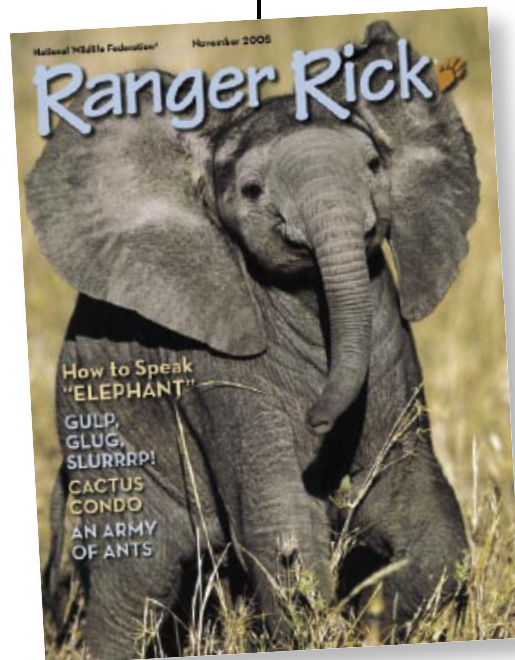


NOVEMBER 2005



EDUCATOR'S  
GUIDE



This guide is designed to complement the November 2005 issue of National Wildlife Federation's *Ranger Rick*® magazine.



NATIONAL  
WILDLIFE  
FEDERATION®  
[www.nwf.org](http://www.nwf.org)®



## Contents & Contacts

**2** Contents & Contacts

**3** Introduction

### ACTIVITIES

**4** ONE—Elephant Talk

**7** TWO—The Trouble with Sharks

**9** THREE—Home, Prickly Home

**12** FOUR—Ants on the Attack!

**14** Family Fun Page

**15** National Science Education  
Standards Charts

**Writer:** Kate Hofmann

**Editors:** Ellen Lambeth and Gerry Bishop

**Designer:** Jeffrey Hutman

#### **NWF Executive Staff**

Larry J. Schweiger, *President and Chief Executive Officer*  
Jaime Berman Matyas, *Executive Vice President and  
Chief Operating Officer*

#### **Education Leadership Staff**

Gerry Bishop, *Editorial Director, Children's Publications*  
Kevin Coyle, *Vice President, Education*

*For more information on NWF's education programs,  
visit [www.nwf.org/education](http://www.nwf.org/education)*

*For more information about this guide, or to offer  
comments, email Kate Hofmann at [chofmann@nwf.org](mailto:chofmann@nwf.org)*

**National Wildlife Federation**  
11100 Wildlife Center Drive  
Reston, VA 20190

1-800-822-9919  
[info@nwf.org](mailto:info@nwf.org)

[www.nwf.org](http://www.nwf.org)

*To subscribe to Ranger Rick® magazine and find other fun stuff for kids, visit  
[www.nwf.org/kids](http://www.nwf.org/kids)*

[nwf.org](http://www.nwf.org)



## Introduction

---

### Welcome to the *Ranger Rick Educator's Guide!*

This guide provides you with educational activities to bring **National Wildlife Federation's** *Ranger Rick*® magazine alive in the classroom and beyond. Using *Ranger Rick* feature articles as an entry point, this guide engages students ages 7-12 in exploring the natural world to build literacy, critical and creative thinking skills, and understanding across the disciplines. Activities are correlated with the National Science Education Standards and are designed to assist you in meeting required curriculum objectives.

### Can we have class outside today?

Find out how you can say "Yes!" at [www.nwf.org/schoolyardhabitats](http://www.nwf.org/schoolyardhabitats). The outdoor environment offers excellent opportunities for active, hands-on, interdisciplinary learning. You can enhance the learning experience by creating your own **Schoolyard Habitats™** or **Backyard Wildlife Habitat™** site. Revitalize an entire schoolyard, a garden, or even a rooftop, windowsill, or balcony by creating an outdoor classroom and sanctuary for birds, butterflies, and other wildlife.

