the globe. But you can take care of animals in your own state, city or backyard. Spend time learning about local wildlife; research local environmental organizations; donate your time or money—get involved. Every part of the world has wonderful native wildlife—and it's all worth preserving.

3. Support international conservation organizations.

Learn all you can. Go to the library, surf the Web, investigate conservation organizations, and become an informed participant. Many non-profit and government organizations are working in the field to restore habitats and preserve species. With support from around the world, people in the field are protecting animals. One example is the Tigris Foundation, which is working in Russia to protect both Siberian tigers and Amur leopards.

Human/Wildlife Conflict

The following three reading exercises: *Chendra's Story*, *Tracking Elephants by Satellite*, and *Maneaters* all illustrate conflicts between people and wildlife. *Chendra's Story* is offered in two versions, one for grades 3-5, and another version for grades 6-8. *Tracking Elephants by Satellite* and *Maneaters* may be most appropriate for grades 6-8.

Use these articles as reading tasks to help strengthen skills relevant to the following benchmarks:

SCIENCE
Grade 5 - Identify different ways and places in which scientists work.
Grade 8 - Describe how scientists study different fields and use different techniques for investigations.

ENGLISH
Grade 3 - Retell, summarize, or identify sequence of events, main ideas, facts and opinions in literary and informative selections.
Grade 5 - Identify sequence of events, main ideas, facts, supporting details, and opinions in literary, informative, and practical selections.
Grade 8 - Identify sequence of events, main ideas, facts, supporting details, and opinions in literary, informative, and practical selections.

SOCIAL STUDIES
Grade 3 - Identify and compare different ways of looking at an event, issue or problem.
Grade 5 - Identify and study two or more points of view on an event, issue or problem.
Grade 8 - Examine a controversial event, issue, or problem from more than one perspective.

Chendra's Story

This is the true story of a baby elephant named Chendra, and how she came to live in Portland, Oregon.

Chendra once lived in a country called Malaysia, which is in South-east Asia. The weather in Malaysia is very hot, and that is just the kind of place elephants like to live. Malaysia also has many jungles, which are forests filled with big trees, beautiful plants, colorful fruits and many animals—including elephants.

Chendra lived in Malaysia with her mother and the rest of their herd. A herd is a group of elephants that live and travel together, just like a big family. Chendra's herd never stayed in one place for very long. Every day, they walked many miles through the jungle. They found their own water to drink, and they hunted for food to eat, like bananas, grass and bamboo.

Sometimes Chendra and the other elephants accidentally ate fruit and leaves from trees that belonged to Malaysian farmers. This made the farmers very angry. They wanted to sell the fruit and oil from these trees for a lot of money—not feed the elephants!

Usually the farmers would try to scare the elephants away by shining bright lights at them or shouting. But the elephants were hungry and just wanted to eat a few pieces of fruit. They didn't know the fruit belonged to the farmers.

Sometimes the farmers got so angry that they would chase after the elephants, even hurting or killing them. One day, Chendra's herd walked onto an oil palm plantation and tried to eat from the trees. The farmers got very mad and chased the herd back into the jungle.

During the chase, Chendra and her mother lost each other in the trees. A few days later, Malaysian rangers found Chendra. She was hungry, tired, and had a hurt leg and eye. When Chendra's mother did not come back for her, the rangers rescued her and took her to a special place for animals called a wildlife preserve. The rangers took care of the wound on Chendra's leg, but they couldn't fix her eye. Now she is blind in her left eye.

In November 1999, Chendra took a very long airplane and truck ride to her new home in Portland, Oregon. It wasn't long before the elephants at the Oregon Zoo began to treat Chendra like a member of their family.

After a while, rangers decided it wasn't safe to return Chendra to the jungle. She didn't have a herd anymore. With one blind eye, she might have trouble finding her own food. Chendra needed to live in a place where people could help take care of her.

That's how Chendra came to live at the Oregon Zoo. The zoo had been asking the Malaysian rangers if they knew of any elephants that needed a new home. The zoo wanted new elephants that might someday have baby elephants and create a bigger zoo family. The Malaysian government decided Chendra would be just the right elephant for the zoo.

So in November 1999, Chendra took a very long airplane and truck ride to her new home in Portland, Oregon. It wasn't long before the elephants at the Oregon Zoo began to treat Chendra like a member of their family. An elephant named Sunshine now helps and protects Chendra like a mother, and an elephant named Rose-Tu treats Chendra just like a sister.

If you visit Chendra at the Oregon Zoo, you will see that she is very happy there. She has found another herd, just like the one she had in Malaysia. At last, Chendra has found a home.

Chendra's Story

This is the true story of a baby elephant named Chendra, and how she came to live in Portland, Oregon.

Chendra once lived in Malaysia, a country in Southeast Asia. The climate in Malaysia is very warm, making it a perfect habitat for elephants. Malaysia also has a great deal of jungle land filled with big trees, beautiful plants, colorful fruits and many animals—including elephants.

Until about 100 years ago, Malaysia was almost entirely covered with jungle. As a result, elephants and people lived closely together. The people lived in villages, usually along a river, and were used to having elephants wander into their communities looking for food and water. Elephants and people learned to accept one another, and to share their habitat.

However, early in the 20th century, Malaysian farmers began converting jungle land into plantations. There, they could grow trees and crops for sale. Developing these plantations often meant cutting down the older trees upon which the elephants used to feed. As a result, the elephants—including Chendra and her herd—began wandering onto the plantations to eat newly planted trees. The farmers weren't too happy about that, since it was ruining their livelihood.

Usually the farmers would try to scare the elephants away by shining bright lights at them, shouting, or setting off firecrackers. In some cases, none of these measures worked. As a result, the farmers began turning their guns on the elephants, sometimes injuring or killing them.

One day, Chendra's herd ventured onto a plantation and was chased back into the jungle by the plantation owners. No one knows exactly what happened during that confrontation. However, we do know that Chendra somehow lost her mother. A few days later, Malaysian rangers found Chendra. She was hungry, tired, and had an injured leg and eye. When Chendra's mother did not come back for her, the rangers rescued

In November 1999, Chendra took a very long airplane and truck ride to her new home in Portland, Oregon. It wasn't long before the elephants at the Oregon Zoo began to treat Chendra like a member of their family.

the orphan and took her to live on a wildlife preserve. The rangers took care of the wound on Chendra's leg, but they quickly learned she had become blind in her left eye.

The Malaysian rangers decided it wasn't safe to return Chendra to the jungle. She didn't have a herd anymore. With one blind eye, she might have trouble finding her own food. Chendra needed to live in a place where people could help take care of her.

That's how Chendra came to live at the Oregon Zoo. The zoo had been working with the Malaysian government to identify elephants that might be exported to the zoo. The zoo is well-known for its research and breeding work with elephants, and was very interested in adding members to its elephant family. The Malaysian government decided Chendra would be just the right elephant for the zoo.

So in November 1999, Chendra took a very long airplane and truck ride to her new home in Portland, Oregon. It wasn't long before the elephants at the Oregon Zoo began to treat Chendra like a member of their family. An elephant named Sunshine now helps and protects Chendra like a mother, and an elephant named Rose-Tu treats Chendra just like a sister.

If you visit Chendra at the Oregon Zoo, you'll immediately see how happy she is there. She's eating well (gaining 40 pounds a week!), and playing happily with the other elephants. She has found another herd, just like the one she had in Malaysia. At last, Chendra has found a home.

Tracking Elephants by Satellite

Peninsular Malaysia is being rapidly developed. Large stretches of forest continue to be converted into oil palm, rubber, and fruit plantations. Currently, rubber trees and oil palms cover 30% of Peninsular Malaysia's land mass. In some areas, only a few small areas of forest are left.

During daylight hours, elephants usually feed in the protection of the forest. But at night, some animals are brave enough to cross electric fences and bypass elephant patrols to enter nearby plantations. Elephants feeding on plantation crops throughout the country can easily cause millions of dollars in crop damage.

As a result, when elephants begin to feed at a plantation, managers usually approach the Department of Wildlife and National Parks of Peninsular Malaysia. The manager is then given several options for preventing further elephant damage.

Moving elephants offers an immediate solution to the crop-raiding problem. However, scientists are trying to decide whether moving the elephants is a good long-term solution.