### How To Use This Guide

Each section of the guide is matched with a specific *Ranger Rick* feature. After you read through the magazine, choose the stories and activities that complement your curriculum and that will interest your students. Each section includes:

- **Learning Links.** A summary of concepts presented in the article.
- **Discussion Questions and Writing Prompts.** Entry points to engage students in discussion or writing to develop literacy and thinking skills.
- **Resources.** Web sites and books where you can find further information.
- **Activity Ideas.** Quick investigations and extended projects to complement article topics.
- **Student Pages.** Ready-to-copy activity sheets for students.

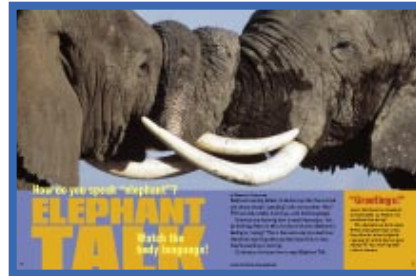
We have also provided a **Family Fun** activities page for you to copy and send home with students.

Subscribe to *Ranger Rick!*  
Special rate classroom subscriptions available.  
Details at [www.nwf.org/rangerrick](http://www.nwf.org/rangerrick)



## Elephant Talk

pages 4-9



### Learning Links:

**Like humans, elephants are part of a complex social system and communicate with one another in a number of ways. Students learn about elephant communication and compare it with communication among people.**

## DISCUSSION QUESTIONS & WRITING PROMPTS

### Pre-Reading Questions:

- When you talk to your friends, what clues help you figure out how they are feeling?
- Elephants are social animals that live together in groups. How do you think they communicate? What might they want to say to each other?

### Comprehension Check:

- This article lists four ways elephants talk to each other. What are they? Which one does the article focus on? (*sounds, smells, touching, **body language***)
- Name several feelings that elephants communicate through body language.
- Compare and contrast an elephant's senses and a human's senses.
- How do elephants communicate when they are separated by long distances?

### Critical and Creative Thinking Connections:

- Do humans use body language too? In the article, find an example of elephant body language that's similar to human body language, and an example that's different.
- How do you think scientists figure out what the elephants' actions mean? How would they know if their interpretations are right or wrong?
- Watching body language gives people some clues about what elephants think and feel. But what if you could really understand—and speak—elephant talk? Describe what you'd like to ask or tell an elephant.
- An elephant uses its sensitive, flexible trunk for touching, smelling, grasping, even showering and snorkeling! What do you think life would be like with a trunk?
- If you could add one body part from another animal to your own body—such as an elephant's trunk, a monkey's tail, a giraffe's neck, a rabbit's ears, or an owl's wings—what would you choose? Why?

## RESOURCES

[www.elephantvoices.org](http://www.elephantvoices.org) The Savanna Elephant Vocalization Project researches elephant communication at Amboseli National Park in Kenya.

[www.birds.cornell.edu/BRP/EleLP.html](http://www.birds.cornell.edu/BRP/EleLP.html) The Elephant Listening Project monitors African forest elephant populations by recording their low-pitched calls.

**Animal Talk** by Etta Kaner (Kids Can Press, 2002). An introduction to the many ways animals communicate through sight, sound, and smell.

**Secrets of Sound: Studying the Calls and Songs of Whales, Elephants, and Birds** by April Pulley Sayre (Houghton Mifflin, 2002). This fascinating look at bioacoustics—the study of animal sounds—focuses on the research of three scientists in the field.

## ACTIVITY IDEAS

### El-e-phant Dic-tion-ary

Have students use information from “Elephant Talk” to create a dictionary of elephant language. Provide a variety of dictionaries as examples, such as a standard English dictionary, a children’s picture dictionary, a sign language dictionary, and foreign language dictionaries. Students can then decide how to structure their dictionary. For a simpler activity, have them fill in the **Elephant Talk student page** that follows. Find many more examples of elephant body language and other information about elephant communication at [www.elephantvoices.org](http://www.elephantvoices.org).