Elephant "Scare Tactics"

One strategy is to hire elephant "guards" who patrol the plantation and scare elephants away with spot lights, blank gun shots or fire crackers. Another option is the construction of an electric fence around the plantation. Electric fences must be monitored closely so any breaks in the fences can be repaired immediately. Some elephants have even learned how to push trees across electric fences to create openings through which they can enter safely.

If an elephant or group of elephants continue to raid a plantation, the Department of Wildlife and National Parks of Peninsular Malaysia sends an elephant management unit to the plantation. They evaluate the damage, and suggest solutions. Sometimes the only solution is to capture and "translocate," or move, the trespassing elephant(s). Since 1974, more than 400 elephants have been moved to Taman Negara National Park or other protected areas

where there are fewer chances for them to get into conflict with humans.

Longer-Term Solutions

Moving elephants offers an immediate solution to the crop-raiding problem. However, scientists are trying to decide whether moving the elephants is a good long-term solution. They are asking questions such as:

- How do the translocated elephants adapt to their new environment?
- Do they stay healthy and survive?
- Do they go back to where they were captured?
- Do they remain where they are released?

How can scientists get answers to these questions? The best option is to follow elephants who have been moved and released into the national park. However, it's not easy to track elephants. They travel at night, often in areas that are hard for humans to access.

Elephants feeding on plantation crops throughout the country can easily cause millions of dollars in crop damage.

Tracking Elephants From Space

That's why scientists from the United States and Malaysia are now working together to follow the elephants using satellite tracking. Here's how it works: the elephant is caught and sedated. While the elephants sleep, scientists attach a transmitter to the animal's neck. When the elephant wakes up and begins to move again, the transmitter beams a signal to satellites passing overhead. The satellites then relay this data back to earth, where computers can pinpoint the elephant's position.

So far, three Malaysian elephants are wearing this type of transmitter. Scientists hope the information they learn from these elephants and others will tell them if moving elephants to less populated areas can help solve the conflict between humans and elephants.

More on Tracking Elephants by Satellite

This study used the weather satellites of the U.S. National Oceanographic and Atmospheric Administration. Some of them include instruments that can detect signals emitted by transmitters on elephants. If the satellite receives at least two messages from the elephant's transmitter as it passes by, computers at the earth station can calculate the geographic location of the elephant.

There are several problems facing researchers in this study. First, the elephants are released close to the equator, and only two satellites pass through this area in a 24-hour period. Second, if an elephant is in the jungle, the signal may not be able to penetrate the dense trees. Third, satellite tracking is very expensive. It costs $3,700 in U.S. dollars each year to track just one elephant.

Please respond to the following questions about satellite tracking:

1. The researchers have asked you to develop a title and design a cover for the book they plan to write about their elephant tracking project. Draw the cover and tell why the cover should be used.
2. In the middle of page 11, what does the word "monitored" mean?
3. In this article, what is an example of the elephants getting into conflict with humans?
4. What does an elephant guard use to scare elephants away from a plantation?
5. How do elephants get through the electric fences?
6. How are the forests of Malaysia now being used?

Maneaters

Man-eating tigers that roam the jungle along the Indian-Nepalese border have plunged frightened farmers and concerned widlife conservationists into a bitter controversy over a government campaign to destroy the wild beasts or trap some of them for zoos.

Man-eating tigers are bound to spark some student interest. The article from *The Oregonian* of June 5, 1983, provides information about a typical situation that often develops around endangered species. There is a conflict between human needs and animal needs.

There is also a conflict between the points of view of different groups of people involved. By leading students through an examination and discussion of the information and issues presented in the article, it should be possible to give students a better sense of the difficulties in solving this kind of conflict. They should also realize that it is not always possible to say one side is right and the other is wrong. Some of the questions on the student worksheet should produce disagreement among the students as to "right" and "wrong" answers. These will provide good opportunities for discussing the impact of values upon our perception of a situation.

In addition to having the students read the article and complete the worksheet, some geography and math work can be done to give students more background for their discussions. Have them use a good atlas or encyclopedia to make maps of India showing where the story took place. This might be extended to a short study of India and its people.

Using information from the article, have them calculate how many square miles of space is available for each tiger in the park. Then have them use an atlas to find the area and population of India and calculate a similar figure for the human population. These numbers are technically not comparable, but can be used to lead students to an understanding of the competition for space (habitat) that is part of the conflict in the story.

Indian tigers stalking man spark dispute

By William Claiborne, LA Times-Washington Post Service
Reprinted from *The Sunday Oregonian*, June 5, 1983

PALIA, India — Man-eating tigers that roam the jungle along the Indian-Nepalese border have plunged the frightened farmers and concerned wildlife conservationists into a bitter controversy over a government campaign to destroy the wild beasts or trap some of them for zoos.

The farmers say the tigers have lost their instinctive fear of man and have acquired a taste for human blood, and as a result are terrifying the countryside in this remote part of the Indian state of Uttar Pradesh. Since 1978, 105 people have been killed by tigers, the most recent on March 22, when the body of a forest worker was found with an arm and a leg missing.

The government, according to the conservationists, has bowed to local political pressure without regard for the future of the fabled jungle cats — who since 1971 have been protected by a ban on shooting by hunters.

At the center of the dispute is Arjan "Billy" Sigh, 66, a hunter-turned-conservationist who has led a campaign to have wayward tigers humanely lured back to their protected preserve in Dudwa National Park here and to create an encroachment-free buffer zone around the tigers' habitat.

The controversy surrounding Singh has been heightened by attempts by some government officials to blame 22 man-eating cases on a zoo-born tigress that the

conservationist brought here from Britain as a cub, raised at home and then introduced into the jungle in an experiment designed to increase the world's dwindling tiger population.

Singh, one of India's best known wildlife experts, proved by comparing markings that his tigress, Tara, was not the man-eater shot by park officials in November 1980 after killing five people, and he has since led the battle against destroying tigers or condemning them to captivity to appease public outcry over man-eating cases.

Indian tigers stalking man spark dispute continued

"The human, under normal circumstances, is not the tiger's prey species. What we have done is to force the tiger to turn on man by denigrating his habitat, and then we say there is no other way to solve this problem except to destroy the tigers," Singh said.

Seven tigers branded as man-eaters have been killed in the past five years, and one was trapped and sent to a zoo in Lucknow last month after being identified as having killed three people and attacked a fourth. Three tigers sent from the wild to the Lucknow zoo have died in captivity, and the one sent there last month is reported to be in deteriorating condition because of the abrupt change in environment.

The survivor of an attack on March 9, Shiv Shanker, 60, a night watchman, said in an interview that he was guarding a wheat field when a tiger grabbed him by the thigh and began to drag him away.

"I knew I was going to die, so I hit at the tiger," Shanker said, displaying a scar on his leg. He said a kerosene lantern tipped over and started a fire. The tiger, after snarling and lashing its tail menacingly for a while, let him go and went away.

Singh and several area farmers agreed that the 60 tigers in the 200-square-mile Dudwa National Park increasingly have stayed outside of the preserve during the past five years and have become more agressive toward humans. In the previous 16 years, there had been only two or three reported man eatings.

The park director, Ashok Singh, said one reason is an increase in sugar-cane acreage adjacent to the park. Previously it was bordered by grass fields, which were not suitable habitat for the tigers and which tended to keep them contained in the preserve. But the encroachment by farmers planting cane closer to the park's edge has enlarged the tigers' preferred habitat and has drawn them closer to areas populated by humans.

Rupinder Singh, a prosperous farmer whose cane fields have gradually been expanded closer to the park's perimeter, acknowledged in an interview that the changing environment had altered the tigers' behavior. But he said the government has a responsibility to protect the local citizenry.

"You see, they are no longer afraid of man. It used to be that they would run away from you. Now, they feel that dogs and humans are easy catching," said the farmer, who has allowed the park officials to install a baited trap in his cane fields to capture tigers.

Arjan Singh, meanwhile, is battling attempts to kill or trap suspected man-eaters. He is also seeking to overturn an Indian Borad for Wildlife ban on introducing to the wilderness tigers or leopards that have been reared in captivity.

Singh, who still monitors the movements of Tara and who last month watched from an observation blind while the tigress and her cubs ate at a water buffalo staked out as bait, said he believes the ban on reintroduction and the labeling of Tara as a man-eater were designed to discredit his experiments.

Maneaters

Read this news story carefully and answer the following questions using information from the article.