#### TIME:

**30 Minutes**

#### MATERIALS:

**Sample dictionaries**

**Internet access**

**[Elephant Talk](#)**

**[student page](#)**

**Writing/art supplies**

### Elephants in Translation

After reading the article and browsing the Web site [www.elephantvoices.org](http://www.elephantvoices.org), have students act out elephant expressions for classmates to interpret. In small groups, they can make up scenarios involving several elephants. Other students can be “scientists” analyzing the behavior of the “elephants” to figure out what they are trying to communicate. Discuss whether it is easier to interpret humans’ or elephants’ expressions and body language and why that might be.

#### TIME:

**30 Minutes**

#### MATERIALS:

**Internet access**

### A World of Senses

In addition to visual and tactile cues, elephants use smells and sounds to communicate with each other. Special glands produce scent messages, and very low frequency sounds (below our range of hearing) travel over long distances. Investigate further with one of the following activities:

- Challenge students to find out more about elephant communication. Have them write an extension to the *Ranger Rick* article explaining how elephants communicate in one or more of these other “languages.”
- Discuss how senses shape our experience of the world. Share examples of other animals whose senses extend beyond our own. For instance, elephants hear infrasound while bats and dolphins use high-pitched sounds for echolocation; many migratory birds have a magnetic sense that works like a built-in compass; pit vipers sense heat (infrared radiation); honeybees see in the ultraviolet range. Have students investigate one of these animals and write a story about experiencing the world this way.

#### TIME:

**60 Minutes**

#### MATERIALS:

**Books/Internet**

**to research senses**

### Persuasion for Pachyderms

One reason scientists study elephant communication is to learn more about elephants’ complex social systems and interactions. This is an important part of understanding how humans can coexist with elephants and protect endangered populations. Ask students to formulate an opinion about elephant conservation. Then have them use their powers of persuasion to advocate for their position. Discuss potential audiences and formats, such as a poster, news article, TV or radio show, film documentary, community meeting, etc. You can find more information to share with students about threats to elephants (such as the ivory trade and competition with humans for land, food, and water) at [www.elephantvoices.org](http://www.elephantvoices.org).

#### TIME:

**60 Minutes**

#### MATERIALS:

**Books/Internet for research**



Now that you understand some “elephant talk,” translate these phrases for an elephant-to-human dictionary. For each phrase, draw or describe the body language elephants use to express that feeling. Then do the same for humans.

PHRASE	ELEPHANT	HUMAN
“Hello friend!”		
“I’m so annoyed.”		
“I’m really angry!”		
“Want to play?”		
“Don’t worry, I’m right here.”		



## The Trouble with Sharks

pages 16-19



### Learning Links:

**As Ranger Rick and his friends discover in this story, most sharks are not nearly as dangerous as many people believe—but some kinds are in a lot of danger from humans.**

## DISCUSSION QUESTIONS & WRITING PROMPTS

### Pre-Reading Questions:

- How would you complete each of these sentences?
  1. I like sharks *less than/about the same as/more than* most other animals.
  2. Most sharks *are/are not* very dangerous to humans.
  3. Sharks *do/do not* need protection from humans.
- Explain your opinions.

### Comprehension Check:

- Why did Rick and Sammy think Punky was a “goner”?
- Why didn't Blackie Blacktip eat Punky?
- According to Blackie, what problems do sharks face?
- What facts from the story support Blackie's statement that sharks are not “people-eating killers”?