Changes

How many tiger attacks happened between 1967 and 1978? _____

How many tiger attacks have happened from 1978 to 1983? _____

What kind of habitat do tigers like? _____

_____

What kind of habitat do tigers not like? _____

_____

How has the habitat changed in recent years? _____

_____

Taking Sides

Here is a chart with the names of all the individuals mentioned in the story. Put a check in the column you think matches their position in the conflict.

	pro-tiger	neutral	anti-tiger
Arjan "Billy" Singh			
government officials			
Shiv Shanker			
Ashok Singh			
Rupinder Singh			
farmers			
tigers			

How does Arjan Singh explain the changes in tiger behavior? _____

_____

How does Rupinder Sigh explain the changes in tiger behavior? _____

_____

How does Ashok Sigh explain the changes in tiger behavior? _____

_____

Who is right? _____

_____

Solutions

What would you recommend to solve the problem of man-eating tigers? _____

_____

Answer Key

How many tiger attacks happened between 1967 and 1978? (2 or 3)

How many tiger attacks have happened from 1978 to 1983? (105)

What kind of habitat do tigers like? (The article does not state specifically what tigers like but does mention jungle and the fact that sugar cane fields were places tigers would go. It is possible to conclude that tigers like places with dense vegetation in which to hide.)

What kind of habitat do tigers not like? (They do not like the open grassy areas that used to surround their jungle reserve.)

How has the habitat changed in recent years? (Farmers have changed some of the open grassy areas into sugar cane fields.)

With this information it will be possible to discuss how the changed behavior of tigers is related to a change in their habitat.

How does Arjan Singh explain the changes in tiger behavior? (Arjan says the tigers have been forced to turn on man because the tigers' habitat has been degraded. The news story uses the word "denigrating" which students may need help with.)

How does Rupinder Sigh explain the changes in tiger behavior? (Rupinder says

the tigers are no longer afraid of man but he also acknowledges that a changed environment has changed the tigers' behavior.)

How does Ashok Sigh explain the changes in tiger behavior? (Ashok says the increase in sugar cane acreage around the park has allowed the tigers to move from the park into areas closer to humans.)

Who is right? (All three of these explanations have some validity and although they may sound like they disagree they are all basically saying the same thing. The real disagreement arises from the values of the individuals and what they want done about the tigers. They are all "right" and that is the crux of the problem. Finding a solution will be difficult because it will be difficult to provide a solution that agrees with the values of all parties.)

	pro-tiger	neutral	anti-tiger
Arjan "Billy" Singh	X		
government officials	X	X	X
Shiv Shanker			X
Ashok Singh	X		
Rupinder Singh			X
farmers			X
tigers	X		

Asian Elephant Habitat and Population

Historically, the Asian elephant's habitat ranged from Syria and Iran east across Asia, south of the Himalayas to Indochina and the Malay Peninsula, north in China to at least the Yangtze River and in Sri Lanka, Sumatra and possibly Java.

Elephants have disappeared entirely from western Asia, Iran, Java and most of China. They now occur in the regions and countries listed below, and in only a fragment of their former range.

Estimates of elephant numbers are often just educated guesses. The logistics of systematically covering the densely forested regions of Asia are overwhelming. In addition, unfavorable political conditions often prevent fieldwork in many countries.

Elephant Population*

REGION	MINIMUM	MAXIMUM
Southern India	5,750	7,150
Central India	1,635	2,335
Northern India	9,050	12,455
Nepal	50	85
Bhutan	60	60
Bangladesh	200	350
China	100	230
Myanmar	6,000	10,000
Thailand	2,925	4,550
Cambodia	2,000	2,000
Laos	2,000	2,000
Vietnam	1,000	1,000
Malaysia	800	3,000
Andaman Islands	20	30
Sri Lanka	2,000	4,000
Sumatra	2,800	4,800
Borneo	500	2,000
TOTAL	36890	56045

*In population counts that may be inexact, researchers will often list a minimum and maximum. To simplify it, on the student pages, the minimum number is used.

Where Have the Elephants Gone?

The "Where Have the Elephants Gone?" activity shows students the change in distribution of the Asian elephant. Directions are given on the student worksheet. Younger students can be given more guidance when doing the math to determine the percentage change in the range of the elephant. Older students can use the map without a grid and draw their own, using the guides on the page.

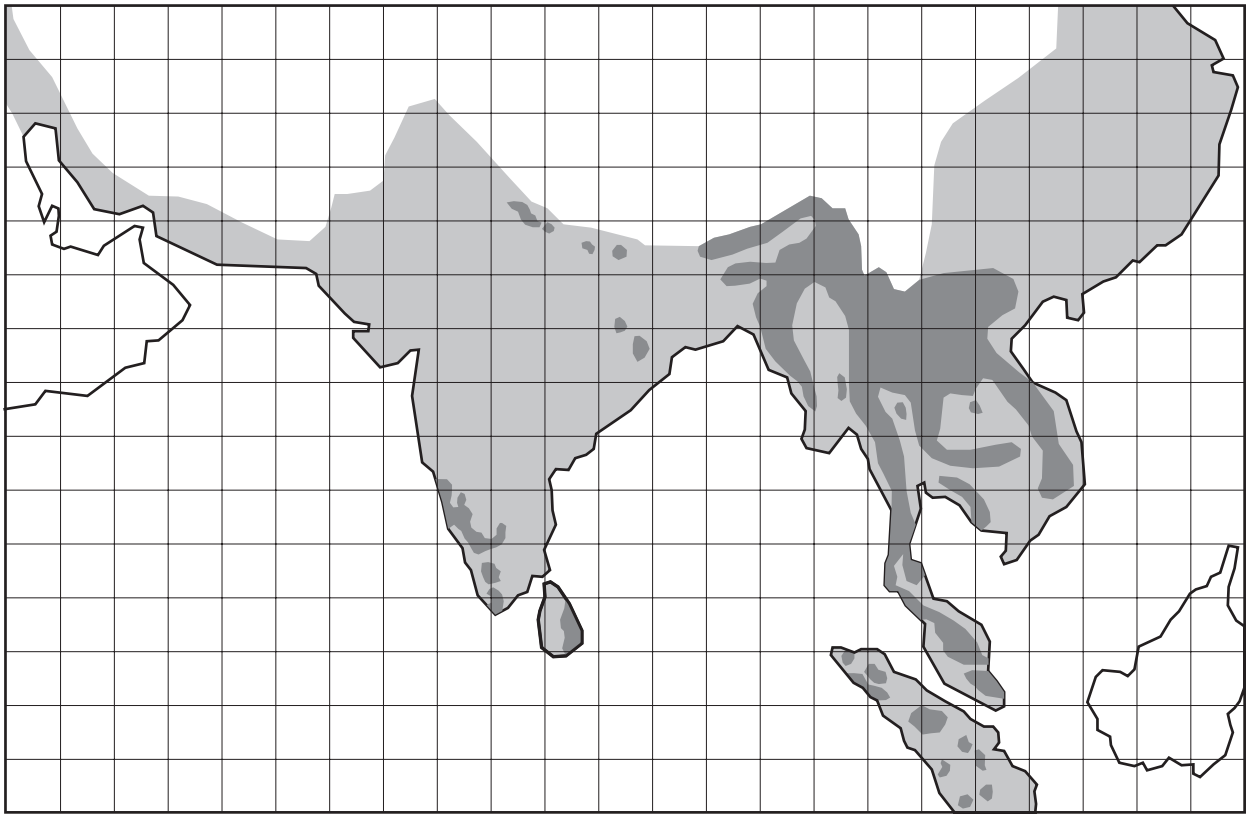
This activity will also strengthen student skills relevant to the following benchmarks:

SOCIAL STUDIES
Grade 3 - View and draw simple maps and pictures to locate, describe, and show movement among places.
Grade 5 - Examine and prepare maps, charts and other visual representations to locate places and interpret geographic information.
Grade 8 - Read interpret, and prepare maps, charts, graphs, and other visual representations to understand geographic relationships

SCIENCE
Grade 3 - Identify examples of change.
Grade 5 - Describe and explain different rates of change.
Grade 8 - Identify and explain patterns of change as cycles and trends.

Where Have the Elephants Gone?