### Critical and Creative Thinking Connections:

- Why do you think sharks have a bad reputation? What examples provided in the story could improve their reputation?
- After reading the story, answer the Pre-Reading Questions again. Did any of your answers change? Why?
- Great white sharks (and many other rare species) are protected by regulations that make it illegal to buy or sell wildlife parts. Do you think this is a good solution to the problem? What other solutions would you suggest?
- Many sharks are killed when they are caught by people trying to catch other fish. Animals caught accidentally are called *bycatch*, and can include dolphins, sea turtles, and many other species. What do you think people should do about this problem?

## RESOURCES

[www.seaworld.org/infobooks/Sharks&Rays/home.html](http://www.seaworld.org/infobooks/Sharks&Rays/home.html) Sea World's compilation of shark facts. A good reference for specific questions.

[www.fimnh.ufl.edu/fish/sharks/attacks/relarisk.htm](http://www.fimnh.ufl.edu/fish/sharks/attacks/relarisk.htm) The International Shark Attack file compares the relative risk of shark attacks with other hazards.

***Sharks: Challengers of the Deep*** by Mary Cerullo (Cobblehill Books, 1993). A complete reference book on sharks, illustrated with many excellent photographs.

***Sharks*** by Seymour Simon (Harper Trophy, 1996). An introduction to shark diversity and characteristics paired with fascinating photographs.

## ACTIVITY IDEAS

### The Truth About Sharks

Engage students in a discussion about the difference between myth and fact. As a class, generate a list of myths about sharks. Using the *Ranger Rick* story and information from additional resources, guide students in compiling facts to debunk these myths. When they have gathered as much information as they can, have them organize their findings in the form of a chart or fact sheet, pairing each myth with facts that disprove it.

**TIME:****30 Minutes****MATERIALS:****Books/Internet  
to research sharks**

### Give Sharks a Chance

The final paragraph of the story explains that the practice of finning (cutting fins off live sharks and throwing them back to die) has been banned by a number of countries. However, other countries have yet to agree to this protection. Have students practice their powers of persuasion by writing a letter to a country that hasn't banned finning, explaining sharks' declining populations and urging this government to join the countries protecting sharks.

**TIME:****30 Minutes****MATERIALS:****Writing materials**

### Sharks on Stage

Turn this month's "Adventures" into a play. Have students design a set, assign roles, and act out the story. Challenge them to find a creative way to communicate the truth about sharks, using information from the end of the comic as well as from additional resources. Encourage students to perform the play for others and after the show engage their audience in a discussion about feelings toward sharks.

**TIME:****1 Hour or more****MATERIALS:****A variety of items for  
props and costumes**

### Sharks: Pro and Con

People's negative feelings toward sharks can make it difficult for them to care about protecting these animals. Give students a chance to voice both positive and negative feelings about sharks in a debate. One side can argue for the value of sharks and the importance of protecting them, while the other argues against protection because of the threat they pose to humans. Alternatively, you could set this up as a mock trial, in which a shark stands accused of being a danger to society. Provide team members on each side with time to research sharks and frame their arguments. After the debate/trial, have students cast off their assigned roles and analyze the arguments objectively, separating facts from feelings and determining which side has a stronger case.

**TIME:****1 Hour or more****MATERIALS:****Books/Internet  
to research sharks**

# 3 Home, Prickly Home

pages 22-29



## Learning Links:

**The saguaro cactus plays a key role in the Sonoran Desert ecosystem, providing food and shelter for a host of desert residents, from woodpeckers and owls to geckos and ringtails.**

## DISCUSSION QUESTIONS & WRITING PROMPTS

### Pre-Reading Questions:

- What's a cactus? How is a cactus different from other kinds of plants?
- Take a look at the picture on pages 2-3 in *Ranger Rick* and read the caption. What desert creatures do you predict might live in or around a cactus?