Color in the squares on the grid that show the former range distribution of the Asian elephant. Those are the areas in which the elephants used to live. Count the squares you colored and fill in the number in the space below.



former distribution

present distribution

Now use a different color to color in any square that shows the present distribution of the Asian elephant (where they live now). You will have to color some of the squares you have already colored. Count these squares and fill in the numbers in the spaces below.

There are _____ colored squares that represent the former distribution (old homes) of the Asian elephant.

There are _____ colored squares that represent the present distribution (current homes) of the Asian elephant.

Use a calculator to solve this problem.

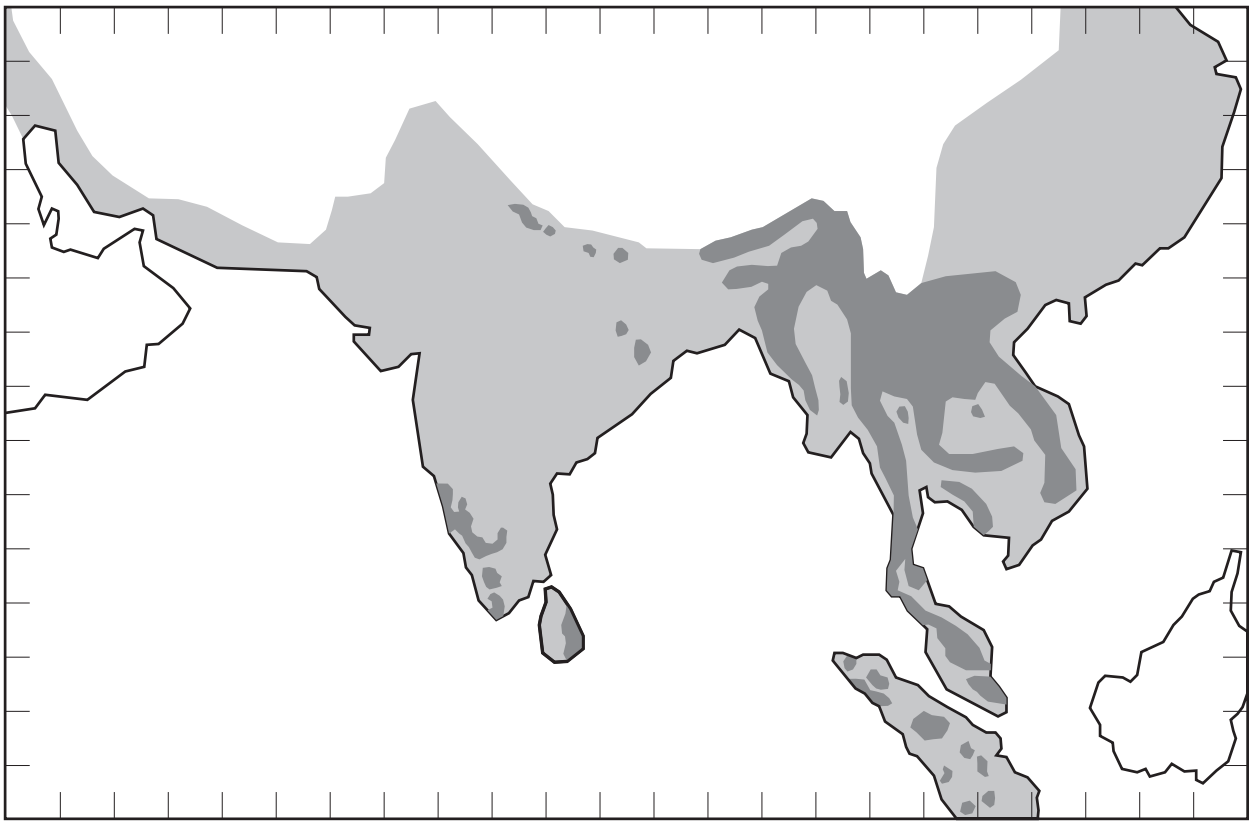
_____ number of squares colored that represent the present distribution of elephants divided by _____ number of squares that represent the former distribution = _____.

Multiply this answer by 100 to find out the percentage of the original range of the Asian elephant that remains.

Where Have the Elephants Gone?

Create a grid over the map, using the reference marks provided for you on the sheet.

Color in the squares on your grid that show the former distribution (previous habitat) of the elephant. Count these squares and fill in the number in the space below. Now use a different color to color in any square that shows the present distribution (current habitat) of the Asian elephant. You will have to color some of the squares you have already colored. Count these squares and fill in the numbers in the spaces below.



former distribution

present distribution

There are _____ colored squares that represent the former distribution of the Asian elephant.

There are _____ colored squares that represent the present distribution of the Asian elephant.

Number of squares that represent the present distribution of the Asian elephant _____ divided by the number of squares that represent the former distribution of the Asian elephant _____ multiplied by 100 for percentage of change in distribution.

Where in the World are Asian Elephants?

Have students use the population table on page 19 to identify countries that are home to Asian elephants. Have them locate the country on the map of Asia on page 24 and write the population of elephants in the correct country on the map. Younger students may work on fewer countries.

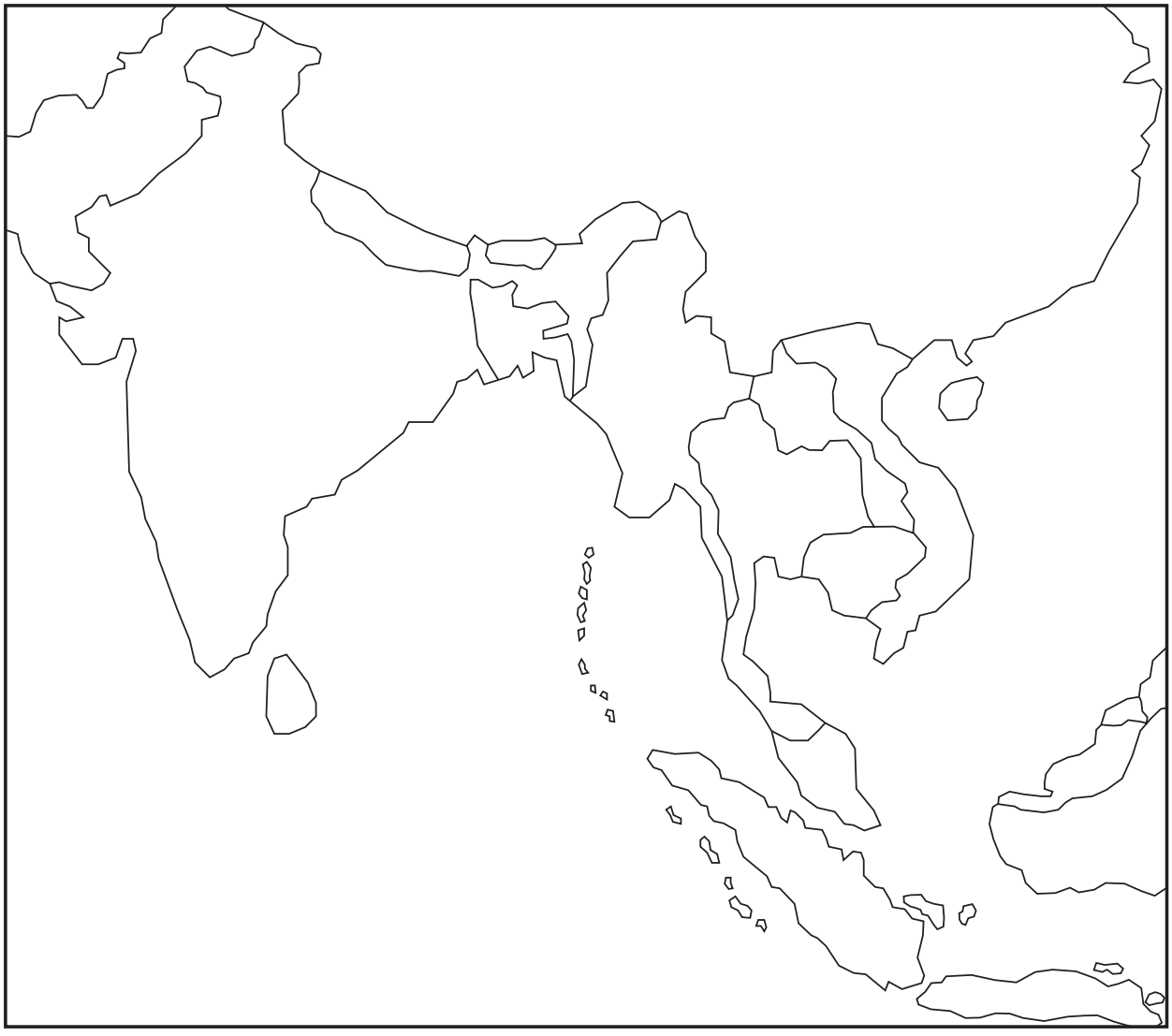
This activity will strengthen student skills relevant to the following benchmarks.