### Comprehension Check:

- What are some of the desert animals that depend on the saguaro cactus?
- Does the cactus depend on other living things? (*Young cactuses grow in the shade of other plants. Birds, bees, and bats pollinate its flowers. Animals disperse its seeds.*)
- Name four things that the saguaro provides for animals. (*Food: nectar, pollen, fruit, seeds; homes and nests; protection from predators.*)
- What is left after a saguaro dies? Is it still useful to animals? (*The woody ribs and boots provide shelter for a variety of animals.*)

### Critical and Creative Thinking Connections:

- How do the photographs in this story make you feel? What mood do they set?
- Even without a "face" like the one on pages 2-3, saguaros resemble a gathering of tall, silent people. What do you think these Saguaro People might have to say? Write captions for some of the other cactuses in the photos.
- What does it mean when people say they work the day shift or the night shift? Why does the author of this story divide desert animals into the same categories, and which creatures belong to each shift?
- People and animals have found ways to use almost every part of the saguaro, dead or alive. Why do you think this cactus is such a valuable resource in the desert?

## RESOURCES

- [www.nps.gov/sagu/](http://www.nps.gov/sagu/) Browse the Web site of Arizona's Saguaro National Park for information about saguaros.
- Desert Giant: The World of the Saguaro Cactus** by Barbara Bash (Sierra Club Books, 1989). A vivid look at the saguaro and the animals and people that depend on it.
- Saguaro Cactus** by Paul and Shirley Berquist (Children's Press, 1997). Striking photographs complement information about the habitat saguaros provide.
- Cactus Hotel** by Brenda Guiberson (Henry Holt, 1993). Illustrations and text chronicle the life cycle of the saguaro and the desert animals that live in, on, and near it.
- A Desert Scrapbook: Dawn to Dusk in the Sonoran Desert** by Virginia Wright -Frierson (Simon and Schuster, 1996). Spend a day wandering in the desert with this watercolor artist and keen observer of nature.

## ACTIVITY IDEAS

### Life of a Cactus

Investigate the life cycle of the saguaro, from its beginnings as a seed and tiny seedling under a nurse tree to its stately many-branched adulthood, through flowering, fruiting, and hosting wildlife, and finally to the woody ribs and boots left behind when everything else is gone. Good references include [www.nps.gov/sagu/Saguaros/saguaro.htm](http://www.nps.gov/sagu/Saguaros/saguaro.htm) and *Cactus Hotel* by Brenda Guiberson. Have students act out each life cycle stage or illustrate the stages in a step-by-step drawing, comic strip, or flip book.

#### TIME:

**30 minutes**

#### MATERIALS:

**Books/ Internet to research saguaros**

### In the Cactus Garden

Visit a botanic garden, greenhouse, or nursery (or just borrow a variety of houseplants) to have students compare cactuses with other plants. What makes a cactus unique? Note the waxy skin, the thick, rounded shape, and the lack of leaves—all adaptations to prevent water loss. Use a magnifying glass to examine the spines (be careful: they're sharp!). Look for pleats that help the cactus expand and store water when it rains. Compare different kinds of cactuses. How are they similar and different? Discuss how these adaptations help cactuses survive in their dry desert habitat. For more information about cactus adaptations, see <http://helios.bto.ed.ac.uk/bto/desertecology/cacti.htm>. Want to grow your own cactus garden? See the May 2005 issue of *Ranger Rick* to learn how.

#### TIME:

**30 minutes**

#### MATERIALS:

**A variety of cactuses and other plants  
Magnifying glasses**

### Create a Cactus Condo

Saguaros are full of life. Here's an art project that will enable students to explore and understand a saguaro "condominium." On a large piece of posterboard or heavy paper, have them paint a saguaro. Help them cut small flaps in the cactus and glue or tape photos or their own illustrations of cactus-dwelling wildlife behind these flaps. (To make flaps, draw a square slightly smaller than the picture, cut out three sides, and fold back the fourth side as a hinge.) Students can then create a guide to accompany their poster identifying the animals and explaining how each one depends on the cactus.