Social Studies
Grade 3 - View and draw simple maps and pictures to locate, describe, and show movement among places.
Grade 5 - Examine and prepare maps, charts and other visual representations to locate places and interpret geographic information.
Grade 8 - Read, interpret and prepare maps, charts, graphs and other visual representations to understand geographic relationships.

Student Activity

Where in the World are Asian Elephants?

Use the table on page 19 to identify the countries that are home to Asian elephants. On the map of Asia, locate the countries and write the population number of elephants and the country's name.



Teacher Notes For Student Activity

Asian Elephant Populations

Have students use the elephant population numbers from the table to create a bar graph. Younger students can graph regions with 200 elephants or less in order to simplify the task.

This activity will also strengthen student skills relevant to the following benchmarks:

MATHEMATICS
Grade 3 - Collect, organize, display, and describe simple data using charts, tables, number lines, bar graphs, and line graphs.
Grade 5 - Collect, organize, display, and analyze data, using number lines, bar graphs, and line graphs, circle graphs, stem and leaf plots and histograms.
Grade 8 - Create, interpret, and analyze charts, tables, and graphs to display data, draw conclusions, and solve problems.

Teacher Notes For Student Activity

The Changing Elephant Habitat

Students will use a bar graph to see deforestation changes over time. Directions are on the worksheet page.

This activity will also strengthen student skills relevant to the following benchmarks:

SCIENCE
Grade 3 - Identify examples of change.
Grade 5 - Describe and explain different rates of change.
Grade 8 - Identify and explain patterns of change as cycles and trends.

MATHEMATICS
Grade 3 - Collect, organize, display and describe simple data using charts, tables, number lines, bar graphs and line graphs.
Grade 5 - Collect, organize, display and analyze data, using number lines, bar graphs and line graphs, circle graphs, stem and leaf plots and histograms.
Grade 8 - Create, interpret, and analyze charts, tables, and graphs to display data, draw conclusions, and solve problems.

Student Activity

Asian Elephant Populations

The table below shows the population of the Asian elephant by country. Use the information to create a bar graph.

REGION	ELEPHANT POPULATION
Southern India	5,750
Central India	1,635
Northern India	9,050
Nepal	50
Bhutan	60
Bangladesh	200
China	100
Myanmar	6,000
Thailand	2,925
Cambodia	2,000
Laos	2,000
Vietnam	1,000
Malaysia	800
Andaman Islands	20
Sri Lanka	2,000
Sumatra	2,800
Borneo	500
TOTAL	36,890

The Changing Elephant Habitat

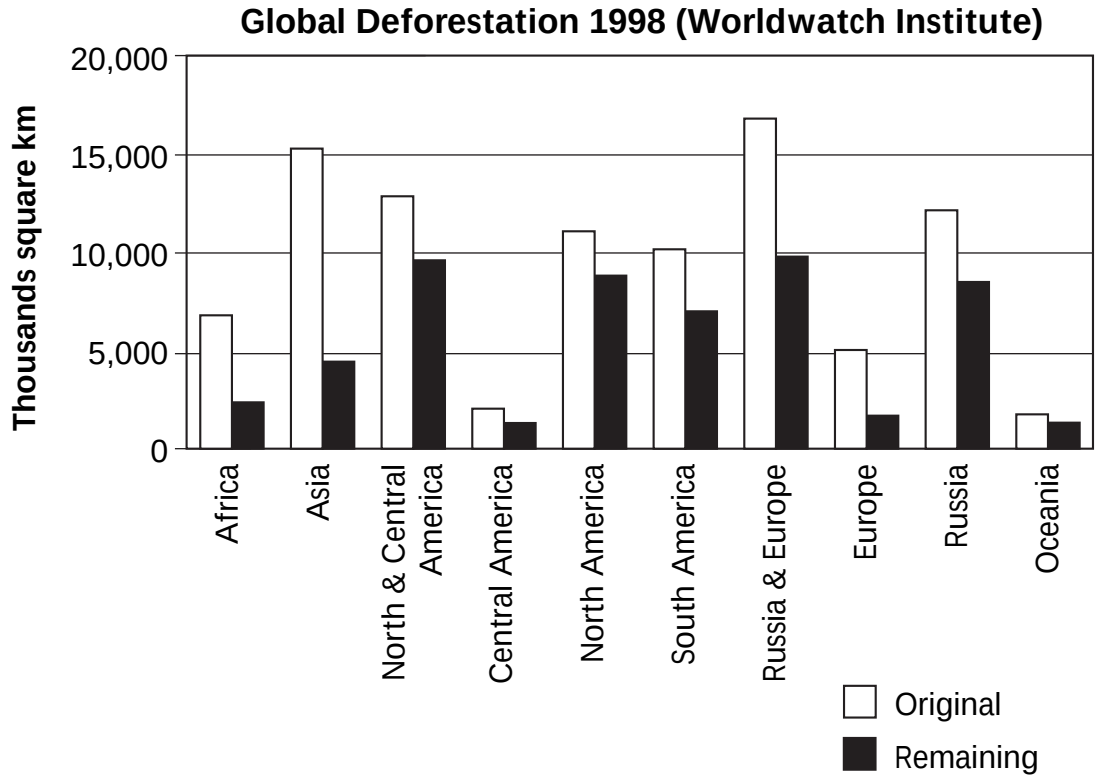
Habitat is defined as "the natural area where an animal or plant lives and finds everything it needs to stay alive and keep healthy." Asian elephants live in a habitat where forest and grassland areas overlap. Any animal that lives in or uses a forest habitat competes with people for that space.

What are some reasons people cut down trees?

Look at the graph titled "Global Deforestation 1998" (Worldwatch Institute) Deforestation means to cut down the trees or forests.

Answer the following questions:

1. In one sentence, describe what information the white of the two bars is giving you.
2. In one sentence, describe what information the black bar is giving you.
3. What area started out with the most forest land?
4. What area currently has the most forest land?
5. What area shows the largest loss of forest land?
6. What area shows the least loss of forest land?



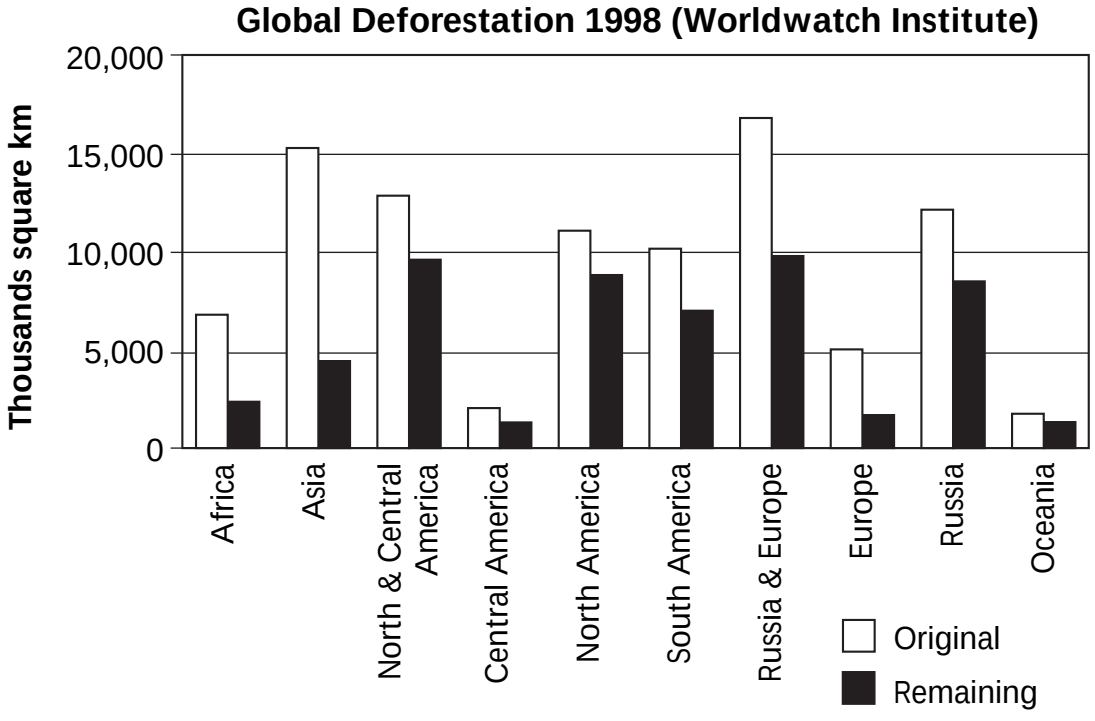
The Changing Elephant Habitat

Habitat is defined as "the natural area where an animal or plant lives and finds everything it needs to stay alive and keep healthy." Asian elephants live in a habitat where forest and grassland areas overlap. Any animal that lives in or uses the forest habitat must compete for that land with people.