#### TIME:

**60 minutes**

#### MATERIALS:

**Posterboard  
Paints & brushes  
Scissors  
Glue or tape  
Drawing paper & crayons  
Writing materials**

### Saguaro Stories

Review what students learned about wildlife living on and in saguaros. Explore the suggested resources to find more information on this subject. Then ask students to write a story set in a single cactus. Encourage them to describe the interactions of the residents. Who lives there? Do they all get along? What's important to each resident? Here are some story-starter ideas:

- Write minutes from a resident association meeting at the Cactus Condo. Who's in charge? What's on the agenda? How do various residents feel about the proposals and complaints discussed? How are they resolved?
- Invent a character who goes "door to door" and interacts with each resident in turn. Perhaps the character is searching for a lost child, conducting a census, collecting responses to a survey question, or running for office.

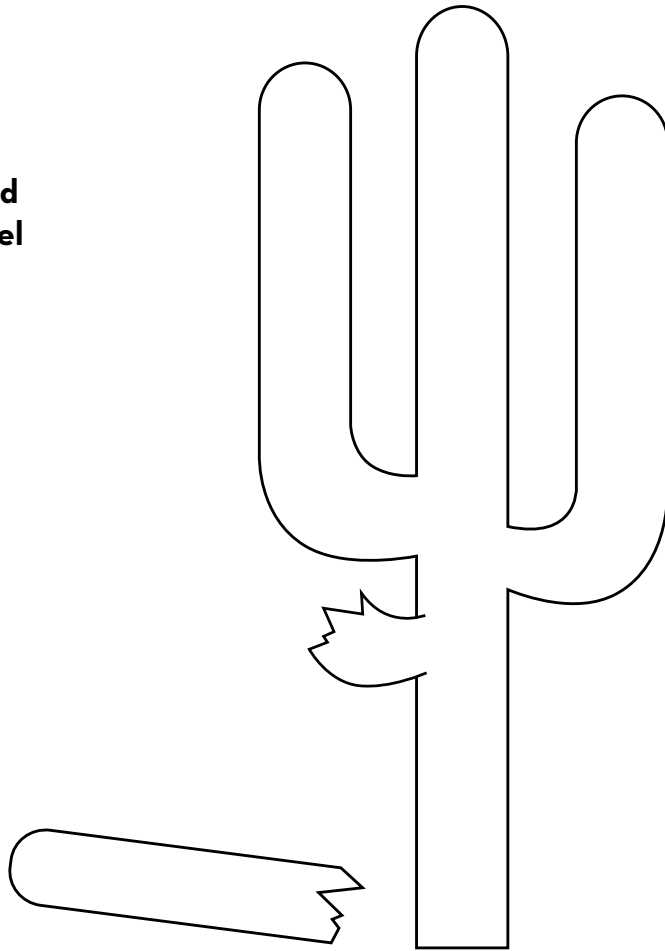
#### TIME:

**60 minutes**

#### MATERIALS:

**Books about desert wildlife  
Writing materials**

**1. A saguaro cactus provides shelter and food for many desert animals. On and around the cactus here, draw and label some of the wildlife that depends on saguaros.**



**2. What does a saguaro provide for animals? List at least five things from the story.**

---

---

---

---

---

**3. Lots of animals depend on saguaros to survive. Does a saguaro depend on any other living things? Explain your answer.**

---

---

---

---

---

## 4

## Ants on the Attack!

pages 32-37

**Learning Links:**

***An army ant swarm sweeps over the rainforest floor, engulfing and eating small animals while many other creatures flee or follow in its wake. This dramatic spectacle highlights the intricate balance of the rainforest ecosystem.***

## DISCUSSION QUESTIONS &amp; WRITING PROMPTS

**Pre-Reading Questions:**

- When do you work together with other people? What can you accomplish as a group that you couldn't accomplish on your own?
- What are some animals that live in groups? How do you think being part of a group helps them survive?