Look at the graph titled "Global Deforestation 1998 (Worldwatch Institute)

Calculate the amount of forest lost in each of the following

	Original	Remaining	Total Forest Land Lost
Africa			
Asia			
Central America			
North America			
South America			
Europe			
Russia			
Oceania			



Look at the Asian elephant range map on page 22 and compare it to this bar graph. What conclusions can you draw about why Asian elephants are endangered?

Deforestation and Loss of the Asian Elephant Habitat

Habitat is defined as "the natural area where an animal or plant lives and finds everything it needs to stay alive and keep healthy." Asian elephants live in a habitat where forest and grassland areas overlap.

On a historical time scale, loss of habitat has been the ultimate cause of decline of elephant populations throughout Asia. This factor is still very serious in many Asian countries. The elephant's habitat either undergoes serious change as a result of the human quest for natural resources or is lost due to expanding human occupation.

People exploit the elephant's habitat to gain control of plant resources such as fruits, bark, fodder, fuel and timber. Exploitation of timber may not always be carried out according to ecologically sound prescriptions, thus resulting in devastation of the natural habitat. (Sukamar 1989)

The elephant's forest habitat has already been reduced to a fraction of what it once was in most countries in its range. The Asian elephant is listed as an endangered species with the U.S. Fish and Wildlife Service.

About 20 percent of the world's population lives in or near the present range of the Asian elephant. With human numbers increasing at a rate of about 3 percent annually, this could mean doubling the human population in just 23 years.

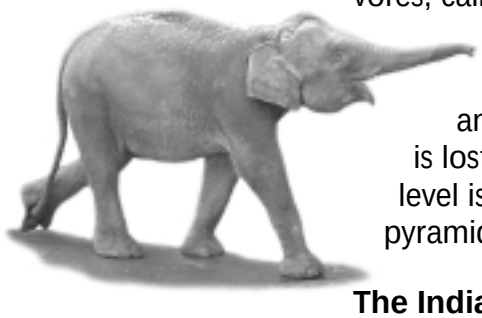
Elephants and the Chain of Life

Asian Elephant Ecosystem

The Asian forest/grassland ecosystem is rich and complex. Like any other ecosystem, the connections can be depicted in several different ways: as a food web or as a food pyramid.

A food chain or web charts the flow of food and energy through a community or ecosystem. Plants use sunlight to combine atmospheric gasses, soil nutrients and water into energy. Animals that eat the plants are called herbivores. Carnivores prey on the herbivores and other carnivores may prey on them. Decomposers, such as bacteria, fungi and some insects break down and transform plant and animal matter into soil.

The food pyramid, similar to a food web, gives more quantifiable information and some different terminology. The base of the pyramid is the source of energy and matter. This includes sunlight, soil, rainwater, air, wind, temperature, and humidity. The next level contains large numbers of energy-producing plants in an energy pyramid called producers. Above them are a smaller number herbivores, called first-level consumers, then a still-smaller number of carnivores, or second-level consumers.



The pyramid shape indicates how the numbers of animals decrease as you move from bottom to top. Energy is lost at each level. Only 10 percent of the energy from each level is utilized by the level above. Therefore, the base of the pyramid is the largest level.

The Indian Forest

PLANTS OR PRODUCERS: Acacia trees, button trees, grasses and bamboo.

HERBIVORES, or first-level consumers: elephant, spotted deer, guar, black buck, wild pig, hog deer, sambar (large Asian deer), muntjac (barking deer), water buffalo, Indian hare, flying squirrel, red jungle fowl and the Kaliej pheasant.

CARNIVORES, or second-level consumers: small Asian mongoose, tiger, leopard, jungle cat, wild dog, gray-headed fish eagle and king cobra. The jackal is considered both a predator and a scavenger.

Elephants and the Chain of Life

Have students cut out the squares on the following page containing the plants and animals of the Indian forest ecosystem. After researching and discussing the possible diet of each animal, have them to paste the squares on paper and draw the connections between each species to show the food web, or paste them into a pyramid like the one on page 33.

A Step Further

Have students work together to research the forest ecosystem of Oregon. Have students create either a food web or an energy pyramid to show the relationships between the members of the ecosystem. (This can also be done on a field trip to the Oregon Zoo using the graphics at the Cascades exhibit).

These activities will strengthen student skills relevant to the following benchmarks:

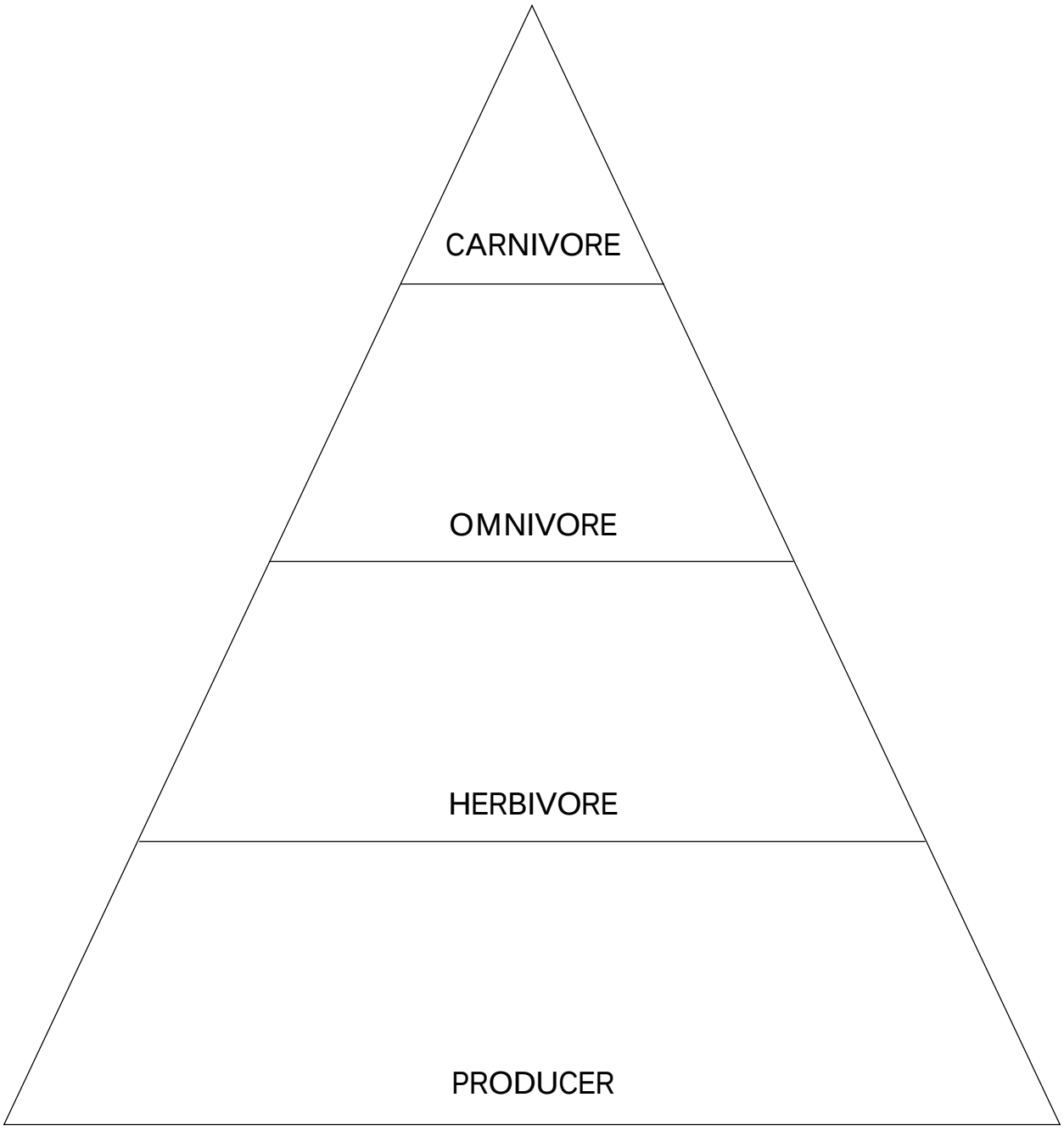
SCIENCE
Grade 3 - Recognize and diagram the parts of a system.
Grade 5 - Identify interactions among parts of a system.
Grade 8 - Identify a system's inputs and outputs. Explain the effects of changing a system's components.