**Comprehension Check:**

- What do army ants eat? How do they get their food?
- Ants in an army ant colony have different jobs. What are these jobs?
- Describe some examples of cooperation in this article.
- What's a bivouac? Why do the ants move their bivouacs every few weeks?
- Why do other animals follow army ants when they're on the march?

**Critical and Creative Thinking Connections:**

- Which would you prefer to encounter: a shark or a swarm of army ants? Why?
- Why are these insects called army ants? Find some other words in the article that relate to military operations.
- Do you think one army ant could survive away from its colony? Why or why not?
- How are army ants similar to and different from other kinds of ants you've seen?
- Ants are tiny and elephants are enormous, but they're both social animals. What are some similarities and differences in the ways they communicate and interact with other members of their group?

## RESOURCES

***Army Ant Parade*** by April Pulley Sayre (Henry Holt and Company, 2002). This book whisks you away to the rainforest for a close encounter with an army ant swarm and the many other animals affected by it.

***Ants*** by Deborah Hodge (Kids Can Press, 2004). Learn more about the anatomy, life cycle, and behavior of ants of all kinds. Also includes several simple activities.

## ACTIVITY IDEAS

### Whose View?

Have students choose one of the photographs from "Ants on the Attack" and consider the scene. How many different living things are in the picture? How might each one describe what is going on? Ask students to write a description of the action from several different perspectives (for example, a soldier ant, a worker ant, a prey animal, or even the photographer). Alternatively, students could draw their own scenes based on information in the article and write about these. For example, they might choose the perspective of a beetle living in the midst of the ant colony or a bird following the ants. Invite students to share their work with one another, and discuss how the same scene can look very different depending on the eyes through which it's viewed.

#### TIME:

**30 Minutes**

#### MATERIALS:

**Writing materials**

**Art supplies**

### Ant Math

Read ***One Hundred Hungry Ants*** by Elinor Pinczes (Houghton Mifflin, 1999) aloud to students. In this lively tale, one hundred ants are marching in line to a picnic. The ants discover that they'll arrive faster if they divide into two lines of 50, then four lines of 25, and so on. This engaging (and subtle) division lesson could lead nicely into more ant math. Pose additional math problems (or have students write their own) and ask them to represent the answers visually with ant illustrations.

#### TIME:

**30 Minutes**

#### MATERIALS:

**"One Hundred Hungry Ants" by Elinor Pinczes**

### How ObservANT!

Encourage students to observe ants in their yard, schoolyard, or a nearby park. Brainstorm a list of questions to focus on, such as: Where are the ants coming from or going to? Can you find their home? Are any of them carrying something? What's the biggest thing they are moving? What kinds of things seem to interest them most? Are they interacting with each other? When students go outdoors, have them take a notebook and make notes and sketches of what they see. Afterward, ask them to compare the ants they observed with the army ants in the article. If it's too cold for ant activity in your area, students could make comparisons based on their past experiences with ants.

#### TIME:

**45 Minutes**

#### MATERIALS:

**Notebooks**

**Pencils**

**Outdoor area to observe ants**

### Rainforest Mural

Have students list all the animals mentioned in the article and then paint a class mural or poster of a rainforest scene. They should show a swarm of army ants as well as a variety of other animals and plants the ants encounter and affect. Take a trip to the library to look for pictures and information about rainforest life. Encourage students to make accurate drawings and share interesting facts they learn about the rainforest with one another.

#### TIME:

**1 Hour or more**

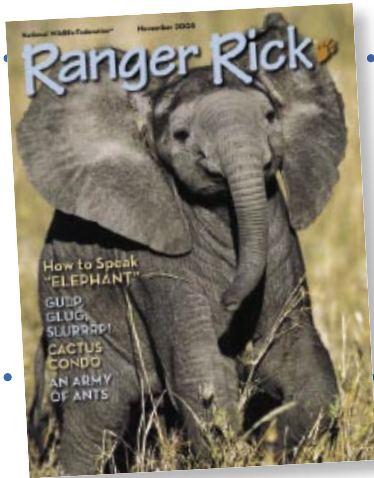
#### MATERIALS:

**Large sheet(s) of paper**

**Paints & brushes**



# Family Fun!



*Dear Parent or Guardian,  
Your child is reading Ranger Rick magazine in class. Each month, amazing photos, feature articles, and activities bring nature, wildlife, and conservation to life. Extend the learning and fun at home with these engaging family activities. Enjoy!*

## **ELEPHANT ART**

Try your hand at drawing elephants using the instructions in “Critter Doodles” on [page 10](#). Get the entire family involved and draw a whole herd! Can you make your elephants talk? Once you master the basic shape, add some of the body language from “Elephant Talk” on [pages 4-9](#). Can you come up with any other e-doodles?

## **CONVERSATION IN TRANSLATION**

If you could talk to elephants, what would you want to tell them? What questions would you ask? As a family, discuss each person’s answer to this question. Then, if you like, send in your ideas to *Ranger Rick*! See “Dear Ranger Rick” on [page 11](#).

## **TRASH TROUBLE**

After you chuckle at the silly pictures in “Gulp, Glug!” on [pages 13-15](#), discuss why these scenes aren’t so funny for the animals in them. How could these containers harm wildlife that finds them? What could your family do to help solve this problem?

## **DESERT DIARY**

After you read “Home, Prickly Home” on [pages 22-29](#), head to your library and check out some books about deserts. Would you like to visit a desert? Plan an imaginary desert trip—or even a real one, if you’re very lucky! What would you pack? What would you do there? What would you see? Fold several pieces of paper together to make a travel journal; then write and draw pictures of the adventures you imagine.

## **SEED CREATURES**

Now that the greens of summer have faded, go on a fall walk to look for pinecones, seeds, seedpods, nuts, and leaves. Collect some of these interesting treasures. Then make your own creatures like the ones in “Look Who’s Coming to Dinner” on [pages 30-31](#). We’d love to see your creations—send photos to *Ranger Rick*!

**For more interactive family fun, be sure to visit [www.nwf.org/kids](http://www.nwf.org/kids)**

# NATIONAL SCIENCE EDUCATION STANDARDS

	Elephants 1	Sharks 2	Saguaros 3	Ants 4

## Science as Inquiry

- K-8 Abilities necessary to do scientific inquiry
- K-8 Understandings about scientific inquiry

## Physical Science

- K-4 Properties of objects and materials
- K-4 Position and motion of objects
- K-4 Light, heat, electricity, and magnetism
- 5-8 Properties and changes of properties in matter
- 5-8 Motions and forces
- 5-8 Transfer of energy


## Life Science

- K-4 Characteristics of organisms
- K-4 Life cycles of organisms
- K-4 Organisms and environments
- 5-8 Structure and function in living systems
- 5-8 Reproduction and heredity
- 5-8 Regulation and behavior
- 5-8 Populations and ecosystems
- 5-8 Diversity and adaptations of organisms


## Earth & Space Science

- K-4 Properties of Earth materials
- K-4 Objects in the sky
- K-4 Changes in earth and sky
- 5-8 Structure of the Earth system
- 5-8 Earth's history
- 5-8 Earth in the solar system


## Science & Technology

- K-4 Abilities to distinguish between natural and human objects
- K-8 Abilities of technological design
- K-8 Understanding about science and technology


## Science in Personal and Social Perspectives

- K-8 Personal health
- K-4 Characteristics and changes in populations
- K-4 Types of resources
- K-4 Changes in environments
- K-4 Science and technology in local challenges
- 5-8 Populations, resources, and environments
- 5-8 Natural Hazards
- 5-8 Risks and benefits
- 5-8 Science and technology in society


## History and Nature of Science

- K-8 Science as a human endeavor
- 5-8 Nature of science
- 5-8 History of science