Indian Forest Ecosystem

Below are some of the plants and animals in an Indian forest ecosystem.

Button Tree	Blackbuck	Guar	Bamboo
Asian mongoose	Wild dog	Elephant	Leopard
Tiger	Indian hare	King cobra	Water buffalo
Flying squirrel	Muntjac	Acacia trees	Sambar
Gray-headed fish eagle	Kaliej pheasant	Spotted deer	Hog deer
Jungle cat	Red jungle fowl	Grasses	Jackal

Food Pyramid



What's the Big Problem?

This activity can be done on a zoo visit. Students can also complete this activity online by visiting our Web site (www.oregonzoo.org). They should click on "About our Animals", then click on "Fact Sheet". They will find the needed information at the bottom of the fact sheet under 'Status'. This activity will show students that the main problem facing animals is the loss of habitat.

This activity will strengthen student skills relevant to the following benchmarks:

MATHEMATICS
Grade 3 - Collect organize, display, and describe simple data using charts, tables, number lines, bar graphs, and line graphs.
Grade 5 - Collect, organize, display, and analyze data, using number lines, bar graphs, and line graphs, circle graphs, stem and leaf plots and histograms.
Grade 8 - Create, interpret, and analyze charts, tables, and graphs to display data, draw conclusions, and solve problems.

Student Activity (at the zoo or the Oregon Zoo Web site)

What's the Big Problem?

During your zoo visit, find out why the animals at the Oregon Zoo are endangered. For all of the animals you find that are endangered, check the column that best describes the reason they are endangered.

You may also complete this activity online by visiting our Web site (www.oregonzoo.org). Click on "About our Animals", then click on "Fact Sheet". You will find the information you need at the bottom of the fact sheet under 'Status".

Name of Animal	Habitat Loss	Hunting	Pesticides	Pet Trade
TOTAL				

From your chart, what have you learned is the most common reason these animals are endangered?

Beauty Has a Price

Make a copy of the activity sheet for each student or group. This photo identification activity is completed on a visit to the zoo.

In this exercise, students will learn that although most animals are endangered because of habitat loss, some are endangered because of the human demand for exotic products. Although endangered and threatened animals are protected by laws that prohibit hunting, this protection is often not enough. Poachers frequently raid protected areas and illegally kill endangered animals—if the price they are paid is high enough.

To protect these species, the illegal trade in animal products must be halted, and protected habitat must be set aside and carefully patrolled.

Answer Key for Photo Identification

1. ANIMAL: Amur Tiger

   Why hunted? Tigers are hunted for their fur, which is made into expensive coats. The rest of their body is used in traditional Asian medicines.

2. ANIMAL: Amur Leopard

   Why hunted? Their beautiful spotted coats are valuable to poachers. Leopards are also killed by farmers who have converted leopard habitat into farms.

3. ANIMAL: Slender-Snouted Crocodile

   Why hunted? All alligators and crocodiles are hunted for their skins, which are made into leather. Once the skin is tanned, it is very difficult to tell if it came from a common or an endangered species.

4. ANIMAL: Lory

   Why hunted? The lory is wanted as a pet.

5. ANIMAL: Rhinoceros

   Why hunted? Rhinos are killed for their horns, which are made into fancy dagger handles and used in traditional Asian medicines.

Beauty has a Price

ZOO EXHIBITS TO VISIT: Big Cats, Elephants, Africa

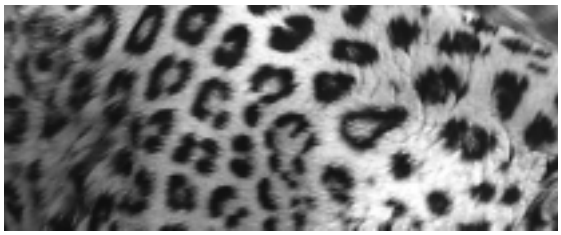
Find the animal at the Zoo that matches each of these pictures. Write down the name of the animal and why it is hunted. Each picture is a hint for why it is hunted.

1. Animal _____

Why hunted?_____

2. Animal _____

Why hunted?_____



3. Animal _____

Why hunted?_____

4. Animal _____

Why hunted?_____

5. Animal _____

Why hunted?_____

Where in the World?

In the "Where in the World?" activity, students will learn that there are endangered animal species in all parts of the world.

While at the zoo, have your students find the pictured animal and each animal's location on the range map included in the exhibit labels. Back in the classroom, instruct students to color the vegetation zones on the map and label them. Then cut out the animals and place each in the correct location on the map.

"Where in the World?" will strengthen student skills relevant to the following benchmarks:

SOCIAL STUDIES
Grade 3 - View and draw simple maps and pictures to locate, describe, and show movement among places.
Grade 5 - Examine and prepare maps, charts and other visual representations to locate places and interpret geographic information.
Grade 8 - Read, interpret and prepare maps, charts, graphs and other visual representations to understand geographic relationships.

A Step Further

This activity can be expanded into a classroom project. Have each student choose an endangered species to research. Ask them to write a paper and then give a class presentation, including marking on a classroom map where the species is found. In addition to the library, there are many excellent sources of information on the World Wide Web, including: www.oregonzoo.com

Extending "Where in the World" in this way, will also strengthen student skills relevant to the following benchmarks.

ENGLISH
Reading
Grade 3 - Retell, summarize, or identify sequence of events, main ideas, facts and opinions in literary and informative selections.
Grade 5 - Identify sequences of events, main ideas, facts, supporting details, and opinions in literary, informative, and practical selections.
Grade 8 - Identify sequences of events, main ideas, facts, supporting details, and opinions in literary, informative, and practical selections.

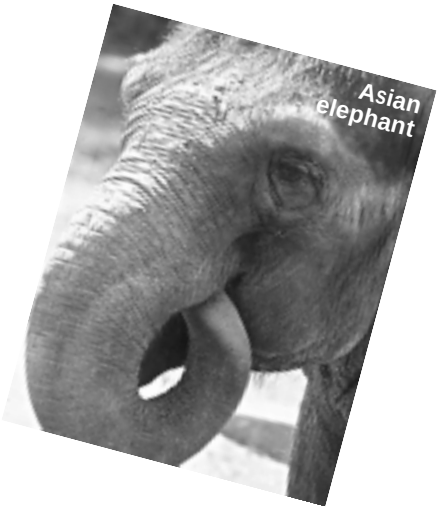
Writing
Grade 3 - Convey main ideas with some details.
Grade 5 - Convey clear main ideas and supporting details in ways appropriate to topic, audience, and purpose.
Grade 8 - Convey clear, focused main ideas supported by details and examples in ways appropriate to topic, audience, and purpose.

Communication
Grade 3 - Convey main ideas with some supporting details appropriate to audience and purpose.
Grade 5 - Convey clear, focused main ideas with supporting details appropriate to audience and purpose.
Grade 8 - Convey clear, focused main ideas with accurate, relevant supporting details, including documentation of sources, appropriate to audience and purpose.

Student Activity

Where in the World?

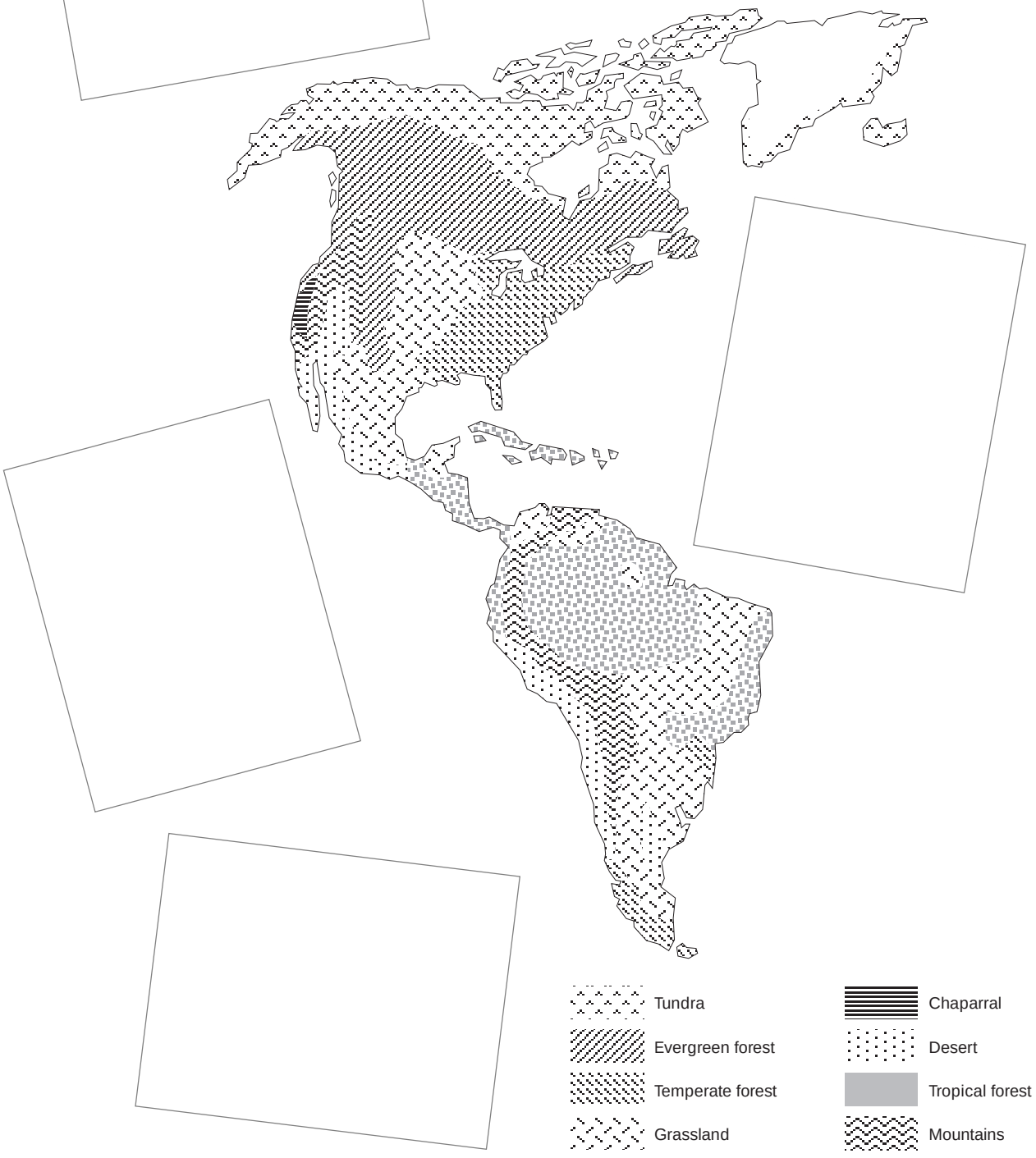
Match the pictures of endangered animals to their homes on the maps



Where in the World?

ZOO EXHIBITS TO VISIT: Big Cats, Bears, Penguins, Primates, Elephants, Africa, Alaska Tundra

Match the pictures of endangered animals to their homes on the map.



Where in the World?

ZOO EXHIBITS TO VISIT:
Big Cats, Bears, Penguins, Primates, Elephants, Africa, Alaska Tundra

Match the pictures of endangered animals to their homes on the map.

How This Curriculum Meets Oregon Benchmarks

The concepts important in teaching a unit on endangered species are well represented in the Oregon Standards. Using the Asian elephant as a primary focus, this curriculum aims to strengthen student skills in the following areas:

SCIENCE

Habitats

GRADE 3 - Describe a habitat and the organisms that live there.

GRADE 5 - Describe the relationship between characteristics of specific habitats and the organisms that live there.

GRADE 8 - Identify and describe the factors that influence or change the balance of populations in their environment.

Change

GRADE 3 - Identify examples of change.

GRADE 5 - Describe and explain different rates of change.

GRADE 8 - Identify and explain patterns of change as cycles and trends.

Systems

GRADE 3 - Recognize and diagram the parts of a system.

GRADE 5 - Identify interactions among parts of a system.

GRADE 8 - Identify a system's inputs and outputs. Explain the effects of changing a system's components.

The Work of Scientists

GRADE 5 - Identify different ways and places in which scientists work.

GRADE 8 - Describe how scientists study different fields and use different techniques for investigations.

MATHEMATICS

Data Tables & Charts

GRADE 3 - Collect organize, display, and describe simple data using charts, tables, number lines, bar graphs, and line graphs.

GRADE 5 - Collect, organize, display, and analyze data, using number lines, bar graphs, and line graphs, circle graphs, stem and leaf plots and histograms.

GRADE 8 - Create, interpret, and analyze charts, tables, and graphs to display data, draw conclusions, and solve problems.

SOCIAL STUDIES

Maps & Charts

GRADE 3 - View and draw simple maps and pictures to locate, describe, and show movement among places.

GRADE 5 - Examine and prepare maps, charts and other visual representations to locate places and interpret geographic information.

GRADE 8 - Read, interpret, and prepare maps, charts, graphs, and other visual representations to understand geographic relationships.

Events

GRADE 3 - Identify and compare different ways of looking at an event, issue or problem.

GRADE 5 - Identify and study two or more points of view on an event, issue or problem.

GRADE 8 - Examine a controversial event, issue, or problem from more than one perspective.

ENGLISH

Reading

GRADE 3 - Retell, summarize, or identify sequence of events, main ideas, facts and opinions in literary and informative selections.

GRADE 5 - Identify sequence of events, main ideas, facts, supporting details, and opinions in literary, informative, and practical selections.

GRADE 8 - Identify sequence of events, main ideas, facts, supporting details, and opinions in literary, informative, and practical selections.

Writing

GRADE 3 - Convey main ideas with some details.

GRADE 5 - Convey clear main ideas and supporting details in ways appropriate to topic, audience, and purpose.

GRADE 8 - Convey clear, focused main ideas supported by details and examples in ways appropriate to topic, audience, and purpose.

Communication

GRADE 3 - Convey main ideas with some supporting details appropriate to audience and purpose.

GRADE 5 - Convey clear, focused main ideas with supporting details appropriate to audience and purpose.

GRADE 8 - Convey clear, focused main ideas with accurate, relevant supporting details, including documentation of sources, appropriate to audience and purpose.

Resources

What can you do to help endangered animals?

Check out "101 Things You Can Do to Help Save Animals and Animal Habitats" at www.oregonzoo.org/ScienceResearch/whatyou.htm.

Learn More About Elephants:

www.wildheart.com/wwwlinks/main_links.html

www.boh.com.my/elephantnet

www.animalinfo.org/species/elepmaxi.htm

www.si.edu/elephant

www.panda.org/kids

Learn More About Wildlife Conservation:

www.oregonzoo.org. Check links for "Education" and "Conservation"

www.fws.gov (U.S. Fish and Wildlife Service)

www.abi.org (Association for Biodiversity Information)

www.audubon.org

www.greenpeace.org

www.tnc.org (The Nature Conservancy)

www.worldwildlife.org

Coloring/Activity Books for Kids

The U.S. Environmental Protection Agency offers a free booklet to help teach children about conservation - Endangered Species: Save Our Species Activity Book. For copies by mail, phone or online:

National Service Center for Environmental Publications, PO Box 42419, Cincinnati, OH 45242, Phone: 800-490-9198; www.epa.gov/kids.

NOTE: This is not an exhaustive list nor an endorsement of specific environmental and wildlife conservation organizations. Many other groups are also actively working to protect the Earth.

Also, since Web site addresses change over time, it's a good idea to verify the validity of these sites before giving them to your students.